Method of prognostication of future values of economic indices on the basis of the forecast model (11) presupposes realization of the following stages:

Stage 1. Gathering of statistical data about the results of enterprises functioning;

Stage 2. Estimation of moment functions $M\left[X^{s}(i)\right]$, $M\left[X_j^{l}(\nu)X_h^{s}(i)\right]$ on the basis of cumulated realizations of random sequence describing the process of change of economic indices;

Stage 3. Calculating of the parameters of the algorithm of extrapolation (11);

Stage 4. Estimation of future values of economic indices on the basis of the forecast model (11);

Stage 5. Estimation of the quality of the solving of the forecast problem for investigated sequence with the help of the expression (12).

4 Results of Numerical Experiment

Method is approbated on the basis of statistical data of functioning of agricultural enterprises in Nikolaev region during the period 2004-2015 (74 enterprises with gross profit 200-900 thousands grivnas). Moment functions $M\left[X_h^{s}(i)\right]$, $M\left[X_j^{l}(\nu)X_h^{s}(i)\right]$ were estimated by known formulae of mathematical statistics for sections 2004, 2005, …, 2014. Data about the work of the enterprises for 2015 were supposed to be unknown and the estimation of moment functions $M\left[X_h^{s}(12)\right]$, $M\left[X_j^{l}(\nu)X_h^{s}(12)\right]$ for the last section (corresponding to 2015) was carried out on the basis of determinate models with the use of four previous years (2011-2014) in tabular processor Microsoft Excel (instrument "Search for solutions"). For example, in Table 1 the values of autocorrelated function $M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(i)\right]$, $\nu=\overline{1,12}$, i=$\overline{1,12}$ for the component $X_1(i)$, i=$\overline{1,12}$ (gross profit) are represented.

For 2015 values $M\left[\overset{o}{X}_h(\nu)\overset{o}{X}_h(12)\right]$, $\nu=\overline{1,11}$ are obtained on the basis of determinate model:

$$M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(12)\right]=0,718M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(11)\right]\text{-}0,053M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(10)\right]+ \quad \mathbf{(13)}$$

$$+0,2128M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(9)\right]-0,105M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(8)\right],\ \nu=\overline{1,11},$$

Coordinate function $\beta_{11}^{(1,1)}(\nu,i)$ $\nu,i=\overline{1,12}$ (Table 2) corresponds to correlated function $M\left[\overset{o}{X}_1(\nu)\overset{o}{X}_1(i)\right]$, $\nu=\overline{1,12}$, $i=\overline{1,12}$.

Table 1. Autocorrelated function of the component $X_1(i)$, i=$\overline{1,12}$

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2004	1	0,99	0,70	0,42	0,79	0,74	0,49	0,72	0,63	0,46	0,55	0,43
2005	0,99	1	0,72	0,42	0,74	0,74	0,52	0,70	0,64	0,48	0,59	0,46
2006	0,70	0,72	1	0,57	0,67	0,58	0,701	0,69	0,70	0,66	0,78	0,60
2007	0,42	0,42	0,57	1	0,38	0,36	0,45	0,21	0,41	0,36	0,19	0,18
2008	0,79	0,74	0,67	0,38	1	0,81	0,55	0,91	0,80	0,72	0,53	0,41
2009	0,74	0,74	0,58	0,36	0,81	1	0,72	0,73	0,92	0,81	0,51	0,44
2010	0,49	0,52	0,70	0,45	0,55	0,72	1	0,51	0,74	0,73	0,49	0,41
2011	0,72	0,70	0,69	0,21	0,91	0,73	0,51	1	0,77	0,80	0,74	0,55
2012	0,63	0,64	0,70	0,41	0,80	0,92	0,74	0,77	1	0,91	0,60	0,59
2013	0,46	0,48	0,66	0,36	0,72	0,81	0,73	0,80	0,91	1	0,71	0,46
2014	0,55	0,59	0,78	0,19	0,53	0,51	0,49	0,74	0,60	0,71	1	0,71
2015	0,43	0,46	0,60	0,18	0,41	0,44	0,41	0,55	0,59	0,46	0,71	1

Table 2. Coordinate function $\beta_{11}^{(1,1)}(\nu,i)$ $\nu,i=\overline{1,12}$

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2004	1	0,89	0,54	0,55	0,62	0,43	0,45	0,89	0,858	0,90	2,36	2,65
2005	0	1	2,25	-1,46	-2,40	0,27	5,47	-2,71	3,55	1,83	2,85	4,70
2006	0	0	1	5,09	1,17	-1,53	-0,03	-2,77	-0,23	-5,52	2,34	5,07
2007	0	0	0	1	0,17	0,26	0,94	0,18	0,77	1,05	-0,57	-1,17
2008	0	0	0	0	1	0,48	1,27	1,06	1,05	2,01	-2,37	0,69
2009	0	0	0	0	0	1	-1,81	0,74	3,53	0,37	9,31	2,86
2010	0	0	0	0	0	0	1	-0,68	1,44	3,18	-6,74	-3,39
2011	0	0	0	0	0	0	0	1	1,29	2,21	-3,30	0,93
2012	0	0	0	0	0	0	0	0	1	3,88	0,19	-8,44
2013	0	0	0	0	0	0	0	0	0	1	1,99	-4,96
2014	0	0	0	0	0	0	0	0	0	0	1	0,50
2015	0	0	0	0	0	0	0	0	0	0	0	1

In Table 3 weight coefficients $\beta_{13}^{(1,1)}(\nu,i)$ $\nu,=\overline{1,11},\ i=\overline{2,12}$ determining the influence of values $x_1^3(i),\ i=\overline{1,11}$ of gross profit in high-order third degree on future values of this parameter are represented.

