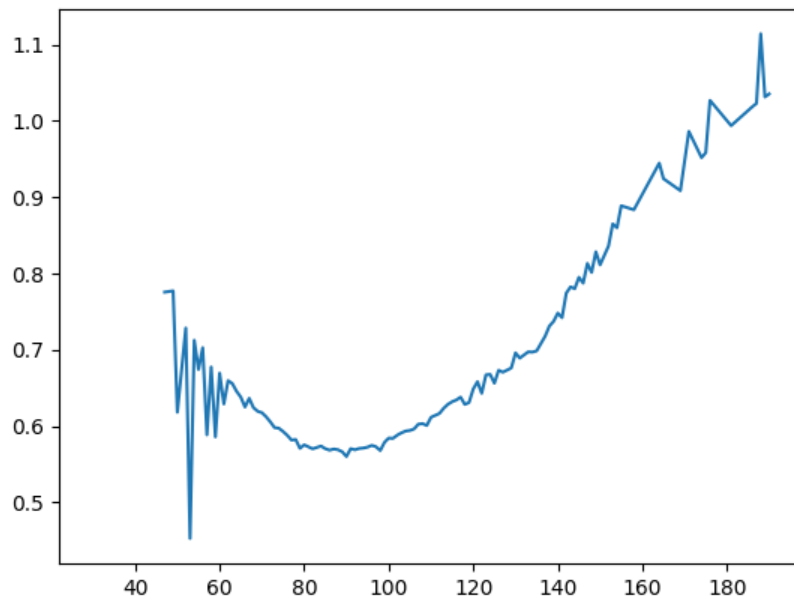


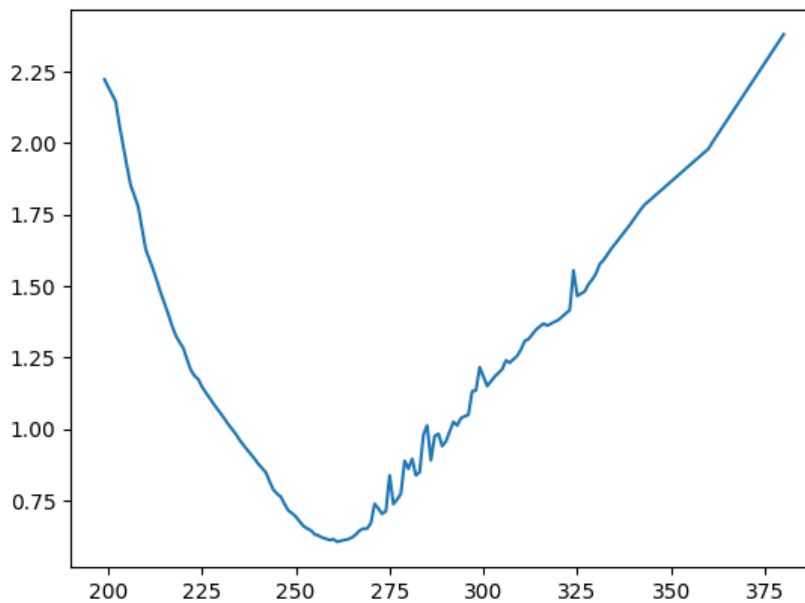
Sam Graf, Bryan Kau, Vincent Liang, Austin Mello

