MA323 - Monte Carlo Simulation

Lab – 7

NAVEEN KUMAR A G 210123075

Lab 06 Question 1: Please refer to the previous lab report and code for the below tabulated result.

Sample Size	95% Confidence Interval	Interval Length	Estimated I_M
100	(1.86353, 2.04259)	0.17906	1.95306
1,000	(1.95704, 2.01242)	0.05538	1.98472
10,000	(1.98279, 2.00003)	0.01724	1.99140
100,000	(1.99655, 2.00201)	0.00546	1.99928

Lab 07 Question 1:

Sample Size	95% Confidence Interval	Interval Length	Estimated I_M
100	(1.99178, 2.00867)	0.01689	2.00022
1,000	(1.99491, 2.00071)	0.0058	1.99780
10,000	(1.99893, 2.00074)	0.00181	1.99983
100,000	(1.99979, 2.00036)	0.00057	2.00007

Comparing simple and antithetic methods.

Sample Size	Simple Interval Length	Antithetic Interval Length	Ratio
100	0.17906	0.01689	10.60154
1,000	0.05538	0.0058	9.54828
10,000	0.01724	0.00181	9.52486
100,000	0.00546	0.00057	9.57895

Observations:

1. The absolute difference between the values of I_M and estimated I_M diminishes as M grows, until they are nearly equal. When M rises, the estimated I_M converges to 2.
2. Using the Antithetic Estimator results in a significant reduction in variance, which is to be expected as doing so lowers the confidence interval.
3. Using the Antithetic Estimator also reduces the confidence interval length by a factor of approximately 10 for the same value of M, thus converging faster.