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STATISTIC METHODS OF DEFINITION OF THE SOCIAL STANDARDS SELECTION OF STATISTIC METHODS FOR DEFINITION OF THE SOCIAL STANDARDS

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ABSTRACT. *Methods of definition of social normd on the example of cumulative volume population's monetary incomes and its separate parts (payment of labour, pensions, scholarships, assistance, subsidies; receipt from own subsidiary economy, other sources) and population's expenses to the food products and nonfood-stuffs has been shown in this work.*

Great attention has been given to the comparative analysis of efficiency of regressive analysis and statistic equations of dependence on level's definition of social norms.

KEY WORDS Payment of labour, pensions, scholar ships, assistance, subsidies, receipt from own subsidiary economy, other sources of incomes, regressive analysis, statistic equations of dependence, method's efficiency, definition of social norms, parameters of regressive equations, normative calculations by the method of statistic equations of dependence.

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Objective characteristic of the development of economic events and processes in the future, and also substantiation of the social standards, can be supplied only with correctly fitted statistic and mathematical methods. It is known, that these methods cease to be a subject of concern in practical activity in those cases, if there is no reliance, in which one they approach a measure to the solution of concrete problems.

Let's consider an example of definition of the social standards ofter the data about the constituents cumulative average income of the population per one month (payment of labour; pensions, grant, help; receipt from a personal house hold and other sources) and expenses to food products and nonfood-stuffs in calculation per one person per month (tab.1).

Table 1. Money incomes and expense to good products and nonfood-stuffs in calculation per 1 person, on the area for one year

(the data is conditional)

№ of group of families	average cumulative income per one month, grn.	including:				expense to food products and nonfood – stuff in calculation per one person, grn, У
		payment of labour x_1	pensions, grant, help x_2	receipt from a personal household x_3	other sources x_4	
1.	23,89	9,29	2,91	4,89	6,80	23,42
2.	45	18,67	4,19	11,43	10,71	38,48
3.	75	31,5	6,68	21,9	14,92	59,92
4.	105	44,42	9,45	32,86	18,27	79,80
5.	135	59,8	12,69	42,53	19,98	96,39
6.	165	71,78	14,85	53,29	25,08	115,17
7.	195	83,27	17,16	60,84	33,73	137,08
8.	225	66,6	12,38	77,17	68,85	163,12

From the data of tab.1, We can see that analysis of relation of a effective factor (expenses to the food products and nonfood-stuffs) carried out on the base of the information of all possible means, without exeption factor, which are form development of population's expenses to the food products and nonfood-stuffs.

So, we have an ideal information example for installation of efficiency of mathematic and statistic methods of analysis of correlation of economic fact.

For carrying out of calculation use method of regressive analysis and statistic methods of dependence. The calculation of parameters of one-factors simple equations of regression[2] and dependence[3] of rectilineal link has permitted to receive such results:

1. Parameters of equation of Regression:[4]

a) For the factor x_1:

$$\bar{y}_x = 8{,}0135 + 1{,}677 x_1 ;$$

b) For the factor x_2:

$$\bar{y}_x = 5{,}448 + 8{,}303 x_2 ;$$

c) For the factor x_3:

$$\bar{y}_x = 15{,}559 + 1{,}922 x_3 ;$$

d) For the factor x_4:

$$\bar{y}_x = 34{,}559 + 2{,}187 x_4 .$$

2. Parameters of equation of Relations:[5]

a) For the factor x_1:

$$y_x = 23{,}42\left(1 + 0{,}67088 d^{\frac{x_{1i}}{x_{1\min}} - 1}\right);$$

b) For the factor x_2:

$$y_x = 23{,}42\left(1 + 1{,}14603 d^{\frac{x_{2i}}{x_{2\min}} - 1}\right);$$

c) For the factor x_3:

$$y_x = 23{,}42\left(1 + 0{,}41945 d^{\frac{x_{3i}}{x_{3\min}} - 1}\right);$$

d) For the factor x_4:

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2 $\overline{y_x} = a + bx;$

3 $y_x = y_{\min}\left(1 + bd^{\frac{x_i}{x_{\min}} - 1}\right)$

4 Real means of student's and Fisher's criteria too much then their decisive level's, so parameters of one-factor equations of regression are real.

