# A study on factors affecting internal rate of return (IRR) and net present value (NPV) of investment projects using the software COMFAR 

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Received: April 20, 2015
Accepted: June 15, 2015


#### Abstract

Investment is one of the most important topics for the conversion of funds in to finance. Knowing that an investment is finally profitable or not, is the most important part of an investment. One of the types of investment is the creation or development of a project the revenue of which can be a service or a product. In order to ensure about the justification of a project and to achieve the internal rate of return and get the net present value, different methods are used for its analysis that one of them is a data analysis project using the COMFAR software .For extraction of the important factors that can affect a project, we studied 20 cases of projects. Thus, the first justification combining proven designs and then to some of the sensitivity analysis variables influencing IRR and NPV and finaly presented the most effective variables specified. Major factors affecting in the internal rate of return is reducing or increasing on sales and affecting in NPV is interest rate. with changing these factors can impact susceptibility to asses project , we analyzed in a different situation. This helps the investor to study different conditions and view their works to correct decision making.


KEY WORDS: Investment, Return, Internal rate of return, net present value

## 1. INTRODUCTION

The term of investment can include a wide range of activities. This term can include investment in certificates of deposit, saving bonds, common stock or mutual funds investment. Investment consists of conversion of funds to one or several types of assets that will be kept for some time in the future. Therefore investment requires the study of the process of investment and management of investors' wealth. This wealth includes the sum of income and the present value of future incomes [1]. The funds that are invested can be from the available assets of the individuals, borrowed or saved money [1]. Investment in the project is also another type that for the implementation of a plan, the needed investment amount is calculated and the way of financial amount supply also is specified [2]. Common method for determination of acceptance / rejection / stay in a project is through the investment evaluation techniques of NPV and IRR for cash flows. Even small deviations from the determined value may simply invalid the decision. The law of decision of investment evaluation technique by investigation of cash flows is necessary for valid decision[3].About any plan, the logical question is that whether performing it is worthy. Different and various criteria have been suggested for evaluating projects. Criteria for evaluating projects are classified under two categories: revelation and non-revelation criteria that the most important revelation criteria are net present value (NPV) and internal rate of return (IRR) [2]. Selection of the best plan and program of supplying funds for investment projects are done separately and repeatedly [4].

## 2. REVIEW OF LITERATURE

There is a theory that the cash flow in the future worth less than its present value. The decline tables in the sixteenth century can be traced...classic form of compound interest formula, determine the present value of its future cash flows by reducing the interest rate. Modern superior standard NPV is as a basis for investment decisions based on Fisher. The shortcoming of NPV law is that, by representativeness of dollar net value of the project amount from the value that it cannot inform about the return rate, i.e. the amount that is obtained for each investment dollar, it provides a comparison with investment in capital markets. Another basic shortcoming of NPV law is of the failure of the value of the available options in a project or of offering wrong information in the presence of asymmetric information in the organization. On the other hand, IRR necessarily does a logic comparison in the job of investment

[^0]law of maximization of net cash flow for each dollar. B"ohm-Bawerk (1889). In the calculation of the "income cash", it is assumed there is no market interest rate, but there is internal interest rate of the company. IRR is marginal efficiency of capital. The method of return rate is unclear or unusual, in cases where the NPV has several roots in the function of discount rate r , is not a determiner alone under IRR (as the discount rate for each NPV minimized to zero). Modification or reduction of cash flow is introduced as guarantee for return rate by Wright (1959). All agree that the ability to get rid of costs reduction or on the other hand, the matter that a project can reduce the time of an activity, is due to the fact that IRR is maximum at the NPV time horizon as a unit. But IRR alone provides the information for return of the main project and generally does not include the NPV criteria [5]. The aim of NPV is to express the value or price of the funds flow in an equal number. Identification of the reality of nominal funds, creation of different times, which have different values, are the how of value that is given to a nominal fund and will vary according to time. The method that estimates the value changes through the reflected time by identifying the discount rate is appropriate for a reduction rate factor r . A nominal fund of X years is equal to $\mathrm{x}(1+\mathrm{r})$ in the following year and so on. NPV is a cash flow defined by the number of reduction values in the flow, where each period has been reduced to one based common day. The important point is that the unit reduction rate will not always be suitable for the calculation of NPV. The reduction rate will be different for the different factors and goals. In certain applications of the appropriate discount rate, the interest rate is often used as a special or return rate of investment. For example, the interest rate that can be borrowed from the market or can be a better alternative for the return rate expected by an investor. IRR is a defined cash flow for discount rate which make NPV cash flow, zero [6].

## 3.Investment

Investment is any kind of value sacrifice at the present (which is usually specified) in the hope of gaining a value in the future (usually the size or quality is unknown) [7].

## 4.Net Present Value (NPV)

Assume that an investor faces expected return rate (or interest rate) $r$ (in decimal, not percentage) in each period or year in the lifetime of a project. Therefore, he will be indifferent toward a unit of extra income in the period he is in or the period he is to invest in, which will be called period year 0 from now on; he is indifferent toward the expectation of earning $(\mathrm{r}+1)$ unit of extra income in the next period. Also this person will be indifferent toward these two amounts and $(\mathrm{r}+1)^{2}$ unit of extra income in the next two periods. It means that if the return rate is $10 \%, 100$ rials of today and 110 rials of the next year, will be considered equally the same by him. On this basis, one income unit which will be achieved in the next period, has the present value ofl/r+1unit in the period of Stowe zero, one extra unit which will be used in the second period, has the present value of $1 /(\mathrm{r}+1)^{2}$ unit in the zero period. The method of calculating the present values in this way is called discount. R or interest rate through which future returns are reduced to present values is called discount rate. In fact, by reduction of different amounts in different years, we create them a basis for comparison, because due to the presence of expected return which is indicator of time value, without applying the discount, one cannot compare them with each other or apply them in calculations as equivalent figures [8]. The net present value criterion tries to, by considering the money time adjustment, find the balance between investment pays and revenue from implementing the investment. Evaluation of balance is in comparison with a standard interest rate that the manager of the company predetermined for the investments and the use of company funds. This interest is also called the minimum acceptable rate of return(MARR). By applying the desired interest rate we can compare the present value of the investment pays and the present value of payments gained from the project implementation over its economic life. The result of the calculation, which will be a positive or negative figure, indicates whether the project is justified by the standard rate. The positive net present value indicates that in the lifelong of the project, the main amount of invested money is returned and the project has an acceptable return rate and also it has provided a more income taken for granted. On the contrary, the negative net present value indicates that the project cannot have enough income to be accepted at standard rates. Net present value of a project is equal to the sum of the present value of all cash flows associated with the project [2].

$$
\begin{equation*}
N P V=\frac{C F_{0}}{(1+K)^{0}}+\frac{C F_{1}}{(1+K)^{1}}+\ldots . .+\frac{C F_{n}}{(1+K)^{n}}=\sum_{t=0}^{n} \frac{C F_{t}}{(1+K)^{t}} \tag{1}
\end{equation*}
$$

In which:
Net Present Value $=$ NPV
Cash flow which is obtained at the end of the year $t(t=0,1, \ldots . . n)$ obtained $=\mathrm{CFt}$ The obtained positive cash flow is shown with positive sign and the spent cash flow is shown by negative sign.

Project life $=n$
Cost of capital which is used as the discount rate $=\mathrm{k}$ or r [2]
If the NPV is negative for the minimumabsorptive rate, the project will benon-economic and if is positive, the project will be economic.
Non-economic project NPV $<0$
Economic project NPV $>0$ or NPV $=0$
If you have several projects, a project is more economical that the present value of its costs is lower[9].

