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# 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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# 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

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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 x(1 + 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 (r+1) unit of extra income in the next period. Also this person will be indifferent toward these two amounts and  $(r+1)^2$  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 of l/r+1unit in the period of Stowe zero, one extra unit which will be used in the second period, has the present value of  $1/(r + 1)^2$  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].

$$NPV = \frac{CF_0}{(1+K)^0} + \frac{CF_1}{(1+K)^1} + \dots + \frac{CF_n}{(1+K)^n} = \sum_{t=0}^n \frac{CF_t}{(1+K)^t}$$

In which:

Net Present Value = NPV

Cash flow which is obtained at the end of the year t (t=0,1,...,n) obtained = CFt The obtained positive cash flow is shown with positive sign and the spent cash flow is shown by negative sign.

(1)

# Project life = n

Cost of capital which is used as the discount rate = k or r [2]

If the NPV is negative for the minimum borptive rate, the project will be non-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:

NPV	IRR	Quantity	COMPANY (A)	Row
613.713	39/44	2	main	1
421.171	31/69	One year	increase of time schedule	2
797.030	45/62	One year	decrease of time schedule	3
1.067.109	51/23	10 %	increase of exchange rate	4
159.633	25/50	10 %	decrease of exchange rate	5
200.960	39/44	10 %	increase of discount rate	6
1.524.957	39/44	10 %	decrease of discount rate	7
572.018	37/04	10 %	increase of fixed cost of investment	8
655.408	42/21	10 %	decrease of fixed cost of investment	9
23.943	20/77	10 %	increase of production costs	10
1.203.483	57/23	10 %	decrease of production costs	11
1.308.295	59/37	10 %	increase of sale	12
-11.410	17/29	10 %	decrease of sale	13
587.288	38/14	10 %	increase of working capital	14
643.420	40/97	10 %	decrease of working capital	15
-11.410	17/29		decrease of sale of the minimum IRR	
1.308.295	59/37		increase of sale of maximum IRR	
-11.410	17/29		decrease of sale of the minimum NPV	
1.524.957	39/44		decrease of discount rate of maximum NPV	

**Table .1** .Sample of result of internal rate of return and net present value using software COMEAR in million risks

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
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Description	Quantity	Α	В	С	D	E	F	G	н	I	1	к	L	м	N	0	Р	Q	R	s	Т
main		39/44	33/65	51/02	24/17	36/73	37/88	28/75	23/51	40/02	46/15	18/36	35/19	55/30	21/27	25/92	21/74	16/17	18/36	15/40	24/31
increase of time schedule	one year	31/69	27/73	38/0	19/30	28/88	29/47	22/37	19/99	30/35	33/04	15/14	27/73	41/54	18/13	19/84	17/81	13/04	15/14	11/84	18/61
decrease of time schedule	one year	45/62	37/29	84/77	29/17	44/12	57/35	41/75	27/21	47/78	56/67	20/31	49/23	84/33	25/14	36/86	21/70	17/95	20/31	19/17	36/22
increase of exchange rate	10%	51/23	29/90	50/87	20/52	31/99	37/88	26/99	22/51	35/89	35/45	18/27	53/23	55/08	21/61	24/97	24/93	12/78	22/76	16/31	24/31
decrease of exchange rate	10%	25/50	33/65	51/16	24/56	33/64	37/88	31/44	23/51	37/61	40/14	14/34	37/74	55/53	19/71	26/93	21/74	14/57	9/77	11/62	24/31
increase of discount rate	10%	39/44	33/65	51/02	24/17	36/73	37/88	28/75	23/51	40/02	46/15	18/36	45/52	55/30	21/27	25/92	21/74	16/17	20/31	15/40	24/31
decrease of discount rate	10%	39/44	33/65	51/02	24/17	36/73	37/88	28/75	23/51	40/02	46/15	18/36	45/52	55/30	21/27	25/92	21/74	16/17	20/31	15/40	24/31
increase of fixed cost of investment	10%	37/04	31/15	46/97	23/48	33/82	34/54	27/33	22/11	36/94	42/18	16/85	32/17	51/76	19/78	23/93	19/88	14/86	16/85	13/84	22/30
decrease of fixed cost of investment	10%	42/21	36/58	55/83	24/89	40/15	41/89	30/31	25/09	43/60	50/88	20/11	38/73	59/40	22/99	28/22	23/86	17/65	20/11	17/21	26/68
increase of production costs	10%	20/77	21/23	15/74	17/88	35/37	36/46	24/45	17/18	21/08	33/22	12/10	11/42	30/58	16/32	3/05	19/66	8/93	12/10	13/42	24/18
decrease of production costs	10%	57/23	45/01	87/74	30/04	38/07	39/30	32/97	29/42	59/49	59/01	24/64	60/65	77/62	25/64	48/13	23/87	23/54	24/64	17/37	24/44
increase of sale	10%	59/37	47/38	91/74	31/16	41/07	42/91	34/68	30/70	62/53	63/23	26/11	63/54	80/69	27/12	49/81	25/90	24/76	26/11	19/05	26/82
decrease of sale	10%	17/29	17/96	10/36	16/03	32/15	32/78	22/30	15/24	17/14	28/55	10/24	7/55	25/59	14/29	-0/29	17/47	7/11	10/24	11/59	21/75
increase of working capital	10%	38/14	33/25	49/86	23/54	36/64	37/72	28/56	22/98	39/20	45/84	18/06	33/98	54/22	21/21	25/34	21/36	15/81	18/09	15/32	24/31
decrease of working capital	10%	40/97	34/18	52/21	24/82	36/82	38/04	28/94	24/01	40/86	46/47	18/64	36/45	56/41	21/34	26/52	22/13	16/54	18/61	15/50	24/31

