Assessing Micro-Investment Projects Risk using Sensitivity Analysis Technique: The Case of Construction Works Project financed by the National Agency for Entrepreneurship Support and Development - ANNABA State-

Nour Elhouda Rezgui [1] / Faculty of Economics, Commerce and Management, University of Badji Mokhtar Annaba, nour-elhouda.rezgui@univ-annaba.dz

Abdelillah Khelassi / Faculty of Economics, Commerce and Management, University of Abou Bekr Belkaid Tlemcen, Khelassi.abdelillah@univ-tlemcen.dz

Received: 14/11/2024 **Accepted: 12/03/2025** **Published : 05/06/2025**

Abstract:

This study outlines the methodology and application of the sensitivity analysis technique in evaluating investment projects for risk assessment. In order to study a real example, the construction works project located in Annaba and financed by the National Agency for Support and Development of Entrepreneurship, was selected as a case study. When applying sensitivity analysis to changes in three key variables cash flow, discount rate and investment cost. It was concluded that sensitivity of the project's NPV to changes in cash flow was more than the other two variables.

Keywords: *Investment, Risk Assessment, Sensitivity Analysis, micro-project*

Jel Classification Codes : *E22 ;D81; C52.*

Résumé:

Cette étude présente la méthodologie et l'application de la technique d'analyse de sensibilité dans l'évaluation des projets d'investissement pour l'évaluation des risques. Afin d'étudier un exemple concret, un projet de travaux de construction situé à Annaba et financé par l' Agence Nationale d'Appui et de Développement de l'Entreprenariat a été sélectionné comme étude de cas. Lors de l'application de l'analyse de sensibilité aux variations de trois variables clés : flux de trésorerie, taux d'actualisation et coût d'investissement, il a été conclu que la sensibilité de la VAN du projet aux variations du flux de trésorerie était plus importante que celle des deux autres variables.

Mots clés: *Investissement, Évaluation des risques, Analyse de sensibilité, micro-projet*

Jel Classification Codes : *E22 ;D81; C52.*

[1] **Corresponding author:** Nour Elhouda Rezgui**, e-mail address:** nour-elhouda.rezgui@univ-annaba.dz

I. Introduction

The initial step in project evaluation involves estimating future values for projected variables. In general, data from past events are often utilized to predict potential outcomes for similar future scenarios. In investment appraisal, a standard method involves generating a "best estimate" based on available data, which is subsequently used as an input in the evaluation model. These estimates are often either the mode (the most probable outcome) or a conservative approximation. However, selecting a single value excludes other possible outcomes for each project variable—data that can be crucial to investment decisions due to their implications for project risk. By solely using single-value inputs, it is implicitly assumed that these values are fixed, leading to a project outcome that is also presented as certain, without accounting for any potential variance or margin of error.

Investment projects are exposed to various risks that can affect the anticipated performance for the beneficiary. Both external environmental factors and internal factors related to the investment's operational and functional structure may deviate over time from initial expectations. The larger these deviations become, the greater the risk that the project might not meet its anticipated outcomes. Recognizing that projected values are not guaranteed, appraisal reports typically incorporate sensitivity analysis. In its basic form, sensitivity analysis involves adjusting the value of a variable to observe its effect on the final outcome, thereby helping to identify the project's most critical and sensitive variables.

Investment projects vary between large, medium, and small scales. However, micro-projects (very small projects) have established their presence across various countries, as they are considered the sole means, especially for developing nations, to achieve economic development. Currently, most countries, including Algeria, aim to establish and implement the foundations of a market economy, seeking to enhance the competitiveness of micro-projects, improve their performance levels, and achieve solid economic growth rates. Among the most important institutions supporting entrepreneurship in Algeria is the National Entrepreneurship Support And Development Agency

This article focuses on the sensitivity analysis technique due to its widespread use in the economic-financial evaluation of investment projects. This method enables the identification of a project's critical variables, allows for assessing the project's financial sustainability in response to potential changes in influencing factors, and serves as a tool for measuring project risk to support decision-making. To apply sensitivity analysis technique, the construction works project was used as a case study, it is a micro project funded by the National Agency for Support and Development of Entrepreneurship. Taking into

consideration three main variables, cash flow, discount rate and investment cost as key factors. The question that can be asked is:

How sensitive is the construction works project' profitability to changing key factors?

I.1 Study hypotheses:

To answer the above question the following hypotheses were set out:

1.The project' profitability is sensitive to changes in discount rate.

2.The project' profitability is sensitive to changes in investment cost.

3.The project' profitability is sensitive to changes in cash flow.

I.2 Objectives of the study: The main objective of this study is to introduce sensitivity analysis technique as a new tool to assess risk in investment project evaluation that can be used by the National Agency for Support and Development of Entrepreneurship. The second objective is to identify the crucial variables affecting the construction works project' profitability.

I.3 Methodology of the study: In this study, the authors relied on analytical descriptive research methodology in addition to the applied quantitative approach. The Excel program was used to facilitate the application of sensitivity analysis methods in the evaluation of the investment project.

I.4 Previous studies: Sensitivity analysis methods have been utilized across a wide range of research domains, including complex engineering systems, economics, physics, social sciences, medical decision-making, and investment decision-making from which we mention:

-The study of (Jareemit, Suwanchaisakul, & Limmeechokchai, 2022) used sensitivity analysis to explore how variations in projected costs—such as initial investment, energy costs, maintenance and operation expenses, interest rates, and discount rates—impact the net present value (NPV) and overall expenses of three sample office buildings. Findings revealed that total costs were highly responsive to investment expenses, with a notable decrease of up to 15.76% when investment costs were reduced by 20%. Additionally, energy prices had a significant effect on NPV, showing fluctuations between 2.83% and 15.12%. The study also concluded that developing zero-energy buildings (ZEBs) in larger buildings led to greater financial gains compared to smaller ones.