## 5.Return:

Return is the average of a rate that is obtained during a specified time interval (of investments) of investment in an asset. The return rate is considered as an essential factor in making financial-investmentdecisions [7].

## 6.Internal rate of return (IRR)

Internal rate of return, is the discount rate based on which the net present value of the project is equal to zero. If the net present value of a project is positive, it will be concluded that the internal rate of return for that project is more than the acceptable rate of return which was applied for the investment and vice versa, if the net present value of a project is negative, the internal rate of return for that project will be lower than the acceptable rate and also if the net present value of a project is zero it will be concluded that total investment spent in the project accompanied by allocated interests in each year are returned and the internal rate of return of project is equal to acceptable return rate. The minimum acceptable interest rate, is equal to real interest rate of long-term loans available in the capital market or the interest rate that is paid for funds borrowed. Ranking and selection among various investment plans are done according to higher internal rate of return, provided that be more than the minimum acceptable rate. To accurately calculate the internal rate of return of projects the trial and error method is used. Therefore, the calculations of present value are tested in various discount rates so to acquire a rate for which the net present value of project becomes zero[2]. Therefore, doing a project will be financially justified if and only if the crisis value of interest rate, i.e. the rate in which the net present value of a project is zero, be more than the real value of interest rate. This statement can be used as a base for decision making (the rule of NPV). Crisis value of interest rate is also often called internal rate of return and sometimes is called economical rate of return or profitability rate of project. Therefore the rule of net present value can be stated as follows, figure " 1 ", if internal rate of return ofan investment project be more than the interest rate, the project must be implemented. Internal rate of return or IRR can be considered as the maximum rate of return that there is expectation to obtain it by investment in a specified project. Usually the real rate of return which is obtained by implementing a project is lower than calculated IRR. In spite of this, a project that it's IRR is significantly bigger than the IRR of other available options, has farbetter chance to obtain more efficiency and growth [8].


Fig. 1Net Present Value

## 7.The relationship between IRR and NPV:

Why knowing the relationship between NPV of cash flow in specific discount rates with IRR is important? IRR of cash flows offers effective interest rate in public sector of pay to provide capital for the project. The aim is to examine the project cost from the perspective of public sector. Effective interest rate is an important cost factor. Even more important than the cost amount, is the cost of opportunity of deposited cash flows that how much loan could be given from national loan fund (NLF) for the costs used in the cash flow of the project. This opportunity cost is measured by NPV of cash flow. The declineof return rate is equal to NLF interest rate. Therefore, knowing the NPV of a cash flow in discount rates unto IRR is an important potential [6].Investment projects often evaluate net present valueequal to internal rate of return from financial, social and economic perspectives. In fact it is one kind of sensitivity analysis to determine the effect of changes in external factors on IRR and to create NPV of zero [10].

## 8.Sensitivity analysis of IRR and NPV:

The goal of this article is to analysis the IRR and NPV sensitivity and examine the effect of different variables on the internal rate of return and net present valueof investment plans which are of factors affecting the implementation of a project. For this purpose, we used justification proposals of twenty different projects and examined different variables that are important and effective till the completion of the project. In this study, the software COMFAR was used and different variables that were analyzed include:

1. Increase and decrease of time schedule of plan for one year
2. Ten percent change are in the exchange rate fluctuations, fluctuations in the discount rate, increase and decrease of fixed cost of plan investing, increase or decrease in production costs, increase or decrease in sale, increase or decrease in working capital and the obtained results are inserted in the table "1" as example:

Table . 1 .Sample of result of internal rate of return and net present value using software COMFAR in million rials

| NPV | IRR | Quantity | COMPANY (A ) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 613.713 | $39 / 44$ |  | main | $\mathbf{1}$ |
| 421.171 | $31 / 69$ | One year | increase of time schedule | $\mathbf{2}$ |
| 797.030 | $45 / 62$ | One year | decrease of time schedule | $\mathbf{3}$ |
| 1.067 .109 | $51 / 23$ | $10 \%$ | increase of exchange rate | $\mathbf{4}$ |
| 159.633 | $25 / 50$ | $10 \%$ | decrease of exchange rate | $\mathbf{5}$ |
| 200.960 | $39 / 44$ | $10 \%$ | increase of discount rate | $\mathbf{6}$ |
| 1.524 .957 | $39 / 44$ | $10 \%$ | decrease of discount rate | $\mathbf{7}$ |
| 572.018 | $37 / 04$ | $10 \%$ | increase of fixed cost of investment | $\mathbf{8}$ |
| 655.408 | $42 / 21$ | $10 \%$ | decrease of fixed cost of investment | $\mathbf{9}$ |
| 23.943 | $20 / 77$ | $10 \%$ | increase of production costs | $\mathbf{1 0}$ |
| 1.203 .483 | $57 / 23$ | $10 \%$ | decrease of production costs | $\mathbf{1 1}$ |
| 1.308 .295 | $59 / 37$ | $10 \%$ | increase of sale | $\mathbf{1 2}$ |
| -11.410 | $17 / 29$ | $10 \%$ | decrease of sale | $\mathbf{1 3}$ |
| 587.288 | $38 / 14$ | $10 \%$ | increase of working capital | $\mathbf{1 4}$ |
| 643.420 | $40 / 97$ | $10 \%$ | decrease of working capital | $\mathbf{1 5}$ |
|  |  |  |  |  |
| -11.410 | $17 / 29$ |  |  |  |
| 1.308 .295 | $59 / 37$ | $17 / 29$ |  |  |
| -11.410 |  |  | decrease of sale of the minimum IRR |  |
| 1.524 .957 |  |  | decrease of sale of maximum IRR |  |
|  |  |  |  |  |

The above table is for twenty projects examined using COMFAR software the details of which are brought in appendix A.

The results of examination of IRR are as summarized in table " 2 ":
Table.2.The results of examination of IRR

