The Institute of Technology and Business

in České Budějovice

Investment Decision Making

Study materials for the part-time study programme

Supervisor: Ing. Simona Hašková, Ph.D.

School of Expertness and Valuation

School of Expertness and Valuation

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Contents

1 Summary

Period	Year 2, 3rd term / 4th term
Course	**Investment Decision Making**
Language	English
Supervisor	Ing. Simona Hašková, Ph.D.
Supervisors department	School of Expertness and Valuation
Department	School of Expertness and Valuation
Lecture tutor	Ing. Simona Hašková, Ph.D.
Seminar tutor	Ing. Lucie Meixnerová, Ph.D.
Assessment type	Examination
Assessment note	Seminar attendance min. 70 %, test success min. 70 %
Extent and intensity	2/2
Credits	5
The goal of the course	The course deals with the investment process - purchase of a technological unit, movable assets, a set of movables, etc., i.e. the pre-investment phase of the project, the investment phase, the implementation phase and the post-investing phase of the project. The focus of the course is the pre-investment phase - the feasibility study and the evaluation of investment options.
Learning outcomes	Having finished the course successfully, the student will: 35.1 Student understands the life cycle of the investment. 35.2 Student plans to realize the investment. 35.3 Student understands the feasibility study. 35.4 Student evaluates investment options. 35.5 Student manages the risk management of investment projects. 35.6 Student compiles decision trees and scenarios. 35.7 Student performs simulations and sensitivity analysis. 35.8 Student organizes the pre-investment preparation of the project. 35.9 Student manages the realization of the investment. 35.10 Student manages the post-investment phase of the project.
Syllabus of the course	Lectures 1. Life Cycle of Investment (35.1) 2. Material Dimension of Investment Planning (35.2) 3. Economic Dimension of Investment Planning (35.2) 4. Feasibility Study (35.3) 5. Static Methods of Investment Valuation (35.4) 6. Dynamic Methods of Investment Valuation (35.4) 7. Risk Analysis of Investment Projects (35.5) 8. Risk Management of Investment Projects (35.5) 9. Decision Trees and Scenarios (35.6)

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11. Pre-investment Preparation of the Project (35.8)
12. Investment Management (35.9)
13. Post-investment Phase of the Project (35.10)

<u>Seminars</u>
1. Finding and Critical Assessment of Life Cycle Examples of an Investment (35.1)
2. Analysis of Examples of the Material Dimension of Investment Planning (35.2)
3. Analysis of Examples of the Economic Dimension of Investment Planning (35.2)
4. Feasibility Study (35.3)
5. Static Methods of Investment Valuation (35.4)
6. Dynamic Methods of Investment Valuation (35.4)
7. Risk Analysis of Investment Projects (35.5)
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<tr><td>Preparation for the final test</td><td>38</td><td>64</td></tr>
<tr><td>Attendance at tests</td><td>2</td><td>2</td></tr>
<tr><td>Total:</td><td>130</td><td>130</td></tr>
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Assessment Methods and Assessment Rate	Final test 70 % Mid-term test 30 %
Exam conditions	Participation in lectures and seminars. Earn at least 70% points from the mid-term and final test.
Teacher's information	Attendance in lessons is defined in a separate internal standard of ITB (Evidence of attendance of students at ITB). It is compulsory, except the lectures, for full-time students to attend 70 % lesson on the course in a semester.
Compulsory literature	BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X.
Recommended literature	ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. FOTR, J. and J. HNILICA, 2014. *Aplikovaná analýza rizika ve finančním managementu a investičním rozhodování*. 2., rev. ext. ed. Prague: Grada. ISBN 978-80-247-5104-7.
Webpages	https://www.ft.com/ https://www.wsj.com/
Publishing activities	Course supervisor and lecturer (Ing. Simona Hašková, Ph.D.) HAŠKOVÁ, S., 2016. Evaluation of Project Investments Based on Comprehensive Risk. In: *Proceedings of 34th international conference mathematical methods in economics (MME 2016)*. Liberec: Technical University Liberec, 260-264. ISBN 978-80-7494-296-9. BRŮŽKOVÁ, P. a S. HAŠKOVÁ, 2016. Přímé zahraniční investice: zhodnocení aktuálního stavu, budoucího potenciálu a možností podpory. In: *Jihočeský kraj v globální ekonomice*. Prague: Setoutbooks.cz, 153-161. ISBN 978-80-86277-82-0. HAŠKOVÁ, S., 2016. Rozhodování o výběru projektu v rámci komplexního rizika. *Auspicia*. **13**(2), 67-75. ISSN 2464-7217. MAROUŠEK, J., S. HAŠKOVÁ, R. ZEMAN a R. VANÍČKOVÁ, 2015. Managerial Preferences in Relation to Financial Indicators Regarding the Mitigation of Global Change. *Science and Engineering Ethics*, Dordrecht: Springer. **21**(1), 203-207. ISSN 1353-3452. HAŠKOVÁ, S., I. CHLÁDEK a P. KOLÁŘ, 2014. Contribution to the formulation of economically efficient subsidy policy in the area of small hydro power plants. *Littera Scripta*. **7**(1), 25-38. ISSN 1802-503X. Seminar tutor (Ing. Lucie Meixnerová, Ph.D.)

	MEIXNEROVÁ, L. and E. SIKOROVÁ, 2017. Intercompany comparison of selected financial indicators of the small and medium enterprises. *Hradec Economic Days 2017*. **7**(1), 620-628. ISSN 2464-6067. PAWLICZEK, A., L. MEIXNEROVÁ and D. NAVRÁTILOVÁ, 2015. Influential analysis of selected management tools on economic value added based on difference analysis method. *International Business Management*. **9**(6), 1249-1256. ISSN 1993-5250. MEIXNEROVÁ, L., M. MENŠÍK and V. PÁSZTO, 2017. Economic analysis and spatial arrangements of engineering SMEs performance in Olomouc region of Czech Republic. *Journal of International studies*. **10**(1), 135-145. ISSN 2071-8330. SIKOROVÁ, E., L. MEIXNEROVÁ, M. MENŠÍK and V. PÁSZTO, 2015. Descriptive Analysis and Spatial Projection of Performance among the Small and Middle Enterprises in the Olomouc Region in the Czech Republic. *Proceedia Economics and Finance*. **34**(-), 528-534. ISSN 2212-5671. MEIXNEROVÁ, L., 2015. Identification and Conduct of Cost Drivers of Variable Costs in the Short Term. *European Business and Management*. **1**(2), 19-24.
Topics of diploma theses	Ex-post analysis of the selected investment decision. Study on the feasibility of an investment project. Risk management of a specific investment project.

2 Preparation for Lectures

2.1 Life Cycle of Investment

Keywords

Investment, Investment Life Cycle, Product Life Cycle, Industry Life Cycle

The goals of the chapter

The aim of this chapter is to get acquainted with the life cycle of investment.

Learning outcomes

- 35.1 student understands the life cycle of the investment

Abstract

At the beginning of the study of investment decision-making issues, the student should make an overview of the information frame in which he/she will move. The important topics will be investment life cycle, investment planning, feasibility study, investment valuation, risks, support tools, investment phases.

To begin with, you need to get an overview in two areas: in the theoretical part it is necessary to consider literature; in the practical part, the student will become acquainted with the actual state of the art in the field of investment decision making.

There are many life cycles in the economy, some of them are connected to economic cycle (macroeconomic contractions and expansions), and some of them are independent.

Students need to know basic information about product lifecycle and its stages:

- 1st stage; Introduction: R&D, product launch
- 2nd stage; Growth: the fastest increasing sales
- 3rd stage; Maturity: the highest sales; high competition
- 4th stage; Decline: sales begin to fall

There are some options to extend the product lifecycle. Students must be able to critically evaluate these techniques. Examples of these options are advertising, price reduction, value addition, exploration of new markets, new packaging etc.

