

# The Financial Situation of Microsoft and Designed Binary Option

Keke Cao<sup>1,\*,†</sup>, Jerry Liu<sup>2,†</sup>, Serena Sun<sup>3,†</sup>, Jason Xie<sup>4,†</sup>

<sup>1</sup> Santa Margarita Catholic High School, CA 92688, Rancho Santa Margarita, The United States

<sup>2</sup> 6 Centerpointe Drive, Suite 701 La Palma, CA, 90623

<sup>3</sup> JPED Academy, 100000, Beijing, China

<sup>4</sup> Xi'an Gaoxin No.1 High School, 710000, Xi'an, China

\*Email: guanghua.ren@gecademy.cn

†These authors contributed equally.

## ABSTRACT

Microsoft is an American multinational technology company that attracts a lot of attention from investors. This report provides effective information for investors by analyzing its financial data, making forecasts and evaluations. This study analyzed Microsoft's financial performance, stock price change, and standard & Poor's constant. At the same time, a special option, binary option, is introduced. Furthermore, the influence of sensitivity analysis on price and volatility is also introduced. MSFT trades at around \$220 to \$290 a month, giving it a return of close to 0.1% to 6%. According to the sensitivity analysis with the market price as the variable, when the market price rises, the call option's value will gradually approach \$20. On the contrary, the value of the call option will gradually decrease with the market price decline. In addition, when the market price rises by \$1, the value of the call option will rise by \$0.1027, in the process showing that there is a positive correlation between the market price and the value of the call option in this case.

**Keywords:** Microsoft, Trades, Sensitivity analysis, Technology company

## 1. INTRODUCTION

The main purpose of this report is to analyse or forecast the target company, Microsoft, about its financial performance and predicted future growth based on the historical financial figures. Thus, the main function of this report will provide a comprehensive and critical evaluation of Microsoft based on a number of quantitative analyses to investors who could obtain the vital and valuable information from this report to assist them in making the investment decision. The report is mainly categorized into three components.

The initial part of the report is to provide a brief introduction about what Microsoft is and how it operates. Besides, the company's financial performance and stock price movements both have also introduced in the first section. In addition, the concept of option one of derivatives in the financial market has also been introduced and discussed how it would work in this report study. The second component of the study is to conduct a financial analysis of Microsoft's performance which is reflected by the calculation of its historical

return and risk based on the CAPM model [1] and [2]. The benchmark index as the S&P 500 index has also been analysing in this section to compare with the performance of Microsoft. It can compare with the S&P 500.

The final part of the report is to focus on the sensitivity analysis of Microsoft. It has introduced the concept of binary options to affect the changes of various parameters such as strike price, market price, volatility and time maturity. The sensitivity analysis's main function is to predict Microsoft's ongoing performance in the financial market and give investors a helpful message to guide their investment decision. Moreover, the characteristics of binary option and sensitivity analysis both have been critically discussed in the report to support the result finding.

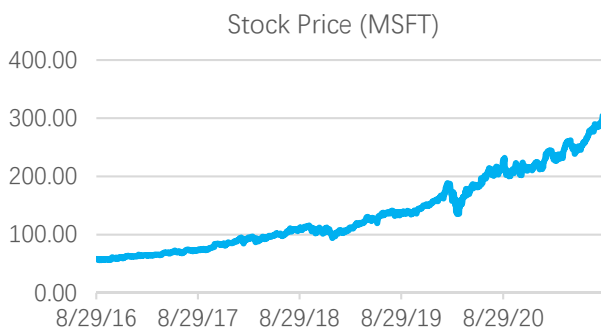
Overall, the essay has used the methods between the stock return calculations based on the CAPM model and outcomes of binary options in association with the Black-Schole model in this article to evaluate the variability of various parameters. As a result, it can be

concluded that Microsoft's returns and risks outperformed the market performance of the S&P 500 index. Besides, it can recommend that investors use binary options to construct their own investment strategies to invest in Microsoft shares.

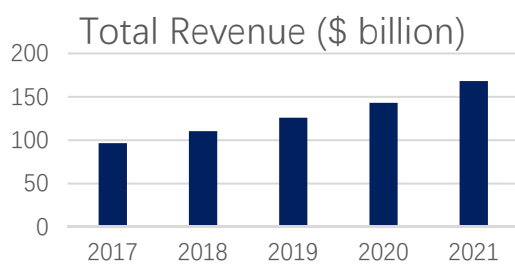
**2. FIRM DESCRIPTION: MICROSOFT (MSFT)**

Microsoft is one of the highest technological companies globally, which focuses on providing computer software, consumer electronics, PCs and relevant services. The organization's core business can generally be divided into three segments: productivity and business processes, intelligence cloud, and personal computing.

