ANTIKRIZISNYY MONITORING OF FINANSOVO-EKONOMICHESKIKH INDEXES OF WORK OF ENTERPRISE

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1. ABSTRACT

In the article the questions of warning of the crisis phenomena are considered on machine-building enterprises. The complex of mathematical functions which design production and market situations on an enterprise is offered. The use of suggestions of authors will help machine-building enterprises to diagnose a crisis on his early stage, to carry out monitoring of innovative activity, design a market situation, forecast the market state of affairs.

Production and commercial activity of machine-building enterprise in a greater or less degree characterize great number of the most different indexes which can part on different groups. As it appears us in the context of the research conducted by us, it is necessary to select two basic group of indexes which are mainly determining at the estimation of level of production and enterprise activity of enterprise and his financial stability:
 a.   indexes of market success of products of enterprise in this period of time;
 b.   indexes of production and financial stability of enterprise.

The existent base of scientific researches recommends and in the group of «a» and in the group of «b» far of indexes and descriptions, to take into account which in a number of cases or in general is not possible or this account carries in itself a considerable error and inaccuracy, leading in the total on occasion to the erroneous conclusions. In this connection chosen by us, appraised and grounded with each of the groups indicated higher only for two index, which, in our view, allow in the total to do fully reliable conclusions and recommendations.

From the indexes of group of «a» we are select the indexes of production and volume of realization of products volume and their intercommunication on every stage of the examined period of time. From the indexes of group of «b» is an index of account receivable, that volumes of financial debt this enterprise by his debtors, and index of the extended account payable, that volumes of financial debt of this enterprise to the creditors, in the budget of the state and it to the workers as a salary.

Research of co-operation of the indicated indexes during the certain period of time allows to define objective tendencies in the change of level the capacity of concrete enterprise, enables to estimate the prospects of his steady stable development. At the same time, the indexes selected by us are used in different cross-correlation dependences, describing the static state and dynamic prospects of development enterprises, the type of which is in a great deal determined the level of range ability of production activity of enterprise, his production program, size of produced unit cost.

For the estimation of the state of production activity of machine-building enterprise it is suggested to use the mechanism of co-operation of the indexes chosen by us from the group of «a» and groups of «b» for period of time equal to one year.

As it appears us, description of production activity of machine-building enterprise can be got with the use of function of $F1$, forming of which has a two variant algorithm:

First variants: $\quad\quad\quad F_1 = tg\ [\pi\ (y - x)/4\ y],\quad$ *if* $x > y.$ $\quad\quad$ (1)

Second variants: $\quad\quad F_1 = tg\ [\pi\ (x - y)/4x],\quad$ *if* $y > x,$ $\quad\quad$ (2)

where x - is a production of goods volume, thousand of Uah.; y - is a volume of realization of products, thousand of $.
Certain limitation of this function is that a condition must be observed in both variants $(y + x) > 0$. It means that the offered function of $F1$ in both the varieties supposes the analysis of Production and commercial activity only production active enterprises, that necessarily carrying out production and (or) sale the independently made products.

Taking into account some transformations of function of $F1$, its varieties (1) and (2) assume an air more comfortable for a research analysis and economic interpretation of separate values of this function:

First variants:

$$F_1 = tg \quad \frac{\pi}{4} \left(\frac{y - x}{y} \right) \rightarrow \quad y > x \quad , \qquad (3)$$

A function is certain in an interval   [0; 1].

Second variants:

$$F_1 = tg \quad \frac{\pi}{4} \left(\frac{y - x}{x} \right) \rightarrow \quad y < x \quad . \qquad (4)$$

A function is certain in an interval   [-1; 0].

Will conduct research of economic essence of the function of *F1* offered for an analysis, and also will offer economic interpretation separate most interesting its values. At the construction of function of *F1* we came from a parcel, that this function must reflect the basic variants of co-operation of volume production (*x*) and volume of realization of products (*y*). In the offered kind the function of *F1* characterizes both successful work of machine-building enterprise (subject to condition *y > x*) and presence of certain market problems in his work (on condition of *x > y*). The indicated difference between a production volume and volume of realization of products can be used as a certain rate fixing depending on the values of õ or at.

A choice for the function of *F1* of tangential analytical dependence allows to limit to the area of values of this function the interval [-1; +1] and by virtue of non-linearity of function of *F1* there is possibility to watch the gradient of change of production of goods or volumes of realization of products volumes at the market. In particular, it is possible to forecast the intervals of falling of production (at *x → 0*) or volume of sales volume (*y → 0*).

Thus, coming from described higher than parcels, range of values of function of *F1* characterized by the next characteristic states economic interpretation of which can be taken to the following.