Another example of life cycles is industry life cycle with its stages. Students need to know it as well:

- 1st stage; Start-up: rapid growth
- 2nd stage; Consolidation: stable growth
- 3rd stage; Maturity: slowing growth
- 4th stage; Relative decline: minimal or negative growth

Based on the above-mentioned stages six groups of companies are recognized. Each student should be able to devise several examples for slow growers (slow grower companies), stalwarts, fast growers, cyclicals, turnarounds, asset plays.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 401-404)

Control Questions

1. What are the key activities in the introduction stage of product lifecycle?
2. What are the key activities in the growth stage of product lifecycle?
3. What are the key activities in the maturity stage of product lifecycle?
4. What are the key activities in the extending stage of product lifecycle?
5. What are the key activities in the decline stage of product lifecycle?
6. What are the key factors in the start-up stage of industry life cycle?
7. What are the key factors in the consolidation stage of industry life cycle?
8. What are the key factors in the maturity stage of industry life cycle?
9. What are the key factors in the relative decline of industry life cycle?
10. How would you describe six groups of companies in industry classification system based on industry life cycle?

Points of Interest

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Link to the Practical Part

3.1 Finding and Critical Assessment of Life Cycle Examples of an Investment

2.2 Material Dimension of Investment Planning

Keywords

Planning, Investment Planning, Material Dimension

The goals of the chapter

The aim of this chapter is to get acquainted with the plans of investment realization. Special attention is paid to material dimension of investment planning.

Learning Outcomes

- 35.2 student plans to realize the investment

Abstract

In this chapter, the student will learn to answer two basic questions of investment planning: "What?" (What to do?) and "How?" (How to do it?). There are other parameters like: "Who?", "When?", "Where?" etc.

The answer to the question "What to do?" is given by porous planning and setting of good goals. A well-defined goal needs to be SMART:

- S for specific
- M for measurable
- A for achievable or assignable
- R for relevant or realistic
- T for time-bound or time-related

Sometimes the method SMARTER is used:

- SMART+
- E for evaluated
- R for reevaluated

The answer to the question "How to do it?" is evaluated by many techniques. Their task is to illustrate specific activities, their links and provide a comprehensive overview of the project.

- Gantt chart is a simple yet effective tool for project management. It is made up of horizontal lines that show the time sequence of the individual steps of the project. A

list of all activities and an estimate of their timing is required for the Gantt chart creation.

- PERT (Program Evaluation and Review Technology) diagram is a representation of the logical sequence of activities. It is a more complex method suitable for more complex projects. A list of all activities and an estimate of their timing is required for the PERT diagram creation.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Control Questions

1. What questions are answered in the material dimension of investment planning?
2. What is the difference between specific and non-specific goal? Can you figure out examples?
3. What is the difference between measurable and unmeasurable goal? Can you figure out examples?
4. What is the difference between achievable and unachievable goal? Can you figure out examples?
5. What is the difference between relevant and irrelevant goal? Can you figure out examples?
6. What is the difference between time-bound and time-unbound goal?
7. How would you create a Gantt chart?
8. What information do you need for the Gantt chart creation?
9. How would you create a PERT diagram?
10. What information do you need for the PERT diagram creation?

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3.2 Analysis of Examples of the Material Dimension of Investment Planning

2.3 Economic Dimension of Investment Planning

Keywords

Planning, Investment Planning, Economic Dimension

The goals of the chapter

The aim of this chapter is to get acquainted with the plans of investment realization. Special attention is paid to economic dimension of investment planning.

Learning Outcomes

- 35.2 student plans to realize the investment

Abstract

In the previous chapter we discussed questions “What?”, “How?”, “Who?”, “When?”, “Where?” etc. There will be only one important question in this chapter “How much?”, because this is the only important question of the economic dimension of investment planning.

First, we need to define the economic environment and its aspects as the state of the business sector, competitive environment, government policy, legal rules, and the situation at the labor market, foreign trade conditions, and conditions at the monetary and capital markets.

An integral part of economic dimension is the following basic financial management principles. An example of these principles is principles of cash flow, net present value, time factor, risk, capital structure, capital market, and financial data.

The student must understand the organization of financial management within this chapter. The basic ones are obtaining funds, achieving optimal capital structure, financing current (short-term) assets, investing in fixed (long-term) assets, and allocation of profit, financial analysis, financial control, financial management and debt exploitation.

The aim of financial planning is the definition of strategic characteristics including the process to achieve the desired future state. This process has two steps: the first step is the determination of financial goals; the second step is the specification of techniques to

achieve these goals. Even financial goals need to follow SMART (or SMARTER) rules of goal settings as mentioned in the previous chapter.

Different variables need to be planned by different methods of financial planning due to the different attributes of these variables.

- Percentage of sales assumes that the value of a planned item depends on sales (for example revenues, costs, assets).
- Extrapolation of time series is applicable where no significant correlation between planned item and sales is.
- Calculation of additional data means the current calculation of known future values (for example depreciation, interest, amount of cash reserves).
- Expert techniques are used for assessment of appropriateness and feasibility of values.
- No planning is only for extraordinary items.

There are some basic elements of the financial plan. Important is to set financial goals and to analyze financial statements (analysis of balance sheet, analysis of cash-flow statement, analysis of income statement).

The student must understand the creation and structure of financial plan in detail. This applies to both its parts:

- The 1st part; Financial statements: pro forma balance sheet with planned future values, pro forma income statement with planned future values, pro forma cash flow statement with planned future values
- The 2nd part; Text section: description of the pricing strategy, research and development, improvement in production process and other relevant information

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Control Questions

1. What are the important aspects of economic environment?

2. What are the basic financial management principles?
3. How would you describe the planning method percentage of sales?
4. How would you describe the planning method extrapolation of time series?
5. How would you describe the planning method calculation of additional data?
6. How would you describe the planning method expert techniques?
7. What are SMART/SMARTER rules of financial goals settings?
8. What are the elements of a financial plan?
9. What is the content of the first part (financial statements) of a financial plan?
10. What is the content of the second part (text section) of a financial plan?

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3.3 Analysis of Examples of the Economic Dimension of Investment Planning

2.4 Feasibility Study

Keywords

Technical Feasibility, Legal Feasibility, Schedule Feasibility, Resource Feasibility, Financial Feasibility

The goals of the chapter

The aim of this chapter is to get acquainted with the feasibility study and all its parts.

Learning Outcomes

- 35.3 student understands the feasibility study

Abstract

The aim of this chapter is to learn about the feasibility study. It is a technical and economic study. It contains the description of the investment plan of the project from all aspects relevant for implementation. It is, therefore, an assessment of project feasibility and providing the basis for the decision. The text verifies the potential for meeting needs. It is necessary to process the project proposal into all operational details.

The feasibility study must consider many external factors. The student needs to know them all and needs to know how to analyze them all. These factors are political, strategic, technical, economic, financial, institutional, management, environmental, socio-cultural, gender aspects.

The content of feasibility study needs to evaluate two dimensions of investment:

- Material dimension answers the question “What to do?” It is done by well-defined goals with SMART/SMRTER method (specific goals, measurable goals, achievable goals, relevant goals and time-bound goals, evaluated goals, reevaluated goals). It answers the second import question “How to do it?” as well. It is done usually with the Gantt chart or PERT diagram.
- Economic dimension answers the question “How much it costs?” It is done by different methods like percentage of sales, extrapolation of time series, and calculation of additional data or expert techniques.

The usual structure of feasibility study is following

- Analysis of market
- Analysis of marketing strategy
- Analysis of inputs
- Analysis of localization
- Analysis of technology
- Analysis of human resources
- Analysis of management
- Analysis of risks
- Analysis of financial requirements
- Proposed plan implementation

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Control Questions

1. How would you define feasibility study?
2. What are the political factors of the feasibility study?
3. What are the strategic factors of the feasibility study?
4. What are the technical factors of the feasibility study?
5. What are the economic factors of the feasibility study?
6. What are the environmental factors of the feasibility study?
7. What are the socio-cultural factors of the feasibility study?
8. What are the gender factors of the feasibility study?
9. What is the usual content of the feasibility study?
10. What is the usual structure of the feasibility study?

