Instructions:
Be verbose. Explain clearly your reasoning, methods, and results in your written work. Write clear code that is well documented. With 99% certainty, you cannot write too many code comments.

Written answers are worth 8 points. Code is worth 2 points. 10 points total.

1. When finished, respond to the questions in Canvas as "done." We will record your grade there.
2. In your code repository, create a folder called "Week06."
3. In that folder, include
   a. a document (preferably a PDF) with your responses.All code
   b. A README file with instructions for us to run your code

Everything must be checked into your repository by 8am Sunday 11/2. A pull will be done at that time. Documents and code checked in after the instructors pull will not be graded. I would suggest getting this done before spring break, but it will not be graded until after.

Data for problems can be found in CSV files with this document in the class repository.

Problem 1
Assume you a call and a put option with the following

- Current Stock Price $165
- Current Date 03/03/2023
- Options Expiration Date 03/17/2023
- Risk Free Rate of 5.25%
- Continuously Compounding Coupon of 0.53%

Calculate the time to maturity using calendar days (not trading days).

For a range of implied volatilities between 10% and 80%, plot the value of the call and the put.

Discuss these graphs. How does the supply and demand affect the implied volatility?

Problem 2
Use the options found in AAPL_Options.csv
- Current AAPL price is 170.15
- Current Date: 10/30/2023
- Risk Free Rate: 5.25%
- Dividend Rate: 0.57%.

Calculate the implied volatility for each option.

Plot the implied volatility vs the strike price for Puts and Calls. Discuss the shape of these graphs. What market dynamics could make these graphs?

Problem 3

Use the portfolios found in problem3.csv

- Current AAPL price is 170.15
- Current Date: 10/30/2023
- Risk Free Rate: 5.25%
- Dividend Rate: 0.57%.

For each of the portfolios, graph the portfolio value over a range of underlying values. Plot the portfolio values and discuss the shapes. Use put-call-parity to explain these graphs.

Using DailyPrices.csv. Calculate the log returns of AAPL. Demean the series so there is 0 mean. Fit an AR(1) model to AAPL returns. Simulate AAPL returns 10 days ahead and apply those returns to the current AAPL price (above). Calculate Mean, VaR and ES. Discuss.

Hints:

- you will need to calculate the implied volatility - might not be the same as #2
- you need to take into account the change in dates for option valuations. You are simulating forward in time and options valuations are a function of time
- Calculate the PL from the current portfolio value using Current Date