| T | s | R | Q | P | o | N | M | L | K | J | 1 | H | G | F | E | D | c | B | A | Quantity | Description |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 24/31 | 15/40 | 18/36 | $16 / 17$ | 21/74 | 25/92 | 21/27 | 55/30 | 35/19 | 18/36 | $46 / 15$ | 40/02 | 23/51 | $28 / 75$ | 37/88 | 36/73 | $24 / 17$ | 51/02 | 33/65 | $39 / 44$ |  | main |
| 18/61 | 11/84 | 15/14 | 13/04 | $17 / 81$ | $19 / 84$ | 18/13 | 41/54 | 27/73 | 15/14 | 33/04 | 30/35 | 19/99 | 22/37 | $29 / 47$ | $28 / 88$ | 19/30 | 38/0 | 27/73 | 31/69 | one year | increase of time schedule |
| $36 / 22$ | 19/17 | 20/31 | 1795 | 21/70 | $36 / 86$ | 25/14 | 84/33 | 49/23 | 20/31 | $56 / 67$ | $47 / 78$ | 27/21 | 41/75 | 57/35 | 44/12 | $29 / 17$ | $84 / 77$ | $37 / 29$ | 45/62 | one year | decrease of time schedule |
| 24/31 | 16/31 | 22/76 | 12/78 | 24/93 | 24/97 | 21/61 | 55/08 | 53/23 | 18/27 | 35/45 | 35/89 | 22/51 | 26/99 | 37/88 | $31 / 99$ | 20/52 | 50/87 | $29 / 90$ | 51/23 | 10\% | increase of <br> exchange <br> rate |
| 24/31 | 11/62 | 9/77 | 14/57 | 21/74 | $26 / 93$ | 19771 | 55/53 | $37 / 74$ | 14/34 | 40/14 | 37/61 | 23/51 | 31/44 | 37/88 | 33/64 | 24/56 | 51/16 | 33/65 | 25/50 | 10\% | decrease of <br> exchange <br> rate |
| 24/31 | 15/40 | 20/31 | $16 / 17$ | 21/74 | 25/92 | 21/27 | 55/30 | 45/52 | 18/36 | $46 / 15$ | 40002 | 23/51 | 28/75 | 37/88 | 36/73 | 24/17 | 51/02 | 33/65 | $39 / 44$ | 10\% | increase of <br> discount rate |
| 24/31 | 15/40 | 20/31 | $16 / 17$ | 21/74 | 25/92 | 21/27 | 55/30 | 45/52 | 18/36 | $46 / 15$ | 40002 | 23/51 | 28/75 | 37/88 | $36 / 73$ | $24 / 17$ | 51/02 | 33/65 | $39 / 44$ | 10\% | decrease of discount rate |
| 22/30 | 13/84 | $16 / 85$ | 14/86 | $19 / 88$ | 23/93 | 19/78 | 51/76 | 32/17 | $16 / 85$ | 42/18 | $36 / 94$ | 22/11 | 27/33 | 34/54 | 33/82 | 23/48 | $46 / 97$ | 31/15 | 37/04 | 10\% | increase of fixed cost of investment |
| $26 / 68$ | 17/21 | 20/11 | $17 / 65$ | 23/86 | 28/22 | 22/99 | 59/40 | 38/73 | 20/11 | 50/88 | 43/60 | 25/09 | 30/31 | 41/89 | $40 / 15$ | $24 / 89$ | 55/83 | $36 / 58$ | 42/21 | 10\% | decrease of fixed cost of investment |
| 24/18 | 13/42 | 12/10 | $8 / 93$ | 19/66 | 3/05 | 16/32 | 30/58 | 11/42 | 12/10 | 33/22 | $21 / 08$ | 17/18 | 24/45 | $36 / 46$ | 35/37 | 17/88 | 15/74 | 21/23 | 20/77 | 10\% | increase of <br> production <br> costs |
| 24/44 | 17/37 | 24/64 | 23/54 | 23/87 | $48 / 13$ | 25/64 | 77/62 | 60/65 | 24/64 | $59 / 01$ | 59/49 | 29/42 | 32/97 | 39/30 | $38 / 07$ | 30/04 | $87 / 74$ | 45/01 | 57/23 | 10\% | decrease of production costs |
| 26/82 | 19/05 | 26/11 | 24/76 | 25/90 | $49 / 81$ | 27/12 | 80/69 | 63/54 | 26/11 | 63/23 | $62 / 53$ | 30/70 | 34/68 | 42/91 | 41/07 | 31/16 | 91/74 | 47/38 | $59 / 37$ | 10\% | increase of <br> sale |
| 21/75 | 11/59 | 10/24 | $7 / 11$ | $17 / 47$ | -0/29 | 14/29 | 25/59 | 7155 | 10/24 | 28/55 | 17/14 | 15/24 | 22/30 | 32/78 | 32/15 | 1603 | 10/36 | $17 / 96$ | 17/29 | 10\% | decrease of <br> sale |
| 24/31 | 15/32 | 18/09 | 15/81 | 21/36 | 25/34 | 21/21 | 54/22 | 33/98 | $18 / 06$ | 45/84 | 39/20 | 22/98 | 28/56 | 37/72 | 36/64 | 23/54 | 49/86 | 33/25 | 38/14 | 10\% | increase of <br> working <br> capital |
| 24/31 | 15/50 | 18/61 | $16 / 54$ | 22/13 | $26 / 52$ | 21/34 | 56/41 | $36 / 45$ | 18/64 | $46 / 47$ | 40186 | 24/01 | 28/94 | $38 / 04$ | $36 / 82$ | 24/82 | 52/21 | 34/18 | $40 / 97$ | 10\% | decrease of working capital |

Table .3.The results of examination of NPV

## In Milliard Rials

| T | S | R | Q | P | 0 | NPV | M | L | K | J | 1 | H | G | F | E | D | C | B | A | Quantity | Description |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 36 | 239 | 3 | 133 | 715 | 12 | 679 | 48 | 18 | 3 | 39 | 38,322 | 1,197 | 1,571 | 186 | 522 | 821 | 81 | 238 | 613 |  | main |
| -14 | -14 | 2 | 37 | -422 | -1 | 29 | 35 | 13 | 2 | 31 | 29,524 | 473 | 511 | 134 | 326 | -155 | 59 | 152 | 421 | one year | increase of time schedule |
| 83 | 435 | 4 | 193 | 718 | 28 | 1,355 | 63 | 20 | 4 | 43 | 40,954 | 1,898 | 2,382 | 213 | 701 | 1,587 | 101 | 292 | 797 | one year | decrease of time schedule |
| 36 | 355 | 5 | 30 | 1,436 | 11 | 849 | 48 | 29 | 4 | 35 | 34,082 | 1,049 | 1,263 | 186 | 646 | 105 | 81 | 194 | 1,067 | 10\% | increase of exchange rate |
| 36 | -28 | -1 | 96 | 715 | 14 | 336 | 48 | 17 | 1 | 38 | 36,258 | 1,197 | 2,033 | 186 | 468 | 919 | 82 | 238 | 159 | 10\% | decrease of exchange rate |


| -34 | -323 | -1 | -111 | -1,043 | -7 | -693 | 26 | 11 | -1 | 18 | 15,555 | -611 | -174 | 68 | 151 | -888 | 39 | 43 | 200 | 10\% | increase of discount rate |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 190 | 1,426 | 18 | 836 | 4,728 | 47 | 6,883 | 85 | 44 | 18 | 80 | 83,985 | 6,223 | 4,652 | 430 | 1,248 | 3,910 | 163 | 689 | 1,524 | 10\% | decrease of discount rate |
| 21 | 139 | 3 | 96 | 244 | 9 | 396 | 46 | 16 | 3 | 37 | 35,611 | 948 | 1,375 | 170 | 1,192 | 699 | 76 | 209 | 572 | 10\% | increase of fixed cost of investment |
| 52 | 339 | 4 | 169 | 1,187 | 16 | 963 | 50 | 19 | 4 | 41 | 41,034 | 1,447 | 1,767 | 202 | 1,304 | 943 | 86 | 267 | 655 | 10\% | decrease of fixed cost of investment |
| 35 | 99 | 1 | -6 | 175 | -2 | -22 | 13 | -1 | 1 | 23 | 6,847 | -35 | 789 | 173 | 1,175 | -36 | -2 | 20 | 23 | 10\% | increase of production costs |
| 37 | 378 | 7 | 365 | 1,255 | 62 | 1,683 | 83 | 40 | 7 | 54 | 69,798 | -3,859 | 2,353 | 198 | 1,321 | 2,046 | 175 | 456 | 1,203 | 10\% | decrease of production costs |
| 58 | 506 | 7 | 417 | 1,825 | 66 | 2,054 | 89 | 43 | 7 | 60 | 76,410 | 2,950 | 2,750 | 233 | 1,500 | 2,361 | 188 | 509 | 1,308 | 10\% | increase of sale |
| 14 | -1 | -1 | -9 | -61 | -3 | -7 | 7 | -2 | 1 | 17 | 235 | -28 | 392 | 139 | 99 | -102 | -3 | -5 | -11 | 10\% | decrease of sale |
| 36 | 234 | 3 | 124 | 625 | 11 | 667 | 47 | 18 | 3 | 39 | 37,628 | 1,099 | 1,544 | 185 | 1,246 | 709 | 80 | 233 | 587 | 10\% | increase of working capital |
| 36 | 244 | 3 | 142 | 805 | 13 | 692 | 49 | 19 | 3 | 39 | 39,017 | 1,289 | 1,598 | 186 | 1,250 | 932 | 83 | 244 | 643 | 10\% | decrease of working capital |