# Table .3. The results of examination of NPV In Milliard Rials

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

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

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:

	I able.	4. The result of sens	itivity analysis of IKR	
No.	Description	Decrease of IRR	Description	Increase of IRR
1	Decrease of sale	16	Increase of sale	14
2	Increase of time schedule	3	Decrease of time schedule	6
3	Decrease of exchange rate	1		

OID D

Also some of variables as shown in table "5", together caused decrease in NPV of projects or some increased NPV:

Table 5. The	result o	f sensitivity	analysis	of NPV
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No.	Description	Decrease of NPV	Description	Increase of NPV
1	Increase of discount rate	10	Decrease of discount rate	19
2	Decrease of sale	8	Increase of sale	1
3	Decrease of production cost	1		
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 in cases 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	one year	increase f time schedule	2
797,030	45/62	one year	decreaseof time schedule	3
1,067,109	51/23	10%	increase of exchange rate	4
159,933	25/50	10%	decrease of exchange rate	5
200,960	39/44	10%	increase of discount rate	6
1,524,957	39/44	10%	decrease of discount rate	7
572,018	37/04	10%	increase of fixed cost of investment	8
655,408	42/21	10%	decrease f fixed cost of investment	9
23,943	20/77	10%	increase of production costs	10
1,203,483	57/23	10%	decrease of production costs	11
1,308,295	59/37	10%	increase f sale	12
-11,410	17/29	10%	decrease f sale	13
587,283	38/14	10%	increase of working capital	14
643,420	40/97	10%	decreaseof working capital	15

decreaseof sale of the minimum IRR	10%	17/29	-11,410	
increaseof sale ofmaximum IRR	10%	59/37	1,308,295	
decreaseof sale of the minimum NPV	10%	17/29	-11,410	
decreaseof discount rate of maximum NPV	10%	39/44	1,524,957	

NPV	IRR	Quantity	(COMPANY (B	Row
238,475	33/65		main	1
152,460	27/73	one year	increaseof time schedule	2
292,034	37/29	one year	decreaseof time schedule	3
194,903	29/90	10%	increase of exchange rate	4
238,475	33/65	10%	decrease of exchange rate	5
43,187	33/65	10%	increase of discount rate	6
689,711	33/65	10%	decreaseof discount rate	7
209,620	31/15	10%	increase of fixed cost of investment	8
267,330	36/58	10%	decrease of fixed cost of investment	9
20,209	21/23	10%	increase of production costs	10
456,741	45/01	10%	decreaseof production costs	11
509,444	47/38	10%	increase of 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

decreaseof sale of the minimum IRR	10%	17/96	-5,397
increaseof sale ofmaximum IRR	10%	47/38	509,444
decrease f sale of the minimum NPV	10%	17/96	-5,397
decreaseof discount rate of maximum NPV	10%	33/65	689,711

