

[Reviewer]

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## Statistical Models and Methods for Financial Markets

Tze Leung LAI and Haipeng XING. New York, NY: Springer, 2008. ISBN: 978-0-387-77826-6. xx+354 pp. \$89.95 (H).

The year 2008 is sure to go down in financial history as one that would test the convictions of almost everyone who has ever engaged the statistical modeling of financial markets. Still, even the most skeptical (or pessimistic) among us has to retain some faith that the relative stability of markets will resume and the quantitative methods that did serve us well in much of the past will again serve us well in much of the future. This text by Lai and Xing was completed as the tumult of 2008 was unfolding, but its methods are (to a substantial extent) timeless, and future students and teachers can benefit in better times from the clear and cohesive exposition that this text provides.

The text is organized into twelve chapters, divided equally into two parts: Part I Basic Statistical Methods and Financial Applications and Part II Advanced Topics in Quantitative Finance. The first chapter deals with linear regression models, including variable selection, regression diagnostics, bootstrapping in regression and generalized least squares. The exposition assumes that the student is comfortable with linear algebra. For stronger MS students in financial mathematics or statistics, the level is fine, but since the first data is introduced only in the last section of the chapter, weaker MS students (or undergraduates) may need some coaxing to become involved.

Chapter 2 deals with multivariate analysis and likelihood inference. The principle example of the chapter deals with the use of principle components (PCA) applied to the yield curve. The multivariate analysis is standard — but clear and succinct. It might have been kind to remind students at this point that asset returns are not very well modeled by the normal distribution, but they did get to see this in the QQ-plots of Chapter 1. In Chapter 3,

Lai and Xing look at some of the classical financial models: Markowitz's portfolio theory, the capital asset pricing model (CAPM), the arbitrage pricing model (APT), and (ultra briefly) the Fama-French three factor model. In Chapter 4 (Parametric Models and Bayesian Methods) Markowitz's theory and the CAPM are revisited with an eye to seeing what shrinkage can add to the story. Chapters 5 and 6, deal succinctly with the core financial time series models, including ARIMA, ARCH, GARCH, and EGARCH models.

Part II of the text is more specialized. Chapter 7 provides an introduction to the basic topics of non-parametric regression and gives an application to yield curve data. Chapter 8 then takes up several topics in option pricing, including the notion of implied volatility. Violations of the assumptions of the Black-Scholes model are then addressed. In teaching this chapter, one might want to add material on the modeling of the volatility surface.

Chapter 9 takes up a collection of topics that are interesting — but not particularly unified. Here you find the generalized method of moments sits cheek-to-jowl with long-memory models, stochastic volatility models, and test for unit roots. Pairs trading links well with testing for a unit root, but it is addressed two chapters later. Chapter 10 is devoted to the statistical modeling of the yield curve, including traditional models for the short rate and an introduction to the Heath-Jarrow-Morton model.

Students are always interested in statistical trading strategies, and these are covered in Chapter 11. The literature on momentum strategies is introduced and pairs trading is now discussed. One interesting but unusual topic discussed here is the modeling of the bid-ask spread. As a classic instance of “last but not least,” Chapter 12 covers statistical methods in risk management, including Value-at-Risk and extreme value distributions.

Lai and Xing have written a useful text that anyone who teaches this material will want to consider. The number of topics covered is remarkably extensive; the exposition is always compact — and often quite elegant. For the teacher who wants to add some spice, I have three suggestions. First, I'd add a bit more skepticism about the classic models, at least enough to ask “Is Beta Dead?” I'd also preach more about the intrinsic limitations of relying on past volatility to judge future risks — what economists call the “Peso problem.” Finally, even if just for human interest, I'd try to get a discussion going on the role of models in financial disasters, such as the collapse of LTCM that was so beautifully chronicled by Roger Lowenstein (2001).

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REFERENCES

Lowenstein, Roger (2001), *When Genius Failed: The Rise and Fall of Long-Term Capital Management*, New York, New York : Random House Trade Paperbacks.