Model Discrimination in Degradation Analysis

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Nowadays, degradation tests are widely used to assess the lifetime information of highly reliable products if there exists quality characteristics (QC) whose degradation over time (also named as degradation paths) can be related to reliability. The performance of a degradation test, obviously, strongly depends on the appropriateness of the modeling of the product's degradation path. A typical degradation path consists of mean degradation path and error term. Conventionally, *mixed-effects* and *stochastic process* formulations are two well-known approaches in the literature. The advantage of mixed-effect formulation has taken the unit-to-unit variation of test coupons into considerations, while stochastic process formulation has provided a good treatment for time-dependent structures in the error term of degradation paths. In this paper, combining the mentioned-above advantages simultaneously, we propose a general formulation of a linear degradation path so that two mentioned-above approaches turned out to be the special cases of our model. In addition, we address the issue of mis-specification and model selection problems.

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