- The research conducted by (Džebo, 2016) focuses on key parameters identified through the application of sensitivity analysis within a discounted cash flow model for underground garage projects. The analysis adjusted each input parameter from its minimum to maximum assumed default values to determine their effect on project profitability. Key parameters were identified as those that had a notable impact on profitability. Additionally, the study assessed how each critical parameter individually affected the net present value (NPV) of the investment over a 20-year project duration, analyzing four different scenarios for garages of varying capacities.

- **The study by (Luban, 2002)** explored various methods that management can employ to address the issue of risk in capital investment decision-making. Utilizing the net present value (NPV) model as a metric for investment project profitability, the study discussed its applicability and interpretation within risk analysis frameworks. It highlighted the potential benefits of developing an integrated decision analysis procedure. The proposed approach integrates a Monte Carlo simulation to produce a probability distribution of net present values (NPV), calculates the expected NPV, and evaluates risk profiles based on the stochastic dominance criterion. The procedure concludes with a sensitivity analysis that utilizes utility functions to account for varying degrees of risk aversion The study also presents numerical results derived from this comprehensive approach.
- **The study by (Jovanovic, 1999)** addressed investment decision-making in the context of uncertainty and risk. It presented several methods applicable to investment decisions under these conditions, including Break-even Analysis, Sensitivity Analysis, Game Theory, and Decision Making Theory. Special emphasis was placed on Sensitivity Analysis, highlighting one of the procedures for its application in investment decision-making amid uncertainty and risk..

II. Theoretical Framework

II.1 Risk conception

Risks are a persistent and inherent aspect of the economic environment and are a natural element of all business activities.

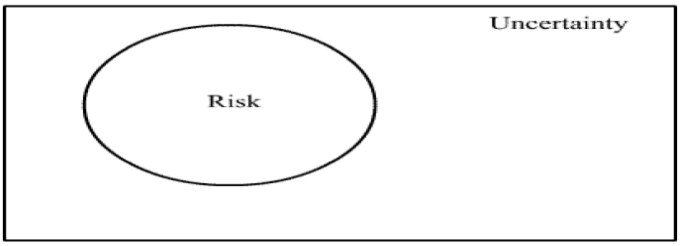
To better understand the concept of risk, it is necessary to make a clear distinction between risk and uncertainty. Risk refers to situations in which probabilities targets can be identified for possible results. In other words, it can be quantified. Instead, uncertainty refers to situations or events about which there is insufficient information to identify objective probabilities (Cleden, 2009,P52).

While both terms pertain to an uncertain future, they do so in fundamentally different ways. Risk refers to situations where the potential outcomes of a decision are known, allowing actions to be predicted based on the likelihood and impact of each event. In contrast, uncertainty describes a scenario where future outcomes are unknown, typically due to insufficient or unavailable information, making it challenging for decision-makers to predict results accurately. While risks can be anticipated and planned for, uncertainty presents a more complex issue, often requiring adaptive strategies rather than direct planning. (George, 2020,P973)

risk can be defined as a stage where there is a lack of information, but by looking at past experience, it is easier to predict the future. Events where the outcome is known and expected (Winch, 2002). Uncertainty is what is left

behind when all the risks have been identified. So one can face a situation like that shown in Figure (1). While all risks are characterized by uncertainty, not all forms of uncertainty are inherently risky.

Fig 1. RISK VERSUS UNCERTAINTY



Source: (Charles Yoe, 2000,P08), Risk Analysis Framework for Cost Estimation, on: https://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/00-R-91.pdf

Risk, in and of itself, is not inherently negative; rather, it is a crucial component of progress, and failure often serves as a valuable learning experience. However, it is important to strike a balance between the possible adverse effects of risk and the potential advantages that come with associated opportunities. A risk represents a potential future harm that may arise from present actions or decisions. (Bisson, 2014,P24)

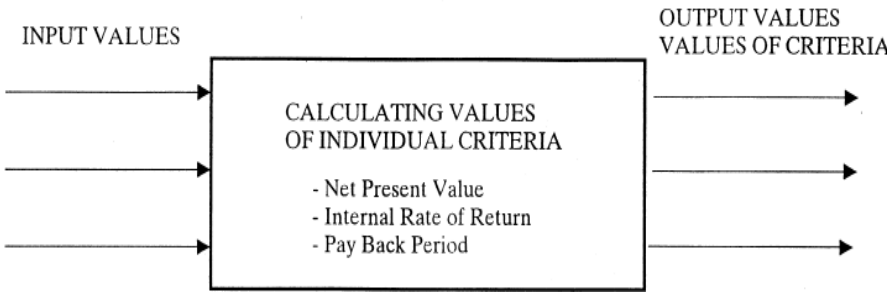
II.2 Sensitivity Analysis

In evaluating an investment project, cash flow forecasts are essential. These projected cash flows are influenced by expected revenues and costs. Expected revenue is determined by both the sales volume and the unit selling price, while the sales volume is affected by market size and the firm's market share. Costs comprise variable costs, which depend on sales volume and unit variable cost, as well as fixed costs. The net present value (NPV) or internal rate of return (IRR) of a project is calculated by analyzing the after-tax cash flows derived from the forecasts of these various variables.

