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Advanced Python for Financial Modeling

Professor Groner

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Proof of Concept

## The goal of proof of concept is to explore a new package, yahoo\_fin, to extract relevant data for our options project. In addition, we also tested out the call options notebooks provided by Professor Groner to see whether the valuation is similar to the actual price exercised in the options contract from Yahoo’s Finance Options page. In the notebook, we used Disney as an example to show our result. Finally, we modified the scope and purpose of our project based on further research and suggestions from Professor Groner.

## Jupyter Notebook Explanation

* 1. Yahoo\_fin package exploration
     1. **Use**: This package can draw data from Yahoo Finance website. It provides stock prices and real-time options data. For example, it can demonstrate a list of expiration dates for Disney. Moreover, the package can transform call and put options information on the website into a dataframe for computation. All information is useful for options valuation.
     2. **Limitation**: since the package is using a web crawling method to retrieve the data, it is possible that Yahoo Finance will change the structure of the HTML.
  2. Call option valuation
     1. **Use**: We want to test out whether the valuation using the Black-Scholes model can predict the option prices, volatility, and options vega accurately. For this test, we manually typed the parameters based on the Yahoo Finance
     2. **Limitation**: We need to figure out the volatility of the underlying asset and the value for a risk-free rate due to the uncertainty of the market. A risk-free rate is measured by a 10-year treasury yield.

## Project Adjustments

* 1. **Goal**: Our options application will provide the user with a table of options values upon request. Furthermore, we will show a payoff diagram based on the user’s portfolio.

## **Single option simulation**: our application will first ask if the user would like to simulate a call/put option with the long/short position. The user will be prompted to input the ticker, the strike price, and the expiration date of the stock. Our application will then crawl the spot price, volatility, risk free rate, and dividend rate from Yahoo Finance as the other input into the option simulation model, calculating the new present value, the Delta, and the Vega of the option.

## **Option portfolio simulation**: the application will also include the feature of simulating an option portfolio. This feature will incorporate the Monte Carlo simulation method, and the user will option contract details (strike price, expiration date, type of option), portfolio weights, and number of simulation runs. Similar to the single option simulation, the application will then crawl the underlying asset price, volatility, and risk-free rate from Yahoo Finance, which will be then put into the Monte Carlo simulation and generate the corresponding payoff digram for the portfolio.

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