Figure 1 shows the performance of Microsoft's stock price movements over the recent five years [3]. It can be clearly seen that Microsoft's stock price remains a growing trend from around \$50 in 2016 to above \$300 in 2021, which has achieved over six times of growth within five years despite few downward volatilities during this period.



**Figure 1.** The stock price of Microsoft



**Figure 2.** Total revenue of the company

Figure 2 illustrates Microsoft's total revenue performance over the recent five years from its annual report [4]. The company reported strong financial during the last reporting quarter. Microsoft reported total revenue of \$46.15 billion, +21% per year, beating consensus at \$44.25 billion and the high end of guidance at \$44.5 billion [3]. Revenue was helped by an incremental ~1% of revenue growth from foreign exchange vs. what was implied at guidance. Gross margins of 69.7% also beat consensus with out-

performance in high margin Server Products helping to offset headwinds from a higher mix of low margin Xbox console revenue. Operating expenses growth of +6% resulted in 42% per year operating income growth. Operating margins of 41.4% also beat the market consensus. Further, generally accepted accounting principles grew 49% coming in at \$2.17. The mid-point of revenue guidance of \$43.75B was over \$1 billion ahead of consensus at \$42.6 million. Importantly, CFO Amy Hood sounded constructive at the prospect for continued margin expansion in the fiscal year 2022 and beyond (ex-useful life accounting change) and guided double-digit revenue and operating margin growth in 2020. Additionally, in constant currency, Azure revenue growth should remain relatively stable on a sequential basis. O365 seat growth accelerated to +17% per year after four quarters of 15% per year growth, helping to drive an overall O365 acceleration. With strong Q4 results and Q1 guide (over \$1B ahead of consensus), and robust forward indicators like commercial bookings growing at an accelerated pace, one can perceive Microsoft to be a good investment opportunity going forward.

**3. OPTION PRICING FOR BINARY OPTIONS**

An option is the right of a buyer to buy or sell a certain amount of underlying assets at an allowable time in the future after paying a certain price for the option. The option price is the only variable that changes with the market supply and demand in the option contract. Its level directly affects the buyer and seller's profit and loss, which is the core problem of options trading. As early as 1900, French financial expert, Laures Bachelier, was the pioneer who published the first article about option pricing and established the modern option pricing theory to price options [5]. Since then, various empirical formulas or measurement pricing models have been published, but it is difficult to get universal recognition because of various limitations. Since the 1970s, with the rapid development of the options market, the study of option pricing theory has made a breakthrough [6] and [7].

Collins et al. [8] have noticed that the formation and development of the international derivative financial market and the reasonable pricing of options have been a big problem for investors. However, with the application of computers and advanced communication technology, the application of complex option pricing formulas becomes possible. Over the past two decades, investors have turned this abstract numerical formula into a wealth of money by using the Black-Scholes option pricing model.

Fama and French [9] also mention that Option pricing is one of the most mathematically complex problems in all financial applications especially

associated with the financial market and stock change. This work has played a significant role in promoting financial innovation and the emergence of various emerging financial products.

Binary options only consider the price trend of the underlying asset (bullish or bearish), while investors need to consider both the price trend (bullish or bearish) and the rise or fall of traditional financial instruments such as stocks and foreign exchange. Therefore, binary options are simplified financial instruments. The return and risk of the binary option are fixed in advance, and the return is only determined by whether the underlying asset's price meets the predetermined conditions. To put it simply, investors can invest options in the stock, index, foreign exchange and commodity futures on the selection platform. They only need to judge the direction of rising and fall and can trade without considering the range of rising and fall.

One of the outstanding characteristics and investment advantages of binary options is that they can make high profits only when the expiration price of the option is increased compared with the strike price (even if it only fluctuates by one cent). Therefore, binary options can bring significant investment returns to investors even in a slow market. On the other hand, if you buy financial products such as stocks or foreign currencies, you need a lot of market volatility to make a positive return.

Binary options are not options in the traditional sense because, unlike primitive trading instruments, they do not give you the right to buy or sell the underlying asset. Instead, they give you the right to earn a fixed return (typically between 65% and 81%).

