Preface

This is the first book of the trilogy on a fixed-income valuation course by Wiley finance.

This trilogy covers the following three areas of fixed-income valuation:

1. Interest rate risk modeling
2. Term structure modeling
3. Credit risk modeling

Unlike other books in fixed-income valuation, which are either too rigorous but mathematically demanding, or easy-to-read but lacking in important details, our goal is to provide readability with sufficient rigor. In the first book, we give a basic introduction to various fixed-income securities and their derivatives. The principal focus of this book is on measuring and managing interest rate risk arising from general nonparallel rate changes in the term structure of interest rates. This book covers five types of interest rate risk models in the fixed-income literature. These models can be applied in a variety of contexts by financial institutions ranging from commercial banks to fixed-income hedge funds. These institutions can design and execute strategies that range from simplest duration-based hedging to the more sophisticated immunization or speculative yield-curve programs, based on multiple risk measures with off-balance sheet positions in swaps, interest rate options, and interest rate futures.

The five interest rate risk models covered in this book are the duration and convexity models in Chapter 2, M-Absolute/M-Square models in Chapter 4, duration vector model in Chapter 5, key rate duration model in Chapter 9, and principal component duration model in Chapter 10. Applications using some of these models are given for regular bonds in Chapters 2,4,5,9, and 10; Treasury futures and Eurodollar futures in Chapter 6; bond options and callable bonds in Chapter 7; forward rate agreements, interest rate options, swaps, and swaptions in Chapter 8; mortgage securities in Chapter 10; and default-prone corporate bonds in Chapter 11.

Chapter 3 also shows how to estimate the term structure of interest rates from a cross-section of bond prices using the Nelson-Siegel exponential

model and the McCulloch's cubic spline model. The interest rate options, such as caps, floors, collars, and swaptions in Chapter 8 are priced using the LIBOR market models of Jamshidian and others. The default-prone zero-coupon bonds in Chapter 11 are priced using the models of Merton and Nawalkha-Shimko et al., while default-prone coupon bonds are priced using the first passage probability models of Longstaff and Schwartz, and Collin-Dufresne and Goldstein.

All three books of the trilogy come with software in a user-friendly excel/VBA format that covers a variety of models in the three respective areas. The software is organized to correspond with the models covered in different chapters, so it can be used as a powerful supplement in the learning process. Using the software for the current book, the user could, for example, design a multiple factor hedging strategy using the three key rate durations or using the three principal component durations. The user could solve for the notional amounts corresponding to interest rate swaps of different maturities to protect against the height, slope, and curvature shifts in the yield curve using a three-element duration vector model. The user could pick from a variety of multiple factor hedging and speculative strategies, such as immunization, bond index replication, and speculative yield-curve strategies, using a variety of interest rate contingent claims, such as regular bonds, bond options, Treasury futures (on T-bills, T-notes, and T-bonds), Eurodollar futures, forward rate agreements, interest rate options (e.g., caps, floors, and collars), swaps, swaptions, and default-prone corporate bonds. Finally, based on Craig Holden's excel program, the software for Chapter 3 also demonstrates a pedagogically useful term structure "movie" using monthly zero-coupon rates as well as forward rates over the period from 1946 to 1991.

After reading chapters on given topics from these books, the reader should be able to follow the examples and be ready to apply these models without searching for missing details from other sources (as we often did while writing this book). Though many of our programs require coding in advanced scientific languages, such as C, C++, the final output is always presented in user-friendly excel/VBA spreadsheets. These spreadsheets allow the readers with basic excel skills to instantly play with these models.

This book will be useful to both fixed-income practitioners, as well as graduate and advanced undergraduate students in an introductory course in fixed-income valuation.

Since this book is a part of the trilogy, it is integrated both conceptually and in terms of the mathematical notation, with the next two books to follow. This implies low cost to the user in reading the next two books, especially for practitioners who do not have the luxury of taking fixed-income courses. The second book on term structure modeling covers various term structure models from the basic Vasicek/CIR models to the more advanced

quadratic, HJM, and LIBOR market models. The third book covers both the structural and reduced-form models on credit risk as well as valuation of credit derivatives.

Various aspects of this trilogy on the fixed-income valuation course, including the book descriptions, software details, and future updates are available on the web site www.fixedincomerisk.com/.

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