

**ISSUES OF FORECASTING AND MANAGEMENT OF ECONOMIC PROCESSES  
IN VIEW OF THE FACTOR OF UNCERTAINTY IN  
FINITE-DIMENSIONAL VECTOR SPACE**

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The basic scientific result of clause is:

- a) study of features of construction in finite-dimensional space of models of a piecewise-linear kind in view of the factor of a difference of corners formed between adjacent piecewise -linear vectors, and also;
- b) formulation of concept and condition of uncertainty, and also, in mathematical representation of predicting function  $\vec{Z}_{n+1}(X_1, X_2, \dots, X_m)$  for such class of processes depending on so-called functions of the unrecorded factors of economic process;
- c) The method of construction of the predicting vector equation  $\vec{Z}_{n+1}(X_1, X_2, \dots, X_m)$  on subsequent in small volume  $\Delta V_{n+1}(X_1, X_2, \dots, X_m)$  of finite-dimensional vector space is offered.

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The purposeful influence on economic processes is impossible without application certain, scientifically constructed system of forecasting and planning at all levels of market economy, as: the individual, enterprise, region, country and all world community.

The complexity of this problem consists in absence of precise definition of concept of uncertainty in economic questions, in absence of appropriate classification, and also, in absence of reliable mathematical representation of this phenomenon. Last years in the world scientific literature the large attention is given scientific formulation of "the phenomena uncertainty in economic processes" [1]. By virtue of extreme complexity of a nature of economic processes connected to character of uncertainty of these processes, the creation of the reliable scientifically proved system of forecasting and planning of economic events is necessary.

At the functioning such kind of economic system on it over foresaid render influence an environment, and also, the various internal and external factors, to which concern:

- Climatic and meteorological conditions;
- Economic risk (market economy);
- Incompleteness of structural construction of system;
- Difficulties of formulation and organization of economic tasks;
- Insufficiency and at times redundancy of the information;
- The factor of instability (including political);
- The other factors

Uniting all set forth above difficultly recorded factors; in one general summing factor also we shall name it as one of the factors of uncertainty.

Such summing uncertain factor has the following features:

- By the factor weak organization of system;
- By the factor of stochasticity of an environment;
- By risk factor;
- By the factor of insufficiency of the information;
- By the factor of instability

To the account of influence of such conglomerate of the factors of uncertainty apply the device of mathematical statistics, which on the basis of the data for the previous period develops probability of realization of casual event. For example, it is possible to allocate five basic kinds of stochasticity of an environment:

- Instability of socio economic processes;
- Sharp change of meteorological conditions;
- Epidemics, illness of the personnel;
- Earthquakes, floods and other acts of nature;
- Socio economic shocks of a society [1, 6, 7]

The repeatedly complicating decision of the given problem is connected to multidimensionality and spatial heterogeneity of occurring economic process, and also, volatility in time of multifactor economic parameters and speed of their change. Other complexity of a problem is connected to reliable construction of such predicting vector equation on subsequent in small volume  $\Delta V_{n+1}(x_1, x_2, \dots, x_m)$  of finite-dimensional vector space, which full enough would reflect a condition of economic process in subsequent (predictable) a step of uncertainty. In other words, as with the help of the given statistical points (vectors), describing certain economic process on previous volume

$V = \sum_{N=1}^N \Delta V_N(x_1, x_2, \dots, x_m)$  of finite-dimensional vector space  $R_m$  to construct the predicting vector equation  $\vec{Z}_{n+1}(x_1, x_2, \dots, x_m)$  on subsequent in small volume  $\Delta V_{n+1}(x_1, x_2, \dots, x_m)$  of finite-dimensional vector space [2,8].

By the purpose of clause consists in a formulation of concept of uncertainty, and also, in mathematical representation of predicting vector function  $\vec{Z}_{n+1}(x_1, x_2, \dots, x_m)$  for one class of processes depending on so-called functions of the unrecorded factors of economic process in finite-dimensional space.

