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Evaluation of economic efficiency of the investment project through controlling′s methods

MARIANA SEDLIAČIKOVÁ
Department of Business Economics, Technical University, Zvolen, Slovakia

Abstract: *Evaluation of economic efficiency of the investment project through controlling's methods*. Building a well-functioning, profitable company is highly laborious and lengthy process. Enterprise can largely influence its success by responsibly planning of their business activities, i.e. to elaborate the investment project. It is necessary to determine the time for which the embedded resources to projects come back, what is their valuation, as well what additional revenues can be expected from the project in the future. So that we can carry out the evaluation of the economic efficiency of the project, it is essential that each investment project must dispose the fundamental economic parameters, which are: capital expenses, anticipated revenues, determination the cost of capital, the economic life of the project and the liquidation price. The aim of the presented paper is to evaluate the economic efficiency of the project - purchase of new condensing turbine in the selected timber company through controlling's methods, namely the method of the Final Value of the project and the Modified Internal Rate of Return.

Keywords: investment, investment project, controlling's evaluation methods of the investment efficiency, final project method, modified internal rate of return

INTRODUCTION

Enterprise can largely influence its success by responsibly planning of their business activities *(BIERNACKA, 2008)*, i.e. to elaborate the investment project. It is necessary to evaluate the effectiveness, efficiency and feasibility of the project. ***The aim of the presented paper*** *is* ***to evaluate the economic efficiency of the project*** - purchase of new condensing turbine *in the selected timber company* ***through controlling's methods, namely the method of the Final Value of the project and the Modified Internal Rate of Return.***

MATERIAL AND METHODS

The investment project can be evaluated by the following methods *(DRÁBEK, 2002)*:

- ***static methods*** - costs comparison , profit comparison, calculation of profitability or payback period,
- ***dynamic methods*** - Net Present Value, Profitability Index, Internal Rate of Return, Discounted Payback Period,
- ***complementary methods*** - return on investment, break even point analysis method, the commercial viability of the project,
- ***methods of controlling*** - Finite Value of the project, Modified Internal Rate of Return.

It will be use controlling's methods of evaluation of the economic efficiency of the investment project, namely: ***method of the Finite Values and Modified Internal Rate of Return (IRR_M),*** which are rarely used, but have very good explanatory power, because they are based on the time value of cash flows.

We consider as a significant positive of the Finite Values method that the evaluation of the investment is not base only on the comparison of cash flows, but also in the evaluation are included cash flows with financial character. It means that the project is evaluated comprehensively. The complete financial plan of the investment project is the prerequisite of this method *(DRÁBEK, POLACH, 2008).*

Internal Rate of Return (IRR) is that rate at which the present value of cash inflows equal to present value of capital expenses. The following pattern presents the calculation of IRR *(FOTR, 1995):*

$$\sum_{t=1}^{n} \frac{P_t}{(1+IRR)^t} = \sum_{t=0}^{n} \frac{K_t}{(1+IRR)^t} \quad [1]$$

where:

K - capital expense,
P_t - cash incomes in different years,
n – economic life,
t - each year of life,
i - required rate of return of the project.

IRR_M is such interest rate (rate of return), in which the capital expenses are equal to the discounted terminal value of the investment project. We derive the IRR_M as follows *(economicworld.eu):*

$$K = \frac{\sum_{t=1}^{n} P_t(1+i)^{n-t}}{(1+IRR_M)^n} \quad \text{, potom} \quad IRR_M = \sqrt[n]{\frac{\sum_{t=1}^{n} P_t(1+i)^{n-t}}{K}} - 1 \quad [2]$$

RESULTS AND DISCUSSION

The analyzed timber company operates in wood production and is the medium-sized enterprise. ***The purchase of a new condensing turbine was the aim of the investment project*** and *thus more effective use of energy obtained by burning biomass to generate electricity and heat, so the company is trying to use waste from production and protect the environment.* Input data for the calculation of the Final Value of the project and the Modified Internal Rate of Return are presented in table 1-5.

