

The Application of Probability Theory and Mathematical Statistics in Economic Life

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Abstract. Mathematics is one of the most practical mathematical and physical disciplines in our time. With the continuous improvement of social development and economic construction, the connection between mathematics knowledge and people's lives is becoming more and more close, especially the application of mathematical system knowledge such as probability estimation and mathematical statistics can effectively solve many problems in life and problems involving calculation. In particular, it is widely used in economic life, and it can accurately calculate the content of multiple work items such as financial investment, financial management, financial risk prediction, risk avoidance, economic and financial management, budget accounting, etc., so that people can be more closely and universally connected with nature and random phenomena in life. This paper analyses the mathematical ideas of probability theory and mathematical statistics, and focuses on the practical application of mathematical methods in real life, and demonstrates the effectiveness and practicability of probability theory and mathematical statistics in terms of economic investment, life lottery, economic management, economic profit, economic sales, financial risk aversion, and financial insurance in mathematics.

Keywords: Probability theory, mathematical statistics, economic life, application discussion.

1. Introduction

Probability theory and mathematical statistics belong to a characteristic and very active branch of economic mathematics, in which probability theory is mainly based on a large number of similar random phenomena of statistical laws, the existence of a certain outcome of the possibility of objective judgment, and to make a quantitative interpretation of the probability of occurrence of the event of the size of the comparative analysis; and mathematical statistics is based on the theory of probability, statistical data for data collection, organization, grouping, preparation of frequency distribution tables and so on, the calculation and description of various characteristics of indicators. On the basis of probability theory, mathematical statistics collects, organizes, groups, and compiles the table of distribution of times, and calculates and describes various characteristic indexes [1].

Paying more attention to life, we can find that the knowledge of probability and mathematical statistics is applied everywhere, permeating every aspect of people's lives. The encountered mathematical problems and related data for scientific and reasonable statistical calculations, and based on the results of the calculations, to have a generalized prediction of the next trend of things. It helps people to better understand the world and improve the quality of life. Nowadays, with the arrival of the era of big data, in the face of massive data, people urgently need to use probability theory and mathematical statistics to effectively analyze big data and solve complex problems in actual production and life. In view of this, the following will discuss the relevant application strategies of probability theory and mathematical statistics in economic life.

2. The Connotation of Probability Theory and Mathematical Statistics

In higher mathematics, probability theory and mathematical statistics methods have their unique thinking characteristics, and are more closely related to economics. Probability theory and mathematical statistics cover a rich content and has an important position in mathematics. In terms of the current division of the discipline system, some people propose that probability theory and mathematical statistics as an independent discipline, because probability theory and mathematical

statistics methods play an important role in people's production and life. Especially in big data analysis, the use of probability theory and mathematical statistics has a unique advantage. But understanding what probability theory and mathematical statistics mean is not as complicated as it seems. Take a generalized example to explain: tossing a coin and landing on the ground with a 50% chance of coming up with heads and 50% chance of coming up with tails is the simplest representation of probability theory. There is no need to imagine how difficult probability theory and mathematical statistics are to understand. In fact, these simplest probability events can show its connotation. However, it is important to note that it cannot be viewed as a stand-alone study; it runs through the internal connections of other disciplines, interconnecting and complementing each other. The scope of application covers a wide range, and it is difficult to describe it individually because it is so broad [2].

3. The Common Methods of Probability Theory and Mathematical Statistics

The application of big data analysis is very common in economic life. And the application of big data analysis is closely related to probability theory and mathematical statistics. The close connection between the two is mainly reflected in the following aspects.

Firstly, the research purposes of the former and the latter are in the same way. The purpose of the former is to study the data structure and other indicators in order to find out the intrinsic connection between many big data, while the latter also has this one in its purpose. Secondly, the development of big data has provided both with room for development and brought certain opportunities, especially in statistics, which has facilitated the development of both. Thirdly, the former differs from the latter in that it is not a branch of statistics, and it can be applied not only in statistics but also contribute to many other fields. Fourthly, probability theory and mathematical statistics have been widely used and matured problem-solving methods and techniques in decision-making, which occupy a very important position in decision-making.

