Evaluation uncertain investment using sensitivity analysis with @RISK Case study of an ANSEJ project

تقييم الاستثمار في حالة عدم التأكد باستخدام تحليل الحساسية وبرنامج @RISK

دراسة حالة لمشروع أونساج

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Abstract*:*

  This research proposes a problem that is constantly studied, to evaluate an uncertain investment by a small Algerian company that represent a car rental project. Applying an interesting method named sensitivity analysis, using @Risk software. We have approached many theoretical and technical aspects of the studied principle, the results obtained with a sufficiently positive NPV led to consider the project profitable and testify the efficiency of these methods, to provide accurate information allowing to take an optimal decision.
.**keyword**: Investment projects; uncertain investment; Sensitivity Analysis; Net Present Value.
JEL classification code : G11 ; C53

ملخص:

يقترح هذا البحث مشكلة يتم دراستها باستمرار، تهدف إلى تقييم استثمار غير مؤكد لشركة جزائرية صغيرة، حيث نحاول تقييم مشروع لتأجير السيارات. بتطبيق طريقة معتمدة تتمثّل في تحليل الحساسية، باستخدام برنامج @Risk. بعد التطرق للعديد من الجوانب النظرية والتقنية للمبادئ المدروسة، أوضحت النتائج المحصل عليها أن القيمة الحالية الصافية للمشروع إيجابية بما فيه الكفاية، تدفعنا الى اعتبار المشروع الاستثماري مربحًا، وتثبت كفاءة هذه الطرق لتوفير معلومات دقيقة تسمح باتخاذ القرار الأمثّل في ظل ظروف غير مؤكدة.
الكلمات المفتاحية: الاستثمار؛ حالة عدم التأكد؛ تحليل الحساسية؛ القيمة الحالية الصافية.
تصنيف JEL: G11، G53

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1. Introduction :

Managers and investors frequently confront with long-term financial decisions for an uncertain investment choice. The investment decision is the only creator of wealth, it allows a better economic results and an increase in the value of the company. It ensures the distribution of wealth between lenders and shareholders. This research focuses on the decision to invest in the uncertain future and the application of methods and models of decision-making and shows that the decision to invest in uncertain future covers many dimensions difficult to compare with conventional models. As long as there are uncertainties about future cash flows, the risk attached to a project becomes a major element of the investment decision. (Alaeddine.ElAyadi.Mohammed, 2008, P1)

Main question:
Is sensitivity analysis an effective tool for evaluating an investment in uncertain conditions in order to make optimal decisions?

Sub-questions:
Does the Sensitivity analysis effects the evaluation of an uncertain investment?
Is the Sensitivity analysis an important tool to make optimal decisions?

Hypotheses:
- Sensitivity analysis is a very effective way to evaluate an uncertain investment.
- Sensitivity analysis is an important tool for making optimal decisions.

Work methodology:
In this paper, we propose a financial evaluation of an uncertain investment using several valuation criteria, the best known of which is the net present value, as well as the application of a sensitivity analysis model. Considering a car rental project.

Research objectives:
The project was well selective, to provide much more value to our work. Because we must know that According to the officials of the National Agency for Youth Employment Support (ANSEJ) of the province of Saida, the majority of the requests concern the "rolling stock". That is to say the transport and car rental, and because the

projects enjoy many tax benefits including the exemption from VAT, 5% reduction of tax taxes on imported equipment, tax exemption taxes imposed on micro-enterprises, even going as far as total exemption from corporate income tax.

2. Theoretical aspects of the investment:

2.1. Investment Definition:

Investment is the purchase of machinery and means of production made by an economic agent with the aim of maintaining or developing its technical capital. (G.Abraham-G.Caire, 2002, P236)

It is determined by the level of investment in the global economy through gross fixed capital formation (GFCF), Commercial investment refers to the development of fixed capital by companies whose real purpose is to produce other goods, Excluding residential investment and expenses of buildings. (POPIOLEK.N, 2006, P.2-3)

2.2. Investment Selection Criteria:

Investment selection criteria are conformed to a range of financial instruments to assist in decision-making to provide managers with the means to evaluate and compare various competing investment projects. There are two different types of criteria: Time standards (payback) and economic criteria (net present value, profitability index and internal rate of return), that we will present below:

2.2.1. Economic Criteria:

These criteria allow us to measure the profitability of a project. The net present value is the main criterion for this type, which account other criteria of this type, a profitability index and internal rate of return. (Bouysso.Denis, 2006, P1)

2.2.1.1. The Net Present Value (NPV):

The net present value (NPV) is an indicator for dynamic investment calculation, it is used in capital budgeting and investment planning to analyze the profitability of an investment or project expected. The (NPV) is the difference between the present value of cash inflows and the present value of cash outflows during a period of time. Moreover, it is calculated in the following formula:

$$NPV = \sum_{t=1}^{n} \frac{R_t}{(1+i)^t}$$

Where:

R_t = Net cash inflow-outflows during a single period t

i = Discount rate or return that could be earned in alternative investments

t = Number of timer periods

2.2.1.2.   Profitability Index (PI):

A financial tool tells us whether an investment should be accepted or rejected. The PI measures the relative advantage, that is to say the return generated from 1 unit of money invested. Moreover, you can calculate the profitability index by dividing the present value of the expected initial cost of the project cash flows, the formula for the PI is as follows: (Gardès.Nathalie, 2006, P 9-11)

$$\text{Profitability Index} = \frac{\text{Present value of future cash flows}}{\text{initial investment}}$$

Or

$$\text{Profitability Index} = \frac{(\text{Net Present value} + \text{Initial Investment})}{\text{initial investment}}$$

2.2.1.3 Internal Rate of Return (IRR) :

Is the interest rate at which the net present value of all the cash flows from the project or the investment equal zero, In other words, the annual rate of return is expected to compound that will be earned in a project or investment. It is calculated by discounting the present value of future cash flows from the investment with the internal rate of return. The IRR Formula:

$$0 = \text{NPV} = \sum_{t=1}^{T} \frac{C_t}{(1 + IRR)^t} - C_0$$

Where:

C_t = Net cash inflow during the period t

C_o = Total initial investment costs

IRR = the internal rate of return

t = the number of time periods

NPV is the standard for comparing projects and IRR is not an appropriate criterion for project selection, It lets you only know if the projects profitable (compared to IRR rate for each project and the rate of capital discount). In choosing between two exclusive investments, it is not always wise to choose an investment with a higher IRR. May be in a conflicting situation according to NPV and IRR standards.

Temporal criteria: Payback Period of the Capital Investment (PP):

This method depends more on liquidity and profitability, according to this standard, between two projects in competition, we prefer a project with a shorter payback period, and In general, this method is commonly used. Now, and outside of the strategic project.

2.2.2. Uncertain investment projects evaluation Criteria:

Under the problem of uncertainty and decision-making, assuming that the consequences of our actions based on the occurrence of different events is supposed to decide what nature is not subject to our control. This decision node problem lies in the fact that we must choose an action before getting the nature of the decision . (Bouysso.Denis, 2006, P23)

Solving problems related to investments under uncertainty conditions, and the possibility of applying different methods and techniques, the most famous are: The sensitivity analysis, the scenario method and Game theory.

3. The technics theoretical aspects :

3.1. The scenario method:

A method demonstrates the potential visions of the future or aspects of the possible future. Probably the most insightful or the method of future studies. The application of scenario methods is not a matter of regions or themes, but of stable or unstable environments. This Simulation prevents analytical solution because it does not provide an accurate answer. It is only useful for studying complex systems. (Dodge.Yadolah, 2008, P6)

3.2. The Game theory:

Game theory is a theoretical framework for visualizing social attitudes among competing players. In some ways, Game theory is a strategy science, it examines situations in which the fate of each participant depends not only on the decisions it takes, but also on the decisions made by the other participants. Thus, the "optimal" option for a member generally depends on what others do. Therefore, too many decisions was set according to the criteria, by simply quoting the most important criteria: the criterion LAPLACE-BAYES, The criterion of WALD or MAXIMIN, the criterion of SAVAGE or MINIMAX Regret,

the HURWICZ criterion and the MAX MAX criterion. (Thisse.Jacques-François, 2011, P2)

3.3.1. The sensitivity analysis:

It's a technique that is used to Specifies how independent variable values will affect a particular dependent variable Within a certain set of assumptions as sensitive analyzes. Generally, it is used in a wide range of areas, Ranging from biology and geography to economics and engineering. It measures the impact of changes in project-specific variables (age, initial capital ...) on the final result (NPV or IRR).