1. ***F1 = (-1).*** Such value this function can take on an at the followings values of arguments: *y = 0, x > 0*. A situation on a machine-building enterprise, which answers this value of function of *F1*, reflects such position, when the production of goods which now by virtue of certain reasons a market does not perceive is carried out, that realization of products absents. All produced products leaves on storage and fills up ware-house supplies. Such production and commercial being of businesses in an enterprise it is suggested to name «orientation on storage». Expedience of such state of enterprise in a number of cases is determined the brief sharp market vibrations of the commodity state of affairs and can be used at presence of certain supply of financial stability of enterprise, because work «on storage» results in the substantial increase of circulating assets. Temporal

scopes of the state of enterprise «orientation on storage» usually not wide (within the framework of one quarter) and determined production (by the level of rangeability of the production program) volumes, level of costs of production and possibilities of enterprise to finance the increase of circulating assets. Efficiency of the state of enterprise a «orientation on storage» consists of the forecast sharp improvement of practically all basic indexes of work of enterprise at the offensive of the growing market state of affairs and presence in this period of certain «commodity advantage» before competitors. Except for it, a «orientation on storage» allows to create certain insurance from the different sort of production and commercial complications: a market presence of enterprise will be solid even in case of brief stopping of production ($x = 0$), all contractual relations an enterprise will satisfy with the use of ware-house supplies.

2. **-1 < F1 < 0.** Such value this function can take on an at the followings values of arguments: $x > y$, that production of goods volumes exceed the volumes of its sale in a money equivalent. Such situation on a machine-building enterprise reflects one or a few from the followings states:
   - an enterprise makes experimental parties of products and with their help carries out the «trial» marketing of market;
   - a dynamics of conjuncture correlations at the market of this commodity is in the falling
     stage (suggestion exceeds demand, a market equilibrium is broken, part of products remains
     unclaimed users);
   - this commodity is on the early stages of the life cycle and coming an enterprise to carry out the considerable complex of marketing's communications (advertising, stimulation, personal sale etc.) with the purpose of substantial increase of demand on the products or to expect the results of already realizable marketing's communications. The unrealized part of the produced products fills up ware-house supplies in expectant of sharp growth of market demand;
   - this commodity is on the final stages of the life cycle and coming an enterprise to carry out conclusion of this good from a market and replacement of him more perspective and more progressive an analogue, satisfying the changing necessities of users at more high level.

   Being of businesses in an enterprise, proper the interval value of function of *F1* from «-1» to «0», requires the special attention of higher management and operative reaction. Ignoring of the folded situation, in majority from the cases considered higher, inevitably can result in the followings economic consequences:

to the exceeding a norm overstocking of storage facilities and their ineffective use;

- to «washing» of circulating assets of enterprise and decline of level of flexibility of reacting on the changes of market situation;
- to appearance of debts before creditors, in a pay-envelope to the personnel, to deductions in the state and local budget etc. (it already is the first signs of increasing crisis on an enterprise);
- to worsening of prospects of further effective production and commercial activity of enterprise.

3. **$F_1 = 0$.** It is a very favorable situation on a machine-building enterprise, which answers this value of function of F_1. It reflects such position, when a production of goods volume exactly corresponds the volume of sales the same products ($x = y$), that a market of this commodity is in a state of equilibrium. To such state usually and all subjects of market aim, because preeminently in such position on an enterprise there are no problems and it definitely skims the «creams» from a market. In general case it is an enough favorable situation at this commodity market, however on occasion after this seeming calmness can hide the certain expected negative tendencies. At first, the situation of market equilibrium answers the central stages of life cycle of commodity more frequent than all, after which inevitably the period of decrease in demand will come and main is not to miss out this moment and be to it ready. Secondly, it is necessary to prepare the update innovative version of good-analogue, which in a greater measure will correspond the future (already changing) necessities of market. As a rule, it enough difficult in a scientific, production and market relation work and failures to complete in this direction can substantial appearance affect future successes of enterprise. And, finally, thirdly, it is necessary expressly to understand that, whether this production (accordingly, and volume of sales) of goods volume answers to production potential of enterprise, whether the commercial aims of enterprise are attained on this top-level position of his production program, whether not in use production capacities and unrealized market possibilities do not hide after such happy state. In fact accordance the state of arguments of $x = y$ can take place and at, for example, to the 10-percent load of production capacities, that not nearly reflects positive tendencies in the folded economic state of enterprise.