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3.4 Feasibility Study

2.5 Static Methods of Investment Valuation

Keywords

Average Annual Return, Average Payback Period, Average Percentage Return, Payback Period

The goals of the chapter

The aim of this chapter is to get acquainted with the evaluation of investment options. Special attention is paid to static methods of investment valuation.

Learning Outcomes

- 35.4 student evaluates investment options

Abstract

After studying this chapter, the student must master the theoretical and practical aspects of static methods of investment valuation.

Average Annual Return calculates the sum of all cash flows (CF_i) associated with the investment (C_0), divided by the number of years of investment life (n).

$$\emptyset \text{ CF} = \frac{\sum_{i=1}^{n} CF_i}{n}.$$

Average Payback Period indicates at what time (t) should be repaid the initial investment (C_0) investment at the steady realization of cash flows based on Average Annual Return (Ø CF).

$$t = \frac{C_0}{\emptyset \text{ CF}}.$$

Average Percentage Return indicates what percentage (Ø r) of invested capital (C_0) will return annually at the steady realization of cash flows based on Average Annual Return (Ø CF).

$$\emptyset\, r = \frac{\emptyset\, CF}{C_0}.$$

Payback Period shows the number of years that are needed to offset the initial investment (C_0). The difference from Average payback period:

- Payback period calculates real cash flows
- Average payback period calculates average cash flows

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 1-159)

Control Questions

1. What are the advantages of static methods of investment valuation?
2. What are the disadvantages of static methods of investment valuation?
3. When is appropriate/inappropriate to use Average Annual Return?
4. How would you calculate Average Annual Return?
5. When is appropriate/inappropriate to use Average Payback Period?
6. How would you calculate Average Payback Period?
7. When is appropriate/inappropriate to use Average Percentage Return?
8. How would you calculate Average Percentage Return?
9. When is appropriate/inappropriate to use Payback Period?
10. How would you calculate Payback Period?

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3.5 Static Methods of Investment Valuation

2.6 Dynamic Methods of Investment Valuation

Keywords

Net Present Value, Internal Rate of Return, Profitability Index, Payback Period

The goals of the chapter

The aim of this chapter is to get acquainted with the evaluation of investment options. Special attention is paid to dynamic methods of investment valuation.

Learning Outcomes

- 35.4 student evaluates investment options

Abstract

After studying this chapter, the student must master the theoretical and practical aspects of dynamic methods of investment valuation.

Net Present Value (NPV) is the basis of all dynamic methods. It is the most widely used and best method because of the comprehensive result and clear decision criteria. Its main advantages are:

- Considering the time value of money
- Dependence only on estimated cash flows and interest rate (alternative costs of capital)
- It gives additive results (value of individual projects can add)
- Disadvantages

The main disadvantages of NPV are high sensitivity to the selected interest rate (alternative costs of capital).

$$NPV = -C_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + ... + \frac{CF_n}{(1+k)^n} = -C_0 + \sum_{i=1}^{n} \frac{CF_i}{(1+k)^i}.$$

Result interpretation: The higher NPV, the better investment profitability. Investment is acceptable if NPV > 0. If the NPV is negative, there will never be a return on invested capital.

Internal Rate of Return (IRR) shows the relative revenue that the project will provide during its life. It is the equivalent to the discount rate that results in NPV = 0.

$$0 = -C_0 + \sum_{i=1}^{n} \frac{CF_i}{(1+IRR)^i} .$$

Result interpretation: The higher NPV, the better investment profitability. Investment is acceptable if IRR > discount rate. If the IRR < discount rate, it is better to prefer risk-free investments (treasuries).

Profitability Index (PI) represents the balance of benefits and initial capital expenditure. Benefits are represented by the present value of expected future cash flows. The advantage is allowing comparison of large and small projects.

$$PI = \frac{\sum_{i=1}^{n} \frac{CF_i}{(1+k)^i}}{C_0} .$$

Result interpretation: The higher PI, the better investment profitability. Investment is acceptable if PI > 1. If the PI is between 0 and 1, there will never be a return on invested capital.

Payback Period (PP) calculates the period for which the revenue cash flow (CF_t) will amount equal to the initial capital expenditure (C_0).

Result interpretation: The shorter PP, the better investment profitability. Investment is acceptable if PP < lifetime. If the PP is longer then lifetime, there will never be a return on invested capital.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 1-159)

Control Questions

1. What are the advantages of dynamic methods of investment valuation?
2. What are the disadvantages of dynamic methods of investment valuation?
3. When is appropriate/inappropriate to use Net Present Value?
4. How would you calculate Net Present Value?
5. When is appropriate/inappropriate to use Internal Rate of Return?
6. How would you calculate Internal Rate of Return?
7. When is appropriate/inappropriate to use Profitability Index?
8. How would you calculate Profitability Index?
9. When is appropriate/inappropriate to use Payback Period?
10. How would you calculate Payback Period?

Points of Interest

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3.6 Dynamic Methods of Investment Valuation

2.7 Risk Analysis of Investment Projects

Keywords

Risk, Risk Analysis, Risk Catalog, Risk Map, Risk Elimination

The goals of the chapter

The aim of this chapter is to get acquainted with the risk and various possibilities of risk analysis of investment project.

Learning Outcomes

- 35.5 student manages the risk management of investment projects

Abstract

The student will learn about risk in this chapter. The most important topics are risk definition and risk evaluation factors. The student needs to know steps of risk analysis process, at least:

1. Identification of potential risks and their division into groups.
2. Evaluation of risks (probability and strength of negative impacts).
3. Creation of risk catalog and risk map.

Systematic classification of all real and potential risk is called risk catalog. It usually contains following parameters:

- Code or number
- Risk name
- Description of the risk
- Risk owner
- Impact
- Probability
- Significance (impact and probability combined)

Graphical representation of the risk catalog; two-dimensional matrix:

1. Impact of risk – Potential negative effects
    - Frequently ranked from 1 (very low impact) to 5 (extreme impact)
2. Probability of risk – Possibility of occurrence

- Frequently ranked from 1 (almost impossible) to 5 (almost certain)

All the knowledge needs to be completed by an acquaintance of selected possibilities of risk elimination such as risk avoidance, insurance, diversification, risk management and continuous risk monitoring, risk planning, transfer to other subjects, reallocation to more subjects and others.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 154-155)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 160-244)

Control Questions

1. How would you define risk?
2. What are the important criteria to evaluate in case of risk?
3. What is the suggested minimum of risk analysis process?
4. How would you describe risk catalog?
5. What parameters of risk would you include in risk catalog?
6. How would you describe risk map?
7. What does probability mean and what is its scale?
8. What does impact mean and what is its scale?
9. What does significance mean and what is its scale?
10. What are the possibilities of risk elimination?

Points of Interest

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Link to the Practical Part

3.7 Risk Analysis of Investment Projects

2.8 Risk Management of Investment Projects

Keywords

Risk, Risk Management, Risk Tolerance

The goals of the chapter

The aim of this chapter is to get acquainted with the risk management of investment projects.

Learning Outcomes

- 35.5 student manages the risk management of investment projects

Abstract

This chapter builds on the previous one with the topic risk. In the previous chapter, we learned about risk analysis of investment projects; risk analysis process (risk identification, risk evaluation, the creation of risk catalog and risk map). Risk catalog is a systematic classification of risks and risk map is a graphical representation of risks. We will build on this knowledge and discuss risk management of investment projects in this chapter. Important areas will be risks, risk management, and risk tolerance.

There are more possible ways how to measure risk within the decision-making process. Students need to study how portfolio risk is measured by variance (σ^2) and standard deviation (σ). The variance and the standard deviation is an expectation of how far a particular value will be from the mean (average, expected value). The subject of their studies will continue with market risk and its measure beta (β).

