UNIVERSITY OF ECONOMICS IN BRATISLAVA

FACULTY OF NATIONAL ECONOMY

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EVALUATION OF THE EFFECTIVENESS OF THE FOREIGN INVESTMENT PROJECT

Diploma Thesis

2018 **Roman Martynenko**

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Diploma Thesis

Study Program: International Finance

Field of Study: Finance, Banking and Investment

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Thesis Supervisor: assoc. doc. Ing. Katarína Belanová, PhD

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Announcement

I confirm, that all literature sources which I used in writing of this thesis are listed in the part “Bibliography” at the end of this document.

ABSTRACT

MARTYNENKO, Roman: Evaluation of the effectiveness of foreign investment project – University of Economics in Bratislava. Faculty of National Economy; Department of Finance. – Thesis Supervisor: assoc. Doc. Ing. Katarina Belanova, PhD. – Bratislava: FNE, 2018, Number of pages: 79.

The aim of the thesis is to evaluate the real investment project of a company from the economic point of view as well as from the aspect of risks and uncertainties According to the summary of the theoretical knowledge of the efficiency of corporate investments.

Thesis is divided into 3 chapters. It consists of 11 graphs and 8 tables.

The first chapter summarizes the theoretical knowledge about investment process from home and abroad. It offers the key indicators which help to evaluate the effectiveness of the investment project. In addition, we will get acquainted with the principles of economic risk analysis.

The second chapter specify goals, methods and methodology of thesis.

The third chapter brings the detailed analysis of the effectiveness of the foreign investment project by using real data from the company located in Czech Republic.

The main conclusion is: all the characteristics of the aforementioned methods for evaluating the effectiveness of investment projects, it is easy to conclude that each of them has both positive and negative sides, and that each of them has its own sphere of application and most accurately describes the characteristic for which analysis it was withdrawn. Thus, the most reliable results of the evaluation will provide a comprehensive analysis of the project in question, considering its specific features.

Key words: investment process, discounted cash flow, internal rate of return, risk.

ABSTRAKT

MARTYNENKO, Roman: Vyhodnotenie efektívnosti zahraničného investičného projektu – Ekonomická univerzita v Bratislave, Národohospodárska fakulta, katedra financií. Školiteľ práce: assoc. Doc. Ing. Katarína Belanová, PhD. – Bratislava: NHF, 2018, Počet strán: 79.

Zameranie tejto práce je vyhodnotiť skutočný investičný projekt spoločnosti z ekonomického pohľadu ako aj z pohľadu rizík a neistôt na základe zhrnutia teoretických vedomostí efektívnosti firemných investícií.

Práca je rozdelená do 3 kapitol, pozostáva z 11 grafov a 8 tabuliek.

Prvá kapitola sumarizuje teoretické vedomosti o investičných projektoch v domácom a zahraničnom prostredí. Ponúka kľúčové indikátory, ktoré pomáhajú vyhodnotiť efektivitu investičného projektu. Okrem iného, kapitola oboznamuje s princípmi ekonomického rizika a analýzy.

Druhá kapitola špecifikuje ciele, metódy a metodológiu práce.

Tretia kapitola prináša detailnú analýzu efektivity zahraničného investičného projektu vďaka využitiu reálnych dát spoločnosti sídliacej v Českej Republike.

Hlavná konklúzia je: na základe všetkých charakteristík a spomenutých metód vyhodnocovania efektivity investičných projektov je možné zhodnotiť, že všetky z nich majú ako pozitívne tak aj negatívne stránky a každý z nich má svoju vlastnú sféru aplikácie a čo najpresnejšie opisuje charakteristiku, pre ktorú bol určený. Teda, najspoľahlivejšie výsledky zhodnotenia poskytujú komplexnú analýzu spomínaného projektu, berúc do úvahy jeho špecifické znaky.

Kľúčové slová: investičný proces, diskontný cash flow, interná miera návratnosti, riziko

Contents

Introduction

Nowadays, investment is a major determinant of the development of market economy, as well as the actual business growth. The investment process is not single-phase or simple. It contains several pre-investment decisions that are influenced by various factors as well as the resulting efficiency of the investment itself. Our project is focused on the company "Clear Energy" which Alpha Investment bought in 2007. "Clear Energy" is located in Czech Republic and it is an energy-machinery producer of generators and their parts for wind and water power units. The subject of our work will be to assess the economic efficiency of the already realized investment as well as analyze it riskiness.

In order to meet the goal of our work, it is necessary to mention the theoretical knowledge of the subject. For general knowledge, we will characterize the concept of investment, we will point to the investment motives as well as to the investment process. In the next step we will pay attention to the evaluation of the effectiveness of corporate investment itself. Efficiency is a measure that can be measured. We will mention the possibilities of measuring economic efficiency through static and dynamic methods. It is also important to note that each investment has some degree of risk. We define the risk, the ways of measuring it or the dependence of cash flows on changing the various factors.

In the practical part of the thesis we will analyze the project's data before investing excision and project's effectiveness before it was released. We will compute all necessary indicators which will help us to evaluate effectiveness properly. In addition, we are going to point into the existence of possible risks associated with the investment process. In assessing the size of the risk, we will consider sensitivity analysis and case scenarios. For the more accurate forecast of the discounted cash flow we will provide Monte Carlo simulation.

I Summary of the theoretical knowledge from home and abroad

1.1. Investment process

In the system of reproduction, regardless of its social form, investment plays a major role in the renewal and increasing of productive resources consequently, in ensuring the specified rates of economic growth. If we can imagine social reproduction as a system of manufacturing, distribution, exchange and consumption, investments are mainly related to the first part - manufacturing, and, it can be said, constitute the material basis for its development.

In accordance with different legislations and interpretations there are several definitions of term “investment”:

- The action or process of investing money for profit.[1]
- Investments are all types of values that are invested in objects of entrepreneurial activity and other kinds of activity, which results into a profit (income) creation and the social and ecological effect. [2]
- The concept of investment defines a complex and controversial economic and financial category while in practice it represents an operation of changing and increasing the initial patrimony. The investment is in fact "(...) the purchase of an asset in the hope of making a profit".[3]
- The concept of investment has evolved in time, because of the socioeconomic practice development as well as of the identical mutations occurring at a conceptual level. In the process of its evolution, the specialized literature.[4]

Despite a lot of different definitions given to us by several authors there certain features inherent for term of investment, namely:

– any investment involves transferring cash into expenses, whether the effort means achieving concrete, tangible assets or financial investments (shares, bonds and securities);

– any investment implies a certain effort, which results in discounting material and social values, usually having a multiplier effect, as an increase in profits and achievement of a

[1] *Oxford dictionary*
[2] THE LAW OF UKRAINE ABOUT INVESTMENT PROCESS REGULATION (2007) Part one of Article 1 as amended by Law N 1981-VIII
[3] *Stiglitz & Walsh, 2005, p. 329*
[4] *POP M.G.S. (2012)*

higher future rate of return, hoped for but uncertain;
– any investment involves temporary but certain "windrowing", of a certain amount of current resources (material, financial, human) whose cost should be replaced by future net effects. Investments are an integral part of the modern economy. This term could be associated with the different activities, but the common target in these activities is to use the money (funds) during the time seeking to increase the investor's wealth.

The investment process is a chain of steps, actions and operations as well as factors involved in the investment activity. The progress of the investment process depends on the subject in which we are going to invest. Capital cannot be invested in the specific target (or project), without having enough information about the unexpected that can show up in the future, while exploiting the concerned target. In this respect, before proceeding to the investment decision, the investor carries on, through specialized bodies, a leading research and forecasting, which will allow him to find out all the information about the possibilities given by the future exploitation of the investment target.[5]

In literature we can find the term capital budgeting. The investment dictionary designates it like process in which a business determines whether projects are worth pursuing.[6] The Free dictionary defines capital budgeting as the process of choosing the firm's long-term assets.[7] The capital budgeting is a series of financing cycles for various projects that are repeated after a certain time. This process provides for a link between its participants and a certain investment environment in which all of activities are carried out. It is very useful to distinguish real and financial investments. [8]

According to Naumov and Khodusov (2005) the structure of the investment process consists of five main stages:

- Choosing of investment policy;
- Conducting monitoring on the securities market;
- Formation of the investment portfolio;
- Work with a portfolio of securities;

[5] *Annals of the University of Petroşani, Economics, 12(2), 2012, 193-204 193 The investment process and its financing*
[6] Investment dictionary: http://investment_terms.enacademic.com/3530/Capital_Budgeting
[7] *Financial Glossary*. (2011).
[8] TSAREV, V. (2004). Estimation of economic efficiency of investments

- Evaluation of the effectiveness of investment project.

At the first stage, we determinate the volume of financing and the main objectives of investors, we consider the expected incomes and risks. Investors estimate the amount of their own free resources, which will act as investments and collect all information about the economic conjuncture. Also at this stage the terms of the whole process are determined in advance. The strategy is developed taking into an account the risk assessment, the estimated investment period and the analysis of future profits. Thus, investors are determined with the volume of investment and the choice of securities. This stage is completed at the initial selection of securities, which, depends on the amount of free cash and the availability of assets.

At the second stage, securities are analyzed and their individual types are studied in detail. There are many ways to conduct such an analysis. Most often economic, sectoral and fundamental analyzes are carried out. It is necessary to consider the economic stability, the prospects of the industry in which the enterprise operates, and the financial position of this enterprise.

At the third stage, a portfolio of securities is formed. To form a portfolio, the investor needs to select several companies whose shares he will acquire, and rationally distribute his own investments. The main difficulty in this choice is focused on the forecasting of growth dynamics of the acquired assets and diversification. It is also necessary to determine the timing of the transactions, when the value of shares will change. Diversification involves the formation of a portfolio with minimal risks.

At the fourth stage of the investment process, investors are reviewing their own portfolios. Investors must understand that after a certain time all the objectives can significantly change, so the portfolio will no longer be optimal. Changing of the stock price is also possible, which will lead to decreasing in the efficiency.

In general, it should be noted that there are two ways to manage the investment process:

- Active
- Passive

For passive management, diversified portfolios are ideally suited. With active management there are regular sale of any shares and purchase of new.

At the fifth stage, the effectiveness of investment project must be evaluated. To make this step successful investor should include several indicators such as the payback period, internal rate of return, net present value and profitability index and net future value.[9]

These stages are determined for the evaluation of financial investments. They were adapted in the evaluation of the effectiveness of the real investments, which is the case of this work. To conclude this introduction to the theory we specify the term investment project.

The investment in practice is called the investment project. Marcela Cristina Hurjui in her scientific work defined that the investment project is "the concrete motivation of some current expenses in the hope of future benefits." [10]

Different investment projects can be classified according to theirs of characteristics.

1) In relation to each other:
    - Independent. Projects that allow simultaneous and separate implementation, their characteristics do not affect each other;
    - Alternative. Projects that do not allow simultaneous implementation. From the aggregate of alternative projects (options), only one can be implemented;
    - Complementary. Projects whose implementation can only occur together.
2) By terms of implementation:
    - Short-term (up to three years of implementation and more);
    - Medium-term (from three to five years of implementation);
    - Long-term (more than five years of implementation).
3) By the project scale:
    - Small projects, acting of which are limited to one small company.
    - Average projects, it is mostly projects of reconstruction and technical refurbishment of the existing production. They are implemented in stages, according to individual industries, in strict accordance with the developed schedules of the receipt of all types of resources;
    - Big projects, projects of large enterprises, which are based on a progressively "new idea" of production, which is built to meet demand in the domestic and foreign markets;

[9] Naumov A. (2005)
[10] Hurjui, I.(2008)

- Megaprojects, these are investment programs containing many interconnected final projects. Such programs can be international, state or regional.

4) On the main thrust:
    - Ccommercial projects, the main purpose of which is only to make a profit;
    - Social projects, addressed, for instance for solving unemployment problem in the region, decreasing a crime level etc.
    - Ecological projects, which are based on improving environment;
    - Other.
5) Depending on the degree of influence on the results of implementation of the investment project on the internal or external markets of financial markets, material products and services, labor, as well as on the ecological and social situation:
    - Global projects, which has impact on economic, social and ecological situation on whole planet.
    - Large-scale projects, which has substantially impact on economic, social and ecological situation on the territory of one state.
    - Local projects, the implementation of which does not have a significant influence on the economic, social or environmental situation in the certain regions or cities, the level and structure of prices for commodity markets.
6) Depending on the magnitude of the risk:
    - Reliable, high probability of obtaining planned results;
    - Risky, high degree of uncertainty.[11]

In practice, this classification is not complete and allows further detail. The implementation of any investment project pursues a certain target. For different projects, these objectives may vary, but in general can be summarized in four main groups:

I. Preservation of products on the market;
II. Expansion of production volumes and improvement of product quality;
III. Release of new products;
IV. Solving social and economic problems.

[11] L.M. Teslyuk A.V. Rumyantseva "Evaluation Of The Efficiency Of The Investment Project" (2014)

All investment projects share some common traits that allows to standardize them, for example a temporary period of time, the achievement of profits, the evaluation of the project, and others.

1.2. Economic evaluation of the effectiveness of investment process

Evaluation of the investments is one of the most important steps in capital budgeting which helps the investor to see in detail all the mathematical aspects of the future project. According to Steven et al. (1993), investment project evaluation is a combination of several activities ranging from setting indicators, developing model, defining measurable outcomes, identifying key stakeholders and their interests, selecting methodology for evaluation, collecting information, analyzing data and disseminating evaluation results for further learning.[12]

According Derek Allen (1991): "Investment projects involve the expenditure of current wealth and other resources in the expectation of generating future benefits, whether in the form of profits, cost savings or social benefits…" For an investment to be worthwhile, the future benefits expected, in whatever form, should be quite profitable in comparison with expenditure of the resources needed to achieve them. Investment appraisal identifies both the resources needed and the expected benefits, and makes this comparison. Economic evaluation is that important part of investment appraisal which relates to the factors which can be quantified, measured and compared in money terms. In a fully appraisal of other aspect which have also to be considered include technical evaluation, financial mechanisms, commercial evaluation, safety, legal and environmental considerations, customer and public goodwill, contribution to the community and prestige.

The purpose of investment appraisal is to create qualitative background for good investment decisions. Proper investment appraisal helps to ensure that the right project is undertaken at the right time, and in a way which gives it the best chance of success.

Investment efficiency is characterized by a system of indicators that reflect the ratio of investment-related costs and benefits and gives an indication of the economic benefits of some investments over others.

Referring to Tesluk (2014) the indicators of investment efficiency can be classified

[12] Stevens, F., Lawrenz, F., & Sharp, L. (1993). *User friendly handbook for project management: Science, Mathematics, Engineering and Technology Education.*.

according to the following characteristics:

1. By the form of a generalizing indicator, which plays the role of a criterion for the economic efficiency of investments:
    - absolute indicators where summarizing indicators are defined as the difference between the estimation of the results and costs, which relate to implementation of the project;
    - relative indicators, where summarizing indicators are defined as correlation of cost estimates of project results to aggregate costs of obtaining them;
    - time indicators that evaluate the payback period of investment costs.
2. According to the method of comparison of multi-temporal monetary costs and results:
    - Statistic indicators, where cash flow is valued as equivalent;
    - Dynamic indicators, where the simultaneous cash flows caused by the implementation of the project

Payback period (PP) and Return of investment (ROI) are related to the first group. These methods operate on individual statistical values of the initial indicators, based on accounting estimates. When using them, we do not consider the duration of the project, as well as the unequal cash flows arising at different time periods. Nevertheless, these methods are widely used, but they are used mainly for rapid evaluation of projects at the preliminary stage of development or for the evaluation of short-term projects.

1.2.1. Payback period (PP)

Uwe Gotze in his work "Investment Appraisal (2008)" used a clear definition about payback period of an investment project "…is the period after which the capital invested is regained from the average cash flow surpluses generated by the project". The target measure used for the payback period is the time it takes to recover the capital invested in the project. It can be calculated based on average figures or on total figures. The payback method is computed as follows:

$$Payback\ period = \frac{Amount\ invested}{Annual\ cash\ flow}$$

The *payback rule* specifies that a project be accepted if it's payback period is less than the specified cutoff period. The following example will demonstrate the absurdity of this statement

S. C. Williams (1980) in his reports also admitted that cash flows for payback calculations are revenues, less all out-of-pocket costs; taxes, and interest paid out on borrowed funds, should not be overlooked. Depreciation is deducted from income to benefit from its use as a tax shield but is then added back to cash flow because it is not an out-of-pocket cost.

The payback period approach is quite simple for application, but can easily lead to an incorrect investment decision, causing substantial loss to the firm. The major drawback of the payback period criterion is that it ignores the time value of money and the cash flows after the payback period.

The payback period starts at the point where the capital investment has all been spent. What exactly the payback time is should be made clear whenever it is quoted. Payback period provides no indication of the expected return on investment or cash return of a project and it is thus very limited in its interpretation.