After examination of different variables affecting IRR and NPV and sorting them in ascending order, we concluded that some of variables as described in table" 4 ", together caused decrease in internal rate of return and some of them increased the internal rate of return:

Table. 4.The result of sensitivity analysis of IRR

| No. | Description | Decrease of IRR | Description | Increase of IRR |
| :---: | :---: | :---: | :---: | :---: |
| $\mathbf{1}$ | Decrease of sale | 16 | Increase of sale | 14 |
| $\mathbf{2}$ | Increase of time schedule | 3 | Decrease of time schedule | 6 |
| $\mathbf{3}$ | Decrease of exchange rate | 1 |  |  |

Also some of variables as shown in table " 5 ", together caused decrease in NPV of projects or some increased NPV:
Table 5.The result of sensitivity analysis of NPV

| No. | Description | Decrease of NPV | Description | Increase of NPV |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{1}$ | Increase of discount rate | 10 | Decrease of discount rate | 19 |
| $\mathbf{2}$ | Decrease of sale | 8 | Increase of sale | 1 |
| $\mathbf{3}$ | Decrease of production cost | 1 |  |  |
| $\mathbf{4}$ | Decrease of exchange rate | 1 |  |  |

As shown in Fig. 2, the variables that caused decrease in IRR are as follows respectively:
Decrease of sale, increase of time schedule, decrease of exchange rate and the variables that caused increase in IRR are as follows respectively: increase of sale, decrease of time schedule.


According to fig. 3, the variables that caused decrease in the NPV are as follows respectively: increase of discount rate, decrease of sale, decrease of production cost, decrease of exchange rate and the variables that caused increase in NPV as are follows respectively: decrease of discount rate, increase of sale.


According to obtained results, one of the most important variables affecting the investment project is the discount rate that varies according to the market rates and an investor should consider this matter as the most important factor. On the other hand, the revenue of an investment project should be considered as its increase or decrease has high impact on justification of a plan. So if a plan does not have significant income that can cover its costs, there is no justification to invest in that project. Also time schedule is very important in some projects and if the time of a project reduces it can increase the justification of a project and vice versa. Therefore exact timing of a project is very important. In some projects that are of exchange type and their investment cost is in the form of foreign exchange and also have their sale in foreign currency, the exchange rate fluctuations is very effective on their feasibility and sometimes make the plan unjustified. In some cases that the project requires high production costs, its fluctuations can affect its NPV.

## Conclusion:

One of the important factors that affect a project's investment is the internal rate of return that this rate must be higher than acceptable return rate equal to real interest rate of long-term loan available in the capital market. Therefore, to justify the plan, sometimes some people try to use different methods and show the internal rate of return higher than real, so they make unrealistic numbers and reduce or raise some numbers in the plan which change the internal rate of return, as the results of the evaluation showed, the most important factor that can cause a rise in internal rate of return, is the increase in sales which was shown unreal in some cases to show the project justified. The next factor which has significant effect in the most of investment plans, is reduction of time schedule of the plan that by changing it and unrealistically showing it, the internal rate of return changes, meanwhile the issue which is considerable is the real time of the project which may make the plan unjustified. Also another factor which is so important for the project investment, is the NPV that if is positive it will show that the plan is justified. According to the investigations done, factors which are effective on the increase of NPV, are decrease of discount rate and in some cases increase in sale and to show a plan is justified, some reduce the discount rate unrealistically or increase the sale to show the NPV high. To prevent such cases, the information of an investment projects must be examined and analyzed carefully and the sensitivity analysis get examined from different perspectives exactly and according to reality. As a suggestion, one can examine different industries.

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Appendix A :

