Preface to the Second Edition

In the second edition the material has been thoroughly revised and rearranged. New features include:

- a new chapter on time-continuous models with intuitive outlines of the mathematical arguments and constructions;
- complete proofs of the two fundamental theorems of mathematical finance in a discrete setting;
- a case study to begin each chapter – a real-life situation motivating the development of theoretical tools;
- a detailed discussion of the case study at the end of each chapter.

In analysing a case study the first task is to pose suitable questions, which can then be cast within the framework of the current chapter. At this point, additional assumptions may be needed so the case can be formulated as a well-posed mathematical problem. Due to the flexibility involved there is no unique solution.

We would like to express our gratitude to the readers of the 1st edition for their invaluable feedback.

Marek Capiński and Tomasz Zastawniak
March 2010

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True to its title, this book itself is an excellent financial investment. For the price of one volume it teaches two Nobel Prize winning theories, with plenty more included for good measure. How many undergraduate mathematics textbooks can boast such a claim?

Building on mathematical models of bond and stock prices, these two theories lead in different directions: Black–Scholes arbitrage pricing of options and other derivative securities on the one hand, and Markowitz portfolio optimisation and the Capital Asset Pricing Model on the other hand. Models based on the Principle of No Arbitrage can also be developed to study interest rates and their term structure. These are three major areas of mathematical finance, all having an enormous impact on the way modern financial markets operate. This textbook presents them at a level aimed at second or third year undergraduate students, not only of mathematics but also, for example, business management, finance or economics.

The contents can be covered in a one-year course of about 100 class hours. Smaller courses on selected topics can readily be designed by choosing the appropriate chapters. The text is interspersed with a multitude of worked examples and exercises, complete with solutions, providing ample material for tutorials as well as making the book ideal for self-study.

Prerequisites include elementary calculus, probability and some linear algebra. In calculus we assume experience with derivatives and partial derivatives, finding maxima or minima of differentiable functions of one or more variables, Lagrange multipliers, the Taylor formula and integrals. Topics in probability include random variables and probability distributions, in particular the binomial and normal distributions, expectation, variance and covariance, conditional probability and independence. Familiarity with the Central Limit Theorem would be a bonus. In linear algebra the reader should be able to solve

In many numerical examples and exercises it may be helpful to use a computer with a spreadsheet application, though this is not absolutely essential. Microsoft Excel files with solutions to selected examples and exercises are available on the web page for this book, a link to which can be found at the address below.

We are indebted to Nigel Cutland for prompting us to steer clear of an inaccuracy frequently encountered in other texts, of which more will be said in Remark 4.1 (in the 1st edition). It is also a great pleasure to thank our students and colleagues for their feedback on preliminary versions of various chapters. We are also grateful to the readers of the first and second printings of this book, and particularly to Andrzej Palczewski, for indicating some mistakes, corrected in this printing, and suggesting various improvements.

Readers of this book are cordially invited to visit the accompanying web page to check for the latest downloads and corrections, or to contact the authors. Your comments will be greatly appreciated.

Marek Capiński and Tomasz Zastawniak
July 2004

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