In conducting sensitivity analysis, the decision-maker calculates the project's NPV (or IRR) based on different forecasts, allowing for "what-if" scenarios. For instance, they may ask: "What is the NPV if sales volume increases or decreases? How will NPV change if variable or fixed costs rise or fall? What happens if the selling price fluctuates?" Sensitivity analysis helps answer these questions by showing how responsive the project's NPV (or IRR) is to shifts in key variables, thereby identifying which factors have the most significant impact on project profitability.

Sensitivity analysis is defined as the assessment of the effect of input value variations on the results (outputs) produced by the model. (Frey, Mokhtari, & Zheng, 2004) .

Fig 2. Calculation of individual criteria using input and output values



Source: Petar Jovanovic (1999) Application of Sensitivity Analysis in Investment Project Evaluation under Uncertainty and Risk. The Journal of Project Management Romania. Vol. 17**.** P 33.

It is essential to determine the possible range for a variable in sensitivity analysis as it is crucial to conducting the analysis itself. The estimates of changes in variables are typically expected values derived from probability distributions. Consequently, identifying these probability distributions adds significant value to sensitivity analysis as a method for assessing risk. In other words, "a project's risk depends on both (1) its sensitivity to changes in key variables and (2) the range of likely values of these variables—the variable probability distributions."

The accuracy of the final decision relies heavily on the correctness of the estimates for these critical input factors. Additionally, monitoring these factors throughout the implementation phase of the investment will enable decision-makers to take appropriate actions in a timely manner (Chaveesuk & Smith, 2003,P132).

II.3 Definition of Micro-Investment Projects in Algeria

The Algerian legislator defines a micro-enterprise as any establishment that employs between 1 and 9 individuals, with an annual turnover not exceeding 20 million Algerian dinars (DZD) and a total annual budget not exceeding 10 million DZD. (القانون رقم 18- 01، 2001)

First and foremost, a micro-investment project is an economic entity with autonomy but on a small scale, allowing it to benefit from various advantages (piganeau, 2001,P05).

Based on the previous definitions, a micro-investment project can be defined as an economic entity that enjoys autonomy, allowing individuals to invest in the production of goods and the provision of services in any area of economic activity, either individually or collectively. The number of employees must be less than 10, and the budget should be less than 10 million Algerian dinars (DZD), enabling them to achieve returns, with an annual turnover not exceeding 20 million DZD.

Micro-projects may face unique challenges and risks that are not typically encountered by other types of projects, including: (زردق و بسيونى ، 2011،ص27)

A. **High Interest Rates:** There is often an increase in bank interest rates, coupled with the difficulty of securing small loans. This is because micro-enterprises pose a higher risk for financing institutions compared to larger companies.
B. **Financial Management Dependence:** Owners of small and medium-sized enterprises often rely on themselves for financial management without hiring a certified accountant or a permanent bookkeeper. This can adversely affect the estimation of costs and revenues.
C. **Competition Risk:** Micro-projects may lack access to modern machinery and cannot benefit from specialization and division of labor. The products in a micro-enterprise are not designed or overseen by highly skilled experts, resulting in lower quality and higher costs compared to goods produced by larger enterprises. Additionally, micro-investment projects typically do not incur expenses for research, experimentation, or development, which limits their ability to compete with larger projects.
D. **Bankruptcy Risk:** The limited resources of small producers make them vulnerable to financial difficulties, and they may face bankruptcy or collapse if they encounter even minor financial setbacks.

These risks do not diminish the importance of micro-projects; rather, they should be addressed and managed through appropriate analysis and measurement methods.

II.4 The National Entrepreneurship Support And Development Agency (NESDA)

The National Entrepreneurship Support and Development Agency (NESDA) is a government entity that operates with a special status, possessing legal

personality and financial independence. It functions under the authority of the Minister Commissioner responsible for small projects, providing assistance to the Prime Minister. The agency's primary mission is to support project holders in establishing and expanding small enterprises focused on the production of goods and services. (**https://www.nesda.dz)**

NESDA offers financing solutions for the creation and growth of micro businesses through three types of funding: **(https://www.nesda.dz)**

1. **Self-Funding**: The project owner finances the entire project independently, without the need for third-party sources.
2. **Mixed Funding**: The project owner and the agency each contribute 50% of the total project cost.
3. **Triangular Funding**: The project owner contributes between 5% and 15% of the project cost, while the agency contributes between 15% and 25%, and the bank covers the remaining 70%.

III.Méthods and data

III.1 Méthods

To assess the significance of risks, sensitivity analysis can be employed to quantify risk factors, while expert evaluation can be used for factors that cannot be quantified, relying instead on qualitative assessments. The primary objective of sensitivity analysis in investment decision-making is to identify how sensitive the selected criteria are to potential changes in the values of risk factors that impact those criteria (Merkova, Drabek, & Jelačić, 2013,P45).

a.Steps for Implementing Sensitivity Analysis

Sensitivity analysis can be performed through the following steps (Kheirollahi & Tofigh, 2015,P218) :

1-Calculate the net present value (NPV) of the project using the most likely (expected) values estimated for each variable. This calculation begins with the application of the following formula:

$$\mathbf{NPV}= \sum_{t=1}^{t=n} CFt\,(1+i)^{-t} - I_0$$

Where the symbols stand for:
CFt : represents the net incomes generated annually by the project;
i: discount rate
I_0 : the capital cost.
n: period of the project exploitation.