4. **$1 < F_1 < 0$.** It is a very favorable situation also, when enterprise and market of his products develop successfully, that the volume of sale exceeds a production volume ($y > x$). In this situation takes place:
- growing commodity market the capacity of which with every temporal interval is increased;

- more suitable for the economy of enterprise the growing stage in the dynamics of the market state of affairs;
- positive influence on the value of function of $F1$ of favorable terms of competition at the market.

A situation which is analyses allows an enterprise successfully to realize not only current products but also its supplies from storage, accumulated in less favorable periods in activity of enterprise (for example, in those situations, when value of function of $F1 = (-1)$ - first from the situations considered higher). Research and analysis of such situation allows to expose some dangers which are unobvious present at the market. For example, a growing market can be dissatisfied production possibilities of this enterprise, the therefore appearing deficit of products inevitably will influence on appearance of new enterprise, that in the total will result in the future toughening of competitive activity at the change of present conjuncture correlations.

5. **$F1 = 1$.** Such value this function of $F1$ can take on an at the values of arguments: $x = 0, y > 0$. It means that a manufacturer by virtue of certain reasons does not produce this products (an enterprise can not nearly works, there can be a model in a certain measure outdated and taken off from a production, an enterprise is temporal reformed on the issue of other model more asked at the market, on an enterprise strike etc.), and execution of prisoners before agreements and satisfaction of nascent or remaining necessities an enterprise as far as possibilities carries out with the use of the ware-house supplies. A situation from the anti is a crisis point of view is in a certain measure threatening, because:
- the present at disposal of enterprise ware-house supplies of this products can quickly dry up;
- an enterprise will appear outside active market operations, that inevitably will result in the losses of markets of sale;
- it can very credible be different family economic approvals for the nonperformance of contract obligations;
- crisis processes develop intensively, if an enterprise does not undertake the special anti is a crisis measures, allowing to pick up thread the production of this goods.

Thus, the area of calculation values of function of $F2$ allows to analyses and estimate work of machine-building enterprise on a production and realization of the products, to carry out the permanent production monitoring of the activity, in time to warn undesirable tendencies both on an enterprise and at the market of his products. If monitoring control of values of function of $F1$ determines its aspiring to the value to (-1), then it means that enterprise not enough efforts puts to activation of sale operations. Aspiring of function of $F1$ to the zero testifies to stable enough work of enterprise, and when tendencies of approaching of value of function of $F1$ are to (+1) – on an enterprise steady

pre-conditions of falling of production of this goods volumes were set. The basic point and interval values of function of *F1* and their economic descriptions, in detail considered by us higher, are presented in Table 1.

Table 1
is Economic description of area of values of function of *F1*

Name of tendencies	Value of function of *F1*	Value of arguments		State of enterprise and his market (description of tendencies)
		x	y	
Orientation on storage	$F_1 = (-1)$	$x > 0$	$y = 0$	The produced products are not for sale at the market and fills up ware-house supplies.
Difficulties at the market	$(-1) < F_1 < 0$	$x > y$	$y < x$	Production of goods volumes exceed the volumes of its sale in a money equivalent.
Equilibrium	$F_1 = 0$	$x = y$	$y = x$	Most favorable situation on an enterprise. A production of goods volume exactly corresponds the volume of its sales (state of market equilibrium).
Growing market	$1 < F_1 < 0$	$x < y$	$y > x$	Favourable situation, when enterprise and market of his products develop successfully
Stop of production	$F_1 = 1$	$x = 0$	$y > 0$	A manufacturer does not make this products, and on implementation of the obligations uses the ware-house supplies of commodity.

At the same time, as it appears us, use in the anti is a crisis monitoring only values of function of *F1* is necessary, but by the not sufficient condition of receipt of objective and reliable information about an existent situation on an enterprise. In this connection, another monitoring function of *F2*, reflecting the external financial mutual relations of enterprise-manufacturer with the contractors, is offered to the use. Economic maintenance of this function can be taken to the next parcels. In basis of forming of function of *F2* it is suggested to put the indexes of production-financial stability of enterprise in a market environment, in particular, debtor-creditor correlations. In this case it is suggested in the index of account receivable to take into account the volumes of financial debt this enterprise his debtors (traditional going near forming of this index), and to interpret the index of account payable in more extended, a few different from traditional formulation sense. It is suggested to the account payable to take the volumes of financial debt of this enterprise the creditors, and also debts of enterprise in a budget (state and local) and it to the workers as a salary.

