

An Integration Approach of Multi-Structure DEA and Random Vector Functional Link Neural Network in Benchmarking Modelling and Forecasting

Phuong Hoa Hoang

English Program of Global Business
Chinese Culture University
Taipei, Taiwan
hoangphuonghoa13@gmail.com

Sin-Jin Lin

Department of Accounting
Chinese Culture University
Taipei, Taiwan
annman1204@gmail.com

Ming-Fu Hsu*

Department of Business Management
National United University
Miaoli, Taiwan
hsumf0222@gmail.com

Abstract

In comparison with the well-addressed topics, such as financial crisis prediction or credit rating forecasting, the work on a performance evaluation that has been considerably acknowledged as the main trigger for financial difficulties is quite scarce. To bridge this gap, an innovative decision framework that integrates multi-structure data envelopment analysis (MS-DEA) and random vector functional link neural network (RVFLNN) for performance analysis is proposed. By implementing MS-DEA, the decision-makers can uncover some of the structure behind the best practice, as well as identify the source of inefficiency within specific processes. In addition, this study further equipped the model with forecasting capability. That is, the outcome derived from MS-DEA are then injected into RVFLNN to construct the forecasting model. If the decision model with superior forecasting quality, the decision-makers can rely on it and then reach a better and reliable judgment. The model, tested by real-life cases, is a promising alternative in performance evaluation and forecasting.

Keywords

Decision making, Random vector functional link neural network, Performance evaluation, Forecasting

Acknowledgements

The authors would like to thank the Ministry of Science and Technology, Taiwan for financially support this research work under Contracts No. 108-2410-H-034 -056 -MY2 and No. 110-2410-H-239 -017.

Biographies

Phuong Hoa Hoang is Master student in English Program of Global Business, at Chinese Culture University.

Sin-Jin Lin is a Full Professor in the Department of Accounting, at Chinese Culture University. She received her PhD in the Department of Business Administration, at National Central University. She has published more than forty journals (such as Information Sciences, Knowledge-Based Systems, International Journal of Production Research,

Neural Computing and Application, Journal of Intelligent and Fuzzy Systems, International Journal of Fuzzy Systems, International Journal of Machine Learning and Cybernetics, and so on) and international proceedings (such as ICIS, PACIS, IEEM, IEEE SMC, IEEE MDM, and so on).

Ming-Fu Hsu is an Assistant Professor in the Department of Business Management, at National United University. He received his PhD in the Department of International Business Studies, at National Chi Nan University. He has published more than forty journals (such as Annals of Operations Research, Information Technology and Management, Information Sciences, Knowledge-Based Systems, Neural Computing and Applications, Quality and Quantity, International Journal of Machine Learning and Cybernetics, Journal of Fuzzy Systems, Journal of Intelligent and Fuzzy Systems, and so on) and international proceedings (such as IEEE SMC, ICIS, PACIS, EMCIS, IEEE MDM, IEOM).