

**BLOCK BOOTSTRAP ESTIMATION OF THE DISTRIBUTION
OF CUMULATIVE OUTDOOR DEGRADATION**

by

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An interesting prediction problem involving degradation of materials exposed to outdoor environments (weathering) is the estimation of the distribution of future cumulative degradation using small- to moderate-size degradation data sets. This distribution, which is assumed to arise as a result of the uncertainty/variability in the weather, can be expressed mathematically as the distribution of the sum of a periodic dependent time series, and is approximately normal by the Central Limit Theorem. The estimation of this distribution is thus equivalent to estimating the mean and the variance of the distribution. In this paper, we propose a block-bootstrap-based approach for the estimation and a novel technique to estimate the variance of the distribution. An example involving the degradation of a solar reflector material is provided. We also present the results of a simulation study to show the efficacy of the proposed estimators. A procedure for constructing an approximate confidence interval for the probability of failure is also given.