  The sensitivity analysis is a process by which we evaluate the robustness of an economic model by examining how the scan results vary when the value of major variables are adjusted within a certain range.

   The sensitivity analysis shows the fluctuation in measures in measures of project profitability (present value, internal rate of return) due to the modification of one or more values of the determinants of project.

   According to COUPER (Couper.J, 2003, P2) sensitivity, analysis is used to determine the impact of technical factors on the economic viability of the project. Due to the sensitivity analysis, we determined the prevalence of each factor and the effects of changes in these factors on the overall project. Every application of the principle here is "What if" For example, What if demand falls by 20%? As well, the method generates very relevant information concerning the exogenous or explanatory variables of the result (the NPV) by recording their critical values.

  Sensitivity analysis is a calculation method used to predict the effects of varying the output of the system because of the changes in the input values (Jovanovic.P ,1999,P3). This method is often used to evaluate investment projects that is in risk and uncertainty; also, there are those that indicate sensitivity analysis as a tool that helps to identify the element of risk and uncertainty in investment projects (Koller.G, 2005)

3.3.2. Sensitivity Analysis Using Spider Plot:

   The Spider plot is a relatively recent method of sensitivity analysis , used in the evaluation of investment projects under conditions of risk and uncertainty, it is based on the idea described in the definition of the

sensitivity analysis, it means to measure the impact of the variation of explanatory factors (exogenous) took one by one. Assuming everything else is equal to the economic benefit of the project (NPV). It is named after its shape very similar to a spider's web (Chaveesuk.R, 2000).The objective of the spider plot is to give an image of the economic performance of the project according to certain factors (Baker.Scott.William, 1997)

Spider plot is a graph whose abscissa represents the expected variations of the variables (usually in percentage), and the ordered indicates the impact on the economic measures , the internal rate of return, or any other saving measure of another project) (Eschenbach.T, 1996)

Spider Plot characterized by:

•   Limits of the expected uncertainty for each variable.

•   The effect of the variation of each factor on the scale of the economic measure.

•   Ability to change each variable for the desired rate.

The sensitivity analysis begins on the broad baseline of the most likely estimates of project inputs. Then it starts to change an entry for the project to a certain percentage above and below the most likely value, keeping the other factors constant. And with each change in the input values, changes in the economic measurement of the project are noted (Pothanun.K, 2004)

3.3.3. The idea of Sensitivity Analysis

Figure 1 : Principle of Sensitivity Analysis
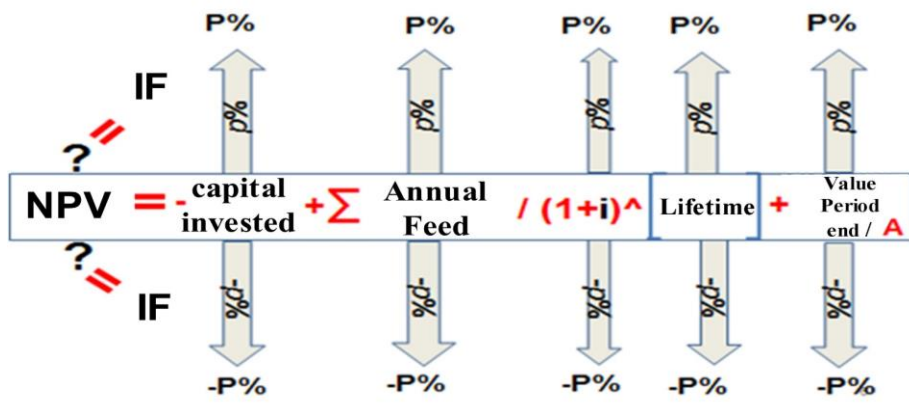
Source: Prepared by the researchers.

p: represents the step + or -5%

P: the interval + or- 50%

Step 1: Defines the equation of the net present value.

Steps 2: Identify the variables most likely to be uncertain.