Related topics are diversification; reduction of portfolio risk; reduction of other risks; value additivity etc.

Another important topic of study is a magic triangle of investments. It shows us the relation between return and risk respectively the relation between time and risk. There are, of course, other factors that influence the magnitude of the risk, for example, costs of capital.

An important aspect of risk management is the person of the decision-maker, his personality, qualities, education, knowledge, and skills. Some people tend to accept more risk than the others. Based on risk tolerance we differentiate:

- Decision makers with risk tendency
- Decision makers with neutral relationship to risk
- Decision makers with risk aversion

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 154-155)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 160-244)

Control Questions

1. How is variance calculated? What input data do you need to calculate variance?
2. How is standard deviation calculated? What input data do you need to calculate standard deviation?
3. How is beta calculated? What input data do you need to beta?
4. How would you use diversification in relation to risk?
5. What is the relation between risk and return? Is it a direct or indirect proportion?
6. What is the relation between risk and liquidity? Is it a direct or indirect proportion?
7. What is your own risk tolerance?
8. How would you characterize decision-makers with risk tendency? What is the impact of this nature on the outcome of the decision-making process?
9. How would you characterize decision-makers with neutral relationship to risk? What is the impact of this nature on the outcome of the decision-making process?
10. How would you characterize decision-makers with risk aversion? What is the impact of this nature on the outcome of the decision-making process?

Points of Interest

https://www.ft.com/

https://www.wsj.com/

Link to the Practical Part

3.8 Risk Management of Investment Projects

2.9 Decision Trees and Scenarios

Keywords

Economic Forecasting, Investment Decision-making, Decision Trees, Scenarios

The goals of the chapter

The aim of this chapter is to get acquainted with different methods of investment decision-making, incl. decision trees and scenarios.

Learning Outcomes

- 35.6 student compiles decision trees and scenarios

Abstract

The student must know the support decision-making techniques. It is important for economic forecasting and investment decision-making. This chapter deals with decision trees and scenarios, the next chapter focuses on simulations and sensitivity analysis. Both chapters form one thematic unit.

Decision trees are a graphical support tool for decision making. Decision trees are usually drawn as a flowchart. Flowcharts serve as a graphical illustration of steps of decision algorithm. Nodes represent decision and probability moments, arrows represent possible consequences. There are several types of nodes in decision tree:

- Decision node (square) where the result is determined by the decision of the decision-maker.
- Probability node (circle) where the result is determined by the external environment and the probability of each option.
- End node (triangle) represents the final state at the end of the process. There is no decision or probability anymore.

The scenarios mean the potential future development of possible variants. Scenarios are used to value of the possible variants. The resulting value is the weighted average of potential impacts. We calculate the average of cash flows, profits, values or other financial indicators and we chose probabilities for weight.

There are different approaches to scenarios analysis. For example, it can be mentioned the best case / the worst case scenario analysis; multiple scenario analysis and more. The student must study the best/worst case scenarios analysis and the multiple scenario analysis theoretically and be able to apply both of them practically.

IT can be used for both techniques (decision trees and scenario analysis). The computer is able to make calculations, but it is necessary to enter the input data and their context correctly. This is the most important knowledge in the decision tree and the scenario analysis.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Control Questions

1. What does a decision node represent? What are the examples for displaying as decision node?
2. How do you recognize a decision node in a decision tree?
3. What does a probability node represent? What are the examples for displaying as probability node?
4. How do you recognize a probability node in a decision tree?
5. What does an end node represent? What are the examples for displaying as end node?
6. How do you recognize an end node in a decision tree?
7. What is the best use of the best/worst case scenario analysis? Can you find practical examples of appropriate and inappropriate use?
8. How would you use the best/worst case scenario analysis?
9. What is the best use of the multiple scenario analysis? Can you find practical examples of appropriate and inappropriate use?
10. How would you use the multiple scenario analysis?

Points of Interest

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Link to the Practical Part

3.9 Decision Trees and Scenarios

2.10 Simulation and Sensitivity Analysis

Keywords

Economic Forecasting, Investment Decision-making, Simulation, Sensitivity Analysis

The goals of the chapter

The aim of this chapter is to get acquainted with different methods of investment decision-making, incl. simulation and sensitivity analysis.

Learning Outcomes

- 35.7 student performs simulations and sensitivity analysis

Abstract

The larger thematic block of supporting decision-making techniques (which is important for economic forecasting and investment decision-making) is divided into two chapters. The previous chapter dealt with decision trees and scenarios. A decision tree is a flowchart as a type of a graphical support tool for decision making. It contains decision nodes, probability nodes, and end nodes. Scenarios are a description of possible future development. There are many approaches like best/worst case, multiple analyses, and others. This chapter is focused on simulation and sensitivity analysis.

Simulation is one method to examine the consequences of risk. It is used in decision making to better input estimation.

Simulation is an abstract (virtual) imitation of reality. It is mostly a model representation, which means that only the key features are displayed. The aim of the simulation is to gain insight into the functioning of the system, in this case, the system to be decided upon. The main advantage of the simulation is that it is possible to monitor and compare the change of outputs at various input conditions changes. When answering the question "What if...?" the simulation passes into the sensitivity analysis.

A special type of simulation is a simulation with constraints.

Sensitivity Analysis is commonly used in different areas of human activity. In business area it is usually used to identify cost drivers, to compare alternative investment

possibilities, to optimize the production process, to optimize resource allocation and to other activities. In using sensitivity analysis, we need to avoid following problems:

- Mutual correlation of variables.
- The future data not known, based only on the past.
- Subjective interpretation.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Control Questions

1. What is a simulation used for?
2. What are the advantages and disadvantages of simulation?
3. What is a simulation with constraints used for?
4. What are the advantages and disadvantages of simulation with constraints?
5. What does cost drivers mean and how to find them?
6. What is the alternative use of the sensitivity analysis?
7. What are the advantages and disadvantages of sensitivity analysis?
8. What is a mutual correlation? How would you avoid a mutual correlation of variables in sensitivity analysis?
9. What is a real example of missing future data? How would you avoid missing future data in sensitivity analysis?
10. What is a real example of subjective interpretation? How would you avoid subjective interpretation in sensitivity analysis?

Points of Interest

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Link to the Practical Part

3.10 Simulation and Sensitivity Analysis

2.11 Pre-investment Preparation of the Project

Keywords

Investment Project, Pre-investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the organization of the pre-investment preparation of the project.

Learning Outcomes

- 35.8 student organizes the pre-investment preparation of the project

Abstract

In the last three chapters, the knowledge overview of the whole issue of investment decision making will be completed. The issue of these three chapters is the management of the whole investment process including pre-investment phase, investment phase, and post-investment phase.

The pre-investment preparation phase of an investment project is the basis for the successful implementation and operation of investment projects. Its main objective is to identify the investment project and its variants, to choose the most suitable option, to decide on the location of the project, to propose a technical solution and to assess the economic aspect of the project. This phase is divided into three sub-phases:

- 1st sub-phase; Opportunity study: Based on the systematic monitoring and evaluation of business environment factors.
- 2nd sub-phase; Pre-feasibility study: Intermediate step between a brief study clarifying investment opportunities and a detailed technical and economic study.
- 3rd sub-phase; Feasibility study: Complete information as the basis for the final investment decision.

The student must realize that the focus is mainly on evaluating business opportunities, preparing an opportunity study, a pre-feasibility study and a feasibility study as a final assessment of the acceptability of the project.

The pre-investment outputs are the identification of possible projects (monitoring of the business environment, technical progress, and development) and preliminary selection (monitoring and evaluation of investment opportunities).