The limitation of payback method:

- Payback does not consider any cash flows that arrive after the payback period
- Payback gives equal weight to all cash flows arriving before the cutoff period (an improved method is to calculate the discounted payback period)
- Usually the large construction projects inevitably have long payback periods

Therefore, payback method is most commonly used when the capital investment is small when the merits of the project is so obvious that formal analysis is unnecessary. Payback period is still used occasionally, particularly where long-term cash flows are difficult to forecast as no estimates are needed beyond the breakeven point. It may be used for example in preliminary evaluation or as a project screening device for risky projects in times of uncertainty. Thus, a company may set a maximum payback time which all project proposals should meet, irrespective of their predicted profitability by other means. Depending on the industry, type of project and the perceived economic risk, maximum payback period of two to five years are often used. Payback time used on its own can lead to incorrect conclusions about a project. Its only real value is as a rule of thumb method for

screening out project alternatives at an early stage of consideration, by saving the effort of trying to make long term cash flow predictions, or for small tactical projects which do not justify the cost and effort of full cash flow preparation throughout the project's life. It should be noted however that the payback method only indicates how quickly the cost of an investment is recovered but does not measure its profitability. It is therefore not designed to measure or reflect all the dimensions of profitability which are relevant to capital expenditure decisions and it is neither inclusive nor sensitive enough to be used as a company's general investment worth. It is based on this, that the academic writers have almost unanimously condemned the use of the payback period as a misleading and worthless in making investment decisions.[13]

Advantages of the payback period:

- It is widely used and easily understood.
- Simple to compute.
- Provides some information on the risk of the investment.
- It addresses capital rationing issues easily.
- Provides a crude measure of liquidity.
- It remains a major supplementary tool in investment analysis.

Disadvantages of the payback method**:**

- It ignores any benefits that occur after the payback period; it does not measure total income.
- The time value of money is ignored.
- It is difficult to distinguish between projects of different size when initial investment amounts are vastly divergent.
- No concrete decision criteria to indicate whether an investment increase the firm's value.
- Ignores the risk of future cash flows.[14]

1.2.2. Return of investment (ROI)

Return on Investment (ROI) is one of the most popular performance measurement and evaluation metrics used in business analysis. With proper use ROI analysis is a powerful tool

[13] Pike, R.H. (1985). Disenchantment with DCF promotes IRR. Certified Accountant July: 14-17

[14] **Advantages of the payback period** *educ.jmu.edu/~drakepp/principles/module6/advdistable.pdf*

for evaluating existing information systems and making informed decisions on software acquisitions and other projects.[15]

According to the Investopedia, ROI is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of several different investments. Return on investment is a measure of the annual *rate* of return on capital employed by a project. The simplest form of the formula for ROI involves only two values: the cost of the investment and the gain from the investment. To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio. The formula is as follows: [16]

$$ROI = \frac{Gain\ from\ investment - Cost\ of\ investment}{Cost\ of\ investment} * 100$$

The ROI calculation is flexible and can be manipulated for different uses. A company may use the calculation to compare the ROI on different potential investments, while an investor could use it to calculate a return on a stock.

We can treat ROI as a measure / metric / ratio / number. In some cases, return on investment is understood as a "method" or "approach" – "ROI analysis".[17]
Advantages of ROI methodic:

- Easy to compute.
- Encourages prudent detailed financial analysis.
- Encourages cost efficiency and focuses on one of the main corporate metrics – profitability.
- Being based on the accounting records, provides objective outputs.
- Permits comparisons of profitability of dissimilar businesses/projects.
- Encourages project teams and finance/accounting practitioners to collaborate.
- Provides quantifiable evidence of value.

The major problem with ROI is that it does not include the time value of money. Specifically, ROI, defined by the equation above, is rather vague, because a 100% ROI

[15] Alexei Botchkarev, Peter Andru A Return on Investment as a Metric for Evaluating Information Systems: Taxonomy and Application
[16] ERMÉNYI, T. (2015)
[17] Mogollon, M., & Raisinghani, M. (2003). Measuring ROI in e-business: a practical approach. *Information Systems Management*, *20*(2), 63-81

realized 1 year from today is more valuable than a 100% ROI realized in 5 years. In addition, the costs of the project may vary over time, with ongoing maintenance and professional services support. The benefits of the project may also vary over time so that the cash flows are different in each time period. Thus, the equation is therefore not a convenient way to compare projects when the inputs and outputs vary with time and it is also not useful for comparing projects that will run over different periods of time.[18]

Payback period and ROI are very selective in the project cash flow information which they use, and they each ignore important relevant information. Payback time provides no indication at all of profitability. They both take no account of the "changing pattern" of cash flow with time during a project.

The other measures to be described, net present value and discounted payback period, internal rate of return and profitability index are closely related to each other and are much better measures because they take better account of the changing pattern of project net cash flow with time. They also take account of the so-called "time value" of money, which is very significant.

1.2.3.Net present value (NPV)

The net present value method focuses on selecting projects that maximize the net present value (NPV) generated for the company. The net present value shows that how amount of wealth growth has been accumulated by the investment during its duration, but it does not inform about the real profitability of capital investment. When using NPV criterion for evaluating projects, we need to pay attention to the following:

- all relevant and related cash flows of ' a project should be included in the computation of its NPV;
- the project's NPV directly reflects its contribution to the present value or market value of the firm;
- the NPV of a project is inversely related to its discount rate (i.e. Required rate of return);
- the required rate of return used to discount a project's cash flows should reflect the project 's cost of capital and risk.

[18] Mark Jeffery, Northwestern University **Return on Investment Analysis**

Gotze 2004 in his work highlight NPV as net monetary gain (or loss) from a project, computed by discounting all present and future cash inflows and outflows related to the project.

Using the NPV method, all future cash flows related to an investment project are discounted back to time 0 (i.e. t = 0), taken to represent the start of the investment project. The NPV represents a specific kind of PV. While it is possible to discount and compound all the cash flows to a later point in time, for example to the end of the investment project, it is more common to use t = 0 as this is the time at which the decision to invest (or not to invest) should be made. It will be explained later that other methods relate cash flows to other points in time, e.g. to the end of the investment project. The most rigid assumptions of the NPV method relate to the existence of a perfect (unrestricted) capital market. The single, or uniform, interest rate for this market represents the rate at which it is possible to borrow or invest without limits. Therefore, this rate is used for discounting or compounding cash flows to any point in time. The discounted cash flow method is used to convert future uneven returns to current value by discounting the corresponding rate of return for each future income. The technique of discounting consists in calculating the compound interest and withdrawing it from regularly received income amounts.

The process of discounting is the present value (PV) of cash receipts for the n-th time interval, taking into account the replacement flows of income. It can be represented by the following formula:

$$DCF = \frac{CF1}{(1+r)^1} + \frac{CF2}{(1+r)^2} + \cdots + \frac{CFn}{(1+r)^n}$$

Where:
CF = Cash Flow
r = discount rate (WACC)

Using the NPV method, the profitability of investment projects is assessed as follows:

- Absolute profitability is achieved if an investment project's NPV is greater than zero.

- Relative profitability*:* An investment project is preferred if it has a higher NPV than the alternative investment project(s)

For the following examples it is assumed that the uniform discount rate remains unchanged over the life of the investment. In that case, a project's NPV at t = 0 can be determined using the following equation:

$$NPV = \sum_{t=0}^{T} (CIF_t - COF_t) * q^{-t}$$

Where:

t = Time index

T = The last year when cash flow take place

CIF_t = Cash inflows in t

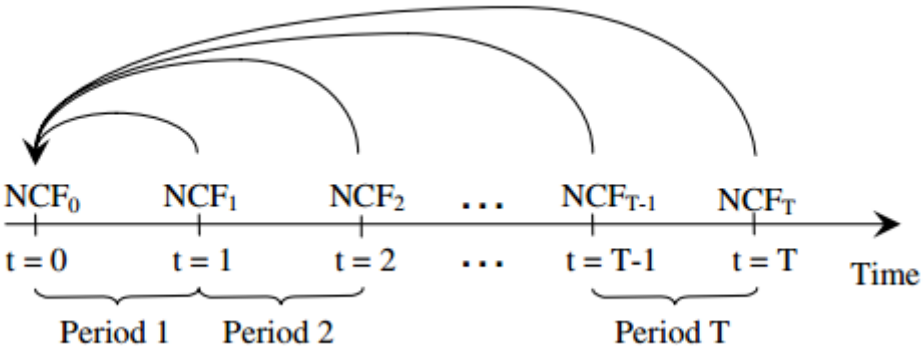
COF_t = Cash outflows in t

q^{-t} = discounting factor in t $\left(q^{-1} = \frac{1}{q^t} = \frac{1}{(1+q)^t}\right)$

The NPV of a project thus consists of the sum of a sequence of discounted project cash flows corresponding to the cash flows which occur throughout the anticipated life of the project. For a typical project some of these discounted cash flows will be negative, corresponding to the initial investment in the project, and some will be positive, corresponding to the later income generated by the project. Because of the effect of discounting, which is that the magnitude of the discount factor decreases the further forward in time the cash flow is projected, the influence of later cash flows on the project's NPV is less than the influence of earlier ones. If the NPV of a project is zero for example, this means that the sum of all its (earlier) discounted negative net cash outflows is exactly balanced by the sum of all its (later) discounted positive net cash inflows. As the discount factors for the earlier net cash outflows are larger (nearer to one) than those for the later net cash inflows, this means that for the NPV to be zero the actual later non-discounted net cash inflows must exceed the actual earlier non- discounted net cash outflows.

The difference between cash inflows and cash outflows (CIFt - COFt) is the net cash flow (NCFt). As shown in the following figure, all net cash flows after t = 0 are discounted back to this point in time.

Picture 1 : Discounting net cash flows for the net present value method



Source: Uwe Götze, Deryl Northcott, Peter Schuster Investment Appraisal Methods and Models

An effect of the discounting of project cash flows is that cash flows later in the life of a project make progressively smaller contributions to the project NPV. Depending on the applied discount rate, cash flows beyond 10 or 15 years have a negligible effect on the project NPV It is therefore fortunate that because of this the precise life of a project is not very significant in its economic evaluation if the project is at least of this length.

The equation indicated above must be detailed if components of the net cash flows are to be considered in a differentiated way. A project's cash flows can be subdivided into: initial investment outlay, liquidation value(s), cash inflows and cash outflows. In addition, the following assumptions may be made when using the NPV method:

- Taxes and transfer payments can be ignored
- Only one type of product is manufactured with the investment project
- Production volume equals sales volume (i.e. no inventory produced)
- The cash flows are assigned to the following points in time:
  - Initial investment outlay: beginning of the first period (t = 0).
  - Cash inflows and outflows: end of each relevant period (t).
  - Liquidation value: end of the project's economic life (t = T)

For an investment project to be economically viable in terms of generating a profit, its NPV should be positive.

Advantages of NPV method:

- Tells whether the investment will increase the firm's value
- Considers all the cash flows

- Considers the time value of money
- Considers the risk of future cash flows (through the cost capital)

Disadvantages of NPV method:

- Requires an estimate of the cost of capital in order to calculate the net present value
- Expressed in terms of dollars, not as a percentage.

1.2.4. Internal rate of return (IRR)

The internal rule of return (IRR) criterion is an evaluation approach which is very similar to the NPV method which was discussed in the previous section.

The internal rate of return (IRR) is a rate of return used in capital budgeting to measure and compare the profitability of investments. The internal rate of return on an investment or project is the "annualized effective compounded return rate" or "rate of return" that makes the net present value of all cash flows (both positive and negative) from a particular investment equal to zero.[19]

In more specific terms, the IRR of an investment is the discount rate at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment. Internal rates of return are commonly used to evaluate the desirability of investments or projects. The higher a project's internal rate of return, the more desirable it is to undertake the project. Virtually, the internal rate of return represents the highest interest rate which an investor could pay without losing money if he borrows the entire capital for the investment's funding and pays off the loan (initial amount and interests) with the revenues coming out from the investment paying at the moment they are made.[20]

If the needs for the investment capitals can be borrowed with an interest rate smaller than internal rate of return or they can be withdrawn from other investments which yield a smaller rate than the internal rate of return then the financial position of the firm would be improved by carrying out the under-consideration investment. [21]

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[19] Bruce J. Feibel. *Investment Performance Measurement.* New York: Wiley, 2003. ISBN 0-471-26849-6

[20] THE INTERNAL RATE OF RETURN PROBLEMS AND MANNERS OF SOLUTION *ATHANASIOS CRISTODOULOU*

[21] Marry, R. 1970. The composite internal rate of return. Fo r. SCi., 16: 276-279

IRR method is largely analogous to the NPV method. Only two assumptions are modified – concerning the reinvestment of free cash flow surpluses and the balancing of capital tie-up and economic life differences. The main difference between NPV and IRR approaches is that the IRR discounts a project's cash flows at a rate so as to make the present value of cash inflows and the present value of the cash outflows equal. Thus, the IRR approach sets a precondition such that when the project's NPV equals zero, the discount rate used to discount the project's cash flows is equal to its internal rate of return. The investment's internal rate of return informs the decision maker that how works the real yield of long capital investment.

According Gotze (2004) the following profitability criteria are applied in the IRR method, although it should be recognized at this point that the method is not applicable to all decision contexts:

- *Absolute profitability* is achieved if an investment project's internal rate of return is higher than the uniform discount rate.
- *Relative profitability:* An investment project is preferred if it has a higher internal rate of return than the alternative investment project(s)

Accordingly, in assessing absolute profitability a comparison is made between the project's rate of interest and the cost of capital or the interest earned by an alternative financial investment, as represented by the uniform discount rate. An investment project should be undertaken when its rate of interest is higher than the cost of capital and/or the interest that could be earned on alternative financial investments.

The internal rate of return was defined above as the interest rate at which the NPV becomes zero. Therefore:

$$NPV = \sum_{t=0}^{T} (CIF_t - COF_t) * (1 + r)^{-t} = 0$$

An acceptable effort is possible when the time span encloses only one or two periods or, in the case of a longer time span, if only two cash flows take place or all the future cash flows are identical. For projects spanning three or more periods, where none of the other special cases apply, approximation procedures should be applied to the determination of the IRR.

The economic potential for any enterprise under study is determined by comparing the calculated IRR to the relevant opportunity cost of capital. If the calculated IRR is higher than the relevant opportunity cost of capital, this indicates that the venture is feasible. If the calculated IRR is lower than the opportunity cost of capital, this indicates that the venture is infeasible. The greater the differential, the more conclusive the findings.[22]

As an investment decision tool, the calculated IRR should not be used to rate mutually exclusive projects, but only to decide whether a single project is worth investing in, because it can cause problems. In cases where one project has a higher initial investment than a second mutually exclusive project, the first project may have a lower IRR (expected return), but a higher NPV (increase in shareholders' wealth) and should thus be accepted over the second project (assuming no capital constraints). IRR assumes reinvestment of interim cash flows in projects with equal rates of return (the reinvestment can be the same project or a different project). Therefore, IRR overstates the annual equivalent rate of return for a project whose interim cash flows are reinvested at a rate lower than the calculated IRR. This presents a problem, especially for high IRR projects, since there is frequently not another project available in the interim that can earn the same rate of return as the first project. When the calculated IRR is higher than the true reinvestment rate for interim cash flows, the measure will overestimate the annual equivalent return from the project. The formula assumes that the company has additional projects, with equally attractive prospects, in which to invest the interim cash flows.[23] This makes IRR a suitable choice for analyzing venture capital and other private equity investments, as these strategies usually require several cash investments throughout the project, but only see one cash outflow at the end of the project.[24]

Disadvantages of IRR:

- the multiplicity of values, when the outflow and inflow of capital alternate;
- lack of additivity property;
- does not indicate a contribution to the change in the capital of the enterprise.

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[22] *ECONOMIC ANALYSIS FOR INVESTMENT DECISION-MAKING PROCEDURE GUIDE I INTERNAL RATE FOR RETURN ANALYSIS, Roe Borsdorf, Maurice Baalman and Cornelius Hugo, Kansas State University, February 1989*

[23] *Internal Rate of Return: A Cautionary Tale (http://www.cfo.com/article.cfm/3304945)*

[24] *Hazen, G. B., "A new perspective on multiple internal rates of return," The Engineering Economist 48(2), 2003, 31–51*

It is also important to point on modified IRR indicator to eliminate possible uncertainty level in the calculations. MIRR along with IRR characterizes the discount rate, in which the total present value of income from investments is equal to the value of these investments. Since the method of IRR calculation sometimes leads to uncertainty level, MIRR value should be calculated in a different way. The calculation methods for the modified internal rate of return (MIRR):

1. Calculate the total discount value of all cash outflows and the total incremental value of all cash inflows. Discounting is carried out at the source`s price of the project financing (cost of the raised capital, the rate of financing or the required rate of return on investments` profitability, Capital Cost, CC or WACC), i.e. at the barrier rate. The increment is carried out at the interest rate equal to the level of reinvestment. The incremental value of the inflows is called net terminal value (Net Terminal Value, NTV).
2. Establish a discount factor, taking into account the total present value of outflows and the terminal value of inflows. The discount rate, which balances the present value of the investment (PV) with its terminal value, is called the MIRR.