NPV	IRR	Quantity	COMPANY (C)	Row
81,934	51/02		main	1
59,136	38/0	one year	increaseof time schedule	2
101,278	84/77	one year	decreaseof time schedule	3
81,763	50/87	10%	increase of exchange rate	4
82,101	51/16	10%	decreaseof exchange rate	5
39,543	51/02	10%	increase of discount rate	6
163,889	51/02	10%	decreaseof discount rate	7
76,912	46/97	10%	increase fixed cost of investment	8
86,952	55/83	10%	decreaseof fixed cost of investment	9
-1,839	15/74	10%	increase of production costs	10
175,015	87/74	10%	decreaseof production costs	11
188,115	91/74	10%	increase of 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

decreaseof sale of the minimum IRR	10%	10/36	-3,010	
increaseof sale ofmaximum IRR	10%	91/74	188,115	
decreaseof sale of the minimum NPV	10%	10/36	-3,010	
decreaseof discount rate of maximum NPV	10%	91/74	188,115	

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

decreaseof sale of the minimum IRR	10%	16/03	-102,449	
increaseof sale ofmaximum IRR	10%	31/16	2,361,151	
increaseof discount rate of maximum NPV	10%	24/17	-888,056	
decreaseof discount rate of maximum NPV	10%	24/17	3,910,472	

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NPV	IRR	Quantity	COMPANY (E)	Row
522,139	36/73		main	1
326,556	28/88	one year	increase f time schedule	2
701,338	44/12	one year	decreaseof time schedule	3
646,325	31/99	10%	increase of exchange rate	4
468,953	33/64	10%	decrease of exchange rate	5
151,285	36/73	10%	increase of discount rate	6
1,248,349	36/73	10%	decreaseof discount rate	7
1,192,439	33/82	10%	increase fixed cost of investment	8
1,304,260	40/15	10%	decrease of fixed cost of investment	9
1,175,433	35/37	10%	increase of production costs	10
1,321,265	38/07	10%	decreaseof production costs	11
1,500,568	41/07	10%	increase of 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

326,556	28/88	One 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%	decrease of 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	one year	increaseof time schedule	2
213,448	57/35	one year	decreaseof time schedule	3
186,109	37/88	10%	increase of exchange rate	4
186,109	37/88	10%	decrease of exchange rate	5
68,483	37/88	10%	increase of discount rate	6
430,860	37/88	10%	decreaseof discount rate	7
170,109	34/54	10%	increase of fixed cost of investment	8
202,108	41/89	10%	decreaseof fixed cost of investment	9
173,750	36/46	10%	increase of production costs	10
198,468	39/30	10%	decreaseof production costs	11
233,078	42/91	10%	increase of 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

increaseof time schedule of the minimum IRR	One year	29/47	134,819
decreaseof time scheduleof the maximum IRR	One year	57/35	213,448
increaseof discount rate of minimum NPV	10%	37/88	68,483
decreaseof discount rate of maximum NPV	10%	37/88	430,860

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

2,382,914	41/75	year	decrease of time schedule	3
		one		
1,263,397	26/99	10%	increase of 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%	increase fixed cost of investment	8
1,767,431	30/31	10%	decreaseof fixed cost of investment	9
789,941	24/45	10%	increase of production costs	10
2,353,041	32/97	10%	decrease of production costs	11
2,750,226	34/68	10%	increase of 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

decreaseof sale of the minimum IRR	10%	22/30	392,755
decrease of time schedule of the maximum IRR	ONE	41/75	2,382,914
increaseof discount rate of mminimum NPV	10%	28/75	-174,310
decreaseof discount rate of maximum NPV	10%	28/75	4,652,707