In connection with told in clause [3] “the principle of spatial - temporary definiteness of economic process was offered in view of influence of the unrecorded factors in finite-dimensional vector space”; the concept of piecewise-uniformity of occurring economic process is entered, and as, “the function of influence of the unrecorded parameters  $\omega_n(\lambda_n^{k_n}, \alpha_{n-1,n})$ ”,

influencing on all previous volume  $V = \sum_{N=1}^N \Delta V_N$  of economic process is offered so-called. On this

basis the dependence  $n$  of piecewise-linear function  $\vec{Z}_n$  from 1st piecewise-linear function  $\vec{Z}_1$  and all of a spatial kind of functions of influence of the unrecorded parameters  $\omega_n(\lambda_n^{k_n}, \alpha_{n-1,n})$ , influencing on all the previous interval of economic process, as (1) was offered:

$$\vec{Z}_n = \vec{Z}_1 \left\{ 1 + A \left[ 1 + \omega_n(\lambda_n, \alpha_{n-1,n}) + \sum_{i=2}^{n-1} \omega_i(\lambda_i^{k_i}, \alpha_{i-1,i}) \right] \right\} \quad (1)$$

Where  $\omega_i(\lambda_i^{k_i}, \alpha_{i-1,i}) = \lambda_i^{k_i} \cos \alpha_{i-1,i}$  And  $\omega_n(\lambda_n, \alpha_{n-1,n}) = \lambda_n \cos \alpha_{n-1,n}$  = There is a function of influence of the unrecorded parameters;  $\lambda_i^{k_i}$  - parameters referred to  $i$  piecewise-linear straight line;

Thus, in finite-dimensional vector space the system of statistical points (vectors) is submitted in the vector form as  $N$  of the piecewise-linear lines depending on the vector equation of 1st piecewise-linear straight line  $\vec{Z}_1 = \lambda_1 \vec{a}_1 + \mu_1 \vec{a}_2$ , and also, functions of influence of the unrecorded parameters  $\omega_n(\lambda_n, \alpha_{n-1,n})$ , met on all researched previous volume of the finite-dimensional vector space  $R_m$  [4,5].

In clause the method of construction of predicting functions of economic process  $\vec{Z}_{N+1}(\lambda_{N+1}, \alpha_{N,N+1})$  at the subsequent  $\Delta V_{N+1}$  stage of event of finite-dimensional space is

offered depending on the listed invisible external facts, fixed at early stages, or their combinations, i.e. functions  $\omega_n(\lambda_n, \alpha_{n-1,n})$ , and also, from so-called predicting function of influence of the unrecorded parameter  $\Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1})$ . In this case predicting functions of economic process  $\vec{Z}_{N+1}(\lambda_{N+1}, \alpha_{N,N+1})$  will have the following kind:

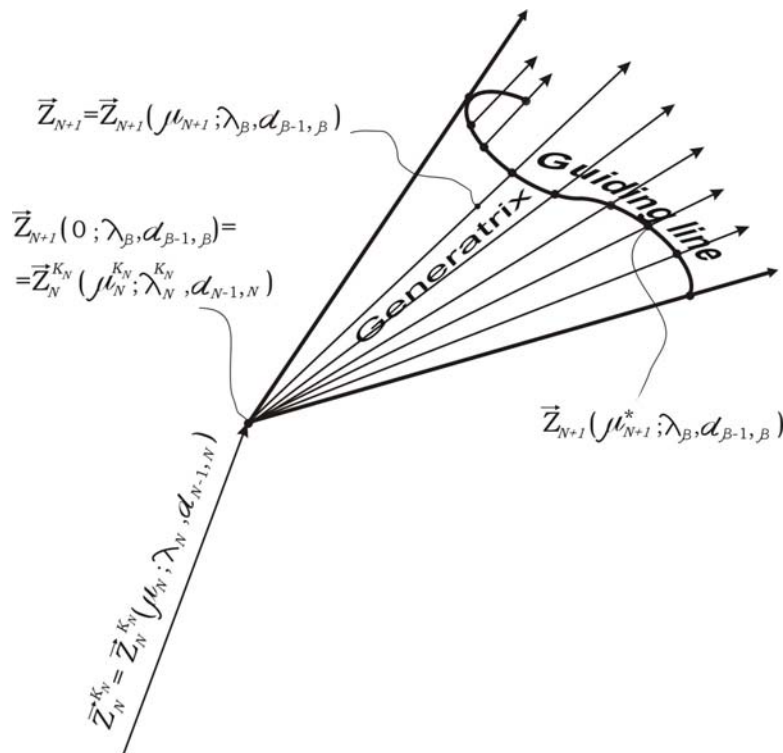
$$\vec{Z}_{N+1}(\beta) = \vec{z}_1 \{1 + A[1 + \sum_{i=2}^N \omega_i(\lambda_i^k, \alpha_{i-1,i}) + \Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1})]\} \quad (2)$$