We can calculate MIRR by using formula:

$$\sum_{i=1}^{N} \frac{CFi^{-}}{(1+r)^{i}} = \frac{\sum_{i}^{N} CFi^{+}(1+WACC)^{N-i}}{(1+MIRR)^{N}}$$ [25]

where:
CF + i - incomes of the i-th period
CF-i - costs (investments) of the i-th period
WACC - weighted average cost of capital
r - discount rate
N - duration of the project

[25] *Modified Profitability Index and Internal Rate of Return Armênio de Souza Rangel1, José Carlos de Souza Santos2 & José Roberto F. Savoia*

1.2.5. The profitability index (PI)

The "Profitability Index" (PI) is simply the ratio between the net present value (NPV, the sum of the discounted cash flows of a project over its lifetime, including the initial investment period) and its initial investment cost. It is one of the numerous ways used to quantify and measure the efficiency of a proposed investment. It is already used in industry and business as an indicator of the profitability of a project, but a recent simple and innovative analysis has shown that its advanced use gives access to a comprehensive, reliable and simple way to analyse the profitability of all kinds of investment projects.[26]

The profitability index refers to the ratio of discounted benefits over the discounted costs. It is an evaluation of the profitability of an investment and can be compared with the profitability of other similar investments which are under consideration.. The profitability index expresses the net present value for an initial expense equal to a monetary unit. It completes analysis of efficiency in relative terms, in the form of net benefit per unit of measurement relative o the cost of the investment.

The PI is computed as follows[27]:

$$PI = \frac{NPV + Inintial\ investment}{Initial\ investment}$$

An investment project or proposal is considered to be profitable if it features a profitability index above 1. On the contrary, a profitability index equal to 1 indicates a break even on the investments without making any profits.

The advantages of profitability index for an enterprise are listed below:

- The profitability index tells about an investment increasing or decreasing the firm's value;
- The profitability index takes the time value of money into consideration;
- The profitability index is also helpful in ranking and picking projects while rationing of capital;
- The profitability index also considers the risk involved in future cash flows with the help of cost of capital;

[26] Bernard Chabot A Simple and Reliable Tool to Optimize Sustainable Energy Programmes: the Profitability Index Method (PIM)

[27] C. DOICIN, *Analiza proiectelor de investiţii în inginerie*, (Analysis of engineering investment projects), Ed. Bren, Bucharest, 2009.

- The profitability index takes into consideration all cash flows of the project.

In addition to the aforesaid advantages, there are also certain disadvantages featured by the profitability index:

- An estimate about the cost of capital is required so as to calculate the profitability index of an enterprise.
- The profitability index of an enterprise might not, sometimes, provide the correct decision while being used to compare mutually exclusive projects under consideration.[28]

The profitability index method and its associated tools can clearly contribute to the economic analysis of sustainable energy projects by providing a sound, simple and reliable view. For market regulators, on what are the best measures or what is the best mix of measures for the regulation of energy and environmental markets in order to give clear advantages to the technologies and to the applications which are in favour of sustainable development, so that the relevant markets can reach specific targeted levels within a specific time frame. For projects developers, on what is the impact of a specific set of incentives or market regulation mechanisms (soft loans, subsidies, energy or carbon based taxes, green certificates or carbon credits to be sold on an environmental derivative market…) on the selling price of the product or the service delivered by a kind of energy project, and what are at the end the profitability and the prospects for market deployment of this kind of projects. For energy services companies, operating under various global specific market regulation conditions, on what are the corresponding economic profitability levels of sustainable energy projects versus the costs and performance ratios of related technologies and applications (renewable energy based projects, energy efficiency projects…), and what is the best potential investment portfolio in order to maximise the economic profitability of the company in a context of capital rationing.

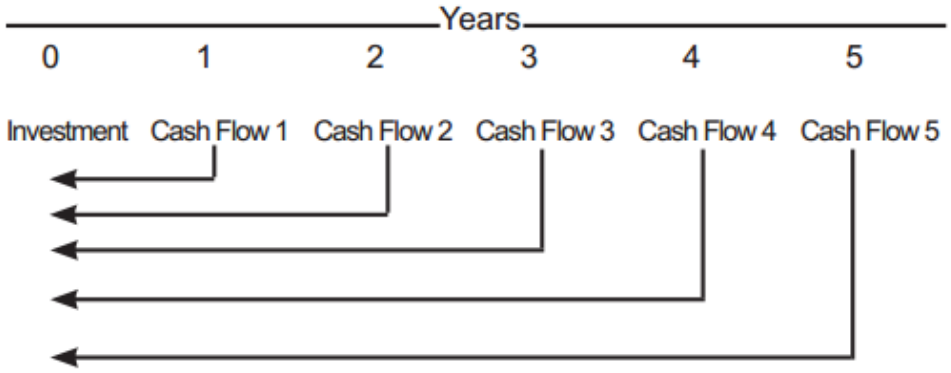
Of course, the preliminary results from the Profitability Index method must be completed by a financial profitability analysis before the final decision to set up a new regulation measure of before to invest in a project, but the advantages of such a comprehensive, simple and reliable preliminary analysis are evident in order to save time and money and in order to reduce the related economic risks.

[28] K.D. Glazebrook, *A profitability index for alternative research projects*, 1976, pp. 79-83.

1.2.6. Discounted payback period (DPP)

The discounted payback period (DPP) is a capital budgeting procedure used to determine the profitability of a project. The Payback Period analysis does not consider the time value of money. To correct for this deficiency, this method was created. The discounted payback period method combines the basic approach of the static payback period method with the discounting cash flow used in the NPV model.

Picture 2: Discounting a series of future cash flows.



Source: Faltsman V. (1999) Evaluation of investment projects and enterprises

As shown in Picture 2, this method discounts the future cash flows back to their present value so the investment and the stream of cash flows can be compared at the same time period. Each of the cash flows is discounted over the number of years from the time of the cash flow payment to the time of the original investment. For example, the first cash flow is discounted over one year and the fifth cash flow is discounted over five years. To properly discount a series of cash flows, a discount rate must be established. The discount rate for a company may represent its cost of capital or the potential rate of return from an alternative investment.

We can calculate DPP by using relative formula:

$$DPP = \frac{Year\ before\ DPP\ occurs\ +\ Cumulative\ DCF\ in\ year\ before\ recovery}{DCF\ in\ year\ after\ recovery}$$

A discounted payback period gives the number of years it takes to break even from undertaking the initial expenditure, by discounting future cash flows and recognizing the

time value of money. The net present value aspect of the discounted payback period does not exist in a payback period in which the gross inflow of future cash flows is not discounted.

According Gotze (2008), For the DPP approach: absolute profitability is achieved, if the payback period of an investment project is shorter than a designated time limit. Relative profitability*:* An investment project is preferred if it has a shorter payback time than the alternative investment project(s). The general rule for the calculation is to accept projects that result in a discounted payback period that is less than the targeted period. A company can compare its required break-even date to when the project will break even in terms of discounted cash flows, to approve or reject the project. The DPP method does not necessarily lead to the same results for absolute or relative profitability as the NPV method. Whether results differ for absolute profitability depends on the designated time limit as well as on the cash flows for the last period(s). Identical results are obtained if the designated time limit is assumed to be the project's economic life. Differences in comparing relative profitability, however, can result from cash flows that occur *after* the payback period has been achieved, as the DPP method does not systematically account for these subsequent cash flows. For calculation of the discounted payback period the cash flow of a project must be estimated and broken down into periods. These cash flows are then reduced by their present value factor to reflect the discounting. With the assumption of a large cash outflow to begin the project, future discounted cash flows are net against the initial outflow. The discounted payback period is calculated when the inflows equal the outflows. The determination of the DPP involves calculating the NPV of the project as at the end of every period of its economic life. As long as this value remains negative, the payback period is not yet reached. When this value reaches zero (or becomes positive for the first time), the payback period is achieved (or exceeded). If the first non-negative value exceeds zero, then payback is achieved somewhere within that last period to be considered. The part of that period (year) which must pass before payback is achieved can be approximated by interpolation.

The DPP method has characteristics that are common to both the NPV and the SPP methods. Compared to the SPP method, the dynamic model has the advantage of using discounted cash flows. But, it still shares some of the limitations of the static model. A crucial problem is the omission of all cash flows occurring in periods after the DPP is achieved, which may be substantial for some long-running projects. Because of this limitation the DPP, like the SPP model, mainly serves as a measure of the risk connected with an investment project (in terms of the time needed to recover the investment outlay),

but it is unsuitable as an exclusive decision criterion. However, the payback period represents a critical value of the economic life in the NPV model.

1.3. Economic risks analysis

Having considered the essence of investment project and its method of evaluation, we can begin to study the concepts of risk and uncertainty encountered in the evaluation of projects.

The first scientific work on the definition of concepts of risk and uncertainty was “Risk, uncertainty and profit”, the work written by F. Knight, who proposed to distinguish them. The conception of "risk" is ordinarily used in a loose way to refer to any sort of uncertainty viewed from the standpoint of the unfavorable contingency and the term "uncertainty" similarly with reference to the favorable outcome. The practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcome in a group of instances is known, while in the case of uncertainty this is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique.[29]

Since the first implementation of risk definition at the beginning of XX century a lot of time has passed and the definition of risk experienced a lot of transformation and change, but they reflect almost the same concept. Nowadays we distinguish between risk and uncertainty. Risk is quantifiable, because we can determine the probabilities, with which the scenarios can happen, uncertainty is not quantifiable.

Risk can be defined as knowing future event probability, and uncertainty as unknown probability of future events. Measured uncertainty is a risk. Terms risk and uncertainty are often used as synonyms in economy because there is no possibility in economy of some event repetition in the same circumstances. That means that it is hard to measure risk, and event’s probability is a highly subjective estimation. The term risk prevails in portfolio analysis whether in the sense of risk measure or in the sense of uncertainty[30]. In the capital

[29] *F. KNIGHT, Risk, Uncertainty and Profit,*
[30] *BRIGHAM E.F. (1989): "Fundamentals of Financial Management", Chicago: The Druden Press, p104*

budgeting the term uncertainty prevails in both senses, (e.g. “techniques of uncertainty measurement”[31])

Fisher D.E., Jordan R.J (1979) in theirs book have defined risk as the probability that the real income from investments will be different from expected revenues.[32]

Vladimir Faltsman (1999) in his works defined risk as the possibility of occurrence of unconfirmed results and unforeseen costs and losses.[33]

In his monograph Rutterford J. (1993) considers risk as a quantitative certainty, where is more than one outcome and each of them can be evaluated.[34]

Gluhov V. and Bakhamov Y. (1995) argue that risk is the probability of the magnitude of possible losses in financial and material units.[35]

Dictionary of business finance and investments defines risk as uncertainty of future events, prices, incomes, markets, influences or chances of losses.[36] The dictionary of banking terms represents a risk as the degree of probability of having losses in credit, investments or other transactions.[37]

Summarizing the most common definitions for the term risk, we can define that risk is the possibility of occurrence of events that entail economic losses. Furthermore, the amount of risk can be estimated quantitatively. If there is no quantitative assessment, then there is uncertainty. In this case, the totality of the risks associated with the investment project, which could reduce its effectiveness is called the project risks.

Project risk can be defined as the cumulative effect of the chances of uncertain occurrences which will adversely affect project objectives. It is the degree of exposure to negative events and their probable consequences. Project risk is characterized by three factors: risk event, risk probability and the amount at stake.[38]

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[31] *BIERMAN H. Jr., SMIDT S. (1992): "The Capital Budgeting Decision. Economic Analysis of Investment Project", p387*
[32] *FISHER D.E., JORDAN R.J. Security analysis & portfolio.*
[33] *FALTSMAN V. Evaluation of investment projects and enterprises: Teis, 1999. - 56 p.*
[34] *RUTTERFORD J. Introduction to stock exchange L.Basingstoke: Macmillan, 1993.*
[35] *GLUKHOV V., BAKHRAMOV Y. Financial management, participants of the market tools, solution- 430 p.*
[36] *Dictionary of business finance & investments, Encyclopedic dictionary of words & phrases 1975.*
[37] *Bank Terminology – 3th ed. /Washington D.C., American Bank Association, 1989.*
[38] M. DIMITRIC, D. SKALAMERA-ALILOVIC: Investment Projects Evaluation Zbomik p. 51-69

Different authors classify project risks from many different aspects. Most frequently we encounter the classification of project risk according to its interrelation with the project objectives. The division of project risks according to the way they impact project objectives is upgrading the risk classification according to its interrelation with project goals. An important task of the analysis of project risks is the classification of risks in relation to the project for the stages of its life cycle. Project risks can be classified according to their appearance during one or another stage of the investment project.

Referring to Tregub (2009) Investment stage risks:

- Risk of insufficient financial support of the investment project. This risk treats to possible investors to become bankrupt and impossibility of project financing. The result of insufficient financing can be represented by failure to complete the investment project partially or impossibility to proceed to processing stage of the investment project.
- Risk of project cost increase. This risk is determined by the possibility of increasing the investment expenditures after starting of project financing. It can be connected with, errors in forecasts, increase of prices, taxes, duties, etc.
- Schedule risk. This type of risk is connected with supplier's defaults, errors in projection, changes in environment, accidents, force-majeure etc.
- Risk of failure to complete the project to the required level of technical or quality performance. This risk is usually caused by supplier's defaults and errors in projection.
- Risk of technical unfeasibility of the project. This type of risk is a borderline case of the previous risk. Technical unfeasibility of the project can be a sequent of blunders in project development, choice of project output and basic process. This risk is typical for the projects connected with product innovation or technological innovation.

Processing stage risks:

- Production risks. Risks of this group are associated with interruptions in production process, increase of outlay, technical problems (technical risk), supply irregularity (transport risk), ecological problems (environmental risk), management incompetence (management risk), etc. This risk can become apparent in current cost increase, unachieved production capacity, suspension of production, loss of product quality.

- Marketing risks. Risks of this group are represented by unachieved planned volume of sales, planned product prices, delay in market entry, etc. Marketing risk is usually the most essential risk in the processing stage of the investment project and is a consequence of price and demand fluctuations, market competition, errors in product choice, errors in market appraisal, errors in market choice, erroneous strategy of marketing and price-formation policy, failure of advertising campaign.
- Risk of supplier's defaults. This type of risk relates to non-delivery or misdelivery of equipment, delays or errors in building. This risk is associated with cost increase, delays in purchasing, failure to achieve the required level of quality performance and therefore the goals of the project.
- Management risks. These risks can appear in the processing stage of the project as variants of production risks or arise in the investment stage. This type of risk is usually connected with errors in managerial control that result in failure to complete project construction.
- Administrative risks. These risks relate to difficulties in permission or license obtainment or changes in regulations during project execution.
- Financial risks. These risks are associated with possibility of negative profit in the situation of uncertainty. The main financial risks are the risk of fluctuations in money spending power (inflationary risk, deflationary risk, currency risk), interest risk.
- Regional (country) risks. These risks are associated with project execution in certain regions or countries that can be characterized by unpredictable governmental performance and other uncontrollable events that can exert negative influence on project outcome.
- Legal risks. The factors of these risks are as follows: legislation defects, lack of judicial practice in some spheres, legislation instability, etc. Foreign investors usually mention lack of property and investments defense.
- Risks of force-majeure. These risks relate to natural disasters, fires, wars, etc. [39]

We distinguish among: quantitative risks and qualitative risks. Qualitative risk assessment methods involve identifying types of risks faced by the project, determine the causes, sources and factors that affect this type of risk. Although there is no specific risk

[39] Investment Project Risk Analysis in the Environment of Russian Economy Ilona TREGUB, Anna OBLAKOVA

assessment in this case, the results of qualitative assessments serve as a basis for qualitative analysis.

The main methods of qualitative approach include:

1. Analysis of the appropriateness of costs;
2. Method of analogies;
3. Method of expert evaluation.

Quality risks are linked with the objective of achieving a suitable performance in the project. It is also possible to divide project risks according to the way they impact project objectives or according to the time sequence of risk recurrence.[40]

There are lots of methods used by project managers to estimate risk. The most popular are sensitivity analysis, scenario analysis and simulation.

Sensitivity analysis is a technique for investigating the impact of changes in project variables on the base-case (most probable outcome scenario). Typically, only adverse changes are considered in sensitivity analysis. Sensitivity analysis helps to measure changes in project result with changes in values of project variables.

There are following steps to complete sensitivity analysis:

1) identify key variables to which the project decision may be sensitive
2) calculate the effect of likely changes in these variables on the base-case IRR or NPV, and calculate a sensitivity indicator and/or switching value
3) consider possible combinations of variables that may change simultaneously in an adverse direction
4) analyze the direction and scale of likely changes for the key variables identified, involving identification of the sources of change.[41]

The higher is the value of the elasticity index, the more sensitive is the project to changes in this parameter, and the stronger at appropriate risk. For clarity of this method we can apply graphical method of interpreting information by constructing a direct correlation between the variation of the variable parameter and the base index. During evaluating and comparing projects riskier will be those in which direct sensitivities will have a greater angle

[40] BURKE R. (1999): "Project Management. Planning and Control Techniques". Third Edition. Chichester: *John Wiley & Sons Ltd. – 19p.*

[41] Mirela ILOIU, Diana CSIMINGA Project Risk Evaluation Methods - Sensitivity Analysis 2009, 33-38

of inclination. Obviously, with such a location of the curve, even a small change in the estimated variable will lead to a strong change in the resulting value.

The main disadvantage of sensitivity analysis is the assumption that the values of a single variable change while the values of the others are certain. Sensitivity analysis is the simplest and widely used form of risk analysis but determines the project risk only in certain points. This leads to the use of the sensitivity analysis as an information source for other methods of risk analysis.

