* Background information that explains the working topic.

US stock market is experiencing significant volatility in the Q4 2023. There are many factors such as financial markets, other investments and current events that present significant opportunity and influence.

Through deeper understanding of the underlying characteristics of the markets and current environment across multiple dimensions, we may be able to leverage our growing knowledge of time series analysis to decompose price movements by price level, price trend, quarterly seasonality, and noise to predict with sound data science principles where the US stock market will be by the end of the first quarter of 2024 and at the end to manage risk and build capital.

* Overview of main points demonstrating gaps of knowledge, strengths, weaknesses, etc.

Key components of the stock market include stock exchanges, such as the New York Stock Exchange (NYSE) and NASDAQ, and various financial instruments like equities and exchange-traded funds (ETFs). In this case we are looking at S&P500 ETF(SPY). Fluctuation of market are often occurred in short-term basis. Therefore, we are looking on short-term time series methodology such as moving average, exponential smoothing and ARIMA. Throughout ADS506 course, other methodology would be included in our analysis.

Besides looking from historical data, external factor predictors would also contribute on stock price prediction.

The stock market is subject to a vast and virtually limitless array of external factors that can impact its performance. Having this large complexity, and lack of domain knowledge, identifying time series model and prediction for this module would be a challenge.

Key finding

Initial EDA findings include the time series of SPDR S&P 500 ETF Trust’s stock price exhibiting non-stationarity over the period of six months from May 2023 to November 2023 using the Augmented Dickey-Fuller test statistic method.

Upon decomposing the data, we see the trend definitely needs to be considered in to our model as well as seasonality. Advanced exponential smoothing RMSE has better value compare to Simple Smoothing methodology

ACF.. PACF.. ARIMA..