Mathematics and Finance

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Abstract

This research article explores the close connection between mathematics and finance, highlighting its essential role in understanding and applying financial concepts. Financial literacy is vital for everyday life and running a business. It helps people make better money decisions and understand how money works. The global financial crisis has highlighted the need to re-evaluate how financial mathematics is taught. The complicated nature of mathematical models used in finance requires advanced thinking skills to comprehend and implement them effectively.

Teaching and Research

After reviewing the seven contribution documents, it is clear that teaching and research in mathematics have provided university faculty with a deeper understanding of the challenges students encounter, from freshmen to postgraduate levels, when studying mathematics (Thomas et al., 2012). Teaching undergraduate students and guiding doctoral candidates in different fields helps faculty members better understand how students learn and how well they grasp the specific methods and ideas within their subjects. This ongoing feedback cycle improves both teaching strategies and curriculum development.

Materials and Methods

This study uses a clear and exact scientific approach to carefully examine a particular situation. After reviewing the seven contribution PowerPoint presentations, it is clear that the methodology includes "previous steps selected by the researcher to obtain favorable results that help him to propose new ideas." In this context, the research coordinates actions involving a bibliographic review to support existing ideas on the importance of mathematical thinking in teaching higher-level finance, leading to more effective methods of delivering complex material.

Results and Discussion

Financial knowledge plays a big role in daily life and is very important for running a business and handling money matters. Won Kim et al. (2016) stated that the best major for a young person seeking a good career is a degree in finance. A finance degree helps people learn how to manage money well, offers many job opportunities,

and supports both personal and overall economic health. Some argue that this is no longer true because of the global financial crisis. Crises are turning points where revolutionary ideas emerge, influencing how finance is taught and applied.

Finance and Mathematics in Practice

There is a clear link between finance and math in financial and economic areas, where financial math is built on mathematical theories. Professionals in financial mathematics often develop and expand on theoretical models and their applications in the economic field. Financial math also uses other fields such as statistics and computer science to help support its methods, as mentioned by Won Kim and others (2016). A financial economist might examine structural factors to determine a specific stock's price or predict market trends using statistical models.

Option Pricing and a Practical Demonstration

Creating financial models with higher-order math skills is important in the finance world. People use something called options, which are special types of contracts, to trade and make decisions about money. These agreements allow the buyer to purchase or sell a specific asset, such as stocks or bonds, at a set price on a particular date when the agreement ends. Some financial experts have raised questions about whether there is a possible price for any derivative or option within a certain economy (Ruíz & Stephens, 2011). In an ideal scenario, the theoretical model predicts that an option's price will equal the initial amount of money invested in the portfolio that replicates the option and will be paid exactly on the option's expiration date. However, this formula requires several assumptions. The model offers a chance to develop higher-order rules and enhance the understanding of option pricing in the financial context (Blanchet-Scalliet et al., 2005).

Illustrative Python Example – Black–Scholes Option Pricing

To demonstrate how mathematical models translate directly into finance, I implemented the Black–Scholes formula to estimate the fair price of a European call option. For an underlying stock priced at $100, strike price $105, annual risk-free rate 3%, volatility 25%, and 90 days to maturity, the Python code below calculates the theoretical call option value:

Explanation

Running this produces a theoretical call price of $3.21. This concise computation shows how logarithms, probability distributions, and exponential discounting combine

to value an option—a direct bridge between higher mathematics and actionable financial insight.

Complexity in Financial Markets

The complexity of financial transactions in securities markets and the industry as a whole should not be underestimated. To grasp how the financial world works, people need to learn about how different systems are connected, even if those systems are very intricate. Much of the physical and chemical aspects of finance have become clearer over time thanks to research. However, some areas still require further investigation. Historically, the use of mathematics in finance is relatively new, which might be why there are still unexplored areas.

Conclusion

This article shows how math and finance are closely connected and why this connection is so important in the world of money and investing. Financial knowledge is essential in everyday life and the business world, offering job opportunities and contributing to the economy. The global financial crisis highlighted the need to renew the teaching of financial mathematics to address new challenges. The difficulty of financial math models and the importance of advanced thinking skills in this area have been emphasized throughout this discussion.

References

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