

## A New Approach to Moments Inequalities of Some Aging Notions with Hypotheses Testing Applications

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### Abstract

Aging notions have been the subject of investigation for more than three decades. Both probabilistic and statistical properties of these distributions were studied for such families as increasing failure rate, new better than used and new better than used in increasing convex order. In the present work, new moments inequalities are derived for the above-mentioned three families that demonstrate that if the mean life is finite for any of them then all higher-order moments exist. Next, based on these inequalities, new testing procedures for exponentiality against any one of the above classes are introduced and studied showing that they are simpler than most earlier ones and hold high relative efficiency for some commonly used alternatives. Finally, the power and the critical values of the proposed statistic are calculated.

**Keywords:** Aging notions, moments inequalities, asymptotic normality, Pitman's asymptotic relative efficiency, Monte Carlo methods, *IFR*, *NBU*, *NBUC*.

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