For analyzing project risk with more realistic assumptions regarding correlated variables it is required to use more exact technique like scenario analysis. Scenario analysis remedies the main shortcoming of the sensitivity analysis and considers the simultaneous change in values of several key project variables thereby constructing an alternative project scenario. Scenario analysis include key factors of risk of the project, its susceptibility to changes in key factors and the probability of their changes. Initially, experts draw up possible scenarios for the development of the project implementation process, considering the possible costs and revenues and performance indicators at the output. As a result, three scenarios are formed: pessimistic, optimistic and most likely (worst case, best case, base case). Scenario analysis makes possible to assign probabilities to the base case, the worst case and the best case so that we can find the expected value and standard deviation of the project's NPV to get a better idea of the project's risk. The worst-case scenario is related to the deterioration of the values of the variable parameters to a certain reasonable level in comparison with the base level. Then, basing on the obtained values of factors (for example, product prices, production volumes, capital investments, current costs, tax payments, etc.), the values of the project efficiency criteria (NPV, IRR, etc.) are calculated. Next step is the comparing the obtained values of efficiency criteria with their baseline values and formulating the necessary recommendations. The recommendations are based on the obligatory condition: even in the best-case scenario it is not possible to leave the project for further consideration if the calculated value is outside of the project's effectiveness (for example, the NPV of the project is negative). Conversely, in a worst-case scenario, obtaining a positive NPV value allows to talk about the acceptability of this project. The goal is to determine whether it is possible to make relevant investment decisions based on the

parameters of projects risk, such as the standard deviation and the coefficient of variation.[42] In the case when the probability distribution of the occurrence of scenarios is unknown we are using the criterion of optimism-pessimism of L. Hurwitz where a is the coefficient of optimism, its value ranges from 0 to 1.[43]

$$NPV_{expected} = a \times NPV_{max} + (1 - a) \times NPV_{min},$$

If the expert is pessimistic, then the coefficient a = 0 is set and the decision takes the efficiency value in the worst-case scenario, if optimistic, then a = 1 and the positive scenario indicator is adopted. Even though the method allows to consider all possible changes of initial parameters, it carries several disadvantages. Firstly, it is the limitations of possible options for the development of the situation. Secondly, it is a subjectivism in setting the probabilities of the occurrence of the optimism coefficient and in the case of applying the Hurwitz criterion.

In conditions of high uncertainty and risk, it is preferable to use alternative methods. Simulation (in our case Monte Carlo method) is the best form of risk analysis in such cases. Monte Carlo simulation is a method for iteratively evaluating a deterministic model using sets of random numbers as inputs. This method is often used when the model is complex, nonlinear, or involves more than just a couple uncertain parameters. Monte Carlo simulation is named after the city of Monte Carlo in Monaco, which is famous for gambling such as roulette, dice, and slot machines. Since the simulation process involves generating chance variables and exhibits random behaviors. Monte Carlo simulation has been applied to diverse problems ranging from the simulation of complex physical phenomena such as atom collisions to the simulation of traffic flow and Dow Jones forecasting. Monte Carlo is also suitable for solving complex engineering problems because it can deal with a large number of random variables, various distribution types, and highly nonlinear engineering models.[44]

Practical application of this method demonstrated wide possibilities of its usage in investment planning, especially in conditions of uncertainty and risk. Monte Carlo methods are a broad class of computational algorithms that rely on repeated random sampling to

[42] Application Of Scenario Analysis In The Investment Projects Evaluation Tomislav BRZAKOVIĆ , ALEKSANDAR BRZAKOvić , JELENA Petrović
[43] TROFIMOVA, L. - TROFIMOV, V. (2011) Management decisions (methods of adoption and implementation): a training manual
[44] http://web.mst.edu/~dux/repository/me360/ch8.pdf

obtain numerical results. Their essential idea is using randomness to solve problems that might be deterministic in principle. [45]

It is a simulation method for the approximate reproduction of real events. It combines an analysis of scenario and sensitivity. Instead of creating separate scenarios (best, worst and most likely), hundreds of possible combinations of factors are generated in the simulation method, considering their probability distribution. [46]

Monte Carlo analysis can be used not only for a realistic evaluation of the project investment attractiveness, but also to select the optimum combination of design parameters.

The essence of the method consists in combining sensitivity analysis and probabilistic distributions of model factors. During the simulation process we are constructing successive scenario by using original forecast data. The process of simulation is carried out in such a way that random selection of values from certain probability distributions does not violate the existence of variable or supposed correlation links between variables. The simulation results are collected and analyzed statistically in order to assess the risk measure, that is, the probability distribution of the possible outcomes of the project (for example, the probability of negative net present value). The purpose of sampling on the input random variables $X= (X_1, X_2 \ldots X_N)$ is to generate samples that represent distributions of the input variable. $F_{xi}\ (x_i)\ (i = 1,2 \ldots n)$. The samples of the random variables will then be used as inputs to the simulation experiments. Selection of key variables are based on the sensitivity analysis, each of which is determined by the range of the values (triangular, normal, uniform, discrete, etc.) and the distribution law. To determine the correlation between the parameters we are using regression analysis methods. Calculated coefficient may take a value from -1 to 1. Thus, the analysis process consists of multiple repeating of two operations: the variable is randomly assigned a value in accordance with a given distribution law, and then this value is used to calculate the resulting indicator (for example, NPV). When NPV is negative statistical analysis is performed and the proportion of scenarios is allocated, which is a measure of the risk of investment project. The obtained probability distributions allow us to establish critical

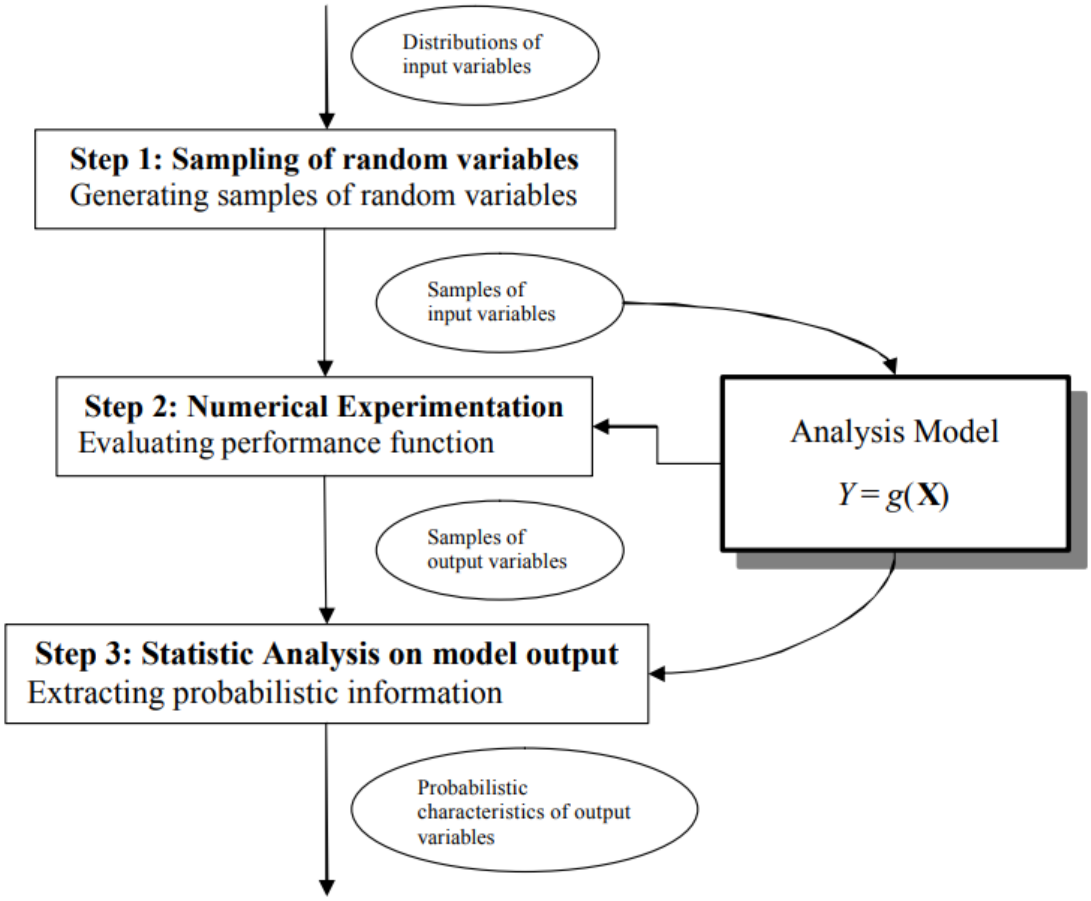
[45] *Kroese, D. P.; Brereton, T.; Taimre, T.; Botev, Z. I. (2014). "Why the Monte Carlo method is so important today".: 386–392.*

[46] EFREMOVA EA, PRYADKIN VA (2014) Application of the Monte Carlo Method for the evaluation of investment

values of variables, which, for example, in our case allows us to determine the ranges of the cash flow values at which the project will be effective. [47]

Process analysis procedure may be represented by the following scheme:

Picture 3 Monte Carlo simulation scheme.



Source: Kroese, D. P.; Brereton, T.; Taimre, T.; Botev, Z. I. (2014).

Due to the usage of special software, model simulation allows us to cover as many factors as possible which impact on the evaluation of the investment project. However, despite the unambiguousness of the obtained results, their reliability can be significantly distorted through the unreasonably chosen correlations of variables and their distribution laws. This is the main problem of the method: extreme difficulty of setting the laws for the

[47] VOLKOV, I.- GRACHEVA, M. (1999) Probabilistic methods of risk analysis - Project analysis.

distribution of probabilities and dependencies of the random parameters of the investment project.

1.4. Foreign investment project

International investment (like investment in general) is the investment of funds in some business with the expectation that they will guarantee the receipt of additional profits in the future. However, when we are talking about foreign investment, it is important to understand that in such circumstances there are own peculiarities of the movement of money between states. Some countries historically had a lower level of development, while others have been leaders in the international market for a long time and they are able to dictate their terms to the global economy. There are alliances, friendly countries and opponents.

Consider this we may can say that the main difference between international investments and domestic ones is the expectation that these investments will change due to participation in the economic processes of several states. So, what are the advantages and disadvantages of international investment for entrepreneurs?

First and very important benefit is guaranteed by the state the opportunity to organize an enterprise that will work with foreign capital. For many investors partly or complete lack of the control of organization's financial resources from its domestic state is very important benefit. Some investors highlight the ability to avoid most taxes or use the minimal rates. Also, some states are creating special economic zones with low taxes to make country more attractive for foreign investment projects. In addition, state can lure foreign investors to the special fields of the economy (green energy, agriculture etc.) whining proposing privileges in those sectors.

The biggest disadvantage of foreign investment project are taxes and tax policy. Usually all tax procedures between resident and non-residents are regulated by OECD and EU or another country. However, “OECD Model Tax Convention” it is just a list of recommendation, the template for the states which recommend how behave with taxes. Thus, we cannot know exact rate of tax implemented be each country. For instance, usually exit tax is big barrier for investors who decided to invest money in some business for short period of time.

Besides, investor must careful review country profile and have clear imagination of future development of the state where he is going to start his investment project. Country

default risk and current political situation are very important in this case. International investment project may not be profitable due to the difficult political situation in a country with volatile currency which may collapse. Therefore, in each situation, before undertaking international investment, it is worthwhile to take a comprehensive look at the situation, make forecasts and decide how profitable will be activity in this case.

By using international investments, the investor allows the country of investment improving of its economic situation. It develops the purchasing power of the state, and therefore it increases the demand for goods produced by the country of the investor. By investing internationally an investor can be confident that later his own state will benefit on this money.

Hence, why do international investments projects bring substantial revenues? First, they provide a broad choice where to invest money, which means that you can always find the most advantageous option. Secondly, international investment is always really directed to state, where there are less risks, and the likelihood of currency growth is greater. Since different countries are developing unevenly, correctly directed international investments can bring different incomes with different rates. Of course, before planning the international investments it is important to understand that in this way money goes abroad, and therefore it is very decisive to choose a reliable option that will accurately return and increase the invested amount. In this regard, there are long-standing criteria that allow us to assess how reliable the implementation of international investment in this or that case.

Among these international investment criteria are the following:

- the optimal ratio of income and risk prospects;
- high level of profitability for certain risks;
- minimum risks at a specific level of profitability.

After examining these criteria, international investors are already able to draw the first conclusions about how promising will be foreign investment project in this or that country. Just consider these criteria, international investors can be acquainted how to implement profitable international investment project for him.

II Goals and methodology of the work

The aim of the thesis is to evaluate the real investment project from the economic point of view as well as from the aspect of risks and uncertainties in the investment decision based on the summary of the theoretical knowledge of the efficiency of corporate investments.

The diploma thesis has several partial goals, which underpin its main goal. The partial goal of the theoretical part of the work is getting acquainted with economic efficiency and methods of its evaluation. We will also try to point out the impact of risk on investment dissemination and the ways in which it can be measured.

The priority of the practical part of the thesis is to follow the following partial objectives:

- determination of actual and projected discounted cash flows of an investment project
- determination of IRR and MIRR
- self-evaluation of the economic efficiency of the investment by using EBIDTA
- the process of determining the net present value of the investment
- expressing the size of the risk of the investment based on sensitivity analysis and case scenarios
- providing the experiment by using Monte Carlo simulation

For careful estimation of the investment profitability we will compare the forecasted indicators in 2008 with achieved in 2011 and make appropriate conclusion. In addition, we will discuss the main features, pros and cons of foreign investment project.

Theme of thesis - effectiveness as a measure of the company's ability to achieve its goals. Its expression depends on the method used. Each method has clearly defined criteria that determine the acceptability or inappropriateness of the investment project.

During the work we used various sources and continued following. In the theoretical part of the thesis we defined the essence of investment process. Subsequently, we characterized economic efficiency of investment and expressed its measurement methods. According to the fulfillment of the partial goals, we have identified the risk and extent of its expression. The practical part of the thesis is focused on assessing the effectiveness of the realized investment and the risk of investment with the help of individual methods. The basis for achieving the goal of work was provided by the company's internal affiliate, which indicates the real income and investment costs for 2008 and 2011.

The assessment of the effectiveness of the investment project was split into two stages: assessment of the project's data before investing and evaluation of the project's effectiveness before it was released. The key factor was the determination was discounted cash flows during the depreciation period. After that, all subsequent calculations and conclusions were developed. For the cash flow statement, we used the actual data for the first two years of investment in the acquisition of the company and subsequent data for the entire investment period. The assumptions about expected income and expenses are based on average actual revenues and expenses. An important step was to determine the discount rate that affects the investment efficiency, since it considers the time moment and determines the current value of cash flows. Then we evaluated the investments by static and dynamic methods. Finally, we evaluated the risk of investment. The risk assessment tool was a sensitivity analysis and case scenarios. Using a standard deviation, we expressed the overall risk of an investment project. It was also conducted an experiment by using the Monte Carlo method.

III Results of the work and discussion.

3.1. General description of the company "Clear Energy" and observation of the market before investing

In the analytical part of my diploma thesis I would like to evaluate the effectiveness of foreign investment project on the example of private company.[48]

In our project we will focus on the company "Clear Energy" which Alpha Investment bought in 2007. "Clear Energy" is located in Czech Republic and it is an energy-machinery producer of generators (up to 25 tons) and their parts for wind and water power units. The major markets include energy, electrical engineering, mechanical engineering, metallurgy and mining. The company employs 603 employees, of whom 417 are skilled manufacturing workers.

Revenues consist of own production and cooperative production (production of parts of generators, electric motors and voltage regulators). The main source of revenues is mainly cooperation, which is approximately 82%. Since 2004 sales have grown steadily. This happened mainly due to the boom in the energy industry (hydro and wind power). The key customers in the cooperation are 4 companies - ABB (especially winding), AVK (generators - stator and rotor plates), M.L.S. Holice (stator and rotor packets, skeletons) and Vestas (gaskets - stator packets for wind power plants, water cooled skeletons, resolvers - wind turbine blades). These companies make up approx. 70% of total co-operating revenues. As mentioned before "Clear Energy" produces two basic product categories:

1. Own products - the final products that have been created with the help of engineering team. This is primarily the production of generators especially for small hydropower plants and electric motors, especially for metallurgical plants, steelworks and other production lines.
2. Products produced according to foreign documentation (so-called "cooperation") - these are often special products and usually the output is a product in progress (88% of production in 2006). Company has a significant role as a subcontractor for components for electric motors and generators for international manufacturers

[48] ***Due to the internal privacy of the company which data is using, all names are changed***

(cooperation). More than 60% of products for export, especially to Germany, Sweden, Austria, Switzerland, USA and France.

Cooperative production involves the production of skeletons and parts of electrical machines or the execution of partial operations in the following fields:

- Engineering technology - plate burning, cutting, sheet metal forming, welding, turning, milling, drilling, grinding, electro-inverting cutting and trenching, etc.
- Electrotechnical technology - sheet metal stamping for electric machines, sheet metal strip packing, baling, balancing, vacuum impregnation, assembly, testing, surface treatment.