NPV	IRR	Quantity	COMPANY (H)	Row
1,197,906	23/51		main	1
473,449	19/99	one year	increase of time schedule	2
1,898,512	27/21	one year	decreaseof time schedule	3
1,049,184	22/51	10%	increase of 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%	increase fixed cost of investment	8
1,447,754	25/09	10%	decreaseof fixed cost of investment	9
-35,226	17/18	10%	increase of production costs	10
-3,859,938	29/42	10%	decreaseof production costs	11
2,950,283	30/70	10%	increase of sale	12
-28,758	15/24	10%	decreaseof sale	13
1,099,762	22/98	10%	increase of working capital	14
1,289,444	24/01	10%	decreaseof working capital	15

-28,758	15/24	10%	decreaseof sale of the minimum IRR
2,950,283	30/70	10%	increase f sale of the maximum IRR
-3,859,938	29/42	10%	decrease of the production costs of the minimum NPV
6,223,060	23/51	10%	decrease of discount rate of the maximum NPV

NP	V	IRR	Quantity		COMPANY (I)	Row
38,322	2,872	40/02			main	1
29,524	1,289	30/35	one year		increaseof time schedule	2
40,954	1,943	47/78	one year		decreaseof time schedule	3
34,082	2,491	35/89	10%		increase of exchange rate	4
36,258	3,997	37/61	10%		decrease of exchange rate	5
15,555	5,727	40/02	10%		increase of discount rate	6
83,985	5,111	40/02	10%		decrease of discount rate	7
35,611	1,026	36/94	10%		increase f fixed cost of investment	8
41,034	4,719	43/60	10%		decrease f fixed cost of investment	9
6,847	,154	21/08	10%		increaseof production costs	10
69,798	3,590	59/49	10%		decrease f production costs	11
76,410	),047	62/53	10%		increase of sale	12
235,0	697	17/14	10%		decrease of sale	13
37,628	8,391	39/20	10%		increase of working capital	14
39,017	7,353	40/86	10%		decreaseof working capital	15
	23	5,697	17/14	10%	decreaseof sale of the minimum IRR	
	76,4	110,047	62/53	10%	increase f sale of the maximum IRR	
	23	5,697	17/14	10%	decrease f sale of the minimum NPV	
	83,9	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	one year	increaseof time schedule	2
43,224	56/67	one year	decreaseof time schedule	3
35,745	35/45	10%	increase of exchange rate	4
38,850	40/14	10%	decreaseof exchange rate	5
18,850	46/15	10%	increase of discount rate	6
80,944	46/15	10%	decreaseof discount rate	7
37,362	42/18	10%	increase of fixed cost of investment	8
41,166	50/88	10%	decreaseof fixed cost of investment	9
23,530	33/22	10%	increase of production costs	10
54,998	59/01	10%	decreaseof production costs	11
60,836	63/23	10%	increase of sale	12
17,692	28/55	10%	decreaseof sale	13
39,137	45/84	10%	increase of working capital	14
39,391	46/47	10%	decreaseof working capital	15

decreaseof sale of the minimum IRR	10%	28/55	17,692
increaseof sale of the maximum IRR	10%	63/23	60,836
decrease f sale of the minimum NPV	10%	28/55	17,692
decreaseof discount rate of maximum NPV	10%	46/15	80,944

NPV	IRR	Quantity	COMPANY (k)	Row
3,337	18/36		main	1
1,883	15/14	one year	increaseof time schedule	2
4,303	20/31	one year	decreaseof time schedule	3
3,718	18/27	10%	increase of exchangerate	4
1,446	14/34	10%	decreaseof exchange rate	5
-1,096	18/36	10%	increase of 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%	decrease of fixed cost of investment	9
55	12/10	10%	increase f production costs	10
6,620	24/64	10%	decreaseof production costs	11
7,574	26/11	10%	increase of 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

decreaseof sale of the minimum IRR	10%	10/24	52	
increaseof sale of the maximum IRR	10%	26/11	7,574	
increaseof discount rate of minimum NPV	10%	18/36	-1,096	
decreaseof discount rate of maximum NPV	10%	18/36	17,698	

NPV	IRR	Quantity	COMPANY (I)	Row
18,394	35/19		main	1
13,848	27/73	one year	increase of time schedule	2
20,733	49/23	one year	decreaseof time schedule	3
29,589	53/23	10%	increase of exchange rate	4
17,342	37/74	10%	decreaseof exchange rate	5

