Analysis of Apple's Stock and Option

A Mid-Semester Test for Computational Finance

Dennis Jonathan
Business Mathematics 2019B
STEM Universitas Prasetiya Mulya

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Abstract

Apple is a tech giant whose stock intrigued the eyes of many. In this analysis, the author simulated Apple's daily closing price for the next 6 months and Apple's weekly closing price, as welll a recommendation the best possible option strategy for October 21st,2022. The authors found that the daily closing price would oscillate between $150 - $160 before steadily rising towards the $170, while the weekly closing price would rise and eventually surpass the $200 threshold in early 2024. A long butterfly spread composed by using puts would be the most profitable option strategy based on the simulated values.

1 Introduction

With the increase in the amount of data available today as well as the increase in computing power, many fields has benefited tremendously. One field in particular is the world of trading. Trading has become a necessity for the humankind to survive. In the olden days, one might expect a simple barter, e.g. a trade for let us say a fish for potatoes and many more trades in similar fashion conducted between say a farmer and a fishmonger.

But nowadays, trading has also developed into a way to obtain more additional wealth and for some, their primary source of income. The instruments or objects one are trading has also developed. One might not only trade for commodities, but now people are trading money, ownership of a certain firm or company (i.e. a stock), agreements to buy or sell an asset (i.e. derivatives), and even trading things which one cannot see nor feel (i.e. cryptocurrency and non-fungible tokens). Accompanied by the increasingly connected world, literally anyone (even a fish) can trade at anytime and anywhere so long as he or she has an access to the internet.

As a consequence of the ever growing field of mathematics, people has come up with more and more ideas to analyze the instruments people trade. One of the most popular way to simulate the chaotic movement of a stock is by using a method referred as Geometric Brownian Motion. Not only that, people has also come up with methods to determine the price of a derivative instrument called as an option such as Black-Scholes method. The author conducted some simple analysis using the aforementioned methods to a stock index of the author's choice. The stock index in particular is AAPL belonging to a certain technology giant called as Apple. The analysis was conducted in Python and the data was taken from Yahoo Finance on May 2nd, 2022.

2 Definitions

2.1 Stock

In the financial world, a stock is a security representing a part of an ownership in a company [1]. From the perspective of a company which issues stock, it is a method to raise capital and get people to invest in their business ventures [2].The amount of part one owns depends on the shares" they own, i.e. the more shares one owns, the bigger the proportion of the ownership. The owner of a share is also called as a shareholder.

There are several popular ways to trade stock, one is via a stock exchange or market such as NASDAQ, NYSE, and IDX or over-the-counter marketplaces both highly regulated by their respective government [3]. Simply put, there are two positions in the stock market, a long and a short position. A long position essentially means one is willing to buy a stock, while a short position means one is willing to sell a stock. There are two ways to gain profit from a stock, the first happens when one buys a stock at a lower price and sells it at a higher price. The other way of gaining profit is through dividend (a share of profits and retained earnings) given by the company to the shareholder, although it should be noted that this is not a must [4].

2.2 Option

To understand the definition of an option, first one must understand the definition of a derivative. A derivative is a financial instrument in which the value is based on an underlying asset [5]. The underlying asset can be stocks, currencies, commodities, exchange rates, and even the weather [6]. There are several kinds of derivatives, those are options, forwards and futures, and swaps.

An option is an agreement between two parties in which there might be an exchange of an asset at some predetermined price in the future [7]. The reason for the word "might" is that the exchange might not actually happen (or in short the option is not exercised) if the person issued does not want to use his or her option. There are two kinds of options, a call option and a put option. A call option is the right to buy an underlying asset. A put option is the right to sell an underlying asset. The positions mentioned for stock are also applicable for options. In order to buy an option, the buyer needs to pay a certain premium to the seller [5].

2.3 Apple

Apple or formally known as Apple Inc is an technology and software designer and manufacturer based in Cupertino, California. It was founded in 1976 by Steve Wozniak and Steve Jobs [8]. Jobs and Wozniak are often credited to be the first to brought computers into the homes of regular people, designing user friendly personal computers which at the time were not really common [9].

Figure 1: Apple.inc's Logo [10]

Apple offers a selection of electronic products which includes the iPhone, iPad, Mac, iPod, Apple Watch, and Apple TV. Apple also manufactures micro-processors, software such as the iOS and macOS, and services such as the Apple Music and iCloud. Currently, Apple is lead by Tim Cook as its chief executive officer, taking the role from Jobs whom stepped down due to health concerns in 2011 [11].

Apple is often regarded as one of the most popular brand in the world. Due to its popular and high quality product lines, Apple was the first company to be valued at one trillion dollars in 2018 and it managed to double the valuation two years after [8]. In 2021, its revenue was reported to be $365.8 billion [12] with a net income of $94.68 billion [13], both are the highest in the company's history. Other advantages of Apple includes their intense and loyal customers as well as a dependency of services in the Apple's ecosystem [14].