Finalization of the preparation phase is feasibility study – a technical and economic study which considers many external factors (technical, economic, political, institutional, environmental, socio-cultural and other aspects). It needs to evaluate material dimension and economic dimension of investment opportunities. Structure of feasibility study focuses on several analyses, such as market, inputs, technology, risk etc.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 597-753)

Control Questions

1. What is an opportunity study?
2. What information does the opportunity study contain?
3. What is a pre-feasibility study?
4. What information does the pre-feasibility study contain?
5. What is a feasibility study?
6. What information does the feasibility study contain?
7. What do you understand by the term identification of possible projects?
8. What do you understand by the term preliminary selection?
9. What are the important aspects of the material dimension of investment opportunity?
10. What are the important aspects of the economic dimension of investment opportunity?

Points of Interest

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Link to the Practical Part

3.11 Pre-investment Preparation of the Model Project

2.12 Investment Management

Keywords

Investment Project, Investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the management of the realization of the investment.

Learning Outcomes

- 35.9 student manages the realization of the investment

Abstract

The investment management phase of an investment project is the project's own implementation and realization. However, the successful implementation presupposes the elaboration of a quality plan and the own management of the implementation of the investment project. This phase involves the creation of a legal, financial and organizational basis for the implementation of the project, the acquisition of technology and the drawing up of project documentation, tender - supplier selection and selection, pre-production marketing activities and stock security.

The investment phase can still be divided into several activities that follow step by step:

- Creation of a legal, financial and organizational basis.
- Elaboration of project documentation.
- Acquisition of technology and its technical documentation.
- Selection of suppliers by tender
- Acquisition of assets.
- Ensuring of other pre-production activities.
- Acquiring and training of human resources.
- Testing and trial operation.

The student already knows the evaluation methods from the previous chapters:

- Static methods of investment valuation such as Average Annual Return; Average Payback Period; Average Percentage Return; Payback Period

- Dynamic methods of investment valuation such as Net Present Value; Internal Rate of Return; Profitability Index; Payback Period
- Methods of public investment valuation such as Cost-Minimizing Analysis; Cost-Effectiveness Analysis; Cost-Utility Analysis and Cost-Benefit Analysis

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 597-753)

Control Questions

1. How would you define investment management? What are common/different elements with other types of management?
2. What is the output of creation of a legal, financial and organizational basis? What are the important features of this output?
3. What is the output of elaboration of project documentation? What are the important features of this output?
4. What is the output of acquisition of technology and its technical documentation? What are the important features of this output?
5. What is the output of a selection of suppliers by tender? What are the important features of this output?
6. What is the output of acquisition of assets? What are the important features of this output?
7. What is the output of ensuring other pre-production activities? What are the important features of this output?
8. What is the output of acquiring and training of human resources? What are the important features of this output?
9. What is the output of testing and trial operation? What are the important features of this output?
10. What evaluation methods of investment projects do you know?

Points of Interest

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Link to the Practical Part

3.12 Model Investment Management

2.13 Post-investment Phase of the Project

Keywords

Investment Project, Post-investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the management of the post-investment phase of the project.

Learning Outcomes

- 35.10 student manages the post-investment phase of the project

Abstract

The post-investment operational phase is the third of the defined phases of the investment project, which lies in the actual operation and long-term sustainability of the project. There may also be a variety of issues such as inadequate technology, unskilled workers, lack of funding, and many others. After a certain period of operation of the investment, the so-called post-audit should be carried out, aiming to compare the originally planned assumptions set out in the technical and economic study with the actual situation at the time of the operation.

The problems of the operating phase concern the putting into operation of the project, respectively running traffic. Here, some difficulties arise, for example, from the failure of the technological process, manufacturing facilities, inadequate qualification of workers, etc. Most of these problems originate in the implementation phase of the project.

Sustainability of projects is their ability to maintain economic returns for a predefined period (in the extreme case for an indefinite period). This is primarily related to economic, but also to economic, legislative, cultural and other internal and external conditions.

Sustainability is the practical ability of the project. Sustainable development is then the goal of the whole business.

The student manages the complete investment decision making by learning the final lesson post-investment phase of the project. A graduate of this course knows all relevant information about investment life cycle, investment valuation methods, decision trees,

scenarios, simulation, and sensitivity. The graduate can plan the investment, create the feasibility study, analyze and manage risks, successfully handle the pre-investment preparation of the project, investment management, and post-investment phase of the project.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 597-753)

Control Questions

1. When does the post-investment phase of the project start? What are the first steps after the start?
2. When does the post-investment phase of the project end? What are the last steps before the end?
3. What are the main risks in this phase? How to deal with these risks?
4. What does the technology risk mean for this phase? How to deal with technology risk?
5. What does the human resources risk mean for this phase? How to deal with human resources risk?
6. What does the financial risk mean for this phase? How to deal with financial risk?
7. What does the post-audit mean?
8. What are the most common problems?
9. Where does the problems usually origin?
10. What is the best solution for common problems?

Points of Interest

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Link to the Practical Part

3.13 Post-investment Phase of the Model Project

3 Preparation for Seminars

3.1 Finding and Critical Assessment of Life Cycle Examples of an Investment

Keywords

Investment, Investment Life Cycle, Product Life Cycle, Industry Life Cycle

The goals of the chapter

The aim of this chapter is to get acquainted with the life cycle of investment.

Learning Outcomes

- 35.1 student understands the life cycle of the investment

Example, model task

1. **In what stages of product lifecycle are located different options for storing computer data?**

1st stage; Introduction:

- Cloud computing

2nd stage; Growth:

- Cloud data storage

3rd stage; Maturity:

- USB flash drive

4th stage; Decline:

- Floppy disc, compact disc

Assignment of Individual Work, Assignment of Task

2. Find relevant information and analyze life cycle of selected stock investment.
3. Find relevant information and analyze life cycle of selected commodity investment.
4. Find relevant information and analyze life cycle of selected production investment.
5. Find relevant information and analyze life cycle of selected trade investment.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 401-404)

3.2 Analysis of Examples of the Material Dimension of Investment Planning

Keywords

Planning, Investment Planning, Material Dimension

The goals of the chapter

The aim of this chapter is to get acquainted with the plans of investment realization. Special attention is paid to material dimension of investment planning.

Learning Outcomes

- 35.2 student plans to realize the investment

Example, model task

1. **Reformulate target "I will do some business on the internet." according to SMART rules.**

Specific:

- Opening e-shop with own paintings

Measurable:

- 100 visitors a day

Achievable:

- I own a shop with own paintings; I want to extend the range of potential customers; I have enough financial resources to start e-shop

Relevant:

- My shop assistant has enough time and knowledge to manage the e-shop; customers are interested in this service

Time-bound:

- This year

"I will open e-shop with own paintings because I want to extend the range of potential customers. I expect 100 visitors to the end of this year. My shop assistant will be e-shop manager."

Assignment of Individual Work, Assignment of Task

2. Find relevant information and analyze material dimension of selected stock investment.
3. Find relevant information and analyze material dimension of selected commodity investment.
4. Find relevant information and analyze material dimension of selected production investment.
5. Find relevant information and analyze material dimension of selected trade investment.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

3.3 Analysis of Examples of the Economic Dimension of Investment Planning

Keywords

Planning, Investment Planning, Economic Dimension

The goals of the chapter

The aim of this chapter is to get acquainted with the plans of investment realization. Special attention is paid to economic dimension of investment planning.

Learning Outcomes

- 35.2 student plans to realize the investment

Example, model task

1. **Reformulate financial target "We need to earn more money." according to SMART rules.**

Specific:

- We want to increase our profit.

Measurable:

- Expected profit 1 million Euros

Achievable:

- Last year's profit was 900 thousand Euros; Economic growth is expected

Relevant:

- In the past 5 years, we have shown a growth rate of at least 10%

Time-bound:

- This financial year

"We will increase our profit to 1 million Euros this year. Financial managers have provided evidence that our company and domestic economy are in a period of growth."

Assignment of Individual Work, Assignment of Task

2. Find relevant information and analyze economic dimension of selected stock investment.
3. Find relevant information and analyze economic dimension of selected commodity investment.
4. Find relevant information and analyze economic dimension of selected production investment.
5. Find relevant information and analyze economic dimension of selected trade investment.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

3.4 Feasibility Study

Keywords

Technical Feasibility, Legal Feasibility, Schedule Feasibility, Resource Feasibility, Financial Feasibility

The goals of the chapter

The aim of this chapter is to get acquainted with the feasibility study and all its parts.

