**Mid Term Report**

**Algorithmic Trading**

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**Introduction**

**Algorithmic trading** is a method of executing orders using automated pre-programmed trading instructions accounting for variables such as time, price, and volume. This type of trading attempts to leverage the speed and computational resources of computers relative to human traders. In the twenty-first century, algorithmic trading has been gaining traction with both retail and institutional traders. A study in 2019 showed that around 92% of trading in the Forex market was performed by trading algorithms rather than humans.

It is widely used by investment banks, pension funds, mutual funds, and hedge funds that may need to spread out the execution of a larger order or perform trades too fast for human traders to react to. However, it is also available to private traders using simple retail tools.

Financial Terminologies

1. **Returns**- Return is defined as the increment in the price (capital gain) + dividend all over the time period for the investment.

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Total stock return = (P1-P0+D)/P0

P0= Initial Stock Price

P1=Ending Stock Price

D= Dividends

1. **Dividend-** Dividend is essentially the money that you receive from the company you are investing into. One can think of it as the cheque received from the company.
2. **Gross Return-** Gross return on the other hand is 1 + Return. It signifies the net return from the company.
3. **Excess Ratio-** Excess Ratio= Portfolio Returns- Benchmark Returns
4. **Information Ratio-**

Ratio= Avg. of excess returns / standard dev. Of excess returns

1. **Sharpe Ratio-** It is actually a special case of the information ratio, suitable when we have a dollar neutral strategy, so that the benchmark to use is always the risk-free rate.

To achieve profit every month, strategies annualised sharpe ratio should be **greater than 2**.

To achieve profit every day, sharpe ratio should be **greater than 3**.

Theories

1. **Efficient Market Hypothesis (EMH)-** EMH states that financial markets are efficient, meaning that prices reflect all available information. This theorem suggests that it is not possible to consistently outperform the market using trading strategies based on historical data alone.
2. **Capital Asset Pricing Model (CAPM)-** CAPM is a model used to determine the expected return on an investment based on its risk. It helps in understanding the relationship between the expected return of a security and its systematic risk.
3. **Black-Scholes-Merton Model:** The Black-Scholes-Merton (BSM) model is a mathematical model used to calculate the price of options. It considers factors like the underlying asset price, strike price, time to expiration, risk-free rate, and volatility to estimate the value of an option.
4. **Kelly Criterion:** The Kelly Criterion is a formula used to determine the optimal position sizing in order to maximize long-term returns while considering the risk of ruin. It provides a framework for allocating capital to different trading strategies based on their expected returns and probabilities of success.
5. **No Free Lunch Theorem:** The No Free Lunch (NFL) theorem states that in the absence of additional information, no trading strategy can outperform random trading over a large number of trades. This theorem suggests that there are no universally superior trading strategies that work in all market conditions.
6. **Mean Reversion:** Mean reversion is a concept often utilized in algorithmic trading. It suggests that prices tend to move back towards their mean or average over time. Traders may use mean reversion strategies to take advantage of temporary deviations from the mean.
7. **Momentum-** Momentum refers to the tendency of assets to continue moving in the same direction for a certain period. Momentum trading strategies aim to identify and exploit trends in asset prices, assuming that assets that have performed well in the recent past will continue to do so in the near future.

**Updated POA**

**Week5-** Read the book by Ernie Chan on Algorithmic Trading

**Week6-** Complete the left modules in the book, and implement at least 2 strategies.

**Week7-** Participate in International Quant Championship.

**Week8-** Final report submission

**Thank You**