On Application of Stochastic Mathematics in Financial and Economic Analysis

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Abstract: Stochastic mathematics is a significant tool in financial and economic analysis. In the field of finance and economy, we can use stochastic process, stochastic calculus, probability theory to conduct in-depth exploration of market activities, and use mathematical formulas to express the internal relations of finance and economy. Therefore, stochastic mathematics plays a great role in financial and economic analysis. Based on this, this paper first analyzes stochastic mathematics and its great role in financial and economic analysis, and then discusses the application of stochastic mathematics in financial and economic analysis, hoping to promote the application of stochastic mathematics in financial and economic analysis and provide better services.

1. Introduction

With the perfection of market economy, the financial industry at this stage is more prosperous, and the financial and economic analysis is more complex. The traditional analysis method has been difficult to meet the actual needs of the current financial and economic progress. In this case, the application of stochastic mathematics in financial and economic analysis is gradually valued by more professionals. Mathematics is a great tool for human science to summarize, refine and analyze, so its application in financial and economic analysis can visualize complex economic phenomena, greatly promoting economic research.

2. Stochastic Mathematics and Its Great Role in Financial and Economic Analysis

As a significant means of financial and economic analysis, stochastic mathematics plays a great role in financial and economic analysis.

2.1 Overview of Stochastic Mathematics

Stochastic mathematics is a branch of mathematics that studies and describes the statistical regularity of random phenomena. As early as 400 years ago, mathematicians used mathematical knowledge to study gambling phenomenon and formed the earliest probability theory. In the 1960s, fuzzy phenomenon was gradually recognized by mathematicians and related research was carried out, forming fuzzy mathematics. Later, with the continuous progress of mathematics and other sciences, more uncertain phenomena were found and more mathematical theories were formed. Nowadays, stochastic mathematics generally includes probability theory, mathematical statistics, stochastic process, multivariate statistical analysis, time series analysis and so on. Among them, probability theory is the basis of all branches. These branches combine with other disciplines to form more applied disciplines. In modern times, with the continuous progress of information science and the rapid updating of knowledge, the great role of stochastic mathematics has become increasingly prominent. It can be predicted that in the future, stochastic mathematics will be applied to more fields, affecting people's production and life.

2.2 Great Role of Stochastic Mathematics in Financial and Economic Analysis

Since the 21st century, with the deepening of economic globalization, financial economy has also ushered in a historic opportunity for progress. With the rapid perfection of financial economy and the improvement of modern economic system, more attention has been paid to the application of

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stochastic mathematics in the field of financial economy. Probability theory, mathematical statistics, stochastic process and other theories in stochastic mathematics are widely used in financial economy, becoming a great work to solve financial and economic problems. For example, in the field of finance and economy, mathematical statistics and stochastic differential equations play a great role in investment risk analysis and option pricing. In the modern era of rapid progress of information technology, the mastery of data information is the mastery of global economic data. If we can use the theory of stochastic mathematics to analyze these data scientifically, it will greatly promote the development and optimization of social economy, and also greatly promote the financial and economic market. Therefore, stochastic mathematics is very crucial in financial and economic analysis, and is an indispensable work in the information age [1].

3. Application of Stochastic Mathematics in Financial and Economic Analysis

The application of stochastic mathematics in financial and economic analysis is mainly reflected in the following points.

3.1 Application of Probability Theory in Financial and Economic Analysis

Probability theory is the final theory of stochastic mathematics. In recent years, probability theory produces a great impact on financial and economic analysis and has strong application value. Its specific application and importance are reflected in the following aspects. Firstly, probability statistics is widely used in financial and economic analysis because of its preciseness, science nature and flexibility. People can use probability and statistics to model and analyze the problems in financial economy more scientifically and accurately, so as to put forward more effective solutions. Secondly, probability and statistics have strict calculation logic. It can transform abstract financial and economic problems into simple logic problems, and optimize economic calculation methods from the perspective of mathematics, so as to better serve the financial economy. Finally, the accuracy of probability and statistics is very high, which can fully meet the requirements of data accuracy in financial and economic analysis. Probability and statistics can make scientific, reasonable and accurate quantitative analysis of many economic data involved in the process of financial and economic analysis. For example, when it is difficult for an enterprise to accurately predict the market prospect of an investment project in financial investment, the leadership of the enterprise will have a heated discussion on the investment project and the amount of investment, and it is difficult to reach an agreement. In this case, the enterprise can fully use probability statistics in stochastic mathematics to comprehensively analyze various economic indicators involved in the investment project, and estimate the risk events that may occur in the process of investment. According to the probability of risk events, the enterprise can determine whether to invest in the project or not. The enterprise can also change the amount of investment to calculate the proportion of return, so as to choose the best investment plan. On the one hand, finally an agreement on the investment plan can be reached. On the other hand, more importantly, the data analysis of objective economic indicators can greatly reduce the risks in the process of enterprise investment, improve the return on investment, and provide favorable scientific basis for enterprise investment decision [2].

