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THE MECHANISM OF THE ESTIMATION OF SUSTAINABLE DEVELOPMENT OF ENTERPRISES OF THE INDUSTRIAL COMPLEX

Theoretical and methodical bases of the mechanism of the estimation of sustainable development of the enterprises of an industrial complex are considered in the article. The offered mechanism of an estimation of sustainable development will allow estimating achievements of the enterprises and its divisions, the responsibility centres on one indicator synthesising all aspects of activity of the enterprise.

The domestic enterprises of an industrial complex show a wide spectrum of variants of the behaviour which are generally based on the aspiration to sustainable development. The experience of the organisations succeeding in conditions of the market convince that for their sustainable development is necessary a set of such properties as flexibility and speed of reaction to market condition changes, competitiveness of production and manufacture, investment activity, high liquidity and financial stability, wide use of innovative factors for self-development. The main point is how to provide the transition of the enterprise to a sustainable development in a combination to global processes.

In the scientific literature questions of sustainable development of the enterprises are considered widely enough. The main principles and approaches to the decision of the problems of sustainable development with reference to various branches and complexes are developed by A. G. Aganbegjanom, A. G. Granbergom, I. P. Smartly, V. A. Koptjugom, D. S. Lvovym, N. N. Nekrasov and others.

At the same time many questions remain unresolved in a domestic science, and the western experience demands careful reconsideration and the analysis and in the most cases does not correspond to conditions of transitive economy.

The analysis of the problem of stability of the industrial enterprise has shown that the research in this field is conducted intensively enough, but the attention of researchers is concentrated basically on its financial and economic aspects, though stability is a complex category which cannot be reflexion of only one aspect of activity of the enterprise.

The problem of an integrated estimation and maintenance of steady functioning of the industrial enterprises, especially in the conditions of globalisation of world economic communications are caused by the following reasons.

At first, the problem of maintenance of steady functioning of the enterprise is difficultly predicted, and danger of instability exists always, especially, if it is caused by the macroeconomic factors which are difficultly giving in to regulation from outside of the enterprise. Secondly, carrying out of an estimation of stability of functioning of industrial activity is necessary not only at the level of the enterprise, but also in the system of branch and regional development.

The conducted research of an estimation of sustainable development on an example of the industrial enterprise of Open Joint-stock Society "Pinema", allowed offering methodical recommendations about formation of a complex estimation of economic stability.

It is necessary to notice that the theme of the research in the conditions of globalisation of world ecenomic communications, economy transition to new market relations, of the increase of level of a competition on internal and foreign markets, necessity of maintenance of economic safety both the separate enterprise, and the state as a whole is actual and demands the further working out.

The interest of the participants of economic process to objective and trustworthy information about productivity of financial and economic activity of the enterprise essentially increases in the conditions of market economy. The paradigm of operation of the enterprise is based on its perception, as a difficult system. The increase of quantity of objects of management and indicators of their estimation, leads to complication of problems of management, therefore it is expedient to estimate achievements of the enterprises and its divisions, the responsibility centers on one any indicator synthesising all aspects of activity of this object. However the inconsistency of allocation of any one productive indicators as the core from among generalising, is caused by complexity of industrial-economic activities. As a result the problems of an efficient control are reduced to the definition of a complex estimation of economic activities on the basis of a system of indicators with aggregation of various receptions of the qualitative and quantitative analysis.

The problem of formation of complex estimations of stability development of the industrial enterprises consists that generally the information about the enterprise characterises variety of the economic objects OB_k presented by set of subobjects SUB_r described by indicators P_i, each of them in its turn accepts value N_j depending on set of factors F_m. It is necessary to notice that factors F_m in dependence on level of their consideration at analysis are subdivided into factors of the first, the second and following usages. The choice of this or that order is defined by necessary depth of the economic analysis [11, p. 123]. The area of changes k, i, j, r, m depends on concrete economic object (enterprise) (fig. 1).

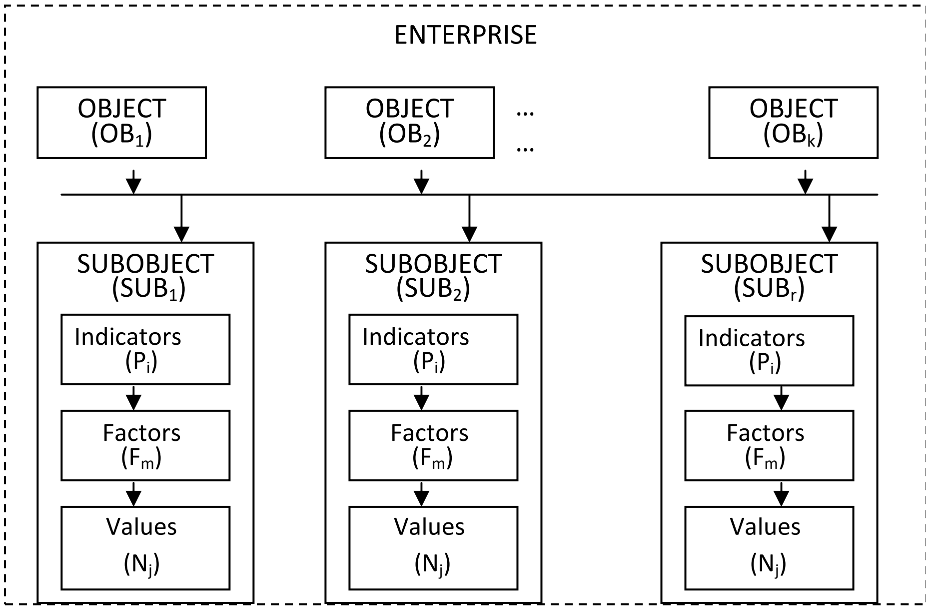

Fig. 1. Representation of economic objects of the enterprise

The example of various objects ($OB_к$), subobjects (SUB_r) and indicators (P_i), giving the information on productivity of financial and economic activity of the enterprise is resulted in table 1.

The quantity of indicators P_i used at the enterprise can reach now some tens and even hundreds that it makes the analysis of financial and economic activity of the enterprise difficult enough [9, p. 107]. Therefore for the analysis it is expedient to generate one or several indicators synthesizing in almost all aspects of activity of enterprise [4].

Such indicators are reflected in a *complex estimation (a summary indicator) J*, representing the characteristic received as a result of simultaneous and coordinated studying of set of indicators P_i, depending on factors F_m.