Tab. 1. The need for capital

The need for investment capital		**12 017 143 €**
The need for working capital		330 180 €
The need for total capital		**12 347 323 €**
Sources of funding	a) own sources	2 347 323 €
	b) foreign sources – loan	4 000 000 €
	c) foreign sources – other	6 000 000 €

Tab. 2 Financing conditions of investment from foreign sources

Bank Loan	Interest Rate (i)	The Maturity of the Loan	Annual Repayment
4 000 000 €	6 %	5 years	800 000 €

Tab. 3 The structure of the assortment and its price

Item	Volume in MWh	Price (€/MWh)	Revenues (€)
Electrical energy	37 281	122,80	4 578 107
Heat	27 780	36	1 000 080
Total expected revenues (€)			**5 578 187**

Tab. 4 Conditions of loan – interest, repayment

Year	Loan (€)	Interest (6%)	Repayment (€)	Rest of Loan (€)
1.	4 000 000	240 000	800 000	3 200 000
2.	3 200 000	192 000	800 000	2 400 000
3.	2 400 000	144 000	800 000	1 600 000
4.	1 600 000	96 000	800 000	800 000
5.	800 000	48 000	800 000	0

Tab. 5 The structure of costs

No.	Costs	(€)
1.	Material costs	2 389 690
2.	Wages and salaries	453 998
3.	Depreciation	1 076 576
4.	Interest on loans	240 000
5.	Energy costs	301 883
6.	Removal of waste	78 724
7.	Other materials coasts	36 434
8.	Services	91 352
9.	Repair and maintenance	68 384
10.	Reserves	134 567
11.	Insurance	50 000
12.	Taxes and fees	26 904
Σ	**The expected total cost**	**4 948 515**
	Costs excluding depreciation and interest	**3 631 939**

- the rate of annual increase of revenues = 2 %
- the rate of annual increase of costs = 2 %
- ROA = 14 %
- WACC = 4,10 %

We calculated the **Final Value of the project** and the **IRR_M** (Table 6-8) base on the previous dates. [1]

Tab. 6 The auxiliary calculations for the Final Value of the project

Indicator/ years	0	1	2	3	4	5	6	7	8	9	10
Brutto revenues	12347323	5578330	5689897	5803695	5919769	6038164	6158927	6282106	6407748	6535903	6666621
Own sources	8347323	0	0	0	0	0	0	0	0	0	0
Loan	4000000	0	0	0	0	0	0	0	0	0	0
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Repayment of Loan	0	4000000	0	0	0	0	0	0	0	0	0
Payment	0	2400000	0	0	0	0	0	0	0	0	0

[1] *interest rate on deposits = 3 %*

of Interest											
Deposits	0	528597	4826211	5035664	5252051	7549305	7962523	8451018	8902232	9372547	9862700
Interest on Deposits	0	0	15858	160644	311714	469276	695755	934631	1188161	1455228	1736404
Tax Payments	0	809733	879544	928675	979432	1041865	1107841	1234281	1306323	1381416	1459675
Final Values											
- Value of Loans	4000000	0	0	0	0	0	0	0	0	0	0
-Value of Deposits	0	528597	5354808	10390472	15642523	23191828	31154351	39605369	48507601	57880148	67742848

Tab. 7 The calculation of Tax Flows (€)

Indicator /years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Brutto revenues	5578330	5689897	5803695	5919769	6038164	6158927	6282106	6407748	6535903	6666621
- Depreciation	1076576	1076576	1076576	1076576	1023942	1023942	720523	720523	720523	720523
- Interest on Loan	240000	0	0	0	0	0	0	0	0	0
+ Interest on Deposits	0	15858	160644	311714	469276	695755	934631	1188161	1455228	1736404
= Tax Base	4261754	4629179	4887763	5154907	5483498	5830740	6496214	6875386	7270608	7682502
- Tax (19 %)	809733	879544	928675	979432	1041865	1107841	1234281	1306323	1381416	1459675
= Nett Profit	3452021	3749635	3959088	4175475	6525363	69385811	7730495	8181709	8652024	9142177
+Depreciation	1076576	1076576	1076576	1076576	1023942	1023942	720523	720523	720523	720523
= CASH FLOW	**4528597**	**4826211**	**5035664**	**5252051**	**7549305**	**7962523**	**8451018**	**8902232**	**9372547**	**9862700**