Steps 3: varing one of the factors over an interval of [-50%, + 50%] with a step of 5% and keeping the other factors constant, then calculate the new NPV;

Then doing the same for the other factors.

4. Study Methodology:

This section represents the essence of our work, where, after an investigation, we try to go back to the question around which our memoir based on « how can we evaluate an investment project in an uncertain and risky universe ». To do this we have resorted to a powerful method. The sensitivity analysis to measure the impact of the fluctuations of the key variables of our project « Car rental from "Ansej" » on the economic performance measured using the VAN settings. To do this we used the Microsoft Office Excel program.

4.1. APPLICATION OF SENSITIVITY ANALYSIS

4.1.1. Introduction:

After exposing the principle of sensitivity analysis as well as the spider plot method, it is proposed in this chapter to apply it to evaluate a car rental project. Constitutes the statement of the project.

4.1.2. Project presentation

a. Project Statement:

The project we propose to evaluate under the conditions of uncertainty and risk, is the one of a car rental, the choice of the latter is explained by the fact that investment in the transport sector (whether in the state of Saîda or other) brings a very great interest. According to the National Agency for Youth Employment Support (ANSEJ) of the province of

Saîda, the majority of the requests concern the "rolling stock", which means transportation and car rental.

The datas related to this type of investment are recorded below:

b. Data Presentation:

For initial expenses :

The project has 10 ATOS type cars priced at 800,000 DA, a total of 8,000,000 DA

An office supply of 100,000 DA

  For annual charges

Paid office worker up to 300,000 DA per year

Security agent remunerated up to 240,000 DA per year

Rental of the goodwill of 240,000 DA per year

A monthly CNSA contribution per employee of 26% of salary is:

 78000DA per year for the office worker and 62400DA for the security guard.

Maintenance of cars with an initial amount of 300.000DA and which evolves of 20% per year.

Insurance of cars amounting to 300,000 DA per year

Repayment of the loan amounting to 8100.000 / 5 per year

Financial expenses of 1% of the credit per year

 Revenues

Average number of cars rented per day 6

Number of days per year for each car 306 days

Rental price 3300 DA

Residual value of 5,000,000 DA

Lifetime of the project 5 years, knowing that the project is exempt from taxes for this same period according to the contract of the ANSEJ.

Discount rate 10% for the entire period.

4.1.3. Required Rate of Return on the project:

For the project to be considered sufficiently profitable, the study must show that the Project's Internal Profitability (IRR) is greater than or equal to the Required Rate of Return on this TRR project (discount rate): its profitability must meet the condition of a minimum return required.

For our project the TIR is 29.6252 calculate according to the formula [1.4]; it is greater than 10% that we retained.

In our case, it is not enough that the project generates wealth and that its profitability is positive: the remuneration represented by this profitability must be sufficiently high given the risks associated with this project and its implementation. The higher the risks, the higher the internal profitability of the project, it must be compensated (each individual is supposed to be risk-free: it accepts to take risks only if it is sufficiently well paid). Our project must be evaluated against a higher required net present value that we must of course determine.

To do this we will consider an investment project that fits into a risk-free framework such as savings to the bank with a profit rate of 7.4%: the return of a capital of 8.100.000 DA will grant a net present value of 3,000,000 DA, which we consider as a minimum expected value,

As a result, the car rental project must generate an NPV greater than 3000000 DA, for it to be accepted.

Table 1: Calculation of the NPV

Capital invested	8100000		Maintenance		300000	20%
Vehicle/day	6		Fixed costs			2840400
Day/Year	306		Amortization			1620000
Price/Vehicle	3300		VAT			0%
lifetime	5		Current Rates			10%
			End period Value			5000000
Year	1	2	3	4		5
Day/Year	306	306	306	306		306
Vehicle/day	6	6	6	6		6
Price/Vehicle	3300	3300	3300	3300		3300
Receipts	6058800	6058800	6058800	6058800		6058800
Maintenance	300000	360000	432000	518400		622080
Fixed costs	2840400	2840400	2840400	2840400		2840400
Debts repayment	1620000	1620000	1620000	1620000		1620000
Financial expenses	81 000	64 800	48 600	32 400		16 200
Amortization	1620000	1620000	1620000	1620000		1620000
Earnings without taxes	1 217 400	1 174 410	1 103 050	1 017 283		914 231
Earnings	1 217 400	1 174 410	1 103 050	1 017 283		914 231
Cash-flow	2 837 400	2 794 410	2 723 050	2 637 283		2 534 231
Fact.actu.	0,909	0,826	0,751	0,683		0,621
RESULT: NET ACTUELE VALUE						
NPV/5	5314216,45					

Source: Prepared by the researchers using Excel.

