

# Handbook of Research on Modeling, Analysis, and Application of Nature– Inspired Metaheuristic Algorithms

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# Chapter 3

## A Novel Hybrid Model Using RBF and PSO for Net Asset Value Prediction

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### **ABSTRACT**

*Net asset value (NAV) prediction is an important area of research as small investors are doing investment in there, Literature survey reveals that very little work has been done in this field. The reported literature mainly used various neural network models for NAV prediction. But the derivative based learning algorithms of these reported models have the problem of trapping into the local solution. Hence in chapter derivative free algorithm, particle swarm optimization is used to update the parameters of radial basis function neural network for prediction of NAV. The positions of particles represent the centers, spreads and weights of the RBF model and the minimum MSE is used as the cost function. The convergence characteristics are obtained to show the performance of the model during training phase. The MAPE and RMSE value are calculated during testing phase to show the performance of the proposed RBF-PSO model. These performance measure exhibits that the proposed model is better model in comparison to MLANN, FLANN and RBFNN models.*

### **1. INTRODUCTION**

Financial forecasting plays an important role by the corporation to do financial planning. The planning includes an assessment of their future financial needs. The accurate prediction of financial time series are usually subject to high risk as the series are more complex than other conventional data due to the

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irregular movement, seasonal and cyclical variation, chaotic in nature and influenced by economical, political, psychological factors. Financial data forecasting is important for optimal utilization of resources, planning of production and human resources in the firms and for efficient investment of firm funds. Most common financial indices which are forecasted by the researchers are stock indices, exchange rate, interest rate, net asset value etc. Apart from the corporate planner, small investors are also handling many kind of investment scheme. Mutual fund (MF) is one of them; MF is an established investment scheme that aggregates the funds collected from the stockholders and the manager invest this money to stocks, bonds, money market instruments and commodities such as precious metals etc. The success of the investment strategies is depending upon the fund managers knowledge and management for earning high returns with minimum risk. The common investors, firms, and brokers etc. faces the difficulties to anticipate the ups and downs in the mutual funds by using conventional methods like least mean square (LMS).

In financial data mining, in order to predict financial data series accurately and efficiently, many researcher shows great interest to develop a robust model using machine learning techniques. This technique can be either conventional statistical models or soft computing techniques or combination of both the models. The conventional statistical methods include exponential smoothing, the moving average, autoregressive moving average, autoregressive integrated moving average and generalized autoregressive conditional heteroskedasticity (GARCH) models (Franses & Ghijssels, 1999). These models are simple and work on the principle that the data of various time series are linearly correlated. But the real time financial data are non-linear and dynamic in nature. To overcome these deficiencies Atsalakis and Valavanis (2009 a,b) suggested soft and evolutionary computing methods to forecast the time series. Moreover, many researchers have applied computational intelligence methods for efficient prediction of various financial data like artificial neural network, fuzzy information systems, support vector machine, evolutionary computations, machine learning techniques etc. Different neural network based techniques like multi layer perception network (MLPN), back propagation neural network (BPNN), radial basis function neural network (RBF-NN), functional link artificial neural network (FLANN), wavelet neural network (WNN), recurrent neural network (RNN), etc. are also extensively used in financial data prediction.

## **2. LITERATURE REVIEW**

On the basis of historical data, the neural network families having inherent features to model complex real world systems as ANN has non-linear nature, which casually point out the complicated relationship of non-linearity in the financial time series. ANN estimates any non-linear function to a desired accuracy with a high degree of input data. Different artificial neural network used by the researchers (Song et al., 2007; Ma et al., 2010; Oliveira et al., 2011) show its viable alternative to statistical conventional techniques to predict the dynamics of non-linear behavior and complicated features of the financial time series data. In some works, probabilistic neural networks (PNN) (Kim & Chun, 1998), generalized regression neural networks (GRNN) (Mostafa, 2010) and cerebellar neural networks (CNN) (Lu & Wu, 2011) are also proposed for forecasting purposes. In the paper, Kumar and Ravi (2007) reported the prediction of bankruptcy of banks and firms. According to this review, a neural network method shows superior performance than other methods and also shows better result when they combine with other methods. In another review done by (Gooijer & Hyndman, 2006) the authors reported many statistical and simulation methods like exponential smoothing (ES), auto regressive integrated moving average