By a complex estimation of efficiency of industrial-marketing and financial and economic activity of one enterprise can be compared with efficiency of activity of other enterprises. Various methods, such as the sums of places, distances, a target estimation, etc. [8] are used for formation of a complex estimation.

Along with advantages of the specified methods, there is a number of lacks:

– the choice of concrete indicators from all their set P_i for formation of a complex estimation is not proved;

– the choice of weight factors of indicators is not proved at calculation of a complex estimation;

– the choice of final function of calculation of a complex estimation is not proved;

– the analysis of influence of factors F_m on dynamics of complex estimation J is not carried out.

Table 1

Objects, subobjects and indicators

Objects ($OB_к$)	*Subobjects (SUB_r)*	*Indicators (P_i)*
The basic means	The basic means of a principal view of activity, active part of the basic means, the equipment	Validity factor, updating factor, fundefficiency, fundprofitability, fundequipment
Labour force	The enterprise personnel, the personnel of a principal view of activity, workers	Numbers, working hours fund, average development of the worker, profitability of the personnel
Payment	Kinds of payments from a wages fund, a wages fund on categories of workers	The sum of payments from a wages fund by kinds, an average wages, factor of an advancing of rates of increase of labour productivity over rates of increase of wages, profit on wages fund rouble
Material resources	Kinds of materials, material expenses	Factor of rhythm of receipt of materials, materialcapacity, materialefficiency
Expenses	Products, articles of expenses under articles of accounting and economic elements	The product cost price, the sum under separate articles of expenses, expensescapacity
Release and realisation of products	Kinds of released products	Volume of release and production realisation, factor of rhythm of output, level of realisation of production
Money resources	Articles of receipt and the expense of money resources	Positive, negative and pure monetary stream, profitability of a pure monetary stream, turn over money resources
Taxes	Types of taxes	The general level of tax loading, level of tax loading on the cost price, a gain, profit
Financial results	Kinds of products	Profit from product realisation, profitability of expenses, profitability of sales
Financial condition	Solvency of the enterprise, financial stability of the enterprise	Factor of current liquidity, factor of provision with own circulating assets, factor of financial independence

For elimination of the specified lacks we will use available author's approaches to an estimation of productivity of financial and economic activity of the enterprise [8, p. 11]. So, it is offered two models of formation of complex estimations of economic stability of the enterprise, which results mutually supplement each other.

The first model can be used for formation of a complex estimation of the enterprises as a whole, and its separate divisions or objects $OB_к$, and it does not dependent on a branch accessory of the enterprise.

The second model is applicable only for the enterprise as a whole, thus it depends on its branch accessory (the industry, agriculture, trade, building etc.).

Let's consider methodical bases of a complex estimation of economic stability on offered models.

The first model of formation of a complex estimation of economic stability provides the following stages:

– formation of indicating spaces P ` indicators $P_i$, $P_i$ € P `;

– formation of reduced indicating spaces $P`_{red}$, $P`_{red}$ € P `;

– formation of normalized reduced space $P`_{norm}$, $P`_{norm} \sim P`_{red}$, $P_{norm\ i} \sim P_i$;

– definition of factors of importance K_i of indicators $P_{norm\ i}$;

– calculation of complex estimation J_1 (fig. 2).

At the first stage there is a formation of indicating spaces P `, i.e. formation of system of indicators P_i characterising all aspects of activity of the enterprise and calculation of their values N_j in the necessary historical period (days, months, quarters, years) in the form of a database. The greatest possible quantity of indicators P_i which characterise such objects $OB_к$, as the basic means, a labour force, a payment, material resources, expenses, release and production realisation, taxes, money resources, financial results, a financial condition, etc. [4, 5, 6] is thus used.

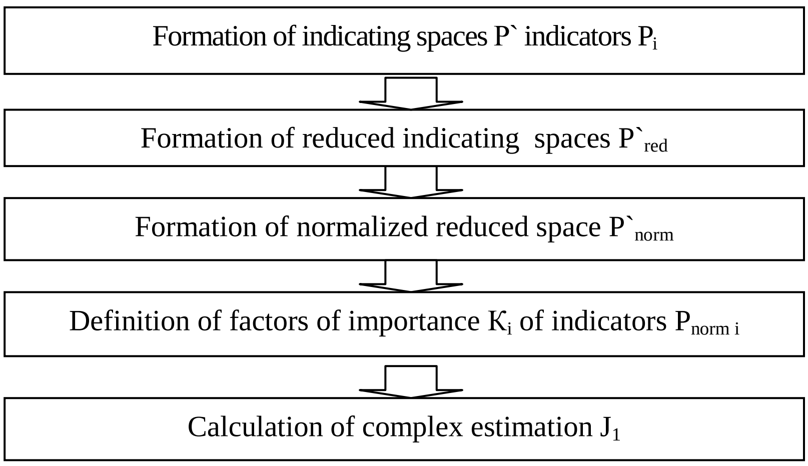

Fig. 2. The first model formation of a complex estimation

At the second stage it is formed reduced indicating space $P`_{red}$, $P`_{red}$ € P ` i.e. those indicators which most informatively describe aspects of activity of the enterprise interesting an analyst are selected. Selection occurs with methods of the natural, artificial and combined intelligence, and also statistical methods and mathematical programming [2, 3, 10] (fig. 3).

Using methods of pair correlation factors of pair correlation r_{ij} indicators $P_{i,}$ for example, pay off the factors of pair correlation r_{ij} indicators P_i and their some threshold value τ is set. According to a scale of Cheddoka it is more expedient to use value $\tau = 0{,}3$ [8]. From the further consideration those indicators $P_{i,}$ for which it is carried out $r_{ij} > \tau$ are excluded and for everyone r_{ij} $_{the}$ expert chooses the most important indicator from the remained indicators on its point of view. Thus, a number of indicators P_i, which are almost independent from each other and form reduced indicating space $P`_{red}$, is left . It is necessary to notice that at small number of indicators $P_i$ and a rather small amount of objects $OB_к$ experts usually successfully form reduced indicating space $P`_{red}$. At increase of quantity of objects $OB_к$ and especially indicators P_i the decision of the problem, however, considerably becomes complicated [2, 8, 10].

At the third stage formation of normalized reduced space $P`_{norm}$ is carryed out. Rationing allows to lead to a uniform scale such diverse indicators P_i as, for example, validity factor, middle age of the equipment advanced in years, fundprofitability in percentage and fundefficiency in millions roubles etc. Thus before rationing it is expedient to apply the rule «of three sigm» to dispose of the casual values $P_{i,}$ belonging $P`_{norm}$.

