

Monte Carlo Simulation - MA 323

Lab 07 - Report - Lakshya Kohli - 210123077

Answer 2.

Lab 06 Answer1-

M	I_M (estimated value of I)	95% Confidence Interval	Width of Confidence Interval
100	1.9947105074120772	[1.90764626644459, 2.0817747483795648]	0.174128482
1000	1.9854670058109818	[1.9581113983963325, 2.012822613225631]	0.054711215
10000	2.0068336334099994	[1.998195161598582, 2.015472105221417]	0.017276944
100000	2.000019269038806	[1.99728645453245, 2.0027520835451615]	0.005465629

Lab 07 Answer1-

M	I_M (estimated value of I)	95% Confidence Interval	Width of Confidence Interval
100	2.002620732196442	[1.9943988208835814, 2.0108426435093025]	0.016443822625721083
1000	2.000235013840382	[1.9974589905434073, 2.003011037137357]	0.005552046593949811
10000	2.00018673946496	[1.9992756016500135, 2.0010978772799066]	0.001822275629893122
100000	2.000100177657908	[1.999814394240872, 2.0003859610749446]	0.000571566834072667

Observations:

M	Width of Confidence Interval (Simple)	Width of Confidence Interval (Antithetic)	Ratio (Simple/Antithetic)
100	0.174128482	0.016443822625721083	10.58929459
1000	0.054711215	0.005552046593949811	9.854242769
10000	0.017276944	0.001822275629893122	9.480971877
100000	0.005465629	0.000571566834072667	9.562537002

1. The variance is greatly reduced when the Antithetic Estimator is used, which is expected as we are reducing the confidence interval by reducing the variance.
2. The l_M converges to the value of 2 as M increases. Similar nature is observed for the value of \hat{l}_M .
3. Both l_M and \hat{l}_M values are almost the same and the absolute difference between them decreases as M increases.