STABLE OPERATION OF FOOD ENTERPRISES IN THE CONDITIONS OF FINANCIAL AND ECONOMIC INSTABILITY

G.V. Alekseev, S.A. Romachikov, A.G. Leu, I.I. Kholiavin

The majority of economic paradigms of the postindustrial society, as one of the basic axioms, are built on the stability and on the financial-economic prosperity of industrial manufacturing. There is no doubt that the enterprises of food production are in the first lines of economic development reports analyzed by economists of all countries for the year. Perhaps, these circumstances are the main reason why the innovative development of industry in these countries is not as acute as in Russia. The acuteness of this problem has intensified in recent years in connection with the so-called "economic sanctions" and objectively overdue issues of the development of new territories for the effective replenishment the main developing industrial manufactures with raw materials.

In the proposed work, the authors made attempts to analyze the responsibility of the state and the administration of food production, a large part of which belongs to the present private business. They act for maintaining the stability of the financial and economic position of enterprises and, thereby, preventing the emergence of conditions for social unrest. As the main indicator of economically responsible for the solution of the task, the authors chose the volume of break-even production. Formulating the task for the computational and graphical analysis of its solutions as the most significant variable parameters, the authors selected: the volume of production of $X(n)$ in the current period, own reserve funds $Сcpc(n)$, borrowed loans $Скр(n)$, proceeds from the sale of previously manufactured products, as well as variable costs $U(n)$), falling on the one product, from the sale of products manufactured in the current period and sold during this period. Conducted calculation and graphical analysis of one of the bakeries located in the regions of the Arctic made it possible to draw very important conclusions: a certain reduction by the state of the value-added tax allows market mechanisms to establish a price of the commodity in which the financial and economic stability of food enterprises will be ensured.

Key words: stability, financial-economic prosperity, food product enterprises, innovative development of manufactures, "economic sanctions", familiarization of new territories

Recent years many domestic industrial enterprises have found themselves in unusual conditions of economic activity. The reason for this was the most different unfriendly steps from foreign partners, dictated by certain political steps of their governments. Firstly this enterprise of food production suffered from it, which in the conditions of the global globalization of the economy became very dependent on the supply of certain types of raw materials and technological equipment. These circumstances have brought additional difficulties for enterprises, whose activities are related to the provision of areas of the Arctic coast of Russia.

In the conditions of stationary conduct of financial and business activities, enterprise management models were usually divided into models that provide planning for the activity of the enterprise, and models that ensure the adoption of decisions on the management of the operation of the enterprise. The planning tasks were solved when determining the output plan, selecting the product range, coordinating the planned indicators with the resources. When analyzing the tasks of the enterprise's operation, the issues of optimizing costs, setting prices, distributing profits, determining sources of financing, accelerating the sale of products, etc., were solved [1-2].

Under the new conditions, with some economic uncertainty of enterprises, one of the main requirements for managing the functioning of an enterprise is to ensure its financial stability, which consists from current solvency and a high level of self-financing. These new requirements need to be taken into account in the structure of economic models of enterprises' interaction in the form of financial and monetary relationships between the economic categories of the objects being modeled. Models should reflect the specifics of the financial and monetary mechanisms of enterprises, the sources of their formation, the feedback between output and sales of products (output of the production model) and production resources (input of the production model). In view of the fact that the sale of products, as a rule, occurs with a shift (time lag) in time (and in some cases is sometimes significant), this feedback reflects the effect of the enterprise's functioning in previous periods of time on its functioning in the current period of time [3].

The tasks of the enterprise management in the new conditions were complicated by the need to study the dependence of the volume of financially - secured output on the price of products and the costs of their production in the event of possible fluctuations in the price of raw materials and components.

Classical models of the functioning of enterprises suggest that the definition of the volume of production of products in a particular enterprise depends on the existing taxation conditions, available financial resources, and the availability of production capacities. The type developed for this purpose of the model depends on the specified conditions, limitations and on accepted assumptions [4].