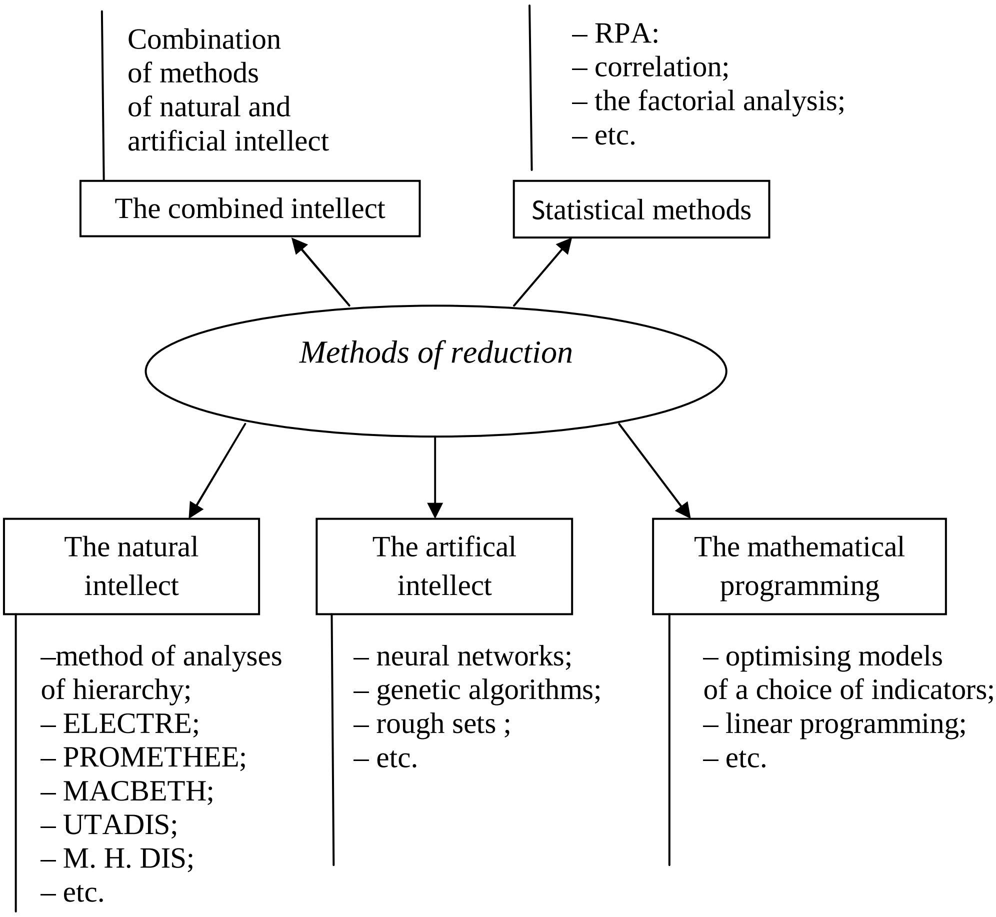

Fig. 3. Methods of a reduction of space of indicators

It is standard in the mathematician to result different sizes in a dimensionless (standard) interval [0; 1], and models of linear, nonlinear, statistical rationing [12] can be used for rationing. The linear model, where direct and return rationing is applied in dependence on an orientation of dynamics of indicators, is more often used.

Direct rationing is applied in a case when growth of indicator is considered as the positive tendency:

$$P_{norm\ i} = (P_i - P_{min}) / (P_{max} - P_{min}), \quad (1)$$

where $P_{norm\ i}$ – normalized value of indicator P_i; P_{min} – the minimum value of indicator P_i; P_{max} – the maximum value P_i.

Return rationing is used in a case when the positive tendency is indicator decrease:

$$P_{norm\ i} = (P_{max} - P_i) / (P_{max} - P_{min}), \quad (2)$$

After rationing the table with normalized values $P_{norm\ i}$ [8] is made.

At the fourth stage factors of importance K_i of indicators $P_{norm\ i}$, and also a vector of priorities V by means of a method of pair comparisons of Saati [7] are defined.

Generally importance factors can be defined also by methods of Fishberna, family of methods Promethee, family of methods Electre, etc. [1].

At the fifth stage calculation of complex estimation J_1 is made. For calculation function of convolution [12], which gets out in dependence on interchangeability and complementarity of indicators, degree of disorder of their values, is used.

It is obvious that values J_1 are in the range from 0 to 1, that facilitates visual representation of its change in time. Besides it is offered to break area of change J_1 on some equal intervals, to each of which there corresponds a verbal estimation (table 2).

Table 2

Verbal estimations of intervals of change J_1

Change interval	*Verbal estimation*
[0; 0,25)	Unsatisfactory situation
[0,25;0,5)	Satisfactory situation
[0,5; 0,75)	Good situation
[0,75;1]	Excellent situation

Dynamics of complex estimation J_1 in time can be presented in the form of the schedule. It is necessary to notice that the first model formation of complex estimation J_1 can effectively be used as for the separate division as for the enterprise as a whole. Besides it allows to estimate separate objects $OB_к$.

Let's make calculations of a complex estimation financially - economic activities of the industrial enterprise on the basis of the first model for which estimation are used over 170 indicators.

1st stage. It is formed indicating space P`, consisting of 120 most important indicators of activity of the enterprise for 12 months.

2nd stage. The reduced space of indicators $P`_{red}$, $P`_{red}$ € P` is defined by drawing up of a matrix of pair correlations of dimension 120×120. Factors of pair correlation r_{ij} indicators P_i pay off and their threshold value τ = 0,3 is set. As a result 5 independent indicators (table 3) are allocated.

Table 3

Actual values of indicators of reduct for calculation of a complex estimation of activity of the enterprise during the investigated period

Indicators	*Months of the accounting period*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Factor of an advancing of rates of increase of labour productivity over rates of increase of wages (Fap)	1,045	0,916	1,137	1,026	0,936	1,049	1,050	0,955	0,983	1,023	0,972	0,976
Factor of provision with own circulating assets(Foca)	0,4966	0,4966	0,4966	0,4869	0,4869	0,4869	0,4977	0,4977	0,4977	0,4774	0,4774	0,4774
Rate of increase of profit (loss) from production realisation (works, services) (Rpr)	0,3396	1,2844	0,8071	1,2655	0,9580	0,4672	0,6406	1,1951	0,9184	0,2222	8,7000	1,4943
Rate of increase of profit of the accounting period (Rpap)	0,1478	1,5536	0,6667	1,9138	0,9369	0,3077	1,7188	1,1455	0,9048	2,7544	0,3758	0,3051
Factor of turnover of debtor's debts (Ft)	0,4697	0,3768	0,5568	0,4356	0,5023	0,4391	0,4043	0,4376	0,4860	0,5171	0,5540	0,4983

3rd stage. Rationing of indicators of reduct is done according to formulas 1 and 2 which results are presented in table 4.