Table 3. Values of coordinate function $\beta_{13}^{(1,1)}(\nu,i) \quad \nu,=\overline{1,11},\ i=\overline{2,12}$

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2004	$9*10^{-6}$	$-1*10^{-7}$	$-3*10^{-7}$	$-5*10^{-7}$	$-3*10^{-7}$	$-2*10^{-7}$	$-8*10^{-6}$	$-3*10^{-6}$	$-1*10^{-6}$	$-3*10^{-7}$	$-4*10^{-7}$
2005	0	$-1*10^{-4}$	$-1*10^{-4}$	$1*10^{-5}$	$-3*10^{-4}$	$3,5*10^{-5}$	$7*10^{-5}$	10^{-4}	$6*10^{-5}$	$-2*10^{-4}$	$8*10^{-5}$
2006	0	0	$-1*10^{-5}$	$2*10^{-6}$	$-3*10^{-6}$	$-9*10^{-7}$	$2*10^{-8}$	$6*10^{-6}$	$-6*10^{-6}$	$-9*10^{-6}$	$-7*10^{-7}$
2007	0	0	0	$2*10^{-8}$	$-9*10^{-8}$	$2*10^{-9}$	$3*10^{-8}$	$7*10^{-8}$	$8*10^{-9}$	$4*10^{-9}$	$3*10^{-7}$
2008	0	0	0	0	$-8*10^{-8}$	$2*10^{-8}$	$2*10^{-8}$	$7*10^{-7}$	$3*10^{-7}$	$4*10^{-7}$	$3*10^{-8}$
2009	0	0	0	0	0	$-8*10^{-7}$	$-6*10^{-7}$	$-7*10^{-7}$	$-4*10^{-8}$	$-3*10^{-7}$	$-9*10^{-8}$
2010	0	0	0	0	0	0	$8*10^{-9}$	$8*10^{-6}$	$5*10^{-7}$	-10^{-8}	$-4*10^{-7}$
2011	0	0	0	0	0	0	0	$2*10^{-5}$	$8*10^{-7}$	$-2*10^{-6}$	$8*10^{-6}$
2012	0	0	0	0	0	0	0	0	$2*10^{-8}$	$4*10^{-7}$	$-3*10^{-6}$
2013	0	0	0	0	0	0	0	0	0	$3*10^{-8}$	$-7*10^{-6}$
2014	0	0	0	0	0	0	0	0	0	0	$9*10^{-6}$

As it can be seen in Table 3 values $\beta_{11}^{(3)}(i),\ i=\overline{1,11}$ are relatively small but this doesn't mean that given weight coefficients don't influence on the forming of the estimation of future value as $\beta_{11}^{(3)}(i),\ i=\overline{1,11}$ are multiplied in the process of calculations by values $x_1^3(i),\ i=\overline{1,11}$ (values of the sixth-seventh order).

For functioning of the forecast model (11) on the basis of statistical data 25 tables of weight coefficients analogous to Tables 2-3 were calculated.

During the application of the method of economic indices prognostication for 2016 optimal order of non-linear relations of the investigated random sequence is unknown. But taking into consideration that N=4 is invariable during 11 years there is quite high probability that given parameter will remain on the same level.

Values in Table 4 reflects the change of relative error of prognostication of gross profit of enterprise (component $X_1(i),\ i=\overline{1,12}$) during 2015 depending on the order of stochastic relations used in model (11).

Table 4. Relative error of prognostication of gross profit

Order of stochastic relations	2	3	4
Relative error	6,9 %	3,3 %	1,5 %

Thus the results of the experiment showed (Table 4) that application of nonlinear relations in the forecast model allows increase considerably the quality of economic indices prognostication.

5 Conclusion

Calculating method of the estimation of future values of economic indices of agricultural enterprises functioning is obtained in the work. The algorithm of extrapolation of vector random sequence based on nonlinear polynomial canonical expansion is assumed as a basis of the method. The optimal algorithm of the extrapolation of the economic indices of agricultural enterprises, which as well as canonical expansion put into its base doesn't impose any essential limitations on the stochastic properties of economic indices. In addition to pre-aggregate indicators (gross output, land resources, manpower, plant and equipment) a range of parameters can be used as the components of investigated random sequence (weather conditions, prices of resources, etc) influencing the effectiveness of the functioning of agricultural enterprises. The results of the numerical experiment showed that the forecast model possesses high accuracy characteristics at the expense of maximal taking into consideration of stochastic qualities of random sequence of economic indices change. Schemes of calculation of the parameters of the forecast model and estimations of future values of economic indices on its basis are introduced in the work. Expression for the mean-square error of extrapolation allows to estimate the quality of the forecast problem solving.

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