

May 2018

Introduction to Financial Mathematics Course

Sonia M F Garcia
U. S. Naval Academy, smg@usna.edu

Follow this and additional works at: https://digitalcommons.usmalibrary.org/mathematica_militaris



Part of the [Education Commons](#), and the [Physical Sciences and Mathematics Commons](#)

Recommended Citation

Garcia, Sonia M F (2018) "Introduction to Financial Mathematics Course," *Mathematica Militaris*: Vol. 23 : Iss. 1 , Article 7.
Available at: https://digitalcommons.usmalibrary.org/mathematica_militaris/vol23/iss1/7

This Article is brought to you for free and open access by the Department of Mathematical Sciences at USMA Digital Commons. It has been accepted for inclusion in *Mathematica Militaris* by an authorized editor of USMA Digital Commons. For more information, please contact nicholas.olijnyk@usma.edu.

Introduction to Financial Mathematics Course

Sonia M. F. Garcia
 U. S. Naval Academy
 Annapolis, Maryland 21402-5002
 Telephone: (410) 293-6728
 Email: smg@usna.edu

Abstract—The teaching of financial mathematics at the university level has become more common in the past decade. It is crucial that young officers of our military system be aware of its intricacies in the financial market in order to present themselves before the world with a more rounded and broader literacy.

I. INTRODUCTION

A decade ago, during my first Fulbright Scholar Fellowship in Europe, I was quite impressed with the development of new courses at the undergraduate level called an introduction on financial mathematics. What was interesting it was that in the past the courses presented to students in financial mathematics were usually given at the Master's degree and PhD degree levels only.

I believe the development of technology has pushed us teachers to enter new territories never before explored due to the complexity involved. I have noticed as well the enormous interest and excitement of students in several countries of being in this new avenue of studies.

When I came back from Europe I decided to start to study a similar course for the Academy. The response from midshipmen was positively overwhelming.

II. WHY FINANCIAL MATHEMATICS

As a teacher in mathematics, I have been since the beginning of my career interested to sell the idea that mathematics is not limited by calculus and its formulas. There is a huge world of applications out there. My research was always applied to different areas of science such as Heat Conduction, Acoustics, Atmosphere Science and others, but I still thought it was hard to cover the gap between the science and the level of the students.

With my experience in Europe with financial mathematics I have realized that this new branch was a great opportunity to bring real applications of mathematics to the students. Financial mathematics is the application of mathematical methods to financial problems. It is common knowledge that investment groups, commercial banks, hedge funds, insurance companies, corporate treasuries, and regulatory agencies apply the methods of financial mathematics to such problems as derivative securities valuation, portfolio structuring, risk management, and scenario simulation. The large part of this science is built to stand behind the ability to create testable hypotheses based on a fundamental understanding of the objects of study and prove or contradict the hypotheses through repeatable studies.

With this in hand, mathematics is the language for representing theories and provides tools for testing their validity[1], [2], [3].

III. WHY AT A SERVICE ACADEMY

Perhaps it would be better to think in terms of finding a way of preparing a finer officer, by thinking about what the essence is of a well-rounded education. All the traditional courses that we teach are the soul of an officer's education and essential to preserve in the core of offered courses. However we want to do more. Much more. We want to prepare a young officer, and show how technology can be used not only for learning but emphasizing access to a well-rounded education that includes a wide variety of disciplines, such as financial mathematics. The students can actually feel the mathematics applications at the tip of their pens. Specifically, my suggestion for the target audience are the students majoring in Mathematics, Operation Analysis, and Economics majors. Of course non-STEM students are welcome to take it as long as they satisfy the requirements, which are the full sequence of calculus and at least one course in Statistics. This restricts the candidates to upperclassmen.

At the Naval Academy this course is offered as an elective. Some of the goals of this course are understanding arbitrage principle, being able to interpret and analyze call and put options, studying the behavior of foreign exchange, distinguishing forward contracts from future contracts, making them aware of the pitfalls of perpetuity and annuity, reviewing all sort of interests in the market today, understand different financial market parameters which help to make decisions in long and short positions, such as the beta statistical parameter. One of the compelling exercises is the study of the beta statistical relevance on current major companies.

The students get very much engaged when they are able to search for data in their habitat, such as the internet, to study behavior of companies that are continuously in their dictionary, such as Apple, Inc, Tesla, Facebook, etc. Finally, a wide range of possible subjects in school, powerfully and creatively taught, can be exactly what it takes to make the difference between disengagement and a lifelong passion for learning.

IV. CONCLUSION

I strongly support the idea to implement a course on financial mathematics in all the service Academies. One will see the enthusiasm of the students and above all, the course

will give them a good feeling that they are getting the best of the best in education: The desired outcome will be the development of a top military officer and with knowledge in fields that will give them a well-rounded education.

ACKNOWLEDGMENT

The author would like to thank the U.S. Naval Academy for taking chances on my idea and allowing me to expose the students to a course on Financial Mathematics.

REFERENCES

- [1] The University of Chicago [Online] Available: <http://finmath.uchicago.edu/> [Accessed: 14- Apr- 2018].
- [2] University of Minnesota [Online] Available: <https://math.umn.edu/mcfam/financial-mathematics> [Accessed: 14- Apr- 2018].
- [3] Illinois Institute of Technology [Online] Available: <https://science.iit.edu/applied-mathematics/programs> [Accessed: 14- Apr- 2018].