Table 4

Normalized values of indicators of reduct for calculation of a complex estimation of activity of the enterprise during the investigated period

Indicators	Months of the accounting period											
	1	2	3	4	5	6	7	8	9	10	11	12
Factor of an advancing of rates of increase of labour productivity over rates of increase of wages (Fap)	0,489	0,000	0,837	0,415	0,073	0,501	0,506	0,146	0,253	0,403	0,210	0,225
Factor of provision with own circulating assets(Foca)	0,132	0,132	0,132	0,066	0,066	0,066	0,140	0,140	0,140	0,000	0,000	0,000
Rate of increase of profit (loss) from production realisation (works, services) (Rpr)	0,887	0,979	0,933	0,978	0,947	0,899	0,916	0,971	0,944	0,875	0,000	1,000
Rate of increase of profit of the accounting period (Rpap)	0,000	0,539	0,199	0,678	0,303	0,061	0,603	0,383	0,290	1,000	0,087	0,060
Factor of turnover of debtor's debts (Ft)	0,544	0,526	0,562	0,538	0,551	0,538	0,531	0,538	0,548	0,554	0,561	0,550

4th stage. Definition of factors of the importance of indicators of reduct (table 5).

Table 5

Definition of factor of the importance with use of a method of the analysis of hierarchies of Saati

	Fap	Foca	Rpr	Rpap	Ft	Average geometrical	Importance factor	Vector of priorities
Fap	1	3	0,5	0,5	0,5	0,822	0,162	5
Foca	0,333	1	4	6	0,5	1,319	0,260	1
Rpr	2	0,25	1	0,5	2	0,871	0,172	4
Rpap	2	0,167	2	1	2	1,060	0,209	2
Ft	2	2	0,5	0,5	1	1,000	0,197	3
The sum						5,071	1,000	x

5th stage. Calculation of a complex estimation is done with the help additive function of convolution (the formula 3):

$$J_1 = \sum_{i=1} K_i \cdot P_{norm\ i} \qquad (3)$$

Graphic representation of results of calculation is shown on fig. 4.

It is necessary to notice that the analysis of influence of separate factors F_m on the general complex estimation J in some cases is interesting. It is necessary to notice that the first model, offered above, allows estimating influence of factors of the first order. Besides the first model complicates carrying out of the factorial analysis, in which used the results of the pair correlation, defining various indicators P_i in various situations.

The second model of formation of complex estimation J is offered for elimination of lacks and more profound analysis.

The factorial analysis put in a basis of construction of the second model, thus indicators P_i represent itself as factors of the first order.

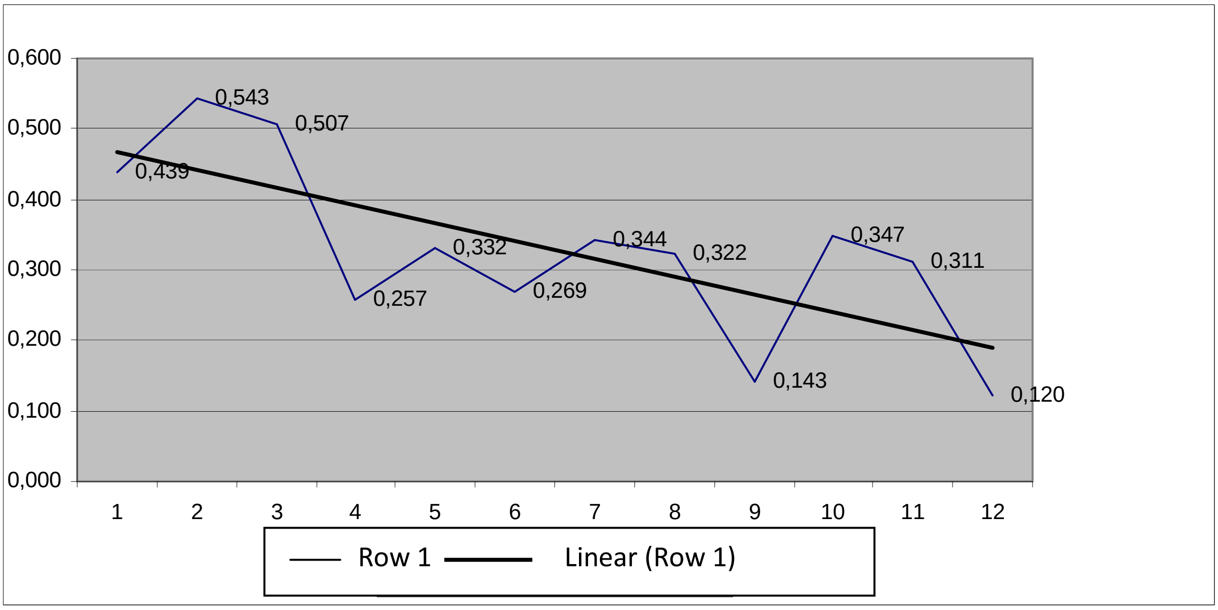

Fig. 4. Graphic representation of results of calculation of complex estimation J_1

The second model of formation of a complex estimation of economic stability provides the following stages (fig 5):

– choice of objects depending on a branch accessory and a kind of activity of the enterprise;
– definition of indicator P_i for each chosen object $OB_к$;
– rationing of indicators $P_{norm\ i} \sim P_i$;
– definition of factors of importance K_i for indicators $P_{norm\ i}$;
– calculation of complex estimation $J_2$$
– definition of a quantity of usages of factorial model for each indicator P_i;
– the analysis of influence of factors F_i on dynamics of a complex estimation.

