Critical Analysis

Financial Prediction, Some Pointers, Pitfalls, and Common Errors by Kevin Swingler

Abstract:

This paper discusses the way around efficient markets hypothesis(EFM) by distinguishing between public availability and secretive availability of information, which contradicts the EFM. Also, it discusses how a perfect prediction "for all" would remove the discrepancies (on which the profit based market system works) and due to high transparency the opportunities for profits would ideally be lost.

This is majorly done by discussing two neural network based approaches, time windowing and Recurrent Networks. The paper further discusses some common mistakes, pre-assumptions, pitfalls and errors made while doing financial analysis of stock markets using neural network based approaches, significantly stressing on the need and requirement of Neural Networks and also their limitations.

Pros:

- Financial Prediction, Some Pointers, Pitfalls, and Common Errors by Kevin Swingler, is one of the first papers written in the domain of financial prediction using time series and neural networks, so it explains the same concepts in a very basic yet understandable manner, letting the readers know about the advantages and disadvantages of the discussed approach along with giving them a warning about the problems they may face while working in this (or similar) domain.
- The paper explains the single step prediction and Multi step prediction approaches, in a very simple manner for the readers to be able to appreciate the concept.

Cons and technical errors:

- The paper, being quite old has some major cons, which should be pointed out. Even though it is supposed to be a technical paper, there is not much detailing been done about the process of time series prediction and neither have some major terms be discussed.
- The concept of multiple epochs to reduce the coincidental nature of the multi-step-ahead prediction is not even referred.
- Time windowing is discussed very vaguely and methods like rolling or sliding time windows are not discussed and used which eventually decrease the reliability of the proposed solutions.
- The author has not touched upon why Linear Machine Learning algorithms are not used for forecasting time series data.
- Methods like ARIMA (Autoregressive Integrated Moving Average) useful for creating the benchmarks for testing are not mentioned, which are the building blocks of any financial analysis and help the readers to understand why there is a need for Neural Networks in the first place.

- Even though the concept of multi-variate approach is discussed (in the Market Modelling section), it is vaguely presented. The need for multi-variate approach (using other parameters of companies and market) and the cons of univariate approach (using only the previous market trends) are not discussed.
- The concept of making the data stationary using Dicky Fuller Test during the pre-processing so as to exponentially improve our model's accuracy, is not discussed.
- The concept of lags is indirectly mentioned in the single and multi-step approaches but the term lag isn't fully explained. This also brings out the absence of clarity on the co-relation present (already) in the training data, in the paper.
- The concept of backpropagation being useful while RNN (LSTMs) are being used is not discussed.

Technical Suggestions:

- Introduction of the concept of stationarity of data during pre-processing and cross checking through Dicky Fuller Test. Stationarity is a property of time series data which implies that the distributional properties (mean/variance) have not changed over a period of time. For time series forecasting, stationarity is important because if stationary data is not present, we are practically expecting the model to predict what it has never seen before.
- Introducing the concept of lags- As in time series, the outcome of today is dependent on the outcome of yesterday and the outcome of day before and so on. We need to lag each independent variable so as to get all in the same domain. If we want to predict k steps ahead, we lag the data by k steps and exclude the first k inputs.
- Using MSE correctly- As we have to minimize MSE, provided it is not constant after a particular point we introduce the concept of high number of epochs (no of trails learnt by input layer).
- Using recurrent neural networks for predicting time series by properly explaining the Long Short Term Memory Networks (LSTM) and introducing a new method of prediction i.e. 1 dimensional Convolutional Neural Networks which are lighter to implement than RNNs(LSTM) and produce almost similar results.
- Properly explaining the usage of multiple variables to train the data such as market parameters, company parameters etc. instead of only training with the previous market trends.

Directions for Future Research:

- The paper primarily focuses on financial analysis of stock markets, but with the advent of cryptocurrency, a new process can be devised so as to predict cryptocurrencies like Bitcoins, Doge coins etc.
- With more and more impacts of short selling and short term peaking coming out this year (GameStop, Blackberry and Signal), one can work upon predicting these sudden yet very profitable and predictable states by using methods for feature extraction(CNNs) and then using those features to eventually determine the profitable states.
- In India, as the digital currency is going to be introduced sooner than later, these models can efficiently be used to predict the value of our localised E-rupee, which can be beneficial not only individually but as a nation.

References:

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