| NPV | IRR | Quantity | COMPANY (A) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 613,713 | 39/44 |  | main | 1 |
| 421,171 | 31/69 |  | increaseof time schedule | 2 |
| 797,030 | 45/62 |  | decreaseof time schedule | 3 |
| 1,067,109 | 51/23 | 10\% | increaseof exchange rate | 4 |
| 159,933 | 25/50 | 10\% | decreaseof exchange rate | 5 |
| 200,960 | 39/44 | 10\% | increaseof discount rate | 6 |
| 1,524,957 | 39/44 | 10\% | decreaseof discount rate | 7 |
| 572,018 | 37/04 | 10\% | increaseof fixed cost of investment | 8 |
| 655,408 | 42/21 | 10\% | decreaseof fixed cost of investment | 9 |
| 23,943 | 20/77 | 10\% | increaseof production costs | 10 |
| 1,203,483 | 57/23 | 10\% | decreaseof production costs | 11 |
| 1,308,295 | 59/37 | 10\% | increaseof sale | 12 |
| -11,410 | 17/29 | 10\% | decreaseof sale | 13 |
| 587,283 | 38/14 | 10\% | increaseof working capital | 14 |
| 643,420 | 40/97 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 1 1 , 4 1 0}$ | $\mathbf{1 7 / 2 9}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| $1,308,295$ | $59 / 37$ | $10 \%$ | increaseof sale ofmaximum IRR |
| $-11,410$ | $17 / 29$ | $10 \%$ | decreaseof sale of the minimum NPV |
| $1,524,957$ | $39 / 44$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | (COMPANY (B | Row |
| :---: | :---: | :---: | :---: | :---: |
| 238,475 | 33/65 |  | main | 1 |
| 152,460 | 27/73 |  | increaseof time schedule | 2 |
| 292,034 | 37/29 | $\begin{aligned} & \text { 亏ँ } \\ & \stackrel{\text { ® }}{0} \\ & \stackrel{0}{0} \end{aligned}$ | decreaseof time schedule | 3 |
| 194,903 | 29/90 | 10\% | increaseof exchange rate | 4 |
| 238,475 | 33/65 | 10\% | decreaseof exchange rate | 5 |
| 43,187 | 33/65 | 10\% | increaseof discount rate | 6 |
| 689,711 | 33/65 | 10\% | decreaseof discount rate | 7 |
| 209,620 | 31/15 | 10\% | increaseof fixed cost of investment | 8 |
| 267,330 | 36/58 | 10\% | decreaseof fixed cost of investment | 9 |
| 20,209 | 21/23 | 10\% | increaseof production costs | 10 |
| 456,741 | 45/01 | 10\% | decreaseof production costs | 11 |
| 509,444 | 47/38 | 10\% | increaseof sale | 12 |
| -5,397 | 17/96 | 10\% | decreaseof sale | 13 |
| 233,547 | 33/25 | 10\% | increaseof working capital | 14 |
| 244,993 | 34/18 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 5 , 3 9 7}$ | $\mathbf{1 7 / 9 6}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 509,444 | $47 / 38$ | $10 \%$ | increaseof sale ofmaximum IRR |
| $-5,397$ | $17 / 96$ | $10 \%$ | decreaseof sale of the minimum NPV |
| 689,711 | $33 / 65$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY ( C) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 81,934 | 51/02 |  | main | 1 |
| 59,136 | 38/0 |  | increaseof time schedule | 2 |
| 101,278 | 84/77 | $\begin{aligned} & \dot{\varpi} \\ & \stackrel{\text { ® }}{\circ} \\ & 0 \end{aligned}$ | decreaseof time schedule | 3 |
| 81,763 | 50/87 | 10\% | increaseof exchange rate | 4 |
| 82,101 | 51/16 | 10\% | decreaseof exchange rate | 5 |
| 39,543 | 51/02 | 10\% | increaseof discount rate | 6 |
| 163,889 | 51/02 | 10\% | decreaseof discount rate | 7 |
| 76,912 | 46/97 | 10\% | increaseof fixed cost of investment | 8 |
| 86,952 | 55/83 | 10\% | decreaseof fixed cost of investment | 9 |
| -1,839 | 15/74 | 10\% | increaseof production costs | 10 |
| 175,015 | 87/74 | 10\% | decreaseof production costs | 11 |
| 188,115 | 91/74 | 10\% | increaseof sale | 12 |
| -3,010 | 10/36 | 10\% | decreaseof sale | 13 |
| 80,441 | 49/86 | 10\% | increaseof working capital | 14 |
| 83,427 | 52/21 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 3 , 0 1 0}$ | $\mathbf{1 0} / \mathbf{3 6}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 188,115 | $91 / 74$ | $10 \%$ | increaseof sale ofmaximum IRR |
| $-3,010$ | $10 / 36$ | $10 \%$ | decreaseof sale of the minimum NPV |
| 188,115 | $91 / 74$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY (D) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 821,401 | 24/17 |  | main | 1 |
| -155,063 | 19/30 | $\begin{aligned} & \text { あ } \\ & \stackrel{0}{0} \\ & 0 \\ & 0 \end{aligned}$ | increaseof time schedule | 2 |
| 1,587,302 | 29/17 |  | decreaseof time schedule | 3 |
| 105,183 | 20/52 | 10\% | increaseof exchange rate | 4 |
| 919,762 | 24/56 | 10\% | decreaseof exchange rate | 5 |
| -888,056 | 24/17 | 10\% | increaseof discount rate | 6 |
| 3,910,472 | 24/17 | 10\% | decreaseof discount rate | 7 |
| 699,161 | 23/48 | 10\% | increaseof fixed cost of investment | 8 |
| 943,641 | 24/89 | 10\% | decreaseof fixed cost of investment | 9 |
| -36,434 | 17/88 | 10\% | increaseof production costs | 10 |
| 2,046,880 | 30/04 | 10\% | decreaseof production costs | 11 |
| 2,361,151 | 31/16 | 10\% | increaseof sale | 12 |
| -102,449 | 16/03 | 10\% | decreaseof sale | 13 |
| 709,848 | 23/54 | 10\% | increaseof working capital | 14 |
| 932,815 | 24/82 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 1 0 2 , 4 4 9}$ | $\mathbf{1 6} / \mathbf{0 3}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| $2,361,151$ | $31 / 16$ | $10 \%$ | increaseof sale ofmaximum IRR |
| $-888,056$ | $24 / 17$ | $10 \%$ | increaseof discount rate of maximum NPV |
| $3,910,472$ | $24 / 17$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY（E） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 522，139 | 36／73 |  | main | 1 |
| 326，556 | 28／88 | $\begin{aligned} & \text { むँ } \\ & \stackrel{1}{0} \\ & 0 \\ & 0 \end{aligned}$ | increaseof time schedule | 2 |
| 701，338 | 44／12 | $\begin{aligned} & \text { 末̈ } \\ & \stackrel{\text { ® }}{0} \end{aligned}$ | decreaseof time schedule | 3 |
| 646，325 | 31／99 | 10\％ | increaseof exchange rate | 4 |
| 468，953 | 33／64 | 10\％ | decreaseof exchange rate | 5 |
| 151，285 | 36／73 | 10\％ | increaseof discount rate | 6 |
| 1，248，349 | 36／73 | 10\％ | decreaseof discount rate | 7 |
| 1，192，439 | 33／82 | 10\％ | increaseof fixed cost of investment | 8 |
| 1，304，260 | 40／15 | 10\％ | decreaseof fixed cost of investment | 9 |
| 1，175，433 | 35／37 | 10\％ | increaseof production costs | 10 |
| 1，321，265 | 38／07 | 10\％ | decreaseof production costs | 11 |
| 1，500，568 | 41／07 | 10\％ | increaseof sale | 12 |
| 99，131 | 32／15 | 10\％ | decreaseof sale | 13 |
| 1，246，651 | 36／64 | 10\％ | increaseof working capital | 14 |
| 1，250，048 | 36／82 | 10\％ | decreaseof working capital | 15 |


| $\mathbf{3 2 6 , 5 5 6}$ | $\mathbf{2 8 / 8 8}$ | One <br> year | increaseof time schedule of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 701,338 | $44 / 12$ | One year | decreaseof time schedule of the maximum IRR |
| 99,131 | $32 / 15$ | $10 \%$ | decreaseof sale of the minimum NPV |
| $1,500,568$ | $41 / 07$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY（ F ） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 186，109 | 37／88 |  | main | 1 |
| 134，819 | 29／47 | $\begin{aligned} & \text { あ } \\ & \stackrel{\text { ® }}{0} \\ & \stackrel{0}{0} \end{aligned}$ | increaseof time schedule | 2 |
| 213，448 | 57／35 | O 哭 | decreaseof time schedule | 3 |
| 186，109 | 37／88 | 10\％ | increaseof exchange rate | 4 |
| 186，109 | 37／88 | 10\％ | decreaseof exchange rate | 5 |
| 68，483 | 37／88 | 10\％ | increaseof discount rate | 6 |
| 430，860 | 37／88 | 10\％ | decreaseof discount rate | 7 |
| 170，109 | 34／54 | 10\％ | increaseof fixed cost of investment | 8 |
| 202，108 | 41／89 | 10\％ | decreaseof fixed cost of investment | 9 |
| 173，750 | 36／46 | 10\％ | increaseof production costs | 10 |
| 198，468 | 39／30 | 10\％ | decreaseof production costs | 11 |
| 233，078 | 42／91 | 10\％ | increaseof sale | 12 |
| 139，139 | 32／78 | 10\％ | decreaseof sale | 13 |
| 185，337 | 37／72 | 10\％ | increaseof working capital | 14 |
| 186，881 | 38／04 | 10\％ | decreaseof working capital | 15 |


| $\mathbf{1 3 4 , 8 1 9}$ | $\mathbf{2 9 / 4 7}$ | One <br> year | increaseof time schedule of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 213,448 | $57 / 35$ | One year | decreaseof time scheduleof the maximum IRR |
| 68,483 | $37 / 88$ | $10 \%$ | increaseof discount rate of minimum NPV |
| 430,860 | $37 / 88$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY（G） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 1，571，491 | 28／75 |  | main | 1 |
| 511，740 | 22／37 |  | increaseof time schedule | 2 |


| 2,382,914 | 41/75 |  | decreaseof time schedule | 3 |
| :---: | :---: | :---: | :---: | :---: |
| 1,263,397 | 26/99 | 10\% | increaseof exchange rate | 4 |
| 2,033,631 | 31/44 | 10\% | decreaseof exchange rate | 5 |
| -174,310 | 28/75 | 10\% | increaseof discount rate | 6 |
| 4,652,707 | 28/75 | 10\% | decreaseof discount rate | 7 |
| 1,375,550 | 27/33 | 10\% | increaseof fixed cost of investment | 8 |
| 1,767,431 | 30/31 | 10\% | decreaseof fixed cost of investment | 9 |
| 789,941 | 24/45 | 10\% | increaseof production costs | 10 |
| 2,353,041 | 32/97 | 10\% | decreaseof production costs | 11 |
| 2,750,226 | 34/68 | 10\% | increaseof sale | 12 |
| 392,755 | 22/30 | 10\% | decreaseof sale | 13 |
| 1,544,952 | 28/56 | 10\% | increaseof working capital | 14 |
| 1,598,105 | 28/94 | 10\% | decreaseof working capital | 15 |


