

Simple Ensemble-Averaging Model based on Generalized Regression Neural Network in Financial Forecasting Problems.

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Abstract

This study introduces an ensemble-averaging model based on GRNN (Generalized Regression Neural Network) for financial forecasting. The model trains all input individually using GRNNs and uses a simple ensemble-averaging committee machine to improve the accuracy performance. In financial problem, there are many different factors that can effect the asset price movement in different time. The experiment is implemented in two different datasets, S&P 500 index and currency exchange rate. The predictive abilities of the model are evaluated on the basis of root mean squared error, standard deviation and percent direction correctness. The study shows a promising result of the model in both datasets.

1. Introduction

The traditional assumption of asset price movement is based on the theory of market efficiency, which simply implies that all public information on future price movement for a tradable asset has already been embraced in its current price [1]. In statistical terms, this implies the so-called "random walk" model, whereby the expectation for the next period is the current value. The empirical finance literature up to the 1970's universally reinforces this view for all actively traded capital markets, by testing and failing to refute the random walk hypothesis on daily, weekly, and monthly data. By the end of the 1980's financial theory had matured to provide a more comfortable fit with trading realities. The conventional tests of the random walk hypothesis were recognized to be rather weak, in the sense that the evidence would have to be very strong to reject this null hypothesis. Econometric tests introduced during the 1980's specify a more general model for the time series behavior of asset returns.

The novelty about neural networks lies in the ability to model nonlinear processes with few a priori assumptions about the specific functional form of the function. Recent research has documented the superiority of non-parametric forecasting methods, such as neural networks over traditional statistical methods for modeling time series data. In financial problem, there are many different factors that possibly effect the asset price movement in different time. Various factors input to the model has more possibility to better shape up the asset price movement behavior.

The purpose of this study is to introduce the simple ensemble-averaging model based on GRNN (Generalized Regression Neural Network) to evaluate the predictive performance in forecasting S&P 500 Index and currency exchange rate. Our goal is to compare the performance of the simple ensemble-averaging model and the single GRNN.

2. Neural Network Architectures

2.1 Generalized Regression Neural Network (GRNN)

GRNN architecture subsumes the basis-function method. It approximates any arbitrary function between input and output vectors, drawing the function estimate directly from training data. It looks much like the common feed-forward topology used with backpropagation training; however, its operation is fundamentally different. GRNN is based on nonlinear regression theory for function estimation. The training set consists of values for x , each with a corresponding value for y . This regression method will produce the estimated value of y , which minimizes the mean-squared error. Based on Radial-Basis Function network architecture, GRNN trains rapidly without any training pathologies such as paralysis or local minima problems [2].