European Journal of Business Startups and Open Society

Vol. 4 No. 11 (Nov - 2024): EJBSOS

http://innovatus.es/index.php/ejbsos

Applying Equation in the Economy Defferensial

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The economy and the university campus samarkand

Abstract: This article qaralayotgan the first and second equation of the economic issues at work, causing her to look at the issues of charging defferensial is orderly. See also equations and system of equations can be applied to economic issues in defferensial defferensial. Defferensial equation will lead to the solution of economic solutions to address the issues.

Key words: Economy, defferensial equations, solution of systems of equations, correlation, regressiya, chekli, account analysis, brand, price, pair korrelatsiya.

To enter. Any economic indicators often not one but multiple factors that effect. For example, a certain brand to not only demand the price of a certain commodity, but complementary and substituting the price of the goods, the income of consumers, and many other factors is determined. In such a case, instead of the multiple regressiya are considered juftlash regressiya

$$.\hat{y} = f\left(x_1, x_2, \ldots, x_p\right) \qquad (1)$$

Many regressiya requirements, campaignprofitability of the world, in addressing the problems of production costs functiondrives studying macroeconomic accounts of the economy and is widely applied in a number of other issues in the book. At the present time is one of the most common methods in many regressiya ekonometrik. The main purpose of the model has a number of regressiya many many factors to create, as well as the modeling of the effects of each factor and their overall effect is to determine the index I.

Many regressiya analysis-analysis of multiple independent variables bound in the cases associated to this variable juftlash regressiya development. The majority of the direct expansion regressiya juftlash analysis of the model, but this land some new problems appear, two of them should highlight. First study the effects of the independent variables on the dependent variables of a specific problem, as well as its effects and distinguish the effects of other independent variables associated with. The second important problem of the specification of this model, the factors which you should add this regressiya (1), and should answer the question about the factors which you should remove it and out of it. We separate these problems in the future, we offer multiple regressiya general analysis of the question. Therefore, we consider that earlier on the specification of our model.

Main part: regressiya Many of the most widely used and most simple model fortwo-this is many of regressiya linear model:

$$y = \alpha' + \beta_1' x_1 + \beta_2' x_2 + \ldots + \beta_p' x_p + \varepsilon \qquad (2)$$

In the mathematical sense β_j' (2) network equation, the coefficient of y equal to the partial surge on relevant factors effective features:

$$\beta_1' = \frac{\partial y}{\partial x_1}, \beta_2' = \frac{\partial y}{\partial x_2}, ..., \beta_p' = \frac{\partial y}{\partial x_p}.$$

A parameter is called the free term and *y* is equal to zero will determine the value of y when understand all of the variables. However, the pair regressiya as factors in the economic structure often does not take the value of zero does not have free term economic value and meaning. In addition, as opposed to the juftlash regressiya each regressiya the coefficient of β_j' y the value of x_j a y's trinity with the increase in the average to change if they are equal, if all other factors remain unchanged. *E* regressiya related to the value of the random error.

It should be noted that the option price is only β_j' one factor *of* x_j to changing, there are other factors are very easy to identify, leaving the value unchanged. Then the parameters of the evaluation function for each pair of factors regressiya of analysis functions is reduced to the order of the series. However, the economy in the natural sciences (physical, chemical, biological) research widely used, this approach can not be taken. Economist tabiatshunos eksperimentator as opposed to the individual factors that regulate because they are deprived of a possibility to teach students: to assess the effect of one factor, have been can not ensure that all other conditions being equal.

