The Econometrics of Financial Markets

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Book Review

The Econometrics of Financial Markets. John Y.
Campbell, Andrew W. Lo, and A. Craig MacKinlay.
Princeton, N.J.: Princeton University Press, 1997. xviii
+ 611 pp., $49.50. ISBN 0-691-04301-9.

Written by three well-known scholars in the field, this
text is an ambitious effort to elucidate a wide range
of important topics in financial econometrics using an
innovative combination of data analysis and sophis-
ticated economic theory. For the first time, we have
available in a single volume a large collection of topics
previously found in specialized journals or advanced
monographs only.

   Are asset returns predictable? Why are portfolio re-
turns strongly positively autocorrelated when individ-
ual security returns are negatively correlated? Does
the CAPM hold? How do we explain the large body
of evidence that excess returns on stocks and other
risky assets are predictable? These are just a few of
the questions raised in the book for which an answer
is provided or the state of the art presented.

   This book is sophisticated, yet accessible; full of
details, yet intriguing. At the beginning of each chap-
ter, the authors clearly identify the type of problems
they are going to cope with and introduce the nec-
essary analytical tools right after. A careful effort has
been made to develop the statistical techniques within
the context of particular financial applications. Stu-
dents are going to like this approach. Instructors will
appreciate the attempt to make each chapter as self-
contained as possible, leaving them free to choose
specified sequences of topics. Professionals will be
pleased with the quick and authoritative introductions
to important areas of finance.

   The choice of topics, although not exaustive, is up
to date and most chapters point to current areas of
research in the field. This, together with an exten-
sive bibliography, make the text particularly useful
for Ph.D. students and industry professionals as well.
It is not completely clear to me if this book can be
useful to MBA students. In fact, while it is true that the

book covers a wide spectrum of empirical finance, the answers are for the most part aiming at the general theory rather than the solution of specific problems. Nonetheless, parts of the text should be accessible to advanced MBA students.

The background required to be able to appreciate the text in full is demanding. Apart from a good knowledge of econometrics, one needs to be familiar with advanced topics in time-series analysis, probability theory, selected areas of statistics and, for continuous-time financial models, elements of stochastic analysis. In addition, to be able to provide the proofs of many results stated in some of the chapters, one needs a certain ability to implement ideas from financial economics and dynamic optimization as well.

The book has few exercises. Nonetheless, I do not see this as a serious limitation. In fact, it becomes clear from the very first chapter that to master the material students are required to fill in lots of intermediate steps, some of which are not trivial. To some extent the book would have benefited from having these problems available in the form of examples. Because of the need to provide intermediate steps and the advanced nature of some of the materials (e.g., Chapters 8 and 9), this book is likely to be more effective when used in a classroom environment rather than for self-study. In a course I took at the University of Minnesota, different chapters were assigned to different students, each being held responsible for providing the details of the assigned chapter during 2- to 3-hour presentations. The result turned out to be positive as the presentations raised constructive criticisms which allowed the instructor to step in to provide details and/or suggest further readings.

It is fair to say that the book consists of three parts. The first part (Chapters 2–6) examines the behavior of stock returns; the second part (Chapters 7–11) focuses on valuing assets and the calculation of prices. Ideally, Chapter 12 can be considered as a part on its own, introducing less standard statistical tools which are becoming increasingly important in the field: ARCH models, nonparametric regression, and neural networks.

Chapter 1. Introduction. Discusses the organization of the book, introduces the notation, and provides some useful background and basic facts about prices, returns, compounding, and the ideas of market efficiency.

Chapter 2. The Predictability of Asset Returns. A lucid effort to survey an important area of the field, this chapter aims at providing an answer to a fundamental question: Are financial asset prices forecastable? To this purpose, three different versions of the random walk hypothesis are introduced and statistical tests are developed for each

of them. The theory is further refined to accomodate several features of the data such as long-horizon returns and long-range dependence. Unit-root tests are also sketched. The final discussion on recent empirical evidence brings the reader to apply the ideas developed in the previous sections. In particular, using cross-effects, the authors provide an explanation to the fact that individual security returns are weakly negatively correlated while portfolio returns are strongly positively autocorrelated. A very enjoyable chapter, written with a lot of statistical taste.

Chapter 3. Market Microstructure. An analysis of how the very process of trading can have a serious impact on the statistical properties of financial asset prices. Nonsynchronous trading and bid-ask spreads are considered and their implications carefully reported. A large section is devoted to modeling transactions data and several recent findings are listed as well.

Chapter 4. Event-Study Analysis. A masterfully written introduction on how to measure and test the effect of economic events such as mergers, acquisitions, abnormal returns, earnings announcements, and so on on the value of a firm. A very accessible chapter, particularly suitable for self-study, where even those readers who lack the most basic notions can leave with a clear idea of what event study analysis is about. To this purpose the authors use earnings announcements as the vehicle to introduce their readers to set up an event study analysis and carefully review the relevant econometric methodologies. In the second part of the chapter, more advanced statistical issues like non-parametric tests, cross-sectional analysis, and the role of the sampling interval are presented. A useful discussion of successes and limitations of event study analysis closes the chapter.