2-Identify specific variables that the project manager considers will have a substantial impact on the project's outcomes.
3-Estimate the values for these variables under three scenarios: optimistic, pessimistic, and most likely, over the project's duration.
4-Recalculate the net present value (NPV) of the project for each of these three scenarios. It is crucial to remember that when calculating the NPV using a particular value (optimistic, pessimistic, or most likely) for each variable, the other variable values are held at their expected levels.
5-Determine the range of change in the project's NPV based on the limits established by the pessimistic and optimistic values for each variable.
6-Identify which variables are critical and have a significant effect on the project's overall evaluation.

b. Selected Sensitivity Analysis Methods

This analysis employs a basic form of sensitivity analysis known as one-factor analysis, which assesses the effects of changes in individual risk factors while keeping all other factors stable at their projected (planned, most probable) values. Sensitivity analysis can be conducted using the following methods:

-Spider Plots Method: Sensitivity plots can be combined into a single chart, known as a spider plot, to display multiple input variables and their effects on net present value (NPV) as each variable changes. The center of the spider plot marks the NPV when all variables are at their baseline values. Each line on the chart represents how NPV responds to changes in an individual variable, with other variables held constant. These lines provide insight into NPV sensitivities, as their slopes indicate how much NPV is affected by changes in each variable. A steeper slope denotes higher sensitivity to that variable, making the spider plot a useful tool for identifying the key factors that most influence NPV (Watson, 1995,P133)

-Sensitivity Index Method: The Sensitivity Index helps determine which variables have a significant influence on the project’s outcome and which have a minimal effect. It serves to quantify the impact of each variable on key evaluation criteria, such as net present value (NPV) or the internal rate of return (IRR) of the investment. A higher Sensitivity Index value indicates that changes in the variable are more likely to affect the chosen evaluation criterion, signaling greater sensitivity and potential risk associated with variations in that particular factor.. The sensitivity index can be represented by the following formula (Iloiu & Csiminga, 2009)

$$SI = \frac{(Npv_1 - Npv_b) / Npv_b}{(X_1 - X_b) / X_b} \times 100$$

Where:

SI: sensitivity index.

Npv_1: The net present value after the change.

NPV_b: The net present value in the base case.

X_1: Value of the variable in the sensitivity test.

X_b: Value of the variable in the sensitivity test.

If the value of the index is less than one, then the risk level is relatively low, but if it exceeds one the risk level becomes higher.

III.2 data

The study project is the construction works project which is a micro investment funded by the The National Entrepreneurship Support & Development Agency in Annaba state (Algeria) during 2023. The overall project' investment cost is **9 335 855,75** DA, seventy percent of which was obtained in the form of a loan with an interest rate of 5,5 %, repayable over seven years[1].

a.Financial arrangements

This project has been included in the tri-party financing plan. Therefore, the financing will be structured as follows:

Table(1) : Financial arrangements of the construction works project

Category	Participation Rate	Amount
Personal Contribution	15%	1,400,378.33
the Agency	15%	1,400,378.33
Bank Loan	70%	6,535,098.87
TOTAL	100%	9,335,855.53

Source: Prepared by the researchers based on financial study data.

[1] The interest rate is used as a discount rate by the agency in the evaluation of all projects submitted to it, ignoring of course, the different risk levels among these projects.

b.Estimation of Annual Cash Flows

According to the income statement generated by the agency, cash flows can be projected through the application of the following formula:

Net Cash Flow = Net Accounting Profit + Depreciation.

The projected cash flows from the project can be determined as follows:

Table (2): Estimated Annual Cash Flow for the Project

Year	Net Profit	Depreciation	Annual cash-flow
1	4 337 555,86	1 819 280,00	**6 156 835,86**
2	5 323 114,33	1 819 280,00	**7 142 394,33**
3	6 433 101,89	1 819 280,00	**8 252 381,89**
4	5 831 149,53	1 819 280,00	**7 650 429,53**
5	6 878 044,09	1 819 280,00	**8 697 324,09**
6	9 423 492,48	0,00	**9 423 492,48**
7	10 714 311,86	0,00	**10 714 311,90**

Source: Prepared by the researchers based on financial study data.

IV.Results

It is natural that financing any investment project should be preceded by an assessment of its financial viability, using the standard evaluation techniques in this field. However, it is observed that, despite the importance of the evaluation process, the documents provided by the agency do not indicate that any such techniques were used. This suggests that the financing was likely based on the positive results shown in the estimated income statement over a 7-year period. Table (3) shows the net present value.

Table (3): construction works Project's Net Present Value

Year	Annual cash-flow	Present Value of Annual Cash Flows
1	6 156 835,86	**5835863,374**
2	7 142 394,33	**6417101,44**
3	8 252 381,89	**7027841,18**
4	7 650 429,53	**6175554,81**
5	8 697 324,09	**6654621,448**
6	9 423 492,48	**6834348,654**
7	10 714 311,90	**7365412,351**
NPV= 36 974 887,51		

Source: : Authors calculation based on the Economic Study of the project provided by the Agency

Since the construction works project's NPV was positive, which means that the project is profitable.

IV.1 Analysing the Sensitivity of the project' NPV to the Key Factors

By applying one-factor sensitivity analysis to the project, using the data gathered from the Agency, we will assess the sensitivity of project profitability to changes in three selected key variables: the discount rate, investment cost, and cash flow. By analyzing how the net present value (NPV) responds to variations in these variables, we can identify which factors most significantly influence the project's profitability, thereby pinpointing the most critical variables.

Table (4) illustrates the variations of the selected variables ranging from -90% to +90%, alongside the corresponding changes in the calculated net present value (NPV). This table provides a detailed overview of the NPV fluctuations associated with each level of change in the chosen variables.

