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INVESTMENT OPTIMIZATION AS A TOOL TO ENHANCE COMPETITIVENESS OF OIL ENTERPRISES

SUMMARY. The current stage of the national economy development is characterized by a decrease in the rate of economic growth, low efficiency of the budget process, growing threats from internal and external environment. External threats are determined by decreasing volumes of exporting hydrocarbons abroad, whereas, domestic threats are associated with a sharp decline in tax revenues in the non-oil sectors of economy and reduced spending on investment. The current condition of equipment in the oil industry, its physical deterioration, does not allow the yield of produce on the technological frontier or modernization in order to increase competitiveness. The authors of this article offer a mechanism to form necessary investment funds for modernization of equipment of an oil enterprise by optimal programming methods. Improving the quality of management accounting in the enterprise will provide a solution to specific management objectives through equity. This will enable the usage of the proposed and practically adjusted economic-mathematical model for the improvement of competitiveness and efficiency in the declining production of hydrocarbons.

KEY WORDS. Oil industry, management accounting, investment project, net present value, gradient type method.

Implementation of the strategy of development of the oil and gas complex in the post-crisis period occurs in the context of growing uncertainty and risk factors. Uncertainty directly depends on the development of the crisis phenomena in the global and domestic economy. Growing risks are primarily associated with an increased technological gap and amortization of the active part of major income as well as with the increasing socio-economic problems of development of oil and gas fields in the context of declining production of hydrocarbons.

The Ministry of Economic Development has prepared a concept for long-term socio-economic development of Russia, which will last until 2020:

— the inertial development scenario assumes GDP annual growth rate of 3.3%;

— the energy resources development scenario assumes GDP annual growth rate of 5.3%;

— the innovative development scenario assumes GDP annual growth rate of 6.6% [1-3].

Implementation of the developed scenarios in the initial period faced the problems of attracting investment, stopping capital outflow (by the end of 2013 the industry will see withdrawal of up to seventy billion dollars), improving the business climate, etc. The Cabinet of Ministers of the Russian Federation reduced the forecast of GDP growth rate down to the level of 1.4-1.8% in 2013 and dared to reduce budget spendings. Once again, the national strategic economic growth forecasts have been undermined. Meanwhile, the problems of development of the oil industry enterprises are growing:

— the low level of oil extraction and a mismatch of reproducing properties of the mineral resource base and strategic development objectives of the industry;

— the general trend of falling oil production due to lack of funds to modernize the oil industry;

— unsatisfactory solution to the problems of petroleum gas (APG) recovery and utilization;

— high degree of depreciation of fixed assets of the oil refining industry and, as a consequence, low quality of oil products [2-4].

Most Russian oil enterprises have up to 80% of their main equipment deteriorated. At the same time, technologies used in production are outdated, energy inefficient and environmentally imperfect. Provision of investment and production stability of an enterprise and its value maximization requires a qualitatively new level of managerial accounting to make effective use of limited aggregate resources of an enterprise. Management accounting is not limited to the generally accepted accounting principles [5-7].

When organizing management accounting, the following positions might be required:

— Its compliance with the goals and objectives of the enterprise;

— A reflection of the peculiarities of technological processes used for production of goods and services;

— Optimization of the structure and level of specification of the accounting database used by managers in the enterprise administration;

— Consistency with the general principles of formation of organizational management structure of the enterprise.

Management accounting unlike general accounting takes into consideration all the information about the assets of the enterprise. It is a system of organization, accumulation and compiling credentials to address specific management tasks in order to increase its competitiveness. Management accounting of an enterprise requires new understanding and approaches in formulating and solving issues related to the assessment of efficiency of investment project decisions [8-11]. In connection with this, investment and economic assessment of design solutions for the enterprise acquires special scientific and practical importance under the conditions of the growing economic crisis.

The necessity to implement expensive technology and equipment is associated with the development of investment project decisions in management accounting, especially during development of small and medium-sized fields. The most important task, that an investor has to face, is the task of choosing an investment subject for the

enterprise. It is sufficient to point out that an enterprise has its own capital, part of which will be spent on investment.

Dependence of the return on investment of a single unit amount (starting next year) f (t) is piecewise linear, since continuity refers to the time of the project investment, while the amount of equity on the account is piecewise continuous (Figure 1) [12], [13].

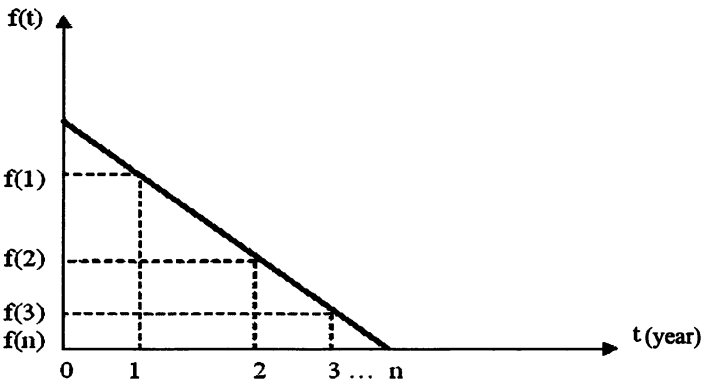

Figure 1. Dependence of the amount in the account on the duration of the investment project

The X-line reflects the investment period t = 1, 2,..., n, the Y-line reflects the return on investment units at appropriate time periods.

