Stages Of Drawing Up A Mathematical Model Of The Economic Issue.

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Annotation: The article presents the concept of a mathematical model and the stages of drawing up a mathematical model of an economic issue.

Key words: Economy, mathematical model, sequence, compound interest, continuous interest.

Этапы Построения Математической Модели Экономической Задачи.

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Аннотация: В статье описывается понятие математической модели и этапы создания математической модели экономических задач.

Ключевые слова: Экономика, математическая модель, последовательность, сложный процент, непрерывный процент.

Iqtisodiy Masalaning Matematik Modelining Tuzish Bosqichlari.

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Annotatsiya: Maqolada matematik model tushunchasi va iqtisodiy masalaning matematik modelini tuzish bosqichlari keltirilgan.

Kalit soʻzlar: Iqtisod, matematik model, ketma-ketlik, murakkab foiz, uzluksiz foiz.

A mathematical model is a approximate description of a reality in the external world, written with the help of mathematical symbols. The analysis of the mathematical model makes it possible to penetrate into the fundamental essence of the studied reality. A mathematical model is a powerful weapon of knowledge of the outside world, which can express an idea in advance and

control both the process of mathematical modeling, that is, the study of reality through a mathematical model can be divided into four stages.

The first stage is a clear expression of the laws that connect the main parts of the model, that is, the definition. This stage requires the study of a lot of information on the realities under study and a deep penetration into the connections between them. This stage is completed by writing out the links expressed in the qualities and qualities of quantities studied by this model with the help of mathematical symbols.

The second stage is the study-examination of the mathematical problem generated by the mathematical model. In this, the main question is to solve the generated mathematical problem, that is, to obtain the result data (theoretical results) when analyzing the model and compare them with the results of observing the studied reality. At this stage, the formulas, rules used in the analysis of the mathematical model play an important role, while this also depends on the computational techniques used in the formation of the result data, which is proposed as a solution to the complex problem under study. Sometimes the mathematical questions that are formed according to the mathematical model in the study of different realities are the same homogeneous. This necessitates a separate study as an independent matter with an abstraction of such realities under study.

The third stage is to determine whether the theoretical results obtained according to the accepted approximate model correspond to the results obtained from the practical observation of the studied reality. If the model is fully identified (all parameters that determine it are given), the difference in the results of the observation of the theoretical results is carried out by an assessment of the difference in the solution of the main issue. If the difference goes out of the accuracy of the tracking results, this model will not be accepted. Sometimes, when building a model, some of its characteristics become obvious. Model descriptions (parametric,functional) are defined issues are called inverse issues according to the ability to compare the results of observations with the results of observations in the said accuracy. If the conditions under which the descriptions of the mathematical model are not obtained are not met, then such a model will not suit the research of the studied reality. Checking the mathematical model according to the criteria for practice allows you to know if what is based on this model is right or wrong. This method is the only way to study unattainable realities.

The fourth stage is the analysis of the model, according to the data collected about the studied reality, there will be an improvement of the model. The development of Science and technology will continue to clarify the information on the realities under study. And finally there comes such a time that those of us who know about reality do not have a row to our information, which is obtained by means of a mathematical model. Then it becomes necessary to build a new modern mathematical model.

It is known that the limit of the sequence $\{x_n\}$ with the general limit $x_n = (1 + \frac{1}{n})^n$ gives the number e :

$$e = \lim_{n \to \infty}(1 + \frac{1}{n})^n \qquad e = 2{,}7182818 \dots$$

Let's look at an example of using the number e in the economy.

For example. We know the complex interest formula

$$Q = Q_O(1 + \frac{P}{100})^n \qquad (1)$$

where, Q_O — the initial amount of the deposit in the bank,
P — the interest rate for a certain period of time (month, year),
N — the amount of time (number) in which the deposit is stored,
Q — formulas in the form of the amount of the deposit after n times are widely used in demographic calculations and economic forecasting. Assume that the initial deposit Q_O is placed in the bank for the year $P = 100\%$. In this case, the deposit will be made after one year $2Q_O$. After half a year (6 months)

The account is closed with the result

$Q_1 = Q_0\left(1 + \frac{50}{100}\right) = Q_0\left(1 + \frac{1}{2}\right) = \frac{3}{2}Q_0 = 1{,}5Q_0$. It is again deposited in the same bank. At the end of the year

$Q_2 = Q_O(1 + \frac{1}{2})^2 = Q_0 \cdot \frac{9}{4} = 2{,}25Q_0$. If we repeat this work every quarter, the deposit is at the end of the year

$$Q_3 = Q_O(1 + \frac{1}{3})^3 = Q_0 \cdot \frac{64}{27} \approx 2{,}37Q_0$$

If we withdraw the deposit at any time during the year, at the end of the year $Q_{12} = Q_O(1 + \frac{1}{12})^{12} \approx 2{,}61Q_0$. If you go to the bank every day,

$Q_{365} = Q_O(1 + \frac{1}{365})^{365} \approx 2{,}714Q_0$, per hour

$Q_{8720} = Q_O(1 + \frac{1}{8720})^{8720} \approx 2{,}718Q_0$ and so on.

It can be seen that the growth sequence of the initial deposit value

$\{q_n\} = \left\{\dfrac{Q_n}{Q_0}\right\}$ $n \to \infty$ overlaps with the sequence that gives the number e. Thus, the income earned in a year when interest is calculated continuouslydoes not exceed

$$\lim_{n \to \infty} \frac{(Q_n - Q_{0)}}{Q_0} \times 100\% = (e - 1) \times 100\% \approx 172\%$$

In general, if the calculated percentage $P-$ is divided into n parts, after t years the deposit will reach $Q_n = Q_O(1 + \frac{r}{n})^{nt}$ soums. Here, $n = \frac{P}{100}$. Let's change the form of this expression:

$Q_n = Q_0\left[\left(1 + \frac{r}{n}\right)^{\frac{n}{r}}\right]^{rt}$. Now let's add a new variable

$m = \frac{n}{r}$, (n $\to \infty$ m $\to \infty$).

$\lim_{n \to \infty} Q_n = \lim_{n \to \infty} Q_0 \left[\left(1 + \frac{1}{m}\right)^m\right]^{rt} = Q_0 e^{rt}$.

The calculation performed by this formula is called continuous percentage calculation.

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ilmiy-amaliy konferensiya materiallari,541-546 betlar, AndMI. 2021-yil 27-29 Noyabr.