4.2. SENSITIVITY ANALYSIS USING SPIDER PLOT

To succeed in constructing a correct model of sensitivity analysis, one must follow some steps, which are defined as follows:

4.2.1. Define the NPV equation:

To calculate the net present value of the project we apply the following formula:

$$NPV = -I + \sum_{j=1}^{n} CF_j (1+t)^{-j} + VR(1+t)^{-n} \quad [1.1]$$

4.2.2. Define the Project data which Most likely to vary:

The sensitivity analysis shows the impact of the fluctuations of the fundamental factors of the project on its profitability expressed by the NPV. We consider as factors likely to be influential, the initial capital,

the discount rate, the lifetime. The cash flows and the residual value (besides these five factors which constitute the formula of the NPV. Which amounts to studying the impact of all the components). The following table lists the initial values of these factors as well as the abbreviations retained:

Table 2: influencing factors

CAPITAL INVESTED	I	8100000 DA
UPDATE RATE	t	10%
VALUE END PERIOD	VR	5000000 DA
DURATION OF PROJECT LIFE	n	5 years
DURATION OF PROJECT LIFE	CF1	2 837 400 DA
	CF2	2 794 410 DA
	CF3	2 723 050 DA
	CF4	2 637 283 DA
	CF5	2 534 231 DA

Source: Prepared by the researchers using Excel.

4.2.3. The NPV calculation:

Applying the project data in equation [1.1] gives:

NPV=5314216,451 DA

The net present value of the project is 5314216,451 which represents a probable estimate.

To know the sensitivity of the current value by contribution the various factors identified, we assume a gradual change in these factors by ± 5%, up to ± 50%.

4.2.4. Define the equations of each change:

We formulate the equations of fluctuations for each factor of the project, as follows:

➢ The change in investment expenditure I by ± p% changes the

net present value according to the following equation:

NPV = -I*(1 ± p%) +CF*(1-((1+t)^-n))/t+ VR*((1+t)^-n)

➢ To indicate changes in current value due to fluctuations of ± p% of annual flows is as follows:

NPV=-I+CF*(1 ± p%)*(1-((1+t)^-n))/t+ VR*((1+t)^-n)

➢ Changing the ending VR period value by ± p%, affects the current value of the project as follows:

NPV=-I+CF*(1-((1+t)^-n))/t+ VR*(1 ± p%)*((1+t)^-n)

➢ The change ± p% for the life of the project n, affects the current value of the project as follows:

NPV=-I+CF*(1-((1+t)^-(n*(1±p%))/t+ VR*((1+t)^-(n*(1±p%))

➢ The change ± p% for the discount rate affects the present value of the project as follows:

NPV=-I+CF*(1-((1+(t*(1±p%)))^-n)/(t*(1±p%))+

VR*((1+(t*(1±p%)))^-n
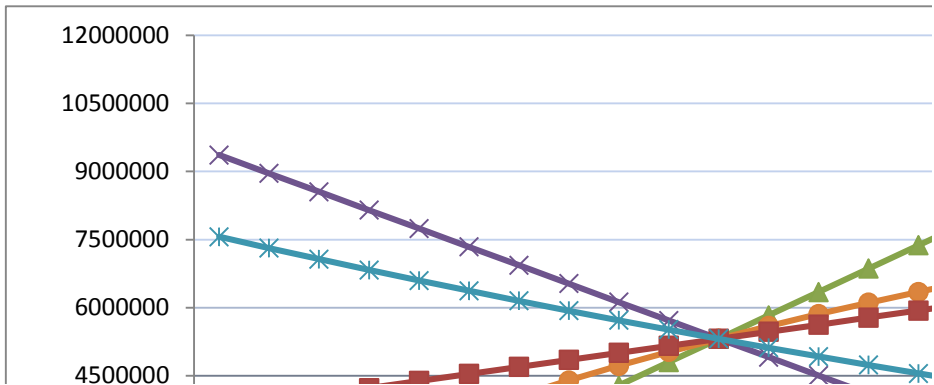
Shows the results :

