MA 323 (2020) Monte Carlo Simulation: LAB 10
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Solution:

1. For M = 100:

I_M	2.018163538499642
$\widehat{I}_M$	2.000207434801428
95% Confidence Interval for I_M	(1.924477496140716, 2.111849580858568)
Length of 95% Confidence Interval for I_M (L_1)	0.18737208471785216
95% Confidence Interval for $\widehat{I}_M$	(1.9939374443867492, 2.0064774252161057)
Length of 95% Confidence Interval for $\widehat{I}_M$ (L_2)	0.012539980829356479
$L_1 : L_2$	14.541491353514237

2. For M = 1,000:

I_M	2.0001578180179225
$\widehat{I}_M$	1.9975783694474099
95% Confidence Interval for I_M	(1.973027791494147, 2.0272878445416977)
Length of 95% Confidence Interval for I_M (L_1)	0.05426005304755077
95% Confidence Interval for $\widehat{I}_M$	(1.9954295623467155, 1.9997271765481042)
Length of 95% Confidence Interval for $\widehat{I}_M$ (L_2)	0.004297614201388633
$L_1 : L_2$	12.967112899895282

3. For M = 10,000:

I_M	1.9905543189369248
$\widehat{I}_M$	1.999587266099406
95% Confidence Interval for I_M	(1.9818509355583733, 1.9992577023154763)
Length of 95% Confidence Interval for I_M (L_1)	0.017406766757102954
95% Confidence Interval for $\widehat{I}_M$	(1.9989353456122279, 2.0002391865865845)
Length of 95% Confidence Interval for $\widehat{I}_M$ (L_2)	0.0013038409743566515
$L_1 : L_2$	13.39182828691966

4. For M = 1,00,000:

I_M	1.9983820139668425
$\widehat{I}_M$	2.0000194917000127
95% Confidence Interval for I_M	(1.9956406776752098, 2.001123350258475)
Length of 95% Confidence Interval for I_M (L_1)	0.005482672583265069
95% Confidence Interval for $\widehat{I}_M$	(1.9998169276071913, 2.000222055792834)
Length of 95% Confidence Interval for $\widehat{I}_M$ (L_2)	0.0004051281856425337
$L_1 : L_2$	13.494872947921088