The greatest demand is for the activities of oil mills and machine shops. The large volume of activity in the co-production is also a winding for ABB. The 86% of this product scope is produced for big names in this business. 14% is production under own brand and according to own design-specification. The other product line consists of big electric motors (rotors). Plus, the company holds a special monopoly position in some machinery semi-products with general purpose in Czech Republic. The main value of the company is the growing demand for energy engineering products, for which, increasing the demand for electricity and energy saving engines. This saves energy while operating. Demand for the company's products causes continuous sales growth in Company “Clear Energy” over the last four years.

The growth of generator production is driven mainly by the attractiveness of green energy. Green energy is a significant global trend. Support for green energy based on state-guaranteed prices for green energy and return on investment in general and legislative support from the state and the EU. This made the project very attractive for the company. The growth of the sector of electrical engines is stable and long-term. Nowadays it is driven by the economic growth. Emerging economies in the CEE region have much stronger economic growth than older EU countries. In the demand for electro engines there is at the same time an anticyclical pillar of demand what is a demand for repassing or repairing of existing production lines and for the buying of engines. “Clear Energy” a leader of production of these engines for the traction of simpler production lines.

In general, it cannot be said that company has significant competition in the relevant market. This is mainly due to the production portfolio. Generators and motors are

manufactured in different sizes and outputs. Company focuses on smaller and less efficient generators and electric motors, while similar vendors produce more and more powerful at higher margins. There are large global players such as Siemens, ABB, Emerson, GE Energy, Alstom, who focus on energy and energy engineering. In addition to these global players, there are medium-sized companies that focus on special products, small-scale and cooperative production for large multinationals. There are still small, so-called garage companies, whose volume and quality do not reach the level of company. However, due to the lack of production capacities and the relatively high entry barriers in the sector, the intensity of competition between individual manufacturers or suppliers of technologically advanced production is relatively low, competition has also the cooperative character which make the sector very attractive for investment.

Before the acquisition “Clear Energy” in 2007 company was in a very healthy financial condition - no interest-beard debt, high EBITDA margin, rapidly growing, volume of orders is 20% over the capacity. The prospects of the sector for the next 3-5 years were very optimistic.

Alpha Investment bought a 100% share in the company “QWE” in 2010 to synergize with company “Clear Energy” in the areas of business, manufacturing, purchasing and other operating activities. Company “QWE”, manufactures and provides service for electric drives, elevator cabinets, provides production and development of dedicated electric machines and service. “QWE” was building on the long-standing tradition of electric engineering production. The original company has been founded in 1919. “QWE” provided engineering and maintenance services, designs, manufacturers and maintains electric machinery (drives and control panels) and developed and produced single-purpose electric devices. In 2011, both private equity companies were sold.

3.2. Risk report of the company

3.2.1. Investment and processing stages risks

Referring to the company report the main risk of the project assumed that the current growth of the Company “Clear Energy” was mainly due to the energy boom. The adjustment in this sector would have a very significant impact, especially in area of cooperation, where

some customers had their own opportunities in the CEE (Central and Eastern Europe). In the case of reduced cooperation, the cooperation would be lost in the first place.[49]

During the investment and processing stages it can be defined the main project risks in the following areas:

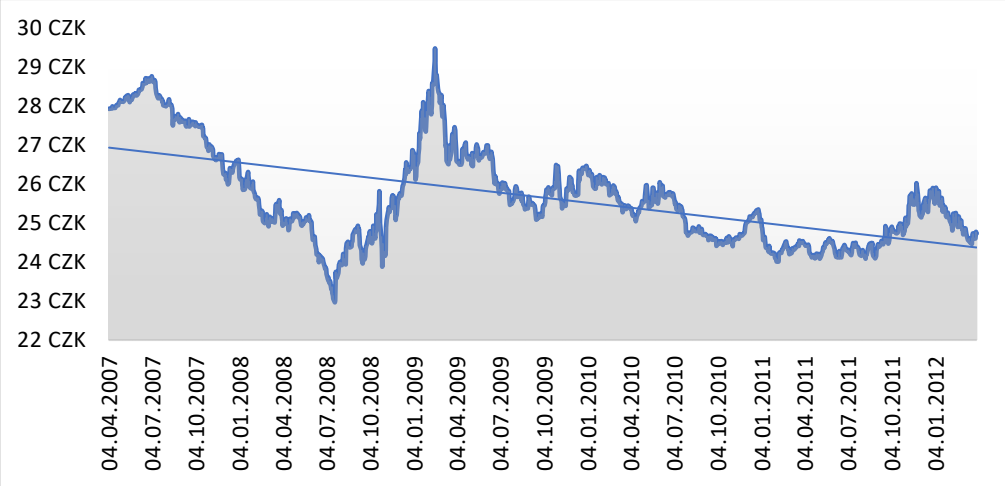
1. Risks related to the sales process:
   - The project team expects bidders to become roughly the same as Alpha investment
2. Risks related to the company operations:
   - Decreasing the demand for the company's products due to significant and long-term economic downturn.
     - It should be noted that the risk will be low due to the excessive demand for the energy engineering sector. Due to the nature of energy investments (long-term projects, often with state support), the energy sector is expected to grow even in the coming years. There is no significant cyclicality in the income of energy companies. Some products of “Clear Energy” (synchronous motors) are "anti-cyclical". Its mean than the demand for these products increases during a recession. Customers may not buy new engines to attract new lines, but they can buy or restore old-fashioned engines where the supply is very limited. Obviously, Company “Clear Energy” has a very strong position in these products.
   - Risk of project cost increase. Increase the cost of inputs (materials, especially cooper parts) that cannot be passed on to customers
   - Customer risk. The main customer's departure from business.
     - The company's policy lies in the fact that there is no decisive customer, the departure of which will pose a significant risk to the company. At present, this risk of outflow of customers is theoretical due to excessive demand pressure over supply and the cooperative nature of production. Power Engineering is often based on the principle of outsourcing in the early stages of production. For example, the most significant client for profit in Holice is completing the work of CEE subcontractors at its plants in the Czech Republic and does not provide this outsourcing production activity at its own production facilities in the region. Even in case of a decrease in demand, Holice simply downloads products from Clear Energy, because they do not have their own production facilities for this

[49] Company “X” DQM report 2007

activity. They strategically focus on the next stage - the completion of production, testing and sales. Eventually it means that customer risk is quite low.

- Financial risk. The currency risk associated with the strong appreciation of the Czech koruna against the euro. (Estimation of the beginning of 2007).
  - ➢ Significant strengthening of Czech koruna against euro may indicate deterioration of Company "Clear Energy" position as an exporter compared to competing manufacturers from the sector of the euro area. As we can see from the graph below, this risk was approved. The trend line is showing an obvious appreciation against EUR.

Picture 4: Historic Exchange rate EUR/CZK



Source: ECB official web site, Access mode: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-czk.en.html

- ➢ Production risk. Extreme growth of prices of raw materials (e.g. electrical sheets iron-copper part).
- ➢ Country risk. Ending global green energy support by government (mainly for wind energy).

3.2.2. Case scenario analysis

Alpha Investment was broadly using case scenario in their reports. Depending on the results of the analysis, company can determine if the level of risk present falls within its comfort zone.

The expected financial indicators that we use to value company financial results can be estimated in one or two ways. They can represent a probability -weighted average of

financial indicators under all possible scenarios or they can be the financial indicators under the most likely scenario.

While the former is the more precise measure, it is seldom used simply because it requires far more information to compile. In both cases, there are other scenarios where all financial indicators will be different from expectations; higher than expected in some and lower than expected in others. In scenario analysis, we estimate DCF, IRR, and nominal profit under various scenarios, with the intent of getting a better sense of the effect of risk on value. In this section, we first consider an extreme version of scenario analysis where we consider 3 the value in the best, the worst and the base case scenarios, and then a more generalized version of scenario analysis. During the lifetime of the project "Clear Energy", Alpha Investment created them at the beginning of the project and before the exit. Scenarios allowed company to evaluate and asses project more effectively. At the beginning the project scenario was created for forecasting and evaluating of future company income expectations. Firstly, we will analyze the discounted cash flow case scenario because it is necessary for the investor to know the rate of return on invested capital (comparable investment objects at the level of risk in future).

Table 1: DCF Value Scenarios in 2008:

		Own Products Production		
		Worst Case	Base Case	Best Case
Cooperation	Worst Case	623 828	681 375	874 248
	Base Case	1 014 392	1 072 020	1 264 935
	Best Case	1 405 356	1 462 985	1 655 900

Source: based on Clear Energy financial data reports.

As I mentioned before, all economic activity of the company we can split on the cooperation and own products. From table 1 we can conclude that cooperation made big impact on company's cash flow. Even with best case scenario of own product production sale we will have lover than average amount of discounted cash flow. The slightest deviation from base scenario which can be accepted is the base case of cooperation and the worst case of own products production sales.

It was also created a case scenario for IRR and nominal profit. From table 2 and table 3 we can conclude that the same tendency is kept: cooperation made significant impact on the general results.

Table 2: IRR Scenarios in 2008:

		Own Products Production		
		Worst Case	Base Case	Best Case
Cooperation	Worst Case	15,27%	17,04%	22,71%
	Base Case	26,35%	27,89%	32,46%
	Best Case	36,15%	37,41%	41,18%

Source: based on Clear Energy financial data reports.

Table 3 Nominal Profit Scenarios in 2008:

		Own Products Production		
		Worst Case	Base Case	Best Case
Cooperation	Worst Case	557 487	639 953	932 044
	Base Case	1 117 693	1 207 976	1 506 477
	Best Case	1 719 817	1 810 100	2 108 602

Source: based on Clear Energy financial data reports.

Referring to the data provided by company (data was provided in 2011) we can build and analyze the scenario analysis.

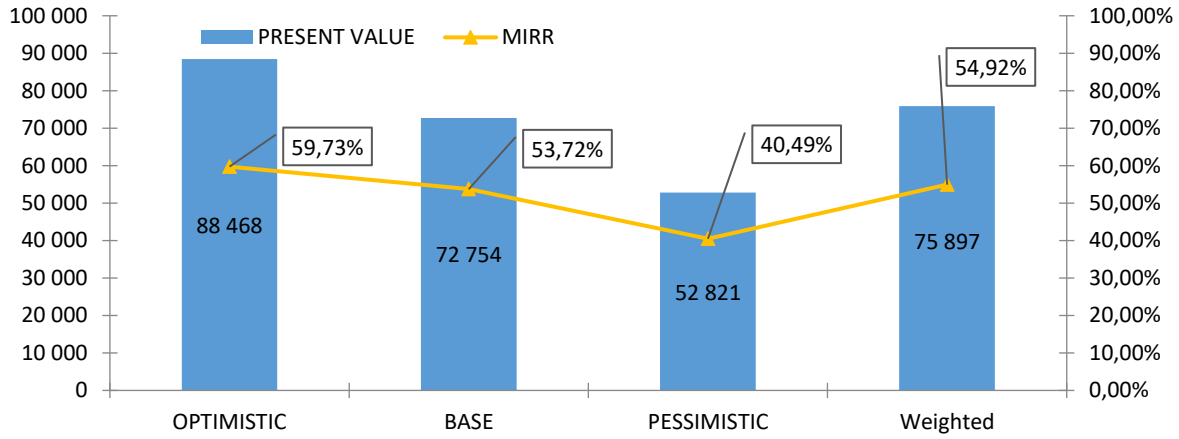
Table 4: Case scenario for "Clear Energy" in 2011:

	Calculated weighted results	OPTIMISTIC	BASE	PESSIMISTIC
Project IRR	**158,86%**	**171,45%**	**155,71%**	**101,89%**
Project MIRR	**39,11%**	**59,73%**	**53,72%**	**40,49%**
Nominal Profit (in EUR ths.)	**79392**	**93 434**	**75 881**	**67 623**
Project Net Equity Exposure (in EUR ths.)	**-4 974**	**-4 974**	**-4 974**	**-4 974**
Project PV (in EUR ths.)	**75897**	**88 468**	**72 754**	**52 821**
Project NPV in (EUR ths.)	**70923**	**83 494**	**67 780**	**47 847**
Project DCF Value in (EUR ths.)	**87282**	**87 282**	**87 282**	**87 282**
Total Net Exit Price (in EUR ths.)	**83771**	**98 594**	**80 065**	**71 217**

Source: based on Clear Energy financial data reports.

Analyzing the table 4 we can clearly see that experts from Alpha Investment made very positive forecast for future development of the company. In a base case scenario, they expect 155% project IRR. This is in 0,62 times bigger than current scenario in 2011. Even pessimistic scenario is looking quite "optimistic" as according to their predictions it should be bigger than current data scenario. All another company indicators are following the same tendency as project IRR indicator. In all 3 possible probabilities they supposed to be higher than in current scenario 2011.

Picture 5: Present value and MIRR in case scenario for Clear Energy in 2011



Source: based on Clear Energy financial data report.

For a better understanding of the project case scenario, I have calculated the weighted results. Weighted results consist of the data from three case scenarios and allows us to see the most realistic results on which we can rely in our forecast. From the picture 5 we can clearly see the comparison between weighted results and case scenarios.

3.2.3. Sensitivity analysis

As it was mentioned in the part 3.2.1, the output products of "Clear Energy" are significantly connected with price on cooper. That's why an expert from Alpha investment provide the sensitivity analysis for cooper and cooper parts to predict possible risk of IRR decreasing.

Table 5: One tailed sensitivity analysis of the price of cooper and cooper parts, current value of IRR 27,89 (*Source: based on the data from enclosures*

	The average monthly price increasing for copper and cooper pats **(2008 - 2012)**							
	0,00%	3,00%	5,00%	8,00%	10,00%	12,00%	15,00%	20,00%
IRR	**27,89%**	25,99%	24,67%	22,59%	21,13%	19,67%	17,38%	13,19%

Source: calculated by author, based on Clear Energy financial reports from enclosure.

From table 5 we can clearly see that IRR can fall from 27,89% to 13,19% if in worse case prices of cooper will rise to 20%. Data was forecasted in 2008.

The global financial crisis in 2008 had visible impact on a price of copper. The average price in 2009 was 5149$ per ton, which was 26% lower than the price of the previous year. The share of copper in the total material consumption is 14%. A substantial part of the copper cables is used for winding up for ABB. However, the contract is based on such that the increase in the price of copper is reflected in the final price of the product.

However, since the beginning of April 2009, relating to the stabilization of the world economy, the price of copper had gradually increased, investment in this industry increased as well, copper production capacities were recovered. Thus, the risk was avoided.

The concept of sensitivity analysis is a simple one, it has three critical components:

The first is the determination of which factors the scenarios will be built around. In general, analysts should focus on the two or three most critical factors that will determine the value of the asset and build scenarios around these factors. In our case it will be total acquisition debt and purchase price. (See table 6)

Table 6: Two tailed sensitivity analysis: How company purchasing price and total acquisition debt will affect company IRR

Static IRR: 27,89%		**Total Acquisition DEBT**					
		400 000	500 000	600 000	800 000	1 000 000	1 200 000
PURCHASE PRICE (ths. CZK)	1 500 000	13,85%	16,49%	19,49%	**26,99%**	**37,83%**	**56,30%**
	1 600 000	11,49%	13,85%	16,49%	22,95%	**31,84%**	**45,58%**
	1 700 000	9,36%	11,49%	13,85%	19,49%	**26,99%**	**37,83%**
	1 800 000	7,43%	9,36%	11,49%	16,49%	22,95%	**31,84%**
	1 900 000	5,67%	7,43%	9,36%	13,85%	19,49%	**26,99%**
	2 000 000	4,04%	5,67%	7,43%	11,49%	16,49%	22,95%

Source: calculated by author, based on Clear Energy financial reports from enclosure.

The second component is determining the number of scenarios to analyze for each factor. I our case we will use 2 scenarios: rising of nominal purchase price and rising of total acquisition debt.

While more scenarios may be more realistic than fewer, it becomes more difficult to collect information and differentiate between the scenarios in terms of asset cash flows. Thus, estimating IRR under each scenario will be easier if the firm lays out 2 scenarios, for instance, than if it lays out 15 scenarios. The question of how many scenarios to consider will depend then upon how different the scenarios are, and how well the analyst can forecast IRR under each scenario. Experts from Alpha investment would like to reach the same level of IRR of the company as it was before the acquisition. That's why, the crucial step for their investment procedure was to find such a combination of purchasing price and total acquisition debt which could fit with level of static IRR.

The final component is the assignment of probabilities to each scenario. For some scenarios, involving macro-economic factors such as exchange rates of currency, revenues and overall economic growth, we can draw on the expertise of services that forecast these variables. For other scenarios, involving either the sector or competitors, we must draw on our knowledge about the industry and company at all. That's why investors from Alpha investment take into the consideration another crucial value – Nominal profit. From the information in table 5 we can find that 2 combinations are the same. That's why we will use an additional analysis (table 7) which can help us to find the best combination.

Table 7: Impact of Acquisition debt and purchase price on nominal profit.

	Acquisition DEBT					
	200 ths. CZK	400 ths. CZK	500 ths. CZK	600 ths. CZK	800 ths. CZK	1 000 ths. CZK
IRR	5,67%	9,36%	11,49%	13,85%	19,49%	**26,99%**
Nominal Profit	387 976	587 976	687 976	787 976	987 976	1 187 976
	Purchase PRICE					
	1 400 ths. CZK	1 500 ths. CZK	1 600 ths. CZK	1 700 ths. CZK	1 900 ths. CZK	2 000 ths. CZK
IRR	**47,43%**	**39,22%**	**32,93%**	**26,70%**	20,14%	17,06%
Nominal Profit	1 507 976	1 407 976	1 307 976	1 107 976	1 007 976	907 976

Source: computed by author, based on Clear Energy financial reports from enclosure.