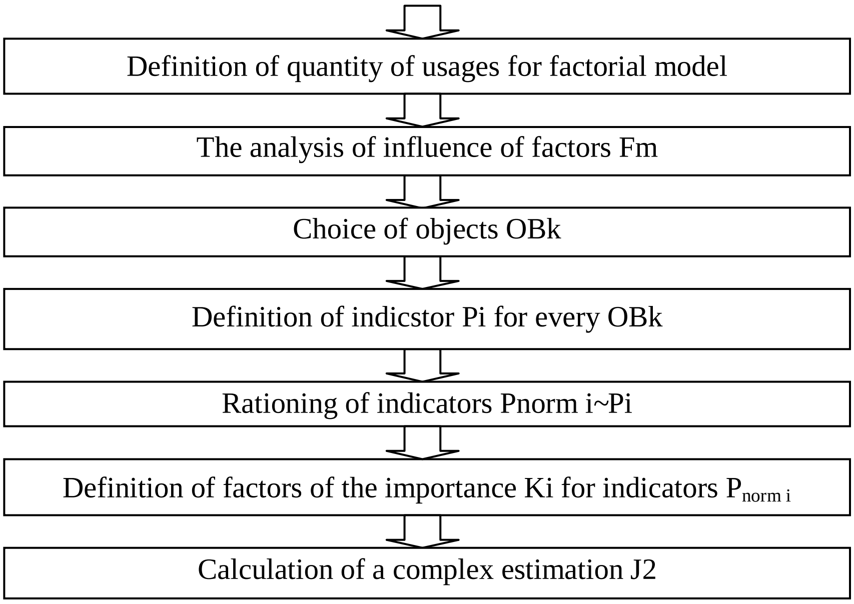

Fig. 5. The second model of formation of a complex estimation

At the first stage the branch accessory and a kind of activity of the enterprise is defined. On the basis of it the objects of the economic analysis get out. It is possible to present the results of a choice in the form of tables (table 6).

Table 6

Choice of objects

Objects (OBк)	*Kinds of activity*						
	Industry	*Trade*	*Transport*	*Agriculture*	*Building*	*Catering*	*etc.*
Labour force	+	+	+	+	+	+	
Payment	+	+	+	+	+	+	
Material resources	+	-	+	-	-	-	
The basic means	+	+	+	+	+	+	
Expenses	+	+	+	+	+	+	
Money resources	+	+	+	+	+	+	
Calculations	+	+	+	+	+	+	
The production program	+	-	-	+	-	-	
Marketing activity	+	+	+	+	+	+	
Financial results	+	+	+	+	+	+	
Financial condition	+	+	+	+	+	+	
Goods turnover	-	+	-	-	-	+	
Commodity stocks	-	+	-	-	-	+	
Distribution costs	-	+	-	-	-	+	
Turnover of goods	-	-	+	-	-	-	
Passenger turnover	-	-	+	-	-	-	
Quantity of executed works	-	-	-	-	+	-	
Complex estimations	+	+	+	+	+	+	

At the second stage indicator P_i for every $OB_к$ is defined As a rule the standard indicators of efficiency get out. For example, for the industrial enterprise for object "labour force" the indicator «average development of the worker» gets out, for object «the basic means» the indicator «fundefficiency» gets out, etc.

At the third stage rationing of indicators $P_{norm\ i} \sim P_{i\ is\ made}$, it is similar to the first model.

At the fourth stage factors of importance $К_i$ of indicators $P_{norm\ i}$, are defined by methods of expert estimations as it is specified in the first model. For the second model, however, it is recommended to expand a quantity of experts for reception of more authentic result (up to 10 experts).

At the fifth stage calculation of complex estimation J_2 c is carried out by use of function of convolution. Unlike the first model, where there is freedom in a choice of a kind of function of convolution, in the second model it is offered to use additive function:

$$J_2 = \sum_{i=1} К_i \cdot P_{norm\ i} \tag{4}$$

Additive function of convolution will allow to carry out the analysis of influence of factors on dynamics of a complex estimation under the most simple scheme.

At the sixth stage the order of factorial model is defined. The quantity of usages of factorial model can be much. It is offered to be limited to the first and second order, thus for factors of the first order to use the additive model coinciding with additive function of convolution, for factors of the second order - multiplicate model.

At the seventh stage the analysis of influence of factors on dynamics of a complex estimation is carried out. The analysis of estimation change ΔJ_2^{pi} is done under each factor P_i separately. For the first order:

$$\Delta J_2^{pi} = К_i \cdot \Delta P_{norm\ i}. \tag{5}$$

For the second order:

$$P_i = \prod_{m=1} F_m\ ; \tag{6}$$

$$\Delta J_2^{pi} = К_i \cdot \Delta P_{norm\ i} = K_i \cdot \sum_{i=1} \Delta P^{F}_{norm\ i}\ , \tag{7}$$

where $\Delta P^{F}_{norm\ i}$ – change of indicator $P_{norm\ i}$ at the expense of factor F_m.

As multiplicate model (6) does not assume rationing of indicators and factors, and change ΔJ_2^{pi} (7) contains normalized values $P_{norm\ i}$, it is necessary to enter the factor of recalculation K_i'':

$$K_i'' = \frac{\Delta P^{F}_{norm\ i}}{\Delta P^{F}_{i}} . \qquad (8)$$

Thus, change of complex estimation $\Delta J^{F}_{2\ norm}$ in dependence on change of factors F_m:

$$\Delta J^{F}_{2\ norm\ i} = K_i \cdot \sum_{i=1} K_i'' \cdot \Delta P_i^F . \qquad (9)$$

For an estimation of influence of factor F_m on dynamics of complex estimation J_2 for the investigated period it is necessary to find its absolute change. The most progressive approach is offered in work [11]. Namely, application of decomposition of a pure gain of the factor by an integrated method of the factorial analysis to a time sign which consists that indicator change for the investigated period (we will tell a year), it is not a difference between accounting and base value, and the sum of dynamics of indicators for each subperiod.

$$\Delta P_i^F = K_i'' \cdot \ln\left(\frac{F_{m\,1}}{F_{m\,0}}\right) , \qquad (10)$$

where F_{m1}, F_{m0} - values of factors in the accounting and base subperiods.

$$K = \frac{\Delta P_i}{\ln\left(P_{i\,1}/P_{i\,0}\right)} \qquad (11)$$

where $P_{i\,1}$, $P_{i\,0}$ - values of factors in the accounting and base subperiods.

Let's make for the specified industrial enterprise calculations of a complex estimation of economic stability of the enterprise by using the second model.

Let's formulate algorithm of calculation of the given complex estimation, having broken it into seven consecutive stages.

1st and 2nd stages are a choice of objects depending on a branch accessory and a kind of activity of the enterprise and definition of indicator P_i. As in the conditions of an example it is necessary to calculate a complex estimation for the industrial enterprise, so according to table 6 we choose objects and corresponding indicators (table 7).