3.2 Application of Stochastic Process in Financial and Economic Analysis

Stochastic process can quantitatively describe dynamic things. It is closely related to other branches of mathematics and is widely used in financial economy. In the field of financial economy, stochastic process theory can be used to model and solve practical problems. The most popular application of stochastic process in the field of finance and economy is option pricing, which means that the holder of an option has the right to buy and sell at a specified price within a certain period of time, including stocks and foreign exchange. It is a right rather than an obligation. The holder has the right to act and the right to give up. Therefore, an option has a price. How to price options reasonably and scientifically is a significant issue in the field of finance and economy. Stochastic process can be used to establish model to solve the problem. For example, if the current price of a

stock is A yuan, and investor A thinks that the stock will rise in the future, then investor A buys options from the exchange or other traders. Investor A has the right to buy options in a certain period of time, and can make purchase price B yuan. Investor A can choose to buy when the stock goes up and give up when it goes down, and always take the initiative. The option price needs to be determined through stochastic process. Through the analysis of the historical stock price, a mathematical model is established to predict the probability of the stock going up, flat and falling in the future. Meanwhile, investors need to consider not only the maximization of investment income, but also the investment risks. They need to effectively reduce and control the risks, so as to get the final appropriate option pricing. It should be noted that there are many factors that affect the stock price. In the stochastic process analysis, it is impossible to include all the factors, such as the impact of national macro policy and investors' subjective factors. Although the final result is not completely accurate, it still has high value for investors and is of great significance to enhance investors' returns and reduce investment risks.

3.3 Application of Mathematical Statistics in Financial and Economic Analysis

Mathematical statistics is a significant branch of stochastic mathematics. Based on probability theory, it collects various data to study the law as a great basis to predict the future progress of the goal. Mathematical statistics has the following applications in financial and economic analysis. Firstly, mathematical statistics is applied in the pricing of financial products. In recent years, there are more and more kinds of financial products, and the pricing problem of these products has become the research goal of many scholars. Using mathematical statistics can develop mathematical modeling at the initial stage of product pricing, comprehensively evaluate the possible risks of the product, and establish a scientific mathematical model considering the highest price and the lowest price, analyze the relationship between the product pricing and its market development and realize scientific pricing by simulation. Secondly, mathematical statistics is applied in risk management of financial and economic analysis. Risk management is an inevitable topic in the financial field. The application of mathematical statistics in risk management can calculate many risk factors faced by the financial market, so as to avoid risks to the greatest extent and protect their own interests. Meanwhile, we can also summarize the financial instruments and financial products. There is a certain relationship between financial instruments. Different financial instruments may increase income or cause loss. Mathematical statistics can match the financial instruments that increase each other's interests to enhance the final income. Finally, mathematical statistics is applied in econometric analysis. Econometric analysis is a crucial means of analysis in the financial field. It is based on mathematical statistics to improve services for various financial fields. It should be noted that applying statistics requires to real-time monitor the progress and change of the financial market, determine the model, use mathematical statistics to determine the parameters in the model, use the method of mathematical statistics to put the collected data into the established model, determine the final optimal model through calculation, and then put the data from mathematical statistics analysis into the optimal model, so as to get the sample value and forecast value. Econometric analysis can analyze the impact of national policies on the financial economy from a macro perspective [3].

4. Conclusion

In a word, with the continuous progress of China's economy, the field of financial economy is becoming more and more complex. Stochastic mathematics is widely used in financial and economic analysis, playing a very positive role in reducing financial management risks, protecting investors' rights and interests, and improving enterprise economic benefits. Therefore, researchers in related fields need to focus on the effective use of stochastic mathematics in the financial economy, further develop in-depth study of stochastic mathematics to promote the rapid progress of China's financial economy.

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