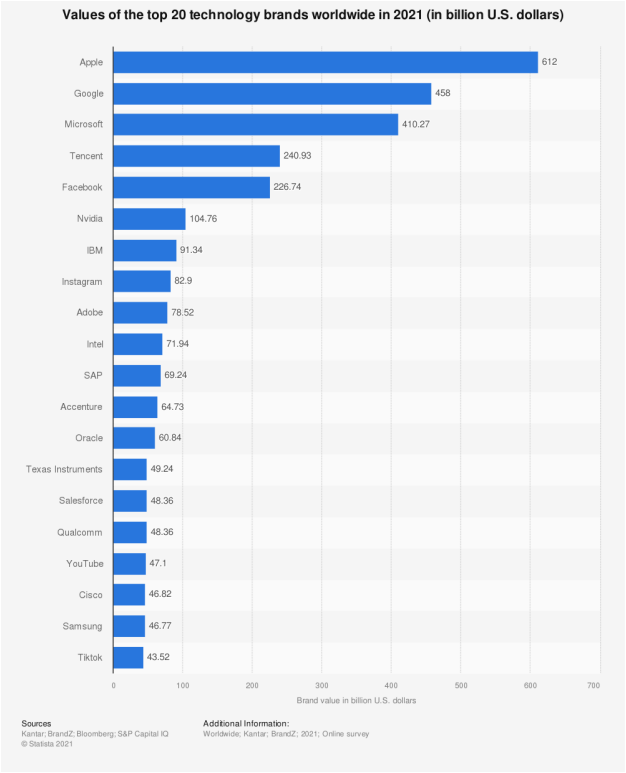


Figure 2: Most Valuable Technology Brand in 2021 [15]

As the stock market essentially rewards great ideas while condemn the opposite, Apple needs to keep in tabs some of their direct competition. Competitors such as Microsoft, Samsung, and Google are nipping at their heels for any ill-advised decisions. That being said, figure 2 showed that compared to other global tech giants, Apple is considered to be the most valuable by some margin. Its brand valuation of $612 billion is only followed by Google, Microsoft, Tencent, and Facebook (Meta), thus confirming Apple's firm position in the rapidly growing technology industry.

Figure 3: Apple's Closing Stock Price May 2021 - May 2022 [16]

Apple's stocks are sold in NASDAQ under the ticker name of AAPL. Experts estimated Apple's market cap to be somewhere around $2,572.8 billion [12].Figure 3 represented the movement of the closing price of Apple's stocks for the last year, it can be clearly observed that there is indeed a positive trend for its price thus indicating a healthy growth for the company. As reported by Yahoo Finance, their time to market earnings per share is roughly $6.01 with price to earning ratio of roughly 26.26 [16]. A study conducted by CNN found that 37 analyst predicted the 12-month price would be around $191 (median) with the highest being $219.94 and the lowest being $145 [17].

A common assumption for tech company like Apple is that releases and announcements would cause a price hike. According to Kerin, there is not a lot of Apple products which immediately caused a big positive spike in the company's stock price [18]. Their products takes a longer period of time to have a positive effect on its stocks. An analysis done by Wilhelm also proved that Apple announcement events such as its Worldwide Developers Conference does not yield in absurd spikes due to factors, the first being the investors most likely does not know the true meaning of the announcement, the second being the efficient market hypothesis due to the abundant amount of information available [19].

3 Research Methods

3.1 Research Objective

The objective of this analysis was to simulate and analyse the next possible closing price of Apple.inc's stock. The author wanted to analyse the daily closing price for the next 6 months as well as the weekly closing price for the next 2 years. Another objective was to predict the option prices, both calls and puts, relative to the predicted price on the date of choice. After that, the author recommended some option combinations which might yield good results on expiration.

3.2 Observation Period and Data Collection

The observation period was be the stock prices for the last year, starting on April 30th, 2021 up to April 29th, 2022. The author also used Apple options which will expire on October 21st 2022. The data for the stock and both options were collected from Yahoo Finance and are valid as of May 2nd, 2022. The author also used the United States Federal Funds rate of 0.5% as of May 2nd,2022 [20].

3.3 Analysis Methods

The main tool used to analyse and conduct the simulation is Python 3.9, using several libraries such as Pandas, SciPy, NumPy, Matplotlib, and Seaborn. To pull the data, the author also used the Pandas Datareader and Yahoo Finance [21] library. In order to simulate the next possible closing prices, the author used the Geometric Brownian Motion Simulation. To predict the option prices, the author utilised Black-Scholes Pricing Model. The following sub-sections will describe the flow of the analysis.

3.3.1 Data Preparation

To prepare the data, first the author pulled the data from Yahoo Finance in the form of a comma-separated value file. The preparation includes dropping missing data, removing redundant columns, renaming the columns into lowercase characters and replacing spaces with underscores.