Table 7

Objects of the analysis of financial and economic activity of the enterprise and indicators, corresponding to them

Object of the analysis (OB_k)	*The chosen indicator (P_i)*	*Conditional designation of an indicator*
1. The basic means	Fundefficiency	FE
2. Labour force	Annual development of the worker	AD
3. Payment	Profitability of wages	Pw
4. Material resources	Materialcapacity	Mc
5. Expenses	Expensescapasity	Ec
6. Release and production realisation	The level of realisation	Lr
7. Money resources	Profitability of money resources	Pmr
8. Taxes	Level of the general tax loading	Ltax
9. Financial results	Profitability of sales	Ps
10. A financial condition	Factor own circulating assets	Foca

3rd stage. It is necessary to carry out rationing of the chosen indicators (table 8) on the basis of their actual values for 12 months (table 9).

Table 8

Actual values of the indicators used for calculation of a complex estimation on the second model

Indicators	*Months of the accounting period*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
FE	0,0300	0,0335	0,0360	0,0339	0,0357	0,0386	0,0392	0,0394	0,0407	0,0382	0,0370	0,0405
AD	4228,74	5653,85	5085,03	4777,78	4946,01	5405,69	5452,83	5399,54	5560,83	5134,70	5016,13	5492,52
Pw	0,1662	0,2198	0,1257	0,1458	0,1608	0,1406	0,0482	0,0500	0,0532	-0,0885	-0,0747	-0,0813
Mc	0,6270	0,6270	0,6270	0,6554	0,6554	0,6554	0,6361	0,6361	0,6361	0,6723	0,6723	0,6723
Ec	0,9380	0,9489	0,9058	0,9726	0,9590	0,9929	0,9631	0,9891	0,9830	1,0321	1,0291	0,9566
Lr	0,7802	0,9293	0,6755	1,1620	1,2421	1,0575	1,1231	1,2351	1,2732	1,3457	1,1486	1,0920
Pmr	0,0251	0,0259	0,0204	0,0192	0,0193	0,0193	0,0060	0,0058	0,0057	-0,0090	-0,0090	-0,0090
Ltax	0,2455	0,2224	0,2831	0,1734	0,1557	0,1610	0,1492	0,1474	0,1430	0,1528	0,1622	0,1600
Ps	4,5341	4,5341	4,5341	2,5666	2,5666	2,5666	0,8625	0,8625	0,8625	-1,3938	-1,3938	-1,3938
Foca	0,4966	0,4966	0,4966	0,4869	0,4869	0,4869	0,4977	0,4977	0,4977	0,4774	0,4774	0,4774

Table 9

Normalized values of the indicators used for calculation of a complex estimation on the second model

Indicators	*Months of the accounting period*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
FE	0,6779	0,4665	0,3137	0,4414	0,3316	0,1568	0,1224	0,1126	0,0324	0,1801	0,2556	0,0437
AD	0,4899	0,0000	0,1955	0,3011	0,2433	0,0853	0,0691	0,0874	0,0320	0,1784	0,2192	0,0555
Pw	0,6426	0,5674	0,6994	0,6713	0,6502	0,6786	0,8082	0,8056	0,8011	1,0000	0,9806	0,9898
Mc	0,5434	0,5434	0,5434	0,2023	0,2023	0,2023	0,4347	0,4347	0,4347	0,0000	0,0000	0,0000.
Ec	0,6166	0,5737	0,7437	0,4798	0,5334	0,3997	0,5174	0,4146	0,4387	0,2446	0,2567	0,5430
Lr	0,8091	0,5958	0,9590	0,2628	0,1483	0,4124	0,3186	0,1583	0,1038	0,0000	0,2820	0,3630
Pmr	0,6272	0,6182	0,6783	0,6917	0,6905	0,6911	0,8362	0,8382	0,8394	1,0000	0,9997 .	1,0000
Ltax	0,3612	0,5049	0,1268	0,8104	0,9206	0,8878	0,9612	0,9726	1,0000	0,9390	0,8806	0,8939
Ps	0,4685	0,4685	0,4685	0,6449	0,6449	0,6449	0,7977	0,7977	0,7977	1,0000	1,0000	1,0000
Foca	0,8677	0,8677	0,8677	0,9345	0,9345	0,9345	0,8604	0,8604	0,8604	1,0000	1,0000	1,0000

4th stage. Definition of factors of the importance. Using a method of the analysis of hierarchies, factors of the importance of indicators (table 10) applied to calculation of complex estimation J_2 are defined.

Table 10

Definition of factors of the importance of the indicators used for calculation of a complex estimation by the expert 1

	FE	*AD*	*Pw*	*Mc*	*Ec*	*Lr*	*Pmr*	*Ltax*	*Ps*	*Foca*	*Average geometrical*	*Importance factor*
FE	1	0,33	3	0,33	0,14	0,17	0,25	0,20	0,20	0,17	0,29	0,019
AD	3	1	4	0,50	0,17	0,20	0,50	0,25	0,25	0,20	0,48	0,03
Pw	0,33	0,25	1	0,25	0,17	0,14	0,50	0,20	0,17	0,17	0,22	0,015
Mc	3	2	4	1	0,25	0,25	0,33	0,25	0,20	0,11	0,52	0,034
Ec	7	6	6	4	1	0,50	5	3	3	2	3,29	0,216
Lr	6	5	7	4	2	1	4	2	2	2	3,35	0,23
Pmr	4	2	2	3	0,20	0,25	1	0,20	0,25	0,25	0,68	0,044
Ltax	5	4	5	4	0,33	0,50	5	1	2	0,25	1,77	0,112
Ps	5	4	6	5	0,33	0,50	4	0,50	1	0,25	1,54	0,1
Foca	6	5	6	9	0,50	0,50	4	4	4	1	3,09	0,2
Sum	x	x	x	x	x	x	x	x	x	x	15,23	1

Having performed similar operations by 9 experts, we have received the following matrix 10×10, presented in table 11. The following workers of the enterprise of Open Joint-stock Society "Pinema" acted as experts : the assistant to the general director on economy, chief of economical department, the leading economist, the chief accountant, the assistant to the chief accountant, the leading bookkeeper, the leading engineer on the organisation and work rationing, chief of work and wages department, leading expert of marketing and sale department. Further by using a median of Kemeni [7, p. 18] we will spend processing of results of a group choice of experts for reception of resultants of factors of importance K_i (a common opinion of expert group).

