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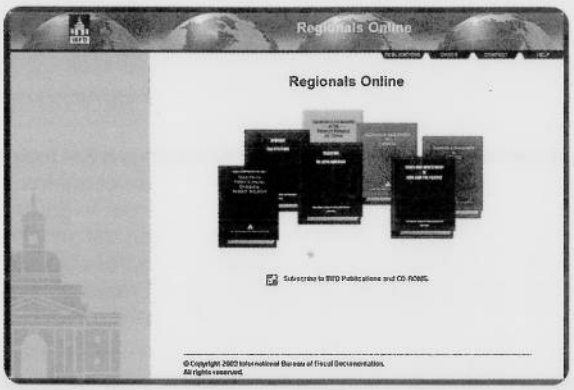

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Book Review

Review of Some Current Financial Literature

Viva Hammer[1]

We are so blessed with financial literature today, that the biggest problem is how to decide what to use. When considering what I will include in my library, I look for a number of things: a good table of contents, a comprehensive index and the number of references. Then I read the preface to see whether the author is a financial geek, but failed English, I flip through the text to see if there is a good organizing principle and I want to see if there are meaty examples and computer applications.

In this review, I will consider two books, as well as one article, and see whether they measure up to the standards I have set.

Pricing Derivative Securities

T.W. Epps

World Scientific Publishing 2000

According to the preface, "The aim in writing [this book] was to help fill the gap between books that offer a theoretical treatment [of equity derivatives] without much application and those that simply present the pricing formulas without deriving them". Moreover, "... understanding is not complete without practice at application and ... applying results one doesn't understand is risky and unsatisfying. This book presents the theory but directs it toward the goals of producing practical pricing formulas ... and implementing them empirically". This is a tall order to satisfy, but does the author deliver on his promises?

Pricing Derivative Securities is divided into three parts. The first part introduces basic concepts in finance and derivatives pricing. Chapter 1 provides an overview of the various derivative products available in different markets. This chapter also explains derivative pricing, arbitrage pricing and static versus dynamic replication. The Black-Scholes-Merton models are dealt with difference or differential equations depending on whether the pricing is modeled in discrete or continuous time. This chapter is an excellent introduction and accessible to all intelligent mortals – in contrast to the rest of the book which is really meant for immortal financial whizzes or mathematicians!

Chapters 2 and 3 present the mathematical background which is the basis for the second and third parts of the book. The main topics covered are measurable functions, integration, special functions and integral transforms, probability spaces, random variables, mathematical expectations and stochastic processes. Chapter 3 concentrates on the mathematics required for continuous-time models in finance: Wiener processes, martingale pricing and discontinuous processes. Sixty-eight examples are given in these two chapters which make the theory easier to follow. The presentation would have been spicier if some of the examples had been finance-related. There are some good recommendations for literature to help to digest these two chapters.

The second part of the book, which is its core, deals with derivatives pricing. Chapter 4 is about dynamics-free pricing. Valuation of forwards and futures contracts and options pricing are derived from static application arguments. There is also material on pay-off distributions for European and American options, and a discussion of how option prices vary with changes in expiration date, strike price and the current market price of the underlying item.

Chapter 5 discusses pricing under Bernoulli dynamics and the related binomial approach in discrete time. Two interpretations of this binomial estimation are given: (i) the partial difference equation and (ii) the risk-neutral (Martingale). These are applied to both European and American style options.

In both Chapters 4 and 5 there are helpful illustrative numerical examples. References for further reading are also provided.

Chapters 6 and 7 deal with the valuation of derivative assets when prices of the underlying assets evolve in continuous time. The Black-Scholes model for pricing European-style derivatives under geometric Brownian motion is introduced. In Chapter 7, the same theory is applied to American and to "exotic" options which have more complex pay-off structures. These chapters use sophisticated mathematics, and unfortunately not one concrete example is provided to illustrate the theory.

Chapters 8 and 9 discuss the pricing of derivatives when the Brownian model does not fit the behaviour of prices of the underlying assets, and so the Black-Scholes model has to be adjusted. Alternative models are introduced, for example, those in which volatility itself is an Ito process. Chapter 9 discusses derivatives with discontinuous processes, e.g. Poisson processes. The second part of the chapter deals with derivatives on assets that are subject to jumps, e.g. random pay-off times. This chapter is illustrated with concrete examples.

