Introduction:

There are multiple trading strategies employed by financial investors to capitalize on the success of a company.

The most common strategy is the 'Hold' strategy. The 'Hold' strategy is when an investor buys shares of a company, and holds it for a certain amount of time, typically long in duration. The shares increase or decrease in value depending on how the company's stock is performing over that period. For example, suppose an investor spends $1,000 to buy 100 shares of company X at 10 dollars. After 2 years, if the stock has increased in value from $10 to $14, his initial investment of $1,000 would now be worth $1,400.

In this report, I will be presenting a new strategy, the 'Daily Trade' strategy, and compare the gains of this strategy to that of the 'Hold' Strategy. The 'Daily Trade' strategy is fairly straightforward – the following steps are executed on a daily basis:

1. At the start of each day, we use the current capital to purchase the maximum number of shares of the selected stock.
2. A cap is set on the gain we are seeking, as a percentage higher than the opening price of the stock. The cap is the same on a day to day basis.
3. An order to sell all the stocks (limit order) purchased is placed at a price determined by the gains cap[1].
4. If the stock price reaches the price of the limit order at any time of the day, all shares will automatically be sold, otherwise the stock will be sold at the closing price.

[1] https://www.sec.gov/fast-answers/answerslimithtm.html

As an example, if the value of a stock is $100 and the gains cap is set at 5%, then a sell order would be placed at price of $105 for that day. If the stock reaches $105 at any point in the day, the limit order would execute, and a daily gain of 5% would be recognized. If the stock never reached the $105 mark, then the stock would be sold at the end of the day at the closing price.

Assume that on day 1 the stock price reaches $105 at some point in the day. The limit price would be executed, and the investor would now have $105 in cash. Assuming the stock price opens the next day at $103, the $105 made the previous day will be reinvested into the same stock. A new gains cap will be set at 5% higher than the opening price, so in this case 108.15 (103 + 103*(0.05)). Assuming the price does not reach this cap at any point in the day and closes at the same price, $103, then we will simply sell at this price, and realize no gains for the day.

To test this strategy against the hold strategy, I looked at Amazon stock date from November 2003 to July 2016 and Facebook stock data from May 2012 to July 2015. The data sets provide the 'Open', 'High', 'Low', and 'Close' price for each day in the respective time periods. I chose both of these stocks because they have been very successful in recent years, and are in the same industry, meaning they are affected by relatively similar factors. Both of these similarities eliminate potential confounding variables.

It is my belief that this daily trade strategy will lead to greater long-term return on investment than using the standard hold strategy.

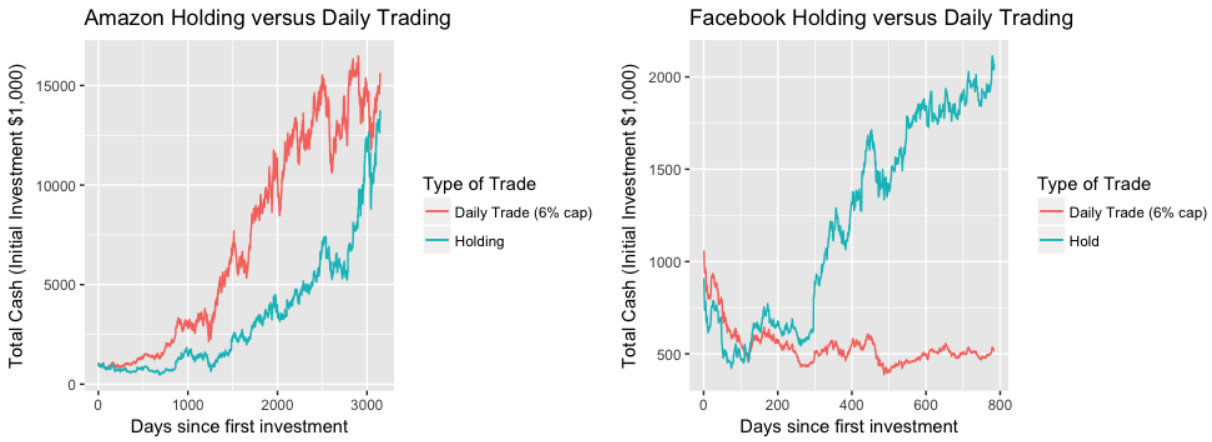
Rational for hypothesis:

