

APPLICATION OF THEORY OF PROBABILITY IN SOLVING ECONOMIC PROBLEMS

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ABSTRACT

The article is devoted to the disclosure of the importance of probability theory in economics, as well as the rationale for its use in solving various problems, namely problems in the areas of credit and insurance. The historical moments of the appearance of the theory of probability are described, as well as the use of methods of the theory of probability where it is possible to create and analyze probabilistic models of actions or phenomena. Due to the fact that with the help of probability theory it is possible to solve various issues related to the study of controversial and imperceptible interrelations of various events and phenomena in different branches of science, it became possible to accurately determine the fluctuations of such economic indicators as demand, supply, prices. For a more detailed study of the application of the theory of probability in practice, the authors of the article examined in detail the solution of problems both in the field of lending and in the field of insurance.

Keywords: probability theory, insurance, crediting, economic sphere, Bernoulli formula, local de Moivre-Laplace theorem, Laplace integral formula.

The theory of probability is a science that is aimed at studying probabilistic events, phenomena, processes, their properties, qualities, patterns. Everything that happens in the finance markets falls under the effect of principles and the laws of this science, due to the fact that The largest number of events in the open The market is random. To accurately determine the results of transactions and operations in financial markets is impossible, because the consequences depend on a large number of factors, predict which is difficult enough. In mathematics the probability is defined as a certain indicator that determines whether this or Another event in the future, which is presented in a numerical form. The value of this The indicator can vary from zero (i.e. the event is definitely impossible), to one (when it will undoubtedly occur). Usually the degree of probability is shown as a percentage. When conducting calculations using the theory of probabilities are applied Also, methods of addition and change, But adhering to certain rules. This science is an important way predestination of the possibility of creating relations and relationships

When studying such a mathematical disciplines as “probability theory”, The question arises of its application in life man. In the economic sphere, which is one of the most important areas of life society, this discipline plays non- Little value, so it became an integral part in learning specific Alists, such as an economist and financier. In particular, to study economic the data use the formula of Berel - Lee, the local theorem of de Moivre-Laplace, Integral formula of Laplace.

Although the history of probability theory takes The beginning from the 13th century, in Russia it has developed only in the 19th century, during the creation of the St. Petersburg mathematical school. Its main representatives were P.L. Chebyshev, founder of the school, A.A.

Markov and A.M. Lyapunov. Among them are numerous merit is distinguished: expansion and generalization of the law of large numbers; Condition of the basis theories of random, or “stochastic”, processes; Development of a special method characteristic functions to prove the central maximum theorem during Extremely general conditions Probability theory is a science, which is engaged in the study of the use of characteristic methods in considering the tasks that appear in the analysis random values, revealing massive Patterns. From this concept, we can conclude that if we study Laws governing random events, then we will be able to influence the process of the onset of these events.

In economic science, there are a sufficient number of economic indicators, the calculation of which does not require accurate values, but allows the presence of small deviations. Methods of probability theory must be used where it is allowed It is possible to create and analyze probabilistic models of actions or phenomena. The characteristics can serve as an example In the field of lending and insurance.

One of the areas in the economy, calculations In which it is allowed to combine the use of various methods of probability theory, the field of insurance is considered. For example, with their help it becomes possible to find the likelihood of any insurance accidents (for example, the onset of the death of a citizen depending on age)

For a more detailed study of the application of probability theory in practice, we will clearly consider the solution of problems in the field insurance.

Example 1.

Insurance company N concluded 80,000 property insurance contracts. The probability of loss of loss, shortage or damage to property under each agreement during the year is 4 %. Find the probability that such cases will be no more than 4000.

Solution. According to the condition of the problem $n = 80000$ (80,000 contracts were concluded), $p = 0,04$ - the probability of an insured event.

