MA323 – Monte Carlo Simulation

Lab - 07

Dipanshu Goyal 210123083

# Question – 2

Lab 06 Answer – 1

|  |  |  |  |
| --- | --- | --- | --- |
| **M** | **IM**  (estimated value of I) | **95% Confidence Interval** | **Width of Confidence Interval** |
| 100 | 1.939856 | (1.861093, 2.018619) | 0.157526 |
| 1000 | 1.991991 | (1.965119, 2.018862) | 0.053743 |
| 10000 | 1.997912 | (1.989242, 2.006582) | 0.01734 |
| 100000 | 1.999248 | (1.9965, 2.001995) | 0.005495 |

Lab 07 Answer – 2

|  |  |  |  |
| --- | --- | --- | --- |
| **M** | **IM**  (estimated value of I) | **95% Confidence Interval** | **Width of Confidence Interval** |
| 100 | 2.007689 | (2.000446, 2.014932) | 0.014487 |
| 1000 | 2.000852 | (1.998066, 2.003638) | 0.005572 |
| 10000 | 1.999457 | (1.998524, 2.00039) | 0.001866 |
| 100000 | 1.999548 | (1.999259, 1.999838) | 0.000579 |

**Observations:**

|  |  |  |  |
| --- | --- | --- | --- |
| **M** | **Width of Confidence Interval** (Simple) | **Width of Confidence Interval** (Antithetic) | **Ratio** (Simple/Antithetic) |
| 100 | 0.157526 | 0.014487 | 10.87361082 |
| 1000 | 0.053743 | 0.005572 | 9.645190237 |
| 10000 | 0.01734 | 0.001866 | 9.292604502 |
| 100000 | 0.005495 | 0.000579 | 9.490500864 |

1. The variance after using Antithetic Estimator is much lesser than the simple method, and the width of confidence interval is also significantly reduced.
2. The IM converges to the exact value 2 as M increases. The Î­M calculated by antithetic method shows similar nature.
3. Both IM and Î­M values are almost the same, and their absolute difference is decreasing as M increases.