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## Project Report

Our project focuses on using Matlab to better understand the money market. We are specifically looking at the usage of technical analysis and ultimately its ability to determine whether a stock will go up or down. We can accomplish these using a variety of tools and mathematics built into Matlab to gain insight into the financial world. We will lay out some of the tools we used to accomplish this and connect them to real-world events. We used three numerical methods to help analyze the data: Statistics and Probability, Linear Regression, and Numerical Differentiation.

One of the most basic indicators used for stocks analysis is the Simple and Exponential Moving Average, the most common method used to calculate the moving average of prices. It simply takes the sum of all of the past closing prices over the time period and divides the result by the number of prices used in the calculation. If you compare Figure 2 to 1, the exponential moving average calculation uses a smoothing factor to place a higher weight on recent data points and is regarded as much more efficient than the linear weighted average. Moving averages can be used to identify whether a security is moving in an uptrend or a downtrend depending on the direction of the moving average. As you can see in Figure 1, when a moving average is heading upward and the price is above it, the security is in an uptrend. Conversely, a downward sloping moving average with the price below can be used to signal a downtrend. We took two averages, one for a 3-week period and 6-week period to compare. The longer period produces a more normalized line that is less reactive to volatility.

The second method we used is Linear Regression. Using this method we can find trends of either up, down, or flat. An uptrend indicates that a stock's price is increasing while a downtrend indicates that a stock's price is decreasing. A flat is when a stock's value is neither increasing nor decreasing, hence the term flat. Again we used 3 and 6-week periods to compare in Figures 3 and 4.

Lastly, we analyzed slope or rate of change in stock prices over a 15 or 30 day period. We found the slope by using numerical differentiation with different step sizes. Slope can be used to quantify the trend. A positive slope is by definition an uptrend and similarly, a negative slope defines a downtrend. Additionally we can determine the volatility of the stocks and how a single news event can significantly impact the prices of a stock. In Figure 5, we analyzed the stock data from Apple Inc. We see that during late 2007 and early 2008, there was a significant decline in stock prices most likely due to the newly released Macbook Air not meeting up to shareholders' expectations and predicted poor sales. To add, this was also around the time of the 2008 housing market crash leading to a 2 year long recession. This shows how certain events can drastically change the price of a stock on any given day.

Lastly, you'll notice that every graph includes a volume, which is the number of shares or contracts traded during a given period of time. We can check if the volume trading follows the price trend, and gives us more insight into whether a stock is being heavily bought or sold. In conclusion, using various tools and indicators we are able to better understand the stock market and it's capability to measure a stock's future outcome. Obviously our understanding only touches upon the surface of Technical Analysis, but displays what we learn in class can be applied in real world situations.

