

# Illustrative Example of Applying the Feasibility Research in Underlying a Typical Investment in the Petroleum Industry

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## Abstract

*The feasibility research represents the main tool on which any investment or approach is based. The estimation of the impact on the environment of the hydrocarbons deposit's exploitation from Cucuiești's field showed the opportunity of exploring in the feasibility field of the investment's projects, aspects treated in this study by means of feasibility research concerning the renewal and systematization of the 395 Pădurăreni battery of tanks.*

**Key words:** *feasibility research, investments, sensitivity analysis*

The main element of financial documentation is the feasibility study, a tool which allows the investor, the initiator or the financial analyst to decide taking into consideration the information he has, whether he can start an investment and the proper moment to finance a project. The decision to invest or not, is one of the most sensible business decisions which businessmen or managers have to take.

The concept of feasibility research implies both the performance of complex marketing, commercial, technical, management and financial analysis of an investment objective seen as a dynamic and open system of goods and services, as well as a study of the implied factors (human resources, capital, material and energetic resources), by underlying the defining judicial aspects, done on a certain period of time, taking into consideration risk and uncertain aspects.

## The Methodology Used in Achieving the Feasibility Research

The efficiency of investments implies the analysis of an economical process which shows the features of the system to which it is applied and which can be studied by using a methodology of economical and financial determination.

The modern method known all over the world as Discount Cash Flow intends to properly illustrate all the transactions, as inputs and outputs from the economic and financial system, so that the difference between them should indicate the profit or loss [2].

The *reference parameters* for this method are:

1. Time 0 – considered as the input to which all the incomes are related to - time which is the moment ( the day) when the first important investment cost has been made. Time 0 is the reference point which all the profits will be related to.
2. The registered incomes when the cash (money) is received;
3. The profit, known as net cash flow calculated with the formula:

$$NCF = VN_{DT} - I \quad (1)$$

$$VN_{DT} = VB - (CO + Taxe) \quad (2)$$

In which:

VN<sub>DT</sub> - the net income (remaining after payment);

I - the investment;

VB - the gross incomes;

CO - the operational costs.

Discount Cash Flow (DCF) model, unlike the financial accounting model, does not use the calculation of the amortization, the investment being taken as it is at the moment of execution.

4. The phasing out of the incomes, investments, operational costs, taxes and financial expenses and profit in time;
5. The update of the net cash flow;
6. The evaluation of some criteria – a system of indicators through which the evaluation of the investment risk and the underlying of the project's profitability as well as the impact on the treasury of a respective company are tried.

## **The Application of the Feasibility Research for Decision Taking Concerning the Renewal and Systematization of Tanks' Battery**

The activities and the flow sheets developed in the petroleum industry may be factors that affect the local and /or regional ambient conditions. The obtained results in the previous research have as purpose to evaluate the impact on the environment by exploiting the deposit of hydrocarbons from Cucuieți's field, Bacău District, leading to the idea of thoroughly researching the feasibility of the investment's project through a feasibility research on the renewal and the systematization of the 395 Padurareni battery of tanks [3].

### **The Results Obtained by Applying the Discount Cash Flow (DCF) Method for the Main Variant of the Investment's Project**

The 365 battery of tanks from Padurareni was started up as a well in 1960 and it has a surface of 4540 m<sup>2</sup>. From the geological evidence and also from the deposit of hydrocarbons studies on Cucuieți's field results that in the drilling wells of the battery tanks there is still 60 thousand tons of mineral oil and 37 thousand m<sup>3</sup>N of gas.

The *endowment* of the tanks'battery is:

- Mixing oil pipelines connected in the battery of tanks : 6 items . x 3<sup>7</sup>;
- Flow lines: 4 items x 8 atmospheres;
- Oil tanks: 3 items X 20 m<sup>3</sup>; 2 items. x 200 m<sup>3</sup>;
- Pumps: 1 item X (5x10), flow Q = 20 m<sup>3</sup>/hour (weekly – flowing pressure p<sub>ref</sub> = 30÷60 atm; pumping time t = 7 hours /day/ daily- flowing pressure p<sub>ref</sub> = 2÷5 atm; pumping time t

= 1 hour/day).

Taking into account the age and the wear status of the installations as well as oil natural reserves to be exploited in the area, we consider the investment for the renewal and the systematization of the 395 Padurareni park as timely.

The *inputs* for the feasibility research are:

- the number of active drilling wells on Cucuieti’s field,  $n_s = 12$ ;
- the total initial flow of mineral oil  $q_{to} = 5$  tones/ day;  $Q_{to} = 1800$  tones/ day;
- extracted gases  $210 \text{ m}^3\text{N/day}$ , locally used at the battery of tanks’ boiler 395;
- the average level of impurities 85%;
- formation water  $5.5 \text{ m}^3/\text{daily}$ ;
- the decline of production  $d = 3\%$ ;
- current rate,  $i = 5\%$ ;
- the sell price of the mineral oil  $p_{vt} = 80$  \$/barrel ( $p_{vt} = 14$  thousand LEI/ tone for exchange rate  $1\$ = 2.5$  lei);
- the estimated value of the investment  $I = 2.500$  thousand lei;
- time  $t = 10$  years;
- due,  $R = 1/6$  VB;
- tax ad value,  $T_{adv} = 1.5\%$  VB;
- production tax,  $T_{pp} = 4.5\%$  VB;
- profit tax,  $T_{profit} = 16\%$  VNT.

