**Q1**. Suppose $Y\~N(1,1)$ and we want to perform Monte Carlo simulation study to evaluate the bias, Standard error, and mean squared error for the estimator “sample median”. Suppose the Monte Carlo sample size is 2,000, original sample size is 200, and the variance estimator is based on bootstrap with size 100. We also want to calculate the relative bias of bootstrap variance estimator, coverage rate, and average length of 95% confidence intervals

**Q2**. Suppose $Y\_{1}$ and $Y\_{2}$ are random variables with bivariate normal distribution with $E\left(Y\_{1}\right)=E\left(Y\_{2}\right)=1$, $V\left(Y\_{1}\right)=V\left(Y\_{2}\right)=2$, and $corr\left(Y\_{1}, Y\_{2}\right)=0.5$. Let the parameters of interest be (1). Pearson correlation coefficient, (2) Ratio of $E\left(Y\_{1}\right)/E\left(Y\_{2}\right)$. Suppose we want to conduct Monte Carlo simulation study to evaluate the statistical properties of sample estimators of the above two parameters. Use Monte Carlo size as 1,000, original sample size as 200, and bootstrap size as 200. Calculate the Monte Carlo relative bias, relative standard error, relative root mean squared error, relative bias of bootstrap variance estimator, coverage rate, and average length of estimated confidence intervals