Regressiya $\alpha', \beta_1', \beta_2' ... , \beta_p'$ the estimation of the parameters of equation (2) is one of the most important functions of many regressiya analysis. Solving this problem is the most common method of most of these small kvadratga (mn we have) method. The deviation of the observed value of the dependent variables kvadrati its essence consists of minimizing the sum of *y* $\hat{y}$ from the value obtained from equation regressiya. Parameters $\alpha', \beta_1', \beta_2' ... , \beta_p'$ had to be random variables, for the reason that of their real value can not be detected on the sample. Therefore, regressiya theoretical equation (2) instead of **regressiya assessed empirical equation**, it can be expressed as follows:

$$y = a + b_1 x_1 + b_2 x_2 + ... + b_p x_p + e \qquad (3)$$

This ground $a, b_1, b_2, ..., b_p$ -evaluation of the theoretical value $\alpha', \beta_1', \beta_2' ... , \beta_p'$ or regressiya empirical coefficient, *e* – to evaluate the deviation *ε*. Then the expression has the following form:

$$\hat{y} = a + b_1 x_1 + b_2 x_2 + ... + b_p x_p \qquad (4)$$

n variables and n observations of character which corresponds to the effective understand them are:

$$\left(x_{i1}, x_{i2}, ..., x_{ip}, y_i\right), \quad i = \overline{1, n} \qquad (5)$$

(4) equation to accurately determine the value of the parameters of the sample size *n* should not be less than the number of parameters, that is $n \geq p+1$.. otherwise, the parameter value can not be detected one by one. If *n\u003d p*+1, the price of the option (5) the value of (4) by replacing the simple expression MN is the only way. *P* updated and expanded a system of linear equations (SLOGAN) applied with any method is chargedthe same amount of unknown gan system of equations (p+1) is obtained. However, from the perspective of the statistical approach, the problem of reliable because the value of the variables measured such a solution of (5) include different types of errors. Therefore, (4) assessment of parameters defined by the equation to obtain a reliable sample size should be increased significantly the number of parameters from it. In

practice, as mentioned above, the sample size, x_j (4) in the equation xj should be 6-7 times more parameters.

In the framework of the linear model for analysis of many regressiya mn must fulfill a number of terms and conditions. This is basically the same conditions as the pair regressiya, but this yhere regressiya need to add multiple specific assumptions:

5^0.The specification of the model (2) has the form of.

6^0.Lack of Multikollinearlikning: strictly do not have a linear relation between the explanatory variables, this model plays an important role in addressing the problem of specification of the factors in the selection.

7^0.The errors $\varepsilon_i, i=\overline{1,n}$ have a normal distribution $(\varepsilon_i \sim N(0,\sigma))$. Your goal assuming this condition it is necessary to establish compatibility test interval and statistical assumptions.

This is the fulfillment of all the terms that have been Gauss – Markov teorema many-dimensional analogues happens: $a, b_1, b_2, ..., b_p$ mn obtained by the class of linear unbiased price assessments we have the most efficient (smallest dispersion in the sense that is).

Many regressiya evaluation of the parameters of linear equations

Please consider three methods of calculating regressiya many linear parameters.

1. **Matrisa method**. Observed data and model parameters in the form of matrisa we offer.

$Y=[y_1, y_2, ..., y_n]'$ – *n* - dimensional vector of observations on the dependent variable column;

$B=[a, b_1, b_2, ..., b_p]'$ – (*p*+1) – regressiya of the parameters of equation-dimensional column vector (3);

$Y=[y_1, y_2, ..., y_n]'$ - *n* - dimensional vectory_i is the value of the standard $\hat{y}_i$ (4) the value obtained by the equation aside from the column exit.

For convenience, write the columns are written as row with a line to show the operation of transpozitsiya and therefore will be provided.

And finally, we matrisa measurement of the value of the independent variable in the form of rectangular , we will write $n\times(p+1)$:

$$X=\begin{bmatrix} 1 & x_{11} & x_{12} & \dots & x_{1p} \\ 1 & x_{21} & x_{22} & \dots & x_{2p} \\ \vdots & \dots & \dots & \dots & \dots \\ 1 & x_{n1} & x_{n2} & \dots & x_{np} \end{bmatrix}$$

This technique matrisa to each column of *the n* of n the value of the package is the answer and one of the factors in terms of freedom, which corresponds to the value of the variable in the first column consists of the unit.

