

## ***Financial Econometrics: Problems, Models and Methods***

By Christian Gourieroux and Joann Jasiak. 2001. Princeton, NJ: Princeton University Press. Pp. 513. \$60.00 hardcover.



The past twenty years have seen a remarkable growth of financial markets, paralleled by an equally remarkable growth of books and articles dealing with the

movement of prices and returns. A distinct characteristic of this literature has been a growing sophistication of statistical tools used in the analysis of data. *Financial Econometrics* represents one of the latest additions to this literature.

With its emphasis on time series analysis, it complements the encyclopedic book on *The Econometrics of Financial Markets* by J.Y. Campbell, A.W. Lo, and A.C. Mackinlay, also published by Princeton University Press, in which the knowledge of time series analysis is assumed. Both books are designed as graduate textbooks for the emerging field of financial econometrics.

According to the authors, the objective of the book is to report on the current state of scientific advancement in the development of econometric methods in finance. The book is intended for graduate students in statistics, mathematics, economics, and business who are interested in financial applications. It is also supposedly useful for applied researchers employed by banks and

financial institutions. The underlying philosophy of the authors is that econometric methods need to be adapted to the problem and data under study on a case-by-case basis.

This is justified by the proposition that statistical models are simplified images of reality and, therefore, are by necessity misspecified. Since specification errors differ from problem to problem, different problems are best served by different models. A crucial task of financial econometrics is to keep the specification errors under control. For this reason the authors do not provide a customary computer disc containing a set of financial series used for empirical illustrations but employ a variety of data sampled at different frequencies.

The text consists of sixteen chapters and almost twenty-four pages of references. The introductory chapter provides a brief discussion of assets and markets, of rudimentary financial theory, and of financial data. The topic of the second chapter is the first-order autoregressive model, AR(1), and its generalization in the form of an autoregressive moving average (ARMA) model of Box-Jenkins fame. The third chapter extends the discussion to multivariate time series models represented by vector-autoregressive (VAR) and vector-autoregressive moving average (VARMA) models. The usefulness of these models for efficient portfolios is a part of the discussion.

In Chapter 4 on simultaneity, recursivity, and causal analysis the authors come close to the traditional econometrics, except for a section on the capital asset pricing model (CAPM). Chapter 5 proceeds to the currently popular time series models with unit roots and cointegrated processes.

The topics of Chapter 6, namely autoregressive conditionally heteroskedastic (ARCH) and stochastic volatility models, lie at the heart of the book. This is, in my opinion, the best chapter of the book. It relates the volatility of asset prices to risk management, and it justifiably presents the ARCH models as a scientific breakthrough that allowed researchers to come up with empirical evidence against the presumption of unpredictability of returns.

Chapter 7 contains a review of various prediction schemes such as the adaptive and the rational expectation models. Special attention is given to the fact that there are multiple dynamic equilibria compatible with the capital asset pricing model, including the speculative bubble effect. After that, the authors turn to intertemporal equilibrium models, especially the consumption-based capital asset pricing model (CCAPM). They also describe the associated generalized moments method (GMM) of estimation.

Chapters 9 and 10 deal with dynamic factor models and dynamic qualitative processes and are not particularly inspiring, partly because of the esoteric nature of the topics and partly because of a not very illuminating presentation. Diffusion models, presented in Chapter 11, are used to introduce the reader to the basic concepts of derivative pricing and continuous time modeling. The authors derive the Black-Scholes formula of derivative pricing from the underlying process of geometric Brownian motion. The possibility of jumping prices due to a discontinuous component is also considered. The difficulties of estimating diffusion models due to the fact that prices are not observed continuously are examined

in Chapter 12. In general, there are two approaches to estimation in this case. One is based on exact methods such as MLE or GMM, which involve problems of identification. The second approach is based on the method of simulated moments, which involves various approximations.

Chapter 13 is devoted to a detailed presentation of the famous Black-Scholes model of option pricing, which is being criticized for its assumption of time-invariant volatility. In Chapter 14 the authors delve into the area of high-frequency data, believed to be "one of the most promising fields of future research in financial econometrics" because of its potential to offer insights into the dynamics of price patterns that are observed at much shorter intervals of time.

The subject of market indexes, described as approximations to the market portfolio, is taken up in Chapter 15. The discussion covers major U.S. indexes such as those developed by S&P and Dow Jones, as well as major indexes used in the UK, France, Japan, and Canada. The failure of some market indexes to provide good approximations of the market portfolio is duly noted. The final chapter is devoted to the subject of management of extreme risk caused by the existence of fat-tailed distributions of prices. In the presence of such distributions the use of volatility as a measure of risk can be misleading since some of these distributions have infinite variances. As an alternative the authors propose a measure called "value-at-risk," which determines the minimum capital required to cover a financial loss with a fixed probability of occurrence.

Following the standard teaching practice, each chapter starts with an outline of the topic to be discussed and ends with a summary of the fore-

going discussion. Both the introductory and especially the summary parts are generally excellent. The middle parts dealing with the subject matter itself are written at a level typical of articles in high-ranking professional journals. The early chapters on basic time series analysis are designed for the novice in the field but progress rapidly to higher levels of sophistication. The subsequent chapters rely strongly on the reader's mathematical and statistical skills by presenting recent results from the literature without shying away from complications.

The book was developed from lectures at various French, Swiss, and Canadian universities in courses which clearly made high demands of the students. The readers who have solid backgrounds in mathematics and statistics and who are willing to work diligently through the presented material will appreciate the comprehensiveness of the content of the book and the frequent useful insights provided by the authors.

