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THE EVALUATION OF A POTENTIAL INVESTOR IN THE ENTERPRISE MANAGEMENT PROCESS

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enterprise management, investment project, investment project sensitivity, economic risk assessment

The article considers the assessment of a potential investor in the process of enterprise management. This article discusses the evaluation of the effectiveness and sensitivity of the investment project. The assessment presented in the article enables the enterprise to adapt to the existing economic conditions. Also, this article proposes an assessment of economic risk, which takes into account the dynamics of prices for the following cost components: material costs, wages with social security contributions and other material costs, which in turn are divided into different types of resources.

ОЦІНКА ПОТЕНЦІЙНОГО ІНВЕСТОРА В ПРОЦЕСІ УПРАВЛІННЯ ПІДПРИЄМСТВОМ

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Ключові слова:
управління підприємством, інвестиційний проект, чутливість інвестиційного проекту, оцінка економічного ризику

У статті розглядається оцінка потенційного інвестора у процесі управління підприємством. У цій статті розглядаються оцінки ефективності та чутливості інвестиційного проекту. Подана у статті оцінка дає можливість підприємству адаптуватися до існуючих економічних умов. Також у цій статті пропонується оцінки економічного ризику, яка враховує динаміку цін за такими складовими витрат: матеріальні витрати, заробітна плата з відрахуваннями на соціальне страхування та інші матеріальні витрати, які у свою чергу поділяються на різні види ресурсів.

Statement of the problem

The success of the management of modern enterprises is determined today by the assessment of potential investors. This assessment takes into account the effectiveness and sensitivity of the investment project. Which determines the relevance of this paper.

Analysis of other researches and publications

Analysis of scientific works of domestic and foreign scientists on the investment attractiveness of enterprises Grebenyuk N.O. [1], Bril K.G. [2], Katan L.I. [3], Butinko V.V. [4], Yepifanov A.O. [5], Butov A.M. [6] confirmed the relevance of this article.

A significant contribution to solving the issues of investment management and investment attractiveness of the enterprise was reflected in the works of I.A. Blank [8], L.I. Katana [3], A.O. Epifanova [5], I.M. Boyarko [7], Boyarko I.M. [7] and others. The analysis of these works confirmed the actual problem.

This problem is of great importance both for the economy and for enterprises. Evaluation of a potential investor in the enterprise management process makes this task relevant.

Objectives of the article

The purpose of this paper is to present a methodology for assessing potential investors, which takes into account the effectiveness and sensitivity of the investment project.

The main material of the research

Sources of investments of an industrial enterprise today are loans from external investors. These enterprises cannot count on attracting a mass investor, that is, on a wide issue of shares. Since all funds received from the sale of shares of the first issue will go to the state budget, and only funds from the second issue will go to the enterprise in the form of its own investments.

The risk of investment in production at the present stage in Ukraine is so great that their volume has dropped

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to a critical level. At the same time, the development of production is the only sure way to get the country out of the protracted crisis.

The impact of sharp rises in inflation, uncertainty in the legislative sphere, the crisis of non-payments and similar circumstances bring to the fore the problem of evaluating an investment project and impose a specific shade on it, which is characteristic only for the situation that has developed in Ukraine. To determine which capital investments in our country are currently able to make a profit, and not ruin an investor, Western methods for evaluating investments are not able to, since they are not designed for such a complex and uncertain economic situation. The conclusion of Western investors is unequivocal – the rejection of almost all investments. A Ukrainian entrepreneur is simply forced to work in such difficult conditions and find ways to invest capital that can bring him profit.

The most correct, but also more time-consuming in the calculations, is a technique that provides for the adjustment of all factors affecting cash flows. Key factors include revenue and variable costs. The adjustment can be carried out using various indices, since the price indices for the products of an industrial enterprise and the raw materials it consumes may differ significantly from the inflation index. With the help of such recalculations, new cash flows are calculated.

The real interest rate is determined through the nominal interest rate r_{nom}:

$$r_{real} = \frac{\left(1 + r_{nom}\right)}{1 + h} - 1, \quad (1)$$

where h – is the amount of inflation.

The real interest rate including income tax is calculated using the nominal interest rate r_{nom} and the inflation rate h:

$$r_{real} = \frac{\left(1 + \left(1 - \tau_p\right) r_{nom}\right)}{1 + h} - 1. \quad (2)$$

Formulas (1) and (2) are explained as follows. Due to inflation, prices rise by ($1+h$) times, so there is a multiplier. The payment of income tax is equivalent to a decrease in the nominal interest rate by (1-) times. This gives rise to the factor (1-).

