BARTLETT-CORRECTED TESTS FOR NORMAL LINEAR MODELS WHEN THE ERROR COVARIANCE MATRIX IS NONSCALAR

Elisete da C. Q. Aubin
Departamento de Estatística, Universidade de São Paulo
Gauss M. Cordeiro
Departamento de Estatística, Universidade Federal da Bahia

The likelihood ratio statistic w is frequently used to test hypotheses of interest. It is well known that this test relies on a first order asymptotic chi-squared approximation, i.e., under H_0 and mild regularity conditions, w has an approximate distribution with degrees of freedom p given by the difference of the dimensions of the parameter spaces under the two hypotheses tested. The χ^2 approximation can be improved by replacing w with a scale satatistic $w^* = c^{-1}w$. The adjustment c, named *Bartlett correction*, is determined by relation $c = p^{-1}E(w)$, where $E(w)$ is evaluated up to order n^{-1} and n is the sample size. The representation of the Bartlett correction c most commonly cited is the original formula derived by Lawley (1956).

In this paper we present, in matrix notation, a general Bartlett correction formula to improve likelihood tests for the normal linear regression models with unknown error covariance matrix for several hypotheses, thus generalizing previous results by Cordeiro (1993). The Bartlett corrections are simple enough to be used algebrically to obtain several closed-form expressions in special cases. The corrections have also advantages for numerical purposes because they require only simple operations on matrices and vectors.

Endereço para correspondência: Elisete da C. Q. Aubin, Depto. de Estatística, IME-USP, CP 66281, CEP 05389-970. e-mail:aubin@ime.usp.br