The motivation behind creating the 'Daily Trade' strategy was to find a way to capitalize on the daily stock fluctuation, especially on days that the stock went down from opening to closing. When looking at yearly returns, both companies saw a significant rise in their stock price. This is not the case when looking at the daily performance though, as both companies closed at a lower price than it opened for almost half of the days traded.

This number was verified using resampling. A random sample of 100 days was taken from the entire population. Of the sample of 100 days, the days in which the closing price was lower than the opening price was determined. Finally, the proportion of days that the closing price was less than the opening price was found for the entire 100-day sample. This process was replicated 20 times, and the mean of all the replications verified that the price went down for approximately half of the days traded for both Facebook and Amazon.

For the days that the stock price closed at a lower price than it opened, the average difference between the high price and opening price was a little less than 1%. Using the 'Daily Trade' strategy, we would be able to realize some of these gains on the days that the stock price went down from Open to Close.

Results for two real-world scenarios:

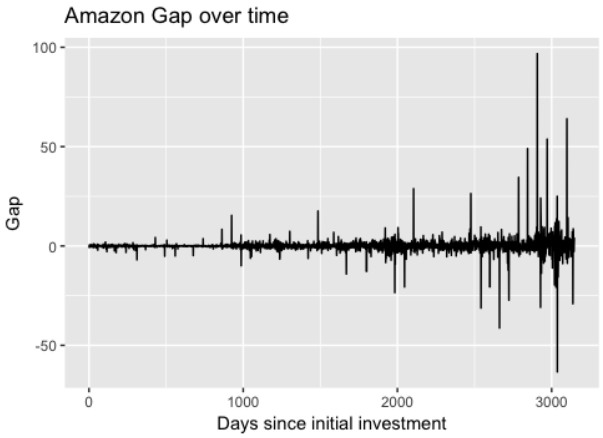


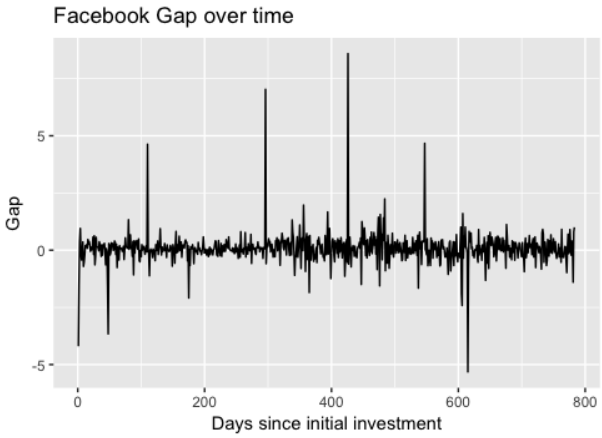
For this simulation, an initial investment was placed at $1,000 at a percentage cap of 6%. The initial investment was an arbitrary number, and does not favor one strategy. In deciding the percentage cap, I chose a number that I believed would be low enough to be executed at a significant rate, while high enough to not miss any potential gains. Assuming an initial investment of $1000 and a percentage cap set at 6%, the graphs above shows the total amount that the initial investment would be worth based on the days after the initial investment. The red line for both graphs assume that the 'Daily Trade' strategy was employed, while the blue line assumes that the 'Hold' Strategy is employed. As we can see from the graphs, the 'Daily Trade' strategy would allow for greater return on investment in the case of Amazon, but significant losses had it been employed with Facebook.

