ABSTRACT

In this thesis, the problem of deriving computable representations of the exact distribution of products of independent beta variates is considered. In particular, special attention is paid to the distribution of Wilks' Λ-criterion. We provide a simpler derivation of the results of Pillai and Gupta(1969). A simpler proof of a result of Kabe(1962) concerning the distribution of sums of independent gamma variates, and a new representation possessing various advantages over Kabe's result are obtained; the two representations being used to obtain the distribution of $-\ln\Lambda$ as a mixture of chi-square distribution functions. Results on the distribution of quadratic forms in normal variates are used to provide various series representations for the distribution of $-\ln\Lambda$. For each representation, recurrence relations for the coefficients are provided, as are truncation error bounds. A series expansion for Meijer's $G^{p,0}_{p,p}$ functions is obtained, and is used to show that the distribution of a product of independent beta variates can be represented as a mixture of beta distribution functions; this is also done explicitly for Wilks' Λ under the null and non-null linear hypotheses. It is also shown that this method is the only one which, in general, will provide computable representations of the distribution of products of independent beta variates. The computational aspects of the new results are discussed, in detail, with reference to Wilks' Λ. The most computable representation is found, and is used to tabulate percentage points (together with their respective error bounds) for various cases.