

Module 3 Assignment

September 2016

This is a Computational Finance task on the use of the Monte Carlo scheme to price Asian options. It is also designed to encourage you to work through the notes - you should not be e-mailing us to enquire where in the material, relevant results are located!

Task

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

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

for the appropriate form of payoff, to consider:

1. Arithmetic Sampling
2. Geometric Sampling

In both cases use the **Milstein** scheme for simulating the underlying stock price. The antithetic variance reduction technique should be used in the simulations with the following set of data

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

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 brief 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

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