Using BSM to price TSLA options

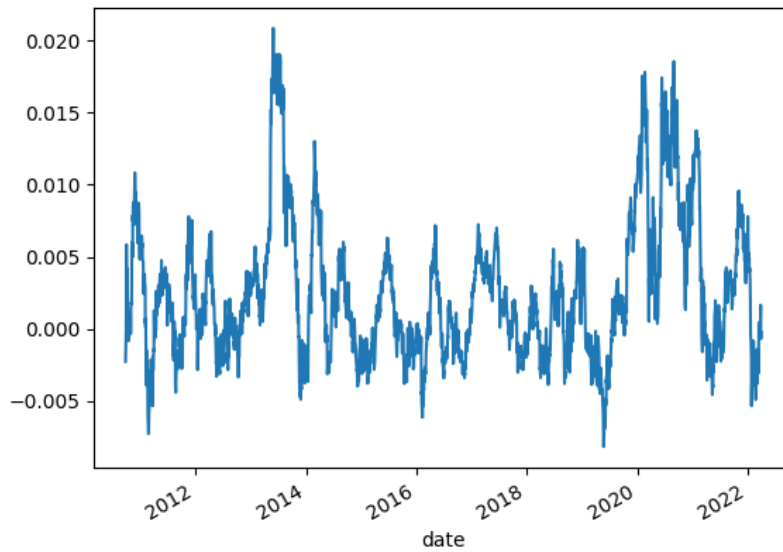
* Insert graph of 2-month calls



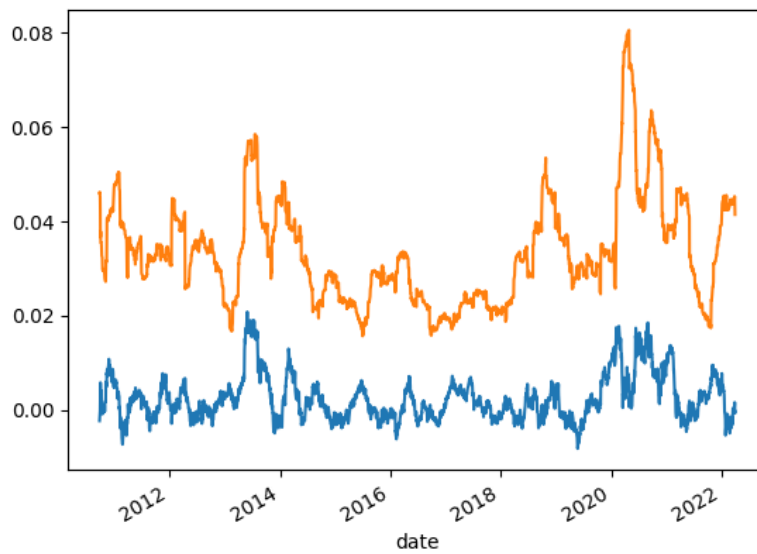
* Insert graph of 2-month puts



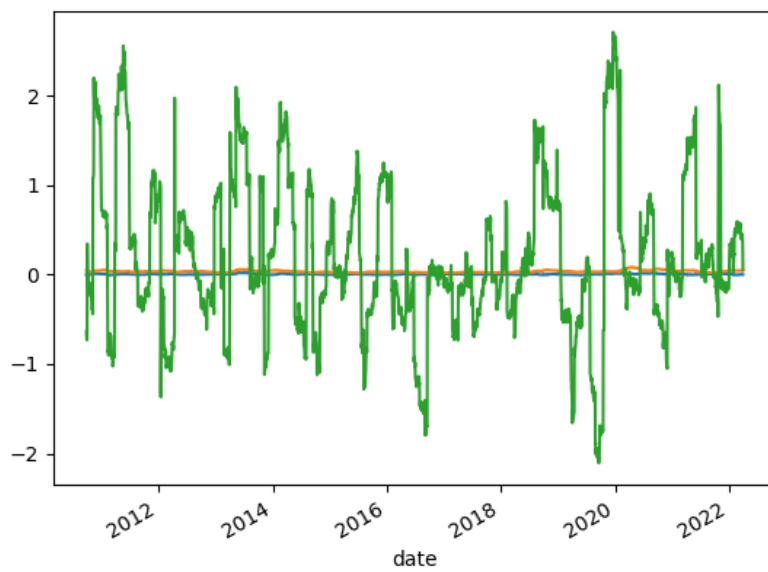
* Insert graph of 60-day rolling mean



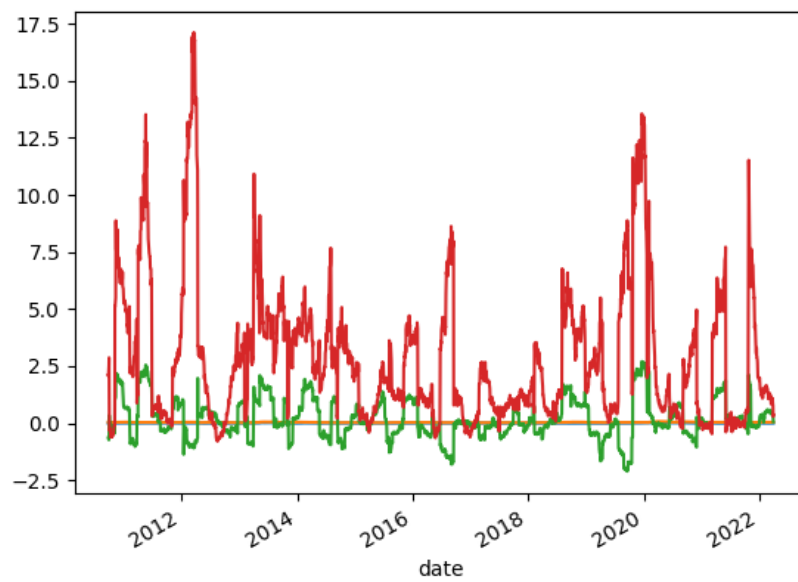
* 60-day rolling volatility



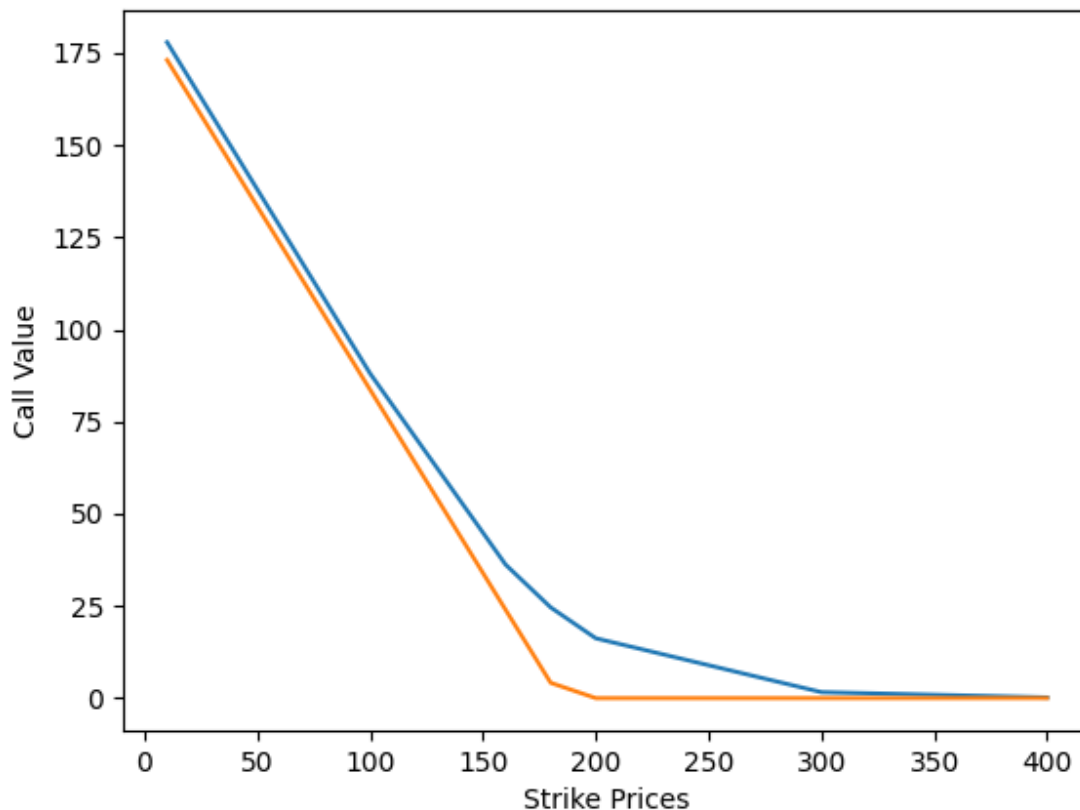
* 60-day rolling skewness



* 60-day rolling excess kurtosis



* Insert bootstrap distribution price and graph if necessary



KEY:

Blue = Monte Carlo

Orange = Black-Scholes

Options traders use implied volatility to characterize an option. Explain why this is a useful practice.

Oftentimes option traders turn to implied volatility to value an option because it provides more insight to the price movements in certain scenarios. Besides being able to trade the VIX or betting on volatility using a straddle or strangle, periods of high and low implied volatility tend to cluster together and a mean reversion is typically observed. Given the inverse relationship between asset prices and volatility, investors can project future option returns based on past volatility and economic climate.

Discuss the possible reasons why the implied volatility plots look as they do.

Looking at the plot of our implied volatilities for both calls and puts of TSLA, we see a significant “smirk” shape in differing directions for both calls and puts. There are a couple reasons that we might see this particular shape and the most pertinent being the excess kurtosis of the asset. TSLA has significantly outperformed the market in recent

years and has had significant and frequent price jumps. The model takes these large jumps that would usually be outliers for indices and assets with lower betas and gives a higher probability of these events specifically to TSLA. The returns are far from a normal distribution and play a key factor in the implied volatility of the asset. Similarly, since the majority of TSLA's price movements were positive from the historical data, the distribution carries a positive skewness that we would typically see with longer maturity options.