

## **SENSITIVITY ANALYSIS TO KNOW THE PROJECT'S ABILITY TO CONTINUE**

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**ABSTRACT:** *Sensitivity analysis allows to evaluate how the resulting performance of the project at different values of given variables required for calculation. This type of analysis to determine the most critical variables that have the greatest affect on the feasibility and effectiveness of the project. In this paper we reviewed the concept and essence of the sensitivity analysis and its stages in addition to the study of one of the projects ability to continue using the net present value index NPV. the ranking of the major indices performed in order of importance to the outcome of the project. In other words, the size of the NPV according to the obtained values of the critical point and sensitive edge.*

**KEYWORDS:** Sensitivity Analysis, Net Present Value, Risk Analysis, Project Sustainability, Investment Management.

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### **INTRODUCTION**

Project sensitivity analysis should be carried out to determine accounting and forecasting the impact of changes in various kinds of initial settings, including:

- 1) Pecuniary inflow.
- 2) Invest costs.
- 3) The level of reinvestment, ie funds that have been received as income on investments and re-directed to - is to invest the same objects and so forth.

This analysis will determine the sustainability of the project likely to change under different conditions of the economic situation and taking into account the internal parameters of the project, for example, changes in distribution of goods or foams. The main purpose of sensitivity analysis is to implement accounting and predict what effect the input parameters of the project on the resulting indicator. The most convenient option in favor of the relative change of the input parameter, for example a change of all cash flows of a few percent, as well as an analysis of the changes in the resulting figures. The most important for the sensitivity analysis is to assess the impact of changes of the input parameters in order to allow for the worst-case scenario.

### **THEORETICAL ASPECTS OF THE PROJECT SENSITIVITY ANALYSIS.**

#### **The concept and essence of the sensitivity analysis of the project.**

The main objective of the sensitivity analysis lies in the account and forecast the impact of the input parameters of the project on the resulting performance. The most convenient option

performs relative change any input parameter and analysis of the changes with respect to the resulting parameters [2, p. 84]. The most important for the sensitivity analysis serves assessment of the impact of changes of the input parameters, it is necessary to be able to predict the course of events in the business plan.

Accordingly, it is generally considered pessimistic, most likely and optimistic forecasts, as well as the final results of the project are calculated. Thus it will be possible to draw a conclusion about the ability of the continuation of a project.

Furthermore, the resulting sensitivity analysis data will be considered in comparison with interchangeable projects. For other things being equal, it will be selected by the project which is the least sensitive with respect to the deterioration of the input parameters [4].

Analyzing the Sensitivity, enterprise management is not looking for opportunities to reduce investment risk, and tries to reflect what the consequences will have to go through the enterprise as a result of an incorrect assessment of a number of variables. By itself, the analysis is not able to change the sensitivity of the risk factors.

Here is the formula that is used to compare the initial parameters with those calculated according to the sensitivity analysis:

$$\Delta A = \frac{A_{ach} - A_{iskh}}{A_{iskh}} \times 100\%, \text{ where in}$$

$\Delta A$  represents a variation of the percentage,

$A_{ref}$  serves as the initial value of the parameter  $A$ ,

$A_h$  serves as the parameters calculated on the basis of sensitivity analysis. Ie totals  $A$ . In order to choose between optimistic and pessimistic scenario will be a sensitivity analysis and the likely trends in selected developments.

Sensitivity analysis and sustainability held in the following key indicators:

- i) **Net present value (NPV),**
- ii) **Internal rate of return (IRR),**
- iii) **Profitability Index (PI),**
- iv) **Payback (PB).**

Regarding possible changes in the conditions of implementation of the sustainability of the project will generally be characterized by the break-even performance boundaries, ie, maximum levels of production volumes, prices of commodities and other parameters [1, p. 78]. Normally the border is determined exactly for the break-even production volume. Calculate it can be only in the period of the enterprise. In practice, it is called a point or a break-even level.

The emergence of the breakeven point is typical for the time when variable and fixed costs are equal to income. In other words, when the company brings not only losses, but profit. This indicator will be expressed in monetary terms and in terms of production, the cost of which is entirely the same as the income received from sales. Break-even analysis is carried graphic or mathematical method [5].