The author also calculated the geometric return for the stock using the formula [22]:

$$R_t = ln\left(\frac{S_t}{S_{t-1}}\right) \tag{1}$$

Where R_t is the return for time t, S_t is the stock price at time t and S_t is the stock price at the time $t-1$.

After computing the geometric return, the author computed the mean and the standard deviation for the daily return and then converted it to the yearly return under the assumption that a year has 252 business days by the following formulas:

$$\mu_{\text{annual}} = \mu_{\text{daily}} \cdot 252 \tag{2}$$

$$\sigma_{\text{annual}} = \sigma_{\text{daily}} \cdot \sqrt{252} \tag{3}$$

3.3.2 Geometric Brownian Motion

Geometric Brownian Motion can be described as Brownian Motion with Drift but a lot more sensitive to changes. The model itself is defined as:

$$S(t) = e^{X(t)} \tag{4}$$

Where $S(t)$ is the value of the simulation at time t and $X(t)$ is actually the value of the Brownian Motion with drift at the same time t.

Geometric Brownian Motion can also be calculated from the equation [23]:

$$S(t) = S(t-1) \cdot e^{N(\mu_{\text{annual}}\Delta t,\, \sigma^2_{\text{annual}}\Delta t)} \tag{5}$$

Where $\Delta t = [t - (t-1)]$. The simulation was done 10 times. For the first task (simulating daily closing price the next 6 months), Δt will be set as $\frac{1}{252}$, under the assumption that a year contains 252 business days. For the second task (simulating the weekly closing price for the next 2 years), Δt will be set as $\frac{1}{52}$, under the assumption that a year contains 52 weeks.

3.3.3 Black-Scholes Model

The Black-Scholes is commonly used to calculate the expected value of an option using current stock prices, the option's strike price, expected interest rates, time to expiration, and expected volatility [24]. The model assumes that the option is a European style option thus it can only be exercised at expiration. For this analysis, the author assumed that the options can only be exercised at expiration, although in reality, that might not be the case. The formula for the model is given below:

$$d_1 = \frac{ln\left(\frac{S_0}{K}\right) + T\left(r + \frac{\sigma^2}{2}\right)}{\sigma\sqrt{T}} \tag{6}$$

$$d_2 = \frac{ln\left(\frac{S_0}{K}\right) + T\left(r - \frac{\sigma^2}{2}\right)}{\sigma\sqrt{T}} \tag{7}$$

$$C_0 = S_0 N(d_1) - K e^{-rt} N(d_2) \tag{8}$$

$$P_0 = K e^{-rt} N(-d_2) - S_0 N(-d_1) \tag{9}$$

Where S_0 is the current stock price, K is the strike price at expiration, T is the period to maturity, r is the continuously compounding interest rate, and σ is the annual volatility. It should be noted that $N(\cdot)$ is the normal cumulative distribution function which is also equal to $P(Z \leq \cdot)$.

After calculating the premiums using the Black-Scholes model, the author compared the latest market price of the options and the theoretical price to determine whether the current price is fairly valued or overvalued. The author also calculated the profit and the payoff for each options using two approaches, using the current market price and also the theoretical price, and then displayed the three highest profit for each option type and holding strategy.

3.3.4 Suggested Option Strategy

Using the available profit calculations done above, the author gave some suggestions of option strategy one might utilize with given information on the expiration date. As mentioned previously, the author assumed that the options can only be exercised at expiration.

4 Results and Analysis

4.1 Geometric Brownian Motion Simulation

Before simulating the closing price, the average annual return for the closing price was computed to be 0.188 and the standard deviation to be 0.258. Both constants are important for the Geometric Brownian Motion simulation as they are both the hyperparameters for the simulation.

4.1.1 Daily Closing Price for the Next Six Months

After running the Geometric Brownian Motion simulation for 10 times, the result of the simulated daily closing price for the next six months could be seen on the figure 4. As one could observe, the simulation started off quite narrow in terms of the predicted values and as there is an increase in time, the simulated values became increasingly varied. A fun fact to know is that Geometric Brownian Motion will never yield a negative value.