Table 11

Opinion of experts on the importance of the indicators used for calculation of a complex estimation

Indicator	*Opinion of experts*										*Median of Kemeni (Ki)*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	
FE	0,01	0,022	0,01	0,018	0,11	0,015	0,026	0,021	0,045	0,014	0,03
AD	0,03	0,037	0,042	0,04	0,041	0,025	0,18	0,046	0,042	0,022	0,0505
Pw	0,01	0,012	0,018	0,013	0,017	0,019	0,02	0,006	0,019	0,01	0,0149
Mc	0,03	0,041	0,04	0,08	0,03	0,125	0,031	0,043	0,016	0,025	0,0465
Ec	0,21	0,209	0,19	0,23	0,21	0,214	0,27	0,105	0,345	0,2	0,2189
Lr	0,23	0,242	0,25	0,19	0,28	0,21	0,106	0,29	0,09	0,21	0,2098
Pmr	0,04	0,01	0,047	0,039	0,06	0,09	0,049	0,107	0,048	0,031	0,0525
Ltax	0,11	0,132	0,1	0,097	0,101	0,04	0,078	0,23	0,015	0,09	0,0995
Ps	0,1	0,109	0,079	0,043	0,03	0,099	0,15	0,15	0,11	0,251	0,1121
Foca	0,2	0,186	0,224	0,25	0,121	0,163	0,09	0,002	0,27	0,147	0,1653

5th stage. Calculation of complex estimation J_2 according to the formula 4. Results are presented in table 12.

Table 12

Values of a complex estimation on the second model

Indicator	*Months of the base period*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Complex estimation	0,4451	0,5398	0,4643	0,5051	0,5440	0,5779	0,7499	0,8232	0,7847	0,6201	0,6912	0,4632
Indicator	*Months of the accounting period*											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Complex estimation	0,3820	0,4372	0,3595	0,4773	0,5224	0,4261	0,4878	0,5002	0,5201	0,4292	0,3480	0,3929

Stage 6. It is offered to limit definition of quantity of usages of factorial model to two. For productive indicator J_2 indicators P_i will act as factors of the first order, each of which characterises efficiency of use of object $OB_к$. Further by using a method of expansion (tab. 13) we will define factors of the second order.

Table 13

Definition of models of the first order and factors of the second order for carrying out the factorial analysis of a complex estimation

The calculation formula	*Entered indicator*	*Expansion model*
FE=OP/BM, where OP - output; BM - mid-annual cost of the basic means of a principal view of activity	BMa - an active part of mid-annual cost of the basic means of a principal view of activity	FE=OP/BM=BMa/OP×OP/BMa=RDa× FEa, where RDa – relative density of an active part of the basic means of a principal view of activity in a total sum; FEa – fundefficiency an active part of the basic means of a principal view of activity
AOP =OP/ANW, where OP - output; ANW - average number of workers of a principal view of activity	ANWw - average number of workers of a principal view of activity	AOP =OP/ANW = ANWw / ANW ×OP/ANWw =RDw× AOPw, where RDw-relative density of working workers in an aggregate number; AOPw - mid-annual development of the worker
Pw=Pr/FW, where Pr - profit on realisation of production, works, services; FW - a wages fund of workers of a principal view of activity	FWw - a wages fund of workers of a principal view of activity	Pw=Pr/FW=FWw/FW×Pr/FWw=RDw×Pww, where RDw - relative density of a wages fund of workers in a total sum of a wages fund of workers of a principal view of activity; Pww - profitability of wages of the worker
Mc=MI/OP, where Mc - material inputs; OP - output	MId - direct material inputs	Mc=MI/OP=MI/MId×MId/OP=Fpar mi× Mcd, where Fpar mi - factor of a parity of all and direct material inputs; Mcd - materialcapacity of direct material inputs
Ec=CP/OP, where CP - the full cost price of let out production; OP - output	CPi - the industrial cost price of let out production	Ec=CP/OP=CP/CPi×CPi/OP=Fpar cp×Eci, where Fpar cp - factor of a parity of the full and industrial cost price of let out production; Eci - expensescapacity of production

Table 13

The calculation formula	*Entered indicator*	*Expansion model*
Lr=G/OP, where G - a gain from realisation of production, works, services; OP - output	CPr - the full cost price of realised production	Lr = G/OP = G/CPr×CPr/OP = Fpar g×Ec r, where Fpar g - factor of a parity of a gain from realisation of production, works, services to its full cost price; Ec r - expensescapacity of realised production
Pmr=Pr/MR, where Pr - profit on realisation of production, works, services; MR - a total sum of money resources	MRr - receipt of money resources (a positive monetary stream)	Pmr=Pr/MR=MRr/MR×Pr/MRr = Da×Pa, where Da - a share of the arrived money resources in their general sum; Pa - profitability of the arrived money resources
Ltax =Tt/G, where Tt - a total sum of the taxes paid by the enterprise; the G-gain	Tg - the sum of the taxes paid by the enterprise from a gain	Ltax =Tg/G=Tt/Tg*Tg/G=Fpar t*Ltg, where Fpar t - factor of a parity of a total sum of taxes to the sum of the taxes paid from a gain; Ltg - level of tax loading on a gain
Ps=Pr/Gr, where Ps - profit on realisation of production, works, services; Gr - a gain from realisation of production, works, services	CPr - the full cost price of realised production	Ps = Pr/Gr = CPr/G×Pr/CPr=De×PEr, where De - a share of expenses for realisation in a gain from realisation of production, works, services; PEr - profitability of expenses realised production, works, services
Foca =OCA/TA, where OCA - own circulating assets; TA - turnaround actives of the enterprise	Ma - material actives of the enterprise	Foca =OCA/TA=OCA/Ma×Ma/TA=Dma×Ft oca ma, where Dma - a share of material turnaround actives of the enterprise in a total sum of turnaround actives; Ft oca ma - factor of security of material turnaround actives own circulating assets

The structurally-logic model of the analysis of complex estimation J_2 is presented on fig. 6.

