

Foreword

The science of Finance during the past four decades has had a profound influence on its practice, and in doing so, it has affected the dramatic and rapid global changes in the financial system. The scientific breakthroughs in Finance in this period have both shaped and were shaped by the extraordinary flow of financial innovation, which coincided with those changes. Financial innovation creates enormous opportunities to improve risk-sharing, lower transactions costs, and reduce information and agency costs. The prime exemplifying case is surely the development and widespread adoption of derivative securities, of which it is estimated that around \$500 trillion of notational amount is outstanding globally. However, financial innovation also creates daunting challenges. As a consequence of innovation, the knowledge base needed to manage and oversee financial institutions effectively, can change considerably from the traditional training and experience of many managers in financial institutions and government regulators. No financial institution, including a central bank or a financial market, can function without the mathematical models developed largely by academic researchers.

Among connoisseurs, Robert A. Jarrow is known as a pro among pros, a mathematical finance maven, who understands real-world financial markets and translates that specified knowledge into mathematical models of that world. Relevant, rigorous, and right on the mark in problem - selection are the constants, that mark the unmistakable stamp of a Jarrow paper.

The present book patiently develops the complex mathematical models at the foundation of option pricing, bond pricing, and credit pricing. These are core areas of Finance. The chapters reproduce articles that have become classics in the field. By the *not-so-tacit* demanding criterion that was evidently applied, Jarrow was by necessity, drastically selective among his many papers. The result, along with their careful placement, creates a whole far richer effect than the simple sum of the individual pieces.

The arrival of this book could not have been more timely: we are in the midst of a deep financial crisis in liquidity and credit, centered around the steep declines in residential housing prices which have impacted financial institutions, Wall Street, Main Street and the largest financial market in the United States, the mortgage

market. The core of understanding mortgage pricing and its risk involves, the confluence of the three subjects of this book: options, interest rates and credit risk. It is precisely in times like this one, that we need well-designed, carefully executed models of the pricing and risk of these securities presented by an experienced and knowledgeable guide, who understands building quantitative finance models; who understands that all models are by necessity, abstractions from complex reality and thus incomplete; who knows the historical data; and who has the experience of practice to evaluate assumptions critically and be cautious about the limitations they induce.

Robert Jarrow is among a handful of experts who satisfy every element of that vector. For three decades, he has been building option, interest-rate, and credit models that incorporate transaction costs, incompletely specified probability distributions, imperfectly estimated parameters of those distributions, and myriad other frictions which are often the sources of large discrepancies between model and real-world prices, especially in times of stress. He has both overseen and refereed countless empirical studies and he has worked with practitioners in large-scale applications of the modeling and technology.

I am proud to have had a part in the Jarrowian march to fame. My colleagues and I were very pleased when a Duke mathematician and management science major with an MBA from Dartmouth, accepted our invitation to pursue a PhD in Finance at the Sloan School at MIT. And pursue it he did! He mastered the mathematics and the economics of Finance from the core foundations to the most advanced, and often still unpublished work of the leading researchers in the field. Working with him as a student was a delight both in the classroom and in independent research discussions. Watching him develop into an accomplished and original researcher was even more of a delight. Waiting as the rest of the profession came to understand the foundational quality of his contributions and recognize him as one of the leaders in the field, gave me the most delight. One of the greatest pleasures of academic life is to see a student who you mentored become a great mentor himself, to his own students; thereby observing the process of how science actually evolves.

The chapters of this volume are rigorous and at times demanding of what the reader must do to gain the full benefits of what they offer. But whether serious academic researcher, seasoned quantitative professional, or a mathematically inclined novice student, the reader is in for a treat well-worth the effort: Bon Appetit!

Robert C. Merton
Nobel Laureate, Economics 1997
Harvard Business School