Stock Market Prediction Using Artificial Neural Networks

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Abstract: Forecasting stock return is an important financial subject that has attracted researchers’ attention for many years. It involves an assumption that fundamental information publicly available in the past has some predictive relationships to the future stock returns. This study tries to help the investors in the stock market to decide the better timing for buying or selling stocks based on the knowledge extracted from the historical prices of such stocks. The automated computer programs using data mining and predictive technologies do a fare amount of trades in the markets. Data mining is well founded on the theory that the historic data holds the essential memory for predicting the future direction.

Keywords- Back Propagation algorithm, Artificial Neural Network(AAN), Stock Prediction.

1. Introduction

From the day stock was born, the movement of prediction has been the focus of interest for years since it can yield significant profits. There are several motivations for trying to predict stock market prices. The most basic of these is financial gain. Any system that can consistently pick winners and losers in the dynamic market place would make the owner of the system very wealthy. Thus, many individuals including researchers, investment professionals, and average investors are continually looking for this superior system which will yield them high returns. There is a second motivation in the research and financial communities.

2. Literature Review

In recent years, there have been a growing number of studies looking at the direction of movements of various kinds of neural network computing to traditional statistical methods of analysis. Both academic researchers and practitioners have made tremendous efforts to predict the future movements of stock market prices index or its return and devise financial trading strategies to translate the forecasts into profit.

Over the past two decades many important changes have taken place in the environment of financial markets. The development of powerful communication and trading facilities has enlarged the scope of selection for investors. The effectiveness of the neural network models was examined and used for level estimation and classification. With the development of artificial neural networks investors are hoping that the market mysteries can be unrevealed because networks have great capability in pattern recognition and machine learning problems such as classification and prediction. In order to be able to extract such relationships from the available data, data mining techniques are new techniques that can be used to extract the knowledge from this data.

Artificial neurons are inspired from biological neuronal structure. The transmission of a signal from one neuron to another through synapses is a complex chemical process in which specific transmitter substances are released from the sending side of the junction. The effect is to raise or lower the electrical potential inside the body of the receiving cell. If this graded potential reaches a threshold, the neuron fires. It is this characteristic that the artificial neuron model attempt to reproduce.[3]

3. Proposed System

Back propagation, an abbreviation for backward propagation of errors, is a common method of training artificial neural networks used in conjunction with an optimization method such as gradient descent. The method calculates the gradient of a loss function with respect to all the weights in the network. The gradient is fed to the optimization method which in turn uses it to update the weights, in an attempt to minimize the loss function. Back propagation requires that the activation function used by the artificial neurons. The algorithm can be decomposed in the following four steps:

i. Feed-forward computation
ii. Back propagation to the output layer
iii. Back propagation to the hidden layer
iv. Weight updates
4. Methodology

Neural networks (NNs), as artificial intelligence (AI) methods, have become very important in making stock market predictions. Much research on the applications of NNs for solving business problems have proven their advantages over statistical and other methods that do not include AI.

Figure 1 Back Propagation flowchart

Algorithm:-
1. Accept input sample
2. Perform its weighted summation.
3. Apply it to input layer neurons.
4. Process all inputs at each neuron by transfer function to get individual.
5. Hidden layer and repeat 1, 2, 3, 4 steps pass it as an input to all neurons of for hidden layer neurons.
6. Pass output of hidden layer neurons to all output layers and repeat 1, 2, 3, 4 steps to get final output.
7. Display the final output.[2]
The network is created with some initial values of above mentioned network parameters. The network was trained using back propagation algorithm with the aim to improve the network performance i.e. to reduce mean square error (mse). In this algorithm, the network is trained by repeatedly processing the training data set and comparing the network output with the actual output and reducing the error to the minimum possible. If the error between network output and the actual falls below the threshold value, then the training stops otherwise weights of the connections between various neurons are modified so as to reduce “mse”.

5. Scope

Following the assumption of technical analysis that patterns exist in price data, it is possible in principle to use data mining techniques to discover these patterns in an automated manner.

Once these patterns have been discovered, future prices can be predicted. Today, the grand challenge of using a database is to generate useful rules from raw data in a database for users to make decisions, and these rules may be hidden deeply in the raw data of the database. Traditionally, the method of turning data into knowledge relies on manual analysis; this is becoming impractical in many domains as data volumes grow exponentially.

6. Conclusion

The objective of prediction research has been largely beyond the capability of traditional AI research which has mainly focused on developing intelligent systems that are supposed to emulate human intelligence. It can be seen from a comparative analysis that the back propagation algorithm has the ability to predict with greater accuracy than other neural network algorithms.

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