In general:
before tax:

$$\left(1 - r_{nom}\right) = (1 + r_{real})\left(1 + h\right); \quad (3)$$

after tax:

$$\left(1 + \left(1 - \tau_p\right) r_{nom}\right) = (1 + r_{real})\left(1 + h\right). \quad (4)$$

In the absence of inflation, the net present value of the project can be written as:

$$NPV_N = \sum_{t=1}^{n} (1 - \tau_p) \frac{CF_t \left(1 + h\right)^t}{\left(1 + r_N\right)^t} + \sum_{t=1}^{n} \tau_p \frac{D_t}{\left(1 + r_N\right)^t}_{real} - I_0), \quad (5)$$

where r_N – the nominal interest rate of discounting; CF_t – the estimated financial flow in period t, expressed in real terms.

In formula (3), the factor $\left(1 + h\right)^t$ is only in the first term. This is due to the fact that initial investments I_0, D_t are depreciated as without inflation adjustment.

Net present value in real terms:

$$NPV_R = \sum_{t=1}^{n} (1 - \tau_p) \frac{CF_t}{\left(1 + r_R\right)^{'}} + \sum_{t=1}^{n} \tau_p \frac{D_t}{\left(1 + r_R\right)^{'} \left(1 + h\right)^{'}} - I_0). \quad (6)$$

Inflation adversely affects the opportunity to invest, reducing the real value from $\sum_{t=1}^{n} \tau_p \frac{D_t}{\left(1 + r_R\right)^{'}}$ to $\sum_{t=1}^{n} \tau_p \frac{D_t}{\left(1 + r_R\right)^{'} \left(1 + h\right)^{'}}$.

$$NPV_N = NPV_R. \quad (7)$$

In the presence of inflation $NPV\left(h\right) < NPV\left(0\right)$.

Thus, in conditions of zero inflation, capital-intensive projects are most profitable. As inflation rises, the least capital-intensive projects become the most profitable.

With inflation, all indicators of formula (6), except for the amount of depreciation, are multiplied by $\left(1 + h\right)$, where h is the inflation rate. So, if the company produces products, then the selling price of products increases in proportion to the level of inflation. At the same time, depreciation is calculated without adjusting for inflation, which results in a reduction in the tax shield. As a result, inflation makes capital-intensive projects unprofitable.

An increase in the rate of inflation requires:
– displacement of cash flows to the beginning;
– reducing the duration of projects.

A decrease in inflation leads to an increase in the profitability of projects:
– long-term;
– capital-intensive.

High inflation hinders investment, so financial stabilization is a necessary condition for the recovery of the economy.

Risk assessment methods based on probabilistic characteristics and measuring the risk of an investment project using the standard deviation of the net present value of the project from its expected value – $\delta\left(\text{NPV}\right)$ have the greatest potential for adaptation to existing conditions – is determined by different approaches.

The simplest approach is to develop three options for the development of an investment project – optimistic, pessimistic and most probable. For each option, a profitability indicator is calculated – the net present value of the project (NPV) and the probability of implementing these options is assigned. Based on this information for the project, the expected value of NPV, weighted by the assigned probabilities, and the standard deviation from it, are calculated. The larger the standard deviation of NPV, the greater the risk of the project. It must be said that the only positive side of this approach is its simplicity, however, the degree of accuracy of risk assessments leaves much to be desired. After all, the optimistic option for the development of the project assumes the maximum possible income minus the minimum costs (moreover, the minimum for each cost item), that is, this option, the probability of which is practically equal to zero. The same can be said about the pessimistic option – minimum income minus maximum costs. It is very difficult to make realistic scenarios of the optimistic and pessimistic development of the project, and even more difficult to set the probabilities of their implementation.

More complex tools for assessing the risk of projects are simulation and analytical models that allow you to consider all possible development options.

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We consider the following as the simplest way out of such a difficult situation: it is not necessary to consider the volume of production as a random variable, but several alternatives of the same project should be evaluated at different production volumes. In this way, you can adjust the price and costs in connection with the changed volumes of production.

In addition, the known models do not allow taking into account the impact of inflation on relative shifts in prices for products sold and on production costs. In order to take into account as many factors as possible influencing the results of choosing a potential investor and project when assessing risk, it is advisable to use two approaches at once: identifying a potential investor; analytical modeling and analysis of the degree of economic risk of the project, to which investment activity is most exposed.