If the investor decides that Google shares will be above the current market price (\$571.15) at 3 p.m., he will click the green button to buy the call option. If not, buy a put option. However, whether buying a call option or a put option, if the investor's price expectation proves correct, he or she will earn a net return equivalent to 70% of the original investment. In this example, a \$100 investment will yield a return of \$70. An investment client who predicted wrong would face only 15% of their initial investment, which in this case would mean a net loss of \$85. If he is a layman and his price expectation is correct 50% of the time, that is, half of the time the price rises and half of the time the price falls, his expected return is  $:(70*0.5)+(-85*0.5)=-7.5$ , that is, the expected loss of \$7.50, the loss rate is 7.5%. By buying binary options, investors can watch the stock price until 3 p.m., when the expiration price is displayed on the trading platform.

#### 4. RESULTS ANALYSIS

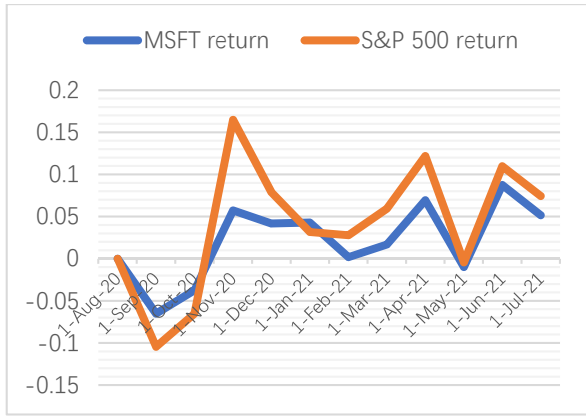
Based on the information I gleaned from Yahoo, it can be seen from this excel that the price of S&P 500

and MSFT and the return from July 2020 to August 2021, the volatility of MSFT and S&P 500, and the risk-free rate of MSFT for one year.

**Table 1.** Specific calculation value in Excel

Date	MSFT price	S&P 500 price	MSFT return	S&P 500 return
1-Jul-21	284.91	4,395.26	0.051716501	0.022748109
1-Jun-21	270.9	4,297.50	0.087515054	0.022213976
1-May-21	249.1	4,204.11	- 0.009936407	0.005486503
1-Apr-21	251.6	4,181.17	0.069591464	0.052425313
1-Mar-21	235.23	3,972.89	0.016946954	0.042438634
1-Feb-21	231.31	3,811.15	0.001819048	0.026091475
1-Jan-21	230.89	3,714.24	0.042863595	-0.01113664
1-Dec-20	221.4	3,756.07	0.041735284	0.037121407
1-Nov-20	212.53	3,621.63	0.057310582	0.107545658
1-Oct-20	201.01	3,269.96	- 0.037400632	- 0.027665775
1-Sep-20	208.82	3,363.00	-0.065138559	- 0.039227954
1-Aug-20	223.37	3,500.31		

Comparing their stock prices, MSFT's monthly stock price is approximately between \$220-290, but the monthly stock price of S&P 500 is nearly ten times higher than that of MSFT, which fluctuates between 3500-4400 per share. For returns, MSFT is close to 0.1%-6% per month, which is relatively tiny of the volatility compared with the S&P 500. But relative to the average returns of other companies in the market, the volatility is also very low. MSFT has three months of negative fund return, which is loss. The return of the S&P 500 is very similar to that of MSFT. Its return rate is 0.5%-10%, with low volatility but slightly larger than MSFT's volatility. It has three months of capital losses, but one month's return is significant and outstanding, at 10%.



**Figure 3.** Line chart of comparison of the return of MSFT and S&P 500

From the return of the two in this chart, it is also obvious that the return of the S&P 500 is higher than that of MSFT for most of the year. MSFT's volatility is 16% a year, and S&P 500 is 14% a year. Volatility is a statistical measure of the dispersion of returns for a given security or market index. In most cases, the higher the volatility, the riskier the security. So the annualized volatility of MSFT is greater than S&P 500, which means that the price of MSFT can be huge changes in either direction occurred in a short period. The lower volatility of the S&P 500 relative to MSFT implies that its value will not fluctuate drastically and is often more stable. The risk-free rate is the key input for calculating the cost of capital and uses CAPM, which describes the relationship between systematic risk and the expected return of assets (especially stocks). The higher the risk-free rate is, the higher the value of the call option is. Through calculations after CAPM, MSFT's risk-free rate for one year is only 0.07%, which is a lower interest rate than other companies. The lower the risk-free rate of return, the lower the risk and the lower the return.

