LITERATURE REVIEW AND COMPETITOR ANALYSIS

MScFE Capstone Project

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Problem Statement:

Python has become the *de factor* programming language for algorithmic trading and different platforms (quantopian, numerai, quantconnect) have risen to cater for traders who want to create their own signal generating algorithms. Unfortunately, some traders do not seem to have the skills nor the aptitude to learn how to code in Python so they can use some of these platforms.

This project aims at leveraging on the power of Python for algorithmic trading to create a standalone signal generating web app traders can access to use for their trading purposes without knowing how to write a single line of Python code.

Literature Review

1. Introduction

A market is said to be trending if you can look at the chart and see which direction it seems to be headed (up or down). Experienced traders have long observed that markets do not trend all the time - sometimes a market seems to be stuck in a range with no clear direction.

Charles Dow co-founded The Wall Street Journal in 1889 primarily to cover business and financial news. He began to publish a series of periodicals on his views of the markets using two market averages he had earlier developed called the Dow Jones Industrial Average (DJIA) and the Dow Jones Transportation Average (DJTA)

The Dow theory can be summarised thus: when the market is trending upwards and if one of the averages (DJIA or DJTA) breaches a previous important high then it is expected that the other will follow suit within a reasonable period of time. Dow theory also explains the movement of the market as consisting of a top, a bottom, an uptrend, and a downtrend. His principles are the basis of what we now call Technical Analysis.

After his death, a lot of people tried to organize and collectively represent the Dow theory based on Dow's published editorials. Many other theorists and speculators later also proposed theories to explain their observations of the behaviour of the markets. Notable of which are the Wyckoff Methodology (Wyckoff 1932) and Elliot Waves (Frost & Prechter 2004) just to name a few.

In the early 1980's, commodity traders Richard Dennis and William Eckhard decided to test to see if traders were born or they were made. They recruited and trained 23 individuals (calling them "Turtles") by teaching them for two weeks and then tested with real money. The trading strategy they used was a trend following technique that used new four-week highs as an entry signal for longs.

Since the complete rules that made up the Turtle strategy have been made public, it has and still is possible to backtest them and see the performance on recent market activity. From some of the backtests it has been reported that the CAGR which was about 216% between 1970 to 1986 when Dennis and Eckhardt were developing the system, and eventually when his Turtle Traders learnt and traded the system to 10.5% between 1986 and 2009 (Liberty 2010)

Toby Crabel introduced the concept of Expansion and Contraction by explaining that the market is constantly changing from a period of movement to a period of rest and back to a period of movement. This interchange between the phases of motion and rest is constantly taking place (Crabel 1990). Understanding this simple explanation can aid us in developing trading strategies that can be used to exploit the forex markets. Machine learning techniques can be mobilized to identify movements in the market for profits that are sustainable.

2. Technical Analysis

The use of past price data to guide a trader's decision today on how to engage the market (either to go long, short, exit a position or to stand aside) is known as Technical Analysis (Neely & Weller 2011). In this work, I will use technical analysis to generate my signals. I will start by generating buy and sell signals from some technical indicators out some indicators.

2.1.   Technical Indicators

We will list some traditional indicators that have been used in stock and commodities trading for some time. The list is endless and some of them have seen a fair use in trading the forex market.

- Trend Indicators: Moving Averages are the most deployed trend indicators on a technical analysts chart. They are usually used to smooth out the price of an asset over a specified length of time by calculating and displaying a constantly updated mean value of the closing price. Simple Moving Averages use Arithmetic means while the Exponential moving (EMA) is a weighted average that is meant to give greater importance to recent price data which tends to it more responsive to new information.

- Momentum Indicators: These help the technical analyst to get a better understanding of the rate of change of price. Some commonly used momentum indicators include: Moving Average Convergence Divergence (or the MACD which is really derived from the difference between two moving averages), the Relative Strength Index (RSI) and the Average Directional Index (ADX) which is derived from the smoothed averages of the -DI and +DI, which are themselves derived from the comparison of two consecutive lows and their respective highs.

2.2.   Trend Trading

Trend trading is a style of trading where technical analyst attempts to make profit on the price movement of a particular asset in the market in a particular direction. When the price of the asset is moving up indicated by the price bars on the chart making consistent higher-highs and higher-lows, the trend is said to be up. Conversely, if the price bars on the chart are making consistent lower-lows and lower highs then the trend is said to be down.
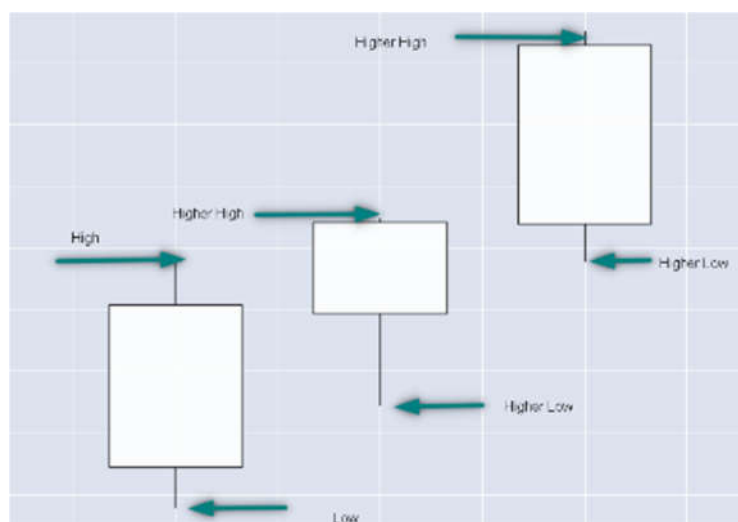