To determine a potential investor in the management of an enterprise, a decision is provided that takes into account the likelihood that the investor will be unjustified both from an economic and technical point of view, will be minimal. In this case, the choice of the investor is the possibility of determining due to the maximum value of the assessment S – the expected value of the ratio of forecast economic indicators to indicators of the financial condition of an industrial enterprise, taking into account the overall risk:

$$S = max\left\{ S_i = \frac{\prod_{j=1}^{k} Y_{j,pr}}{\prod_{j=1}^{k} X_j} P_e P_t \right\},\ i = \overline{1,n}, \qquad (8)$$

where $Y_{j,pr}$ – predicted values of the j-th economic indicators (liquidity, solvency, profitability, and others); X_j – indicators of the financial condition of an industrial enterprise; P_e – probability of economic success; P_t – probability of technical success.

When solving the problem of assessing economic risk, it is necessary to separately take into account the price dynamics for the following cost elements: material costs, wages with social insurance contributions and other material costs, which, in turn, are divided into different types of resources. The more heterogeneous the structure of material costs, the more meaningful their splitting is for the study of relative price changes. And vice versa, the more homogeneous the structure of material costs from the point of view of price changes, the more meaningful it is to consolidate them (combine them into homogeneous groups) to reduce the complexity of calculations.

A measure of the risk of profit deviation from the expected value is its standard deviation. The risk of profit deviation from the expected value may be primarily due to changes in prices for finished products, raw materials, materials, fuel, energy, etc. under the influence of various factors. In addition, profits may deviate from those expected as a result of an inadequate assessment of the cost-benefit ratio in basic prices, for example, due to the lack of necessary information or the use of aggregate methods of calculation.

Based on the model of profit formation in settlement prices, a formula was obtained for determining the standard deviation of profit. Taking into account the interdependence of relative price changes, this formula has the following form:

$$\begin{aligned}\sigma^2(Pr) = {} & D(S_0)\times D(I_0) + M^2(S_0)\times D(I_S) + \\ & + D(S_0)\times D(I_S) + M^2(S_0)\times D(I_C) + \\ & + M^2(S_C) D(S_0)\times 2M(S_0)\times M(C_0)\times \\ & \times \sigma(I_S)\times\sigma(I_C)\times\rho_{I_S I_C},\end{aligned} \qquad (9)$$

where $\sigma^2(Pr)$ – is the variance of balance sheet profit; $D(S_0), D(S_0)$ – respectively, dispersion and mathematical expectation of proceeds from sales in basic prices; $D(S_0), D(C_0),$ – dispersion and mathematical expectation for production and sale in basic prices; $D(I_S), M(I_S), \sigma(I_S)$ – dispersion, mathematical expectation and standard deviation of the price index for products sold, cleared of the effect of inflation; $D(I_C), M(I_C), \sigma(I_C)$ – variance, mathematical expectation and standard deviation of the index of change in costs, cleared of the effect of inflation; $\rho_{I_S I_C}$ – coefficient of correlation between the dynamics of costs and prices for products sold.

Despite the fact that risk is understood as the probability of unforeseen losses, when assessing the degree of investment risk, only those factors leading to a loss that the investor can foresee (predict) can be taken into account.

Therefore, in formula (9), the expectation of price indices should be considered their predicted values, and the measure of the risk of deviation of the price index from its expected value is the standard error of the forecast. In other words, the inability to predict the future value of price indices in narrower intervals can be interpreted as a greater risk. Information on the degree of accuracy of costs in basic prices must also be presented as standard deviations of these values from their expected values.

The projection of benchmark price indices should be carried out at a fixed rate of headline inflation at the expected level, and the uncertainty of the inflation rate itself should be taken into account using sensitivity analysis.

If necessary, projects should be checked for sensitivity to changes in the following investment conditions: loan interest rate, investment costs, income tax rate, if such changes in tax legislation are likely, since in formula (9) these values were considered as deterministic, not random.

Knowing $\sigma(Pr_t)$, $\sigma(SF_t)$ we define:

$$\sigma(SF_t) = (1-T)*\sigma(Pr_1), \qquad (10)$$

where $\sigma(SF_t)$ – the standard deviation of the cash flow of the period; T – is the income tax rate (in fractions of a unit).