Chapter 10 provides an extensive review of the literature on the pricing of interest-sensitive assets and derivatives. The centrepiece of the chapter is the Heath, Jarrow and Morton models which compare forward prices under stochastic rates.

The third part of this book is devoted to computation methods. Chapter 11 is an overview of some of the litera-

1. Office of Tax Policy, US Department of the Treasury.

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ture on simulation methods for problems in finance. Chapter 12 presents three procedures for the numerical solution of partial differential equations applying finite difference methods. The author uses a specific numerical example to compare the accuracy of the methods. This chapter is one of the most useful in the book.

The final chapter presents computer programs in FORTRAN and C++ for the implementation of the principal methods discussed in the book. But this chapter, like many before it, lacks specific numerical examples.

Pricing Derivative Securities has some excellent features for the sophisticated student of finance. However, a future edition could improve upon these further: there should be more solved examples, and unsolved ones too, with a web site where readers can go for solutions. A web site would also be useful so that readers can dialogue with the author, and where the author can update material and methods as this field continues to change.

Equity Derivatives – Theory and Applications

Marcus Overhaus, Andrew Ferraris, et al.

John Wiley 2002

The book consists of nine chapters. In the first five chapters we find an overview of the theory and practice of equity derivatives and the last four chapters deal with computer implementations.

Chapter 1 summarizes the basic mathematical concepts and financial interpretations of the theory of stochastic processes and stochastic calculus which are used in the book. To understand these chapters, the reader is assumed to be familiar with basic probability theory and statistics.

Chapter 2 deals with pricing and hedging in incomplete markets; variance – optimal pricing, super hedging and quantitative hedging. Several helpful examples are given to illustrate the concepts and the relationships between equivalent martingale measures. The Heston and the Hill-White models are introduced for the volatility of currency and interest rate options.

Chapter 3 is a primer on Levy processes; some of their applications in modeling pricing of derivative products are given. For their numerical solution the authors discuss the Fast Fourier Transform, Monte Carlo simulation and the Finite Difference Methods (FDM). This chapter contains several helpful examples.

Chapter 4 examines several pricing models and discretizations of their corresponding systems of parabolic partial differential equations. For numerical solutions the authors promote and discuss FDM because they are extensively used in applied mathematics. In the second part of the chapter, several volatility models are reviewed.

Chapter 5 examines convertible bond models. The effect of interest rate stochasticity and volatility skew on convertible bond valuation are analysed. In this chapter the theory and practice of convertible bond asset swaps are discussed. These kinds of swaps permit the separation of equity risk and credit risk in the convertible bond, which allows different market segments greater flexibility in portfolio management.

Chapters 6 and 7 outline the computer systems XML (Extensible Markup Language) for data representation and transmission and SDAP (Simple Object Access Protocol), which permits quick delivery of systems to the desktop. Chapter 8 surveys Web applications.

In Chapter 9, the final chapter, there are examples for algorithms and software design in discrete hedging and volatility for certain markets.

A notable feature of the book is that about one third of it is spent on the availability and applicability of computer packages in finance, particularly pricing and hedging of derivatives. However, it is unclear what audience was intended for the text. It is certainly not for beginners, yet it is too superficial to be for experts. In the preface the authors inform us that they have written two previous texts on the same topic, yet nowhere in this book do they reference their previous work. Are they being deliberately repetitive, one wonders?

The authors use acronyms a great deal in the text, but there is no glossary to translate these into English. Those that are in the index do not appear in correct alphabetical order! This is more than minimally sloppy.

The book may be useful for highly literate economists or mathematicians who want a deep dive into the world of finance.

Financial Derivatives and Partial Differential Equations

Robert Almgren

American Mathematical Monthly

Vol. 109, Jan. 2002, pp. 1-11

This well-written article is aimed at mathematically literate readers who want an introduction to finance. The basic theory of pricing and hedging several types of options are introduced. Then Ito's Lemma, the Black-Scholes equations are derived heuristically. The variables and parameters related to these equations are explained and the notations are "translated" into financial terminology. For example, the fact that the Black-Scholes equation is linear means that (i) two identical options are worth twice as much as one option and (ii) a portfolio consisting of two different options has a value equalling the sum of the individual options. For those mathematical or financial concepts which the author does not have space to explain, he provides excellent references. This article is recommended for anyone who wants a first glimpse of the modern theory of finance without having to read through one of the other tomes in this review!

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