Reasoning for difference:

An explanation for the difference can be found by examining the "gap". The term 'gap' refers to the difference between the opening price on a given day and the closing price of the previous day[2]. Essentially, gap is the change in stock price while the market is closed. While the 'Daily Trade' strategy allows investors to capitalize on market fluctuations, it does not allow investors to realize gains during times when the market is closed. Using the 'Hold' strategy, these closed-market gains would have been realized. Below is a graph of the Amazon and Facebook gap over their respective time periods.

[2] https://www.investopedia.com/terms/g/gain.asp

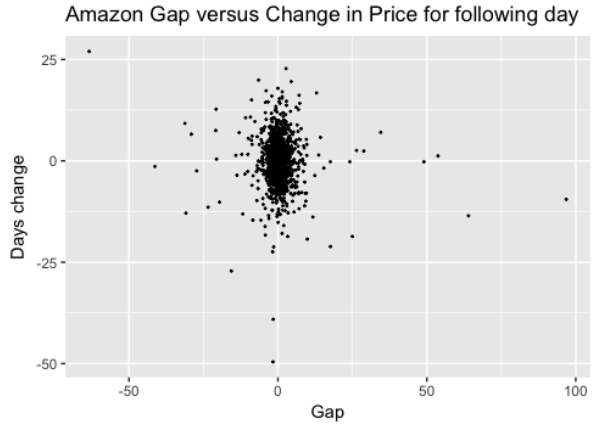


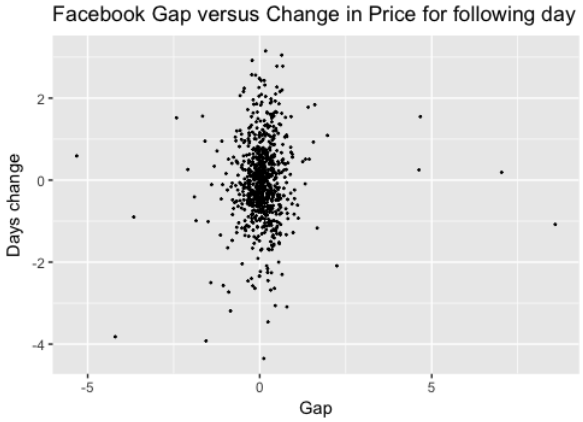


Evaluating effect of Gap on each Strategy:

To evaluate the change that the gap has on both of the strategies, the most effective method would be to determine if there is a correlation or a linear relationship between the gap and the daily change in total cash value.

Before analyzing the effect of gap on both of these strategies, we must first verify that there is no relationship between the gap and the day's change in stock price for the following day. The day's change in stock price is the price that the stock closed at, minus the price that the stock opened at. As these are the only two factors that affect the day-to-day change in stock price, a correlation between the two may signal that the day's change in the stock price is a confounding variable when looking at the effect of gap on the two strategies. If there is no correlation, then we can reasonably believe that a correlation between gap price and day over day change in total cash for 'Daily Trade' strategy or 'Hold' strategy is truly due to the gap, or some factor that would affect the gap. Below is a graph that plots the gap and the day's change in stock price the following day.

