Assignment 3

MTH 314-Multivariate Analysis

All questions are in reference of the chapter on correlation coefficients. So all terms have the usual meaning. The numerical-based questions have to be analyzed using any open-source software.

Q.1 Consider the distribution of the set of correlation coefficients when the population covariance matrix is a diagonal matrix with different elements. Find out the case for $p = 2$.

Q.2: Consider the distribution of the set of correlation coefficients when the population covariance matrix is a diagonal matrix with different elements. Find out the case when $N = 2$, $p = 2$ and find the mean and variance.

Q.3: Consider the distribution of the set of correlation coefficients when the population covariance matrix is a diagonal matrix with different elements. Find out the case when $N = 4$, $p = 2$ and find the mean and variance.

Q.4: Consider the distribution of the set of correlation coefficients when the population covariance matrix is a diagonal matrix with different elements. Consider the case when $N = 5$ and $p = 2$. If $P(|r| \geq K) = \alpha$ then show that K is the root of the equation $K\sqrt{(1-K^2} + Sin^{-1}K - \frac{\pi(1-\alpha)}{2} = 0$.

Q.5: Derive the likelihood ratio test for a bivariate correlation coefficient where a sample of size N is drawn from $N_2\left(\begin{bmatrix}\mu_1\\ \mu_2\end{bmatrix}, \begin{bmatrix}\sigma_1^2 & \rho\sigma_1\sigma_2\\ \rho\sigma_1\sigma_2 & \sigma_2^2\end{bmatrix}\right)$ for testing $H_0: \rho = \rho_0$ against $H_0: \rho \neq \rho_0$. Find the decision rule.

Q.6: Derive the likelihood ratio test for a multiple correlation coefficient where a sample of size N is drawn from $N_p(\mu, \Sigma)$ for testing $H_0: \bar{R} = 0$ against $H_0: H_0: \bar{R} > 0$.

Q.7: Compute the bias and standard error of simple correlation coefficient using the bootstrap technique. Use any sample of size 30.