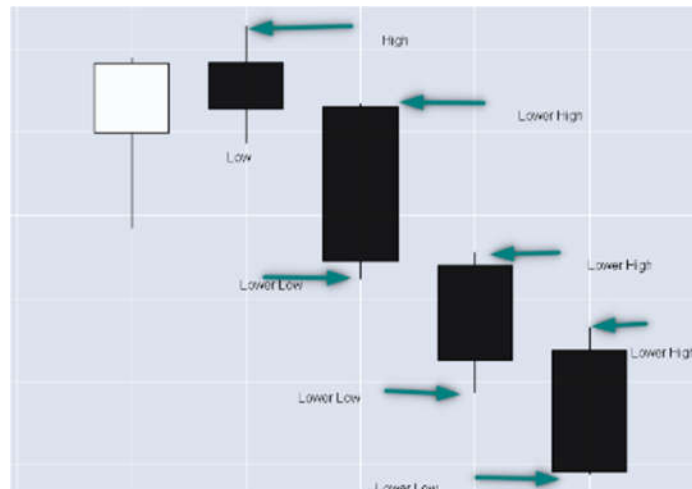**Figure 1. Candles making higher highs and higher lows**

Figure 2. Candles making lower lows and lower highs

One common way of generating signals for trend trading using the moving average is to consider a long trade when a fast moving average crosses above a slow one and for shorts we wait for the fast moving average to cross down. Another signal generating technique is for the closing price of the asset be above or below the moving average in question. The choice of technique is at the discretion of the trader. We will use a similar technique as the latter, however using less traditional indicators most of which have seen some great success in the forex market.

Figure 3. Simple moving average cross over system

3. Machine Learning

Since Arthur Samuel popularized the term Machine Learning in the late 1950's the field has seen tremendous progress in recent years. The financial industry especially algorithmic traders around the world also try to benefit from these technological advances (Hilpisch 2020). Arthur Samuel's idea was

instead of programming a computer step by step on how to solve a particular problem, it is shown examples of problems and their solutions thus allowing it to figure it out by itself using statistical and Machine Learning techniques. Like Statistical techniques, Machine Learning techniques also seeks to map the elements of a particular domain (in our case features we have selected from our dataset) with those of another domain (the direction of the market up or down).

(Wang et al. 2003) used volume as a feature to help in forecasting the direction of S&P 500 and DJI of which they found no strong corelation. Using a Machine Learning technique called support vector machine (SVM) model on stock prediction, (Ince & Trafalis, 2008) made a comparison between multi-layer perceptron (MLP) and SVM. They showed that in many cases, SVM seemed to have outperformed MLP on the datasets they used. (Liu &Wang, 2019) combined machine learning and deep learning techniques that have been utilised by prior research approaches, to get new training features for prediction.

Competitor Analysis

With the rise of machine learning and the interest that trading equities, CFDs, Stocks and the foreign exchange markets, so many researchers and retail traders are interested in merging the two to find out how they could beat the market. Platforms like Quantopian, QuantConnect and NumerAI (to mention a few) have risen to fill that gap. Despite the success of these platforms in bringing great traders and technicians together, a large niche of non-techie traders are not involved as learning Python, C# or R stands as a barrier for many of them.

This project aims on concentrating on such traders. When fully launched, the traders would be heavily assisted from receiving signals while they spend time on trading using whatever money management approach they prefer. Waiting by a computer screen for a trade setup can cause traders to start imagining chart patterns or to be affected by paralysis of analysis.

Strengths
- This project aims to be designed to provide signals generated from machine learning algorithms that have been found to better than chance (>50%) to non-tech traders via a simple webapp.
- It will encourage traders to concentrate more on entries and exit making them less prone to paralysis of analysis.

Weakness
- This project will not include money management techniques as that would be left to the discretion of the trader interacting with it.

Opportunities
- This will bring in more players from the trading community into the machine learning by lowering the barriers to entry.
- Since it will be an open source project, it would also bring in other machine learning enthusiast to contribute there by increasing the popularity.

Threats
- There are big corporations with deep pockets who are interested in this domain.
- Some trading platforms already have signal generation via dashboards.

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