Table (4) : Sensitivity analysis of NPV to the changes in Key Factors

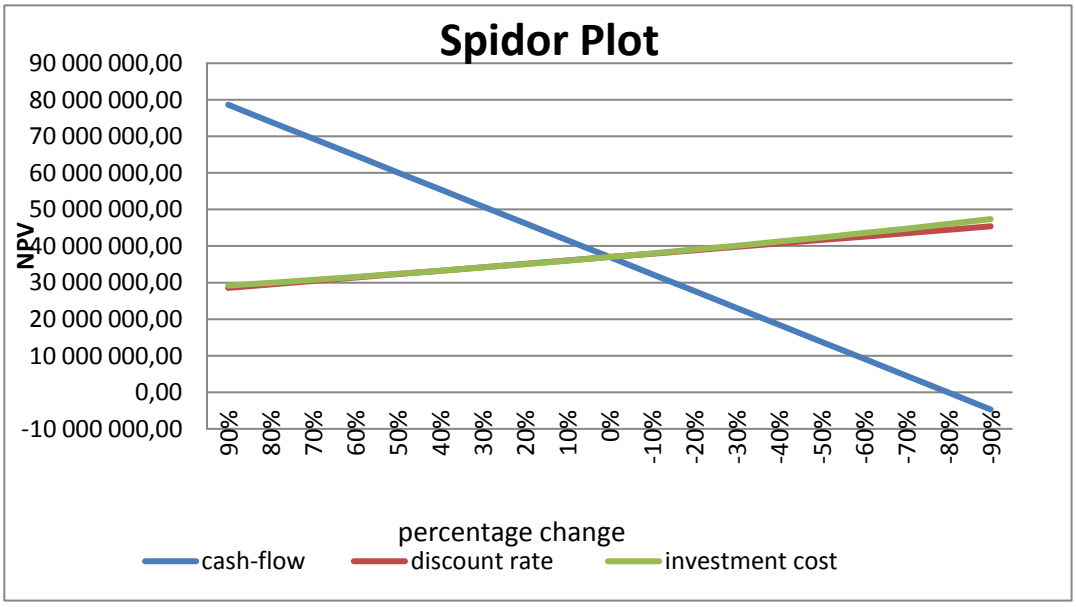
Change	Sensitivity of NPV to discount rate change	Sensitivity of NPV to investment cost change	Sensitivity of NPV to cash flow change
90%	29 183 708,15	28572617,33	**78 654 556,44**
80%	29 948 023,47	29506202,91	**74 023 482,11**
70%	30 735 469,58	30439788,48	**69 392 407,79**
60%	31 546 931,21	31373374,06	**64 761 333,46**
50%	32 383 333,14	32306959,63	**60 130 259,13**
40%	33 245 642,23	33240545,21	**55 499 184,81**
30%	34 134 869,64	34174130,78	**50 868 110,48**
20%	35 052 073,15	35107716,36	**46 237 036,16**
10%	35 998 359,60	36041301,93	**41 605 961,83**
0%	**36 974 887,51**	**36 974 887,51**	36 974 887,51
-10%	37 982 869,80	37908473,08	**32 343 813,18**
-20%	39 023 576,78	38842058,66	**27 712 738,85**
-30%	40 098 339,15	39775644,23	**23 081 664,53**
-40%	41 208 551,38	40709229,81	**18 450 590,20**
-50%	42 355 675,12	41642815,38	**13 819 515,88**
-60%	43 541 242,93	42576400,96	**9 188 441,55**
-70%	44 766 862,20	43509986,53	**4 557 367,23**
-80%	46 034 219,30	44443572,11	**-73 707,10**
-90%	47 345 084,03	45377157,68	**-4 704 781,42**

source: calculated by the Authors using Excel

a. Sensitivity Analysis of the project profitability using the spider-plot method:

By plotting the NPV values obtained from the changes in table (4) and placed them on the *Y*-axis, against the change percentage in the variable on the *X*-axis, we can observe the sensitivity of NPV to the change in each of the variables compared to other variables.

Fig 3. Sensitivity (Spider) Graph



Source: The authors using Excel

b. Sensitivity Analysis of the project profitability using the Sensitivity Index and Switching Values methods.

Using data given in table (4) the sensitivity Index value can be calculated as following:

Table (05). Sensitivity Index

variables	Investment costs	Discount rate	Cash Flow
Sensitivity Index	0,25	0,27	1,25

source: Author's calculations

V. Discussion

It is evident that the project's net present value (NPV) is significantly more sensitive to changes in the cash flow variable than to the other variables assessed. This seems logical because the cash flow value is the difference between revenues and costs and can reflect changes either as a result of changes in quantities or prices of inputs or outputs. It is the variable with a more sloping line than the other variables of the chart (as shown in figure 3). We can note that with an estimated 80 percent decline, the NPV value turns negative, if other things remain as expected, while it remains positive for other variables. This is confirmed by The value of the sensitivity index which is more than one (1.25), this means that a decrease of 10% in the cash flows of the project results in a decrease in NPV of 12.5 percent. Indicating of course, a higher risk associated with cash flow variable.

The project' NPV, however, is sensitive to neither investment costs nor discount rate. As noted from table (4) and figure (3), even with a change of 90% up and down the base case, the NPV still positive. This result is also confirmed by the sensitivity index values for both key variables (see table 5) which are less than one. For investment cost an increase of 10 percent in this variable will cause a decrease in NPV of 2.5 percent, while an increase of 10 percent in discount rate will result in a decrease of 2.7 percent in project profitability.