5 It is impossible to compare parametres of equations of regression and dependence. It is necessary to do calculation after corresponding formula.

$$У_x = 23{,}42\left(1 + 1{,}06105d^{\frac{x_{4i}}{x_{4\min}} - 1}\right).$$

This values of coefficient of stability of connection for parameters of equations testify about stable dependance between populations expenses to the food products and nonfood-stuff by each part of cumulative average income per one month (vames of coefficient are from 0,7 to 0,97).[6] It's permit to choose all parts of cumulative average income for carring out real calculations (tab.2).

So, results of calculation of traditional formulation with a method of statistical equations of relations "A level of an effective factor how much will change at change of the factors per unit?" is possible to interprete so, that growing every part of cumulative average income per 1 grn. promote increasing of expenses to the food products and nonfood-stuffs in calculation per 1 person on 1,69 grn. (in consequence of increasing of payment of labour); on 9,22 grn. (in consequence of increasing of pensions, scholarships, assistance, subsidies); on 2,01 grn. (in consequence of increasing of receipt from own subsidiary economy), and on 3,65 grn. (in consequence of encreasing income from other sources).

Table 2. The comparative table of levels of parameters of equations of one-factors regression and normative calculation by the method of statistic equalization of dependence

Factor	**Calculation of values of change effective factor, when levels of factors change per unit (1 grn.)**	
	method of statistic equalization of dependence	**one-factor equations of regression (parameters)**
1. Payment of labour	+ 1,69	+ 1,677
2. Pensions, scholarships, assistance, subsidies	+ 9,22	+ 8,3
3. Receipt from own subsidary economy	+ 2,01	+ 1,92
4. Other sources	+ 3,65	+ 2,187

It is necessary to note, that at the solution of same problems by a method of regressive analysis we have almost identical results (tab.2).

Complexity of calculations, made by one-factor regressive equalization and equalization of dependence, consists in changing of effective factor under operation of many factors, and one-factor equation are characterizes influencing both separate factor, and all bound with it factors, which form development of affective factor.

Outgoing from this aspect it is necessary to use equation of plural regression for estimation of influence of various constituents of cumulative average income on the population's expenses to the food products and nonfood-stuffs.

Comparing values of parameters of one-factor's and plural equation it is necessary to note their different levels, as at transition from one-factor' parameters to plural, so at miscellaneous affiliation of the factors in plural equations. It is necessary to note change of regressive characteristic (directly or indirectly), that is change of signs at parameters (plus and minus).

Allowing that even in cases full maintence of application of method of least squares we received enougt exactly theoretical values of a line of one-factor regression and according its graphics image, that plural equations of regression resolve only to determine theoretical values of effective factor, and the parameters of these equations for any of the factors act as abstract estimated values for maintenance of theoretical values of regressive line. So efficiency of this method poor for a quantative estimation of a degree of influencing of each factor, includes in equations of plural regressin, on effective factor and accordingly for diagnostic of economic events, particulary of the social standards.

[6] In consiquence to factors of significance of relations the normative calculations may be real when koefficient is from 0,7 to 1,0.