The analysis conducted by us retuned that in a most degree answers description of dynamics of the indicated indexes and variants of their co-operation, as it will be retuned by us below, analytical function of cotangent. Taking into account the parcels resulted higher an analytical type of the offered function of *F2* will be following:

$$F_2 \; = \; \frac{4}{\pi} \, arctg \; \left(\frac{\alpha \; - \; \beta \; - \; \gamma \; - \; \eta}{\sqrt{\alpha^2 \; + \; (\beta \; + \; \gamma \; + \; \eta)^2}} \right)$$

where α - it is an account receivable of enterprise, thousand of \$; β - it is an account payable, thousand of \$; γ - it is a debt of enterprise before a budget, thousand of \$; η - it is a debt of enterprises on a salary the personnel, thousand of \$.

The function of *F2* is intended for the objective and reliable estimation of the financial state of concrete enterprise, to expose and describe exception financial conditions on an enterprise (taken and not returned credits, that $(\beta \; + \; \gamma \; + \; \eta) > \alpha$; an enterprise plays role of financial investor, when $(\beta \; + \; \gamma \; + \; \eta) < \alpha$.

Choice of function of arctangent of cconditioned more exact and by more objective analysis of situation, when a sum $(\beta \; + \; \gamma \; + \; \eta)$ aspires to the value α, and on the whole the function of *F2* aspires to the zero. Also the choice of type of analytical function of arctangent instrumental in circumstance that it in a greater measure is added rate fixing in the interval of values [-1; +1].

The analysis of area of values of function of *F2* conducted by us allows to select and ground the row of characteristic situations in financial activity of machine-building enterprise.

1. **F2 = (-1).** Such value this function can take on an at the value of account receivable equal to the zero ($\alpha = 0$). A situation on a machine-building enterprise, which answers this state of enterprise, talks that an enterprise works in the mode of account payable, but here no financial obligations before this enterprise at none of his production and commercial partners are present. It is necessary to establish circumstance that work of industrial enterprises in the mode of account payable is most ordinary, however, here at enterprises, as a rule, there are partners which must this enterprise. The examined situation is considerably more difficult, because in this case the question is about an absolute account payable, which without radical interference with an economic situation already abuts upon bankruptcy of enterprise.

2. **-1 < F2 < 0.** Such value of the probed function corresponds the area of its values, where total accounts payable of enterprise exceed the total obligations of debtors of enterprise, that $(\beta \; + \; \gamma \; + \; \eta) > \alpha$. In this situation an enterprise requires a certain economic revival, because the real financial situation shows certain complication at the decision of question of payment of creditor obligations. This position is not something original,

it is an ordinary situation (usually creditor obligations can be anymore or less than debtor). An enterprise a not fact exceeding of account payable above a debtor, but size of this exceeding must fluster Δ ($\Delta = (\beta + \gamma + \eta) - \alpha$). What anymore value Δ, the nearer value $F2$ to (-1). In this connection, as it appears us, there is a certain confiding area of values of function of $F2$, which a happy economic situation can in a greater or less degree correspond on an enterprise, the analysis of financially-production indexes of which is conducted. Within the framework of this confiding area the deficit of balance of payments of enterprise does not cause the special fears. For example, such area can be a great number of values of function of F2 in an interval [-0,5 < $F2$ < 0], that mainly corresponds practice of work of most machine-building enterprises Charkov and Charkov area.

3. **$F2 = 0$.** Such situation characterizes self-supporting ness of pay possibilities of concrete enterprise – the debts of enterprise correspond debts before an enterprise, that $(\beta + \gamma + \eta) = \alpha$. Such position in relative sense is fully acceptable, the additional analysis of the folded situation is however needed on the followings parameters:

   - the absolute sizes of financial obligations of enterprise are which before creditors;
   - the real possibilities of return of account receivable are which on terms and volumes;
   - in what correlation terms are volumes of receipt of debts and settling debt;
   - the real financial possibilities of enterprise are which on payment of obligations under credits without the account of present account receivable.

   The indicated parameters will help more exactly to estimate a financial situation on an enterprise, which can be critical even at $(\beta + \gamma + \eta) = \alpha$, and can be fully happy even on some leaving of value of function of $F2$ outside a confidence interval [-0,5 < $F2$ < 0].

4. **$1 < F2 < 0$.** Such area of values of function of $F2$ corresponds the successful enough functioning of enterprise. It practically jam-free settles accounts on the creditor obligations, though has on occasion substantial debts from the side of the contractors, that $(\beta + \gamma + \eta) < \alpha$. However, in some situations and such position of enterprise does not allow to count him to a full degree successful. To the indicated correlation of arguments of function of $F2$ could bring not quite positive tendencies over in-process enterprise. To them follows, for example, to take:

   - innovative stagnation of enterprise (dread to take credits by virtue of large interest rates or not enough positive market prospects of object of crediting);

- low business reputation of debtors is enterprises which exceeded a time limit payment of debtor debts and prospect of their receipt in the nearest prospect enough misty;
- an enterprise practically does not have free financial resources and mainly counts the debtors on honesty.