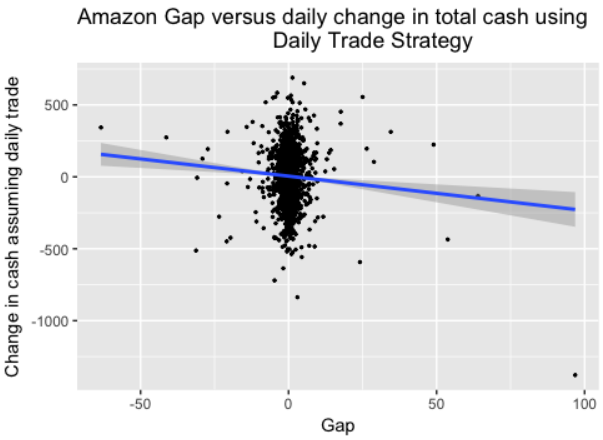


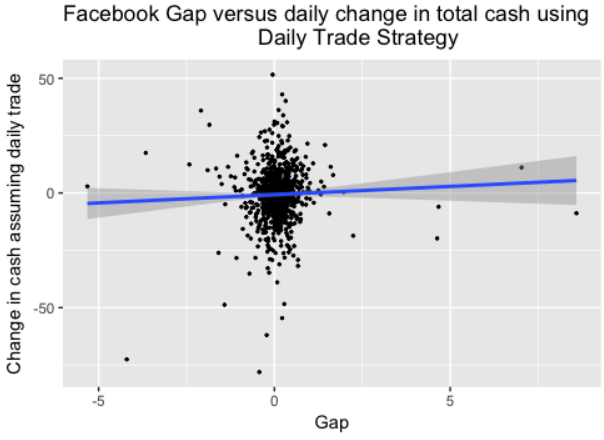


Both graphs above have a correlation of approximately 0.06, and p-values greater than 0.05. Due to the large p-value, we would fail to reject the null hypothesis - there is no significant correlation between Gap and change in price for the following day. We can now proceed with evaluating the effect of gap on the 'Daily Trade' and 'Hold' strategy with reasonable confidence that daily change in the stock price is not a confounding variable.

Effect of Gap on 'Daily Trade' strategy:

As mentioned earlier, the Daily Trade strategy does not recognize gains during closed market activities. For the 'Daily Trade' strategy, the daily change in cash value is the cash value after closing on a given day, minus the cash value at the closing on the previous day. Below is a graph of the gap and the daily change in total cash using the 'Daily Trade' strategy.



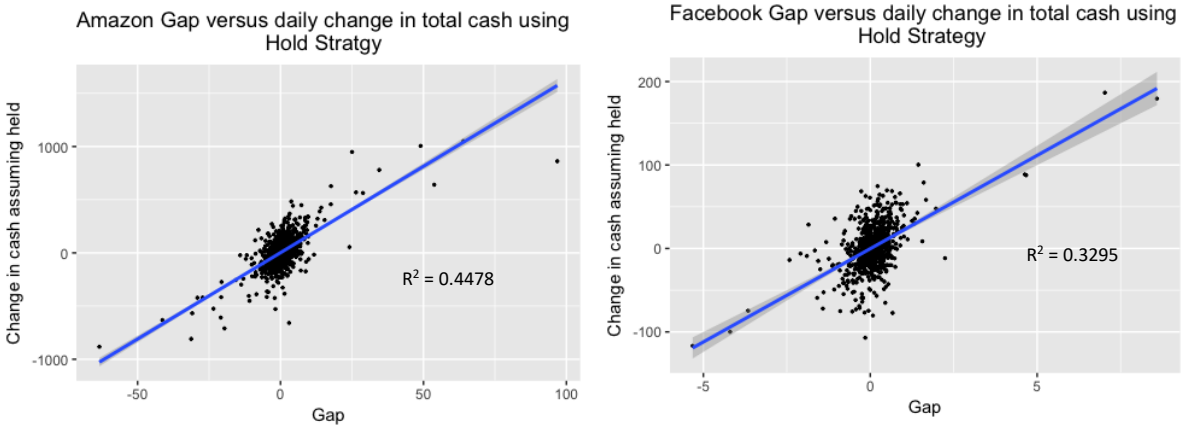


R^2 = 0.0001329

Both graphs above have a very low R^2 indicating that there is no linear relationship between gap and change in total cash. Furthermore, when evaluating the graphs using the "Pearson" correlation test, both graphs had p-values significantly higher than 0.05, meaning we would fail to reject the null hypothesis, that there is no significant correlation between the Gap and the daily change in total cash using the 'Daily Trade' strategy. Based on this analysis, the effectiveness of the 'Daily Trade' strategy is not affected by the gap.