Table 3: Result of Sensitivity Analysis

Varia-tion rate	NPV/val end period	NPV/Annual Feed	NPV/ invested capital	NPV/ Current rate	NPV/ Lifetime
-50%	3761913,144	159411,533	9364216,451	7562137,220	1801674,422
-45%	3917143,474	674892,025	8959216,451	7312667,546	2207443,993
-40%	4072373,805	1190372,517	8554216,451	7069123,447	2591325,995
-35%	4227604,136	1705853,009	8149216,451	6831329,049	3086424,356
-30%	4382834,467	2221333,501	7744216,451	6599114,616	3361114,483
-25%	4538064,798	2736813,992	7339216,451	6372316,311	3715721,167
-20%	4693295,128	3252294,484	6934216,451	6150775,956	4051119,316
-15%	4848525,459	3767774,976	6529216,451	5934340,814	4393247,859
-10%	5003755,790	4283255,468	6124216,451	5722863,371	4717371,598
-5%	5158986,121	4798735,960	5719216,451	5516201,139	5024148,733
0%	5314216,451	5314216,451	5314216,451	5314216,451	5314216,451

5%	5469446,782	5829696,943	4909216,451	5116776,285	5593843,540
10%	5624677,113	6345177,435	4504216,451	4923752,077	5858581,255
15%	5779907,444	6860657,927	4099216,451	4735019,555	6108975,736
20%	5935137,774	7376138,419	3694216,451	4550458,573	6345555,660
25%	6090368,105	7891618,910	3289216,451	4369952,956	6582686,688
30%	6245598,436	8407099,402	2884216,451	4193390,350	6807086,034
35%	6400828,767	8922579,894	2479216,451	4020662,077	7019221,789
40%	6556059,097	9438060,386	2074216,451	3851662,998	7219547,059
45%	6711289,428	9953540,878	1669216,451	3686291,384	7416492,994
50%	6866519,759	10469021,369	1264216,451	3524448,784	7602741,886

Source: Prepared by the researchers using Excel.

Figure 2: The Project's Spider Plot

Source: Prepared by the researchers using Excel.

5. Study Results :

Through the visualization of the figure 2 knowing that the sensitivity analysis exposes the effect of the variation of a single factor while supposing the constancy of the others (it is besides the biggest disadvantage of this method since it implicitly assumes the absence of correlation or interaction between the factors) the following statement was made:

The nature of the relations between the factors and the NPV can be detected by visualizing the curves:

As for annual flows, the end-of-period value and the lifetime: the relation that binds these three factors with the NPV is positive, which corroborates with the theoretical foundation. The first two factors being revenues and the NPV is calculated by subtracting expenses from revenues, and for the lifetime. This is explained by the fact that the more we spread over time, the more flows we will have and the lower initial expenses for our case (the elimination of reimbursement costs and financial expenses). And the addition of taxes after the fifth year (as indicated by the ANSEJ contract) With regard to the capital invested and the discount rate the relationship is contradictory which also corroborates with the theoretical basis, the capital invested being expenditure and for the discount rate the more the latter increases the more the present value of the income decreases.

 The effect can be appreciated through the curves of each factor, plus the slope increases, and the sensitivity of the net present value by contribution to this factor increases.

The factor whose variation has the greatest weight on the profitability is of course the annual flows followed by the lifetime, the capital invested, the discount rate and ultimately the residual value, the effect of which may be negligible.

The intersection of each curve with the vertical axis " the ordinate " Indicates the cases where the current value is zero, which means the total rejection of the project of course.

For our project, NPV nullity requires fluctuations of more than ± 50% for all factors.

The point of interaction between the different factors is the initial NPV of the project ″without any variation″

The figure allowed us to identify the different impacts, and this is the table that will allow us to identify the values that judge reviews. Each factor ie d. that if the (real) values of the different factors exceed

the designated critical value for each of them the project is rejected. Remember that the minimum value required was an NPV of 3,000,000 DA resulting from a project involving no risk.