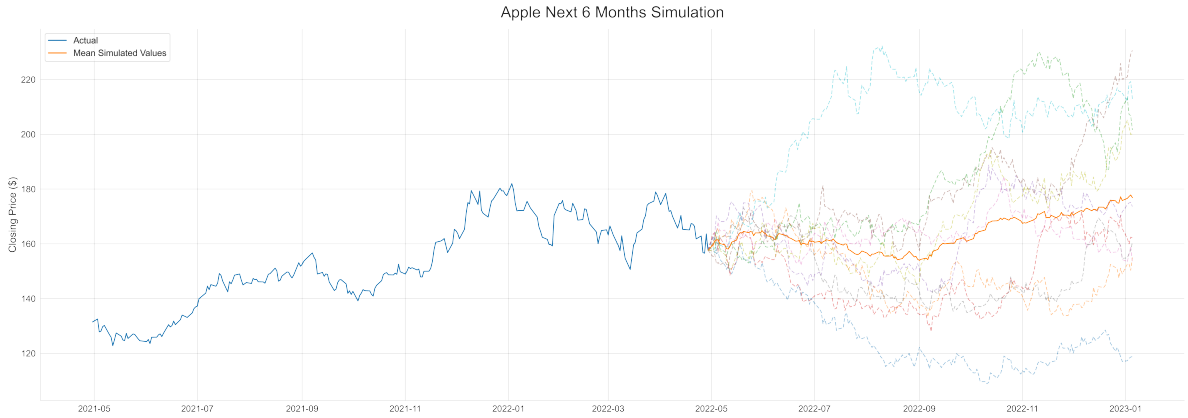


Figure 4: Apple's Simulated Daily Closing Price for the Next 6 Months

By looking at the figure, it could be said that the simulation thought the closing stock price on average would be relatively similar and lied on a similar range to the observed actual value for the past year. A safe assumption gathered from the result would be that the price would oscillate between $140 and $180, which is in a similar ballpark to the actual closing price from the year prior. The mean simulated price also gave the indication that the price would be oscillating around high $150s and low $160s for the next to months before steadily rising up to the high $170s by late November or early December 2022.

There are a few outliers which predicted a sharp increase or a sharp decrease. Around four simulations predicted that by the end of the year, the closing price would be in th $200 range. On the opposite spectrum, one simulation predicted that the price would be as low as $110.

4.1.2 Weekly Closing Price for the Next Two Years

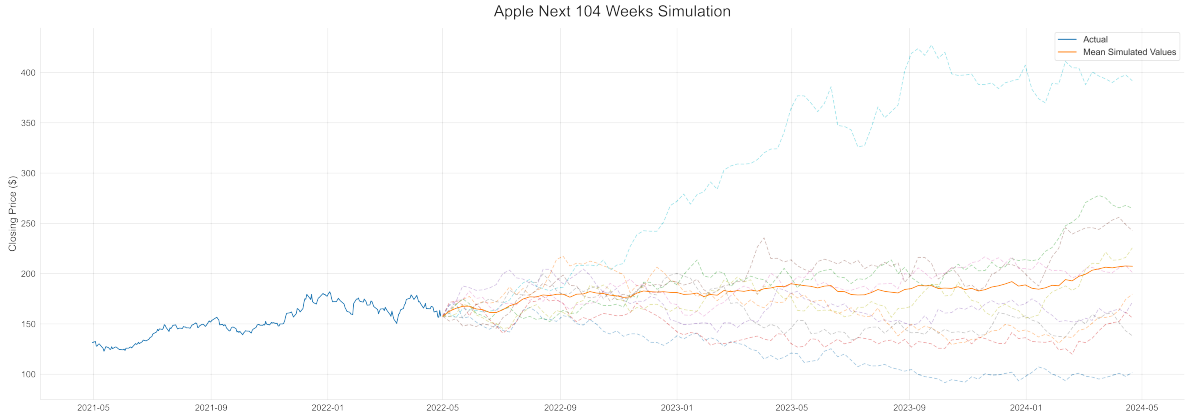


Figure 5: Apple's Simulated Weekly Closing Price for the Next 2 Years

The result of the simulated weekly closing price for the next two years could be seen on the figure 5. The changes in the simulated values were not as rapid as Δt is greater than that of the daily closing price.

The figure indicated that by the end of the simulated period, most of the simulation thought that the price would surpass the $200 barrier. A super-optimistic simulation thought that it might even surpass the $400 barrier somewhere around August 2023. Two of the simulated values had a slightly less optimistic perspective in which they both expected passing the $250 in early 2024. Contrary to that, a very-pessimistic simulation expected the stock price to drop below $100 after September 2023 and oscillates around that point until the end of the simulation.

By taking the mean of the simulated values, it could be observed that the general trend of the simulation was positive. The closing price is expected to steadily rise for almost every week. Eventually, it would surpass the $200 barrier around late February or early March 2024.

That being said, the accuracy of the simulation might not be good in reflecting what might happen in the future. This occur due to the lack of complexity in the simulation where it does not account for inflation, interest rate, as well as the unexpected events which might or might not happen in the future.

4.2 Black-Scholes Model

As mentioned in chapter 3, the options used in the analysis will expire on October 21st, 2022. The reason behind taking the aforementioned date was that the date is relatively far enough from when this research was made but not absurdly far. If the chosen expiration date is too far, then there would be things which would need further considerations which might result in a lot more uncertainties of the results.

Table 1: Simulated Daily Closing Price on Expiration

Simulation	Price($)
1	119.02
2	145.04
3	209.67
4	141.02
5	179.94
6	191.51
7	184.46
8	139.78
9	184.24
10	199.75

Using the daily simulated values for the next six months, the simulated values could be seen on table 1. Thus to decide the stock price at expiration, the author took the average of the simulation which yield the value of $169.44. The value was then used to decide whether the option would be exercised at the expiration date or not. The author also used the interest rate of 0.5% and converted it to its equivalent in continuous compounding annual interest rate 0.004987541511038968. The interest rate will be used to calculate the future value of the cost in order to compute the profit.

