

Abstract

The distribution of the vector of the normalized traces of $\frac{1}{n}XX'$ and of $\left(\frac{1}{n}XX'\right)^2$, where the matrix $X : p \times n$ follows a matrix normal distribution and is proved, under the Kolmogorov condition $\lim_{n,p \rightarrow \infty} \frac{n}{p} = c > 0$, to be multivariate normally distributed. Asymptotic moments and cumulants are obtained using a recursive formula derived in Pielaszkiewicz et al. (2015) on $\mathbb{E}\left[\prod_{i=0}^k \text{Tr}\{W^{m_i}\}\right]$, where $W \sim \mathcal{W}_p(I, n)$. We use this result to test for identity of the covariance matrix using a goodness-of-fit approach. The test performs well regarding the power compared to presented alternatives, for both $c < 1$ or $c \geq 1$.