OPTIMIZING THE CALCULATION OF THE PRODUCTION PROGRAM FOR AN ENTERPRISE WITH A GROWING ECONOMIC POTENTIAL

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Annotation.The article considers a new solution to the task of making an efficient production program for an enterprise with a growing economic potential which is based on financial management. The method of accumulating marginal income is offered to be used for optimizing the production program of an enterprise. Selection of the optimal production program is carried out by estimating the cash flows for each of the production of the product. This selection may be accomplished by the using of linear programming methods.In this case, it is necessary to find the optimum objective function under the conditions of specified functional limitations.

Key words: economic potential, production program, accumulated marginal income, optimization model, financial management.

1. Introduction

At present, the enterprises efficiency increasingly depends on the practical management mastery, which as a branch of study has at its disposal all the required methods to solve basic management goals. However, at the management methods disposal the questions of financial service integration with other functional units with intercompany planning is still insufficiently developed, which leads to inefficient decisions making [1].

2. Materials and methods

The shortage of financial service integration with other units adversely affects the formation of an effective economic potential of enterprise (EPP), which is the main source of profit. Production program (PP) is the result of programming, which is the kind of management activity and, in turn, a sub function and the result element of economic potential [2].

3. Results

As optimality criterion of PP task forming is used maximization of the marginal profit (*MP)*:

$$MP = \sum_{j=1}^{N} MP_j \times X_j \rightarrow max. \qquad (1)$$

MP - marginal profit of the production program. It has defined as the difference between the volume of sales and variable costs;

MP_j- marginal profit of product unit j (the specific characteristics of the product j);

X_j – variable scale, which determines the amount of product j - ro name;

j - range of manufactured products ($j = \overline{1, N}$).

In our view, the objective function (1) has a significant drawback. The criterion of marginal profit maximum does not allow consideration of the dynamics of its formation. This criterion does not take into account the time factor, and, hence, the time value of money, which makes it not susceptible to the distribution of revenue from goods receipt in time (period of receivables) and the timing of payment of variable costs for the products (the period of accounts payable).

Accounting for the time factor by using mathematical methods of financial mathematics, which allows to display a temporary disparity of money: the method of accumulation (savings) and discounting. We propose to use the method of thus gained marginal profit (GMP) for optimization the production program of the company.

Thus, the objective function takes the form:

$$GMP_t = \sum_{j=1}^{N} GMP_{jt} \times X_{jt} \longrightarrow \max \qquad (2)$$

GMP_{jt} can be calculated by the following formula:

$$GMPjt = \sum_{k=0}^{K-1} (H_{jtk} - B_{jtk}) \times (1+r_{tk})^k + (H_{jtk} - B_{jtk}) \qquad (3)$$

K - border settlement. It is equal to the number of calculation steps, at which there is the last entry / disbursement of the production program as a whole;

$(H_{jtk} - B_{jtk})$ cash flow in the k-step of the calculation ($k = \overline{1...K}$) of product j in planning step t;

r_{tk}–the rate of accumulation in the - step of the calculation.

The cost of PP financing sources directly affect the value of the accumulation rate rtk, which is used in calculating GMPjt by the formula (3). We provide that elected PP is financed by borrowing, and at their own expense. The cost of financing sources noted in the general case is different. In connection with this objective function is represented (2) as:

$$GMP_t = \sum_{j=1}^{N} \left[\left(GMP^B{}_{jt} \times X^B_{jt} \right) + \left(GMP^P_{jt} \times X^P_{jt} \right) \right] \rightarrow \max \qquad (4)$$

GMP_t – the accumulated profit margins of the production program;

GMP^B_{jt} – gained marginal revenue of product j, financed by the company's own funds;

GMP^P_{jt} – gained marginal revenue of product j, funded by borrowing;

X^B_{jt} – required variable quantity, that refers to the amount of j products, the production of which is financed by its own funds;

X^P_{jt} – required variable quantity, that refers to the amount of j products, the production of which is financed by borrowing;

t – number of planning step.

Quantities GMP^B_{jt} and GMP^P_{jt} are calculated by the formula (3), where the variable rate savings rtk takes a value or a weighted average cost of funding of the production program at their own expense, or the amount of reinvestment rate (when the amount of revenue has surpassed the amount of disbursements under this article).

Under the reinvestment rate we will understand the value of percent, which can be reinvested under the temporarily free funds from the sale of products in the production program to generate income [3].

