Tanya Sharma
Derivatives
Professor Naumova
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HONOR PLEDGE

On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment.

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I decided to concentrate my research for this project on Meta, a buzzy new IT firm that runs WhatsApp, Facebook, Instagram, and Threads. These well-known social media platforms are expanding even further thanks to AI features. Social media platforms regularly shift in relevance due to weekly trends. Though it is believed to increase productivity on the app, Meta AI, a new feature akin to chat GPT, has lost $200 billion in value despite Meta's strong earnings. Although this is significant, many may anticipate that if the TikTok ban is put into effect, the value will rise once more. Instagram reels, which are very similar to TikTok's short video format, will be popular with users of the app. Thus, due to Meta's volatility, hedging can benefit the company. By mitigating risk from the volatility of Meta, option holders can invest in these versus other AI competitors in the market.

To start, I found data from mid-March to mid-April. Then, I computed linear regression in Excel to predict the next business day's stock price using the stock prices. Using the intercept and business day values, I was able to get my m and b for the y=mx+b formula. I made x = 22 because that is the business day we were solving for. With that, I found the expected stock price of April 23rd to be $500.80, which was closely reflected in the other stock prices for the month I used.

Then, I used the Black-Scholes Merton formula to calculate the price of the call option given the stock price that I calculated, the strike price of the option, the 10-year yield I found, and volatility, which I found on Yahoo Finance and accordingly calculated my d1 and d2 values. With that, I got a call value of $218.23.

Next, I calculated the Greek values of delta, vega, theta, rho, and gamma using the same values that I used to calculate the BSM. My delta of .84 means that for every dollar increase the option price will increase by .84 cents, which is fairly high, which is where hedging will be beneficial.

The vega indicates that for a 1% increase in volatility, the option price will change by $.29.My gamma value was very small, indicating that the changes to delta will be slower as the stock price increases by 1 dollar. My theta variable indicated changes over a year in price was -682.95, and my rho value shows that for every 1% increase in the risk-free asset, the option price will change by $11.80.

Then, I performed delta hedging. Delta hedging helps eliminate and reduce potential changes in stock prices by creating a counterbalance position to cancel out the delta. In my case, to make the position in our portfolio delta-neutral, we need to buy 82805 shares. Using weights of 50,000 for both options 1 and two, I performed gamma and vega hedging using the gamma 1, gamma2, gamma of the portfolio, vega1, vega2, and vega of the portfolio values. I set up two equations and conducted a system of equations using the solver function on Excel and found that we should sell 60504.07 shares of option 1 and 40782.02 shares of option 2 to make the portfolio gamma and vega neutral. To find how to make the delta neutral in this case, I multiplied w1 by 50K and added it to W2*50,000. When doing this, I found that we needed to buy 82341.56 shares to make the delta neutral.

Overall, this company is highly volatile as it is a tech company with many changes, as indicated by the values we computed for the Greeks. However, this risk can be mitigated by performing hedging on delta, vega, and gamma, as it reduces the risk that is associated with volatility and stock price.

Works Cited

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