4.2.1 Call Options

As a simple rule of thumb, one should expect a higher price or premium for lower strike prices compared to higher strike prices for call options. The main reason is that a buyer would probably rather exercising the option and buying the stoke at a lower price than a higher price relative to the market price at the time, thus the seller would want more in return.

Table 2: Most Profitable Long Call Options

Strike($)	Payoff($)	FV Price($)	FV BS($)	Profit	BS Profit($)
100	69	-59.8	-58.1	9.2	10.9
75	94	-85.8	-83	8.2	11
120	49	-41.1	-38.7	7.9	10.3

Based on the available information obtained by the author, table 2 represents the three most profitable call options should an investor take a long position on Apple's stock sorted according to the profit relative to the last trading price. BS is short for Black-Scholes in which the model was used to calculate the theoretical price, and BS Profit is the profit using the modeled price. It could be observed that for long calls, it was more profitable to long options with the strike price around $75 up to $120. That being said, even the three most profitable long call options could not be considered as undervalued since the absolute theoretical value were a lot lower than the absolute value last price at the time in which each ooption was purchased.

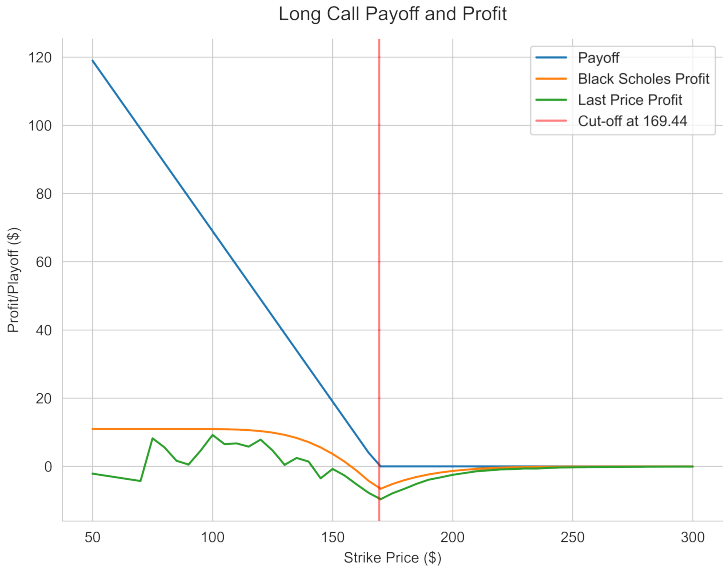


Figure 6: Apple Long Call Options Payoff and Profit relative to Strike Price

Figure 6 confirmed the result in which the most profitable call options to have a long position lied before the threshold price which was $169.4. In order to profit of the transaction, one might want to purchase the calls with strike price somewhere around $75 and $145. Other than the suggested interval, it would be expected that the buyer would lose out. A thing to note is as the strike price increased, the profit would converge somewhere near 0. That happened because the calls prices, both actual and modeled prices, would also be near to 0.

Table 3: Most Profitable Short Call Options

Strike($)	Payoff($)	FV Price($)	FV BS($)	Profit	BS Profit($)
170	0	9.6	6.6	9.6	6.6
175	0	7.9	5.2	7.9	5.2
165	-4	11.8	8.2	7.8	4.2

Table 3 represented the profits should one choose the short the available calls. The profits calculated for the short position were similar enough to the long position seen on table 2. All of the three options could not be considered as undervalued just like its long position counterpart. The two options which would yield the highest profit had 0 payoff as those would not be expected to be exercised given the threshold.

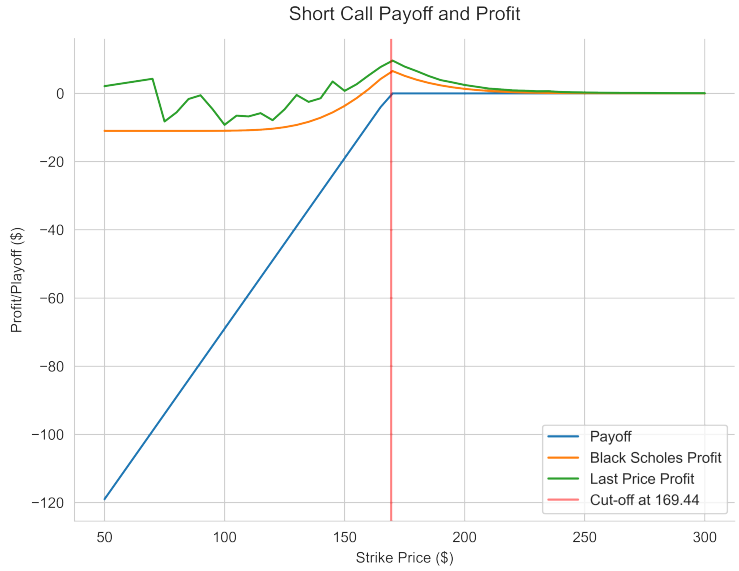


Figure 7: Apple Short Call Options Payoff and Profit relative to Strike Price

As one might observe in figure 7, the short position would be the exact opposite of the long position. One could profit by selling the calls at strike price between $50 to $55 and any price greater than $145. The reason behind the first interval was that the premiums one would received should be plenty to cover the loss should the price at expiration lied on the simulated price. The reason for the second interval was the opposite of the first, in that the premiums received would be moderate but the loss incurred would be small, thus yielding the profit. The three highest profit for calls in this position lied on the second interval.