Thus, $f(t) = k*((nt)/n)$, if $t \leq n$, or $f(t) = 0$, if $t \geq n$.

With the growth of the invested sum the payoff for sufficiently large amounts reaches the maximum point. We believe that this relationship can be expressed as: $g(c) = c/(1 + c)$ (Figure 2).

Thus, the return on investment equal to c through time t, will be $f(t)*g(c)$.

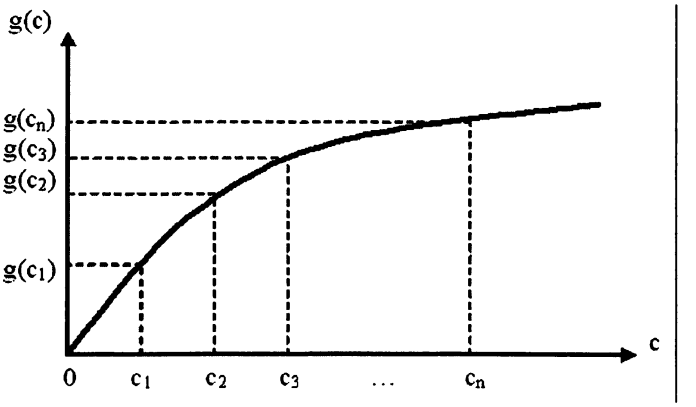

Figure 2. Dependence of the amount in the account on the size of payments

The aim is to define a strategy for an enterprise to invest its capital in innovation, which will give the maximum financial impact.

An enterprise contributes funds at the beginning of each moment during the period of investment. It is necessary to analyze the process of receiving money and consider a special case when the total investment of the project takes place at a time in order to choose the most suitable strategy. The maximum financial effect will be defined as net present value (*NPV*) [14].

$$NPV(C,i) = \sum_{j=1}^{n} C_j \cdot v^{T-j}$$

Statement of the problem. It is necessary to determine the flow of successive payments C that will provide the maximum financial effect for the time period t. It is assumed that the time period 1 < 2 <... <n. The variables used to solve this problem are the following:

P_0 – initial capital (in rubles);

P_1, P_2,..., P_n – amounts in the account before investments in innovation (in rubles);

$C = (c_0, c_1,..., c_n)$ a stream of payments – the share of investment in innovation at the appropriate time periods (in rubles);

i – effective interest rate, $i > 0$;

v – discount rate: $v = 1/(1 + i)$;

j – index of payments;

NPV – net present value, where T – the time to execute the investment project.

Let $c_0 \le P_0$ be the value of the initial investment (the first payment), it does not exceed the company's own capital P.

From the moment 1, the enterprise makes profit from investing activities:

$$c_1 \le (P_0 - c_0) * (1 + i) + f(0) * g(c_0) = P_1,$$

where P_1 is the amount in the account at time period 1 before payments, part of which will focus on investing, plus a return on investment in a zero period;

$$c_2 \le (P_1 - c_1) * (1 + i) + f(1) * g(c_0) + f(0) * g(c_1) = P_2,$$

where P_2 is the amount in the account before payments, part of which will be aimed at investment, plus a return on investment in the first and zero periods;

...

$$c_n \le (P_n\text{-}1 - c_n\text{-}1) * (1 + i) + f(n\text{-}1) * g(c_0) + f(n\text{-}2) * g(c_1) + ... + f(0) * g(n\text{-}1) = P_n,$$

where P_n is the amount in the account after the payments, part of which will be aimed at investment, plus the return on investment for the (n-1) period.

The target function is a set of investment payments that maximizes the financial effect of such payments [15]:

$$NPV(C, i) = \sum_{j=0}^{n} \frac{C_j}{(1+i)^j} \rightarrow max.$$

The problem is solved by the gradient type method (the method of Hooke – Jeeves), since the formulation of the problem is multidimensional and the objective function depends on several parameters, determined by the highest value of the objective function defined on a set of possible values of its parameters, the algorithm of the solution is to move to the minimum in the direction of the most rapid decrease of the function, which is determined by an antigradient before reaching the domain boundary. The result is a point at which the function value is smaller than the original. The new point will see the repetition of the procedure: we shall calculate the gradient of the function again and take a step backwards. Continuing this process, we will move in the direction of decreasing functions. Specific selection of the direction of motion at each step allows us to construct an approximation to the optimal point of the problem.

The proposed formulation allows us to give an economic assessment of investment in the enterprise development, taken from its own assets (capital), and to determine the values of successive payments, which can be adjusted over time, depending on the internal and external environmental factors that influence the results of its operation.

The net present value indicates the maximum economic benefit from the rational investment activity of the company aimed at reducing the depreciation of the fixed assets of the enterprise and improving its competitiveness. The developed model has been implemented and adjusted to the peculiarities of operation of an enterprise which is a part of OJSC "Surgutneftegas". It is embedded in the management accounting department of OJSC "Surgutneftegas" within "Surgutneftespetsstroy" and is part of the rationale for the equity capital investment in modern equipment and technology.

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