



Book Review

Efficient Methods for Valuing Interest Rate Derivatives, by Antoon Pelsser, Springer Verlag 2000, pp. xii + 172.

This compact book is based on Dr. Pelsser's 1999 Ph.D. dissertation, which won the prestigious Christian Huygens prize, awarded by the Royal Dutch Academy of Science. The book under review displays an impressive command of its complex subject, including applications in a trading environment. However, it suffers from its dissertation origin: It could have been made more effective as a learning tool for advanced graduate students and practitioners. A somewhat longer book, such as Rebonato (1998), would have been advisable.

There are twelve chapters, including the introduction. The second chapter (Arbitrage, Martingales, and Numerical Methods) provides a concise overview of the standard mathematical tools: Martingale measures, change of numeraire theorem, Radon–Nikodym derivative, Girsanov's theorem, Ito's lemma, Feynman–Kac equation, numerical solution of PDEs, Monte Carlo simulation, etc. This chapter is a good review of the material, but it is too concise to be of use to a reader who is not already fully acquainted with the subject. The unacquainted reader will have to refer to books such as *Methods of Mathematical Finance* by Karatzas and Shreve, and *Stochastic Integrals* by Oksendal).

Part I of the book (Spot and Forward Rate Models, chapters 3 to 7) is in large part a survey of the literature on one-factor spot rate models, from the seminal works of Vasicek and Ho–Lee to the more recent Heath–Jarrow–Morton and Hull–White. These models are clearly relevant in understanding interest rate derivatives, although their practical limitations are now being overcome by market rate models and by multifactor models. Again, this Part I is extremely concise, and could be expanded to provide an introduction to the subject to advanced students and practitioners.

In chapter five the author examines the mean-reverting Hull–White generalization of the Ho–Lee model (and suggests an explicit finite differences algorithm to price exotic options). In chapter six the author uses an approach developed in Pelsser (1997) to propose a different formalization of one-factor squared Gaussian models. This chapter also shows an efficient trinomial tree implementation of the explicit finite difference method. Chapter seven reports on an empirical comparison of three one-factor models: Hull–White, squared Gaussian, and lognormal (in the

1994 Hull–White specification of Black–Karasinsky 1991). The data used in this investigation are relative to the US dollar. The yield curve is the standard money market curve for maturities up to 1 year, and the swap rate for maturities from 2 to 10 years. The market data for cap and floor prices are the screen-based bid-offer quotations made available to the author by Intercapital brokers. Pelsser finds that the lognormal model provides the best specification.

Part II of the book (Market Rate Models, chapters 8 to 11) relies more on the author's research and market experience with the ABN AMRO Bank. Both academics and practitioners will find it more relevant than Part I. This part of the book moves away from the mathematically convenient spot rate models to consider less analytically tractable but more realistic models that use the prices of liquid instruments available in the market (LIBOR deposits, swaps, etc.) to recover the probability distributions of fixed-interest asset prices. These models clearly provide a better fit to market prices; however they suffer from the inherent limitations of one-factor lognormal-rate models. The author's choice to concentrate on single-factor models reflects the view that the complexity of the correlation structure of multi-factor models can make them a poor tool for the pricing of derivative products.

Chapter eight introduces LIBOR and swap-rate models (first proposed in the late 1990s). Monte Carlo simulation methods are used to deal with the complexity of the stochastic processes. This chapter also shows examples of applications to the pricing of exotics such as ratchet options and spread options.

Chapter nine is dedicated to Markov-functional models, and relies heavily on the recent work by Hunt, Kennedy, and Pelsser. Their models requires numerical implementation (numeric integration) and should allow overcome some of the difficulties inherent in Monte Carlo methods when pricing American and Bermudan style products. The following chapter reports concisely on an empirical investigation comparing market-rate and Markov-functional models.

Chapter eleven addresses the well-known topic of convexity correction, and is partly based on unpublished work by the author. The book under review is concluded by an agenda for future research.

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Giorgio S. Questa
Department of Finance, City University Business School – London
G.Questa@city.ac.uk

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