4.2.2 Put Options

One should expect a higher price or premium for higher strike prices compared to lower strike prices for put options. The reason would be the opposite of that of the call options, in which the buyer would want to sell their stocks with higher price compared to the market price, thus the seller would want more in return.

Table 4: Most Profitable Long Put Options

Strike($)	Payoff($)	FV Price($)	FV BS($)	Profit	BS Profit($)
215	45	-39.6	-57.5	5.4	-12.5
50	≈0	-0.1	≈0	-0.1	≈0
60	≈0	-0.1	≈0	-0.1	≈0

Table 2 represented the most profitable long puts. The most profitable was a $215 strike price in which it would yield a $5.4. That particular put could also be considered as undervalued as it had a absolute greater theoretical price than the absolute last traded price. For the other two options, the payoff, modeled price and profit were not actually 0, but somewhere to the order of 10^{-8}. Despite of that, the last two were still the most "profitable" or to be exact the least one would lost should the market price be equal to the average simulated value.

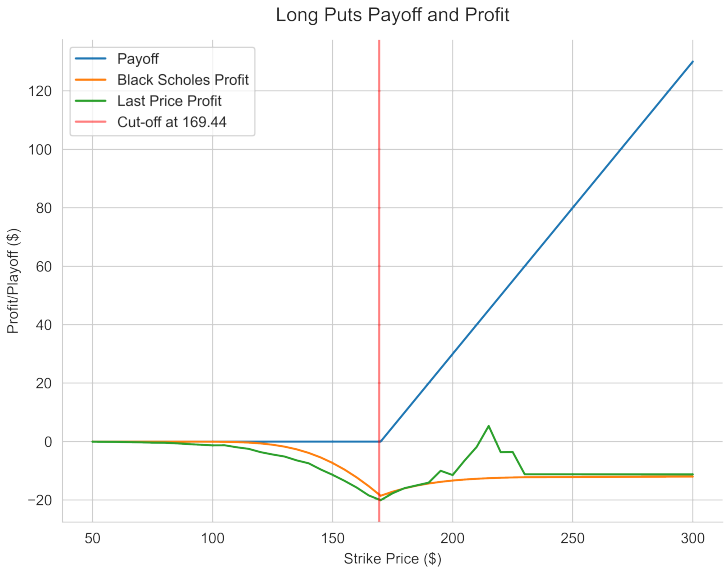


Figure 8: Apple Long Put Options Payoff and Profit relative to Strike Price

Based on figure 8, this option and holding position would not yield a good return. The only point where the strike price would yield a profit was the $215 strike. The main reason why this might happen was due to the expected price at expiration was predicted to be $169.44, thus any options preceeding that value would never be exercised. To add to that, for the strikes greater than or equal to $170, the market price at the time of writing would generally be too high barring the only profitable strike mentioned before. The Black-Scholes model also confirmed the result and generally expected a loss with the given circumstances.

Table 5: Most Profitable Short Put Options

Strike($)	Payoff($)	FV Price($)	FV BS($)	Profit	BS Profit($)
170	0	20	18.5	20	18.5
165	0	18.4	15.2	18.4	15.2
175	-5	22.7	22.1	17.7	17.1

The result for the short position indicated a much more positive outlook as observed on table 5. As the short position would be the exact opposite for the long position, the options would yield a profit. That being said, the absolute Black-Scholes price were still higher than the actual value, thus indicating that the options were still a tad overpriced. For the $170 strike price put, the payoff was actually near to 0, but it would still yield a profit since the premium would cover it.