| $\mathbf{3 9 2 , 7 5 5}$ | $\mathbf{2 2 / 3 0}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| $2,382,914$ | $41 / 75$ | ONE | decrease of time schedule of the maximum IRR |
| $-174,310$ | $28 / 75$ | YEAR |  |
| $4,652,707$ | $28 / 75$ | $10 \%$ | increaseof discount rate of mminimum NPV |


| NPV | IRR | Quantity | COMPANY (H) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 1,197,906 | 23/51 |  | main | 1 |
| 473,449 | 19/99 |  | increaseof time schedule | 2 |
| 1,898,512 | 27/21 | $\begin{aligned} & \text { 点 } \\ & \stackrel{0}{0} \\ & 0 . \end{aligned}$ | decreaseof time schedule | 3 |
| 1,049,184 | 22/51 | 10\% | increaseof exchange rate | 4 |
| 1,197,906 | 23/51 | 10\% | decreaseof exchange rate | 5 |
| -611,803 | 23/51 | 10\% | increaseof discount rate | 6 |
| 6,223,060 | 23/51 | 10\% | decreaseof discount rate | 7 |
| 948,057 | 22/11 | 10\% | increaseof fixed cost of investment | 8 |
| 1,447,754 | 25/09 | 10\% | decreaseof fixed cost of investment | 9 |
| -35,226 | 17/18 | 10\% | increaseof production costs | 10 |
| -3,859,938 | 29/42 | 10\% | decreaseof production costs | 11 |
| 2,950,283 | 30/70 | 10\% | increaseof sale | 12 |
| -28,758 | 15/24 | 10\% | decreaseof sale | 13 |
| 1,099,762 | 22/98 | 10\% | increaseof working capital | 14 |
| 1,289,444 | 24/01 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 2 8 , 7 5 8}$ | $\mathbf{1 5 / 2 4}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| $2,950,283$ | $30 / 70$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-3,859,938$ | $29 / 42$ | $10 \%$ | decreaseof the production costs of the minimum NPV |
| $6,223,060$ | $23 / 51$ | $10 \%$ | decreaseof discount rate of the maximum NPV |


| NPV | IRR | Quantity |  | COMPANY (I) | Row |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 38,322,872 | 40/02 |  |  | main | 1 |
| 29,524,289 | 30/35 | $\begin{aligned} & \text { 告 } \\ & 0 \\ & 0 . \end{aligned}$ |  | increaseof time schedule | 2 |
| 40,954,943 | 47/78 |  |  | decreaseof time schedule | 3 |
| 34,082,491 | 35/89 | 10\% |  | increaseof exchange rate | 4 |
| 36,258,997 | 37/61 | 10\% |  | decreaseof exchange rate | 5 |
| 15,555,727 | 40/02 | 10\% |  | increaseof discount rate | 6 |
| 83,985,111 | 40/02 | 10\% |  | decreaseof discount rate | 7 |
| 35,611,026 | 36/94 | 10\% |  | increaseof fixed cost of investment | 8 |
| 41,034,719 | 43/60 | 10\% |  | decreaseof fixed cost of investment | 9 |
| 6,847,154 | 21/08 | 10\% |  | increaseof production costs | 10 |
| 69,798,590 | 59/49 | 10\% |  | decreaseof production costs | 11 |
| 76,410,047 | 62/53 | 10\% |  | increaseof sale | 12 |
| 235,697 | 17/14 | 10\% |  | decreaseof sale | 13 |
| 37,628,391 | 39/20 | 10\% |  | increaseof working capital | 14 |
| 39,017,353 | 40/86 | 10\% |  | decreaseof working capital | 15 |
|  | 235,697 | 17/14 | 10\% | decreaseof sale of the minimum IRR |  |
|  | 76,410,047 | 62/53 | 10\% | increaseof sale of the maximum IRR |  |
|  | 235,697 | 17/14 | 10\% | decreaseof sale of the minimum NPV |  |
|  | 83,985,111 | 40/02 | 10\% | decreaseof discount rate of maximum NPV |  |


| NPV | IRR | Quantity | COMPANY (j) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 39,264 | 46/15 |  | main | 1 |
| 31,404 | 33/04 | $\begin{aligned} & \text { ँ } \\ & \stackrel{1}{\circ} \\ & \stackrel{0}{0} \end{aligned}$ | increaseof time schedule | 2 |
| 43,224 | 56/67 |  | decreaseof time schedule | 3 |
| 35,745 | 35/45 | 10\% | increaseof exchange rate | 4 |
| 38,850 | 40/14 | 10\% | decreaseof exchange rate | 5 |
| 18,850 | 46/15 | 10\% | increaseof discount rate | 6 |
| 80,944 | 46/15 | 10\% | decreaseof discount rate | 7 |
| 37,362 | 42/18 | 10\% | increaseof fixed cost of investment | 8 |
| 41,166 | 50/88 | 10\% | decreaseof fixed cost of investment | 9 |
| 23,530 | 33/22 | 10\% | increaseof production costs | 10 |
| 54,998 | 59/01 | 10\% | decreaseof production costs | 11 |
| 60,836 | 63/23 | 10\% | increaseof sale | 12 |
| 17,692 | 28/55 | 10\% | decreaseof sale | 13 |
| 39,137 | 45/84 | 10\% | increaseof working capital | 14 |
| 39,391 | 46/47 | 10\% | decreaseof working capital | 15 |


| $\mathbf{1 7 , 6 9 2}$ | $\mathbf{2 8} / \mathbf{5 5}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 60,836 | $63 / 23$ | $10 \%$ | increaseof sale of the maximum IRR |
| 17,692 | $28 / 55$ | $10 \%$ | decreaseof sale of the minimum NPV |
| 80,944 | $46 / 15$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY (k) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 3,337 | 18/36 |  | main | 1 |
| 1,883 | 15/14 |  | increaseof time schedule | 2 |
| 4,303 | 20/31 | $\begin{aligned} & \text { ँँ } \\ & \stackrel{y}{\circ} \\ & \stackrel{0}{0} \end{aligned}$ | decreaseof time schedule | 3 |
| 3,718 | 18/27 | 10\% | increaseof exchangerate | 4 |
| 1,446 | 14/34 | 10\% | decreaseof exchange rate | 5 |
| -1,096 | 18/36 | 10\% | increaseof discount rate | 6 |
| 17,698 | 18/36 | 10\% | decreaseof discount rate | 7 |
| 2,726 | 16/85 | 10\% | increaseof fixed cost of investment | 8 |
| 3,949 | 20/11 | 10\% | decreaseof fixed cost of investment | 9 |
| 55 | 12/10 | 10\% | increaseof production costs | 10 |
| 6,620 | 24/64 | 10\% | decreaseof production costs | 11 |
| 7,574 | 26/11 | 10\% | increaseof sale | 12 |
| 52 | 10/24 | 10\% | decreaseof sale | 13 |
| 3,222 | 18/06 | 10\% | increaseof working capital | 14 |
| 3,442 | 18/64 | 10\% | decreaseof working capital | 15 |


| $\mathbf{5 2}$ | $\mathbf{1 0} / \mathbf{2 4}$ | $\mathbf{1 0} \%$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 7,574 | $26 / 11$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-1,096$ | $18 / 36$ | $10 \%$ | increaseof discount rate of minimum NPV |
| 17,698 | $18 / 36$ | $10 \%$ | decreaseof discount rate of maximum NPV |


