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Heikin-Ashi Transformation and Vix Index data for Stock Market Index Prediction and It's Effects

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ABSTRACT

This paper performs a comprehensive analysis of Vix Index data with Heikin Ashi Transformation of stock index Neural Network Learning. It has been demonstrated that Heikin Ashi Transformation can improve the learning effect of Neural Network and the effect can also be filter out if volume weights are also considered. This paper introduces another improvement beside using volume-weighted data. Instead volatility index is used as an input and its effect for neural network learning process is analyzed.

Keywords : Heikin Ashi Transformation, Vix Data, Neural Network, Stock Market Analysis, Time series filtering

I. INTRODUCTION

Predicting uncertain events have been a curious subject for human beings. we were able to make better prediction framework with the computation power we have. The science of examining information and its effects is extremely valuable. The information itself is of no use if it is raw and unprocessed. The process of locating hidden patterns or data inside can be very useful. High power machine can turn this data into recognizable patterns far easily now. Identification of patterns inside given data is a key variable in modern research. Since we have abundance of computational power available to us, we would formulate techniques that enable machine to analyse data patterns and discover underlying information easily.

Neural network are system that mimic human brain and allow machine to learn underlying patterns just like human beings. If a large training data is available then neural network can learn it properties and make prediction based on the learning [1] . One of the most desired fields of such research includes stock market. Stock market is a very dynamic place with tons of information. Stock market data creates patterns, that when harvested can provide better decision making opportunity. But stock market data is full of unwanted entropy. Such noise can be a short term fluctuation in stock market data or may be long term disturbence. Such Noise is undesired within the data and may or may not be related to the underlying stock data trend. We have already demonstrated that such noise can interfere with learning of neural network and hence reduces the effectiveness of learning and its effectiveness. The Heikin-Ashi transformation has worked remarkably well reducing noise and its effect can be further improved using Vix Index data.

Some Researchers [2] have demonstrated the importance of availability of favorable methods for finance managers and incorporating many systems for portfolio management. Such connection of selection of technology and company is vital [3] for a finance driven system. Artificial Neural network has been a very important learning system [4] and it has provided a definite edge for it's user. The effect of neural network and genetic algorithm has been researched [5] and found to be very effective. Neural network for trend determination [6] and optimized neural network [7] are a few key methods to work with. Many researchers have incorporated hybrid models [8] and had early success. Generating buy and sell signal using deep neural network [9] as well as a self organizing rule based system [10] perform very well. Effect and result of ANN on NASDAQ Composite [11] and results are inline with expectations.

II. METHODS AND MATERIAL

Heikin-Ashi is widely used in candlestick charts. In Japanese, Heikin means "average" and "Ashi" means "pace". Since it is based on candlestick patterns. We give a brief intro to candlesticks. A candlestick describes trade information of a given time period. Every candlestick has 4 values Open, High, Low and Close. These values represent the value at which stock or index candle opened, highest value of stock, lowest value of stock and closing value of the stock in that time period. Heikin-Ashi transforms these 4 values using following formulas to create new candlesticks. New Candlestick produces simpler and smoother candlestick for analysis.

Transformation rules:

Let $O_{current}$, $H_{current}$, $L_{current}$, $C_{current}$ represents current open, high, low, close values.

Let O_{Prev}, H_{Prev}, L_{Prev}, C_{Prev} represents Previous day/period open, high, low, close values.

Then Heikin-Ashi values (HA) are calculated as:-

$HA\text{-}_{Close} = (O_{current} + H_{current} + L_{current} + C_{current})/ 4$

$HA\text{-}_{Open} = (HA\text{-}_{OpenPrev} + HA\text{-}_{ClosePrev}) / 2$

$HA\text{-}_{High}$ = Maximum of the $H_{current}$, $HA\text{-}_{Open}$ or $HA\text{-}_{Close}$

$HA\text{-}_{Low}$ = Minimum of the $L_{Current}$, $HA\text{-}_{Open}$ or $HA\text{-}_{Close}$

Using Vix Data:

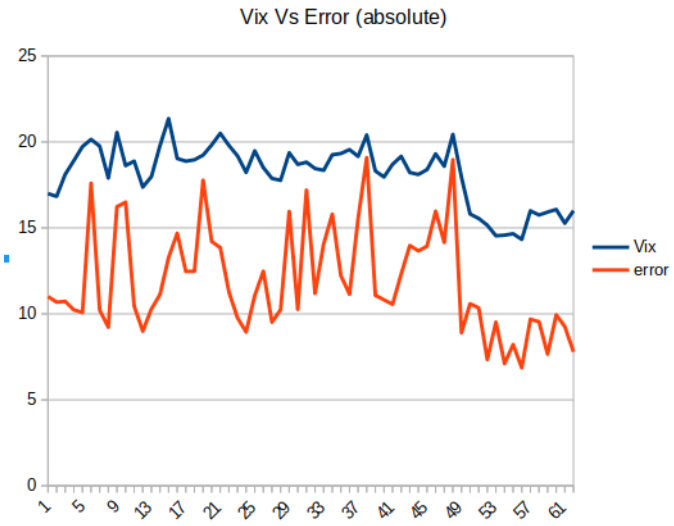
Vix is a volatility index and tracks volatility measured as per the options of stock index. Since the value of Vix may very between some fraction value, it is converted between [0,1.0] using inversion.

A 2 hidden layer ANN is used with configuration 5,6,3,1. The choice of structure of ANN is quite subjective. This setup given relatively stable results. Again test data is converted into 2 sets. One is for learning and other for test results.

III. RESULTS AND DISCUSSION

A Plot of Prediction by ANN and its original value provides us with an absolute error. This absolute error is plotted against Vix data and results are compared.

Mean Average Error	11.87130668
Mean error when Vix is above 19	14.00708243
Mean Error when Vix is below 16	8.658732212



These results clearly show an increase in error rate

when Vix is High. A vix above 19 causes a spike in error rate. Also a lower level of vix causes low error rate. However variation in lower level of vix is not linear with the error rate. This phenomenon can't be explained and a further study might be needed.

IV.CONCLUSION

It is clear that Vix data may be an indication of volatility of underlying system and the noise may increase during high period of volatility which affect the learning capability of ANN but it is also clear that there is a still a disconnect between vix and stock market movement and a further research might be needed.

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