

Book Review:*

**“Bond Pricing and Portfolio Analysis.
Protecting Investors in the Long Run”**
by Olivier de La Grandville (2001)

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Olivier de La Grandville: “Bond Pricing and Portfolio Analysis. Protecting Investors in the Long Run”, Cambridge, MA: MIT Press, 2001, 455 pages, SFr. 80

The other day, I was talking to a retired practitioner considering to audit some classes offered by our department. On the subject of fixed income he mumbled that it should all be about *compound interest*, “what else?”. It is only a few years ago, that I took myself the first classes on that subject as undergraduate. Looking for a decent textbook, the quest was largely defined by figuring out the difference between titles such as “Fixed Income Mathematics”, “The Handbook of Fixed Income” and variations thereof¹. Indeed, the major topic appeared to be compound interests as well as parallel shifts in the term structure. At least to me, these presentations did not come across as being about something very exciting².

The book by Olivier de La Grandville is different than the above mentioned on several accounts: Firstly, it offers a unified treatment moving gradually from the basics of fixed income analysis to conventional risk measures like duration and convexity and then on to the more advanced including immunization against *any shift* in the term structure as well as the model of Heath, Jarrow, and Morton (1992). Some of the aspects covered here are not only presented brilliantly, they contain even some genuinely new results. Secondly, it contains several chapters on finance basics such as the normal/log-normal model of prices and a graphical visualization of martingale probabilities which would constitute great classroom material even for non-fixed-income specific courses. And lastly, this book is very well written with great care for detail, be it in the form of end-of-chapter summaries of key concepts and formulas, in the lucid

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pieces on some historical background or in the numerous footnotes on the content of valuable references encouraging further study.

So this book has merits on various levels. Let me run you through them in more detail: As book on fixed income, this book sets out with the basics of calculating rates of return, arbitrage-enforced forward rates and an overview of typical fixed income instruments. Arbitrage is the overarching principle guiding the valuation of fixed income instruments in this book³. The other key issue covered is the immunization of bond portfolios. The first half of the book (targeted at core studies for undergraduates) deals in discrete time with the classic topics of duration and convexity as risk measures for immunization against parallel moves of the term structure. The second half turns over to continuous models presenting a new measure of duration, *directional duration*, immunization against any shift in the term structure as well as a clear treatment of the term structure model of Heath, Jarrow, and Morton (1992). The latter is also applied to bond immunization in a separate chapter. In addition, there is an overview of using parametric and spline methods in estimating the term structure from coupon bonds data.

Throughout the book, De La Grandville presents several new results, of which I can name here but a few⁴: Expressing a bond price as weighted average between face value and the ratio of coupon rate to interest rate. An entire chapter on the *relative* bias in T-bond futures as a function of duration. An extension to general term structure shocks leading to the concept of *directional duration* and a general immunization theorem.

The book contains also some very lucid – and even new – presentations of issues pertaining to finance in general: Chapter 13 (together with 12.1) offers a solid justification of the log-normal model of asset prices with a graphical depiction of the log-normal distribution's properties and exact formulas for expected returns and variances over varying time-horizons. Amongst others, this section offers the analytical background for the case-study of Kritzman (2000, Chapter 4) “When the Expected Return is Not Expected”. Of general interest should also be the treatment of the no-arbitrage principle in discrete and continuous time (Chapter 16). Starting from a *geometrical* construction of the riskfree probability measure in a binomial tree, the chapter turns to an intuitive proof of the Cameron-Martin-Girsanov theorem.

Personally, I found the introductory remarks on the analytical backgrounds of fixed income analysis, from the 18th century's Turgot de L'Aulne, to the 19th century's work by Irving Fisher and finally arriving at today's workhorse model of Heath, Jarrow, and Morton most illuminating⁵. Equally intriguing are the author's recurring forays into variational techniques, be it in the derivation of the immunization theorem (Chapter 10) or in opening up some new avenues in solving variational problems based upon his discussion of the general immunization theorem (Chapter 15). Clearly, the wider economic context of intertemporal decision making and growth theory is lurking everywhere in this book, thus making fixed income analysis look less susceptible to being a branch of pure mathematics.

This book is also simply well written and a great example of what makes a good textbook. End-of-chapter boxes summarize key concepts and major formulas devel-

oped in the text. A separate appendix contains answers and solution guides to the questions and problem sets accompanying each chapter. This makes the book also a good tool for self-study. In numerous footnotes the reader is encouraged and guided to study original articles. The great care for detail is most visible in the selection of quotations – mostly from Shakespeare but on occasion also from Fischer Black – opening up each chapter. Who would have doubted that, the appropriate definition of duration – “to peize the time” or in modern language⁶: “[p]lacing time in equilibrium” – had not already been given in *The Merchant of Venice*?

At the risk of concealing an otherwise great enthusiasm for this book, let me also briefly mention some critical points. Contents-wise I found only one item missing: Swaps and their use in asset-liability management get no mention at all. This could be regarded as a separate topic to be treated in other books. An additional chapter on the topic would render the book even more *the* comprehensive fixed income textbook for undergraduates and beginning graduates. The overall presentation and structure is very clear, however the title and introduction to Chapter 11 promise “. . . Two Important Applications” which are only taken up in the next chapter. And the brilliant account of Chapter 13 is actually less on “[e]stimating” expected returns, variances and so on but rather on recovering these log-normal moments from the underlying normal distribution. Fair enough, the author gives short shrift to estimation methods as “the practitioner may well has his own method”. Perhaps it would behove that chapter to be entitled accordingly, for example “Recovering Dollar Returns and Time Horizons”.

The author describes his own target audience as undergraduates (first part of the book up to parallel shifts of the term structure) and beginning graduates (second part using continuous models in the analysis of non-parallel term structure shifts and the model of Heath, Jarrow, and Morton) and I do fully agree with him. The level of technicality is indeed kept very accessible, always striving for intuition, also in the second half of the book. As mentioned above, Chapters 13 (log-normal model of asset prices and time-horizons) and 16 (arbitrage pricing in discrete and continuous time) would even constitute brilliant material for courses not focused on fixed income.

This book shows that fixed-income treatments need not be split between the (seeming) dullness of compound interest and the (sometimes) arcane of term-structure modelling in continuous time. In its well written style, it presents with great intuition the basics of fixed income analysis, an analysis of immunization to any shift in the term structure and the model of Heath, Jarrow, and Morton together with a lot of new results.

Notes

¹Occasionally sprinkled with attributes like “international”, “emerging markets” or “mortgage backed”.

²Luckily, it was in class where we found out that there was more to the topic than just day counts, compound interest and parallel shifts of the term structure.

³For the beginners, it contains also detailed presentations of how to exploit the arbitrage opportunities arising from over-/undervaluation of instruments.

⁴Below I will argue that the book is also very well written and structured. Amongst others, an exhaustive list of what are “some (nice) surprises and hopefully novel results” is given by the author

himself in his introduction on page XV.

⁵Ever wondered how to make sense of Keynes' issue with "backwardation" being a normal thing? In case you missed the correction of Duffie (1989), De La Grandville straightens it out in his section 5.2.5. The only item I find amiss in his presentation is that there is no mention of risk premia as in his discussion preceding that section and in particular as in the original correction of Duffie (1989, p. 98ff and in particular Appendix 4F).

⁶See his Chapter 4. It goes without saying that the appropriate help from The Shorter Oxford English Dictionary has been furnished by De La Grandville in an annotation.

References

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