

Practical  
Problems and Solutions

# BUSINESS FORECASTING

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# **Business Forecasting**

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*Practical Problems and  
Solutions*

**Edited by  
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**WILEY**

Cover design: Wiley

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Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

Published simultaneously in Canada.

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***Library of Congress Cataloging-in-Publication Data:***

Names: Gilliland, Michael, editor. | Sglavo, Udo, 1968 – editor. | Tashman, Len, 1942 – editor.

Title: Business forecasting : practical problems and solutions / edited by Michael Gilliland, Udo Sglavo, Len Tashman.

Description: Hoboken : Wiley, 2015. | Series: Wiley and SAS business series | Includes bibliographical references and index.

Identifiers: LCCN 2015039621 | ISBN 978-1-119-22456-3 (hardback) | ISBN 978-1-119-22829-5 (ePDF) | ISBN 978-1-119-22827-1 (ePub) | ISBN 978-1-119-19988-5 (obook)

Subjects: LCSH: Business forecasting. | BISAC: BUSINESS & ECONOMICS / Forecasting.

Classification: LCC HD30.27 .B874 2015 | DDC 658.4/0355—dc23 LC record available at <http://lccn.loc.gov/2015039621>

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

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# Praise for *Business Forecasting: Practical Problems and Solutions*

This book is the survivor's guide for business forecasters. It covers a wide range of need-to-know topics from "what is demand" to "why should I trust your forecast."

—Scott Roy, Collaboration Planning Manager,  
Wells Enterprises Inc.

This is a wonderful resource for anyone in the field of forecasting, covering all of the major areas that a practitioner would need in order to be successful. This book covers the key areas of concern for most folks dealing with forecast, from basics such as forecastability and benchmarking to more advanced topics like dealing with politics in forecast. I would definitely recommend this reader as a key resource for those looking to learn more or to have knowledge at their fingertips for that moment when they need a refresher.

—Curtis Brewer, Forecasting Manager, Bayer CropScience

An essential reading on business forecasting indeed! Every article is in its place, and every one is worth reading. In spite of my many years in forecasting and planning, the reading was so captivating that I could not stop before it was over. Absolutely a "must read" for every person working in business forecasting.

—Igor Gusakov, Consulting Director, Goodsforecast

The science of forecasting has existed for centuries and continues to evolve. However, while it asymptotically approaches better methods of prediction, it will always have its limits. Forecasting must be recognized as a science and an art. *Business Forecasting: Practical Problems and Solutions* is an honest and true look at the craft of forecasting. This is a tremendous compilation from some of the best forecasting analytics and business minds of today. A reference that should be on the shelf of anyone whose job is to develop forecasts.

—Jim Ferris, Director of Supply Chain Analytics,  
Clarkston Consulting

The editors do an excellent job of introducing a broad set of topics critical for deploying and maintaining a successful forecasting process within an organization.

—Sam Iosevich, Managing Principal, Prognos

In this age when “big data,” “machine learning,” and “data science” are attracting all of the attention, the art and science of forecasting is often neglected. Since many forecasting methods and practices date back decades, the temptation is to conclude that “there is nothing new there.” This terrific compilation of writings—from virtually all of the big names in the forecasting community—proves that innovation in forecasting is vibrant. More accurate forecasts can be one of the most effective drivers of a firm’s financial performance, and the learnings gleaned from this book are sure to help any organization improve.

—Rob Stevens, Vice President, First Analytics

This book is a wonderful compendium of demand planning and S&OP insights drawn from some of the best minds and practitioners in the industry.

—Patrick Bower, Sr. Director, Global Supply Chain Planning &  
Customer Service, Combe Incorporated

Finally, a book tailored to business forecasting that is comprehensive for everything from data gathering to the art and politics of explaining why we are wrong!

—Eric Wilson, Director Demand Planning and S&OP,  
Tempur Sealy International

*Business Forecasting: Practical Problems and Solutions* gathers knowledge from around the globe some 60 years after computer-era forecasting research began by pioneers such as Robert G. Brown (the “father of exponential smoothing”). As a protégé of Brown’s, I appreciate the content as it reflects his aptitude for capturing “lots of good ole logic.”