### **Stages of sensitivity analysis.**

Procedure sensitivity analysis includes a number of stages:

1. Selection of key performance indicators of investment, which can act as internal rate of return, ie, IRR, or the index of net present value, ie,( NPV).
2. Selection factors that management can not be certain. We are talking about capital expenditures and investments in working capital, as well as market factors, components of cost of goods, the timing of construction and commissioning of plant and equipment,
3. Setting the lower and upper limits of these factors,
4. Calculation of key indicators for each of the selected limit factors,
5. Scheduling sensitivity for each uncertain factors, by which it can be concluded the most critical aspects of the project. This is to ensure possibility of adjusting them [3].

For example, when as a critical factor is the cost of goods sold, it makes sense to think about how to change the marketing strategy, as well as improve the quality of products.

### **An example of a sensitivity analysis of the project.**

The essence of the analysis of the projects is to assess the impact of any project parameters at the project results, provided that all the other parameters will be unchanged. In order to more deeply explore the subject, it makes sense to analyze break-even on a practical example. Start by assessing the impact of the parameters on the main / baseline efficiency of projects, ie, the current (net) cost of the project, ie, NPV. It takes the basic model the dependence of the net present cost of the project from the effects of internal and external factors. This model should be assumed that the project cash flow is equal to the net profit after tax, which will be adjusted to the size of non-cash expense items. This is not taken into account the residual value of fixed assets and working capital. This will significantly simplify the calculations. According to this model, you need to determine the critical points of the main indicators of the project, as well as a sensitive edge on all of them. Initial data for analysis Sensitivity was reflected in (Table 1).

**Table (1) - Initial data for analysis of investment sensitivity**

Index	Settlement Period						Average value
	Construction	Development	Total production capacity				
	0%	75%	100%	100%	100%	100%	
The annual volume of sales, ths. Pcs.	-	30	40	40	40	40	38
The price per unit of output, ths. Rub.	-	35	35	35	35	35	35
Variable costs per unit of output, ths. Rub.	-	20	20	20	20	20	20
Annual conditionally fixed costs, ths. Rub.	-	84,64	84,64	84,64	84,64	84,64	84,64
The initial investment cost, ths. Rub.	262	10	-	-	-	-	272
Implementation term, years	-	-	-	-	-	-	5
The amount of depreciation for the period of one thousand. Rub.	-	20,64	20,64	20,64	20,64	20,64	20,64
Discount Coefficient	1	0,8621	0,743	0,641	0,552	0,476	-
The total discount rate	-	-	-	-	-	-	3,274
Income tax rate, %	-	0,20	0,20	0,20	0,20	0,20	0,2
Net operating cash flow	-262	302,93	432,93	432,93	432,93	432,93	1772,64
The discounted net cash flow	-262	261,14	321,74	277,36	239,10	206,12	1043,46
The net present value of the cumulative total	-262	-0,86	320,88	598,24	837,34	1043,46	-

Variable costs will amount to 20 thousand rubles. Annual fixed costs will include in its membership overheads and depreciation. It makes sense to determine the average values of the investment project, it needs to calculate the critical points, as well as indicators of safety limit them appropriate for each of the parameters.

Checkpoints are ranked according to the level of materiality, ie according to the limiting value of errors in the evaluation of investment totals. With this figure the project will not be considered cost-effective. When the (table 2) represent the calculated results. At the same time as the initial data are the figures from the (table 1).

**Table (2) - Calculation of the critical points and the sensitive edge**

The parameters	The calculation of the critical point	Calculation %,sensitive edge	Conclusions
The annual volume of sales, ths. Pcs	10,845	71,46	Average value of the safety factor
.Unit price, thousand. D. E	24,281	30,63	The slight decrease in prices significantly affects the efficiency
Variable costs per unit of .output, thousand. D. E	30,719	53,59	A slight change in variable costs is dangerous for the effectiveness of the
Annual semi-fixed costs, mln. D. E	491,961	481,24	a large margin to change fixed costs
The initial investment costs, .million. D. E	1338,950	392,26	Great tensile strength to change the initial investment
%,Income tax rate	0,871	335,69	The income tax rate can be raised to 87.1%
Term of realization of the investment project, years	0,665	86,70	Large enough margin of safety

This table reflect the influence of the sensitivity of the investment project with respect to changes in its main parameters. After analyzing the sensitivity of the project will be identified the main parameters affecting the results of the project, in particular on indicators such as NPV.