There are two main methods commonly used by probability theory and mathematical statistics in big data analysis, one is hierarchical analysis; the other is Monte Carlo method. Hierarchical analysis is aimed at the evolution of certain uncertainties, for the evolution of the law and the development trend of the understanding of the relationship between these uncertainties, and in accordance with the primary and secondary ranking of uncertainty factors, so that each level of uncertainty is also included. In analyzing the application levels, the following steps need to be performed. The first step is to identify the factors included in the problem and then to stratify these factors so that the whole structure of the problem belongs to a kind of pairwise comparison of subordinate elements and using the superior elements as a criterion for determining the importance of subordinate and superior elements based on the assessment. A scale corresponds to a judgment matrix that together form the mathematical model. The overall importance of the problem is then summarized in a hierarchical ordering of the factors involved in the problem to provide a reference for the decision maker. The Monte Carlo method can simulate the actual operation of the problem, and its mathematical expression is $Z=k(x_1, x_2, x_3, \dots, x_n)$, in which x_i ($i=1, 2, 3, \dots, n$) represents the existence of n independent random variables in the complex problem. This algorithm is short in time and high in accuracy in solving practical problems [3].

4. Specific Applications of Probability Theory and Mathematical Statistics in Economic Life

4.1. Application in Economic Profit

Economic profits include all the economic amounts that can be obtained from the production of goods, investment, market consumption, financial investment, etc. This part is more accurate in the application of probability theory and mathematical statistics. The main reason for this is that the data that can be used for calculation by the investment and operation of market economy entities and non-

economic entities are relatively accurate, and the calculation of economic profits of investment projects in the market, the economic costs of entity operation inputs, and the mathematical statistical ratio of possible economic profits can obtain more accurate results. For the market, the results obtained after accurate economic data calculation are the fundamental basis for the future economic strategic development and the expansion of enterprise scale, and also the fundamental premise for the overall operating cost and economic budget investment of the enterprise. The fundamental purpose of the development of the market economy and the operation of enterprises is to obtain economic profits; if blindly putting products into the market or investing large sums of money, without considering the prediction and calculation of economic profits and the consideration of market risk factors, it is bound to increase the risk of loss, which is extremely unfavourable to the development of enterprise operations and market economy [4].

4.2. Application in Economic Production

In the economic construction and production activities, the knowledge of probability theory and mathematical statistics is widely used. Especially in the production-oriented enterprises, probability theory and mathematical statistics are used in the calculation of product qualification rate and quality inspection rate. The quantity and probability of unqualified products can provide an accurate probability basis for inferring the number of unqualified products in all production products, and then infer whether the product quality can be put into the market and flow into consumer applications.

In addition, the probability theory and mathematical statistics knowledge will also be used in the trial of new products in production-oriented enterprises. New product development will first be carried out for the consumer market demand for goods survey, according to the current trend in the consumer market and the demand for goods for the consumer group probability calculations, through the sample selection and market research to obtain relatively real consumer data, and according to the number of samples taken to investigate the number of demand for goods and the number of results obtained by probability theory of comparative analysis and mathematical statistics data. Calculation. By accurately calculating the actual percentage of the probability of obtaining the consumption of goods to determine whether the new product has the potential to capture the market, but also to calculate the cost of inputs required for new products and the amount of profit to obtain the accurate calculation, and make accurate calculations to obtain the results of the probability of obtaining the results need to rely on the market survey of the new product. According to this result, the cost and economic profit calculation is carried out, and the final decision is made whether the new product is put into research and development and mass production and put into the market [5].

