



## **WARRANTY COST ESTIMATION FROM DRIVING FACTORS VIA A GENERAL LINEAR MIXED MODEL**

*Presentation By:*

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Factors including the number of products shipped, product reliability, and warranty term, that are suspected of driving computing system product warranty costs have complex statistical characteristics (distributions, transformations, and factor types) making warranty cost estimations from historical data a consequential challenge. The candidate driving factor statistical characteristics analysis shows that a reasonable choice of an estimating model is a General Linear Mixed Model (GLMM). This model incorporates the fixed and random effects factor behaviors, and the time dependency of the quarter-over-quarter warranty cost variability as repeated measures.

The warranty cost estimates of the GLMM are compared with actual warranty costs on a per-product basis to evaluate the efficacy of the modeling technique. The differences between the estimates and the actuals are independently identically distributed normal random variables, which is an indication of the adequacy of the estimates. Ongoing work includes model construction on an increased product base sample size as well as continuous monitoring of the estimates versus the actual warranty costs. GLMM methods are not commonly applied to warranty cost estimating, and the model accuracy shows this method to be a promising alternative to the essentially descriptive statistics used conventionally to estimate warranty costs.



Participants will learn the following:

- How to recognize the statistical characteristics of candidate warranty cost drivers.
- How to know if a factor needs "reshaping" (transformation).
- How to recognize autocorrelation within factors.
- How to categorize factor types for predictive modeling.
- What type of predictive model is appropriate considering the factor statistical characteristics.