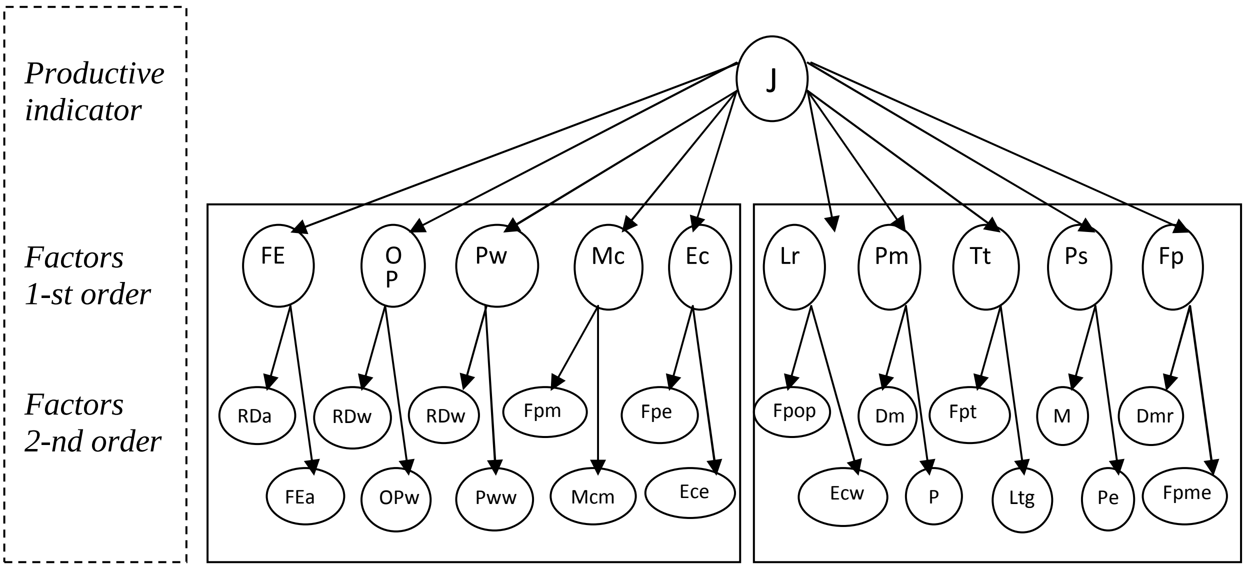

Fig. 6. Structurally-logic model of the analysis of complex estimation J_2

Stage 7. The factorial analysis of a complex estimation. Calculation of influence of factors of the first and second usages with use of methods of absolute differences and integrated [5, p. 89] according to formulas 5-9 is carried out. Results of such analysis for one of months (February of a base year) are presented in table 14.

Table 14.

The analysis of influence of factors of 1-st and 2-nd order on dynamics of a complex estimation of financial and economic activity of the enterprise for the investigated period

Month	*Change of a summary indicator*										
	In	*For the account*									
Februar y of a base year	0,1132	FE		AD		Pw		Mc		Ec	
		AIFE	-	AIAD	0,0029	AIPw	0,000	AIMc	0	ΔIEc	0,0506
		AI RDa	0	AIRD	0	AI	0,000	ΔI Fpar	0	ΔI Fpar	0,0028
		AI FEa	-	AIAO	0,0029	AI	0,000	Δl Mcd	0	ΔI Eci	0,0477

For the account									
Lr		PMR		Ltax		Ps		Foca	
ΔI Lr	0,0642	ΔlPmr	-	A1Ltax	0,0257	ΔlPs	-0,0069	ΔlFoca	0
ΔI Fpar	-0,0039	ΔI Da	0,000	ΔI Fpar	0,0264	ΔI De	0,0005	ΔI Dma	0
ΔI Ec r	0,0681	Δl Pa	-	ΔI Tg	-0,0007	AI PEr	-0,0074	ΔI Ft oca ma	0

For an estimation of adequacy of the offered models comparison of results of calculation J_1 and J_2 is spent.

Apparently, the results on the first and second model slightly disperse, affinity of the results (factor of correlation 0,7) allows to draw a conclusion about reliability of the received results that in turn allows to draw a conclusion on adequacy of the offered models for an estimation of stability of the enterprise (fig. 7).

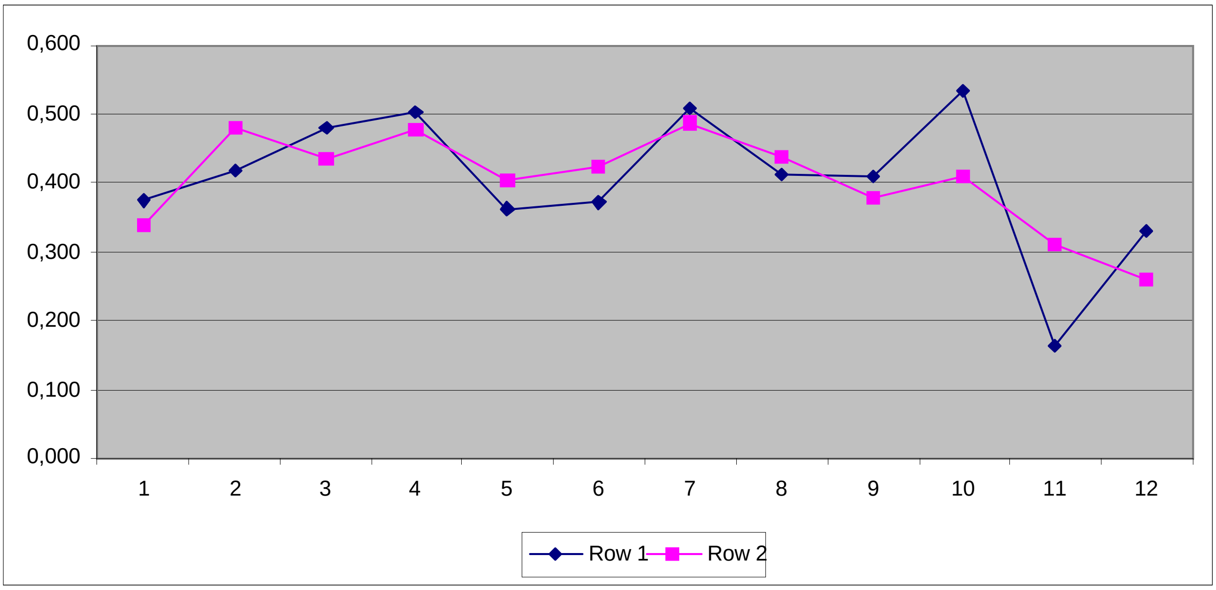

Fig. 7. Graphic representation of the results of calculation of complex estimations

The considered models of formation of a complex estimation of economic stability of the enterprise in our opinion are universal and can be applied at the enterprises of various patterns of ownership. Besides, they eliminate such lacks, as groundlessness of a choice of concrete indicators, their weight factors, and verification function. Thus the first model can be used for formation of a complex estimation of the enterprises as a whole, and its separate divisions or objects, and it does not dependent on a branch accessory of the enterprise. The second model is applicable only for the enterprise as a whole, thus it depends on its branch accessory (the industry, agriculture, trade, building, etc.). Thus, the offered mechanism of an estimation of a sustainable development will allow estimating achievements of the enterprises and its divisions, the responsibility centres on one indicator synthesising all aspects of activity of the enterprise that will lead to well-founded administrative decisions at the enterprise.

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