The shaded cells in Table 3 refer to the cases where the project « considered less profitable than savings » is rejected.

For annual flows the project is rejected if the annual flows decrease by -25% of their initial values to be more precise, the project is rejected if the flows were less than:

Table 4: Cash Flow Reviews

	year 1	Year 2	Year 3	Year 4	Year 5
Critical values	2128050	2095807,5	2042287,5	1977962,25	1900673,25

Source: Prepared by the researchers.

For the invested capital, we rejects the project if the amount exceeds 30% of the sum of 8.100.000 DA to be more precise the sum of 10.530.000 DA.

For the lifetime, the project is rejected if its life is 3 years or less.

For the end-of-period value, it would require a variation of more than 75%, i.e. an end-of-period value of 1,250,000 DA to reject the project.

For the rate of interest no doubt that we will reject the project for the rate of 25.47% which corresponds to the TIR of our project, but for the criterion to adopt that of beating the project without risk, the project will be rejected if the discount rate equals or exceeds 17%.

Decision-making:

We propose to invest in a context of risk and uncertainty, this risk taking can not be unjustified, we demand for this that the project generates a profitability superior to 3,000,000 DA generated by an investment carrying no risk, Sensitivity analysis is a tool for decision indeed identifies the variables whose profitability is most sensitive.

This will allow us to adapt to a not always favorable environment so we will accept if the circumstances are as follows:

We will agree to invest in a car rental if the cost is less than 10,530,000 DA. If the lifetime of the project exceeds 3 years, if the discount rate does not reach 17%. If the residual value of the project does not abbreviate 1.250.000 DA. Moreover, if the annual flows of the five years exceed 2128050, 2095807.5, 2042287.5, 1977962.25 and 1900673.25 DA successively.

The sensitivity analysis allows us to identify the external environment of the project, identifying the dominant and fundamental factors of an investment project does not mean to influence them, it's about instead of adapting to them, adapt to an environment of uncertainty and risk where these are likely to vary. The use of suitable software such as @RISK advantage facilitate the implementation of this technique.

6.   Conclusion :

In order to address the issue that is the subject of interest of this research namely the assessment of a project in a risky and uncertain environment, we have discussed many theoretical and technical aspects the evaluation of investment projects principle of Monte Carlo simulation and sensitivity analysis. We first tried to understand theoretically the principle of these tools, and then we concretely approached these two methods by applying them to evaluate a car rental project from the National Agency for Youth Employment Support (ANSEJ). The interest of this choice is that according to this same agency the majority of the requests concerns the "rolling", that is to say, transport and car rental, this is so that our study must put a tangible scientific interest. As a criterion of project acceptance we have adopted overcoming the profitability of a risk-free project that of saving, where it generates a net present value of DA 3,000,000 over

five years, the sensitivity analysis method allowed us to identify the external environment of this project, and provided a very likely approximation of the actual NPV.

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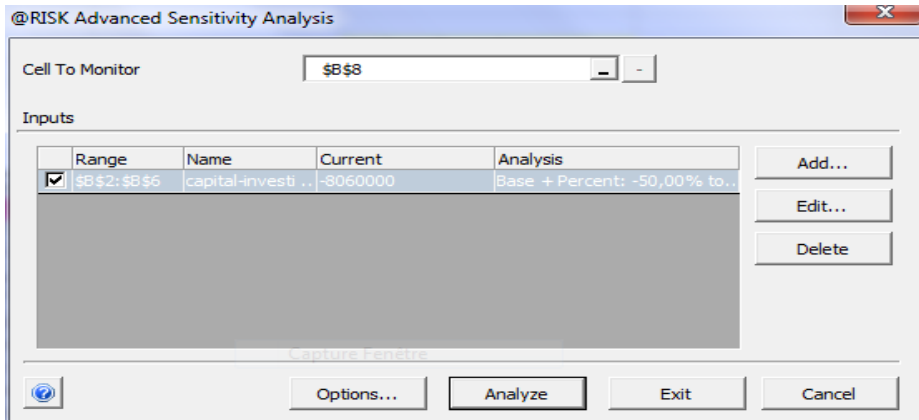15. Jean-Louis Boimond, Simulation systèmes de production réseaux de pétri P2