—Donald Parent, CPF, CFPIM, CSCP, LOGOLville.com

The editors of this book of essential readings for the business forecaster have achieved their objective to “assemble a mix of the most interesting, important and influential authors and their writings in applied forecasting since 2001.” Practitioners as well as forecasting managers will find this volume well-organized in these four general areas: fundamental considerations, methods

of statistical forecasting, performance evaluation and reporting, and process and politics, which, along with the summaries beginning each section, make it easy for the reader to find the appropriate selection addressing the real-world forecasting challenge being faced. I predict that this volume will prove vital as a reference to all those who seek “to generate forecasts as accurate and unbiased as can be reasonably expected—and to do this as efficiently as possible.”

—Carolyn I. Allmon, Detector Electronics Corporation

# **Business Forecasting**

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# Foreword

Vice Admiral Robert FitzRoy is a man whom most people will not have heard of, but should have—for at least two reasons.

Readers would likely fail to name FitzRoy as the captain of *HMS Beagle*, the ship on which Charles Darwin sailed when Darwin was formulating his thinking on evolution through natural selection, thoughts that eventually saw the light of day in *The Origin of Species*.

What is even less well known is that FitzRoy was the man who founded what was later to become the British Meteorological Office. Furthermore, he was the one to coin the term *forecast* to describe his pioneering work. In *The Weather Book*, published in 1863, he wrote: “[P]rophesies or predications they are not; the term “forecast” is strictly applicable to such an opinion as is the result of a scientific combination and calculation.”

A century and a half later, the Met Office is still around and still involved in “scientific combination and calculation.” The intervening years have seen enormous advances in the understanding of the physics of weather systems, in the speed, quality, and quantity of data collection, in mathematical techniques, and in computational power. Today, organizations like the Met Office own some of the most powerful computers on the planet. As a result, weather forecasts are significantly more accurate than they were even 10 years ago.

Despite these advances, it is still not possible to forecast the weather with any degree of confidence more than a week or so into the future—and it almost certainly never will be. This is because there are practical limits to what it is possible to predict using any approach known to man.

Our everyday experience of weather forecasts serves as a salutary lesson to those working in the messy and complex world of business who might be tempted to believe that the path to better forecasting lies in using ever more sophisticated mathematics. However, despite what we know about our ability to predict the weather, people with a naïve faith in the power of mathematics are not hard to find. This is good news for some software vendors who make a handsome living from selling exotic black-box forecasting solutions to clients who want to believe that a fancy system will somehow make their forecasting problems disappear.

Happily, the editors of this book do not share any of these shortcomings. This is not because they lack technical expertise—far from it—nor is it because of a lack of faith in the value of forecasting to business. It is because they have the intellectual self-confidence to recognize the limits as well as the value of

mathematical computation, the humility to be open to new ideas, and the honesty to let results be the judge of what is right and good. I respect and admire these qualities, so I was happy to write this foreword.

But if more math is not the “silver bullet” for forecasting, what is?

I cannot improve on the analysis advanced by David Orrell in his excellent book, *The Future of Everything*. He argues:

- Mathematical models interpret the world in simple mechanical terms, which have limited applicability in the context of complex systems such as living systems or systems that contain living systems, such as economies and organizations.
- Such living systems have properties that elude prediction. This is not just because such systems are complex; it is because they adapt and evolve. Their very nature involves making the future different from the past, which limits our ability to forecast the future by extrapolating from what has gone before.
- Forecasting has a large psychological component. Human beings are not automata; we can be rational, but we are also passionate, intuitive, and impulsive, and the way our brains are wired makes our judgment prone to bias and hopeless at understanding probability. This is compounded by the fact that, in organizations, forecasts are often embedded in a political process where many stakeholders—such as those in sales, finance, and general management—have vested interests that can skew the outcome.
- Some predictions (forecasts) are still possible. The future is never the same as the past, but neither does it completely differ. So approaches that involve mathematical modeling based on what has gone before are an essential part of the forecasting process, not least because our brains need their help to deal with the complexity of the world.

Orrell concludes that we fall short of what is possible—and to get better, we need to change our approach to making predictions. His prescription involves a more eclectic approach, using multiple perspectives rather than having blind faith in a single algorithm. We should draw on different mathematical methodologies and supplement them with judgment and intuition.

This doesn’t mean abandoning rigor. We should aim to develop a deeper understanding of the mechanics of the systems we are forecasting, rather than treating them as a black box. We need to improve by testing our predictions against reality and learning from what our errors are telling us about the shortcomings of our methods. And forecasting should be embedded in a properly specified business process, run by appropriately trained and equipped professionals.

As practitioners, we should never lose sight of the fact that forecasting is only of value if it helps us deal with the real world. This means that we need to be able to explain and convince our colleagues, recognizing that not everyone will share our knowledge or perspective on the world or our motivation to expose the objective “truth.” It also means that we need to be able to balance the aesthetic pleasure we derive from an elegant piece of mathematics or a beautifully designed process with the usefulness of the results and the degree of effort required to produce them.