Let us consider the model of functioning of the enterprise for the sample case: the enterprise produces and releases only one type of products (the same as in the previous year). The production capacity is sufficient to continue the work, and the realization of the produced products takes a considerable time (up to four periods), while the market is studied, stable and there is statistics on the specific weight of sales of products in time after manufacture. The main factor limiting the possible volume of production is the volume of own available reserve funds available at the beginning of the planned period and loans received. The planned interval of time is the one period.

Let us suppose that at the beginning of the period under consideration **n** the enterprise does not have previously paid stocks of raw materials, materials, components, there are no reserves of products. Payments for goods come after it is sold by the buyer. During the period **n**, payments for previously sent and sold products will be received.

For the enterprise there is its own reserved finances **Cсрс(п)** and given loans **Cкр(п)** with payment periods (п + 1), (п + 2), (п + 3)... (п + т). In the period **п** the enterprise is obliged to repay certain part of loans. Material consumption, energy intensity, fuel intensity of production of one product, salary costs, tax rates and mandatory payments to the budget are known [5-7].

When compiling the model for the planned volume of production, the cost of producing products is divided into two groups:

- variable costs, depending on the volume of production, including costs for raw materials, materials, components, electricity, fuel, wages of production personnel, including taxes and mandatory payments to it:

- fixed costs that do not depend on the volume of the produced products (rent for land, premises and equipment overheads, telephone charges, security costs, payments for repayment of previously received loans, payments for electricity, fuel used in the non-productive sphere, wages to non-productive personnel, taking into account taxes and payments to it, the costs of marketing, sales, etc.).

With such division of costs, the financially-secured output of **X (n)** in the period **n** is a fraction of which the numerator is its own reserve funds **Cсрс(п)**, attracted loans **Cкр(п)**, plus receipts in **Z(n)** in the period **n**, and the denominator is the variable costs **U (n)** per one product, minus the proceeds from the sale of products manufactured during the period **n** and the realized ones in the same period, per one product.

Mathematical formalization of the ratio for the volume of production **X(n)**:

$$X(n) = \frac{C_{cpc}(n) + C_{\kappa p}(n) + \sum_{r=1}^{m} X(n-r) \cdot a_r \cdot \text{Ц}^{(1)} - Z(n)}{U(n) - a_0 \cdot \text{Ц}^{(1)}},$$

This dependence is obtained without taking into account the tax on profit, the norm which is denoted by the symbol **(β пр).** Here, in addition to the notations indicated earlier, the following notation is also used:

u_r - the relative relative weight of the products sold in the period (n - d), the proceeds from

which are transferred to the accounts of the enterprise in the accounting period;

Ц(1)) - wholesale selling price of one product;

The recorded ratio follows from the equation of the balance of financial assets, which the enterprise expects to have in the billing period:

$$X(n) \cdot U(n) + Z(n) =$$

$$= C_{cpc}(n) + C_{\kappa p}(n) + \sum_{r=1}^{m} X(n-r) \cdot a_\kappa \cdot \text{Ц}^{(1)} + a_0 \cdot \text{Ц}^{(1)} \cdot X(n)$$

The left part of this equation is the required costs, and the right part is the available funds for the calculation period.

The financial balance equation characterizes the company's ability to purchase all material resources necessary for production of **X(n)** products, pay the labor of the enterprise's personnel, make deductions for compensation of spent basic production assets (for depreciation of equipment and buildings), pay fixed costs enterprises, payments to extra-budgetary funds [8-9].

In the new conditions, an additional study of the model in question is required in cases where it operates at a specific time (actions of sanctions) or for a particular location (for example - Arctic).

Thus, in addition to the traditional task of determining the financially-secured production volume and determining (at the found values of the unit price for variable costs per unit of constant costs) income from sales of products produced during the accounting period, it is necessary to determine total costs, profit, derived from production and futures-accurate volume.