The main purpose of the sensitivity analysis acts setting boundaries change the main settings, in which the level of efficiency and financial solvency will be maintained.

In the case where the project is focused on the fact that in the future to get a loan, the most interesting will be the maximum lending rate sensitivity of the project to possible changes in the parameters laid down in the draft. This calculation criterion serves current cost effectiveness. On the results of the project affect the following factors:

- 1) Dimensions variable costs per unit of product.
- 2) cost of the merchandise.
- 3) The annual volume of sales of goods.

In case the price of 30.63%, the company will be at break-even level of NPV.

Thus, NPV is equal to zero. The same will happen in case of an increase in variable costs per unit of product by 53, 59%, and in the case of reducing the volume of output at 71.46%.

Accordingly, in order to be able to protect the project, the company's management should be to develop an appropriate pricing policy, as well as to carry out the organization of work related to the supply of materials, it is necessary to exclude the possibility of growth of their value, a change which will cause the growth of variable costs per unit of product as well as the reason for the decrease to a critical level indicator of the effectiveness of the project.

The project has a large margin of safety with respect to changes in the amount of fixed costs. This fact will allow for compensation of the high risk of the project at the expense of advertising measures that will increase the probability of sale of the goods at the price taken into account.

**Table (3) The sensitivity of the control points of the investment project**

The parameters	The planned value of e	Ultra safe	Sensitive edge %,(materiality	Ranking of key indicators place
The annual volume of sales, <del>th. pcs.</del>	38	10,845	71,46	5
Unit price, thousand. D. E.	35	24,281	30.63	7
Variable costs per unit of output, thousand. D. E.	20	30,719	53,59	6
Annual conditional constants costs <del>ppm. e.</del>	84,64	491,961	481,24	1
The initial investment costs, million. D. E.	272	1338,950	392,26	2
Income tax rate%,	0,2	0,871	335,69	3
Term of realization of the investment project, years	5	0,665	86,70	4

A substantial change in the cost of equipment and other initial costs for the project will not play a special role. The results reflect the sensitivity of the project with respect to changes in key parameters. Summarized results of the analysis are shown in (table 3).

It should be noted that the ranking of the major indices performed in order of importance to the outcome of the project. In other words, the size of the NPV according to the obtained values of the critical point and sensitive edge.

## CONCLUSION

The most important for the sensitivity analysis serves assessment of the impact of the change. All input parameters that must be to be able to predict the development of events in the business plans. Accordingly, it is generally considered pessimistic, most likely and optimistic forecasts, as well as the final results of the project are calculated. Thus it will be possible to draw a conclusion about the ability of the continuation of a project.

Sensitivity analysis and sustainability held in the following key indicators:

- v) Net present value (NPV).
- vi) Internal rate of return (IRR).
- vii) Profitability Index (PI).
- viii) Payback (PB).

Analyzing the Sensitivity, enterprise management does not send opportunities to reduce investment risk, and tries to reflect what the consequences will have to go through in-company by an incorrect assessment of a number of variables. By itself, the analysis is not able to change the sensitivity of the risk factors.

## REFERENCES

- Form IA Investment management - Kyiv, 2011.
- Birman G., Schmidt C. Economic analysis of investment projects, Moscow, 2012.
- Risk analysis and project sustainability [electronic resource] Access: <http://kasideas.ru/kollekcija-biznes-planov/analiz-riskov-i-ustojchivosti-proekta.html>.
- Analysis of the stability and sensitivity of the project [electronic resource], the mode of access: <http://wiasite.com/elektronnoy-kommertsii-osnovy/331analiz-ustoychivosti-chuvstvitelnosti.html>.
- Section of the business plan: Sensitivity analysis [electronic resource], mode of access: <http://www.openbusinee.ru/bplan/step10.htm>.
- Sensitivity analysis [electronic resource], mode of access: <http://www.market-pages.ru/bplan/17.html>.
- Sensitivity Analysis [electronic resource], the mode of access: <http://financial-analysis.ru/metodes/metIASensitivityAnalysis.html>.