Tab. 8 The calculation of Final Value of the project and IRR_M

Indicator/years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CF	4528597	4826211	5035664	5252051	7549305	7962523	8451018	8902232	9372547	9862700
Discount (7 %)	1,8385	1,7182	1,6058	1,5007	1,4026	1,3108	1,2250	1,1449	1,07	1
Final Values	8325826	8292396	8086269	7881753	10588655	10437275	10352497	10192165	10028625	9862700
Sum of Final Values (€)	**94 048 162**									
IRR_M	**40,27 %**									

It results clearly from the table 8 that the final ***value of the project at the end of its economic life*** is ***positive*** and there has been an increase in the company's own resources. This means that ***the investment decision to invest is right*** and *project increases the value of the business assets, and thus its financial stability.*

$$IRRM = \sqrt[6]{\frac{Final\ Values\ in\ total}{Invested\ capital}} - 1 = \sqrt[6]{\frac{94048162}{12347323}} - 1 = 40,27\ \%$$

The Modified Internal Rate of Return confirmed the decision to invest to the project.

The following table presents the values of economic efficiency of the investment project calculated through dynamic investment evaluation methods. These methods are considered as relevant, because they take into account not only the return on investment, but also their distribution in time and risk, which is included in the method of converting future

cash flows to present value (i.e. discounting). However, the evaluation of investment through dynamic methods was not the subject of the presented paper, so we mention briefly their calculated values in the following table.

Tab. 9 Results of investment project evaluation with dynamic methods

Required value	Calculated value	Criterion (+/-)
Nett Net Present Value (NPV) > 0	2 571 093	+
Profitability Index (PI) > 1	1,21	+
Internal Rate of Return (IRR) > Discount (7 %)	20	+
Discounted Payback period < T^2 (10 years)	7,75	+

CONCLUSION

As it can be seen from the Table 9, it can be concluded ***based on the dynamic methods of evaluation of investment project that the project is effectively to implement.*** We applied the methods of controlling (which are less used in practice) to confirm respectively to reject the results of dynamic methods. We used methods Final Value of the project and Modified Internal Rate of Return. ***The Final Value of the project is positive (94 048162 €)*** at the end of the economic life, which means that there was a significant increase in the company's own sources. This means that ***the investment decision (invest) is correct*** and the project increases *the value of the business assets, and thus the financial stability, too.* ***The IRR_M is 40,27 %,*** *compared with a planned cost of capital of 7 % clearly demonstrates sufficient margin of maneuver to risk. Both methods of controlling confirmed that the project will be effective for the company.*

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[2] *T – economic lives of the project*

Streszczenie: *Ocena efektywności ekonomicznej projektu inwestycyjnego metodami kontroli.* Zbudowanie dobrze funkcjonującego i zyskownego przedsiębiorstwa jest procesem wymagającym duzych nakładów pracy oraz czasu. Przedsięwzięcie zawdzięcza swój sukces odpowiedzialnemu planowaniu zadań businessowych, takich jak opracowanie inwestycji. Konieczna jest ocena czasu zwrotu nakładów, ocena ich wartości, oraz ocena dodatkowych zysków z inwestycji oczekiwanych w przyszłości. W celu oceny efektywności ekonomicznej każdy projekt musi podlegać ocenie podstawowych parametrów ekonomicznych. Celem przedstawionej pracy jest ocena efektywności ekonomicznej inwestycji w postaci zakupu turbiny kondensacyjnej do wybranego przedsiębiorstwa przemysłu drzewnego za pomozą metod kontroli.

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Corresponding author:

Mariana Sedliačiková
Department of Business Economics,
Faculty of Wood Science and Technology,
Technical University in Zvolen,
T. G. Masaryka 24,
Slovakia
e-mail: sedliacikova@tuzvo.sk