The formulated problem is convenient to study graphically, for which purpose we will construct graphs of the break-even volume of production for the following cases:

- with usual statement of $Z(n)$,$U(n)$ and changing $Ц^{(1)}$ in the limits $0.5* Ц^{(1)}$ до $2* Ц^{(1)}$ with step $ΔЦ = 0.1*Ц^{(1)}$.

- with $Z(n)=$ const and $Ц^{(1)}=$ const and changing $U(n)$ in the limits from $0.5* U(n)$ to $2* U(n)$ with step $ΔЦ = 0.1* U(n)$.

Besides let us define financially secured volume of production with considering VAT, income tax, and both VAT and income tax [10]

Table 1 - Calculation of the break-even volume of production

X(n)	Income	Consumption	Profit	Volume without damages
1342910	308869209	303081921	5787288	1150000

Table 2 - Calculation of break-even production with a change in the selling price of the product

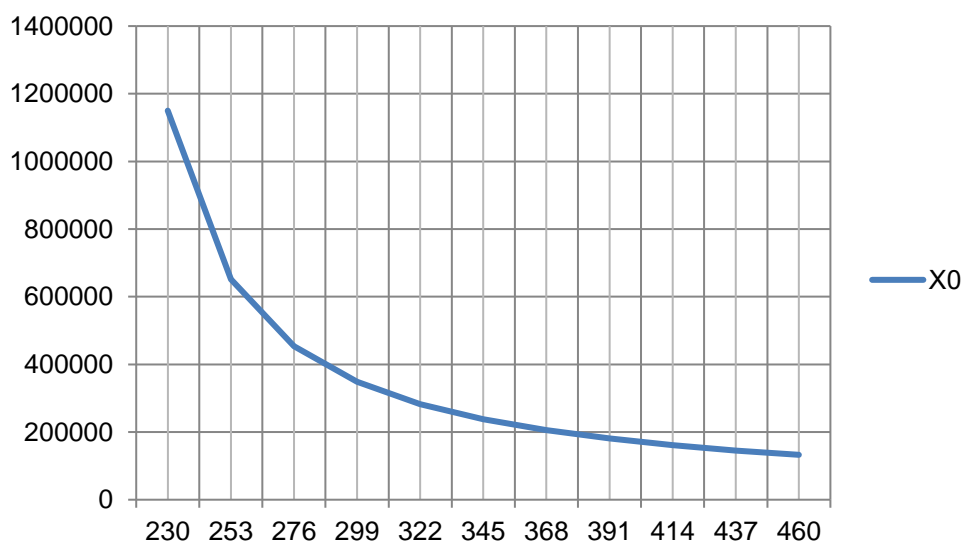|	1	1,2	1,4	1,6	1,8	2
Ц(1)	230	276	322	368	414	460
X0	1150000	453947	282787	205357	161215	132692

Figure 1- Change in the break-even volume of production when the wholesale
price of a product changes

Table 3 - Calculation of loss-free production with variable costs

	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8
U(n)	20	40	60	80	100	120	140	160
X0(2)	164286	181579	202941	230000	265385	313636	383333	492857

