

*Principles of Forecasting: A Handbook for Researchers and Practitioners*, J. Scott Armstrong (Ed.), (2001), Boston: Kluwer Academic Publishers, 849 pages.

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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 methods. The look 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 authors argue 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 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 methods 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 dear evidence that following such a formal procedure for evaluating 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.