These results negate the validity of the first two hypotheses, while it confirms the third one, that is, the project's profitability is more sensitive to the change in cash flow.

IV.Conclusion

Risk awareness and good risk management are prerequisites for creating long-term value and for securing good profitability. Investors should continuously evaluate the risks to which their projects are exposed, and carefully monitors the development of factors that influence the main risks that have been identified. The reliance on the positive results shown in the estimated income statement alone by the National Entrepreneurship Support & Development Agency in In the approval of funding for investment projects may be misleading. Therefore, the agency should use other more effective methods that address the risk problem. To rationalize the investment decision, we recommend using sensitivity analysis, as a very useful and an easy technique to be applied. More than that the agency as well as other financial organisations must cooperate with the universities so that they can benefit from the competencies provided by them. In addition micro-projects are at risk of misestimating net cash flows due to inaccurate cost and revenue projections. Sensitivity analysis is the method that measures the impact of changes in net cash flows or any other variable on the

project's profitability, making it the most suitable approach for analyzing the risks associated with micro-projects.

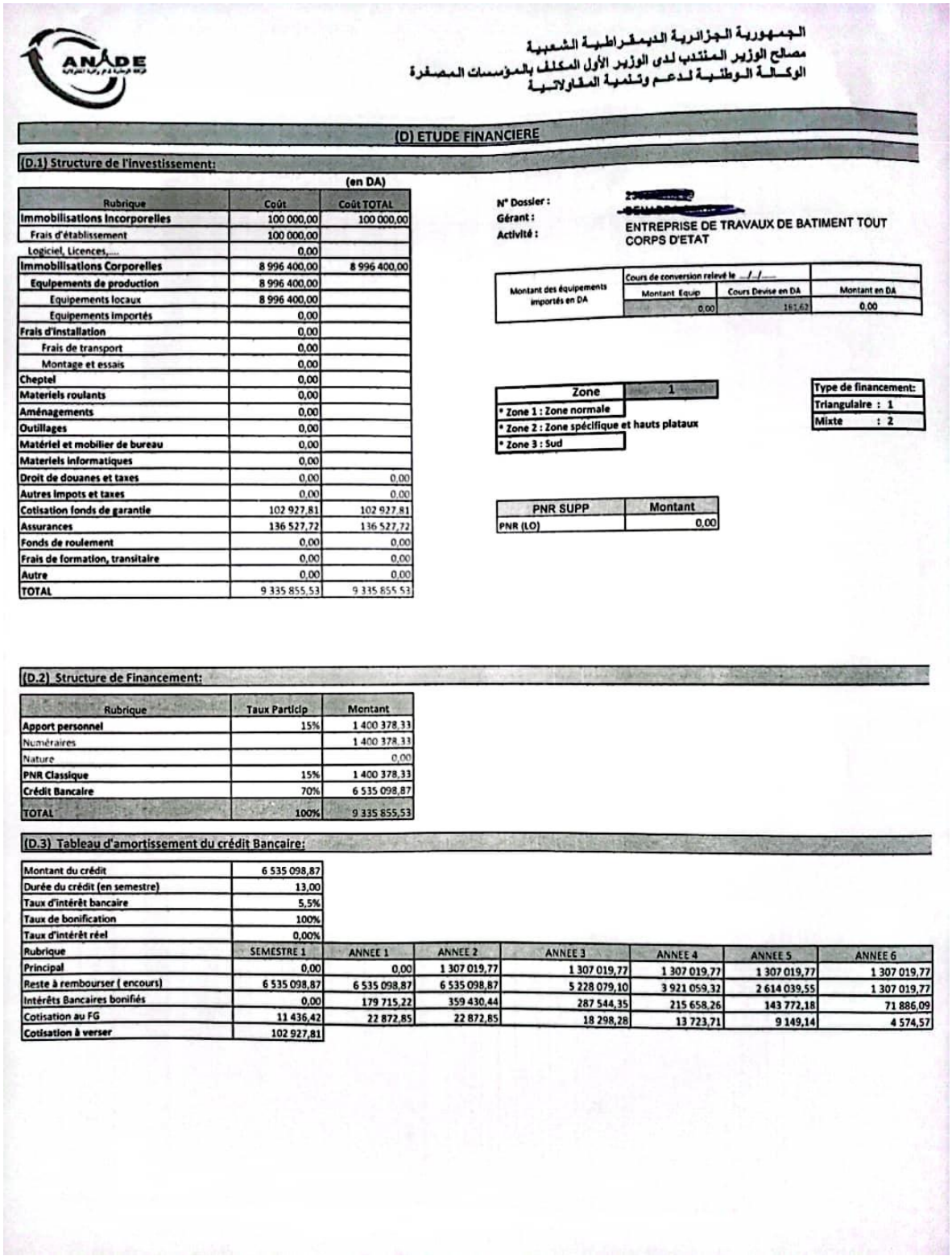
Finally, we can confirm that this study could be further expanded using other investment risk management techniques in Algerian financial organizations. It is also essential to consult with experts and specialists when evaluating projects and preparing financial reports, as well as directing the individuals involved to continuous training courses to keep them informed about the latest evaluation methods, especially in the context of risk conditions.

Bibliography List.