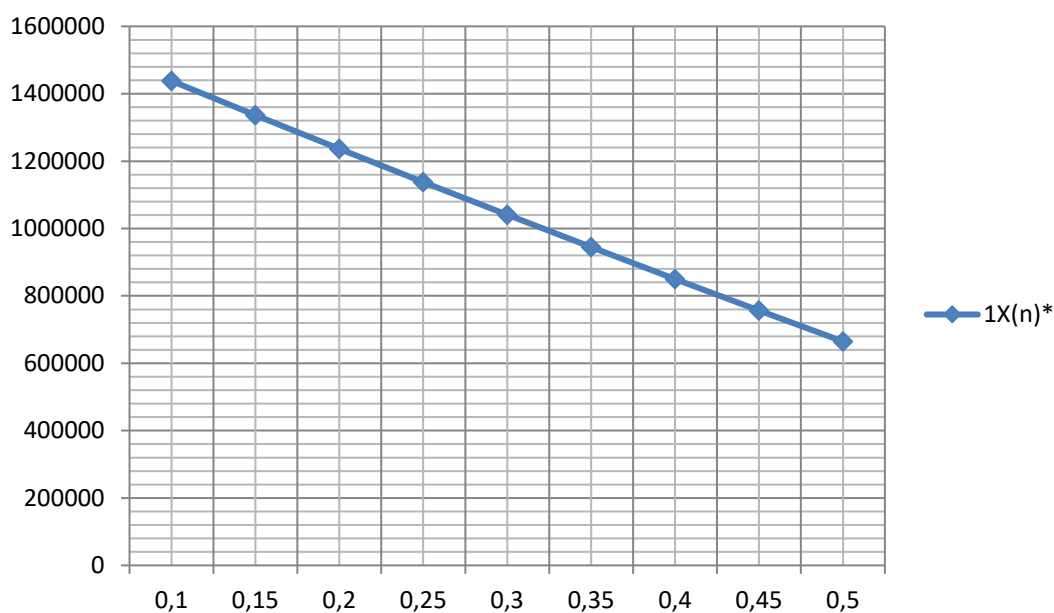G.V. ALEKSEEV, S.A. ROMACHIKOV, A.G. LEU, I.I. KHOLIAVIN

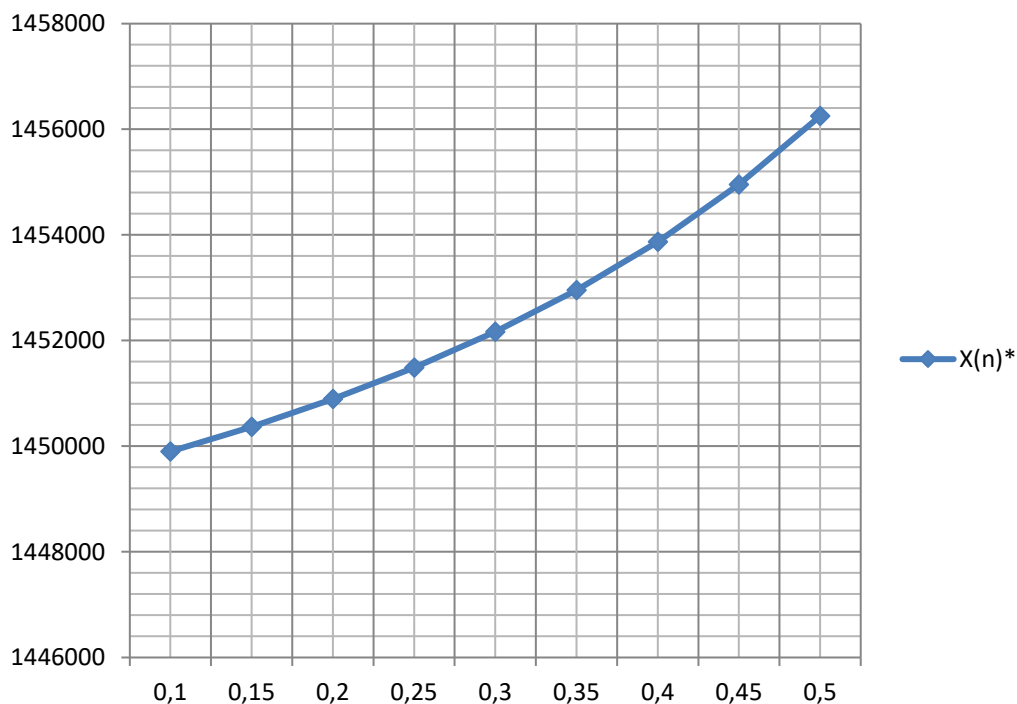Figure 2- Financially-secured production volume with a change in VAT

Figure 3 – Financially - secured production with a change in the income tax

The analysis shows that during the operation of food production in special conditions, it is necessary to apply measures of state regulation, in particular, the reduction of VAT (Fig. 2). This will help to keep the break-even of production at a level sufficient to meet the needs of the population. On the other hand, stable work of enterprises establishes a certain level of production (Fig.1), in which it quite stably works (Fig. 3).