Chapter 5. The Capital Asset Pricing Model. In the first part of the chapter the relevant theory is presented without proofs, which can be found in most textbooks in financial economics [e.g., Huang and Litzenberger (1988)]. Successively, the statistical framework to estimate and test this model is provided for both the Sharpe–Lintner and the Black versions. In the last part of the chapter, several statistical issues are carefully reviewed in connection with the well-known difficulties in testing the CAPM. Among them are size of tests, power of tests, nonnormal and non i.i.d. returns, GMM estimation, and cross-sectional regressions which introduce the reader to the now well-known approach of Fama and MacBeth (1973).

Chapter 6. Multifactor Pricing Models. An introduction to the APT and the intertemporal CAPM. The theoretical background is provided and particular care is used in explaining to the reader the estimation and testing of various forms of the exact factor pricing relation. The

more advanced issues discussed in the chapter involve the statistical approaches in the selection of factors and the implications for separating alternative theories.

Chapter 7. Present Value Relations. The goal is to analyze the relation between prices, dividends, and returns. The present-value model, which relates the price of a stock to its expected future cash flows discounted using a constant or time-varying discount rate, is the vehicle to achieve this goal. Several versions of this model—with constant expected returns, with time-varying expected returns, and with rational bubbles—are provided. The identities derived from the models are then used to interpret recent empirical findings related to time series of U.S. stock prices. The use of long-horizon regressions, volatility tests, and VAR models are also discussed with a certain amount of detail.

Chapter 8. Intertemporal Equilibrium Models. An advanced chapter that introduces the student to the use of intertemporal equilibrium models of asset pricing. The stochastic discount factor is introduced and then specialized to the consumption CAPM. Several important implications are derived in the case of the representative agent maximizing a time-separable power utility function. The authors look also at a couple of interesting issues—the equity premium puzzle and the risk-free rate puzzle—and try to provide an explanation for each of them. The third part of this chapter deals with market frictions. The Hansen–Jagannathan bounds and the Epstein, Zin, and Weil model are presented. To learn the material in this chapter, the readers are required to derive the final formulae, and this is not always a trivial task. The last part of the chapter aims at referencing more general utility functions, and introducing habit formations and psychological models of preferences.

Chapter 9. Derivative Pricing Models. This is a rather technical chapter in which the authors do their best to provide their readers with the basic notions of continuous-time modeling in a limited amount of space and avoiding the technicalities. The construction of Brownian motion and the use of stochastic differential equations are briefly introduced together with the famous Itô's formula. Derivative pricing methods are shortly reviewed. It is a lucky circumstance that the reader is today in the position to supplement this chapter with the recent book by Baxter and Rennie (1996). On the contrary, a careful presentation is provided for the implementation of parametric option pricing models and the use of Monte Carlo simulation for pricing path-dependent derivatives. This chapter discusses the use of GMM estimation and reports the results from the important article by Hansen and Scheinkman (1985) to generate moment conditions. Unfortunately this is a difficult article and it doesn't seem that the authors put any particular effort into making the theory more accessible.

Chapter 10. Fixed Income Securities. An introduction to the basic concepts of fixed-income securities is provided. The middle section of the chapter is centered around the immunization problem and estimating the zero-coupon term structure. OLS, spline, and nonlinear models are discussed. The last part of the chapter looks at the term structure of interest rates in the framework of the expectation hypothesis model. Theoretical results are compared with empirical findings.

Chapter 11. Term-Structure Models. As the authors declare in the opening statement of the chapter, this is devoted to exploring the large modern literature of fully specified general-equilibrium models of the the term structure of interest rates. This is done using a discrete-time approach which is more suitable for econometric applications, the object of the text, but results are related to the continuous-time equivalents. The topics discussed cover affine-yield models, fitting term-structure models to the data when payoffs are riskless in nominal terms rather than in real terms, and pricing fixed-income derivative securities.

Chapter 12. Nonlinearities in Financial Data. An attempt to address several important issues related to modeling nonlinear structure in financial data. Several parametric nonlinear models for time series are discussed. The ARCH and GARCH families of models are introduced as tools to model changing volatilities. The reader can use it as an introduction to the ideas of the methodology and then can apply him/herself to the book by C. Gourieroux (1997). The basics of nonparametric regression are provided and their use in estimating state-price densities is also discussed. The last part of the chapter is devoted to neural networks and an application to the Black–Scholes formula is provided.

Appendix. A brief introduction to those techniques that are most commonly used in financial econometrics: linear instrumental variables, generalized method of moments, serially correlated and heteroskedastic errors, and ML.

Overall the book is a well-written introduction (indeed, something more) to financial econometrics. It is alert, explicit, and articulate about assumptions, competing attitudes, levels of abstraction, scope of applicability, interpretation, and relevance of the statistical methodologies developed. The value as a textbook would increase if, in a future edition, the authors could add more examples and provide more intuitive proofs for some of the more advanced topics. Nonetheless, even as it is, the book is in my opinion a splendid offering, almost a must for students, researchers, and professionals with a strong interest in statistical applications to finance.

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