

On the Application of Mathematics in the Financial Field

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ABSTRACT: With the continuous development of social economy and the continuous development of modern financial theory, financial theory is more complicated than before, and mathematics is an important support for financial theory. As a science that studies quantitative relationships and spatial forms, mathematics is widely used in the financial field because of its high-precision computing power and logical rigor. The article analyzes the application of mathematics in the financial field briefly, and points out the necessity of applying mathematics in the financial field and the limitations in the application process. We briefly outline some typical applications of mathematical methods in the financial field, so that everyone can explore and understand.

KEYWORDS: Mathematics; Financial field; Applied Mathematics.

I. INTRODUCTION

With the continuous development of modern economy and the continuous progress of the times, the forms of financial transactions in society have become increasingly complex, the financial field has become increasingly mature, and the financial system has gradually established. Many mathematical methods have been incorporated into it. These mathematical methods have an important impact on the establishment of the financial system. The use of mathematical methods has led people to explore more possibilities in the financial field, and the application of mathematical methods has produced many typical financial theories.

II. THE NECESSITY OF APPLYING MATHEMATICAL METHODS IN THE FINANCIAL FIELD

1. Financial research objects are measurable

The research in the financial field focuses on the various quantitative relationships in financial activities, so we can know that the research objects in the financial field are measurable. Various financial activities in the financial field have quantitative regulations and qualitative indicators, so the application of mathematics in the financial field is reasonable and can effectively help the construction of the financial field system. There are huge amounts of data in activities in the financial field, such as the volume of securities transactions, the purchase and sale of futures, etc. Every capital flow is a piece of data. These data are the foundation for the construction of the financial industry. When we are building a financial system and establishing financial theories, we must collect and organize these data, and analyze them through mathematical methods, so that a more accurate theoretical result can be drawn.

2. Mathematics has high precision and strict logic

The subject of mathematics itself is an abstract subject, at the same time it has a high degree of accuracy and very strict logical thinking. Finance itself is also an abstract concept, a collection of numbers, so the application of mathematics in the financial field is very reasonable.

The various quantitative relationships in the financial field are intricate and complex. Mathematics can describe various quantitative relationships well in such relationships, and extend its rigorous logic in the financial field, and conduct scientific analysis and reasoning on financial theories to make the financial field. The logical relationship can be shown intuitively through mathematics.

III. LIMITATIONS OF APPLYING MATHEMATICAL METHODS IN THE FINANCIAL FIELD

The application of mathematical methods in the financial field also has certain limitations, which are mainly reflected in the following two aspects:

1. Influence of non-economic factors

The financial sector is a complex industry that not only includes pure quantitative relationships, money exchanges and other quantifiable content, but also contains many political, psychological, cultural and other human factors. The existence of these non-economic factors determines that the application of mathematics in the financial field has limitations. In the financial field, if political influence factors, humanities and social science factors, or psychological factors of participants are mixed into the establishment of a theory, it will reduce the accuracy of mathematics for its evaluation. Because the application of mathematics in the financial field is conditional, relative, not absolute. That is to say, we will find that the application of mathematical methods in the financial field will also have unexpected surprises. For example, the outbreak of the subprime mortgage crisis is a good example.

2. The purpose of applying mathematical methods is not clear

The purpose of applying mathematical methods in the financial field is to better solve financial problems and improve financial theory, but in the application, we must also be aware of the limitations of mathematics itself, and find the purpose of applying mathematical methods in the application process, not blindly Use mathematical methods. Because mathematics itself is a language, its advantage over other languages is that it can express certain content in a more concise and concise way, but there are also many things that cannot be expressed in mathematical language. When applying mathematical methods in the financial field, we must clearly realize this. When we realize that the use of mathematical methods cannot make the problem more concise, we must consider a different way of expression instead of blindly using mathematical methods. Not only can it not solve the problem effectively, it can even go astray.

IV. TYPICAL APPLICATIONS OF MATHEMATICAL METHODS IN THE FINANCIAL FIELD

1. Asset valuation theory

Asset valuation theory is a typical application of mathematical methods in the financial field. Funds have time value, and cash flows at different time nodes cannot be directly compared. In response to this problem, American economist Irving Fisher put forward the view that the current value of assets is equal to the sum of the discounted value of future cash flows. This view laid the foundation for the theory of asset valuation, which was calculated by mathematical methods and expressed in the form of mathematical formulas.

2. Securities portfolio theory

There are great uncertainties in the development of the financial sector. When people conduct financial transactions in the financial market, there is a certain lag in their income and investment in time. It is this lag that brings great uncertainty to the future direction of the financial market. Under such uncertain circumstances, investors have to bear certain investment risks, and their returns may exceed expectations, or there may be losses. This degree of risk is the degree of deviation between actual returns and expected returns. In the financial field, people use mathematical methods to study the degree of deviation. In financial theory, the future price of stocks is regarded as a random variable. Because stock prices in different periods cannot be compared, people convert the sequence of prices into a sequence of comparable returns in a certain way, which is more conducive to processing with mathematical methods. That is, the variance or standard deviation, a value that can be approached infinitely, is used to express the degree of risk.

3. Option value theory

Option value theory is the top shelf formula for call options. This formula minimizes the influence of all human factors and guides investors into a risk-neutral world. The so-called risk-neutral world is the risk-free interest rate as the rate of return on investment. Option value theory is widely used in product price setting in the financial field, and it is also an effective tool for developing new products.

V. CONCLUSION

In summary, the application of mathematical methods in the financial field is very necessary. Although there are certain limitations, mathematics has still made great progress for the development of the financial field due to its precision, measurable, and rigorous logic.

REFERENCES

- [1]. Havane TEMBELO (2020), “Digital Transformation in Financial Field”, International Journal of Commerce and Finance, Vol. 6(2): 139-144.
- [2]. Hayal Yavuz Mumcu (2016), “Using Mathematics, Mathematical Applications, Mathematical Modelling, and Mathematical Literacy: A Theoretical Study”, Journal of Education and Practice, Vol.7, No.36.
- [3]. Liang Qibao. On the application of mathematics in various fields [J]. Science and Technology Outlook, 2016, (12): 206.
- [4]. Robert E. Verrecchia (1982), “The Use of Mathematical Models in Financial Accounting”, Journal of Accounting Research, Published By: Wiley, Vol. 20: 1-42.
- [5]. Sanjay Tripathi (2019), “Application of Mathematics in Financial Management”, Advances in mathematical finance & applications, Vol. 4(2): 1-14.