Learning Outcomes

- 35.3 student understands the feasibility study

Example, model task

1. **What are the key components of a model feasibility study?**

Introductory information: Project name, investor

Evaluation of the project: Costs and benefits

Description of the project: Stages description

Market analysis: Demand, marketing

Project management: Human resources

Technical solution: Technology needed

Impact on the environment: Environment analysis

Securing of investment property: Buildings construction, machines purchase etc.

Working capital management: Current assets analysis

Financial plan: Financial analysis

Effectiveness and sustainability: Profit or loss

Risk analysis and risk management: Sensitivity analysis

Project timetable: Stages schedule

Final summary: Conclusion of project evaluation

Assignment of Individual Work, Assignment of Task

2. What are the key components of a selected real feasibility study?

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

3.5 Static Methods of Investment Valuation

Keywords

Average Annual Return, Average Payback Period, Average Percentage Return, Payback Period

The goals of the chapter

The aim of this chapter is to get acquainted with the evaluation of investment options. Special attention is paid to static methods of investment valuation.

Learning Outcomes

- 35.4 student evaluates investment options

Example, model task

1. **Calculate static methods for the initial investment, C_0 = 2 €; a lifetime of the investment, n = 3 years; and following cash flows:**

Tab. 1: Cash flows

Year, i	Initial investment, C_0	Cash Flow, CFi
0	2	
1		1
2		1
3		4
n = 3		**ΣCF = 6**

Source: Own processing

Average Annual Return

$$\emptyset \text{ CF} = \frac{\sum_{i=1}^{n} CF_i}{n}.$$

AAR = 6 / 3 = 2 €

Average Payback Period

$$t = \frac{C_0}{\emptyset \text{ CF}}.$$

APP = 2 / 2 = 1 year

Average Percentage Return

$$\emptyset \text{ r} = \frac{\emptyset \text{ CF}}{C_0}.$$

APR = 2 / 2 = 1 ~ 100 %

Payback Period

PP = 2 years

Assignment of Individual Work, Assignment of Task

2. Calculate static methods for the selected real investment.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 1-159)

3.6 Dynamic Methods of Investment Valuation

Keywords

Net Present Value, Internal Rate of Return, Profitability Index, Payback Period

The goals of the chapter

The aim of this chapter is to get acquainted with the evaluation of investment options. Special attention is paid to dynamic methods of investment valuation.

Learning Outcomes

- 35.4 student evaluates investment options

Example, model task

1. **Calculate dynamic methods for the initial investment, C_0 = 2 €; a lifetime of the investment, n = 3 years; and following cash flows:**

Tab. 2: Cash flows

Year, i	Initial investment, C_0	Cash Flow, CFi
0	2	
1		1
2		1
3		4
n = 3		**ΣCF = 6**

Source: Own processing

Interest rate

1. k = 0.5 ~ 50%
2. k = 0.7 ~ 70%

Tab. 3: Net Present Value

Year, i	Initial investment, C_0	Cash Flow, CFi	Present value, PV at k = 0.5	Present value, PV at k = 0.7
0	2			
1		1	1/1.5 = 0.67	1/1.7 = 0.59
2		1	1/2.25 = 0.44	1/2.89 = 0.35
3		4	4/3.37 = 1.19	4/4.91 = 0.81
n = 3		**ΣCF = 6**	**Σ(CF/1.5i) = 2.30**	**Σ(CF/1.7i) = 1.75**

Source: Own processing

$NPV_{0.5} = -2 + 2.30 = 0.30$ €

$NPV_{0.7} = -2 + 1.75 = -0.25$ €

Tab. 4: Internal Rate of Return

Year, i	Initial investment, C_0	Cash Flow, CFi	Present value, PV at k = 0.5	Present value, PV at k = 0.7
0	2			
1		1	0.67	0.59
2		1	0.44	0.35
3		4	1.19	0.81
n = 3		**ΣCF = 6**	**Σ(CF/1.5i) = 2.30**	**Σ(CF/1.7i) = 1.75**

Source: Own processing

$0 = -2 + \Sigma(CF/1.5971i)$

IRR = 0.5971 ~ 59.71 %

Tab. 5: Profitability Index

Year, i	Initial investment, C_0	Cash Flow, CFi	Present value, PV at k = 0.5	Present value, PV at k = 0.7
0	2			
1		1	0.67	0.59
2		1	0.44	0.35
3		4	1.19	0.81
n = 3		**ΣCF = 6**	**Σ(CF/1.5i) = 2.30**	**Σ(CF/1.7i) = 1.75**

Source: Own processing

$PI_{0.5} = 2.30/2 = 1.15$ ~ +15 %

$PI_{0.7}$ = 1.75/2 = 0.87 ~ -13 %

Tab. 6: Payback Period

Year, i	Initial investment, C_0	Cash Flow, CFi	Present value, PV at k = 0.5	Present value, PV at k = 0.7
0	2			
1		1	0.67	0.59
2		1	0.44	0.35
3		4	1.19	0.81
n = 3		**ΣCF = 6**	**Σ(CF/1.5i) = 2.30**	**Σ(CF/1.7i) = 1.75**

Source: Own processing

$PP_{0.5}$ = 2 years and 9 months

$PP_{0.7}$ = never

Assignment of Individual Work, Assignment of Task

2. Calculate dynamic methods for the selected real investment.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 1-159)

3.7 Risk Analysis of Investment Projects

Keywords

Risk, Risk Analysis, Risk Catalog, Risk Map, Risk Elimination

The goals of the chapter

The aim of this chapter is to get acquainted with the risk and various possibilities of risk analysis of investment project.

Learning Outcomes

- 35.5 student manages the risk management of investment projects

Example, model task

1. **Create sample risk catalog for an educational institution.**

Tab. 7: Sample risk catalog

Group	Code	Name	Description	Owner
Human factor risks	HFR01	Fraud	Fraud cause by employee or management	Head of Economic Department
	HFR02	Thefts	Unlawful acts, thefts, embezzlement	Head of Asset Management
	HFR03	Misuse of information	Misuse of information and personal data	Head of Personnel Department
	HFR04	Unethicality	Non-compliance with the ethical code	Head of Personnel Department
	…	…	…	…
Financial risks	FR01	Budgeting	Insufficient financial planning and budgeting	Head of Economic Department
	FR02	Inventorying	Incomplete and inaccurate inventory evidence	Head of Economic Department
	…	…	…	…

Group	Code	Name	Description	Owner
Information technology risks	ITR01	Software	Insufficient software equipment	Head of IT Department
	ITR02	Hardware	Insufficient hardware equipment	Head of IT Department
	…	…	…	…
Operational risks	OPR	…	…	…
Organizational risks	ORR	…	…	…
Legal risks	LR	…	…	…
Management risks	MR	…	…	…
…	…	…	…	…

Source: Own processing

Assignment of Individual Work, Assignment of Task

2. Create risk map for an educational institution based on sample risk catalog (Example, model task).
3. Create sample risk catalog and risk map for a manufacturing company.
4. Create sample risk catalog and risk map for a non-profit organization.
5. Create sample risk catalog and risk map for a public administration office.
6. Compare created risk maps (educational institution, manufacturing company, non-profit organization and public administration office) and discuss differences.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 154-155)

Recommended Literature

ALLEN, R. A., S. C. BREALEY a F. MYERS, 2014. *Principles of corporate finance*. 11th ed. New York: NY: McGraw-Hill Education. ISBN 978-0-07-715156-0. (pp. 160-244)

3.8 Risk Management of Investment Projects

Keywords

Risk, Risk Management, Risk Tolerance

The goals of the chapter

The aim of this chapter is to get acquainted with the risk management of investment projects.