Table 3. Value of parameters of equations of plural regression of relations of population's expenses to the food products and nonfood-stuffs from separate constituents of cumulative average income

Factor	Number of the factor	Parameteds of equations of plural regressin[7]
Payment of labour (x_1); pensions, scholarships, assistance, subsidies (x_2)	x_1 and x_2	$\bar{y}_{x_1x_2} = 34{,}737 + 7{,}938x_1 - 32{,}701x_2$
Payment of labour (x_1); pensions, scholarships, assistance, subsidies (x_2); receipt from own subsidiary economy (x_3)	x_1, x_2 and x_3	$\bar{y}_{x_1x_2x_3} = 19{,}5335 + 1{,}6979x_1 - 7{,}032x_2 + 1{,}5237x_3$
Payment of labour (x_1); pensions, scholarships, assistance, subsidies (x_2); receipt from own subsidiary economy (x_3); other sources (x_4)	x_1, x_2, x_3 and x_4	$\bar{y}_{x_1x_2x_3x_4} = 10{,}4963 + 1{,}655x_1 - 3{,}526x_2 + 0{,}2831x_3 + 0{,}9352x_4$

But it for the solution of this problem instead of analysis of influencing of separate parts of cumulative average income, to accept for the all its volume we can say, that:

1) at application of one-factor equation of regressio, increase of cumulative average income on 1 grn., will allow to increase expenses to food products and nonfood-stuffs on 0,673 grn. (after regressive equalization $\bar{y}_x$=7,667+0,673x);

2) at application of one-factor equations of dependence, increase of cumulative average income on 1 grn., will allow to increase expenses to food products and non food-stuffs on 0,68 grn.

This calculations almost coincide, also them already it is possible logically to interprete as by results of application of regressive equations, so equations of dependence. Now we can do the conclusion, that increase of cumulative average income on 1 grn., assistance increasing of expenses to food products and non food-stuffs on 0,673 grn. (after regressive equalization), and on 0,68 grn. (after equalization of dependence). From this conclusion means, that in first case 0,327 grn. leave to population's for expences to payment of favours, accumulation and other purposes, and in second – 0,32 grn.

Allowing that at analysis of communications of economic events is difficult to supply input data about influencing all factors on effective factor, that in such cases interpretation of this problem will be logically justified at application for calculation of it plural equation of dependence.[8]

Ways of definition of the social standards.

For the solution of a problem: "How will be a size of change of effective factor (population's expenses to food products and nonfood stuffs) at change any constituents of cumulative average income per unite (one grn.)[2]" applicable equations of plural linear dependence:

$$y_{x_{1-4}} = y_{\min}[1 + B(d_{\frac{x_{1i}}{x_{1\min}}-1} + d_{\frac{x_{2i}}{x_{2\min}}-1} + d_{\frac{x_{3i}}{x_{3\min}}-1} + d_{\frac{x_{4i}}{x_{4\min}}-1})],$$

[7] Factical values of Fisher's factors more than their normative values, so parameters all equations of plural regression is real.

[8] Plural equatio of regression can't made this task.

where $y_{x_{1-4}}$ - the equation of plural linear dependence (x_{1-4} – is a number of factors from maiden, till fourth);

y_{min} – minimum value of effective factor (initial parameter);

B – cumulative parameter of plural dependence;

x_{min} - minimum value of the factor;

d – sign of deflection.

By the input data of tabl.1 the equation will be :

$$y_{x_{1-4}} = 23{,}42\left[1 + 0{,}1757567 \cdot \begin{pmatrix} d_{\frac{x_{1i}}{x_{1\min}}-1} + d_{\frac{x_{2i}}{x_{2\min}}-1} + \\ + d_{\frac{x_{3i}}{x_{3\min}}-1} + d_{\frac{x_{4i}}{x_{4\min}}-1} \end{pmatrix}\right]$$

Using parameters of this equation is added one grn. to minimum values of any of the factors, and received theoretical value of population's expenses to food and non food-stuffs:

$$y_H = \left[1 + 0{,}1757567 \cdot \left\{ \begin{matrix} \left(\frac{10{,},29}{9{,}29} - 1\right) + \left(\frac{3{,}91}{2{,}91} - 1\right) + \\ + \left(\frac{5{,}89}{4{,}89} - 1\right) + \left(\frac{7{,}80}{6{,}80} - 1\right) \end{matrix} \right\}\right] \cdot 23{,}42 = 26{,}72 .$$

So, if all constituents of average cumulative month income to increase on 1 grn., that populations expenses to food products and nonfood-stuffs in calculation per 1 person will encrease on 3,3 grn. (26,72-23,42), that is 0,7 grn. leave to populations for expences to payment of servises, accumulation and other.