Effect of Gap on 'Hold' strategy:

The 'Hold' strategy recognizes gains during closed market activities, so it would be expected that there would be a correlation between the gap and the daily change in cash. For the graph below the daily change in cash would be the potential cash value if all shares were sold on a given day, minus the potential cash value if all shares were sold on the previous day. Below is a graph of the gap and the daily change in total cash using the 'Hold strategy. Note that for this graph, change in cash refers to the amount the stock appreciated or depreciated between the given days close and the previous days close.



Both of the graphs had R^2 that indicate a slight linear relationship. Furthermore, when evaluating the graphs using the "Pearson" correlation test, both graphs had p-values much lower than 0.05, meaning we would reject the null hypothesis, that there is no significant correlation between the Gap and the daily change in total cash using the 'Daily Trade' strategy. This means that we can reasonably believe that gap is correlated with the total change using the 'Hold' strategy.

Limitations:

While I attempted to be as comprehensive as possible, there are two major limitations to the study that are expected to affect the results. First, it was assumed for the 'Daily Trade' strategy that there would be no commission paid after each transaction. This was assumed because many large financial firms do not pay commission based on the number of trades, rather having the technology either in-house or paying a standard rate to another brokerage firm. The second limitation is that capital gains tax was not taken into account. Capital gains tax is the profits an investor realizes when he sells a capital asset for a price that is higher than the purchase price[3]. Because capital gains tax is only triggered when a stock is sold, it would be expected that this would reduce the gains realized from the 'Daily Trade' strategy much more than it would affect the gains in the 'Hold' strategy.

Conclusion:

While my research could not conclusively state whether the 'Daily Trade' strategy is more effective in generating returns than the 'Hold' strategy, it did provide an insight into a major factor – Gap - that will influence the success of a certain strategy. In times when the gap

[3] https://www.investopedia.com/terms/c/capital_gains_tax.asp

is high, the hold strategy is better, whereas in times when the gap is low, or there is no gap, the 'Daily Trade' strategy would perform better.

Looking at the Amazon 'Gap over Time' graph, we can see that in the first 2000 days the gap values are very small. In this period, the 'Daily Trade' strategy was much more efficient. However, in the last 500 days, when the Amazon stock experienced major Gap values, the 'Hold' strategy seemed to be much more effective than the 'Daily Trade' strategy. Since Facebook experienced major gaps through the majority of the time period, there was no time period when the 'Daily Trade' strategy was able to gain head on the 'Hold' strategy. This visual trend is verified by the correlations between the gap and the change in total value of the cash for both the 'Daily Trade' and 'Hold' strategy in both companies.

Further Research:

In looking at whether the 'Daily Trade' strategy would be more effective than the 'Hold' strategy, there is much more research to be done. The first, and most important, would be evaluating and ideal percentage cap for each company. An ideal percentage cap would be low enough for the limit order to be executed at a significant rate, while high enough to not miss any potential gains. One method for evaluating this would be through comparing the total change in price for each day with the maximum change in price for each day.

Ideally, the best strategy would involve holding onto the stock at the closing price if a high gap can be reasonably predicted before the opening price the next day. For this, further research would have to be done in finding factors that would affect the gap. Currently, gaps are affected by a variety of factors such as regular buying or selling pressure, earnings

announcements, a change in an analyst's outlook or any other type of news release[4]. A critical look at these factors would be beneficial in developing a new strategy to maximize return on investment.

**All exact p-values, R^2 values, and proportions can be referenced in the appendix. These values are denoted in red

References

Data set was provided by Professor Holt for a project in 'STAT 3250: Data Analysis using Python'

All R code was developed using notes from Gretchen Martinet's 'STAT 3080: Data to Knowledge' class.

All statistical reasoning and methodology was verified using notes from Gretchen Martinet's 'STAT 3080: Data to Knowledge' class.

All investing terms were verified using 'Investopedia'.

[4] https://www.investopedia.com/terms/g/gain.asp