5. **F2 = 1.** Such value this function of *F2* can take on an at the followings values of arguments: an enterprise does not have an account payable, that to nobody nothing it must - $(\beta + \gamma + \eta) = 0$, $\alpha > 0$. In our view, it in a financial relation the friendliest to the enterprise situation. An enterprise has all begun to work facilities possibility to inlay in perspective from his point of view investment and innovative projects, diminishing the profits on the sum of debts is not needed. At the same time, as it appears us, to the ideal state of production and commercial activity here also yet far. Circumstance that an enterprise does not have credits in general, talks that it uses for maintenance of the activity and innovative development only the personal funds. These resources more frequent than all are limited and does not allow to a full degree to realize considerable investment and innovative projects, that weakens both production and market possibilities of enterprise definitely. A receipt of the credit financing in many cases is the extraordinarily progressive phenomenon and ignoring of this sourcing of the activity very often does not do an enterprise stronger and weakens his financial stability.

Thus, the area of calculation values of function of *F2* allows to analyses and estimate the financial indexes of work of machine-building enterprise, carry out the permanent financial monitoring of the activity, in good time to warn undesirable tendencies both on an enterprise and at the market of his products. If monitoring control of values of function of *F2* determines its aspiring to the value to (-1), then it means that total accounts payable of enterprise exceed the total obligations of debtors of enterprise which can be functions not on facilities substantially, having an excessive volume of creditor obligations. Aspiring of function of *F2* to the zero testifies that within the framework of certain confiding area the deficit of balance of payments of enterprise does not cause the special fears. When tendencies of approaching of value of function of *F2* are to (+1) – on an enterprise steady pre-conditions were set there is the enough successful functioning. The basic point and interval values of function of *F2* and their economic descriptions, in detail considered by us higher, are presented in Table.2.

Table 2
is Economic description of area of values of function of F2

Name of tendencies	Value of function of F2	Value of arguments		State of enterprise and his market (description of tendencies)
		α	$\beta+\gamma+\eta$	
Creditor pit	$F2 = (-1)$	$\alpha = 0$	$(\beta+\gamma+\eta)>0$	Accounts payable have absolute character, a situation on an enterprise abuts upon bankruptcy
Dangerous credits	$F_2 = (-1)$	$\alpha<(\beta+\gamma+\eta)$	$(\beta+\gamma+\eta)>\alpha$	An enterprise lives not on facilities, having an excessive volume of creditor obligations
Balance of payments	$(-1) < F_2 < 0$	$\alpha=(\beta+\gamma+\eta)$	$(\beta+\gamma+\eta)=\alpha$	Self-supporting ness of pay possibilities of concrete enterprise
Successful work	$F_2 = 0$	$\alpha>(\beta+\gamma+\eta)$	$(\beta+\gamma+\eta)<\alpha$	Successful enough functioning of enterprise
Potential investing	$1 < F_2 < 0$	$\alpha >0$	$(\beta+\gamma+\eta)=0$	All begun to work facilities are inlaid in innovative development of enterprise projects

The use for the anti is a crisis monitoring of financial and production indexes of work of machine-building enterprises of functions of *F1* and *F2* gives the positive results. However, each of the indicated functions reflects the results of consisting of separate sphere – by a production or financial, which, in spite of their major value in activity of enterprise, have autonomous enough spheres of influence. Therefore, as it appears us, the complex anti is a crisis monitoring of financial and economic indexes of work of machine-building enterprise can be carried out only with the simultaneous (integral) use of functions of *F1* and *F2*. For achievement of this purpose it is suggested to use the cartesian system of co-ordinates (cartesian phase plane), the rate fixing of axes in which will be carried out with the use of values of functions of *F1* and *F2*. In connection with that area of values limited each of the functions of *F1* and *F2* examined by us by values +1.-1, it means that internal points of square $(-1) \leq F_1 \leq (+1)$; $(-1) \leq F_2 \leq (+1)$ engulf all variety of joint values of functions of *F1* and *F2*. Defining in every concrete moment of time the value

of these functions we find on a phase plane a point and depending on its location can do economic comment of the production-financial state of enterprise.

Monitoring of values of functions of *F1* and *F2* during a few years (quarters, month, ten-day periods et cetera) one by one and enables a that enterprise to watch the change of position of integral estimation on a phase plane (motion of integral point into a square) and the same estimate tendencies in the change of the state of businesses on an enterprise and, that is extraordinarily important, to estimate efficiency of the efforts undertaken on an enterprise on the improvement (to strengthening) of production-financial situation.

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