**Understanding Correlation Matrices**

**Online Appendix**

1. **Testing Equality of Two Correlations in a Correlation Matrix (No Variable in Common)**

**Function**: CorCoefN(R, ind1, ind2, N)

**Description**: This function is used to test if two correlations ($r\_{jk}$ and $r\_{hm}$) embedded in a correlation matrix are equal in the population. This function is used if the two correlations have no variable in common. The function outputs the two tested correlations, the test statistic (*Z*, as described in Hadd & Rodgers, 2020), and the p-value associated with the test statistic.

**Arguments**:

 R: The correlation matrix in which the two correlations to be tested are embedded.

 ind1: A two-dimensional vector indicating the positioning of the first correlation in the correlation matrix.

 ind2: A two-dimensional vector indicating the positioning of the first correlation in the correlation matrix.

 N: The sample size associated with the correlation matrix.

**Example:**

 > CorCoefN(girlIQ, c(3,4), c(9,10), 495)

 rjk rhm z p

 0.780 0.870 -5.294 0.000

1. **Testing Equality of Two Correlations in a Correlation Matrix (Variable in Common)**

**Function**: CorCoefY(R, ind1, ind2, N)

**Description**: This function is used to test if two correlations ($r\_{jk}$ and $r\_{jh}$) embedded in a correlation matrix are equal in the population. This function is used if the two correlations have a variable in common. The function outputs the two tested correlations, the test statistic (*Z*, as described in Hadd & Rodgers, 2020), and the p-value associated with the test statistic.

**Arguments**:

 R: The correlation matrix in which the two correlations to be tested are embedded.

 ind1: A two-dimensional vector indicating the positioning of the first correlation in the correlation matrix. The first number in the vector must indicate the position of the variable in common and be the same as the first number in the ind2 vector.

 ind2: A two-dimensional vector indicating the positioning of the first correlation in the correlation matrix. The first number in the vector must indicate the position of the variable in common and be the same as the first number in the ind1 vector.

 N: The sample size associated with the correlation matrix.

**Example:**

 > CorCoefY(NBA, c(2,3), c(2,4), 26)

 rjk rjh z p

 0.3700 0.2900 0.4285 0.6683

1. **Testing Equality to a Specified Population Correlation Matrix**

**Function:** CorMat(R, P, N)

**Description:** This function is used to test the equality of a correlation matrix ($R$) to a user-specified population correlation matrix ($P$). The function outputs the $χ^{2}$ test statistic and its associated *p* value.

**Arguments:**

 R: The sample correlation matrix.

 P: The population correlation matrix.

 N: The sample size associated with the sample correlation matrix.

**Examples:**

> P = matrix(c(1.00, .50, .50, .50, .50, 1.00, .50, .50, .50, .50, 1.00, .50, .50, .50, .50, 1.00),4,4)

> CorMat(MLB, P, 26)

 chisq p

89.1894 0.0000

> CorMat(Countries, diag(5),33)

 chisq p

90.9909 0.0000

1. **Testing Equality of Two Correlation Matrices from Independent Groups**

**Function:** CorMatRR(R1, R2, N1, N2)

**Description:** This function is used to test if two sample correlation matrices of equal size ($R\_{1}$and $R\_{2}$) are equal in the population. The function outputs the $χ^{2}$ test statistic and its associated *p* value.

**Arguments:**

R1: The first sample correlation matrix.

 R2: The second sample correlation matrix.

 N1: The sample size associated with the first sample correlation matrix.

 N2: The sample size associated with the second sample correlation matrix.

**Example:**

> CorMatRR(boyIQ, girlIQ, 391, 495)

 chisq p

89.9915 0.0001

1. **Testing Equality of Three Correlation Matrices from Independent Groups**

**Function:** CorMatRRR(R1, R2, R3, N1, N2, N3)

**Description:** This function is used to test if three sample correlation matrices of equal size ($R\_{1}$, $R\_{2}$, and $R\_{3}$) are equal in the population. The function outputs the $χ^{2}$ test statistic and its associated *p* value.

**Arguments:**

R1: The first sample correlation matrix.

 R2: The second sample correlation matrix.

 R3: The third sample correlation matrix.

 N1: The sample size associated with the first sample correlation matrix.

 N2: The sample size associated with the second sample correlation matrix.

 N3: The sample size associated with the second sample correlation matrix.

**Example:**

> CorMatRRR(MLB, NFL, NBA, 26, 26, 26)

 chisq p

19.2288 0.0832

1. **Testing Equality of Multiple Independent Correlations**

**Function:** CorIndr(r.vec, N.vec)

**Description:** This function is used to test if several sample correlations ($r\_{1}$, $r\_{2}$,…, $r\_{m}$) are equal in the population. The function outputs the $H$ test statistic and its associated *p* value.

**Arguments:**

r.vec: A vector of length $m$ containing the sample correlations.

N.vec: A vector of length $m$ containing the sample sizes associated with each sample correlation, in order respectively.

**Example:**

> CorIndr(c(.21, .25, .18, .20), c(16, 16, 16, 16))

 H p

0.0449 0.9975

1. **Testing for Linear Trend of Correlation Matrix Eigenvalues**

**Function:** EigenLin(R, N, q)

**Description:** This function is used to test if the last $q$ eigenvectors of a correlation matrix ($R$) exhibit a linear trend. The function outputs the eigenvalues of $R$, the number of eigenvalues tested, the $T$ statistic, is its associated *p* value.

**Arguments:**

 R: The sample correlation matrix.

 N: The sample size associated with the sample correlation matrix.

 q: The number of eigenvalues to be tested.

**Example:**

 > EigenLin(KidsSmooth1, 7000, 3)

 eig1 eig2 eig3 eig4 eig5 q T Sig

 2.150 1.569 0.647 0.493 0.142 3.000 3819.000 0.000