**5. SENSITIVITY ANALYSIS**

Market price, volatility, time maturity, and strike price are four factors that could impact the change of a call option value based on the Black Shole model proposed by CAPINSKI, M., & KOPP, P.[10]. Besides, the fluctuation of the price will indicate the market's current condition and will directly affect the gains and losses of the consumer ultimately.

**5.1. Sensitivity analysis as the strike price is the only variable**

To begin with, the strike price means that the buyer of the call option will own the rights to purchase the derivative at a set price at the time of contract expires. Moreover, the strike price determines the value of the call option. Call option buyers believe that in the future, the product's market price will be higher than the strike

price on the contract, and therefore they can gain benefit by purchasing the product at a lower price.

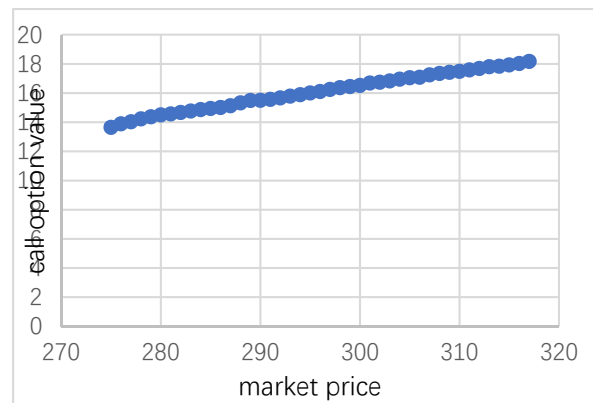


**Figure 4.** Sensitivity analysis based on strike price as a variable

From the sensitivity analysis based on the strike price as a variable, it is found that the value of the call option increases when the strike price decreases. Therefore, as the strike price gradually decreases, the call option's value gradually approaches \$20 (based on the binary option designed in this article only). Conversely, as the strike price gradually rises, the value of the call option gradually falls due to the reason that this implies that in the future, there are fewer opportunities that the strike price will be higher than the future market price, which means that there is a greater chance of loss.

**5.2. Sensitivity analysis as the future market price is the only variable**

Secondly, another factor that affects the strike price in a binary option is the future market price. According to the binary option price definition, when the future market price is greater than the strike price, the consumer holding the call option will benefit. Otherwise, the consumer will gain nothing. Therefore, depending on the market price, the value of the call option will also change accordingly.

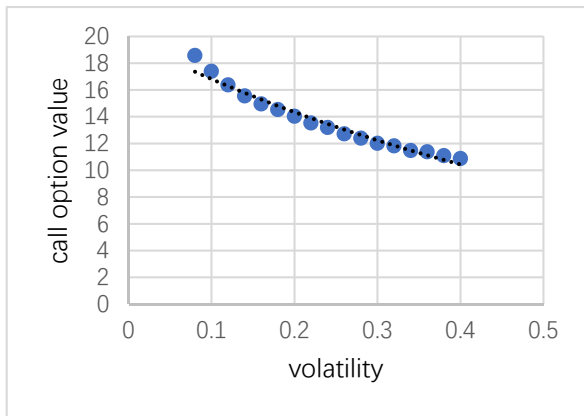


**Figure 5.** Sensitivity analysis based on market price as a variable

According to the sensitivity analysis with the market price as the variable, when the market price rises, the call option's value will gradually approach \$20. On the contrary, the value of the call option will gradually decline as the market price falls. Furthermore, when the market price rises by \$1, the call option's value rises by \$0.1027, which demonstrates the positive correlation between the market price and the value of the call option on this occasion.

**5.3. Sensitivity analysis as the volatility being the only variable**

Thirdly, market volatility exhibits the likelihood and range of an increase or decrease in the product's market price. For example, in the design of the binary option in this article, the product's market price is initially higher than the strike price on the contract, which means that the consumer purchasing the call option expects the market price of the product to remain above the strike price.

