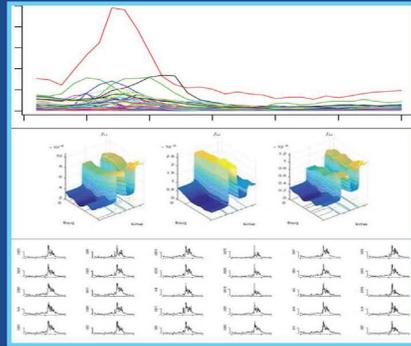


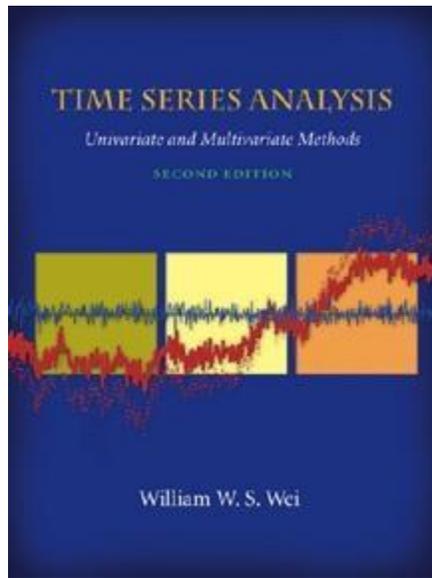
Multivariate Time Series Analysis *and Applications*

William W.S. Wei



WILEY

Forthcoming



Time
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Univariate & Multivariate Methods
Second Edition

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PREFACE TO THE SECOND EDITION

Since the publication of the first edition, this book has been used by many researchers and universities worldwide. I am very grateful for the numerous encouraging letters and comments that I have received from researchers, instructors, and students. Although the original chapters in the book still form the necessary foundation for time series analysis, many new theories and methods have been developed during the past decade, and the time has come to incorporate these new developments into a more comprehensive view of the field. In the process of updating this book, I also took the opportunity to clarify certain concepts and correct previous errors.

In time series analysis, we often encounter nonstationary time series, and a formal testing procedure for a unit root has now become the standard routine in time series modeling. To address this procedure, Chapter 9 on unit root tests for both nonseasonal and seasonal models has been added.

Regression analysis is the most commonly used statistical method, and time series data are widely used in regression modeling, particularly in business and economic research. The standard assumptions of uncorrelated errors and constant variance are often violated when time series variables are used in the model. In a separate new chapter, Chapter 15, I discuss the use of time series variables in regression analysis. In particular, this chapter introduces models with

autocorrelated errors and ARCH/GARCH models for heteroscedasticity that are useful in many economic and financial studies.

Although the basic procedures of model building between univariate time series and vector time series are the same, there are some important phenomena unique to vector time series. After an introduction to various vector time series models in Chapter 16, I go on to cover cointegration, partial processes, and equivalent representations of a vector time series model in the new Chapter 17. They are useful in understanding and analyzing relationships of time series variables.

Many time series exhibit characteristics that cannot be described by linear models. Therefore, I have included Chapter 19 on long memory processes and nonlinear time series models that are useful in describing these long memory and nonlinear phenomena.

To aid understanding, I have also added supplements, Appendix 16A on multivariate linear regression models and Appendix 18A on canonical correlations. In the chapter on aggregation, I include some new results on the effects of aggregation on testing for linearity, normality, and unit roots.

In this revision, I follow the fundamental theme of the first edition and balance the emphasis between both theory and applications. Methodologies are introduced with proper theoretical justifications and illustrated with empirical data sets that may be down loaded from the web site: <http://www.sbm.temple.edu/~wwei/>. As with the first edition, exercise problems are included at the end of each chapter to enhance the reader's understanding of the subject. The book should be useful for graduate and advanced undergraduate students who have proper backgrounds and are interested in learning the subject. It should also be helpful as a reference for researchers who encounter time series data in their studies.

As indicated in the first edition, the book was developed from a one-year course given in the Department of Statistics at Temple University. Topics of univariate time series analysis from Chapters 1 through 13 were covered during the first semester, and the remaining chapters related to multivariate time series plus supplemental journal articles were discussed in the second semester. With the proper selection of topics, the book can be used for a variety of one- or two-semester courses in time series analysis, model building, and forecasting.