Here predicting functions of influence of the unrecorded parameters  $\Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1})$  will have the following feature:

$$\begin{aligned} \Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1}) &= 0 & \text{at} & \mu_{N+1} = 0 \\ \Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1}) &\neq 0 & \text{at} & \mu_{N+1} > 0 \end{aligned} \quad (3)$$

It means, that an index point, from which will start the vector equation of predicting function of economic process  $\vec{Z}_{N+1}(\beta)$  will coincide with a final point N vector equation of a piecewise-linear straight  $\vec{Z}_N$ . At any other meanings of parameter  $\mu_{N+1} \neq 0$  of a point of (N+1) vector equation will be defined by the formula (3). From the formula (3) it is visible, that at  $\text{Cos} \alpha_{N,N+1} \neq 0$  and  $\mu_{N+1} \neq 0$  will be  $\lambda_{N+1} = 0$  and  $\Omega_{N+1}(\lambda_{N+1} = 0; \alpha_{N,N+1}) = 0$ . It will correspond to a case, when influence of the internal unrecorded factors on subsequent in small volume  $\Delta V_{N+1}$  are those as on previous in small volume  $\Delta V_N$  of finite-dimensional vector space. In this case will be enough to continue previous vector equation  $\vec{Z}_N$  up to a desirable point  $\mu_{N+1} = \mu_{N+1}^* > \mu_N^{k_N}$  of following small volume of finite-dimensional vector space. The meaning of the vector function  $\vec{Z}_{N+1}(\mu_{N+1}^*) = \vec{z}_N(\mu_{N+1}^*; \lambda_N, \alpha_{N-1,N})$  in a point  $\mu_{N+1} = \mu_{N+1}^*$  will be one of expected predictable meanings of economic process on subsequent in small volume  $\Delta V_{N+1}$ . In this case meaning of managing parameter of the unrecorded factors will be equal to zero,  $\Omega_{N+1}(\mu_{N+1} \neq 0; \lambda_{N+1} \neq 0; \text{Cos} \alpha_{N,N+1} = 0; \alpha_{N,N+1})$ .

At any other meaning of parameter  $\mu_{N+1}$ , taken in an interval  $0 \leq \mu_{N+1} \leq \mu_{N+1}^*$ , and  $\text{Cos} \alpha_{N,N+1} \neq 0$  the predicting function, appropriate to it, of the unrecorded parameters will be distinct from zero, i.e.  $\Omega_{N+1}(\lambda_{N+1}, \alpha_{N,N+1}) \neq 0$ . Thus, choosing at will numerical meanings of function of the unrecorded parameters  $\omega_\beta(\lambda_\beta, \alpha_{\beta-1,\beta}) = \Omega_{N+1}(\lambda_{N+1}^*, \alpha_{N,N+1})$ , appropriate to the previous small volumes, and influencing by them since a point  $\mu_{N+1} = 0$  up to a desirable point,  $\mu_{N+1}^*$  we shall receive numerical meanings of the predictable economic event  $\vec{Z}_{N+1}(\mu_{N+1}^*; \lambda_{N+1}^*, \alpha_{N,N+1})$  on the subsequent step of small volume  $\Delta V_{N+1}$



**Fig.1.** The diagram of function of forecasting and management of economic process in conditions of uncertainty in finite-dimensional vector space is submitted as hyper conical of a surface, in which guiding line there is a line of management of process.

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