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### ***Principles of Forecasting: A Handbook for Researchers and Practitioners***

*Edited by J. Scott Armstrong. 2001.  
Boston, MA: Kluwer Academic  
Publishers. Pp. 864. \$190.00 hard-  
cover, \$95.00 paperback.*

This book is a compilation of peer-reviewed articles from thirty-nine different authors and spans a wide range of practical forecasting issues ranging from role-playing methods for forecast decisions to econometric meth-



ods. The book is conveniently arranged to be used as a reference source for practitioners; and, although it claims to serve a very broad audience from researchers and educators to journalists, it is actually more oriented toward practitioners.

This review will focus on the sections of the text that are most relevant to practicing business economists: econometric methods, selecting methods, and evaluating methods. A number of other sections will certainly be of interest in specific situations as those arise in the course of developing forecasts.

In the econometric methods section, Geoff Allen and Robert Fildes center most of the discussion on time series methods such as vector autoregression (VAR) systems and ARIMA models, although one of the guiding principles of the chapter is that when theory provides a functional form, researchers should follow it. A fairly structured strategy for econometric forecasters is outlined in this chapter and can be concisely summarized in the following seven steps:

1. *Clearly define the objectives of the model.* Judgment, guided by previous research in the area, is used to then determine the best set of variables (the authors suggest narrowing to six variables prior to estimation) to use in the model.
2. *Collect the data.* The authors point to the obvious objective of obtaining the longest time series possible. Unfortunately, in much applied work both the quality and the length of available data series leave much to be desired.
3. *Form an initial model specification.* The authors suggest starting with a high-lag order VAR, which

is then estimated using ordinary least squares (OLS). One issue that is not addressed explicitly in this chapter, but which occasionally arises in applied work, is that of not being able to specify a high-lag order VAR because of a lack of data. There are also reasonable objections to using the atheoretic VAR approach to define the cause-and-effect relations in each equation of the system.

4. *Estimate the model following the VAR specification, using OLS.* The author argues that when the equations have different sets of regressors, the seemingly unrelated regressions (SUR) methods can be justified in theory but have yet to show any substantial advantage in practice.
5. *Conduct misspecification tests to point out problems with the model.*
6. *Use specification tests to simplify the model as much as possible.* These tests can be used to reduce the number of lags on explanatory variables
7. *Compare out-of-sample performance of the final model against a benchmark model.* Benchmark models are typically univariate models and the rationale suggested here is the common-sense approach that if the carefully developed model cannot forecast better than such a simple alternative, then it is not a particularly useful model.

The remainder of this section goes into detail on each of the above points and provides some useful and practical approaches for the practitioner that are often not found in more theoretical treatises on forecasting.

The section on selecting methods is written by J. Scott Armstrong and describes six procedures for selecting from the variety of forecasting meth-

ods currently available to practitioners. Armstrong offers simple but powerful advice by suggesting that we consider first what not to do. This chapter provides a concise discussion on evaluating the following procedures, and Armstrong offers his thoughts on the pros and cons of each:

1. *Convenience.* Frequently, analysts fall back into methodologies in which they are comfortable but Armstrong correctly points out that this is not recommended.
2. *Market popularity.* This is essentially an extension of the convenience approach but refers not to reliance upon one's own expertise but to the use of methods that other organizations employ, operating on the assumption that people figure out which methods work over time. Again, this approach is no guarantee of forecasting success and should be avoided.
3. *Structured judgment.* An effective approach when a number of criteria are relevant and a number of methods are possible. The forecaster here first develops explicit criteria such as accuracy, ease of interpretation, and ease of implementation and then rates various methods against them.
4. *Statistical criteria.* These criteria are useful for selection only after the decision has been made about the general type of method to be used and are not appropriate for making comparisons among substantially different methods. However, forecasters often make use of statistical criteria to select methods. This is sometimes useful in determining, for example, whether forecasters should use seasonal factors in extrapolation forecasts.
5. *Relative track record.* Refers to the comparative performance of

methods that are evaluated by systematic and unbiased procedures.

6. *Principles from published research.* This is a useful summary of procedures for analysts and is the most extensive of the chapter. Armstrong discusses a number of important issues and suggests that previous research be extensively used by forecasters. This prior research provides an inexpensive way of benefiting from expert judgments on over half a century of forecasting research. While time-consuming, this systematic approach provides the best chance for accurate and effective forecasts.

Armstrong also authors the section on evaluating forecasting methods, which is a critical but often neglected component to the forecasting process. Armstrong argues in favor of testing both inputs and outputs in the forecast process. Testing inputs helps the practitioner learn how to improve a given model and/or to better assess the effects of policy changes. Testing outputs helps to select the best models and to assess uncertainty by answering such questions as, "Can the outputs be replicated and how can we assess those outputs?" Armstrong draws most of the principles in this section from established procedures in the social sciences, most of which are based on common sense or perceived wisdom. The "Evaluation Principles Checklist" presented at the end of this section is a particularly useful reference. Some of the more frequently neglected principles cited by Armstrong include "obtaining a large sample of independent forecasts, describing conditions, and conducting replications." The usefulness of this section lies in its formalization of the "checklist" and clear evidence that following such a formal procedure for evalu-

ating forecasts will ultimately aid in the process of generating more accurate forecasts.

Overall, *Principles of Forecasting* is an effective reference text for practicing researchers and analysts and is a useful text for those business economists who are responsible for preparing forecasts on a regular basis. Armstrong has brought together a wide range of forecasting articles written by established experts in their fields into a single definitive volume on the subject. While it is difficult to span a field as diverse as “forecasting,” Armstrong has done an admirable job in compiling relevant and interesting articles that will certainly be of interest to practitioners.

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