I wish to thank Dr. Olcay Akman of the College of Charleston, Dr. Mukhtar Ali of the University of Kentucky, Dr. H.K. Hsieh of the University of Massachusetts, Dr. Robert Miller of the University of Wisconsin, Dr. Mohsen Pourahamadi of Northern Illinois University, Dr. David Quigg of Bradley University, and Dr. Tom Short of Indiana University of Pennsylvania for their numerous suggestions and comments that have improved this revision. I am grateful to Ceylan Yozgatligil for her help in preparing some of the updated figures and tables. Finally, I would like to thank Ms. Deirdre Lynch, Senior Editor of Statistics, Addison Wesley for her continuing interest and assistance with this project as well as Ms. Kathleen Manley, Mr. Jim McLaughlin, and the staff at Progressive Publishing Alternatives who provide wonderful assistance in the production of the book.

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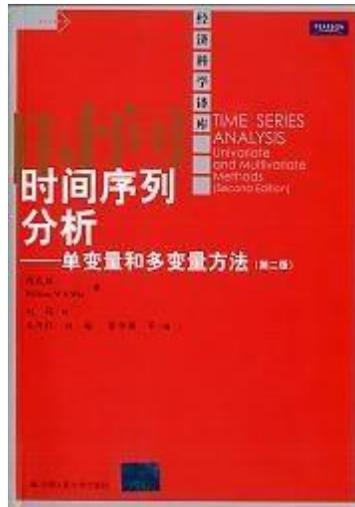
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The book was translated into Chinese by Professor Danhui Yi and a group of faculty members of the School of Statistics at Renmin University of China (People's University of China) in Beijing, China, and published by People's University Press of China in April 2009.

<https://book.douban.com/subject/3704339/>

魏武雄 (William W.S. Wei) 博士是宾夕法尼亚州费城天普大学 (Temple University) 的统计学教授, 自1974年就在此任教。他于1966年获得台湾大学经济学学士学位, 又于1969年获得俄勒冈大学 (University of Oregon) 的数学学士学位, 1972年和1974年分别获得威斯康星大学麦迪逊分校 (University of Wisconsin-Madison) 的统计学硕士和统计学博士学位。他的研究兴趣包括时间序列分析、预测方法、统计建模以及统计学在商业和经济中的应用。他是美国统计学会 (American Statistical Association, 简称 ASA) 院士, 英国皇家统计学会 (Royal Statistical Society, RSS) 会员, 国际统计学会 (ISI) 入选会员, 2002年泛华统计协会 (ICSA) 的主席。他还是期刊《预测》(*Journal of Forecasting*) 和《应用统计学》(*the Journal of Applied Statistical Science*) 的副编辑。

受中国人民大学出版社的委托，我们翻译了魏武雄教授编写的《时间序列分析——单变量和多变量方法》（第二版）一书。该书是针对有合适专业背景和对该学科感兴趣的研究生和高年级本科生编写的一本教材。对那些在研究中经常遇到时间序列数据的研究人员来说，本书也是一本非常有价值的参考用书。

对于本书即将出版，我们颇感欣慰。因为目前翻译出版的有关时间序列分析的书已经不少，我们担心该书没有特色，无法奉献给读者更多的知识，所以在翻译过程中付出了巨大的精力。翻译完成后，感到辛苦没有白费。

近年来，时间序列已经成为一个相当活跃的领域，出版了很多相关书籍，其中的大部分要么关注时域分析，要么关注频域分析。在这些书中，有些提供的理论背景资料不充分，有些则关于具体应用的介绍太少。而且，大部分书只是关注于单变量时间序列，即使有少量讨论多变量时间序列的书，也多局限于理论部分。