Find $np = 80000 \cdot 0,04 = 3200$. For in order to calculate $P(M \leq 4000)$, it is necessary to use the integral theorem Muavre-Laplace, which has the following view:

$$P(0 < m \leq 4000) = \Phi_0(x_2) - \Phi_0(x_1)$$

$$x_1 = \frac{0 - 3200}{55} = -58,18$$

and

$$x_2 = \frac{4000 - 3200}{55} = 14,54$$

which are in this way: $x_1 = \frac{0 - np}{npq}$; $x_2 = \frac{400 - np}{npq}$

According to the table $\Phi(x_1) = 0,5$ at $x_1 = -58,18$

$\Phi(x_2) = 0,5$ at $x_2 = 14,54$

We find a function of values in the table Laplace:

$$P(0 < m \leq 4000) = \Phi_0(x_2) - \Phi_0(x_1) = \Phi_0(14,54) - \Phi_0(-58,18) = 0,5 + 0,5 = 1$$

Based on the calculations carried out We can say that the likelihood that insurance cases will be no more than 4000, amounted to 1.

In addition to solving problems in the field of insurance, we consider the application of probability theory in solving problems affecting credit sphere

Example 2.

The course of the action issued by credit by the organization K, within 1 day is capable of increase by 1 point with a probability of 50 %, Seeing - 30 % and not change - 20 %. What is the likelihood of raising the course by 2 point for 5 days.

Solution. When considering conditions

The tasks show that only 2 possible options for the development of events take place:

In the first case, the course can grow on the last two days, without falling and not changing for three days;

In the second case - growth is noticed on The last 3 days, the fall is 1 day, and the course remains unchanged - 1 day.

Therefore, you can make an expression:

$$P(A) = P_5(2,0,3) + P_5(3,1,1) = \frac{5!}{2!0!3!} 0,5^2 \cdot 0,3^0 \cdot 0,2^3 + \\ + \frac{5!}{3!1!1!} 0,5^3 \cdot 0,3^1 \cdot 0,2^1 = 0,02 + 0,15 = 0,17$$

Based on the calculations, you can see - the probability that in 5 days of trading The course will rise by 2 points was 0.17.

Using the theory of probability, you can make calculations for a possible profit that can receive Insurance Company. However, for this you need to know the number of potential customers, terms of the insurance contract And the likelihood of cases prescribed in it. The following example is this the conditions corresponds, and we can make the calculations we need.

Insurance company M has 100,000 potential customers. In order to conclude a personal insurance contract, It is necessary to pay 700 coins. With the occurrence of insurance cases prescribed in the contract that is likely $p = 0,005$, the company undertakes to pay 55,000 coins.

What profit can a company with a reliability of 90 % get?

The solution to the problem must begin With determining the formula of the arrival of the insurance company. For this, it is necessary from the total amount that customers will make, deduct the amount that will be paid The insurance company due to the formation of cases specified in the insurance contract.

Thus:

$$\Pi = 700 \cdot 100 - 55n_0 \text{ thousand coin}$$

To find n_0 , you need to use the formula of the Muavre-Laplace:

$$npq = 100000 \cdot 0,005 \cdot 0,995 = 497,5$$

$$P_{100000}(0 \leq m \leq n_0) = \frac{1}{2} [\Phi(x_2) - \Phi(x_1)] = 0,90$$

$$\Phi(x_2) = 1,8 + \Phi(x_1) = 1,8 + \Phi(-27,72) = 1,8 - 0,5 = 1,3$$

$$x_1 \frac{0 - 500}{22} = -27,72$$

It is quite difficult to overestimate the meaning of the science under consideration. By using probabilities theory solve issues, related to the study of controversial and inconspicuous relationships of various events and phenomena in different branches of science. Theory Probability makes it possible to accurately determine the fluctuations of economic indicators as demand, offer, price. In addition, probability theory is The basis of such science as statistics.

Considering the scope of theory probabilities, it is difficult to pass by the economic and technical sciences. Today It is difficult to imagine the study of phenomena economic and technical nature discarding the modeling that relies on the use of probability theory

Events taking place on roads, the level of security of motor vehicle, car accident, various situations in the process Design of motorways fall in the range of issues resolved using methods of probability theory

The studies allow you to draw a conclusion about the importance of practical application of theory methods. Based on solving problems in such economic areas, as lending and insurance, we clearly saw that using the presented methods, it is possible to make calculations significant for the company when planning and forecasting, as well as the necessary to increase the efficiency of the economy.

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