The lowest marginal IRR for investment was 26,99%. We could reach this rate in two cases:

1. with price of purchasing 1500 ths. CZK and acquisition debt 800 ths. CZK;
2. with price of purchasing 1700 ths. CZK and acquisition debt 1000 ths. CZK;

So, in the next step Alpha Investment were adding nominal profit to check the possibility of losses. From table 7 we can admit that if we decided to use second case IRR will be approximately the same as marginal. In the first case average IRR will be 1% less than in 2d case.

3.2.4. Monte Carlo analysis

Monte Carlo method is based on the generation of multiple trials to determine the expected value of a random variable. Analytics from Alpha Investment did not try this approach in their evaluations. In my opinion, in conditions of high uncertainty and risk, it is preferable to use alternative methods. Thus, Monte Carlo simulation is the best form of such a risk analysis.

Subject of my experiment will be discounted cash flow (DCF). DCF is one of the most important instrument for financial analytics. This method broadly used for evaluation of financial value of the company and calculation of net present value of investment projects. Despite its popularity, this method has several widely known drawbacks both from the theoretical and the practical point of view. On a practical level, the discounted cash flow method is very sensitive to changes in the parameters of the financial model, for example, in the discount rate or the rate of growth of cash flows. As a result, small changes in these parameters can lead to significant fluctuations in the net present value of projects or the fundamental value of companies. At the theoretical level, the discounted cash flow method does not consider the probabilistic nature of the results of the investment project. Method ignores the strategic component of the value of companies and does not allow to assess the contribution to the cost of management flexibility (the ability to take optimizing management decisions during the implementation of projects). DCF works particularly poorly under conditions of high uncertainty and risk. Thus, in this case Monte Carlo simulation will help us to evaluate this risk.

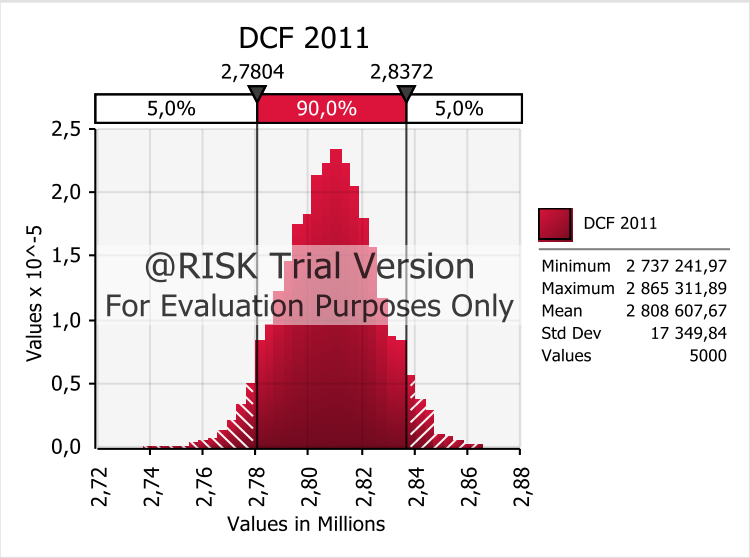
In 2010 experts from Alpha Investment calculated the estimated discounted cash flow values for 2011-2014 years.[50] My task was to check the risk of changing the estimated DCF in case of some random fluctuations in key indicators (all DCF data and calculations of the Company "Clear Energy" you can find in appendix 1). For my simulation I was using @Risk

[50] *In part 3.2.4.I am going to detailed and describe only estimated 2011 year to show how Monte Carlo simulation is working in practice. Results for following years you can see in enclosures.*

software. For more broad and significant results I conducted 5000 iterations. Key indicators which for which I set the random changes were:

1. *Net income*. In my opinion, NI can affect DCF as it is straightforwardly connected with future cash flow.
2. *Depreciation costs* because fixed assets can reduce its value.
3. *Loans*. Value of project loans can fluctuate as it depends on the investment decision.
4. *Cost of equity*, because a lot of factors can make impact on this indicator (secondary market yields of government bonds with a remaining maturity close to 10 years, local risk free in local currency / local risk-free EUR or USD denominated, inflation)
5. *Tax rate*, corporate income rate may change (decision based on historical results historical results).

Picture 6: Monte Carlo simulation for DCF 2011(value estimated by Alpha Investment analytics)

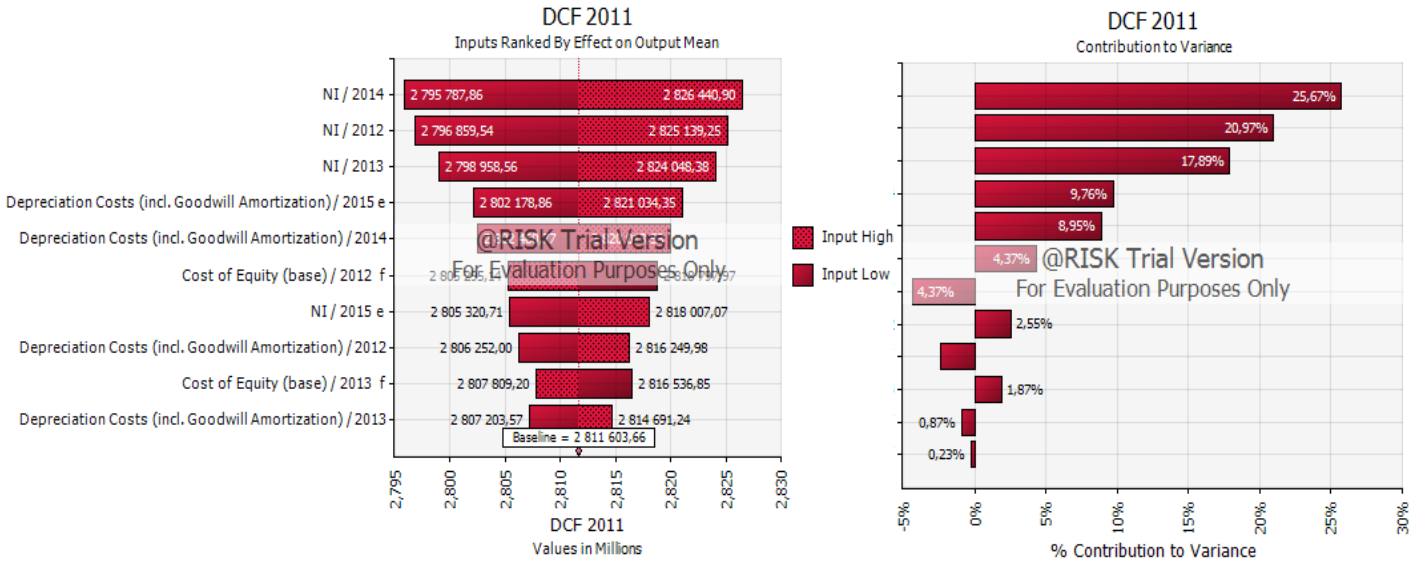


Source: calculated by author, based on Clear Energy financial reports from enclosure.

When all random variables are set, we are running the simulation (picture 6). From our histogram chart we can see how sensitive is DCF when different input variables are changings results. Next step is checking if the probability is differing from results conducted by analytics from Alpha Investment. They expected DCF around 2 809 373 ths. CZK and this is a little bit more from mean value 2 808 607 ths. CZK. This indicate that there aren't potential big risks which can have the impact on the result, however the final value may vary from 2 780 400 ths. CZK to 2 839 000 CZK. Also, our distribution is leptokurtic and a little

negative skewed. There is 56,6% probability to reach calculated result or higher. That's why company must find key indicators which must be controlled in future to avoid potential risk.

Picture 7: Monte Carlo simulation for DCF 2011, key inputs; contribution to variance



Source: calculated by author, based on Clear Energy financial reports from enclosure.

There are three the most important indicators which affect our final DCF results: NI for future years, depreciation costs and cost of equity. NI 2014 is affecting output by 25%, NI from 2012 and 2013 20,97% and 17,89% respectively. From the following results we can make conclusion that company must pay attention to those three indicators because DCF is quite sensitive to their changings.

3.3. Discussions about results of Company "Clear Energy"

This stage of analysis is the most difficult and requires both financial literacy and great care of the employee, as it involves working with large data sets and consolidating information from various sources and reports coming from other departments of the enterprise. We can divide evaluating of the effectiveness of the investment process of Alpha Investment on two parts:

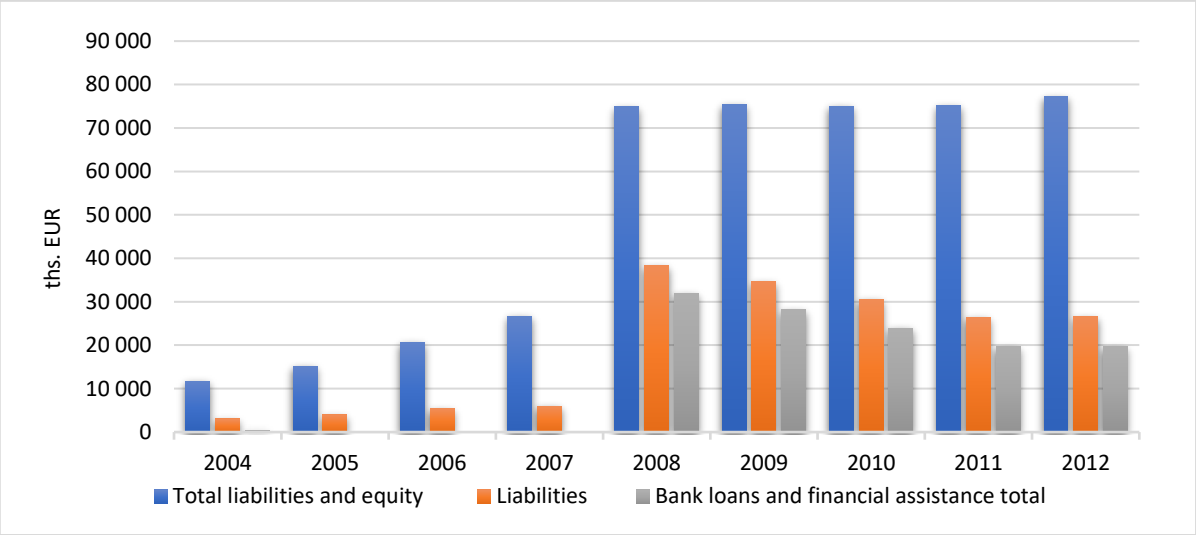
1. Project evaluation before purchasing (2007).
2. Project evaluation before exit approval (2011).

3.3.1. Project evaluation before purchasing

The purchase price was financed in part by Alpha Investment own funds (about 1,000 million CZK) and partly used a bank loan (about 700 million CZK). To finance the transaction

company used surplus cash of the company (at the level of 130-150 million CZK) and leverage. Moreover Company "Clear Energy" did not use bank financing to manage the company. Retained earnings in the company was 530 million CZK, including the profit for 2007. (Picture 8)

Picture 8 Structure of assets and liabilities before and after the acquisition in 2008



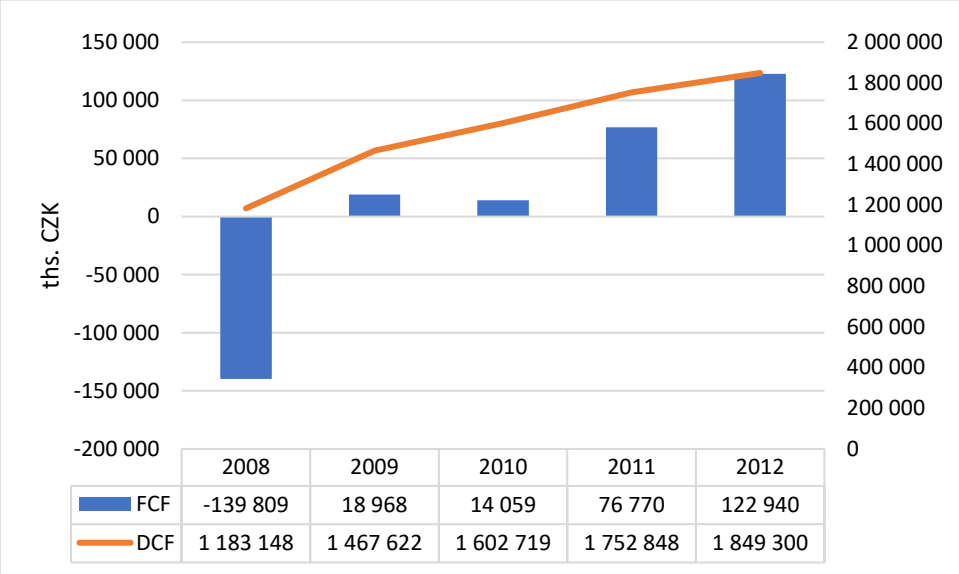
Source: computed by author, based on Clear Energy financial reports from enclosure.

From picture 8 we can observe the changings in project structure of assets and liabilities after the acquisition by Alpha Investment with future forecast of investment developing. We can note that investors expect stable development of the company. Thus, they believed that the company can hold a solid market position that would increase the price and the value of future profits.

I order to evaluate project effectiveness in the initial stage we will use DCF method, IRR and NPV.

Firs of all, I would like to underline that discounted cash flow determines how far out into the future we should project cash flows. DCF analysis is based on the concept of the temporary value of money. The monetary unit is subject to inflationary processes, changes in the economic and political situation in the country and many other factors. During computing DCF value is necessary to use a discount rate that takes into account the company equity rate and time lag. We are computing the company equity rate by using capital pricing model where are involved such indicators as risk free rate (RFR), beta coefficient, company risk premium and market equity premium. Discounted cash flow was computed for 5 years.

Picture 9 FCF and DCF forecast growth for the project (forecasted in 2007) [51]



	2008	2009	2010	2011	2012
FCF	-139 809	18 968	14 059	76 770	122 940
DCF	1 183 148	1 467 622	1 602 719	1 752 848	1 849 300

Source: calculated by author, based on Clear Energy financial reports from enclosure.

From the graph above we can notice that discounted cash flow is increasing in yearly basis. Besides future cash flow also is following the increasing trend. This surely indicates positive future project development and promises high project effectiveness. In my opinion, key factors which lead to such an effectiveness are increasing in potential dividends, decreasing in risk factor rate and moderate increasing of net income.

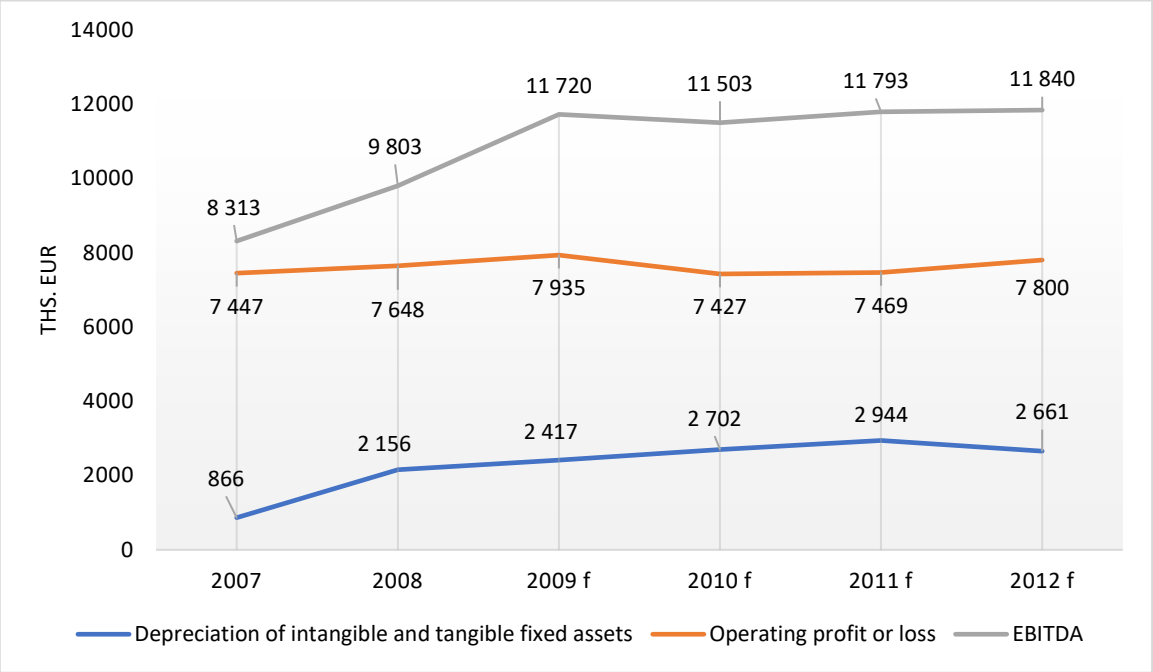
Internal Rate of Return is the discount rate that results in a net present value of zero for a series of future cash flows. The major difference is that while Net Present Value is expressed in monetary units (Euro's or Dollars for example), the IRR is the true interest yield expected from an investment expressed as a percentage. In our project valuation we got positive IRR which was equal to 27%. This rate mean that all cash receipts should be invested at a rate of 27%. Despite the popularity of IRR, it must be remembered that it does not always consider the specifics of the analyzed projects, and therefore it is necessary to additionally use other analysis tools.

