
Preface



Tyche

Goddess of Chance and Fortune

By Tatjana Heinz

This textbook is a basic introduction to the key topics in mathematical finance and financial economics—two realms of ideas that substantially overlap but are often treated separately from each other. Our goal is to present the highlights in the field, with the emphasis on the financial and economic content of the models, concepts and results. The book provides a novel, unified treatment of the subject by deriving each topic from common fundamental principles and showing the interrelations between the key themes.

Although our presentation is fully rigorous, with some rare and clearly marked exceptions, we restrict ourselves to the use of only elementary mathematical concepts and techniques. No advanced mathematics (such as stochastic calculus) is used. The main source for the book, and a “proving ground” for testing our presentation of the material, are courses on mathematical finance, financial

economics and risk management which we have delivered, over the last decade, to undergraduate and graduate students in economics and finance at the Universities of Manchester, Zurich and Leeds.

The textbook contains 18 chapters corresponding to 18 lectures in a course based upon it. There are three chapters with problems and exercises, most of which have been used in tutorials, take-home tests and examinations, with full and detailed answers. The problems and exercises contain not only numerical examples, but also theoretical questions that complement the material presented in the body of the textbook. Two mathematical appendices provide rigorous definitions of some of the mathematical notions and statements of general theorems used in the text.

The textbook covers the classical topics, such as mean-variance portfolio analysis (Markowitz, CAPM, factor models, the Ross-Huberman APT), derivative securities pricing, and general equilibrium models of asset markets (Arrow, Debreu and Radner). A less standard but very important topic, which to our knowledge has not previously been covered in elementary textbooks, is capital growth theory (Kelly, Breiman, Cover and others). Absolutely new material, reflecting research achievements of recent years, is an introduction to new dynamic equilibrium models of financial markets combining behavioral and evolutionary principles.

A characteristic feature of financial economics is that it has to focus on the analysis of random, unpredictable market situations. To model such situations our discipline created powerful theoretical tools based on probability and stochastic processes. However, the power of human mind is not unlimited, and it can never fully eliminate the influence of chance and fortune, personified by goddess Tyche, looking at us from the epigraph to this book.

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