

## Preface to the 2nd Edition

The second edition of this book widens the scope of presented methods and topics. We have introduced new chapters covering ongoing and currently dominant topics like Value-at-Risk, Credit Risk, the pricing of multivariate Bermudan options and Collateralized Debt Obligations, Realized Volatility and High-Frequency Econometrics. Since modern statistical methods, like e.g. copulae estimation, are increasingly important in quantitative finance such as in credit risk management, we have put more weight on the presentation of these themes. Moreover, we included more up-to-date data sets in our examples and applications. These modifications and give the text a higher degree of timeliness and strengthens the applicability. Accordingly, we the structure of the second edition is slightly changed.

The probably most important step towards readability and user friendliness of this book is that we have translated all numerical Quantlets into the R and Matlab language. The algorithms can be downloaded from the publisher's web sites. In the preparation of this 2nd edition, we received helpful input from Ying Chen and Song Song. We would like to thank them.

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## Preface to the 1st Edition

This book is designed for students and researchers who want to develop professional skill in modern quantitative applications in finance. The Center for Applied Statistics and Economics (CASE) course at Humboldt-Universität zu Berlin that forms the basis for this book is offered to interested students who have had some experience with probability, statistics and software applications but have not had advanced courses in mathematical finance. Although the course assumes only a modest background it moves quickly between different fields of applications and in the end, the reader can expect to have theoretical and computational tools that are deep enough and rich enough to be relied on throughout future professional careers.

The text is readable for the graduate student in financial engineering as well as for the inexperienced newcomer to quantitative finance who wants to get a grip on modern statistical tools in financial data analysis. The experienced reader with a bright knowledge of mathematical finance will probably skip some sections but will hopefully enjoy the various computational tools of the presented techniques. A graduate student might think that some of the econometric techniques are well known. The mathematics of risk management and volatility dynamics will certainly introduce him into the rich realm of quantitative financial data analysis.

The computer inexperienced user of this e-book is softly introduced into the interactive book concept and will certainly enjoy the various practical examples. The e-book is designed as an interactive document: a stream of text and information with various hints and links to additional tools and features. Our e-book design offers also a complete PDF and HTML file with links to world wide computing servers. The reader of this book may therefore without download or purchase of software use all the presented examples and methods via the enclosed license code number with a local XploRe Quantlet Server (XQS). Such XQ Servers may also be installed in a department or addressed freely on the web, click to [www.xplo-re-stat.de](http://www.xplo-re-stat.de) and [www.quantlet.com](http://www.quantlet.com).

“Applied Quantitative Finance” consists of four main parts: Value at Risk, Credit Risk, Implied Volatility and Econometrics. In the first part Jaschke and Jiang treat the Approximation of the Value at Risk in conditional Gaussian Models and Rank and Siegl show how the VaR can be calculated using copulas.

The second part starts with an analysis of rating migration probabilities by Höse, Huschens and Wania. Frisch and Knöchlein quantify the risk of yield spread changes via historical simulations. This part is completed by an analysis of the sensitivity of risk measures to changes in the dependency structure between single positions of a portfolio by Kiesel and Kleinow.

The third part is devoted to the analysis of implied volatilities and their dynamics. Fengler, Härdle and Schmidt start with an analysis of the implied volatility surface and show how common PCA can be applied to model the dynamics of the surface. In the next two chapters the authors estimate the risk neutral state price density from observed option prices and the corresponding implied volatilities. While Härdle and Zheng apply implied binomial trees to estimate the SPD, the method by Huynh, Kervella and Zheng is based on a local polynomial estimation of the implied volatility and its derivatives. Blaskowitz and Schmidt use the proposed methods to develop trading strategies based on the comparison of the historical SPD and the one implied by option prices.

Recently developed econometric methods are presented in the last part of the book. Fengler and Herwartz introduce a multivariate volatility model and apply it to exchange rates. Methods used to monitor sequentially observed data are treated by Knoth. Chen, Härdle and Kleinow apply the empirical likelihood concept to develop a test about a parametric diffusion model. Schulz and Werwatz estimate a state space model of Berlin house prices that can be used to construct a time series of the price of a standard house. The influence of long memory effects on financial time series is analyzed by Blaskowitz and Schmidt. Mercurio proposes a methodology to identify time intervals of homogeneity for time series. The pricing of exotic options via a simulation approach is introduced by Lüssem and Schumacher. The chapter by Franke, Holzberger and Müller is devoted to a nonparametric estimation approach of GARCH models. The book closes with a chapter of Aydinli, who introduces a technology to connect standard software with the XploRe server in order to have access to quantlets developed in this book.

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