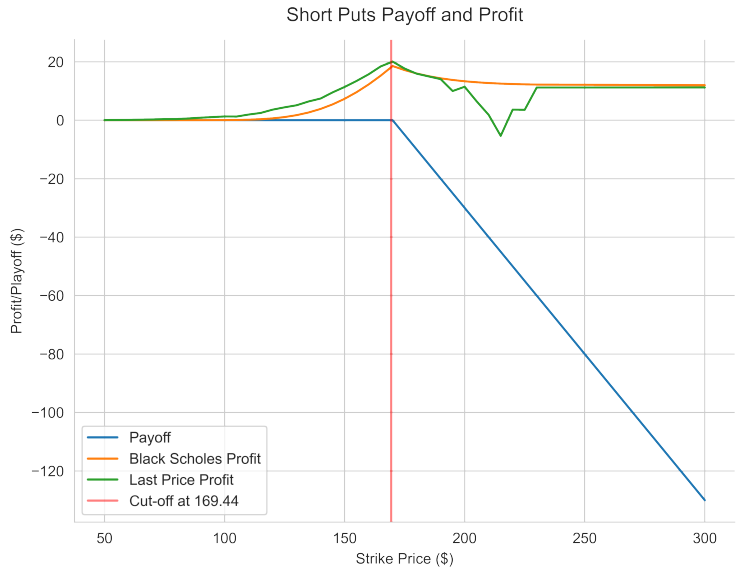


Figure 9: Apple Long Put Options Payoff and Profit relative to Strike Price

The result in figure 9 confirmed the result on table 5. Selling a strike somewhere around the $80 mark would yield a profit, even for the higher strike prices relative to the expected price of our simulation. The reason why the higher strike prices would still be profitable was because eventhough it would probably be exercised, the premiums for the seller should cover the loss (with the exception of the $215 option). For the lower prices relative to the simulated value, the options would be unlikely to be exercised, thus yielding no payoffs but as a consequence the seller would recieve smaller premiums.

4.3 Suggested Option Strategy

Based on the result on section 4.2, in order to maximised profit, an investor would likely to consider selling Apple's put options or either buying or selling Apple's call options with expiration date on October 21st,2022 It should be noted that the results would only be valid assuming that the only way to exercise those options is only at the expiration date. Thus the author would recommend either constructing a short straddle or a long put butterfly spread.

4.3.1 Short Straddle

A short straddle is an option trading strategy composed of selling a call and a put at the same expiration date with the same strike price. The author proposed to sell options with the strike price of \$170. The reason behind setting the strike price to the aforementioned value was mainly due to the \$170 put having the largest possible profit out of all the options analysed, and it was also paired with the call which would yield the highest profit should the investor short.

Table 6: Components of the Short Straddle

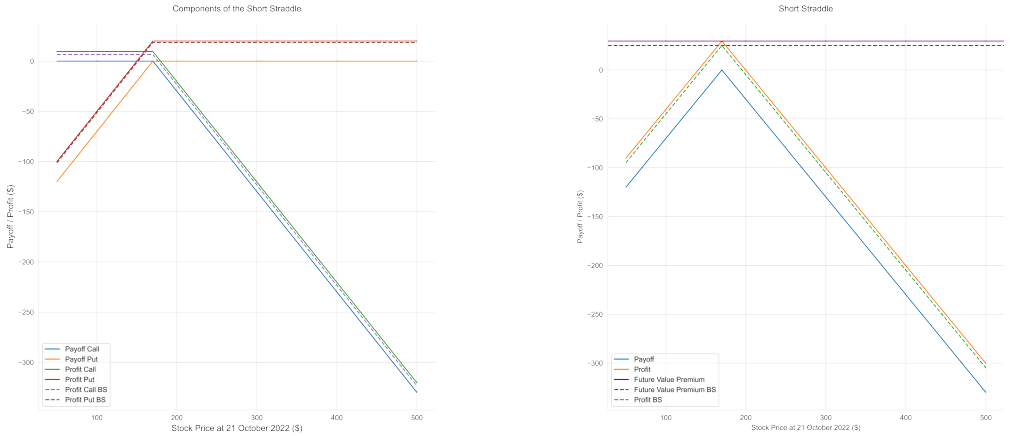
Option	Position	Strike(\$)	PV Price(\$)	PV BS(\$)
Call	Short	170	9.6	6.5
Put	Short	170	20	18.5

A small simulation of profit and payoff for stock values ± \$10 from the strike price resulted in the following:

Table 7: Profit and Payoff from Each Component

S_t	\$170 S. Call	\$170 S. Put	Payoff(\$)	Profit(\$)	BS Profit(\$)
160	0	-10	-10	19.7	15.1
165	0	-5	-5	24.7	20.1
170	0	0	0	29.7	25.1
175	-5	0	-5	24.7	20.1
180	-10	0	-10	19.7	15.1

Table 7 gave an indication that the profit would be relatively high. The maximum profit for this strategy would be achieved if the stock price at expiration is equal to the strike price of the options, thus netting a profit of \$29.7 (latest market price at time of writing) or \$25.1 (Black-Scholes price). The following figure would be the complete breakdown of each components' and the join payoff and profit simulation for stock prices at expiration ranging from \$50 up until \$500.