Formation of the production program for the proposed approach involves the use of an optimization the accumulated marginal income model, which is considered as the reason that causes the time of payment and receipt of funds. Selection of the optimal production program is carried out by estimating the cash flows for each of the production of the product. This selection may be accomplished by the using of linear programming methods. In this case, it is necessary to find the optimum objective function under the conditions of specified functional limitations. [4] In this regard, we believe that the formation of PP must consider such restrictions:

1. Restrictions on equity and debt, which are used in the implementation of the production program.

2. Restrictions on the production program of the debt ratio (the ratio of debt and equity).

3. Restrictions on the coverage ratio of PP interest for the loan and the principal and spent on PP company's own funds.

Selecting of marked restrictions is based, firstly, on the possibility of their inclusion in the optimization model, secondly, they characterize the limits of variation of sources of funds, and third, the latter restriction - the required level of solvency, its use in the formation of PP allows for control of production program that generates financial stability (FS).

Limitations of own (BKt) and loan (PKt) tools that are used to finance the production program, characterize the financial capacity of the enterprise and can be summarized in this way:

$$PK_t = \sum_{j=1}^{N} S^P_{jt} \times X^P_{jt} \le \psi^{PK}_t \qquad (5)$$

$$BK_t = \sum_{j=1}^{N} S^B_{jt} \times X^B_{jt} \le \psi^{BK}_t \qquad (6)$$

S^P_{jt} – the amount of borrowed funds that are used for financing the production of the product j in planning step t;

ψ^{BK}_t – regulated value of using borrowed funds for the PP implementation;

S^B_{jt} – the amount of own fund, which are used for financing productj production in planning step t;

ψ^{BK}_t – regulated value of using their own funds for the implementation of the PP.

Limiting the quantity of debt ratio (DR) in planning step t has the following form:

$$DR_t = \sum_{j=1}^{N} S^P_{jt} \times X^P_{jt} / \sum_{j=1}^{N} S^B{}_{jt} \times X^B_{jt} \le \psi^{DR}_t \qquad (7)$$

S^P_{jt} - the amount of loan funds, which are used to finance the j product production;

S^B_{jt} – the amount of borrowed funds, which are used to finance the j product production;

X^P_{jt} – variable quantity, which means the volume of product j production from borrowed funds;

X^B_{jt} – variable quantity, which means the volume of product j production from own funds;

ψ^{DR}_t – regulated level of debt and own funds proportion which are used in the PP implementation.

The financial limit on the coverage ratio (KP_t) for PP can be written this way:

$$KP^P_t = \frac{\sum_{j=1}^{N}\left[\left(GMP^P_{jt} - IR^P_{jt}\right)\times X^P_{jt} + \left(GMP^B_{jt} - IR^B_{jt} + C^B_{jt}\right)\times X^B_{jt}\right]}{\sum_{j=1}^{N}\left[\left(AVC^+_{jt} + C^P_{jt}\right)\times X^P_{jt} + AVC^+_{jt} \times X^B_{jt}\right]} \ge \psi^{KP}_t \qquad (8)$$

AVC^+_{jt} – limited cost of product j taking into account the cost of property taxes;

IR^P_{jt} – income from reinvesting funds for product j, financed by borrowed funds;

IR^B_{jt} – income from reinvesting funds for product j, financed from its own funds;

C^P_{jt} – the cost of borrowed funds that are used to finance the product j production;

C^B_{jt} – the cost of own funds that are used to finance the product j production;

ψ^{KP}_t – regulated quantity by the value of PP coverage ratio;

X^B_{jt} – variable quantity, which means the volume of j product production from its own funds;

X^P_{jt} – variable quantity, which means the volume of j product production from its borrowed funds.

4. Conclusions

Analysis of the traditional approaches to the PP formation has shown that they do not contribute to the optimal choice of the enterprise production program as a major component of the enterprise economic potential. Participation of the financial manager in choosing PP brings to the process necessity to consider the factor of time and financial constraints that provide control over the results of the achievement of specific financial objectives in the PP formation.

The financial approach to the PP formation based on the concept of money time value. In the market economy conditions it is necessary to introduce the subject of the

financial management function "Taking part in the selection of the production program" and develop a mechanism for its implementation. The economic feasibility of the proposed approach to the choice of the production program is planned to increase the profit from the sale of products through a more rational use of the limited financial resources of the company, which in turn will lead to greater economic potential.

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