11,772	45/52	10%	increase of discount rate	6
44,934	45/52	10%	decreaseof discount rate	7
16,813	32/17	10%	increase of fixed cost of investment	8
19,974	38/73	10%	decreaseof fixed cost of investment	9
-1,193	11/42	10%	increase of production costs	10
40,157	60/65	10%	decreaseof production costs	11
43,577	63/54	10%	increase of sale	12
-1,752	7/55	10%	decreaseof sale	13
17,830	33/98	10%	increase of working capital	14
18,958	36/45	10%	decreaseof working capital	15

decreaseof sale of the minimum IRR	10%	7/55	-1,752
increase f sale of the maximum IRR	10%	63/54	43,577
decrease f sale of the minimum NPV	10%	7/55	-1,752
decreaseof discount rate of maximum NPV	10%	45/52	44,934

NPV	IRR	Quantity	COMPANY (M)	Row
48,413	55/30		main	1
35,559	41/54	one year	increase of time schedule	2
63,831	84/33	one year	decreaseof time schedule	3
48,297	55/08	10%	increase of 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%	increase fixed cost of investment	8
50,352	59/40	10%	decrease fixed cost of investment	9
13,795	30/58	10%	increase of production costs	10
83,031	77/62	10%	decreaseof production costs	11
89,819	80/69	10%	increase of 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

% decrease f sale of the minimum IRR	10%	25/59	7,007	
NE decreaseof time schedule of the maximum IRR	ONE	84/33	63,831	
% decrease of sale of the minimum NPV	10%	25/59	7.007	
% increase f sale of the maximum NPV	10%	80/69	89,819	

NPV	IRR	Quantity	COMPANY (N)	Row
679,977	21/27		main	1
29,261	18/13	one year	increaseof time schedule	2
1,355,422	25/14	one year	decreaseof time schedule	3
849,964	21/61	10%	increase of exchange rate	4
336,302	19/71	10%	decreaseof exchange rate	5
-693,612	21/27	10%	increase of discount rate	6
6,883,986	21/27	10%	decrease of discount rate	7
396,618	19/78	10%	increase fixed cost of investment	8
963,335	22/99	10%	decreaseof fixed cost of investment	9
-22,666	16/32	10%	increase of production costs	10
1,683,752	25/64	10%	decreaseof production costs	11
2,054,369	27/12	10%	increase of sale	12
-7,219	14/29	10%	decreaseof sale	13
667,369	21/21	10%	increaseof working capital	14
692,314	21/34	10%	decreaseof working capital	15

decreaseof sale of the minimum IRR	10%	14/29	-7,219
increaseof sale of the maximum IRR	10%	27/12	2,054,369
increase of discount rate of the minimumNPV	10%	21/27	-693,612
decrease of discount rate of the maximumNPV	10%	21/27	6,883,986

NPV	IRR	Quantity	COMPANY (O)	Row
12,777	25/92		main	1
-401	19/84	one year	increaseof time schedule	2
28,512	36/86	one year	decreaseof time schedule	3
11,096	24/97	10%	increase of exchange rate	4
14,459	26/93	10%	decreaseof exchange rate	5
-6,649	25/92	10%	increase of discount rate	6
47,433	25/92	10%	decreaseof discount rate	7
9,115	23/93	10%	increase f fixed cost of investment	8
16,440	28/22	10%	decreaseof fixed cost of investment	9
-1,879	3/05	10%	increase of production costs	10
61,630	48/13	10%	decreaseof production costs	11
66,671	49/81	10%	increase of 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

-3,391	-0/29	10%	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	one year	increaseof time schedule	2
718,290	21/70	one year	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%	increase of discount rate	6
4,728,408	21/74	10%	decreaseof discount rate	7
244,125	19/88	10%	increase of fixed cost of investment	8
1,187,272	23/86	10%	decreaseof fixed cost of investment	9
175,795	19/66	10%	increase of production costs	10
1,255,605	23/87	10%	decreaseof production costs	11
1,825,450	25/90	10%	increase of 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

decreaseof sale of the minimum IRR	10%	17/47	-61,127
increaseof sale of the maximum IRR	10%	25/90	1,825,450
increase of discount rate of the minimumNPV	10%	21/74	-1,043,284
decrease of discount rate of the maximumNPV	10%	21/74	4,728,408