References

1. Bitch D., Medoff J. «Gazells»/Solomon L. C, Levenson A. R. (eds.) Labor Markets, Employment Policy, and Job Creation. Boulder, CO: Westview, 1994.

2. Puchkov V.F., Alekseev G.V., Leu A.G. Ispol'-zovanie innovacij v pishchevyh proizvodstvah v uslo-viyah ehkonomicheskih sankcij. V sborni-ke: Inno-

vacionnaya nauka: proshloe, nastoyashchee, bu-dush-chee Sbornik statej Mezhdunarodnoj nauchno-prak-ticheskoj konferencii: v 2 chastyah. 2016. S. 56-59.

3. Davis S. J. at al. Small Business and Job Creation: Dissecting Myth and Reassessing the Facts/7 Business Economics. 1994. Vol. 29.4» 3.

4. Kirchhoff B. A. Entrepreneurship and Dynamic Capitalism. Westport, Conn: Praeger, 1994.

5. Alekseev G.V., Holyavin I.I., Aksenova O.I. Ispol'zovanie matematicheskogo modelirovaniya dlya ocenki ehkonomicheskoj ehffektivnosti v real'nom sektore ehkonomiki. ZHurnal pravovyh i ehkonomich-eskih issledovanij. 2014. № 3. S. 156-162. Lovelock C. Services Marketing. People, Technology,Strategy. New Jersey, 2001.

6. Birch D. L The Job Generation Process: A Report prepared by the Massachusetts Institute of Technology Program on Neighborhood and Regional Change for the Economic Development Administra-tion/US Department of Commerce. Washington -Cambridge, Mass: MIT Press, 1979

7. Puchkov V. F. Matematicheskie modeli makro-ehkonomiki uchebnoe posobie: uchebnoe posobie dlya studentov, obuchayushchihsya po ehko-nomicheskim special'nostyam / V. F. Puchkov. Gatch-ina, 2010. (Izd. 3-e, pererab. i dop.)

8. Gracinskaya G.V., Puchkov V.F. Region-al'nye osobennosti celenapravlennogo formirovaniya chelovecheskogo kapitala. ZHurnal pravovyh i ehko-nomicheskih issledovanij. 2014. № 1. S. 177-181.

9. Holyavin I.I., Novikov I.V., Leu A.G. Ocenka ehffektivnosti predvaritel'noj podgotovki pri vyrabotke krahmala. V sbornike statej mezhdunarodnoj nauchno-prakticheskoj konferencii: Innovacionno-tekhnolog-icheskoe razvitie nauki: v 3 chastyah. 2017. S. 162-166.

Alexeev Gennady Valentinovich, *Doctor of Technical Sciences, professor Saint Peters-burg State National Research University of Infor-mation Technologies, Mechanics and Optics, De-partment of Process and Equipment in Food Pro-duction, St. Petersburg National Research Uni-versity of Information Technology, Mechanics and Optics, St. Petersburg, Russia,* e-mail: gva2003@mail.ru

Romanchikov Sergey Aleksandrovich, *Candidate of Technical Sciences, Doctoral stu-dent, Military academy of logistics, St. Peters-burg, Russia, e-mail:* ro-manchkovspb@mail.ru.

Leu Anna Gennadyevna, *Undergraduate, Department of Process and Equipment in Food Production, Saint Petersburg State National Re-search University of Information Technologies, Mechanics and Optics, e-mail:* anna.ieu@mail.ru

Kholiavin Ivan Ivanovich, *Candidate of Physical and Mathematical Sciences, Asso-ciate Professor, State Institute of Economics, Finance, Law, and Technology, 188300, Leningrad Re-gion, Gatchina, st. Roshchinskaya 5.*