

Indonesian Financial Data Modeling and Forecasting by Using Econometrics Time Series and Neural Network

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Abstract

In recent years, many researchers have been using neural network (NN) model as an instrument of their research. The motivation behind the application of NN is that it can be used to solve any application problem, such as pattern recognition, signal processing, process control and forecasting. Inference statistics procedure, testing hypothesis, parameter distribution and cross validation have been developed to select the best NN model. The aim of this research is to develop NN modeling in statistic structure modeling and apply it to the inflation data in Indonesia. This research is about optimizing the development of Feed Forward Neural Network (FFNN) model procedure and its application. FFNN Model and Time series model are evaluated based on RMSE, MAD and MAPE. The Best model is the one with minimum RMSE, MAD and MAPE. One of the results is a new procedure based on statistics inference, $R^2_{\text{Incremental}}$ test, in NN model especially FFNN modeling. The comparison between FFNN model and time series model shows that FFNN model is better than time series model.

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1. Introduction

In the beginning, neural network (NN) was designed to model the architecture of the nerves in human brain. However, researches on NN that have been widely conducted recently are, especially, motivated by a promising possibility of using NN as an instrument to overcome various application problems such as pattern recognition, signal processing, process control, and time series forecasting [5], [15]. Feedforward Neural Networks (FFNN) model is considered as an NN model that can be classified as a very flexible model group; and as such it can be used for various applications. A specific form of FFNN model that approaches the non-linear mapping using the sum of Gaussian kernels' values (activation function) is known as Radial Basis Function (RBF) networks [9], [17], [28].

Forecasting the data of time series is one field that widely uses NN model. Haykin [14], Bishop [7] and Kaashoek and Van Dijk [16], were part of researchers that first applied NN model to analyze time series data, i.e: forecasting non-linear signal raised by computer. In the research development, inferential statistical procedures were applied as well, to decide the best FFNN model. Based on Richard et al. [24], that Terasvirta dan Lin in 1993 were the first researchers that applied inferential statistical procedures to obtain the optimum number of units at the hidden layer of FFNN model with single hidden layer. Some latest articles about forming FFNN model by applying the inferential statistical procedures can be found in Kock and Terasvirta [18], Zhang [31], and Bagheri et al. [4].

The procedures for establishing the right, valid, and reliable model is the main problem in modelling. Modelling data of time series is no exception. Within the last decade,