Problem Statement

Understanding Option Prices and Risk for a Hedge Fund

You are working as a **junior analyst at an equity-focused hedge fund** that uses **options** to manage risk and generate returns. The fund trades **simple option strategies** on major stocks and indices and wants to ensure that the option prices used in its trading decisions are **reasonable, transparent, and well understood**.

The senior investment team has observed that option prices change not only due to movements in the **underlying stock price**, but also because of **time decay** and changes in **market uncertainty (volatility)**. To address this, the team seeks a **clear and structured framework** to:

- Estimate a fair value for an option
- Understand the key risks in an option position
- Decide how to adjust or hedge positions when market conditions change

In this assignment, you are required to **select one live option contract** on a mega-cap stock-**AAPL, MSFT, NVDA, TSLA, AMZN, META, or GOOGL**-and use the **most recent 12 months of historical price data**, sourced via **yfinance or any other reliable data source**, to conduct your analysis.

Your role is to apply **basic option pricing concepts and Greeks**, interpret the results intuitively, and provide **clear, actionable recommendations** to the fund's decision-makers.

Objectives

Participants are expected to address the following:

1. Option Pricing Basics

- Use a simple pricing approach (such as Black–Scholes intuition or provided formulas) to estimate the price of a call or put option
- Compare the model-estimated price with the observed market price of the selected live option
- Comment on possible reasons for any differences between the model price and market price

2. Introduction to Greeks

- Calculate and interpret the following basic Greeks:
    - **Delta**: How the option price changes when the underlying stock price moves
    - **Theta**: How the option price changes as time passes
    - **Vega**: How the option price changes when market volatility changes
- Explain each Greek in **plain language**, supported by simple examples

3. Risk Awareness and Hedging

- Use Greeks to identify and explain the primary risks of holding the option position
- Propose a **basic hedging strategy**, such as using the underlying stock to manage Delta risk

4. Consulting Recommendation

- Summarize your findings in a **short, consulting-style memo** addressed to the hedge fund manager, covering:
  - Whether the option appears cheap or expensive based on your model
  - The main risks associated with the position
  - How the fund should manage or monitor the position going forward

Data Requirement

- Select **one live option contract** on AAPL, MSFT, NVDA, TSLA, AMZN, META, or GOOGL
- Use the **most recent 12 months of historical data** for the underlying stock, obtained via **yfinance or any other reliable source**
- Use this data to estimate volatility, support pricing assumptions, and compute Greeks

Deliverables

Teams should submit:

- A **slide deck of maximum 9 pages** *(excluding index and appendix)* explaining:
  - Option price estimation
  - Interpretation of Greeks
  - A simple hedging idea
- A **one-page consulting-style summary** written for a non-technical portfolio manager

Evaluation Criteria

Submissions will be judged on:

- Correct understanding of basic option pricing concepts
- Clear, intuitive explanation of Greeks without heavy mathematics
- Practical relevance to hedge fund decision-making
- Clarity, structure, and professionalism of recommendations

Optional Extensions (Bonus)

For teams that wish to go further:

- Analyze how results change if volatility increases or time to expiry decreases
- Compare call and put options
- Discuss real-world limitations of simple option pricing models