

Two-step estimators for sequential k -out-of- n systems and their asymptotic relative efficiency

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Abstract

It is an important problem in reliability analysis to decide whether for a given k -out-of- n system the static or the sequential k -out-of- n model is appropriate. Often components are redundantly added to a system to protect against failure of the system. If the failure of any component of the system induces a higher rate of failure of the remaining components due to increased load, the sequential k -out-of- n model is appropriate. The increase of the failure rate of the remaining components after a failure of some component implies that the effects of the component redundancy are diminished. On the other hand, if all the components have the same failure distribution and whenever a failure occurs, the remaining components are not affected, the static k -out-of- n model is adequate.

We therefore construct test statistics to make a decision between the static k -out-of- n model and the sequential k -out-of- n model. Test statistics based on the profile score process as well as test statistics based on a two-step estimator are analyzed and their asymptotic distribution is derived. Finally, we study asymptotic relative efficiencies.