International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **2**, February **2010**

 ISSN 1349-4198
pp. 475–486

FORECAST OF FINANCIAL TIME SERIES BASED ON GREY SELF-ORGANIZING MAPS

Yen-Tseng Hsu[1], Hui-Fen Hung[2], Jerome Yeh[1]
and Ming-Chung Liu[2]

[1]Department of Computer Science and Information Engineering
[2]Department of Electrical Engineering
National Taiwan University of Science and Technology
43, Keelung Road, Section 4, Taipei, 106, Taiwan
{ ythsu; Jerome }@mail.ntust.edu.tw
fen8515@ms43.hinet.net; a7679505@ms33.hinet.net

Received August 2008; revised January 2009

Abstract. *A self-organizing map (SOM) is an unsupervised neural network that reflects the similarity of high-dimensional data in a two-dimensional or one-dimensional coordinate space to facilitate data classification. GM(1,1) is a basic model for grey prediction, capable of system prediction under uncertainty and information imperfection. A grey self-organizing map (GreySOM) is a mechanism integrating GM(1,1), GRG, and SOM, and is a novel method for predicting financial time series. It classifies time-series differencing data in a SOM structure through grey correlation, and corrects the predicted values of the data to achieve more ideal predicted values. The experimental results show that GreySOM has an excellent forecasting ability, and can help investors predict future stock price indices and grasp profit-making opportunities.*
Keywords: Forecasting, Grey self-organizing maps, Grey relation analysis, Stock market

1. **Introduction.** In recent years, the development of information technology has accelerated the maturation and globalization of financial markets, and financial investment with the assistance of information technology is attracting more attention from investors. Predicting changes in various financial indices has always been a concern for many investors, and is an important topic in academic research. However, the complexity and uncertainty of the stock market make predicting stock price indices extremely difficult. Typical prediction mechanisms include neural networks [1-5], fuzzy theory [6,7], genetic algorithms [8,9], statistical methods [10], etc. Although experts have not reached a consensus concerning time-series forecasting methods, neural networks are nonlinear adaptive models compared to other prediction mechanisms. Neural networks are capable of modeling the complicated relationship between input data and output data and have shown some promises in time-series forecasting [11].

A SOM is a kind of unsupervised neural network rooted in competitive learning. A SOM maps high-dimensional data to a low-dimensional grid while maintaining the topology of the original data, and is therefore a useful tool for clustering. SOMs are widely applied in pattern recognition, image processing, time-series forecasting, etc. [12-15] A specific financial pattern may implicate certain messages. Lo and MacKinlay [16] indicated that previous prices can be used to forecast future profits to some extent. Due to the diversity and complexity of financial patterns, it is very difficult to classify them with the naked eye, but a SOM has the ability to identify and classify them. The core of the traditional SOM algorithm is to process numeric data. It uses the numeric distance function to find