ALTERNATIVE METHOD FOR CONSTRUCTION OF CORRELATION MODELS

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Abstract: *this article has developed a new method for constructing production functions. Based on specific data, a methodology for calculating the coefficients of the desired mathematical models is shown. Traditional methods for constructing production and correlation functions are considered in the works of various authors. These methods are well mathematically sound and there seem to be no serious problems for their practical application. But the fear to the practical application of the results obtained on the basis of mathematical research of objects still exists.*
Keywords: *production function, correlation analysis, derivative function, approximation, forecasting.*

АЛЬТЕРНАТИВНЫЙ МЕТОД ПОСТРОЕНИЯ КОРРЕЛЯЦИОННЫХ МОДЕЛЕЙ

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Аннотация: *в этой статье разработан новый метод построения производственных функций. На основе конкретных данных показана методика вычисления коэффициентов искомых математических моделей. Традиционные методы построения производственных и корреляционных функций рассмотрены в работах различных авторов. Эти методы хорошо математически обоснованы и вроде нет никаких серьёзных проблем к их практическому применению. Но опасение к практическому применению результатов полученных на основе математических исследований объектов все-таки существует.*
Ключевые слова: *производственная функция, корреляционный анализ, функция производного, аппроксимация, прогнозирование.*

These fears, first of all, appear when predicting the state of economic objects using mathematical models. Sometimes theoretical and real data diverge greatly. We noticed these discrepancies in mathematical modeling and forecasting the number of population of the Republic of Uzbekistan in the period 2015 - 2025. As well as in forecasting the volume of production of basic agricultural products in this period. The study showed that although the correlation coefficient in constructing the dependence is quite high, the results of the reliability of forecasts will not always be satisfactory. For a deep analysis of this phenomenon, consider the following example. Let the statistics obtained on the basis of observations have the following form:

2	5	10	15	20	25	30	35	40	45
0,0349	0,08715	0,1736	0,2588	0,3420	0,4226	0,5	0,5735	0,6428	0,7071

Using traditional methods for constructing a correlation dependence, we can determine what has the form.

Calculations showed that the closeness of the connection between the studied phenomena is very high. But if you carefully monitor the values, you can understand that this is the exact value of the function where. Yes, indeed. But beyond this gap, these inequalities are greatly violated.

Here in the zone the difference between the actual and theoretical values is very small. And in the zone, these values are very different. Now we can imagine what mistake would have been made if the forecast had been made on the basis of a function in the interval.

This is certainly not news. Until today, there is no universal method that increases the reliability of forecasts made by mathematical methods in the economy and in other sectors of the economy. But in this work a certain attempt is made to eliminate this drawback.

Let statistics be given and for which it is required to determine the correlation dependence. Unlike traditional methods, dependency is found as follows:

1) In the place of determination of the dependence is determined or; When there is statistics and based on we can determine the value of the derivative of the function at all points

2) Based on these data, the exact relationship is determined or

3) By integrating, we get the desired dependence

We will consider the above theory using a specific example. Let be the productivity of cotton (t /ha) and the amount of organic fertilizer applied under cotton (t /ha). And it is required to determine the correlation dependence. To do this, we will prepare all the necessary data for the calculations.

To get a function derived from a function $f(x)$ calculated as $\sum y_i$ consider $\sum \frac{\Delta y_i}{\Delta x_i}$ and as $\sum x_i y_i$ take $\sum \frac{\Delta y_i}{\Delta x_i} \cdot x_i$

And so applying the least squares method, we have a system of equations

$$\begin{cases} \sum_{i=1}^{9} \frac{\Delta y_i}{\Delta x_i} = 9a_0 + b \cdot \sum_{i=1}^{9} x_i \\ \sum_{i=1}^{9} \frac{\Delta y_i}{\Delta x_i} \cdot x_i = a_0 \cdot \sum_{i=1}^{9} x_i + b \cdot \sum_{i=1}^{9} x_i^2 \end{cases} \text{ или } \begin{cases} 34{,}83 = 9a_0 + 40{,}8b \\ 164{,}6 = 40{,}8a_0 + 186{,}7b \end{cases}$$

So $z = y' = \frac{dy}{dx} = -23{,}645 + 6{,}07x$

Integrating this function provided $y(3{,}5) = 24$ we get the desired dependency.

$$y = \int (-23{,}645 + 6{,}07x)dx = -23{,}645x + \frac{6{,}07}{2}x^2 + c$$

$y(3{,}5) = -23{,}6 \cdot 3{,}5 + 3{,}035 \cdot 3{,}5^2 + c = 24$ и отсюда $c = 69{,}5795$

$y = 3{,}035x^2 - 23{,}645x + 69{,}5795$

And solving this problem by the traditional method, we get the dependence

$\bar{y} = 18{,}212 + 1{,}6x$

As a result of these calculations, we have:

1) The traditional function method $\bar{y} = 18{,}212 + 1{,}6x$

2) The function proposed by the method $y = 3{,}035x^2 - 23{,}645x + 69{,}5795$

The proposed method has the following advantages relative to the traditional:

1) As a result of integration, we always get a nonlinear function $y = \int Z(x)dx$. A nonlinear function more accurately describes real processes.

2) Since the derivative of the function determines the growth and decrease of the function in the entire domain of definition, therefore, the obtained function by this method should be closer to real processes.

3) From the table and based on other calculations, one can find that the reliability in forecasting economic indicators is greater in the proposed method than when using traditional methods.

But there are many questions that require their mathematical confirmation.

1) Is the proposed method always effective.

2) Is it possible to mathematically compare these two methods.

3) How can mathematically evaluate the reliability of forecasts.

These are issues that need to be addressed in the future.

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