**Figure 1**

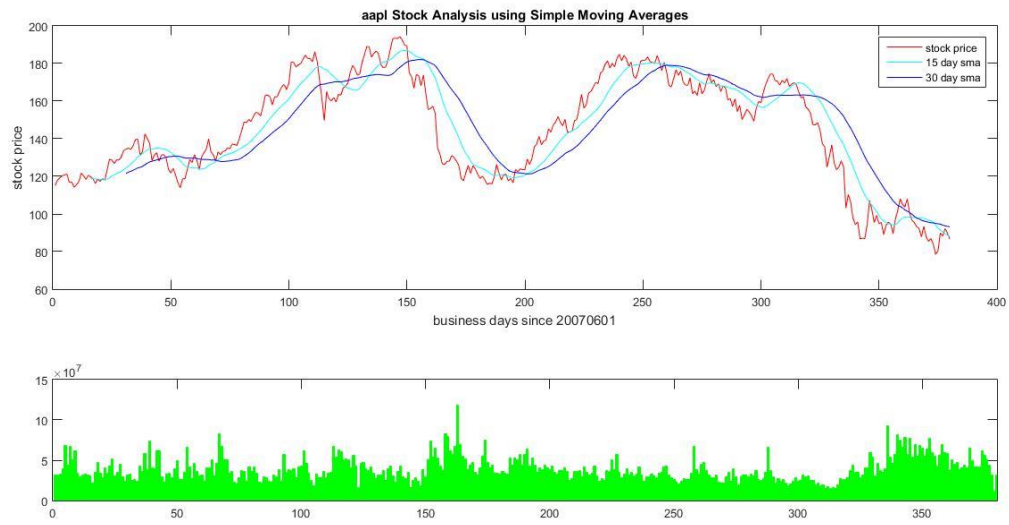


Figure 2

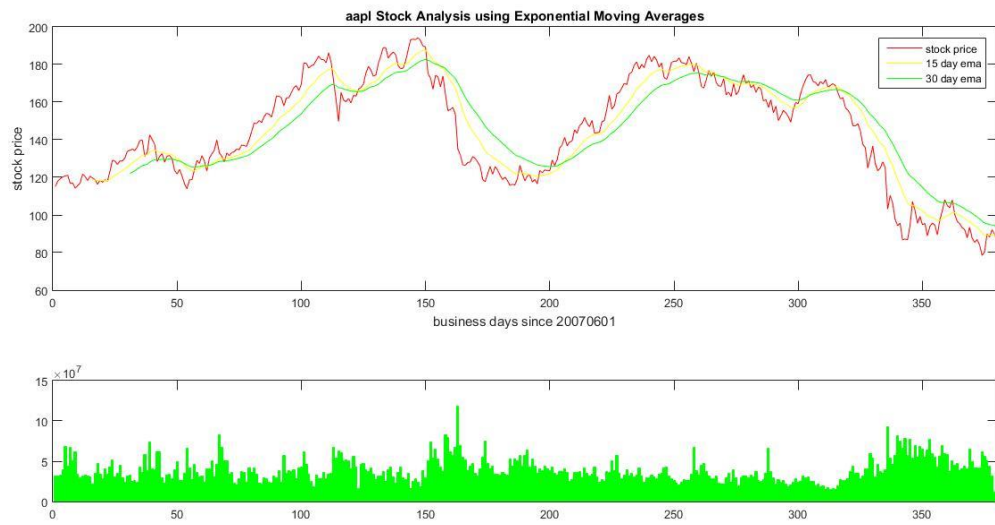
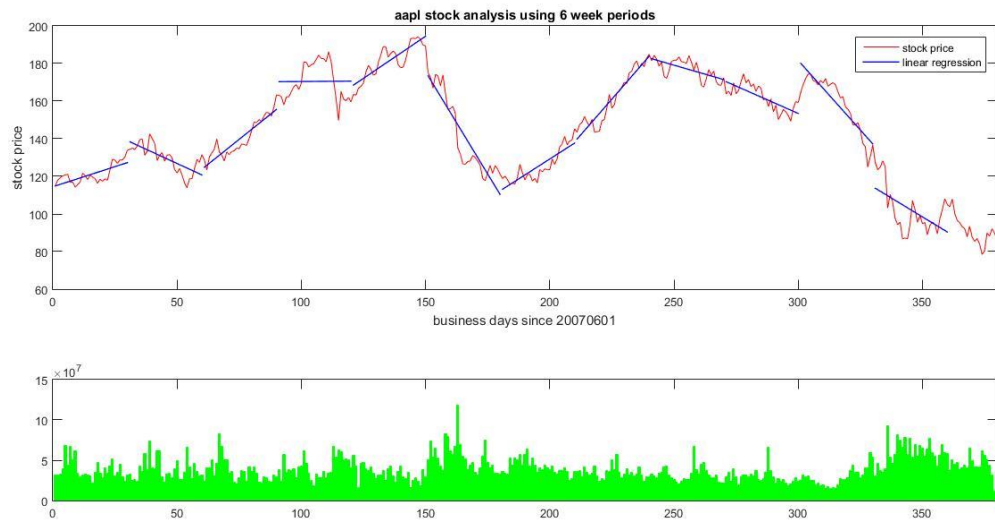
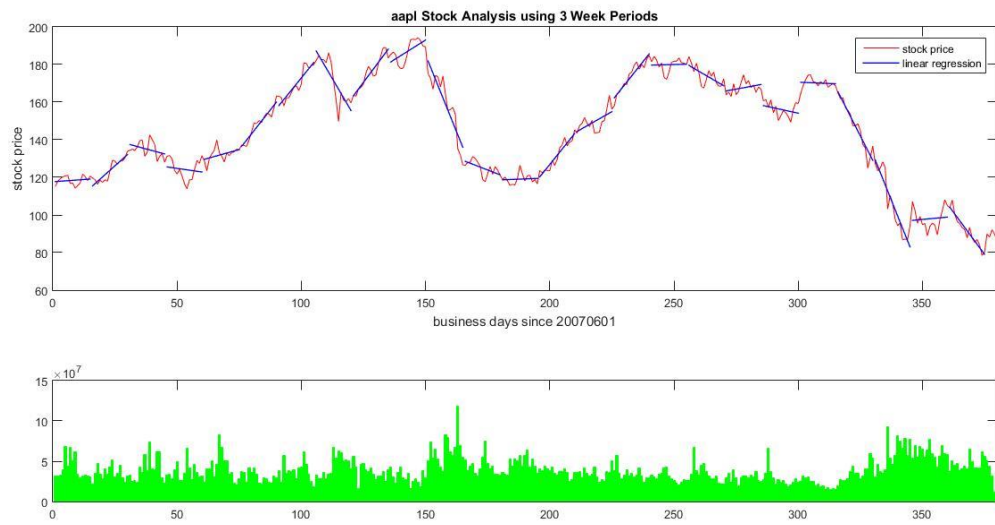


Figure 3



**Figure 4**



**Figure 5**