1. (s.d.). Récupéré sur https://www.nesda.dz
2. Bisson, C. (2014). Risks aren't always negative. *PM Network, 28*(8). Retrieved from https://www.pmi.org/learning/library/risk-management-assessing-positives-negatives-3834#
3. Chaveesuk, ., & Smith. (2003). Economic valuation of capital projects using neural network metamodels,. *The Engineering Economist, 48*(01).
4. Cleden, D. (2009). *Managing project uncertainty.* Abingdon: Ash gate Publishing Group.
5. Džebo, S. (2016). Application of sensitivity analysis for investment decision in building of underground garage. *4th the International Conference on Road and Rail Infrastructure.* Šibenik, Croatia.
6. Frey, C., Mokhtari, A., & Zheng, J. (2004). *Recommended Practice Regarding Selection, Application, and Interpretation of Sensitivity Analysis Methods Applied to Food Safety Process Risk Models.* Washington: Office of Risk Assessment and Cost-Benefit Analysis. Récupéré sur file:///C:/Users/finan/Downloads/Recommended_Practice_Regarding_Selection_Applicati.pdf
7. George, C. (2020). The Essence of Risk Identification in Project Risk Management: An Overview. *International Journal of Science and Research , 9*(2).
8. Iloiu, . M., & Csiminga, D. (2009). Project Risk Evaluation Methods-Sensitivity Analysis. *Annals of the University of Petrosani, Economics, 9*(2).
9. Jareemit, D., Suwanchaisakul, A., & Limmeechokchai, B. (2022). Assessment of key financial supports for promoting zero energy office. *Energy Reports, 8*.
10. Jovanovic, P. (1999). Application of sensitivity analysis in investment project evaluation under uncertainty and risk. *International Journal of Project Management, 17*(4).
11. Kheirollahi, H., & Tofigh, F. (2015). SENSITIVITY AND RISK ANALYSIS OF THE ECONOMIC EVALUATION OF INVESTMENT PROJECTS CASE STUDY : DEVELOPMENT PLAN IN SUFIAN CEMENT PLANT. *Indian Journal of Fundamental and Applied Life Sciences, 5*(3).
12. Knight. (1921). *Risk Uncertainty and Profit.* Boston: Houston Mifflin.
13. Luban, F. (2002). An Integrated Investment Decision Analysis Procedure Combining Simulation and Utility Theory. *European Research Studies, V*((1-2)).

14. Merkova, M., Drabek, J., & Jelačić, D. (2013). Application of Risk Analysis in Business Investment Decision-Making. *DRVNA INDUSTRIJA, 64* .
15. piganeau, L. (2001). *la micro-entreprise de A à Z.* France: édition d'organisation.
16. Valeria, S. (2012). Risk and Uncertainty. *Procedia Economics and Finance, 3*.
17. Watson, K. (1995). Sensitivity Analysis in Outcome Evaluations: A Research and practice Note. *The Canadian Journal of Program Evaluation, 10* (02).
18. Winch. (2002). *Managing construction projects, an information processing approach.* Oxford: Blackwell Publishing.
19. Yoe, C. (2000). *Risk Analysis Framework for Cost Estimation.* Alexandria: U.S. Army Corps of Engineers. Retrieved from https://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/00-R-91.pdf
20. أحمد عبد الرحيم زردق، و محمد سعيد بسيوني . (2011). *مبادئ دراسات الجدوى الاقتصادية*. مصر.
21. القانون رقم 18- 01. (12 ديسمبر, 2001). *الجريدة الرسمية للجمهورية الجزائرية(77)*.

Annexes



الجمهورية الجزائرية الديمقراطية الشعبية
مصالح الوزير المنتدب لدى الوزير الأول المكلف بالمؤسسات المصغرة
الوكالة الوطنية لدعم وتنمية المقاولاتية

ANADE

(D) ETUDE FINANCIERE

(D.1) Structure de l'investissement:

(en DA)

Rubrique	Coût	Coût TOTAL
Immobilisations Incorporelles	100 000,00	100 000,00
Frais d'établissement	100 000,00	
Logiciel, Licences,...	0,00	
Immobilisations Corporelles	8 996 400,00	8 996 400,00
Equipements de production	8 996 400,00	
Equipements locaux	8 996 400,00	
Equipements importés	0,00	
Frais d'installation	0,00	
Frais de transport	0,00	
Montage et essais	0,00	
Cheptel	0,00	
Materiels roulants	0,00	
Aménagements	0,00	
Outillages	0,00	
Matériel et mobilier de bureau	0,00	
Materiels informatiques	0,00	
Droit de douanes et taxes	0,00	0,00
Autres impots et taxes	0,00	0,00
Cotisation fonds de garantie	102 927,81	102 927,81
Assurances	136 527,72	136 527,72
Fonds de roulement	0,00	0,00
Frais de formation, transitaire	0,00	0,00
Autre	0,00	0,00
TOTAL	9 335 855,53	9 335 855,53

N° Dossier : [redacted]
Gérant : [redacted]
Activité : ENTREPRISE DE TRAVAUX DE BATIMENT TOUT CORPS D'ETAT

Montant des équipements importés en DA	Cours de conversion relevé le .../.../....		
	Montant Equip	Cours Devise en DA	Montant en DA
	0,00	181,62	0,00

Zone	1

* Zone 1 : Zone normale
* Zone 2 : Zone spécifique et hauts plataux
* Zone 3 : Sud

Type de financement:
Triangulaire : 1
Mixte : 2

PNR SUPP	Montant
PNR (LO)	0,00

(D.2) Structure de Financement:

Rubrique	Taux Particip	Montant
Apport personnel	15%	1 400 378,33
Numéraires		1 400 378,33
Nature		0,00
PNR Classique	15%	1 400 378,33
Crédit Bancaire	70%	6 535 098,87
TOTAL	100%	9 335 855,53

(D.3) Tableau d'amortissement du crédit Bancaire:

Montant du crédit	6 535 098,87
Durée du crédit (en semestre)	13,00
Taux d'intérêt bancaire	5,5%
Taux de bonification	100%
Taux d'intérêt réel	0,00%

Rubrique	SEMESTRE 1	ANNEE 1	ANNEE 2	ANNEE 3	ANNEE 4	ANNEE 5	ANNEE 6
Principal	0,00	0,00	1 307 019,77	1 307 019,77	1 307 019,77	1 307 019,77	1 307 019,77
Reste à rembourser (encours)	6 535 098,87	6 535 098,87	6 535 098,87	5 228 079,10	3 921 059,32	2 614 039,55	1 307 019,77
Intérêts Bancaires bonifiés	0,00	179 715,22	359 430,44	287 544,35	215 658,26	143 772,18	71 886,09
Cotisation au FG	11 436,42	22 872,85	22 872,85	18 298,28	13 723,71	9 149,14	4 574,57
Cotisation à verser	102 927,81						

N°Dossier :	[illegible]
Nom et Prénom du Gérant :	[illegible]
Activité :	ENTREPRISE DE TRAVAUX DE BATIMENT TOUT CORPS D'ETAT

(D.5) TCR PREVISIONNELS

	ANNEE 1	ANNEE 2	ANNEE 3	ANNEE 4	ANNEE 5	ANNEE 6	ANNEE 7
VENTES ET PRODUITS ANNEXES	12 480 000,00	13 728 000,00	15 100 800,00	16 610 880,00	18 271 968,00	20 099 164,80	22 109 081,28
VARIATION STOCKS PRODUITS FINIS ET EN COURS							
PRODUCTION IMMOBILISEE							
SUBVENTIONS D'EXPLOITATION							
I- PRODUCTION DE L'EXERCICE	12 480 000,00	13 728 000,00	15 100 800,00	16 610 880,00	18 271 968,00	20 099 164,80	22 109 081,28
Achats consommés	4 260 000,00	4 473 000,00	4 696 650,00	4 931 482,50	5 178 056,63	5 436 959,46	5 708 807,43
Services extérieurs et autres consommations	496 527,72	516 388,83	537 044,38	558 526,16	580 867,20	604 101,89	628 265,97
II- CONSOMMATION DE L'EXERCICE	4 756 527,72	4 989 388,83	5 233 694,38	5 490 008,66	5 758 923,83	6 041 061,35	6 337 073,40
III- VALEUR AJOUTEE D'EXPLOITATION (I-II)	7 723 472,28	8 738 611,17	9 867 105,62	11 120 871,34	12 513 044,17	14 058 103,45	15 772 007,88
Charges de personnel	1 555 200,00	1 573 344,00	1 591 850,88	1 610 727,90	1 629 982,46	1 649 622,10	1 669 654,55
Impôts, taxes et versements assimilés							
IV- EXCEDENT BRUT D'EXPLOITATION	6 168 272,28	7 165 267,17	8 275 254,74	9 510 143,45	10 883 061,72	12 408 481,35	14 102 353,34
Autres produits opérationnels							
Autres charges opérationnelles							
Dotations aux amortissements, provisions et pertes de valeur	1 819 280,00	1 819 280,00	1 819 280,00	1 819 280,00	1 819 280,00	0,00	0,00
Reprise sur pertes de valeur et provisions							
V-RESULTAT OPERATIONNEL	4 348 992,28	5 345 987,17	6 455 974,74	7 690 863,45	9 063 781,72	12 408 481,35	14 102 353,34
Produits financiers							
Charges financières	11 436,42	22 872,85	22 872,85	18 298,28	13 723,71	9 149,14	4 574,57
VI-RESULTAT FINANCIER	-11 436,42	-22 872,85	-22 872,85	-18 298,28	-13 723,71	-9 149,14	-4 574,57
VII-RESULTAT ORDINAIRE AVANT IMPOT (V+VI)	4 337 555,86	5 323 114,33	6 433 101,89	7 672 565,17	9 050 058,01	12 399 332,21	14 097 778,77
Impots exigibles sur résultats ordinaires	0,00	0,00	0,00	920 707,82	1 086 006,96	1 487 919,87	1 691 733,45
Impots différés (variations) sur résultats ordinaires							
TOTAL DES PRODUITS DES ACTIVITES ORDINAIRES	12 480 000,00	13 728 000,00	15 100 800,00	16 610 880,00	18 271 968,00	20 099 164,80	22 109 081,28
TOTAL DES CHARGES DES ACTIVITES ORDINAIRES	8 142 444,14	8 404 885,67	8 667 698,11	9 859 022,65	10 307 916,95	9 187 752,46	9 703 035,96
VIII- RESULTAT NET DES ACTIVITES ORDINAIRES	4 337 555,86	5 323 114,33	6 433 101,89	5 831 149,53	6 878 044,09	9 423 492,48	10 714 311,86
Elements extraordinaires (produits) (à préciser)							
Elements extraordinaires (charges) (à préciser)							
IX-RESULTAT EXTRAORDINAIRE	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X-RESULTAT NET DE L'EXERCICE	4 337 555,86	5 323 114,33	6 433 101,89	5 831 149,53	6 878 044,09	9 423 492,48	10 714 311,86
Part dans les résultats nets des sociétés mises en équivalence (1)							
XI- RESULTAT NET DE L'ENSEMBLE CONSOLIDE (1)	4 337 555,86	5 323 114,33	6 433 101,89	5 831 149,53	6 878 044,09	9 423 492,48	10 714 311,86
Dont part des minoritaires (1)							
Part du groupe (1)							