Learning Outcomes

- 35.5 student manages the risk management of investment projects

Example, model task

1. **Use the expected value of the distribution to decide. A company sells ice-cream. Profit of each ice-cream is 1€ (costs 1.50; revenues 2.50). The company can decide how many portions to produce. The company is depended on weather conditions.**

Tab. 8: Profit as the result of a combination of demand and supply (production)

		Demand			Expected v. S(E)
		Stormy 1 (10%)	Cloudy 10 (30%)	Sunny 100 (60%)	
Production	Small 1	1,00	1,00	1,00	1,00
	Medium 10	-12,50	10,00	10,00	7,75
	Large 100	-147,50	-125,00	100,00	7,75

Source: Own processing

The highest expected value of profit is in case of medium or large production.

Assignment of Individual Work, Assignment of Task

2. Use the expected value and variance of the distribution to decide.

3. Use the expected utility to decide.
4. Use the maximax criterion to decide.
5. Use the Wald's maximin criterion to decide.
6. Use the Hurwicz's criterion to decide.
7. Use the Savage's criterion to decide.
8. Use the Laplace's insufficient reason criterion to decide.

Literature

Compulsory Literature

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BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 154-155)

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3.9 Decision Trees and Scenarios

Keywords

Economic Forecasting, Investment Decision-making, Decision Trees, Scenarios

The goals of the chapter

The aim of this chapter is to get acquainted with different methods of investment decision-making, incl. decision trees and scenarios.

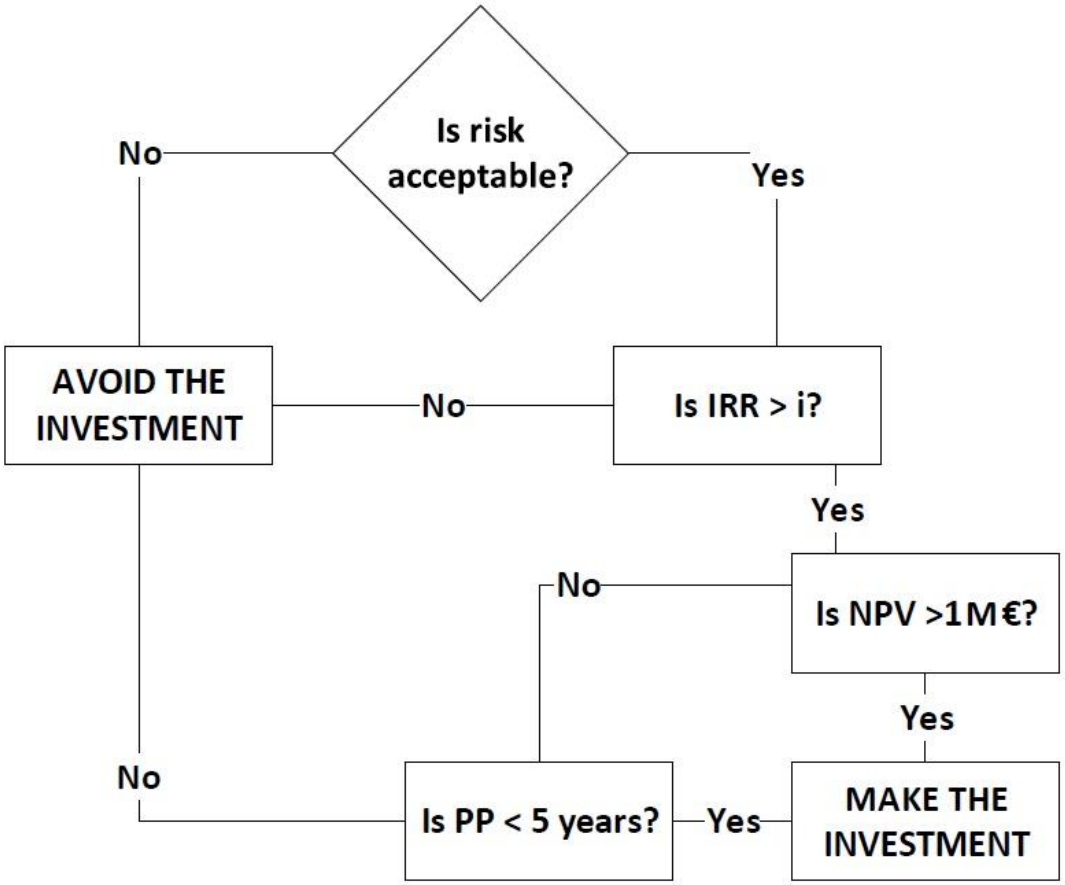
Learning Outcomes

- 35.6 student compiles decision trees and scenarios

Example, model task

1. **Create a decision tree for an investment process, where you need to choose investments with acceptable risk and Internal Rate of Return (IRR) greater than the interest rate. Payback Period (PP) of the investment should be shorter than 5 years or Net Present Value (NPV) should be higher than 5 million Euros.**

Fig. 1: Decision Tree



Source: Own processing

Assignment of Individual Work, Assignment of Task

2. Create a decision tree for an investment process, where you need to choose investments with acceptable risk, IRR greater than 5%, NPV higher than 1 million Euros and PP shorter than 20 years.
3. Create a decision tree for an investment process with parameters you consider to be important.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 1-765)

3.10 Simulation and Sensitivity Analysis

Keywords

Economic Forecasting, Investment Decision-making, Simulation, Sensitivity Analysis

The goals of the chapter

The aim of this chapter is to get acquainted with different methods of investment decision-making, incl. simulation and sensitivity analysis.

Learning Outcomes

- 35.7 student performs simulations and sensitivity analysis

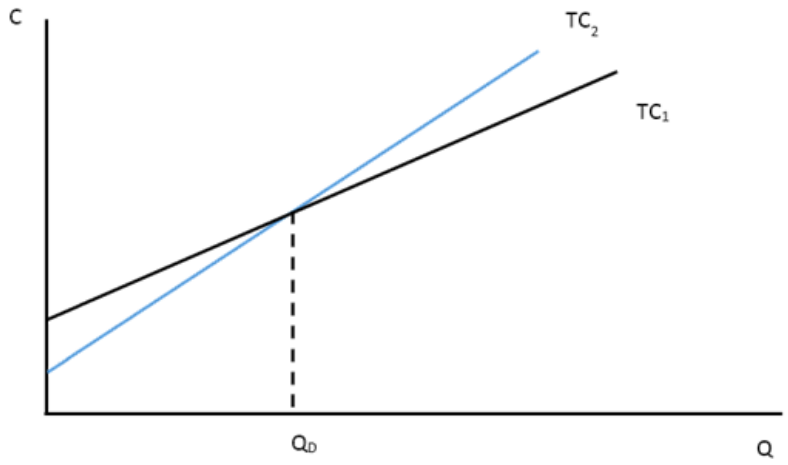
Example, model task

1. **The company has a choice of two technological options. Variant 1 costs are as follows: fixed costs (FC) 1000$ and average variable costs (AVC) 10$/pc. Variant 2 costs are as follows: fixed costs (FC) 500$ and average variable costs (AVC) 20$/pc. What is the critical quantity (Q_D), where the minimal costs of variants 1 and 2 are changing?**

$TC_1 = 1000 + 10\ Q$

$TC_2 = 500 + 20\ Q$

Fig. 2: Sensitivity Analysis



Source: Own processing

For Q_D, equality applies $TC_1 = TC_2$

$1000 + 10\ Q_D = 500 + 20\ Q_D$

$500 = 10\ Q_D$

$\underline{Q_D = 50 \text{ pcs}}$

- The 2nd variant is cheaper in case of quantity smaller than 50. For example, Q = 40 pcs.
    - $TC_1 = 1000 + 10\ Q = 1000 + 10 * 40 = \underline{1400\$}$
    - $TC_2 = 500 + 20\ Q = 500 + 20 * 40 = \underline{1300\$}$
- The 1st variant is cheaper in case of quantity bigger than 50. For example, Q = 60 pcs.
    - $TC_1 = 1000 + 10\ Q = 1000 + 10 * 60 = \underline{1600\$}$
    - $TC_2 = 500 + 20\ Q = 500 + 20 * 60 = \underline{1700\$}$

Assignment of Individual Work, Assignment of Task

2. You have a choice of two investments. Investment 1 costs are FC=100, AVC=10. Investment 2 costs are: FC=1000, AVC=1. What is the critical quantity (Q_D)?
3. You have a choice of two investments. Investment 1 costs are FC=1000, AVC=10. Investment 2 costs are: FC=100, AVC=1. What is the critical quantity (Q_D)? Explain the result and interpret it.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

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3.11 Pre-investment Preparation of the Model Project

Keywords

Investment Project, Pre-investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the organization of the pre-investment preparation of the project.