This character looks regressiya empirical equation as follows:

$$Y=XB+e \qquad (6)$$

Therefore, regressiya the residual vector can be expressed as follows:

$$e=Y-XB \qquad (7)$$

In so doing $Q = \sum e_i^2$ we actually minimallashtirilgan by the functional mn ***e' vector e' can be written as the product of a column vector*** :

$$Q = e'e = (Y - XB)'(Y - XB) \qquad (8)$$

In accordance with the instant mn ***Q***b vq ektor's differenesiatsiyasi ***V*** leads to the following expression:

$$\frac{\partial Q}{\partial B} = -2X'Y + 2(X'X)B \qquad (9)$$

ekstremum should explain it equal to zero to find. The expression for the vector of parameters as a result of the changes we regressiya we get:

$$B = (X'X)^{-1}X'Y \qquad 10)$$

This earth $(X'X)^{-1}$ matrisa technique of the reverse side $X'X$.

Example. The controller gave the following results five randomly selected family budget (thousand rubles):

The Family	The Family Fund ***S***	Income, ***Y,***	Property, ***W***
1	3	40	60
2	6	55	36
3	5	45	36
4	3.5	30	15
5	1.5	30	90

SY **and** s at the rate of w regressiya.***W***.

Our records will put:

S=[3;6;5;3,5;1,5]' – vector of dependent variables is observed;

B=[$a;b_1;b_2$]' – is the vector of the parameters of equation regressiya;

$$X = \begin{bmatrix} 1 & 40 & 60 \\ 1 & 55 & 36 \\ 1 & 45 & 36 \\ 1 & 30 & 15 \\ 1 & 30 & 90 \end{bmatrix}$$

- matrisa of the value of the independent variable.

Later, the matrisa of the operations using consider (we have MS Excel table from the processor and which TRANSPLAR, MUMNOJ and supervision that performs a functionfrom s , we will use)

$$X'X = \begin{bmatrix} 5 & 200 & 237 \\ 200 & 8450 & 9150 \\ 237 & 9150 & 14517 \end{bmatrix}; \quad (X'X)^{-1} = \begin{bmatrix} 5{,}6916 & -0{,}1074 & -0{,}0252 \\ -0{,}1074 & 0{,}0024 & 0{,}00024 \\ -0{,}0252 & 0{,}00024 & 0{,}00033 \end{bmatrix}$$

$$B = (X'X)^{-1}X'Y = (0{,}2787 \quad 0{,}1229 \quad -0{,}0294)$$

Skalaryregressiya in the form of ar model:

$$\hat{S} = 0{,}2787 + 0{,}1229Y - 0{,}0294W$$

2. Skalaryar method. It is formed using the system of normal equations, allows to estimate the parameters of its solutions regressiya:

$$\begin{cases} an & +b_1\sum x_1 & +b_2\sum x_2 & +\ldots+b_p\sum x_p & =\sum y \\ a\sum x_1 & +b_1\sum x_1^2 & +b_2\sum x_2x_1 & .+\ldots+b_p\sum x_px_1 & =\sum yx_1 \\ \ldots & \ldots & \ldots & \ldots & \ldots \\ a\sum x_p & +b_1\sum x_1x_p & +b_2\sum x_2x_p & +\ldots+b_p\sum x_p^2 & =\sum yx_p \end{cases} \quad (11)$$

This system in any suitable way, for example, the determinant method or the method you can solve with Gauss. To use with the little amount of the determinant of the specified parameters is preferable.

Let us consider the above example. This on earth, *y* and w for the two factors *W* the system of normal equations is written as follows:

$$\begin{cases} an & +b1\sum Y & +b2\sum W & =\sum S \\ a\sum Y & +b1\sum Y^2 & +b2\sum WY & =\sum SY \\ a\sum W & +b1\sum YW & +b2\sum W^2 & =\sum SW \end{cases}$$

Consider the value of the amount have been, we get the following:

$$\begin{cases} 5a & +200b1 & +237b2 & =19 \\ 200a & +8450b1 & +9150b2 & =825 \\ 237a & +9150b1 & +14517b2 & =863{,}5 \end{cases}$$

We we are calculating the value of the determinant of this system, MOPRED in excel functionthat we will use as it explains:

$$\Delta = 6842700; \quad \Delta_a = 1903325; \quad \Delta_{b_1} = 840825; \quad \Delta_{b_2} = -201225.$$

This hereof the assumption of the model parameters we can n we have:

$$a = \Delta / \Delta_a = 1903325 / 6842700 = 0{,}2787;$$

$$b_1 = \Delta_{b_1} / \Delta = 840825 / 6842700 = 0{,}1229;$$

$$b_2 = \Delta_{b_2} / \Delta = -201205 / 6842700 = -0{,}0294.$$

Pay attention, the coefficient on the left side of the system of normal equations knew matrisa fit with the elements of the appropriate technique $X'X$ comes in .