I believe that forecasting in business should be regarded as a craft. Good craftspeople understand the materials they are working with and know that their work will only be as good as the tools they use. But they understand equally that real skill comes from knowing how and when to use those tools. So we need craftspeople who are eclectic but rigorous, professional, and pragmatic.

Acquiring such knowledge from personal experience can take a lifetime, which is longer than most of us are prepared to give. What we can learn from others is worth a high price.

I don’t know of a better source of forecasting craft than this book—and I commend it to you.

Steve Morlidge  
CatchBull Ltd.  
London, UK

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# Preface

Anthologies are only as good as the material compiled, and 2001 saw publication of a seminal anthology in the forecasting field, J. Scott Armstrong's *Principles of Forecasting*. That broad collection, along with the Armstrong and Kesten Green website [www.forecastingprinciples.com](http://www.forecastingprinciples.com), has been a standard reference for academics, forecasting software developers, and a subset of forecasting practitioners. And yet, the principles and evidence behind them remain largely unpracticed by the great majority of business forecasters.

Now, in 2015, the editors of this volume sought to assemble a mix of the most interesting, important, and influential authors and their writings in applied forecasting since 2001. Our objective was to provide material that is both thought-provoking and of great practical value to everyone involved in the business forecasting function. Our intended audience includes forecast analysts, demand planners, and other participants in the forecasting process, as well as the managers and executives overseeing the process and utilizing the forecasts produced.

Several articles highlight findings of recent research, and many reveal areas still subject to discussion and dispute. The common message, however, is that enlightened forecasting management (not just fancy new algorithms) may be the best way to improve forecasting practice.

This book could be subtitled: *What Management Must Know about Forecasting*. Forecasting is an inherently politicized process within organizations, and the self-interests of process participants are frequently at odds. This is an issue that only management can solve, but to do so, management must first be cognizant of the problem.

One thing every business executive does know is the harm of *error* in an organization's forecasting. Harms include customer service failures, revenue shortfalls, and other public embarrassments. But what is the solution? The standard quick fixes—implementing fancy-sounding forecasting algorithms or elaborate collaborative processes—have generally failed to effect improvement. What is needed, we contend, is something less familiar—a critical understanding of the capabilities, and *limitations*, of what forecasting can realistically deliver.

The material is organized into four chapters:

Chapter 1: Fundamental Considerations in Business Forecasting

Chapter 2: Methods of Statistical Forecasting

Chapter 3: Forecasting Performance Evaluation and Reporting

Chapter 4: Process and Politics of Business Forecasting

We provide a brief introduction to each chapter, along with commentary on the significance and implications of each article.

Much of this book's content first appeared in *Foresight: The International Journal of Applied Forecasting*, and appears with permission from the International Institute of Forecasters. Len Tashman, co-editor of this compilation and *Foresight's* editor in chief, extends special thanks to his staff: Liza Woodruff, Kim Leonard, Mary Ellen Bridge, Ralph Culver, and Stacey Hilliard.

We include several articles from the *Journal of Business Forecasting*, with permission graciously provided by its editor-in-chief, Dr. Chaman Jain. Thanks also to our longtime friends at the Institute of Business Forecasting: Anish Jain, Stephanie Murray, and Latosha Staton.

In addition, we incorporate various book, blog, and newsletter adaptations, as well as some original material, with thanks to Elizabeth Proctor of APICS, Rob Hyndman of Monash University, Andrey Davydenko and Robert Fildes of Lancaster University, Eric Stellwagen of Business Forecast Systems, Shaun Snapp of SCM Focus, Tim Rey of Steelcase, and Chip Wells of SAS.

The authors wish to thank SAS Press and Wiley for accepting the manuscript into the Wiley and SAS Business Series. We were assisted at SAS by Julie Platt, Shelley Sessoms, and Karen Day with the book contract and administration, by Brenna Leath as our managing editor, and by Jeff Alford and Denise Lange in many of the nuts and bolts of book production. Deborah Blackburn of BB&T reviewed and commented on the manuscript.

A special debt of gratitude is owed to Steve Morlidge of CatchBull Ltd., who wrote the foreword in addition to providing four of the articles.

Last, and most important, the editors wish to acknowledge all the authors whose work has been included in this book. We thank them for their tremendous contributions to the understanding, and better practice, of business forecasting.

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