

## Assignment 4

**This assignment is due on Wednesday 13th April, 2011.**

This assignment concerns the use of Monte Carlo methods to price Asian options.

1. Use Monte-Carlo to compute a geometric average fixed-strike Asian call option on an asset with volatility  $\sigma = 0.75$  and expiry 1 year. Suppose that the asset's current value is \$1, and the strike price is \$1. Assume a continuously-compounded interest rate of 0.01% and dividend yield of 0.005%. Estimate the 95% confidence interval and use it to predict the number of paths you would need to ensure that, with this confidence, your answer was accurate to within two significant figures. [Note: describe how you have made sure that your price paths have enough points in them to ensure that the accuracy of the computed option value is not affected by this discretisation.]
2. Compare your answer in Part 1 with the value predicted by the Black-Scholes-based formula with  $N$  discrete sample times (where  $N$  is the number of timesteps used in Part 1).
3. Adapt your Monte Carlo code to price (i.e. obtain a 95% confidence interval for) an arithmetic average Asian option with the same strike price.
4. Combine your solutions to Parts 1-3 to implement a control variate improvement to your Monte Carlo estimate.