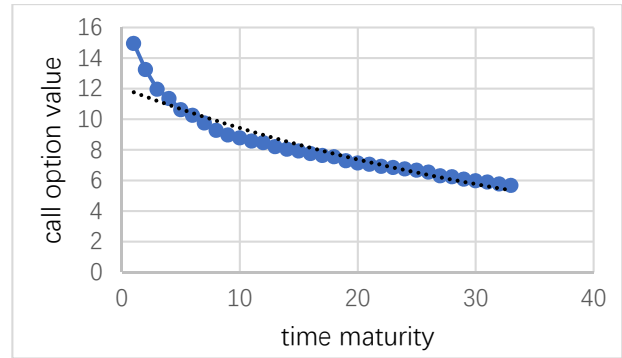


**Figure 6.** Sensitivity analysis based on volatility as a variable

An increase in volatility increases the possibility of the market price falling, or even falling below the strike price. Therefore, an increase in volatility causes an increase in the possibility of loss. On the contrary, when volatility decreases, the market price of the product is ensured to fluctuate in a small range, rooting from the reason that the possibility of the market price falling below the price of the product is reduced, in which case the consumer's return is more favorably ensured.

**5.4. Sensitivity analysis as the time maturity being the only variable**

Fourthly, time maturity refers to the length of time a derivative contract will expire. In general, a longer option term means that there is a greater likelihood and chance that the market price will be higher than the strike price and hit the strike price and that consumers will be able to benefit from this situation, so generally, a longer option term tends to imply a higher value of the call option.



**Figure 7.** Sensitivity analysis based on time maturity as a variable

However, in the call option designed in this article, the product's market price is higher than the strike price at the beginning. Therefore, the shorter the time maturity is, the more secure the consumer's return will be. More precisely, if the time maturity of the binary option becomes longer, there is a greater chance that the market price may fall under the strike price. Under the circumstance, the consumer may benefit nothing. On the other hand, a shorter time maturity indicates that the price of the product will usually not change much during this time period, leading to the effect that the market price will remain higher than the strike price. In this case, the consumer can gain when the contract expires.

**6. CONCLUSION**

We demonstrate the varying return trends and outcomes of binary options in this article depending on the variability of various parameters. The sensitivity analysis, which focuses on the variables such as strike price, market price, volatility and time maturity, provides a more comprehensive forecast for investments and assists investors in making better decisions based on future changes in the market. Furthermore, the analysis and processing of the financial situation of Microsoft reveal the investment potential and financial capability of the company. By further analyzing Microsoft's stock price over the past year and analyzing it with the S&P 500 data, we can determine the return rate and volatility of the company. Moreover, by analyzing the return rate and volatility of the company, we can estimate the risk level of investing in Microsoft. In this process, these analyses based on the company's financial situation and investment potential highly encourage investors to make better decisions and reveal the timing of buying and selling options.

To further extend the understanding of this binary option, we present the impact of different variables on the final option value in the sensitivity analysis section, which helps consumers to better ensure their benefits by showing how the value of these binary options changes under different scenarios, for example, an increase in

the strike price implies a decrease in the option value. Through the analysis of the company's development potential and the discussion of future option value according to varying parameters, the earning potential and speculative risk of this binary option have been fully discussed.

## REFERENCES

- [1] Sharpe W.F. (1964) 'Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk', *Journal of Finance*, 19(3), pp. 425-442.
- [2] Markowitz H. (1952) 'Portfolio Selection', *Journal of Finance*, 7 (1), pp. 77-91.
- [3] Yahoo Finance. (2021). "Microsoft Corporation (MSFT)." Yahoo Finance, 2021. Available at: <https://finance.yahoo.com/quote/MSFT/>
- [4] Microsoft Annual report (2021). Available at: <https://www.microsoft.com/en-us/Investor/annual-reports.aspx>.
- [5] Edward, J.S. and Timothy, M.W. (2014). 'Louis Bachelier: The Father of Modern Option Pricing Theory', *The Journal of Economic Education*, 22(2), pp.165-171.
- [6] Black, F., Michael J.C. and Myron S. (1972). The capital asset pricing model: some empirical tests, in M. Jensen, ed: *Studies in the Theory of Capital Markets* (Praeger).
- [7] Engle, R. F. (2016). Dynamic conditional beta. *Journal of Financial Econometrics*, 14(4), 643–667.
- [8] HCollins, D. W., Ledolter, J., & Rayburn, J. (1987). Some further evidence on the stochastic properties of systematic risk. *Journal of Business*, 425–448.
- [9] Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427–465.
- [10] CAPINSKI, M., & KOPP, P. (2013). *The Black-Scholes model*. Cambridge, UK, Cambridge University Press.