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I-Search

Four trillion dollars change hands each day in the foreign exchange market (Forex). The desire to be part of that motivated my research. Though market is/was extremely volatile; consequently to trade optimally is nearly impossible without a computer, I decided I would research, develop, and publish what is called an algorithmic trader. To begin I developed a question “How to program a computer to forecast and effectively trade instruments?” After my initial research I discovered the primary problem when predicting the market is that it is a dynamical chaotic system (a system who’s underlying function is in flux and seemingly unpredictable) [1] consequently forecasting the market is nearly impossible. With a more formal perspective I was able to rephrase my question obtaining a more specific direction.

Completing my initial research I came up with a hypothesis: To forecast and effectively trade instruments in a dynamical chaotic system, incorporate the current state of the market that by training multiple agents (instances of the algorithm) with different evolutionary parameters and triggers (systems to detect when a trade should be made) that are mutated with the other said agents (they mix their properties) to better dynamically model market. Where possible, decrease the amount of chaos that each agent has to deal with by splitting situations that an agent has to evaluate into roughly statistically similar situations (probably a pattern is repeating) continually optimizing what “roughly statistically similar” means then making a market action.

To come to this conclusion I examined research on a variety of topics including Neural Networks (ANNs), Genetic Algorithms (GP), and Statistical Analysis (SA) as they related to algorithmic trading. All of my references are academic journal articles that were published in peer reviewed journals. Furthermore, every one of these journals are sanctioned IEEE (IEEE is known as “the largest professional association for the advancement of technology”, and is regarded as one of the most discerning and reputable technology communities). Additionally, all of the articles cited have experimental evidence or have cited articles which do, to support any claims made.

One of the articles "Comparative Study of Stock Trend Prediction using Time Delay, Recurrent and Probabilistic Neural Networks” by Saad et al. I studied about ANNs included the basic model for and relative advantages and disadvantages of three major ANNs. [2] is very terse, effectively hitting the high points of each ANN in just a few paragraphs. The rest of the paper was about how well ANNs worked (or didn’t) in the context of short term prediction. The overall effect of this paper was to lead me in the direction of using ANNs for the short term part of prediction in my algorithm.

I reviewed Hayward’s article on finding the optimal predictor to find what would be some critical concepts, hybrid methods and the basic form of an agent. In the article GP is used to try to find an optimal predictor alongside an ANN [3]. [3] Also pointed to some interesting articles in the bibliography that may help with the specific details of implementing these algorithms and what challenges are specific to them. The basic ideas lead to Hybrid algorithms, in the context of my work, being algorithms using GP for the construction, training, use, and acquisitions of ANNs that function as triggers.

The last article I reviewed about ANNs was “Stock Market Prediction using Neural Networks: Does Trading Volume Help in Short-Term Prediction?” by Wang, Phua, and Lin. This article explored an interesting phenomenon in which a variable that inarguably had an effect on the market when observed in retrospect seemed to still be useless when using trying to use it to make future predications. A big takeaway from [4] is the concept of variables having such a weak causality on the market that they are sometimes worse than useless. The warnings in this article have influenced my final algorithm by encouraging the use of multiple indicators.

After ANNs I decided to move to GP. I learned that one way to classify GP algorithms was by how they adapted to their environment. The article was overall well written though a bit narrow in its focus. While being narrow is normally a good attribute, in this article I felt that it may have taken away from the validity of the conclusions. Nevertheless, since SFI algorithms (discussed in the article) perform so much better it only makes since to use one which is why my algorithm can create new ANNs to identify situations that the algorithm has not been exposed to before.

While researching GPs I came over what would be the crux of my hypothesis, “Social Learning” as described in “Learning with Imperfections - a Multi-Agent Neural-Genetic Trading System with Differing Levels of Social Learning” (Kendall, Su, & Kendali, 2004). [5] described a system that allowed agents to trade triggers with each other. I found this article to be riveting, in a much as a research article can be, [5] is well written and thoroughly explains exactly how each claim was derived and why it is true. [5] also did a good job of not being written in a way that it was not completely inaccessible to someone not in academia. Not only is [5] well written but it also introduces a really cool concept which I am using in my hypothesis.

After completing this research, I feel very confident in the potential of my hypothesis and therefor my argument being meaningful. There are still a few key pieces missing though, More research on the merits of the different types of ANNs and chose one that fits my situation is needed, an Estimate of the cost of the algorithm I am proposing to verify that it is practical. After these tidbits are collected I will be able to implement and test my algorithm and come up with an argument as to its efficacy.

Works Cited (IEEE)

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