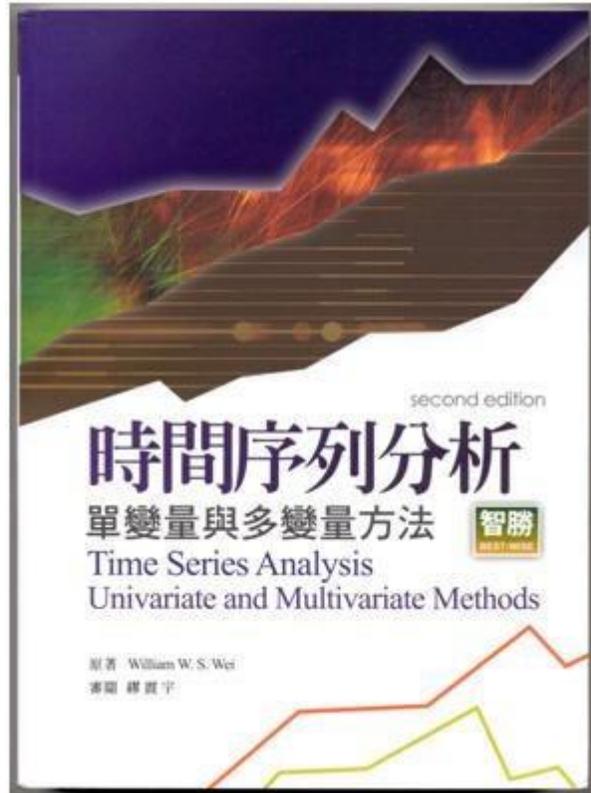
本书不仅对单变量与多变量时间序列的时域和频域分析提供了一个全面的介绍，而且在书中包含了许多单变量和多变量时间序列模型的新进展，如逆自相关函数、扩展样本自相关函数、干预分析及干预探测、向量自回归移动平均模型、偏滞后自相关矩阵函数、局部过程、状态空间模型、卡尔曼滤波、非季节和季节模型的单位根检验、向量时间序列模型中协整、局部过程和等价表示、长记忆过程和非线性时间序列模型、累积问题等许多内容。

本书的难度适当，叙述通俗易懂，并结合大量的应用实例说明时间序列分析方法的应用，极大地方便了读者对这些方法的学习和理解。当读者完成本书学习的时候，将会理解怎样应用统计工具做出数据分析和决策。另外，还会发现所学的许多主题与方法可以用在其他课程里，包括数量经济以及统计等。本书不仅对在校的学生有用，对于那些已经参加工作、但需要运用统计方法分析问题的读者来说，也颇有意义。相信该书对在经济、财政、金融、市场、会计、管理和其他商业管理领域从业的工作者大有裨益。

本书的翻译由我及中国人民大学统计学院的部分硕士、博士共同完成。具体有：刘超、贺学强、陈堰平、王旭、童小军、陈凯。最后由刘超负责全部校对。对于他们所付出的艰辛工作，在此表示深深的感谢。

愿本书的出版能够对时间序列分析方法更广泛的应用起到积极的推动作用。

易丹辉



The book was also translated into traditional Chinese in Taiwan and published by Best-Wise Publishing Co., LTD, Taipei, Taiwan, in January 2012.

<http://www.bestwise.com.tw/book.aspx?bco=52WAS01801>

審閱序

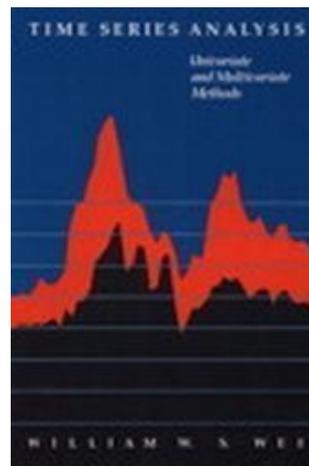
時間序列分析在實務應用與學術研究上扮演愈來愈重要的角色，國內也有不少關於時間序列的書籍，智勝文化此次將天普大學所採用的教科書引入國內則頗有深意。

本書的作者魏武雄(William W. S. Wei)教授任教於美國天普大學(Temple University)統計學系，同時還擔任多本統計學術期刊的副主編，將臺灣之光頒給魏教授可說一點也不為過。魏教授主要的研究領域即為時間序列分析，並在季節性調整、聚集以及向量時間序列分析上有許多重要的研究成果，這也使得本書特別豐富精彩。

本書的前 13 章介紹單變量時間序列，後半部分則為多變量時間分析，做為教科書使用時可以根據授課目標與時數加以選擇。由於第 11 章至第 14 章的內容需要較多的數學基礎，對於非數理科系的同學來說可能較為艱澀，這部分可以視程度選讀。本書對於時間序列的發展有完整深入的介紹，不僅適合做為大學部或研究所的教科書，學者在進行研究時當作參考書籍絕對也很適合。

繆震宇

2012 年 1 月



1st Edition

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