MA323 Lab-07 Report

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Q1)

For 100 Samples:

Estimated mean = 1.992667

95% Confidence Interval = [1.714923, 2.270411]

For 1000 Samples:

Estimated mean = 1.998731

95% Confidence Interval = [1.911041, 2.086421]

For 10000 Samples:

Estimated mean = 1.999810

95% Confidence Interval = [1.972078,2.027542]

For 100000 Samples:

Estimated mean = 1.999960

95% Confidence Interval = [1.991190, 2.008729]

Q2)

	Monte Carlo Estimator(6)			Antithetic Estimator(7)			
Samples	Mean	95% Confidence Interval	Width (wa)	Mean	95% Confidence Interval	Width (wb)	Ratio (wb/wa)
100	2.007270	[1.920766, 2.093773]	0.173007	1.997247	[1.987927, 2.006567]	0.018640	9.281317
1000	2.003736	[1.976655, 2.030877]	0.054223	1.999217	[1.996290, 2.002143]	0.005853	9.264011
10000	1.993149	[1.984524, 2.001775]	0.017251	1.999731	[1.998821, 2.000642]	0.001820	9.477158
100000	1.999599	[1.996867, 2.002330]	0.005464	2.000117	[1.999830, 2.000403]	0.000573	9.541493

Observations:

- The estimated mean converges to the actual value 2 as the sample size increases.
- The value of the estimated means are similar in both methods.
- The variance and thus the confidence interval width are greatly reduced by using the Antithetic Estimator as evident from the table