Starting from the input data and the future estimated production and using the algorithm of the method, we have drawn a phasing in time of the investments, costs and incomes. We took into consideration the current factor (as well as the fact that the debit of the drilling wells is not constant in time, but varies as a consequence of the oil deposit conditions, which can be calculated by taking into account the decline of production [1]).

### The Indicators of the Discount Cash Flow Method

1. NPV, Net present value;

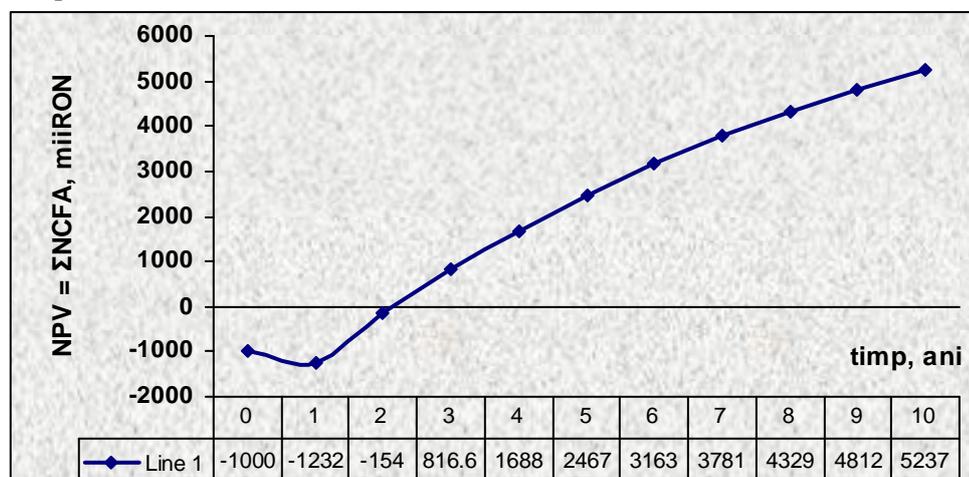


Fig. 1. Dynamics of the net profit value, NPV, in time – the main variant

By the end of a 10-year period, we can observe that, given the condition, there is a positive sum of current net profits  $ENCFA = 5236.62$  thousand Lei. This fact shows that the investment's project is profitable from this point of view because the total future Cash Flows would cover the initial cost.

## 2. DCFROR, Discounted Cash Flow Rate Of Return;

From the calculation  $NCFA = 0$  for  $DCFROR = 58.82\%$ , which is a significant value for this indicator. We can state that the investment's project can absorb a fluctuation current rate between 0 and 58.82%.

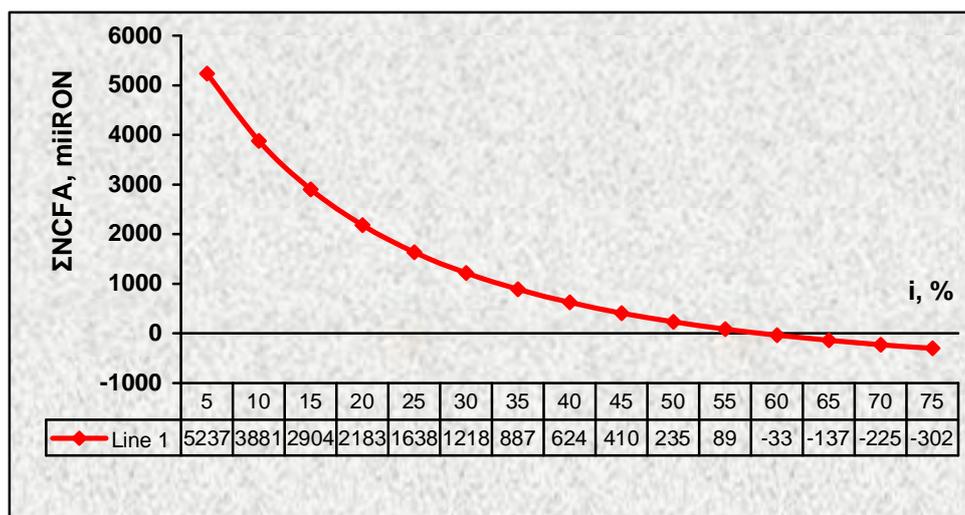


Fig. 2. The Calculation of DCFROR – the main variant

## 3. Pay out time, POT;

From figure number 2 results that pay out time,  $POT = 2.15$  years, which means that the investment is paid back in a relatively short time.

