FIN 5350 - Homework 3

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Problem 1

Let $K = \$40.0$, $r = 8\%$, $\sigma = 30\%$, $T = 1.0$, and $\delta = 0.0$.

a. Write `Python` functions for delta, gamma, vega, theta and rho for European call and put options under the BSM model.

b. Calculate and plot delta, gamma, vega, theta, and rho for a call option for a range of time T stock prices (S_T) ranging from \$0.0 to \$80.0.

c. Repeat the above for a put option.

Problem 2

Using the same basic data above, plus an initial stock price of $S_0 = \$41.0$ simulate five daily prices (sequentially), using the following:

$$S_{t+h} = S_t \exp\left\{(r - \delta - \frac{1}{2}\sigma^2)h + \sigma\sqrt{h}Z\right\}$$

where Z is a draw from a standard normal distribution. This can be done in `Python` as follows (for a single draw):

```python
import numpy as np
z = np.random.normal(size=1)
```

See Chapter 19 in the McDonald text for additional guidance on the simulation. Once you have the five simulated daily prices construct a table for delta-hedging similar to table 13.2 (page 420 2nd edition, page 387 3rd edition) of the McDonald textbook. Be sure to set h to equal a day (i.e. $h = 1/252$).

Problem 3