Another indicator on which analysts from Alpha investment are focused on their forecast is EBIDTA. Usually, investors are guided by EBITDA as an indicator of the expected return of their investments. EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) - profit before interest, taxes and depreciation. EBITDA

[51] Extended data you can find in appendix

shows the financial result of the company, excluding the effect of the capital structure (interest paid on borrowed funds), tax rates and depreciation policy of the organization. EBITDA allows a rough estimate of the cash flow, excluding such a "non-cash" item as depreciation. The indicator is useful when we are comparing enterprises of one industry, but having a different capital structure. For calculation EBITDA we are using P&L statement of the company. To get final result we need to summaries depreciation of intangible and tangible fixed assets and operating profit and loss.

Picture 10: Forecasted (f) EBTDA of the Company "X"



Source: calculated by author, based on Clear Energy financial reports from enclosure.

From picture 10 we can admit positive trend of growing EBITDA which tell us that the activities of the organization are already profitable at the operational stage, even before payment for the use of borrowed capital, taxes, depreciation. We can connect such a positive EBIDTA growth with a successful company performance since 2008. Following the results of 2008 the plan was exceeded, and the sales volume amounted to about 1.3 billion dollars. CZK (more than 200 million CZK). Own production is mostly single production. In 2008, 100% of the sales plan was signed with the contract. That led to an increase in the future share of the social production. The product portfolio was to be expanded with new products - generators of more than 5 MVA and other projects on existing production lines. For 2008, there are signals from current customers that the number of pieces for some products may be even greater - the GSH is above 5 MVA, as well as the permanent magnet engines.

Cooperation - for 2008, sales of about 350 million CZK are completed (at the same time last year it was only 170 million CZK). Company was planning huge expansion in cooperation sector at the expense of involving new business partners. I believe that in this sector the company has a great potential for growth.

3.3.2. Project evaluation before exit approval

Next step which we will take into the consideration will be the results of the company before the selling in 2011. It is important to note that company successful achieved all goals settled in the beginning and in some cases impressively overfulfilled. Before the analyses of the key indicators of the project effectiveness it is also important to mention that in 2010 "Clear Energy" was merged with company "QWE" which without no doubt made crucial impact on general investment project result.

I would like to begin with analyzing the profitability index. The procedure of the calculation PI was mentioned before in part 1.2.5. It will help us to measure the rentability of the project.

$$PI = \frac{NPV + initial\ investment}{initial\ investment} = \frac{67\,780\,000\ EUR + 63\,080\,000\ EUR}{63\,080\,000\ EUR} = 2{,}07$$

From our results we can make a conclusion that index is bigger than 1 and project is profitable and attractive. Furthermore, it shows us that company is performing impressive double result which conclude that project is successful. For better picture of the company performance we will have a look on table 8.

Table 8 Company "Clear Energy" and Company "QWE" sales, EBIDTA, net debt and DCF value for 2011 and forecast

Source: Alpha Investment financial report

Company "Clear Energy"	**2008**	**2009**	**2010**	**2011**	**2012 f**	**2013 f**	**2014 f**
SALES	1 216 589	1 060 116	1 101 946	1 244 650	1 380 703	1 570 533	1 757 037
EBITDA	273 197	300 077	335 715	349 537	372 323	418 409	455 268
Net Debt	-70 396	846 310	725 070	640 789	460 020	207 561	-59 067
DCF Value			2 643 703	2 800 444	2 943 860	3 031 085	3 115 301
Company "QWE"							
SALES	408 410	338 142	346 975	342 066	401 132	456 282	511 892
EBITDA	27 584	44 371	40 985	51 400	66 347	71 375	75 689
Net Debt	13 125	-916	21 713	19 886	-14 321	-54 881	-99 988
DCF Value			290 364	297 337	302 151	300 450	293 131

Picture 11: Investment project final results indicators before the exit in 2011

Project IRR	• 155,71%
Nominal Profit (in EUR ths.)	• 75 881
Project Net Equity Exposure (in EUR ths.) as of 31.12.2010	• -4 974
Project PV (in EUR ths.)	• 72 754
Project NPV in (EUR ths.)	• 67 780
Project DCF Value in (EUR ths.)	• 87 282
Total Net Exit Price (in EUR ths.)	• 80 065

Source: computed by author by using Alpha Investment financial reports

In table 8 we can observe a constant growing of all key values which indicates perfect company development. We can note that sales and EBITDA are significantly growing and net debt is decreasing in both company "Clear Energy" and company "QWE". This in turn is accompanied by an increasing in DCF, which cause positive company's performance.

With data from picture 11 we can compare the results from initial period and conclude that project was effective. In comparison with 2008 project IRR grow up from 27% to 155%; Project discounted cash flow value from 1 183 148 ths CZK (42 795 ths. EUR) to 87282 ths. EUR.

Alpha Investment achievement during the investment process:

- Company "Clear Energy" become producer № 1 in Europe in segment of small hydro generators up to 5 MW (low speed);
- Strong management team / CEO with attractive motivation scheme linked to the company performance;
- Hands on approach of the PT with focus on value increasing phase and exit;
- Best practices implementation in all functional areas;
- Stable and constant growth of the company 2008-2011 (EBITDA growth CAGR 27%). Company increased EBITDA even in time of financial and economic downturn, competitors declined by 30% - 40%. Stable growth of the company was one of the key factors which generated high exit price;

- Right strategic measures (focus on green energy, own production, buy and build – "QWE" acquisition), operational measures (productivity increase, cost optimizing) and financial measures (financial engineering);
- Acquisition of "QWE", acquisition of engineering knows how, system integration and service, additional EBITDA 41 mln. CZK in 2010 + cost synergies with "Clear Energy";
- Constant productivity increase, not just cost cutting but mainly productivity increase as key element of the growth of the company; (operational improvement, work flow, ABC costing, production standards, 5S, investments into productive technology – capex, Company "Clear Energy" and "QWE" synergies, machine operations rules) all these factors leaded to stable EBITDA growth
- Consolidation of the management team; hiring of new top management members and design engineers; management team.
- Sales activities development - Routes to the market & Business development
- Product innovations and R&D (generator with permanent magnet)

3.4. Recommendation for successful foreign investment project

Based on the thorough theoretical research, we may claim that financial practices executed by Alpha Investment belong to the best practices on the market both outcome and approach-wise. It is very important to highlight obvious successful progress of the Company "Clear Energy" and "QWE". Under the professional leadership of Alfa Investment, the company has made significant progress in the field of electricity manufacturing in the Czech Republic.

It is hard to recommend any suggestion for improvement as the project has exceeded the expectations. However, in some cases Alpha Investment still could do better. In my opinion, they could calculate more indicators for evaluation of investment in initial stage of investment. For instance, calculation of payback and discounted payback period could help company to predict future development of the company more accurate.

Another no less important factor which I would like to mention is the condition of the global economy during world financial crisis in 2008. Noteworthily, we may notice that risky steps undertaken by the company were implemented during the times of crisis and great uncertainty on the market. Alpha Investment accepted audacious decision to start foreign

project in terms of uncertainty. However, probably exactly this decision helps company to achieve such an impressive result and bypass key competitors.

In addition, we must also take into account that international investment process is closely linked to international trade. The size of tariff rates has a direct impact on attracting international investment, because the low rate often plays a large role in the selection, then for example, the existence of customs privileges. The competent use of this advantage provides several countries with deep integration with the international market, as evidenced by recent studies in the field of the international economy. International investments provide substantial benefits to the country of the investor. This is not obvious at first glance, but a small analysis allows a better understanding of this mechanism, like it was in case of company “Clear Energy” and green energy tariffs in Czech Republic.

Conclusion

Investment is one of the forms of successful growth in the market value of the company. In the system of reproduction, regardless of its social form, investment plays a major role in the renewal and increasing of productive resources consequently, in ensuring the specified rates of economic growth. Evaluation of the investments is one of the most important steps in capital budgeting which helps the investor to see in detail all the mathematical aspects of the future project. The purpose of investment appraisal is to create qualitative background for good investment decisions. Proper investment appraisal helps to ensure that the right project is undertaken at the right time, and in a way which gives it the best chance of success.

Based on all the characteristics of the aforementioned methods for evaluating the effectiveness of investment projects, it is easy to conclude that each of them has both positive and negative sides, and that each of them has its own sphere of application and most accurately describes the characteristic for which analysis it was withdrawn. Thus, the most reliable results of the evaluation will provide a comprehensive analysis of the project in question, considering its specific features.

Depending on the situation, the end result may differ both in the positive and in the negative direction. Here it is necessary to distinguish between the concepts of uncertainty and risk, because risk is a numerically characterized measure of uncertainty. That is why we considered several the methods that identify the level of the risk.

In the analyst part of diploma thesis, we evaluate the effectiveness of the foreign investment project in Czech Republic by using real data provided by company. Based on the thorough theoretical research, we may claim that financial practices executed by Alpha Investment belong to the best practices on the market both outcome and approach-wise. Company “Clear Energy” has undergone a very positive development in recent years. Alpha Investment have accomplished own goals of increasing the company's value significantly. During their involvement, EBITDA has increased by 110 %, to almost EUR 16 million. Company “Clear Energy” has become a leading European player in its line of business and expanded to new markets successfully. Beside using the traditional methods of evaluating investment projects (NPV, IRR, discounted payback period), Alfa Investment does not use more sophisticated methods to assess the economic efficiency of investment projects in its investment activities.

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ENCLOSURES

Enclosure A: Balance sheet of the company Clear Energy in 2007 (and forecast for 5 years)

A.1. Assets

Item (in ths. EUR)	2004	2005	2006	2007	2008 f	2009 f	2010 f	2011 f	2012 f
Total assets	11 733	15 161	20 660	27 160	73 480	64 420	66 270	66 176	51 711
Non-current assets	3 598	3 935	6 028	8 885	52 638	52 608	52 080	49 270	32 560
Intangible fixed assets total	291	235	229	234	240	245	246	246	246
Tangible fixed assets total	3 306	3 700	5 799	8 651	52 398	52 364	51 834	49 023	32 313
Long-term financial investments total	0	0	0	0	0	0	0	0	0
Current assets	8 046	11 123	14 573	18 214	20 779	11 786	14 165	16 881	19 125
Inventory total	3 297	4 580	4 941	5 735	6 399	6 670	6 877	7 117	7 311
Long-term receivables total	0	0	0	0	0	0	0	0	0
Short-term receivables total	3 065	4 064	6 107	5 943	6 646	7 068	7 289	7 552	7 754
Cash & financial accounts total	1 684	2 478	3 525	6 535	7 733	-1 952	0	2 212	4 061
Accruals & deferred items total	89	103	60	61	63	25	25	26	26

A.2. Liabiities and equty

Total liabilities and equity	11 733	15 161	20 660	27 160	73 480	64 420	66 270	66 176	51 711
Equity	8 599	10 959	14 908	20 921	37 106	34 591	39 421	42 312	44 453
Registered capital total	157	168	1 413	1 441	1 484	1 509	1 515	1 521	1 521
Capital funds total	20	22	23	23	24	25	25	25	25
Funds created from profits	21	17	140	143	148	150	151	151	151
Retained profit / loss from previous years	7 039	8 788	9 645	13 595	19 886	17 318	22 121	24 875	25 405
Profit/loss for current period	1 362	1 965	3 686	5 717	4 876	4 719	4 699	4 788	6 399
Liabilities	3 032	3 955	5 444	5 924	36 049	29 499	26 518	23 532	6 926

Reserves total	802	839	1 166	1 189	1 224	1 245	1 250	1 255	1 255
Long-term liabilities total	210	224	258	263	271	276	277	278	278
Short-term liabilities total	1 657	2 892	4 019	4 472	4 869	5 039	5 155	5 289	5 393
Bank loans and financial assistance total	363	0	0	0	29 685	22 939	19 837	16 710	0
Accruals & deferred items	102	247	309	315	325	330	331	333	333

Enclosure B: Clear Energy DCF valuation before the question

	2007	**2008 f**	**2009 f**	**2010 f**	**2011 f**	**2012 f**
Revenues	1 111 830	1 205 144	1 263 622	1 300 030	1 344 270	1 382 000
NI	144 217	122 777	117 946	114 365	120 770	130 600
Depreciation Costs (incl. Goodwill Amortization)	24 025	58 092	100 306	107 607	113 707	106 256
Delta WC	2 850	18 586	10 198	7 328	8 821	7 660
Investments	100 000	142 092	74 800	86 300	34 600	106 256
Δ Loans	0	-160 000	-114 286	-114 286	-114 286	0
FCF	65 392	-139 809	18 968	14 059	76 770	122 940
PV_CF	**0**	**-126 678**	**15 492**	**10 379**	**51 367**	**74 554**
DCF	**X**	**1 183 148**	**1 467 622**	**1 602 719**	**1 752 848**	**1 849 300**

Enclosure C: Company "Clear Energy" DCF Valuation 2010 (and forecast for 5 years)

Years	**2010**	**2011 e**	**2012 e**	**2013 e**	**2014 e**
Revenues	X	1 244 650	1 380 703	1 570 533	1 757 037
NI	X	96 984	115 149	154 981	196 656
Depreciation Costs (incl. Goodwill Amortization)	X	152 108	162 263	170 222	177 059
Δ WC	X	7 321	16 702	23 314	22 904
Investments	X	89 665	79 941	49 429	84 184
Δ Loans	X	-131 431	-149 635	-164 598	-284 306
FCF	X	20 675	31 134	87 862	-17 679
PV CF	**X**	**18 194**	**24 304**	**61 064**	**-10 995**
Value GR	***X***		***11,37%***	***8,87%***	***12,39%***
CASH EB	X	127 470	222 797	491 452	780 791
FV	**X**	**2 286 176**	**2 546 084**	**2 771 898**	**3 115 301**
Real DIVIDENDS	**X**	**67 824**			
Adjusted PV of FCFE (w/o debt financing impact)	**x**	**170 097**	**166 347**	**191 442**	**169 789**
DCF (w/o impact of acquisition debt financing)	**2 641 781**	**2 808 731**	**2 953 188**	**3 041 565**	**3 125 944**
RV		**3 169 542**			
PV RV		**1 770 601**			
Long_growth		2,00%			
long_ds		11,75%			
Multiplikátor		10,46			
PV All		**2 037 674**			
Cost of equity		**2011 f**	**2012 f**	**2013 f**	**2014 f**
RFR		3,89%	3,89%	3,89%	3,89%
Beta		1,2	1,13	1,07	0,99
EMP		6,93%	6,93%	6,93%	6,93%
Cost of Equity (base)		12,21%	11,73%	11,32%	10,75%
Company Risk Premium		1,00%	1,00%	1,00%	1,00%
Company Equity Rate		**13,21%**	**12,73%**	**12,32%**	**11,75%**
DF		0,883	0,887	0,890	0,895
DF_kumul		0,880	0,781	0,695	0,622
MARKET VALUE of EQUITY		2 286 176	2 546 084	2 771 898	3 115 301
D/E		30%	21%	13%	3%
Effective Tax Rate		20,00%	20,00%	20,00%	20,00%
Leverage Factor		1,24	1,17	1,11	1,02
Levered (equity) Beta		1,2	1,13	1,07	0,99
Unlevered beta		0,97			

Enclosure D: Profit and loss statement of Clear Energy in 2007 (and forecast for 5 years)

Item (in ths. EUR)	2004	2005	2006	2007	2008 f	2009 f	2010 f	2011 f	2012 f
Total sales	**16 590**	**25 973**	**33 190**	**39 317**	**44 191**	**47 123**	**48 664**	**50 511**	**51 929**
Sales of goods bought for resale	269	1	4	27	26	26	27	27	27
Costs of goods sold	267	1	4	27	26	26	26	26	26
Gross margin	**2,1**	**0,6**	**0,2**	**0,0**	**0,3**	**0,3**	**0,3**	**0,3**	**0,3**
Gross margin %	*0,8%*	*42,2%*	*4,4%*	*0,0%*	*1,0%*	*1,0%*	*1,0%*	*1,0%*	*1,0%*
Sales of own products and services	16 320	25 972	33 186	39 290	44 165	47 096	48 637	50 485	51 902
Consumables and services purchased	10 929	18 492	22 345	25 935	28 937	30 162	31 095	32 182	33 059
Consumed material, energy and other non-inventory items	8 869	15 294	18 785	22 347	25 071	26 448	27 282	28 259	29 039
Services	2 060	3 198	3 560	3 588	3 866	3 714	3 814	3 923	4 019
Added value	**6 608**	**8 441**	**11 195**	**14 165**	**15 755**	**17 496**	**18 122**	**18 905**	**19 463**
Added value on Sales %	*40%*	*32%*	*34%*	*36%*	*36%*	*37%*	*37%*	*37%*	*37%*
Total personnel expenses	4 644	5 688	6 609	7 249	8 204	8 140	9 029	9 584	10 136
Depreciation of intangible and tangible fixed assets	649	561	597	866	2 156	2 417	2 702	2 944	2 661
Sales of long-term assets and inventory	1 030	1 582	2 269	2 785	3 119	3 277	3 346	3 435	3 497
Net book value of long-term assets and material sold	353	459	560	635	501	535	552	573	589
Operating profit or loss	**2 105**	**2 913**	**5 236**	**7 447**	**7 648**	**7 935**	**7 427**	**7 469**	**7 800**
Profit/loss from financing activities	-273	-273	-380	76	-1 475	-1 693	-1 303	-1 235	-1 138
Profit/loss from ordinary activities	1 362	1 965	3 686	5 717	4 876	4 719	4 699	4 788	6 399
Profit/loss for accounting period	**1 362**	**1 965**	**3 686**	**5 717**	**4 876**	**4 719**	**4 699**	**4 788**	**6 399**
EBITDA	**2 754**	**3 473**	**5 833**	**8 313**	**9 803**	**11 720**	**11 503**	**11 793**	**11 840**
EBITDA margin %	*17%*	*13%*	*18%*	*21%*	*22%*	*25%*	*24%*	*23%*	*23%*
FCF					1 004	-1 952	2 039	4 259	6 108

