International Journal of Innovative
Computing, Information and Control
Volume **5**, Number **12(B)**, December **2009**

ICIC International ©2009 ISSN 1349-4198
pp. 4835–4844

BIOLOGICALLY INSPIRED FUZZY FORECASTING: A NEW FORECASTING METHODOLOGY

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Received July 2008; revised December 2008

Abstract. *There are many forecasting techniques including the ARIMA model, GARCH model, exponential smoothing, neural networks, genetic algorithm, etc. Those methods, however, have their drawbacks and advantages. Since financial time series may be influenced by many factors, such as trading volume, business cycle, oil price, and seasonal factor, conventional model based on prediction methodologies and hard computing methods seem inadequate. In recent years, the innovation and improvement of forecasting methodologies have caught more attention, and also provide indispensable information in the decision-making process, especially in the fields of financial economics and engineering management. In this paper, a new forecasting methodology inspired by natural selection is developed. The new forecasting methodology may be of use to a nonlinear time series forecasting. The method combines mathematical, computational, and biological sciences, which includes fuzzy logic, DNA encoding, polymerase chain reaction, and DNA quantification. In the empirical study, currency exchange rate forecasting is demonstrated. The Mean Absolute Forecasting Accuracy method is defined for evaluating the performance, and the result comparing with the ARIMA method is illustrated.*
Keywords: Forecasting, Bio-inspired computing, Fuzzy time series forecasting, Nonlinear time series analysis

1. **Introduction.** The practical possibility of using DNA molecules as a medium for computation was first demonstrated by Adleman [1]. He showed a proof-of-concept use of DNA as form of computation to solve the seven-vertex Hamiltonian path problem, which is a special case of an NP-complete problem that attempts to visit every node in a graph exactly once. The primary intention of Adleman's work was to prove the feasibility of molecular computation, and also gave an indication that the emergence of this new computational paradigm could provide an advantage over conventional electronic computing techniques. Computing with DNA, also known as a part of molecular computing, is a new computing paradigm. Biologically inspired computation with DNA is fundamentally comparable to parallel computing, which the advantage is taken by using many different DNA molecules which lead to various possibilities. Specifically, DNA has shown to