| NPV | IRR | Quantity | COMPANY (1) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 18,394 | 35/19 |  | main | 1 |
| 13,848 | 27/73 | $\begin{aligned} & \text { む } \\ & \stackrel{y}{0} \\ & 0 \\ & 0 \end{aligned}$ | increaseof time schedule | 2 |
| 20,733 | 49/23 | $\begin{aligned} & \text { 戸ँ } \\ & \stackrel{1}{0} \\ & 0 \end{aligned}$ | decreaseof time schedule | 3 |
| 29,589 | 53/23 | 10\% | increaseof exchange rate | 4 |
| 17,342 | 37/74 | 10\% | decreaseof exchange rate | 5 |


| 11,772 | $45 / 52$ | $10 \%$ | increaseof discount rate |
| :---: | :---: | :---: | :---: |
| 44,934 | $45 / 52$ | $10 \%$ | decreaseof discount rate |
| 16,813 | $32 / 17$ | $10 \%$ | increaseof fixed cost of investment |
| 19,974 | $38 / 73$ | $10 \%$ | decreaseof fixed cost of investment |
| $-1,193$ | $11 / 42$ | $10 \%$ | increaseof production costs |
| 40,157 | $60 / 65$ | $10 \%$ | decreaseof production costs |
| 43,577 | $63 / 54$ | $10 \%$ | increaseof sale |
| $-1,752$ | $7 / 55$ | $10 \%$ | decreaseof sale |
| 17,830 | $33 / 98$ | $10 \%$ | $\mathbf{8}$ |
| 18,958 | $36 / 45$ | $10 \%$ | increaseof working capital |
|  |  | decreaseof working capital | $\mathbf{1 1}$ |
|  |  | $\mathbf{1 2}$ |  |
|  |  | $\mathbf{1 3}$ |  |


| $\mathbf{- 1 , 7 5 2}$ | $\mathbf{7 / 5 5}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 43,577 | $63 / 54$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-1,752$ | $7 / 55$ | $10 \%$ | decreaseof sale of the minimum NPV |
| 44,934 | $45 / 52$ | $10 \%$ | decreaseof discount rate of maximum NPV |
|  |  |  |  |


| NPV | IRR | Quantity | COMPANY (M) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 48,413 | 55/30 |  | main | 1 |
| 35,559 | 41/54 |  | increaseof time schedule | 2 |
| 63,831 | 84/33 |  | decreaseof time schedule | 3 |
| 48,297 | 55/08 | 10\% | increaseof exchange rate | 4 |
| 48,530 | 55/53 | 10\% | decreaseof exchange rate | 5 |
| 26,138 | 55/30 | 10\% | increaseof discount rate | 6 |
| 85,880 | 55/30 | 10\% | decreaseof discount rate | 7 |
| 46,474 | 51/76 | 10\% | increaseof fixed cost of investment | 8 |
| 50,352 | 59/40 | 10\% | decreaseof fixed cost of investment | 9 |
| 13,795 | 30/58 | 10\% | increaseof production costs | 10 |
| 83,031 | 77/62 | 10\% | decreaseof production costs | 11 |
| 89,819 | 80/69 | 10\% | increaseof sale | 12 |
| 7,007 | 25/59 | 10\% | decreaseof sale | 13 |
| 47,706 | 54/22 | 10\% | increaseof working capital | 14 |
| 49,120 | 56/41 | 10\% | decreaseof working capital | 15 |


| $\mathbf{7 , 0 0 7}$ | $\mathbf{2 5} / \mathbf{5 9}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 63,831 | $84 / 33$ | ONE | decreaseof time schedule of the maximum IRR |
| 7,007 | $25 / 59$ | $10 \%$ |  |
| 89,819 | $80 / 69$ | $10 \%$ | decreaseof sale of the minimum NPV |
|  |  | increaseof sale of the maximum NPV |  |



| NPV | IRR | Quantity | COMPANY（O） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 12，777 | 25／92 |  | main | 1 |
| －401 | 19／84 | $\begin{aligned} & \text { ॐ } \\ & \stackrel{y}{0} \\ & 0 \\ & 0 \end{aligned}$ | increaseof time schedule | 2 |
| 28，512 | 36／86 |  | decreaseof time schedule | 3 |
| 11，096 | 24／97 | 10\％ | increaseof exchange rate | 4 |
| 14，459 | 26／93 | 10\％ | decreaseof exchange rate | 5 |
| －6，649 | 25／92 | 10\％ | increaseof discount rate | 6 |
| 47，433 | 25／92 | 10\％ | decreaseof discount rate | 7 |
| 9，115 | 23／93 | 10\％ | increaseof fixed cost of investment | 8 |
| 16，440 | 28／22 | 10\％ | decreaseof fixed cost of investment | 9 |
| －1，879 | 3／05 | 10\％ | increaseof production costs | 10 |
| 61，630 | 48／13 | 10\％ | decreaseof production costs | 11 |
| 66，671 | 49／81 | 10\％ | increaseof sale | 12 |
| －3，391 | －0／29 | 10\％ | decreaseof sale | 13 |
| 11，756 | 25／34 | 10\％ | increaseof working capital | 14 |
| 13，798 | 26／52 | 10\％ | decreaseof working capital | 15 |


| $\mathbf{- 3 , 3 9 1}$ | $\mathbf{- 0 / 2 9}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 66,671 | $49 / 81$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-6,649$ | $25 / 92$ | $10 \%$ | increase of discount rate of the minimumNPV |
| 66,671 | $49 / 81$ | $10 \%$ | decrease of discount rate of the maximumNPV |


| NPV | IRR | Quantity | COMPANY（P） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 715，699 | 21／74 |  | main | 1 |
| －422，132 | 17／81 |  | increaseof time schedule | 2 |
| 718，290 | 21／70 |  | decreaseof time schedule | 3 |
| 1，436，014 | 24／93 | 10\％ | increaseof exchange rate | 4 |
| 715，699 | 21／74 | 10\％ | decreaseof exchange rate | 5 |
| －1，043，284 | 21／74 | 10\％ | increaseof discount rate | 6 |
| 4，728，408 | 21／74 | 10\％ | decreaseof discount rate | 7 |
| 244，125 | 19／88 | 10\％ | increaseof fixed cost of investment | 8 |
| 1，187，272 | 23／86 | 10\％ | decreaseof fixed cost of investment | 9 |
| 175，795 | 19／66 | 10\％ | increaseof production costs | 10 |
| 1，255，605 | 23／87 | 10\％ | decreaseof production costs | 11 |
| 1，825，450 | 25／90 | 10\％ | increaseof sale | 12 |
| －61，127 | 17／47 | 10\％ | decreaseof sale | 13 |
| 625，665 | 21／36 | 10\％ | increaseof working capital | 14 |
| 805，487 | 22／13 | 10\％ | decreaseof working capital | 15 |


| $\mathbf{- 6 1 , 1 2 7}$ | $\mathbf{1 7 / 4 7}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| $1,825,450$ | $25 / 90$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-1,043,284$ | $21 / 74$ | $10 \%$ | increase of discount rate of the minimumNPV |
| $4,728,408$ | $21 / 74$ | $10 \%$ | decrease of discount rate of the maximumNPV |


| NPV | IRR | Quantity | COMPANY（Q） | Row |
| :---: | :---: | :---: | :---: | :---: |
| 133，104 | 16／17 |  | main | 1 |
| 37，859 | 13／04 | $\stackrel{\text { ¹ }}{\substack{\text { ® }}}$ | increaseof time schedule | 2 |
| 193，850 | 17／95 | だ た O． | decreaseof time schedule | 3 |
| 30，553 | 12／78 | 10\％ | increaseof exchange rate | 4 |