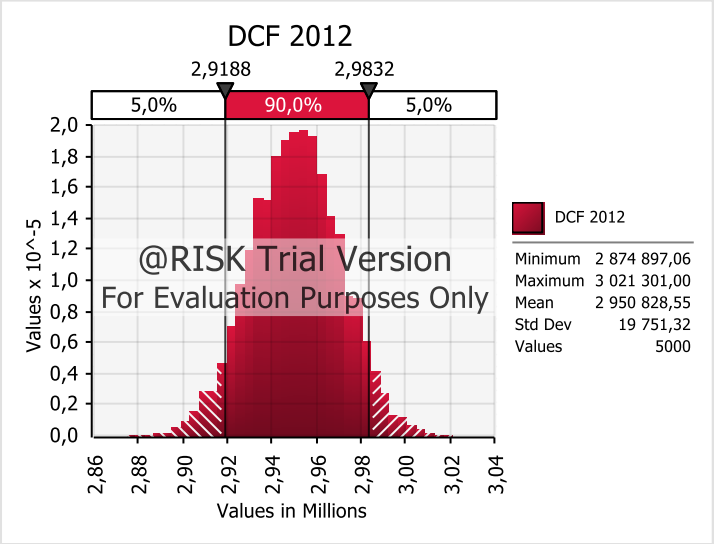
Enclosure E: Clear Energy and QWE pivot cash flow and NPV calculated (*due to the company policy some of the transaction are hidden*)

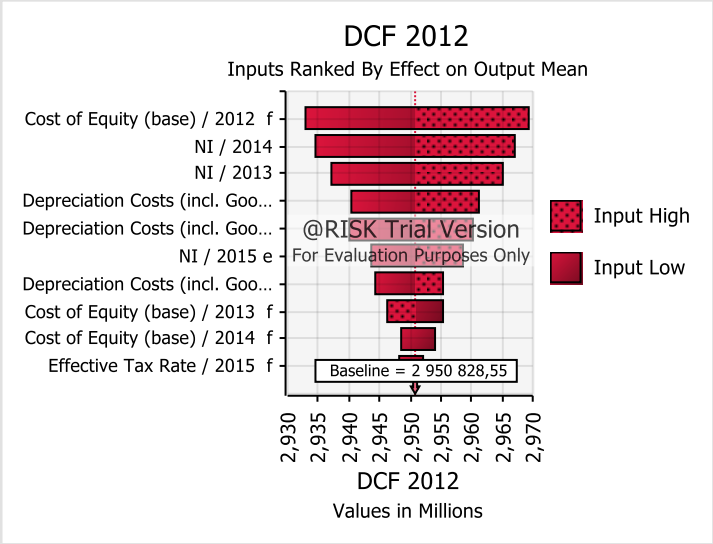
Operations:	Date	CFs CZK ths.	Original CF	FX	DF	NPV	PV
Other Project Costs 2007	31.12.2007	-119	-119	1,00	1,00	-119	0
Arrangement Fee	11.03.2008	-200	-200	1,00	1,00	-200	0
Other Project Costs 2008	01.04.2008	-1 441	-1 441	1,00	1,00	-1 441	0
Purchase Price (1. PMNT)	22.05.2008	-376 000	-376 000	1,00	1,00	-376 000	0
Arrangement Fee	27.05.2008	-14 000	-14 000	1,00	1,00	-14 000	0
Partial Exit	30.05.2008	160 000	160 000	1,00	1,00	160 000	0
Other Project Costs 2008	31.05.2008	-1 145	-1 145	1,00	1,00	-1 145	0
Hidden transaction	10.06.2008	100 000	100 000	1,00	1,00	100 000	0
KB - Interest Costs	24.06.2008	-3 000	-3 000	1,00	1,00	-3 000	0
KB - Interest Costs	28.07.2008	-1 000	-1 000	1,00	1,00	-1 000	0
KB - Interest Costs	26.08.2008	-1 000	-1 000	1,00	1,00	-1 000	0
Dividends	25.09.2008	173 998	7 146	24,35	1,00	173 998	0
Loan RPMNT	30.09.2008	-173 998	-7 146	24,35	1,00	-173 998	0
Loan RPMNT	01.10.2008	23 548	23 548	1,00	1,00	23 548	0
Extra dividend	22.12.2008	29 120	29 120	1,00	1,00	29 120	0
Other project costs 2008	31.12.2008	-6 522	-6 522	1,00	1,00	-6 522	0
Other project costs 2009	31.03.2009	-650	-650	1,00	1,00	-650	0
Purchase Price	01.06.2009	-1 000	-1 000	1,00	1,00	-1 000	0
PP - Zlámalík	19.08.2009	100	100	1,00	1,00	100	0
PP - Dušek	20.08.2009	100	100	1,00	1,00	100	0
Hidden transaction	21.08.2009	-37	-37	1,00	1,00	-37	0
Dividends	02.09.2009	36 010	36 010	1,00	1,00	36 010	0
Dividends	02.10.2009	24 000	24 000	1,00	1,00	24 000	0
Other Project Costs 2009	31.12.2009	-9 557	-9 557	1,00	1,00	-9 557	0
Hidden transaction	01.01.2010	-1 507	-1 507	1,00	1,00	-1 507	0
Hidden transaction	18.01.2010	-58 375	-58 375	1,00	1,00	-58 375	0
Hidden transaction	31.01.2010	-1 500	-1 500	1,00	1,00	-1 500	0
Hidden transaction	25.03.2010	26 000	26 000	1,00	1,00	26 000	0
Clear Energy dividend paid	15.04.2010	20 000	20 000	1,00	1,00	20 000	0
drawing a loan	19.04.2010	-20 000	-20 000	1,00	1,00	-20 000	0
Extraordinary reward	30.04.2010	-45	-45	1,00	1,00	-45	0
Hidden transaction	04.06.2010	-60 425	-60 425	1,00	1,00	-60 425	0
bill of exchange	16.06.2010	50 000	50 000	1,00	1,00	50 000	0
Drawing of credit	12.07.2010	-1 900	-1 900	1,00	1,00	-1 900	0
Clear Energy payment of dividend cash	30.07.2010	5 210	5 210	1,00	1,00	5 210	0
Redemption of bank bills of exchange	23.09.2010	-3 959	-3 959	1,00	1,00	-3 959	0
Redemption of bank bills of exchange	16.12.2010	-23 415	-23 415	1,00	1,00	-23 415	0
Hidden transaction	25.12.2010	-26 940	-26 940	1,00	1,00	-26 940	0
Hidden transaction	22.12.2010	15 000	15 000	1,00	1,00	15 000	0
Clear Energy payment of dividend cash (30,9m CZK)	07.01.2011	30 259	1 232	24,57	1,00	30 130	30 130
Clear Energy payment of dividend cash, return overpayment	18.01.2011	-773	-32	24,30	1,01	-764	-764
QWE borrowing (20m CZK)	19.01.2011	19 963	823	24,25	1,01	19 732	19 732
Bill of exchange	12.01.2011	24 376	1 005	24,25	1,01	24 198	24 198
QWE difference after credit	10.02.2011	1 197	50	24,12	1,03	1 168	1 168
Loan repayment	10.02.2011	1 985	82	24,12	1,03	1 936	1 936

bill	16.06.2011	-28 458	-28 458	1,00	1,11	-25 696	-25 696
bill	30.06.2011	-15 453	-15 453	1,00	1,12	-13 834	-13 834
bill	30.06.2011	-25 053	-25 053	1,00	1,12	-22 429	-22 429
Purchase Price	31.03.2011	-15 000	-15 000	1,00	1,06	-14 197	-14 197
Dividends Clear Energy	31.03.2011	24 000	24 000	1,00	1,06	22 715	22 715
Dividends QWE	31.03.2011	30 000	30 000	1,00	1,06	28 394	28 394
Exit fee - PWC	30.06.2011	-20 625	-852	24,20	1,12	-18 465	-18 465
Exit fee *hidden*	30.06.2011	-6 619	-273	24,20	1,12	-5 925	-5 925
EXIT Company "Clear Energy"	**30.06.2011**	**1 693 864**	**1 693 864**	**-0,04**	**1,12**	**1 516 428**	**1 516 428**
EXIT "QWE"	**30.06.2011**	**312 573**	**312 573**	**-0,04**	**1,12**	**279 830**	**279 830**

Enclosure F: Monte Carlo simulation results

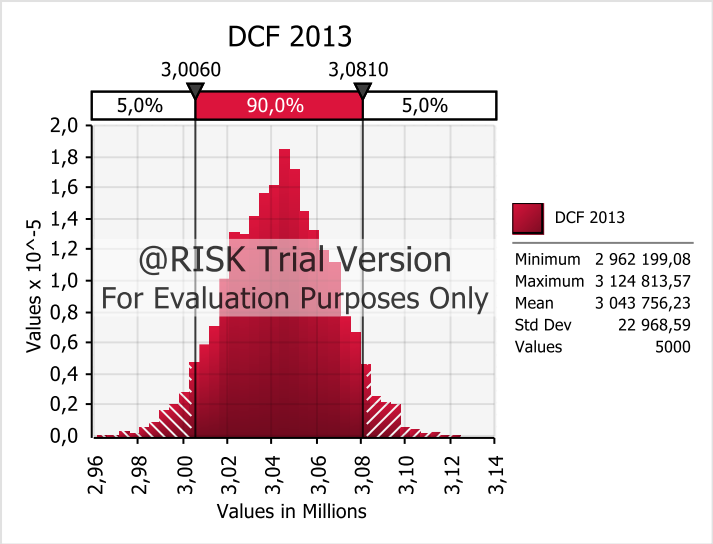
F.1. Monte Carlo simulation results for 2012

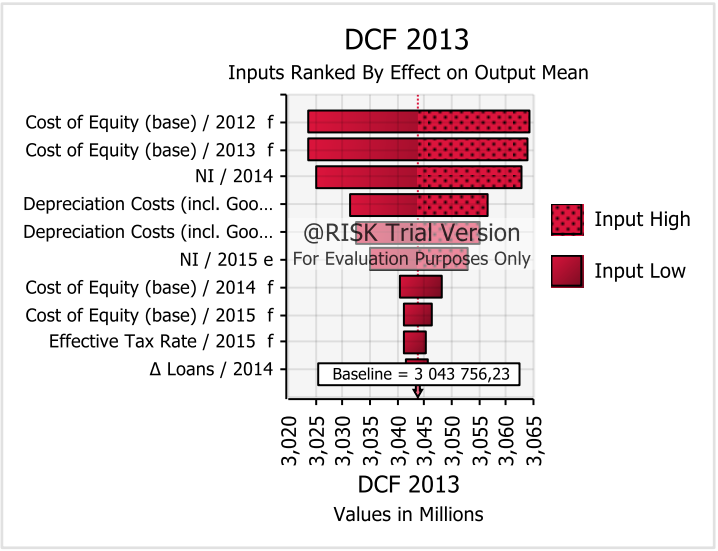




Summary Statistics for DCF 2012			
Statistics		**Percentile**	
Minimum	2 874 897	**5%**	2 918 824
Maximum	3 021 301	**10%**	2 925 446
Mean	2 950 829	**15%**	2 930 244
Std Dev	19 751	**20%**	2 933 697
Variance	390114775,2	**25%**	2 936 907
Skewness	0,000158754	**30%**	2 940 275
Kurtosis	2,831806217	**35%**	2 943 035
Median	2 950 924	**40%**	2 945 608
Mode	2 954 139	**45%**	2 948 347
Left X	2 918 824	**50%**	2 950 924
Left P	5%	**55%**	2 953 503
Right X	2 983 155	**60%**	2 955 984
Right P	95%	**65%**	2 958 511
#Errors	0	**80%**	2 967 753
Filter Min	Off	**85%**	2 971 689
Filter Max	Off	**90%**	2 976 746

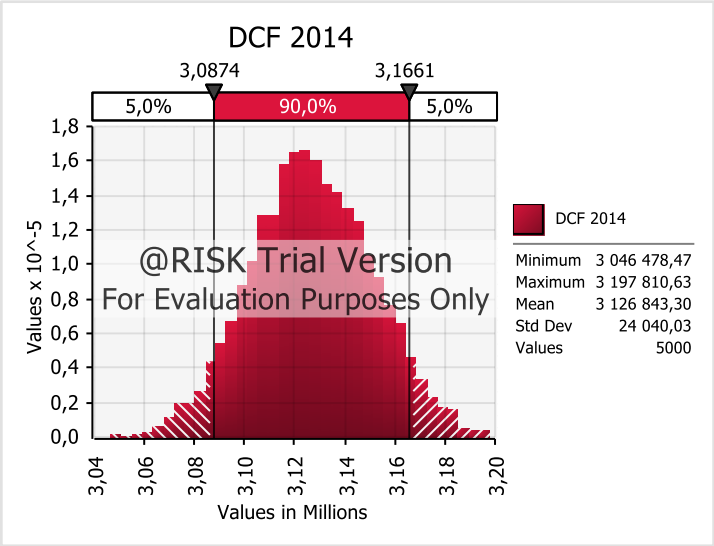
F.2. Monte Carlo simulation results for 2013

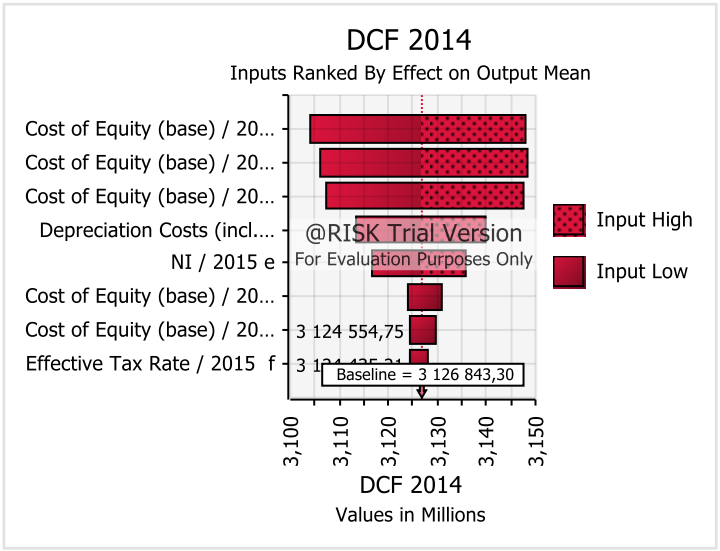




Summary Statistics for DCF 2013			
Statistics		**Percentile**	
Minimum	2 962 199	**5%**	3 005 972
Maximum	3 124 814	**10%**	3 014 198
Mean	3 043 756	**15%**	3 019 817
Std Dev	22 969	**20%**	3 023 969
Variance	527555901,9	**25%**	3 027 746
Skewness	-0,031365929	**30%**	3 031 418
Kurtosis	2,826763319	**35%**	3 035 008
Median	3 044 132	**40%**	3 038 210
Mode	3 047 155	**45%**	3 041 215
Left X	3 005 972	**50%**	3 044 132
Left P	5%	**55%**	3 046 956
Right X	3 080 979	**60%**	3 049 636
Right P	95%	**65%**	3 052 652
Diff X	75 007	**70%**	3 055 925
Diff P	90%	**75%**	3 059 367
#Errors	0	**80%**	3 063 593
Filter Min	Off	**85%**	3 068 051
Filter Max	Off	**90%**	3 073 502

F.3. Monte Carlo simulation results





Summary Statistics for DCF 2014			
Statistics		**Percentile**	
Minimum	3 046 478	**5%**	3 087 370
Maximum	3 197 811	**10%**	3 096 082
Mean	3 126 843	**15%**	3 101 814
Std Dev	24 040	**20%**	3 106 445
Variance	577923205,1	**25%**	3 110 552
Skewness	-0,003663329	**30%**	3 114 220
Kurtosis	2,787761168	**35%**	3 117 359
Median	3 126 392	**40%**	3 120 305
Mode	3 129 887	**45%**	3 123 322
Left X	3 087 370	**50%**	3 126 392
Left P	5%	**55%**	3 129 602
Right X	3 166 076	**60%**	3 132 669
Right P	95%	**65%**	3 136 084
Diff X	78 705	**70%**	3 139 726
Diff P	90%	**75%**	3 143 702
#Errors	0	**80%**	3 147 674
Filter Min	Off	**85%**	3 152 644
Filter Max	Off	**90%**	3 158 380