Principles of Business Forecasting

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Price of Unleaded Gasoline

Month Year

1996 1999

MSE = \sum_{i=1}^{m} (Y_{t+i} - F_{t+i})^2 / m = \sum_{i=1}^{m} e_{t+i}^2 / m

\text{relMAE} = \frac{\sum_{i=1}^{m} |Y_{t+i} - F_{t+i}|}{\sum_{i=1}^{m} |Y_{t+i} - Y_{t+i-1}|}

\text{MAE} = \frac{\sum_{i=1}^{m} |Y_{t+i} - F_{t+i}| / m = \sum_{i=1}^{m} |e_{t+i}| / m}
Business forecasting is art woven into science and principle teamed with pragmatism. Virtually every manager has to make plans or decisions that depend on forecasts. Research over the past 50 years or more has shown that taking an analytical approach rather than just relying on informal intuition leads to more accurate forecasts and more effective plans and decisions. However, forecasting is often the poor relation of more theoretical material, available through courses in regression, and time series analysis.

This book not only provides an introduction to both standard and advanced approaches to forecasting, but also presents general principles that underlie forecasting practice. What makes this book unique is its emphasis on incorporating the latest research findings to help practicing forecasters carry out their job and to enable students to prepare for a managerial or analytical career.

brief contents
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*Advanced topic

about the authors

Keith Ord is Professor Emeritus in the Operations and Information Management group at the McDonough School of Business at Georgetown University. He completed his graduate work at the University of London and held faculty positions at the Universities of Bristol and Warwick before moving to The Pennsylvania State University in 1980 and then to Georgetown University in 1999. His research interests include time series and forecasting, spatial modeling and the statistical modeling of business processes. He is a co-author of the 2008 research monograph Forecasting with Exponential Smoothing: The State Space Approach and also co-authored Kendall’s Advanced Theory of Statistics. He has served as an editor of the International Journal of Forecasting and is currently on the editorial boards of several other journals. Keith is a Fellow of the American Statistical Association and of the International Institute of Forecasters.

Robert Fildes is Distinguished Professor of Management Science in the Management School, Lancaster University and Founding Director of the Lancaster Centre for Marketing Analytics and Forecasting. He has a mathematics degree from Oxford and a Ph.D. from the University of California in Statistics. He was co-founder in 1981 of the Journal of Forecasting and in 1985 of the International Journal of Forecasting (IJF). For ten years from 1988 he was Editor-in-Chief of the IJF and remains an associate editor. He was president of the International Institute of Forecasters between 2000 and 2004. His research interests are concerned with the comparative evaluation of different forecasting methods, the implementation of improved forecasting procedures in organizations and the design of forecasting systems. In 1976 he wrote one of the earliest business forecasting textbooks. Though long out-of-print, many of its core ideas have survived the test of time to surface again here in a more modern guise. Robert is a Fellow of the International Institute of Forecasters and of the UK Operational Research Society. In 2014 he was awarded the Beale Medal from the UK OR Society, its highest accolade.

Nikolaos Kourentzes is an Associate Professor in the Department of Management Science at Lancaster University Management School. His background is in Strategic Management, but quickly changed his interests to Management Science, with a Ph.D. from Lancaster University in forecasting with neural networks. He is on the editorial board of the International Journal of Forecasting and founding member of the Forecasting Society. Nikos’ primary research interest is modeling uncertainty in a business forecasting context, whether that concerns model specification and selection, or ways to make forecasts more reliable and robust. His research addresses forecasting issues of aggregation and hierarchies, model combination, promotional modeling, and supply chain collaboration. He has published multiple forecasting related open-source packages for R, in his attempt to bring current forecasting research to practice.
Each chapter opens with a detailed table of contents showing the subject matter contained therein.

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3.2 Extrapolative Methods

Extrapolative methods of forecasting focus on a single time series to identify past patterns in the historical data. These patterns are then extrapolated to map the likely future path of the series. The overall structure is shown in Figure 3.1.

Figure 3.1 General Framework for Forecasting with a Single Series

Forecasts are generated from a regression on past observations or with other statistical techniques. The forecast yhat is used to predict the actual value of a future time period. A typical framework for forecasting a single time series is shown in Figure 3.1.

**Figure 3.1**

- **Time Period:** Past and future values of the time series are represented as T, Y, Y_t, Y_t ± 1, Y_t ± 2, etc.
- **Data:** Past observations Y, Y_T ± 1, Y_T ± 2, etc., are used to make forecasts.
- **Forecast:** Future values Y_t ± 1, Y_t ± 2, etc., are predicted based on past data.

3.10 Principles of Extrapolative Methods

To avoid undue repetition, we assume that the data series being forecast is appropriate for the problem at hand in terms of relevance, timelessness, and non-outliers. These assumptions are by no means trivial, but we have discussed them in the previous chapters and they remain critical in any forecasting exercise. We should always recall the maxim: "Garbage in, garbage out." If the data do not satisfy the aforementioned criteria, further analysis may be needed. As before, Armstrong (2001) is a valuable resource, and many of the principles quoted reflect his ideas. A few principles are repeated from Chapter 2 because they are an integral part of the forecasting approach described in the current chapter.

3.1 Plot the series.
3.2 Clean the data.
3.3 Forecast the series.
3.4 Validate the forecast.

For each chapter, a set of principles to guide forecasting practice is provided.
“Principles of Business Forecasting is in my opinion the most readable book in the field, and I think I own all of them. The authors of the first edition are eminent researchers, both known for clear writing which is on display here. They have been joined in the second edition by Nikos Kourentzes who has added new ideas and R based tutorials, the aim being to make the book more widely usable in applications. … One novel feature is the emphasis on evidence-based principles of forecasting rather than quantitative modeling. That is, modeling is used to support the principles; for some years, I have tried to teach this way, but I have never had a text to support me. …”

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