| 96,050 | $14 / 57$ | $10 \%$ | decreaseof exchange rate |
| :---: | :---: | :---: | :---: |
| $-11,971$ | $16 / 17$ | $10 \%$ | increaseof discount rate |
| 836,455 | $16 / 17$ | $10 \%$ | decreaseof discount rate |
| 96,641 | $14 / 86$ | $10 \%$ | increaseof fixed cost of investment |
| 169,566 | $17 / 65$ | $10 \%$ | decreaseof fixed cost of investment |
| $-6,134$ | $8 / 93$ | $10 \%$ | increaseof production costs |
| 365,167 | $23 / 54$ | $10 \%$ | decreaseof production costs |
| 417,662 | $24 / 76$ | $10 \%$ | increaseof sale |
| $-9,175$ | $7 / 11$ | $10 \%$ | decreaseof sale |
| 124,046 | $15 / 81$ | $10 \%$ | $\mathbf{8}$ |
| 142,154 | $16 / 54$ | $10 \%$ | increaseof working capital |
|  | decreaseof working capital | $\mathbf{1 1}$ |  |
|  |  | $\mathbf{1 2}$ |  |
|  |  | $\mathbf{1 3}$ |  |
|  |  | $\mathbf{1 4}$ |  |


| $\mathbf{- 9 , 1 7 5}$ | $\mathbf{7 / 1 1}$ | $\mathbf{1 0 \%}$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 417,662 | $24 / 76$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-111,971$ | $16 / 17$ | $10 \%$ | increase of discount rate of the minimumNPV |
| 836,455 | $16 / 17$ | $10 \%$ | decrease of discount rate of the maximumNPV |


| NPV | IRR | Quantity | COMPANY (R) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 3,337 | 18/36 |  | main | 1 |
| 1,883 | 15/14 | $\begin{aligned} & \text { औँ } \\ & \stackrel{y}{0} \\ & \stackrel{0}{0} \end{aligned}$ | increaseof time schedule | 2 |
| 4,303 | 20/31 | 戸̈ $\stackrel{\text { ®. }}{0}$ $\stackrel{0}{0}$ | decreaseof time schedule | 3 |
| 5,403 | 22/76 | 10\% | increaseof exchange rate | 4 |
| -1,374 | 9/77 | 10\% | decreaseof exchange rate | 5 |
| -531 | 20/31 | 10\% | increaseof discount rate | 6 |
| 18,309 | 20/31 | 10\% | decreaseof discount rate | 7 |
| 2,726 | 16/85 | 10\% | increaseof fixed cost of investment | 8 |
| 3,949 | 20/11 | 10\% | decreaseof fixed cost of investment | 9 |
| 55 | 12/10 | 10\% | increaseof production costs | 10 |
| 6,620 | 24/64 | 10\% | decreaseof production costs | 11 |
| 7,574 | 26/11 | 10\% | increaseof sale | 12 |
| -52 | 10/24 | 10\% | decreaseof sale | 13 |
| 3,233 | 18/09 | 10\% | increaseof working capital | 14 |
| 3,432 | 18/61 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 1 , 3 7 4}$ | $\mathbf{9 / 7 7}$ | $\mathbf{1 0 \%}$ | decreaseof exchange rate of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 7,574 | $26 / 11$ | $10 \%$ | increaseof sale of the maximum IRR |
| $-1,374$ | $9 / 77$ | $10 \%$ | decreaseof exchange rate of the minimum NPV |
| 18,309 | $20 / 31$ | $10 \%$ | decrease of discount rate of the maximumNPV |


| NPV | IRR | Quantity | COMPANY (S) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 239 | 15/40 |  | main | 1 |
| -14 | 11/84 | $\begin{aligned} & \text { む̈ } \\ & \stackrel{0}{0} \\ & \stackrel{0}{0} \end{aligned}$ | increaseof time schedule | 2 |
| 435 | 19/17 |  | decreaseof time schedule | 3 |
| 355 | 16/31 | 10\% | increaseof exchange rate | 4 |
| -28 | 11/62 | 10\% | decreaseof exchange rate | 5 |
| -323 | 15/40 | 10\% | increaseof discount rate | 6 |
| 1,426 | 15/40 | 10\% | decreaseof discount rate | 7 |
| 139 | 13/84 | 10\% | increaseof fixed cost of investment | 8 |
| 339 | 17/21 | 10\% | decreaseof fixed cost of investment | 9 |
| 99 | 13/42 | 10\% | increaseof production costs | 10 |
| 378 | 17/37 | 10\% | decreaseof production costs | 11 |
| 506 | 19/05 | 10\% | increaseof sale | 12 |
| -1 | 11/59 | 10\% | decreaseof sale | 13 |
| 234 | 15/32 | 10\% | increaseof working capital | 14 |
| 244 | 15/50 | 10\% | decreaseof working capital | 15 |


| -1 | $11 / 59$ | $10 \%$ | decreaseof sale of the minimum IRR |
| :---: | :---: | :---: | :---: |
| 435 | $19 / 17$ | ONE | decreaseof time schedule of the maximum IRR |
|  |  | YEAR |  |
| -323 | $15 / 40$ | $10 \%$ | increase of discount rate of the minimumNPV |
| 1,426 | $15 / 40$ | $10 \%$ | decrease of discount rate of the maximumNPV |


| NPV | IRR | Quantity | COMPANY (T) | Row |
| :---: | :---: | :---: | :---: | :---: |
| 36,869 | 24/31 |  | main | 1 |
| -14,325 | 18/61 | $\begin{aligned} & \text { \#̈ } \\ & \stackrel{1}{\otimes} \\ & 0 \\ & 0 \end{aligned}$ | increaseof time schedule | 2 |
| 83,503 | 36/22 | $\begin{aligned} & \text { そ. } \\ & \stackrel{\text { ® }}{\sim} \\ & \stackrel{0}{0} \end{aligned}$ | decreaseof time schedule | 3 |
| 36,870 | 24/31 | 10\% | increaseof exchange rate | 4 |
| 36,870 | 24/31 | 10\% | decreaseof exchange rate | 5 |
| -34,836 | 24/31 | 10\% | increaseof discount rate | 6 |
| 190,993 | 24/31 | 10\% | decreaseof discount rate | 7 |
| 21,212 | 22/30 | 10\% | increaseof fixed cost of investment | 8 |
| 52,528 | 26/68 | 10\% | decreaseof fixed cost of investment | 9 |
| 35,774 | 24/18 | 10\% | increaseof production costs | 10 |
| 37,966 | 24/44 | 10\% | decreaseof production costs | 11 |
| 58,978 | 26/82 | 10\% | increaseof sale | 12 |
| 14,762 | 21/75 | 10\% | decreaseof sale | 13 |
| 36,869 | 24/31 | 10\% | increaseof working capital | 14 |
| 36,869 | 24/31 | 10\% | decreaseof working capital | 15 |


| $\mathbf{- 1 4 , 3 2 5}$ | $\mathbf{1 8} / 61$ | ONE <br> YEAR | increaseof time schedule of the minimum IRR |
| :---: | :---: | :---: | :--- |
| 83,503 | $36 / 22$ | ONE <br> YEAR | decreaseof time schedule of the maximum IRR |
| $-34,836$ | $24 / 31$ | $10 \%$ | increase of discount rate of the minimumNPV |
| 190,993 | $24 / 31$ | $10 \%$ | decrease of discount rate of the maximumNPV |


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