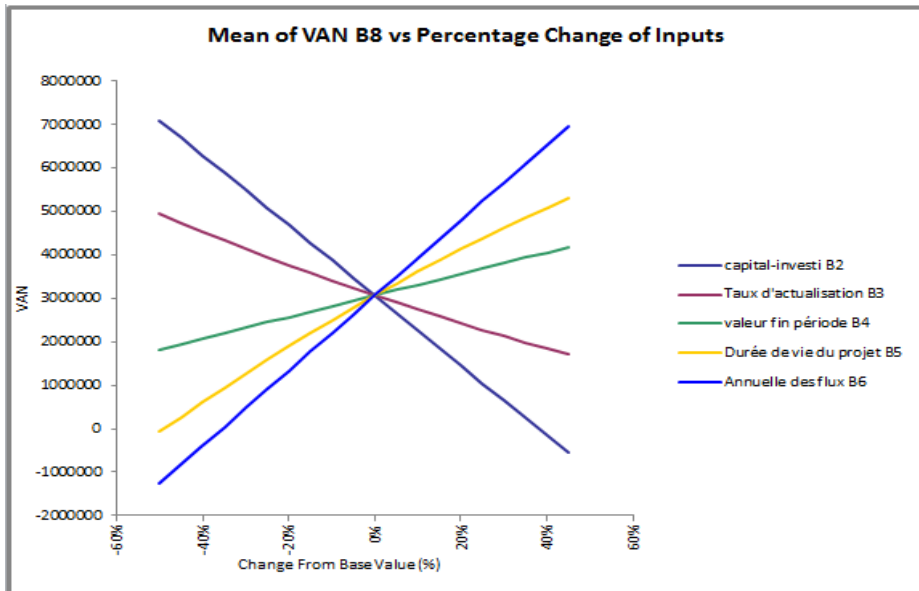## 8.   Appendices :

Figure 3: Input data definition with @Risk
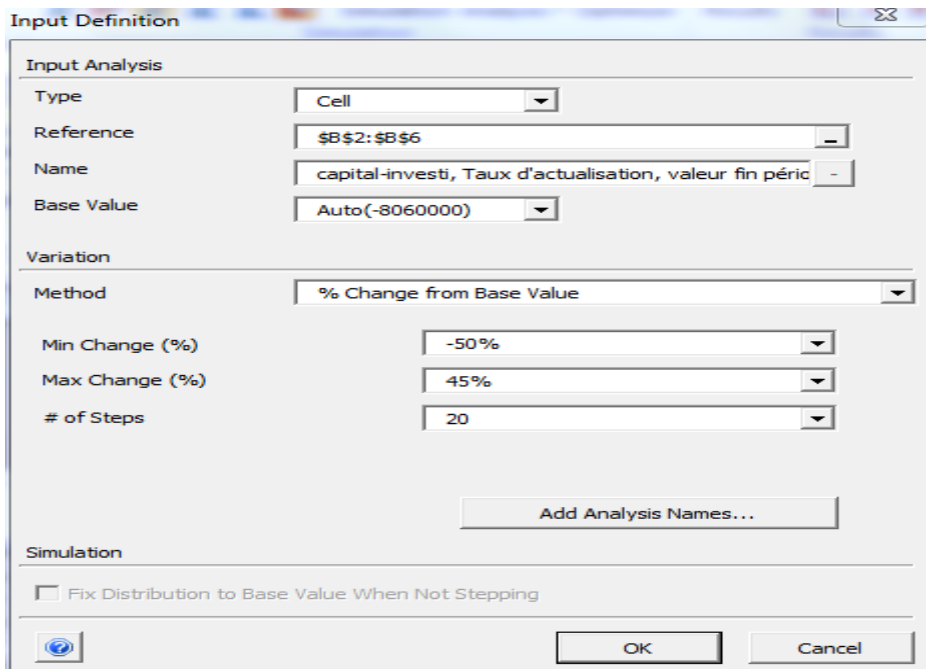
Source: Prepared by the researchers using @risk.

Figure 4: Sensitivity analysis window with @risk

Source: Prepared by the researchers using @risk.

Figure 5: The Project's Spider Plot

Source: Prepared by the researchers using @risk.