INVERSE GAUSSIAN REGRESSION AND ACCELERATED LIFE TESTS

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1. Introduction

A parametric analysis of accelerated life test data largely depends on the model chosen for the distribution of the life time and the relation of the parameter(s) to the stress variable. In addition to the consideration of empirical fit, a life distribution derived from reasonable postulates of the underlying failure process adds credence to its statistical use. The exponential, Weibull and log-normal families have been the popular choices in the extensive literature of engineering applications of accelerated stress testing. The first two draw from the extreme value theory and have simple forms of the failure rate function while the third is capable of using the large resources of the normal theory inference results. In regard to the parameter-stress relation, some empirical engineering models, such as the Arrhenius, Eyring and inverse power law, are ordinarily used. These are cast in a common framework that makes the logarithm of the scale parameter of the life distribution linearly related to the stress. Consequently, the distribution of the log-life is in a location-scale form with a linear regression for the location. Inference procedures under these formulations are discussed in Mann, Schafer and Singpurwalla (1974), Nelson (1971) and others.

This article focuses on a versatile but not so well known life distribution, called the inverse Gaussian distribution $IG(\theta,\lambda)$, whose probability density