Useful definition

Moneyness is a description of a derivative relating its strike price to the price of its underlying asset. At the money is a situation where an option's [strike price](https://www.investopedia.com/terms/s/strikeprice.asp) is identical to the price of the [underlying security](https://www.investopedia.com/terms/u/underlying-security.asp).

df[df$Strike==460,] has the smallest absolute value of moneyness is the one we are interested about.

The break-even points refers to the value that We can start to make money on our call option. It is defined as strike price + premium, which in our case is 460+58.55 = **518.55**

58.55 is the last price

GBSOption(TypeFlag = "c",S=461.7,X=460,Time =65/360, **r=0.00079** ,b=0.00079,sigma = 0.7424)

R = 0.7% is a suitable rate after for loop searching for the range(0,2%)

The kind of implied interest rate in our case is 0.7% very close to 0, and this matches with the current market situation of nearly zero interest rate.

From the GBS characteristics we can easier derive the vega and theta of the option we are trading

**$vega**

**[1] 77.03978**

**$theta**

**[1] -157.9161**

10 days later, TSLA stock is UP 6% and Implied Volatility has risen 10 points. What is the value of your option then? How did the Greeks change?



The table provides how the Greek changes over the time in both situation

Generally, when the stock goes up, the option value goes up and delta goes up; when the stock price drops, the premium value goes down.

Part2

change the xlsx file into csv for better locate the current data range

Chart, scatter chart

Description automatically generated

Use the last price as inputs of GBSvolatility

Because the deep in money call is illiquid so some of them yield nearly 0 volatility because the last price is behind of the current price.

In a more practical way , I tend to use the midpoint of bid and ask to generate the volatility smile curve. Here is it

# draw the graph with the midpoint of bid and ask

A picture containing chart

Description automatically generated

It looks exactly like the typical volatility smile curve. Very high Iv at low-moneyness range and the lowest point happens nearly the current spot price and it goes up again when the moneyness goes positive and goes high.