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General Random-Effects Trend Renewal Processes with Applications

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A repairable system can be reused after repairs, but data from such systems often exhibit cyclic patterns. However, as seen in the charge-discharge cycles of a battery where capacity decreases with each cycle, the system's performance may not fully recover after each repair. To address this issue, the trend renewal process (TRP) transforms periodic data using a trend function to ensure the transformed data displays independent and stationary increments. This study investigates random-effects models with a conjugate structure, achieved by reparameterizing the TRP models. These random-effects TRP models, adaptable to any TRP model with a renewal distribution possessing a conjugate structure, provide enhanced convenience and flexibility in describing sample heterogeneity. Moreover, in addition to analyzing aircraft cooling system data, the proposed random-effects models are extended to accelerated TRP for assessing the reliability of lithium-ion battery data.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

Repairable system, accelerated trend renewal process, inverse Gaussian distribution, link function, end of performance (EOP).

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