In mathing with similar calculations after parameters of one-factor equations, the interpretation of the obtained conclusion with the help of plural equation of dependence is more logical and understand able. Therefore, application of equations of plural dependence (in particular in those cases if there is no capability to study influencing all factors on effective factor) resolves to receive the most authentic estimation of connection between the factors and effective factors.

More logical is interpretation of ormative calculations another kind, that is the solution of the problem "On how much will change a level of a factor at change of a affective factor on unit, or any given value[2]"[9]

For definition of normative levels of the factors and size of their change at increase effective factor on unit (1 grn.) at first we shall calculate a difference of a factor of matching of effective coefficient aster the formula:

$$d_{yH} = \frac{Y_H}{Y_{\min}} - 1 = \frac{24{,}42}{23{,}42} - 1 = 0{,}0426985 .$$

Normative levels of factor will be such:

a) for the factor x_1:

$$x_{1H} = \left(\frac{d_{yH}}{b_{x_1}} + 1\right) x_{1\min} =$$

$$= \left(\frac{0{,}0426985}{0{,}6708843} + 1\right) 9{,}29 = 9{,}88 \quad \text{grn..}$$

б) for the factor x_2:

[9] Traditional method haven't solution.

$$x_{2H} = \left(\frac{d_{yH}}{b_{x_2}} + 1 \right) x_{2\min} =$$

$$= \left(\frac{0{,}0426985}{1{,}1460309} + 1 \right) 2{,}91 = 3{,}02 \quad \text{grn.}$$

в) for the factor x_3:

$$x_{3H} = \left(\frac{d_{yH}}{b_{x_3}} + 1 \right) x_{3\min} =$$

$$= \left(\frac{0{,}0426985}{0{,}419451} + 1 \right) 4{,}89 = 5{,}39 \quad \text{grn.}$$

г) for the factor x_4:

$$x_{4H} = \left(\frac{d_{yH}}{b_{x_4}} + 1 \right) x_{4\min} =$$

$$= \left(\frac{0{,}0426985}{1{,}0610461} + 1 \right) 6{,}80 = 7{,}07 \quad \text{grn.}$$

This data we shall place in tab.4.

Table 4. The comparative table of real and normative levels of increasing of monetary population's expenses on 1 grn. in calculation per 1 person.

Symbol of the factor	Factor	Levels of factors		Need to increase real levels of factors
		minimum (direct dependence)	normative	
x_1	Payment of labour	9,29	9,88	+0,59
x_2	Pensions, scholarships, assistance, subsidies	2,91	3,02	+0,11
x_3	Receipt from own subsidiary economy	4,89	5,39	+0,50
x_4	Other sources	6,80	7,07	+0,27

From the data of tab.4 we can see, that increasing of effective factor (population's expences) on 1 grn. will demand increase of payment of labour – on 0,59 grn., increase of pensions, scholarships, assistance, subsidies – on 0.11 grn., increase of receipt from own subsidiary economy – on 0.5 grn., and increase of receipt from other sourses – on 0.27 grn., or together increase of all these parts of cumulative average income will make 1,47 grn.

So, increase of all constituents of cumulative average income of population on 1,47 grn., will allow to supply increasing of monetary expences in cumulation on 1 person. On food products and nonfood-stuffs is 1 grn., and 0,47 for payment of servise, accumulation and other purposes.

At such formulation, which one by the conventional regression analysis is not calculated there is more logical and understandable interpretation of one-factor and plural regressive equations.

This methods of definition of social standards of the levels of monetary incomes and expenses of population to food products and nonfood-stuffs may be using and to calculation normative levels of average income and population's consumption of main food products.

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