Learning Outcomes

- 35.8 student organizes the pre-investment preparation of the project

Example, model task

1. **Describe pre-investment preparation of a model project – construction of a new production hall.**

The company should determine the strategy of the process and the objective of the project. In our case, it would be an extension of the existing space (extension of the offered range). The company must choose a suitable location for the new hall - this is also the case for a suitable building site. It is necessary to consider on which land the building is to be located. Another important factor is how to organize and manage the project. For example, the construction manager, the person responsible for the construction and planning is determined.

Then determine the way of financing. We must consider both options - whether to build a hall from our own financial resources or whether to borrow foreign capital - to build a bank loan. In addition, we should process the documentation - it is, for example, a study of a building (the architect works - these are floor plans, cuts, views, etc.). Documentation for a Territorial Decision is a permit for the location of the building. The client is the investor. The documentation covers, for example, the layout of the areas, the layout of the utility networks, the design of the number of parking places, etc. In this stage the goal of the project (building of the hall) is defined, preliminary economic and technical evaluation is carried out. It is necessary to estimate the acquisition costs.

In next step, this is a more sophisticated version of the previous stage, where the architectural and constructional technical solutions are specified, the economic consequences of this solution, the way of financing, organization and management of the project. The aim of this stage is to elaborate the relevant project documentation of the construction, to obtain the building permit, to select the most inconvenient supplier of the building and to conclude the contract with him and to allow the construction to commence.

The main activity at this stage is to clarify the procedure. Define the main terms of construction - how long should be done. At the same time, the term in which the entire construction is to be completed is determined. The way of financing must be determined - the determination of the specific financing method, the financing of foreign sources has already been decided on a bank or a specific interest. Also, the payment period and the number of repayments are determined.

Document processing is also in the next phase at the stage when the building permit documentation is already submitted to the application for a building permit. This documentation is more detailed than the documentation for the Territorial Decision. It already contains a material and technical solution. Documentation for the execution of the construction is more detailed than the documentation for the building permit. Includes detailed design of construction and building elements, with more detail. For example, there are detailed specifications for the filling of holes, plumbing, locksmith and joinery and other construction details. The meaning of the documentation is that it is possible to realize the construction.

Further, the budget costs of the construction are decided. The designer processes a control budget that serves as a basis for comparison of bid prices from suppliers. This comparison is dependent on the choice of the most appropriate contractor. The investor selects the most suitable supplier in the form of a tender. The final step is the conclusion of a contract for the work.

Assignment of Individual Work, Assignment of Task

2. Describe pre-investment preparation of a model project – buying a new machine.
3. Describe pre-investment preparation of a model project – purchasing know-how.
4. Describe pre-investment preparation of a model project – expanding the portfolio of financial investments.

Literature

Compulsory Literature

BASU, A. et al., 2013. *Principles of Investments*. [s. l.]: McGraw-Hill. ISBN 9780071012386. (pp. 1-571)

BODIE, Z. et al., 2013. *Essentials of Investments*. [s. l.]: McGraw-Hill. ISBN 007714824X. (pp. 597-753)

3.12 Model Investment Management

Keywords

Investment Project, Investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the management of the realization of the investment.

Learning Outcomes

- 35.9 student manages the realization of the investment

Example, model task

1. **Describe investment management of a model project – construction of a new production hall.**

This stage begins with handing over and taking over the building site between our company (investor) and the supplier. The goal of this stage is to execute the construction according to the concluded contract at a fixed price, at the set time and the required quality. The winner of the tender runs the construction work either by his own resources or can hire some subcontractors for some works.

Activities at this stage include handover and takeover of the site. The conditions for handing over and taking over the site are agreed in the Works Agreement. Another essential activity is to check the quality and progress of construction work - everything must be done according to pre-arranged conditions, in the right way and at the right time.

An advantage is keeping a building log. The building log contains a daily record of events on the site, from the start of construction to completion. After construction, the handing over and taking over of the building works - it is checked whether everything is in order and according to the agreed conditions. In the event of problems, defects and defects will be removed.

The documentation is further elaborated. The implementation documentation is processed by the contractor. Changes that occur during the construction are being processed here. In the case of minor changes, they are incorporated into the Building Authorization

Documentation. In practice, most of the implementation documentation is not processed because it is based on the already prepared Actual documentation for the execution of the construction.

Upon completion of the designer's construction according to the building log and the project supplements processed during the execution of the construction and based on changes caused by the requirements of the contractor or investor, the Documentation of the actual execution of the construction will be prepared. This project then serves as the basis for approval for approval.

The actual operation of the construction is in progress. The construction project is terminated and the warranty period, which was negotiated in the Contract for Work, begins to run.

Each of the stages of the construction project is important, the division into stages allows for better control over the whole project, for example, monitoring the main activities (indicators) of the project. The stages follow. Successful completion of one stage is needed to start another stage. In practice, the individual stages may overlap, so we should not underestimate their interdependence.

Assignment of Individual Work, Assignment of Task

2. Describe investment management of a model project – buying a new machine.
3. Describe investment management of a model project – purchasing know-how.
4. Describe investment management of a model project – expanding the portfolio of financial investments.

Literature

Compulsory Literature

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3.13 Post-investment Phase of the Model Project

Keywords

Investment Project, Post-investment Phase

The goals of the chapter

The aim of this chapter is to get acquainted with the management of the post-investment phase of the project.

Learning Outcomes

- 35.10 student manages the post-investment phase of the project

Example, model task

1. **Describe post-investment phase of a model project – construction of a new production hall.**

This phase follows a certain time span after the completion of the investment project - after the construction of the hall.

The main objective is to find the various factors that have led to the deviation of the results of the investment from the planned ones. This may be, for example, poor construction of structures, necessary reconstruction soon from construction, etc. Therefore, the aim is not to evaluate the rate of success or failure of building construction but to determine the causes that caused unexpected problems.

The post-investment phase can then be the learning process, the results of which are reflected in the success of future investment projects and hence in the future prosperity of the enterprise.

There is a financial settlement of the obligations - the construction must be paid for. The construction is put into operation and the construction is evaluated. Other costs are just maintenance and minor repairs. Another cost may be the cost of modernization. At this stage, the company also compares the expenses it has incurred for the building of the hall and the revenues that come from this construction.

Additionally, the company evaluates the effectiveness of the investment. The method that is appropriate to use is the return on investment method. This method sums up all the costs

incurred for the construction of the hall (material costs, energy costs, labor costs, and cost of land). These costs will gradually accrue the proceeds from the investment until the amount exceeds the negative threshold. The return on investment should be as short as possible. In the future, the company can also count on revenue from any sale of a building.
Investments in construction projects are often evaluated only based on projected energy savings. But this effect is not the only positive impact. Finally, it is also necessary to include a subjective perception of increased user comfort, a change in the aesthetic value of the object and other, often neglected, consequences of the project implementation for the accuracy of calculations.

Assignment of Individual Work, Assignment of Task

2. Describe post-investment phase of a model project – buying a new machine.
3. Describe post-investment phase of a model project – purchasing know-how.
4. Describe post-investment phase of a model project – expanding the portfolio of financial investments.

Literature

Compulsory Literature

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