## The Analysis of Sensitivity

The analysis of sensitivity is an essential instrument in making investment decision and represents the investigation realized concerning the level of some factors, the possible modifications or errors and the impact which all those may have upon the effects of the investment (as a resultant of all factors). In this respect, more scenarios are built resulting from an analysis of sensitivity meant both to emphasize the possible different risks for the project and to allow the defining of the strategy. The predicament of the profits and costs, previous presented, correspond to the main variant for which the feasibility research is made. For the analysis of feasibility we discussed the following alternatives:

### 1. Optimistic alternative:

Variant A: the current rate decreases with 20 %;

Variant B: the production increases with 20 %;

Variant C: the sell price of petroleum increases with 10 %.

### 2. Pessimistic alternative:

Variant D: the current rate increases with 20 %;

Variant E: the production decreases with 20 %;

Variant F: the sell price of petroleum decreases with 10 %.

The analysis of sensitivity is achieved by showing the indicators with the highest influence on the evaluation of the project's viability.

## Conclusions

In the feasibility research it is necessary to underline the sensitivity of the investment with respect to the modifications which may appear during the project. None of the initial inputs in making decision is surely known, the risk being a constant problem.

The analysis of sensitivity was made to underline those indicators that have the highest influence in the evaluation of the project's viability. The changes of the basic assumption may contain one or more factors commented above. To this aim, we have developed and analysed more scenarios in order to underline the possible risks for the project. The results of the DCF method's indicators calculation are presented in Table 1.

**Table 1.** The values of the Discount Cash Flow method's indicators for the calculated scenarios

Variants	The indicators		
	NPV, thousands lei	DCFROR, %	POT, years
<b>Base</b>	5236,62	58,82	2,15
<b>A</b>	5569,30	58,82	2,12
<b>B</b>	6995,58	76,40	1,76
<b>C</b>	6159,50	67,80	1,92
<b>D</b>	4926,80	58,82	2,18
<b>E</b>	3466,64	41,20	2,82
<b>F</b>	4355,69	49,8	2,45

From the analysis of these data, in comparison with the main variant, results the following:

### 1. The influence of the current rate fluctuation:

- The decrease of 20% leads to the rise of the net current profit value NPV, with 6.36% and to the decrease of the pay back time, POT, with 1.4 %; the DCFROR indicator remains unchanged.( Variant A);
- The rise of the current rate with 20% entails, for the same value of the non- updated profit, a decrease of the current net profit value NPV, with 5.91% and an insignificant rise of the Pay Out Time, POT, the period in which the investment is paid back on the profit's base with 1.39%. DCFROR isn't influenced by the current rate fluctuation. (Variant D).

### 2. The influence of the extracted mineral oil's quantity fluctuation:

- If the production was underrated and it shows a rise of 20% in comparison to the estimated initial quantity of the main variant, this will lead to a bigger current net profit value of 33.58%. DCFROR will be 29.88 % bigger than the value of this indicator in the main variant, and this allows that, in this optimistic variant, the project remains viable for a variation of DCFROR between 0 and 76.40%.The payback period of 2500 thousand lei will be 1.76 years with 18.14% smaller (variant B).
- The unrealistic overrate of the production in the main variant leads to less satisfactory results than those that actually exist. So, if the production is with 20 % smaller than the initial estimated one, the current net profit value will be 33.8 % smaller than the one

estimated, DCFROR will decrease 29.95% and the payback period will increase by 31.16% (variant E).

### 3. The influence of the sale petroleum price:

- The frequent fluctuations of the reference price for the petroleum barrel influence, in their turn, the estimations made in the main variant of the investment's project. Thus, the rise 10% of the petroleum sale price entails the rise of the incomes, and finally, of the net current profit. The rise is 17.62% for the net profit value, NPV indicator, in comparison with the value obtained in the main variant. DCFROR shows a similar increase of 15.26%. The payback time is influenced positively by (reducing it) 10.69% towards the initial calculated time (variant C).
- The decrease of the sell price leads to a net profit value smaller by 16.82% than the one calculated in the main variant. DCFROR has a smaller value of 15.33% and POT is with 13.95% bigger, which shows a delay in the payback towards the initial estimated period (variant F).

The conclusions that can be drawn show on the one hand, the fact that the positive impact with the best results belongs to the production increase. This fact leads us to the idea that it is recommendable to try, by available means, to increase the quantity of extracted mineral oil without registering the excessive increase of the costs which would diminish the profit. On the other hand there is a decrease in production which shows that the unrealistic overrate of the main variant of the extracted mineral oil's quantity leads in the end to the most severe changes, in a negative way, of the Discount Cash Flow method's indicators of the level.

## References

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## Exemplu ilustrativ de utilizare a studiului de fezabilitate în fundamentarea unei investiții specifice din industria petrolieră

### Rezumat

*Instrumentul de bază prin intermediul căruia se fundamentează orice fel de investiție sau întreprindere este studiul de fezabilitate. Evaluarea impactului asupra mediului la exploatarea zăcămintelor de hidrocarburi de pe structura Cucuieți a arătat oportunitatea aprofundării în domeniul fezabilității proiectelor de investiții - aspect concretizat în acest articol printr-un studiu de fezabilitate privind modernizarea și sistematizarea parcului 395 Pădurăreni.*