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Statistical Analysis of Financial Data in S-PLUS

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This book is intended primarily for an undergraduate course in financial engineering. It provides a very nice introduction to exploratory and model building approaches for analyzing and understanding financial data. The main concepts and techniques presented in the book are illustrated in the S-PLUS computing environment.

The book is divided into three parts. The first part introduces the readers to univariate and multivariate exploratory data analytic techniques, the second part covers parametric and nonparametric regression models and the third part discusses linear and nonlinear time series models. The statistical techniques are illustrated by familiar to finance students concepts, such as yield curve estimation, value-at-risk computation, option pricing, term structure of interest rates, the CAPM model, etc. This way the student gets a firm grasp of how data can be used to estimate models covered in an introductory finance course. Every chapter is complemented with several theoretical and empirical homework problems. Finally, there is a 40-page appendix that provides a quick introduction to S-PLUS.

The breadth of topics covered is impressive; from exploratory graphics, to classical linear regression, to kernel and projection pursuit regression, to univariate ARMA models, to Kalman filtering to ARCH-GARCH and Hidden Markov models. However, the presentation of the various concepts is at times fairly dense and at other times somewhat incomplete. Personally, I like a succinct presentation style, but I suspect that an instructor may have to complement the material in the book with lecture notes that provide additional details.

The book begins with a chapter on univariate exploratory analysis, with the emphasis being on histograms and kernel density estimation and qq-plots. A nice feature of the book is the emphasis placed on heavy tailed distributions which are explored through qq-plots and complimentary cdf plots. The second chapter deals with multivariate data exploration; however, this chapter is really a patchwork of various topics, ranging from the correlation coefficient, to copulas and simulating random samples to

Chapter 3 introduces the reader to parametric regression models. It discusses simple and multiple linear regression, polynomial models and non-linear regression. A nice feature of of this chapter is the discussion of L_1 regression models. The next chapter covers local and

nonparametric regression and discusses various scatterplot smoothers, kernel and projection pursuit regression.

Chapter 5 discusses the classical time series models, such as autoregressive, moving average and combinations of the two, while chapter 6 is a hodgepodge of various topics, such as multivariate linear time series models, state space models, Kalman filtering, etc. Finally, in chapter 7 the very popular in finance ARCH and GARCH models are reviewed, together with filtering of nonlinear systems and discretization of continuous time financial models.

Some particularly welcome overall features of this book are: (i) the reference notes at the end of each chapter that provide a brief historical perspective and additional references for readers interested in further exploring the topic, (ii) explanations of the various S-functions used and in particular their idiosyncracies, and (iii) the illustration of the various models and techniques with illuminating examples through interesting financial data sets.

As can be seen from the chapters' contents, the breadth in terms of topics covered of this book is impressive. However, this comes at the cost of a more in depth coverage of many topics. For example, inferential issues and model diagnostics are largely ignored. I would have preferred a more selective choice of models and techniques and a more extensive discussion. Moreover, despite the presence of many plots, even more and richer plots would have been useful.

Another downside of this book is the use of the S-PLUS platform. Many departments have switched from S-PLUS to R and I strongly suspect that they are not interested in dedicating any financial resources on acquiring an S-PLUS license. Therefore, a new edition of the book that would substitute R for S-PLUS would be very welcome.

Overall, this is a very nice book for introducing students to a variety of models for analyzing financial data. However, the instructor should be prepared to provide extra material for many of the topics discussed in the book.

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