4.3. Application in Financial Investment Projects

At present, China's financial market is very hot, in which the more popular financial projects are mostly stocks and futures and other investment projects, including heavy metal investment, real estate and other investment projects. One of the more extensive and frequent use of probability theory and mathematical statistics knowledge is the stock. In the stock market, professional financial knowledge and concepts from probability theory and mathematical statistics need to be applied, in order to reduce the risk of financial and stock investments, and to seize favourable opportunities to generate greater economic profits. Despite the downturn in the stock market, stock speculation is still a popular and popular topic. Unlike buying lottery tickets, investing in stocks requires the use of considerable specialized financial knowledge and knowledge of mathematical probability theory. According to the price changes of stocks in the current financial market, it is necessary to maintain a wait-and-see approach, accurate judgment, precise mathematical calculations and the use of mathematical and statistical knowledge, in order to seize fleeting opportunities and avoid potential and obvious financial risks in the highly competitive financial market. Stock buyers can calculate the probability of various stocks making a profit in advance according to the established probability data, through the search of big data and information collection according to certain mathematical and scientific laws, using ready-made probability calculation formulas to calculate the probability that at least one of the stocks

can make a profit. Stock investment can be leveraged on probability theory and numbers. The knowledge of physical statistics can produce more accurate statistical results of probability data, but there is still a great deal of uncertainty and risk in stock investment, and the purpose of probability statistics is only to minimise this risk. Investment needs to be cautious, and it is necessary to strengthen the awareness of investment risk prevention, and scientifically and reasonably apply the knowledge of probability theory and mathematical statistics [6].

4.4. Application of Predicting Winning Probabilities

The design of a lottery is actually a form of number play. Complex mathematical calculations and probabilistic mathematical statistics are needed to increase the chances of winning. More and more people hope that buying a lottery ticket will bring them good luck and a chance to improve their living conditions. However, the chances of winning a lottery ticket are very small and buying a lottery ticket to improve the quality of life and become rich is always a luxury. In sports lottery, the odds of the Super Lotto are set high, while the odds of winning are very low. The 5 numbers in the red ball area have to be chosen from 35 numbers, and the blue ball area has to choose 2 numbers from 11 numbers as the winning numbers. The odds of 35:5 is 77%, and 11:2 is 5.57%, which is a very small probability. However, it can be said that the winning principle is designed according to some mathematical laws and probabilistic principles. According to the current lottery game setup, a person who buys the lotto 100 times has only 7 chances to win, but since each draw is randomly selected and the numbers keep changing, other factors must be taken into account. This calculation shows that the chances of winning the lottery are very low. However, applying knowledge of probability theory and mathematical statistics before purchasing a lottery ticket can benefit the lottery buyer [7].

4.5. Application in Insurance Issues

In the financial investment market, insurance is also considered one of the services of financial investment. Numerous insurance protection services can also be calculated through the use of probability theory and mathematical statistics knowledge of insurance returns. When people choose insurance business service items, they always hope to be able to choose the kind of insurance service items that can bring considerable economic benefits to themselves, and in many insurance protection businesses, only by calculating the probability of each insurance business item bringing actual benefits to themselves, can they help themselves to make the correct choice of insurance service items. Insurance has become a well-known and widely chosen investment project for the general public, but only through the application of the knowledge of mathematical statistics and probability theory to the calculation of the income of insurance projects can we help ourselves make the choice of the largest economic profit project. Before applying for an insurance project, insurance investors can calculate and compare the results by referring to the relevant service data and the probability data of economic returns of the insurance company over the years. Of course, these calculation results will be affected by some uncertain factors in the external environment, or the influence of the policyholder's own factors and there is a certain probability of accidents, but they can still provide certain data reference for insurance investors, and are also conducive to insurance investors to make service projects that can bring the greatest probability of economic returns to themselves in the selection of insurance business projects [8].

5. Summary

Probability theory and mathematical statistics are disciplines within mathematics that are applied very frequently and widely. In practical applications, economic life requires accurate understanding and probability calculations, and enterprises are effective tools for achieving stable development in a market economy and for the financial industry to obtain economic profits. For economic life, whether it is investment, production, or management, precise understanding is necessary, and a large amount

of market data and risk information must be digitised. Using mathematical tools for numerical calculations of data is the greatest guarantee for obtaining financial profits.

Probability theory and mathematical statistics are widely used in economic life. Probability theory and mathematical statistics are easy-to-use tools and efficient analysis methods. When analyzing data, the process, trend and impact of various data types in big data have become the main body of analysis. In the face of the rapid growth trend of big data, the scientific and rational application of probability theory and mathematical statistics in life will help to improve people's production and living standards and promote China's economy to a new level.

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