3. Regressiya standardized at the level of the model. A standardized scale regressiya equation has the following form:

$$t_y = \beta_1 t_{x_1} + \beta_2 t_{x_2} + \ldots + \beta_p t_{x_p} + \varepsilon \quad (12)$$

$t_y, t_{x_1}, t_{x_2}, ..., t_{x_p}$ standardized qa variablesthere:

$$t_y = \frac{y - \bar{y}}{\sigma_y}; \quad t_{x_j} = \frac{x_j - \bar{x}_j}{\sigma_{x_j}}, \quad j = \overline{1,n} \qquad (13)$$

do this to the average value is equal to zero: $\bar{t}_y = \bar{t}_{x_1} = \bar{t}_{x_2} = ... = \bar{t}_{x_p} = 0$ average square deviation equal to unity: $\sigma_y = \sigma_{t_{x_j}} = 1,\ j = \overline{1,n}$; β_j – regressiya coefficient or the standardized β – coefficient knew (them, (2) parameters should be confused with the equation).

(12) noted that the use of mn have reached the stage to the equation, with the appropriate changes after we get the system of normal equations:

$$\begin{cases} \beta_1 + \beta_2 r_{x_2x_1} + \beta_3 r_{x_3x_1} + \beta_p r_{x_px_1} = r_{yx_1} \\ \beta_1 r_{x_1x_2} + \beta_2 + \beta_3 r_{x_3x_2} + \beta_p r_{x_px_2} = r_{yx_2} \\ \dots \quad \dots \quad \dots \quad \dots \quad \dots \\ \beta_1 r_{x_1x_p} + \beta_2 r_{x_2x_p} + \beta_3 r_{x_3x_p} + \beta_p = r_{yx_p} \end{cases} \qquad (14)$$

In this system r_{yx_j}, $r_{x_ix_j}$, $j,k = \overline{1,p}$ the elements of their enhanced matrisa pair correlation coefficient or in other words, different factors or factors and is the correlation coefficient between pairs of effective features. The measured value of all the variables without having to, for example, the processor or spreadsheet program ms excel using statistics, kompyutearth in the computer's calculation of the correlation coefficient is not difficult pair matrisa MS Statistics.

Of the system, y isthe solution of (14) β – coefficient were also determined. K. o. S. nin knew this coefficientindicates how much the value of g. Agar to suit the factor is the average result x_j x j one changewill change to. k. o. with the average rate of change of other factors. Normallashtirilgan and centralized for the reason of all variables, *the* β – factor are compared with each other. Comparing them with each other, depending on the strength of the factors to affect the results can be filtered. The main advantage of this regressiya their standardized coefficient, coefficient unlike simple regressiya from taqqoslanmaydigan with each other.

Y of the production cost functionc *y* (thousand rubles), with the description of equations of the form I noticed:

$$y = 200 + 1{,}2x_1 + 1{,}1x_2 + \varepsilon$$

this earth, the main factors of production funds (thousand rubles) and the number of those who are engaged in the production (of people). Also seen as the main constant work means grow to a value of 1 thousand rubles. the costs of the technical equipment of the average increased to 1.2 thousand rubles to a person with permanent and leads to the increase in the number of those who are busy with work an average of 1.1 thousand rubles.. leads to increased costs, however this will affect production cost more than the first two factors does not mean that a man had two sons. If you apply to a standardized scale regressiya equation, such a comparison can be. See this so:

$$\hat{t}_y = 0{,}5t_{x_1} + 0{,}8t_{x_2}$$

This means that the first factor of s. k. o with the growth of ha. the number of those who are constantly busy with work the product with the average costs of 0.5 s. k. o. premium. $\beta_1 < \beta_2$

(0,5<0.8) had to be, for the reason that the first factor of the product is not production, but the first two factors will affect more than just come to the conclusion that we can. from the equation it seems natural regressiya of this scale.

