Preface

Forecasting forms the foundation for strategic, tactical, as well as operational decisions in many business organizations. Its role in successful planning in finance, marketing, production, personnel, and other functional areas is well established. Increasingly, businesses have recognized the importance of accurate forecasting in effective operations and enhanced competitiveness.

Artificial neural networks (ANNs) are a relatively recent and promising method for business forecasting. The success of ANN applications can be attributed to their unique features and powerful pattern recognition capability. Unlike most traditional model-based forecasting techniques, ANNs are data-driven, self-adaptive, and nonlinear methods that do not require specific assumptions on the underlying data generating process. These features are particularly appealing for practical forecasting situations where data are abundant or easily available, yet the theoretical model or the underlying relationship is not known. In addition, ANNs have universal functional approximation ability and are capable of capturing any type of complex relationship. Since the number of possible nonlinear relationships in business data is typically large, ANNs have the advantage in approximating them well.

ANNs have been successfully applied to a wide range of forecasting problems in almost all areas of business, industry, and science. For example, in financial applications, ANNs have been used for predicting bankruptcy or business failure, exchange rate, interest rate, futures price, stock return, trading volume, capital market index, initial public offering price, property value, and many others. In marketing, we have seen applications in forecasting long

distance telephone usage, future orders, market share, market response, product and retail sales, and airline passenger volumes. Numerous forecasting applications in other areas such as accounting, management information system, and operations have also been reported in the literature.

This book aims to provide for researchers and practitioners with recent developments in business forecasting with neural networks. Three types of research papers are included in the book: (1) review articles that provide summaries and guidelines for neural network applications, (2) case studies that demonstrate successful applications, and (3) studies that address practical issues for improving ANN model building and implementation.

Chapter 1 by Zhang provides an overview of forecasting using artificial neural networks. It gives a brief introduction to the neural networks and discusses the advantages of using ANNs for forecasting. This chapter identifies a wide range of forecasting application areas from the literature and summarizes the general issues and implementation guidelines in neural network forecasting.

Chapter 2 by Parsons and Dixit reviews the literature of neural network applications for market response prediction and marketing effort planning. Several traditional market response models such as sales response models, market share models, and brand choice models are examined, followed by discussions of neural network applications in these settings.

Chapter 3 by Thawornwong and Enke provides a survey of the literature on neural network forecasting for stock returns. The authors examine various methodological issues of ANNs in stock return forecasting applications.

In Chapter 4, Walczak addresses the issue of how to best forecast emerging market indexes. Various neural network models utilizing different levels of global information are constructed to forecast the Singapore, Malaysian, and Mexican stock market indexes. This chapter demonstrates that, especially for emerging markets, inclusion of heterogeneous or global market information can improve neural network forecasting performance over similar homogeneous models that do not consider information from other markets.

Chapter 5 by West and Dellana demonstrates a successful application of time delayed neural networks in forecasting the level of biochemical oxygen demand (BOD), an important wastewater quality index. The proposed neural networks are tested against several benchmark linear models such as naïve, exponential smoothing, and ARIMA with intervention.

Chapter 6 by Law and Pine presents a case study of Hong Kong tourism demand forecasting. Income, relative price, population, exchange rate, hotel rate, and marketing expenses are chosen to be input variables to predict tourist arrivals to Hong Kong from five countries/regions.

In Chapter 7, Kiang, Fisher, Hu, and Chi describe the use of a self-organizing map (SOM) network to predict market segment membership in a telecommunication company. The model building procedure of the proposed extended SOM network is detailed and applied to a residential market data set from AT&T.

Chapter 8 by Lee, Booth, and Alam presents a comparative study between feedforward and SOM networks in bankruptcy prediction. In addition, the performance of these two types of neural networks is compared with that of logistic regression and discriminant analysis.

In Chapter 9, Hu, Shanker, and Hung present a detailed case study of consumer choice prediction. The focus is on how to design and develop neural networks that are parsimonious, yet able to provide accurate forecasts. A feature selection method is proposed and applied to predict consumer choice of various telecommunication modes.

Chapter 10 by Li, Pang, Yu, and Troutt reports on an application of recurrent neural networks (RNNs) to model and forecast short-term exchange rate movements. Time series of daily observations on four exchange rates are collected and used in the study. Forecasting results of RNNs are compared with those of moving average and exponential smoothing models.

Chapter 11 by Zhang demonstrates that by combining both linear and nonlinear models, time series forecasting accuracy can be significantly improved. The motivations of and the literature on forecasting combining are discussed. The proposed combining approach is used to forecast three monthly US industrial production data sets.

In Chapter 12, Kline investigates the issue of multi-step forecasting. The study focuses on two methods: the joint method that uses one single network with multiple output nodes to directly forecast all future points in a forecast horizon and the independent method that uses a dedicated network to forecast each future point in the horizon. Experimenting with 149 quarterly time series, the author concludes that the independent method is better used for a short forecasting horizon and the joint method is better for a relatively longer time horizon.

Chapter 13 by Morantz, Whalen, and Zhang proposes a weighted window approach for time series forecasting. With this approach, very old data including forecast errors will receive much less weights than very recent observations. The effectiveness of the proposed method is tested with seven economic time series.

Finally, in Chapter 14, Nargundkar and Priestley examine and compare several model building and evaluation methods for consumer risk prediction in

the credit industry. Using a large data set on applicants for car loans in the US, they find that each modeling technique has its own merits and the best method to use often depends on the evaluation method and the cost of misclassification errors.

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