Module 3 Assignment

April 2018

This is a Computational Finance task on the use of the Monte Carlo scheme to price various **call** options.

Queries to **riaz.ahmad@fitchlearning.com**

Task

Use the expected value of the discounted payoff under the risk-neutral density $\mathbb{Q}$

$$V(S,t) = \mathbb{E}^{\mathbb{Q}}\left[e^{-\int_t^T r_\tau d\tau}\textbf{Payoff}\left(S_T\right)\right]$$

for the appropriate form of payoff, to consider:

1. European options. Compare your simulated price to the theoretical Black-Scholes value to check the error in the Monte Carlo method
2. Asian: Arithmetic Sampling - fixed and floating strike
3. Geometric: Sampling - fixed and floating strike

In both cases use the **Euler** scheme for simulating the underlying stock price using the following set of data

$$\begin{aligned} \text{Today's stock price } S_0 &= 100 \\ \text{Strike } E &= 100 \\ \text{Time to expiry } (T-t) &= 1 \text{ year} \\ \text{volatility } \sigma &= 20\% \\ \text{constant risk-free interest rate } r &= 5\% \end{aligned}$$

In the case of Asian options, consider both discrete and continuous sampling.

This is an open ended exercise and marking will be based on initiative shown and willingness to experiment, but your completed assignment should centre on a short report (and **computer code** separately) to include:

- Outline of the numerical procedure used
- Results - appropriate tables, comparisons and error graphs (e.g. changing number of simulations).
- Any interesting observations and problems encountered.
- Conclusion and references

Do not include code as an appendix to the report, this should be in a separate file.