The pair standardized coefficient the correlation coefficient is not a different thing from regressiya associated linear *r* is the correlation coefficient and the associated regressiya pair related to each other at many regressiya in "pure" regressiya coefficient b_j *b* coefficient associated with:

$$b_j = \beta_j \frac{\sigma_y}{\sigma_{x_j}} \qquad (15)$$

This allows you to scale from a standardized regressiya equation:

$$\hat{t}_y = \beta_1 t_{x_1} + \beta_2 t_{x_2} + \ldots + \beta_p t_{x_p} \qquad (16)$$

regressiya go to the natural scale in equation (4). Option *a* is determined as follows:

$$a = \bar{y} - b_1\bar{x}_1 - b_2\bar{x}_2 - \ldots - b_p\bar{x}_p \qquad (17)$$

(16) terms in the equation are not available for free, because the average standardized all variables is equal to zero.

Standardized coefficient regressiya their review, the factors in them not meaning allows you to work – out which has the lowest value of the factors of the model is dropped β_j.

Regressiya computer programs they used it to build many of equations ysolution algorithm, depending on the initial data for equation regressiya only, or in addition to a standardized scale regressiya gives you the chance to get the equation.

In conclusion, the example discussed above, the digital data according to the standardized regressiya consider the equation. Correlation in excel the functionusing that as explains, we consider the correlation coefficient improved the way their juftlash matrisa:

$$R = \begin{bmatrix} 1 & -0{,}27149 & 0{,}873684 \\ -0{,}27149 & 1 & -0{,}68224 \end{bmatrix}$$

the last column consists of the elements $r_{yx_1}\,(r_{SY})$ and $r_{SW}\,(r_{yx_2})$ the corresponding first two elements in the column to fit the unit $r_{YW}\,(r_{x_1x_2})$ comes . This matrisa the b-coefficient of the system of equations to determine also enlarged matrisa of β:

$$\begin{cases} \beta_1 + 0{,}27149\beta_2 = 0{,}873684, \\ -0{,}27149\beta_1 + \beta_2 = -0{,}68224 \end{cases}$$

We will solve the determinant of the system with the method, we get the following:

Δ=0,926291; Δ_1=0,688461; Δ_2=-0,44504;

β_1=0,688461/0,926291=0,743245;

β_2=-0,44504/0,926291=-0,48045;

Then follows a standardized regressiya equation is written as:

$$\hat{t}_y = 0{,}743245t_Y - 0{,}48045t_W$$

Also seen as a man had two sons, the first factor that affects the result of more than two ($|\beta_1|>|\beta_2|$), but this difference coefficient of the natural scale network (0,1229 and -0,0294) is not as large.

From this equation you can go to the natural equation of the scale. Do this to Excel STANDOTCLON functionthat explains using, all o'zgaruvchilarning standard og'work will determine:

$$\sigma_S = 1{,}75357; \quad \sigma_Y = 10{,}6066; \quad \sigma_W = 28{,}6496,$$

and the average functionusing that as explains the average value:

$$\bar{S} = 3{,}8; \quad \bar{Y} = 40; \quad \bar{W} = 47{,}4.$$

Later, determine the price of the option:

$$b_1 = \beta_1 \frac{\sigma_y}{\sigma_{x_1}} = 0{,}743245 \cdot \frac{1{,}75357}{10{,}6066} = 0{,}1229;$$

$$b_2 = \beta_2 \frac{\sigma_y}{\sigma_{x_2}} = -0{,}48045 \cdot \frac{1{,}75357}{28{,}6496} = -0{,}0294;$$

$$a = \bar{s} - b_1\bar{Y} - b_2\bar{W} = 3{,}8 - 0{,}1229 \cdot 40 + 0{,}0294 \cdot 47{,}4 = 0{,}2787.$$

The value of this assessment previously obtained points are same.

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