Lab Assignment - 9

Instructor: Dr. Arabin Kumar Dey

1 Due date:

- 27/3/2013.

2 Notes:

- Make a proper documentation preferably in latex or using some other software and submit the printout of the report in .pdf form.

- Each student needs to write his/ her own solutions, even though discussions of the assignments between students are encouraged.

3 Assignments:

1. Generate 10 sample paths for the standard Brownian Motion in the time interval $[0, 5]$ using the recursion

$$W(t_{i+1}) = W(t_i) + \sqrt{t_{i+1} - t_i} \cdot Z_{i+1}$$

with 5000 generated values for each of the paths where $Z_{i+1} \sim N(0, 1)$. Plot all the sample paths in a single figure. Also estimate E[W(2)] and E[W(5)] from the 10 paths that you have generated.

2. Repeat the above exercise with the following Brownian motion $(\text{BM}(\mu, \sigma^2))$ discretization $X(t_{i+1}) = X(t_i) + \mu(t_{i+1} - t_i) + \sigma\sqrt{t_{i+1} - t_i} \cdot Z_{i+1}$. Take $X(0) = 5$, $\mu = 0.06$ and $\sigma = 0.3$.

3. The Euler approximated recursion with time dependent μ and σ is given by

$$Y(t_{i+1}) = Y(t_i) + \mu(t_i)(t_{i+1} - t_i) + \sigma(t_i)\sqrt{t_{i+1} - t_i} \cdot Z_{i+1}.$$

Repeat the above exercise by taking

$$Y(0) = 5, \mu(t) = 0.0325 - 0.05t, \sigma(t) = 0.012 + 0.0138t + 0.00125t^2.$$