NPV	IRR	Quantity	COMPANY (Q)	Row
133,104	16/17		main	1
37,859	13/04	one year	increase f time schedule	2
193,850	17/95	one year	decreaseof time schedule	3
30,553	12/78	10%	increase of exchange rate	4

96,050	14/57	10%	decreaseof exchange rate	5
-111,971	16/17	10%	increase of discount rate	6
836,455	16/17	10%	decreaseof discount rate	7
96,641	14/86	10%	increase fixed cost of investment	8
169,566	17/65	10%	decreaseof fixed cost of investment	9
-6,134	8/93	10%	increase of production costs	10
365,167	23/54	10%	decreaseof production costs	11
417,662	24/76	10%	increase of sale	12
-9,175	7/11	10%	decrease of sale	13
124,046	15/81	10%	increaseof working capital	14
142,154	16/54	10%	decreaseof working capital	15

decreaseof sale of the minimum IRR	10%	7/11	-9,175
increaseof sale of the maximum IRR	10%	24/76	417,662
increase of discount rate of the minimumNPV	10%	16/17	-111,971
decrease of discount rate of the maximumNPV	10%	16/17	836,455

NPV	IRR	Quantity	COMPANY (R)	Row
3,337	18/36		main	1
1,883	15/14	one year	increaseof time schedule	2
4,303	20/31	one year	decreaseof time schedule	3
5,403	22/76	10%	increase of exchange rate	4
-1,374	9/77	10%	decreaseof exchange rate	5
-531	20/31	10%	increase of discount rate	6
18,309	20/31	10%	decreaseof discount rate	7
2,726	16/85	10%	increase of fixed cost of investment	8
3,949	20/11	10%	decreaseof fixed cost of investment	9
55	12/10	10%	increase of production costs	10
6,620	24/64	10%	decreaseof production costs	11
7,574	26/11	10%	increase of 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

decreaseof exchange rate of the minimum IRR	10%	9/77	-1,374
increaseof sale of the maximum IRR	10%	26/11	7,574
decreaseof exchange rate of the minimum NPV	10%	9/77	-1,374
decrease of discount rate of the maximumNPV	10%	20/31	18,309

NPV	IRR	Quantity	COMPANY (S)	Row
239	15/40		main	1
-14	11/84	one year	increaseof time schedule	2
435	19/17	one year	decreaseof time schedule	3
355	16/31	10%	increase of exchange rate	4
-28	11/62	10%	decreaseof exchange rate	5
-323	15/40	10%	increase of discount rate	6
1,426	15/40	10%	decrease of discount rate	7
139	13/84	10%	increase fixed cost of investment	8
339	17/21	10%	decrease of fixed cost of investment	9
99	13/42	10%	increase of production costs	10
378	17/37	10%	decrease of production costs	11
506	19/05	10%	increase of sale	12
-1	11/59	10%	decrease of sale	13
234	15/32	10%	increaseof working capital	14
244	15/50	10%	decreaseof working capital	15

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

NPV	IRR	Quantity	COMPANY (T)	Row
36,869	24/31		main	1
-14,325	18/61	one year	increase of time schedule	2
83,503	36/22	one year	decreaseof time schedule	3
36,870	24/31	10%	increase of exchange rate	4
36,870	24/31	10%	decreaseof exchange rate	5
-34,836	24/31	10%	increase of discount rate	6
190,993	24/31	10%	decreaseof discount rate	7
21,212	22/30	10%	increase of fixed cost of investment	8
52,528	26/68	10%	decreaseof fixed cost of investment	9
35,774	24/18	10%	increase of production costs	10
37,966	24/44	10%	decreaseof production costs	11
58,978	26/82	10%	increase of sale	12
14,762	21/75	10%	decrease f sale	13
36,869	24/31	10%	increaseof working capital	14
36,869	24/31	10%	decreaseof working capital	15

increaseof time schedule of the minimum IRR	ONE	18/61	-14,325
	YEAR		
decreaseof time schedule of the maximum IRR	ONE	36/22	83,503
	YEAR		
increase of discount rate of the minimumNPV	10%	24/31	-34,836
decrease of discount rate of the maximumNPV	10%	24/31	190,993