By calculating $\sigma(SF_t)$ for each year of the project implementation, it is possible to determine $\sigma^2(\text{NPV})$:

$$\sigma^2(\text{NPV}) = \sum_{t=0}^{T} \frac{\sigma^2(SF_t)}{(1+d)^{2t}} + \sum_{t=0}^{T} 2\rho_{t,t-1} * \frac{\sigma(SF_t)*\sigma(SF_{t-1})}{(1+d)^{2t-1}}, \qquad (11)$$

where $\sigma^2(\text{NPV})$ – is the variance of the net present value; d – is the discount factor; $\rho_{t,t-1}$ – coefficient of correlation between cash flows of nearby periods.

Formula (11) takes into account the relationship between the cash flows of nearby periods. The covariance dependence between cash flows separated from each

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other for significant periods is extremely small, but for nearby periods it is present and, as a rule, positive, that is, $0 < \rho_{t,t-1} < 1$. If we assume that the cash flows of different years are independent, then the formula simplifies and takes the form:

$$\sigma^2(\mathrm{NPV}) = \sum_{t=0}^{T} \frac{\sigma^2(SF_t)}{(1+d)^{2t}}. \quad (12)$$

Regarding the relationship between cash flows, I would like to note the following. The value of this dependence is influenced by both controllable and uncontrollable factors. You can manage the situation, for example, in such cases: if the selling price of finished products at the time of entering the market turned out to be lower than the expected value, then due to more effective advertising in the subsequent period, it can be increased; if the main supplier increased the price of raw materials and the costs were higher than expected in one period, then another, cheaper source of raw materials will probably be found in the next period.

Therefore, it is impossible to determine exactly $\rho_{t,t-1}$ it is only possible to establish its boundary values by expert means. For example, if the degree of influence of controlled factors is significant $\rho_{t,t-1}$, then it can be set in the range from 0 to 0.5. The minimum and maximum value (NPV) can then be calculated.

Thus, it is considered how it is possible to determine the main indicator of the degree of risk of an investment project (NPV). However, information about the degree of risk of the project, presented in the form of a standard deviation of the net present value, will not be sufficient for practical investors. But the probability of losses of specific amounts, determined using this indicator, is extremely necessary information for making a decision. The investor's actions will be more justified if he knows the probability of losing the expected profit from the project in which he is going to invest his capital, the probability of losing this capital, and also has an idea of how possible losses will affect his property condition.

The practical implementation of this technique was carried out by us not completely due to the lack of statistical data on cash flows in the middle of the annual period. Therefore, one cannot be guided by the data obtained without a share of error. To obtain a more probable assessment of an investment project, it is necessary to accumulate statistical data on the project throughout its operation and make appropriate adjustments to the data obtained.

The data obtained as a result of the evaluation of the investment project are given in Table 1.

The results of the investment project evaluation were obtained for each year of its operation:

$$Pr1 \rightarrow 246567665$$

$$Pr2 \rightarrow 929028410$$

$$Pr3 \rightarrow 1462159633$$

$$Pr4 \rightarrow 1851848149$$

$$Pr5 \rightarrow 2324769972$$

$$\sigma^2(Pr) = 1{,}17528\mathrm{E}{+16},$$

$$\sigma(CF) = 75887242{,}24,$$

$$\sigma^2(NPV) = 459094\mathrm{E}{+10}.$$

The value $K_{NPV} = \frac{\Delta \mathrm{NPV}}{NPV}$ is defined as the sensitivity coefficient of the investment project according to the criterion of net present value. It shows to what extent the deviations of the selected parameters affect the change in NPV, which allows you to choose one or more investment projects from a variety of alternatives.

Sensitivity coefficients:

$$\frac{\Delta \mathrm{NPV}}{\Delta X_n} = 15623.53; \quad \frac{\Delta \mathrm{NPV}}{\Delta C} = 1000884221.$$

Conclusions

The article proposes a method for assessing a potential investor in the process of enterprise management and an investment project in enterprise management, which makes it possible to determine an investment project taking into account the degree of risk.

Determining the degree of project risk is one of the stages along with the assessment of economic efficiency, since both of these factors are equally significant, especially in a market economy.

Table 1 – Initial data for the evaluation of the investment project

Investment period	The amount of costs	The sales proceeds	The cost change indices	The price indices	The profit amount
1 year	594 955 000	676 503 000	1,24	1,455	246 567 665
2 years	789 985 924	1 251 092 933	1,327	1,581	929 028 410
3 years	804 789 193	1 705 552 682	1,018	1,338	1 462 159 633
4 years	821 668 633	2 169 959 877	1,020	1,24	1 851 848 149
5 years	833 281 688	2 641 524 040	1,014	1,20	2 324 769 972

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