(a) Payoff and Profits for Each Component

(b) Combined Payoff and Profits

Figure 10: Proposed Payoff and Profit Straddle Breakdown

As one might observe by looking at figure 10, the profit window for this strategy would lie between \$145 and \$195. A big drawback of this strategy was risk. Should the price baloons at the expiration date, the loss incurred by this strategy would be relatively high. As this strategy did not incorporate some sort of cap, theoretically, one could lose infinite money. In fact, this strategy would be a viable option but executing the strategy would also depend on the risk tolarance for each individual

4.3.2 Long Put Butterfly Spread

A long put butterfly spread can be made by selling two at-the-money put at the same strike price, buying an in-the-money put, and also buying an out-of-the-money put all expiring on the same date. The author proposed that the two at-the-money short puts should have a \$170 strike price, the out-of-the-money long put should have a \$50 strike price, and the in-the-money long put should have a strike price of \$210. Essentially, the idea was that the \$50 long put would never be exercised and generated the highest profit out of all in-the-money puts, The \$210 long put would be highly unlikely to be exercised, but there was a concern to keep the cost as low as possible, thus \$210 put was selected. The short puts were chosen at the particular strike price since it according to the simulation, it would yield the highest profit.

Table 8: Components of the Long Put Butterfly Spread

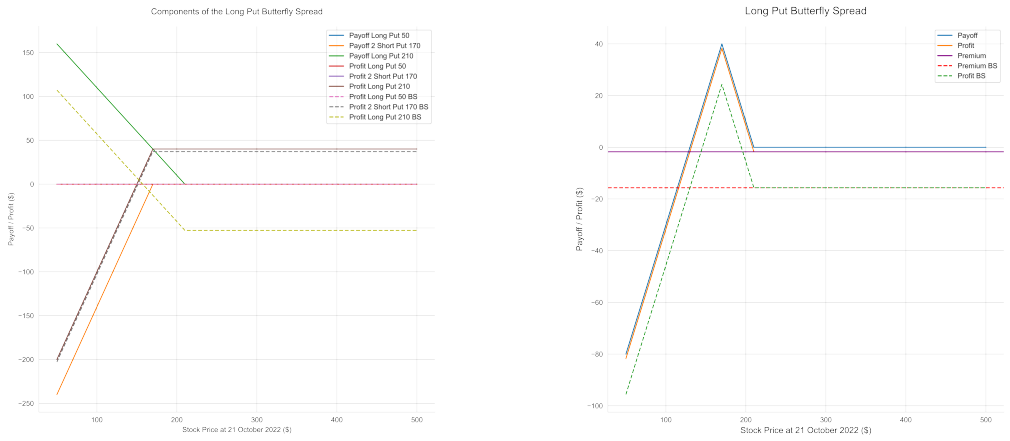
Option	Position	Strike(\$)	PV Price(\$)	PV BS(\$)
Put	Long	50	0.05	≈0
Put	Short	170	20	18.5
Put	Short	170	20	18.5
Put	Long	210	41.7	52.6

A small simulation of profit and payoff for stock values ± \$10 from the strike price resulted in the following:

Table 9: Profit and Payoff from Each Component

S_t	\$50 L. Put	2 \$170 S. Put	\$210 L. Put	Payoff(\$)	Profit(\$)	BS Profit(\$)
160	0	-20	50	30	28.2	14.3
165	0	-10	45	35.7	33.2	19.3
170	0	0	40	40	38.2	24.3
175	0	0	35	35	33.2	19.3
180	0	0	30	30	28.2	14.3

By observing table 9, it was clear that both profits were higher than the previous strategy. Peak profit would be achieved on the short puts's strike price of \$170. As previously mentioned, the \$50 put would never be exercised. This strategy also benefits from having a steady contribution from the long \$210 put. The following figure would be the complete breakdown of each components' and the join payoff and profit simulation for stock prices at expiration ranging from \$50 up until \$500.



(a) Payoff and Profits for Each Component

(b) Combined Payoff and Profits

Figure 11: Proposed Payoff and Profit Straddle Breakdown

Figure 11 gave a confirmation of the result. This strategy yielded higher profit than the short straddle. The profit window would also be larger, ranging from \$135 to \$205 when considering the price as the last traded price at the time of writing and a slightly narrower \$150 to \$ 190 when considering the modelled price. A benefit of this type of strategy is the added security. The loss generated from this strategy should the price balooned would not exceed the premium and Black Scholes modeled prices of \$1.7 and \$ for the profit and \$15.7 for both premiums respectively. The only drawback was the big potential loss should the stock price drops below the lower boundary of the window.

5 Conclusion

Apple.inc's stock could be simulated using Geometric Brownian Motion. The 10 simulations indicated an upward trejectory. For the daily closing price, the average simulated predicted that there would be some oscillation between $150s to $160s before steadily rising towards the $170s. The weekly closing price also indicated a positive trend in which it would surpass the $200 threshold by late February to March 2024.

Generally speaking, the observed Apple's options expiring in October 21st, 2022 tend to be overvalued when compared to its calculated Black-Scholes theoretical values. The average simulated values indicated that the closing price on the expiration date would be $169.44. It would be possible to create a long put butterfly spread in order to minimise the possible loss as well as maximizing profit for the aforementioned expiration price. The maximum profit from the proposed strategy would be somewhere around $24.3 up to $38.2 depending on the flucatuation of the premiums for the options.

Author's Remarks

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