

A Poisson Regression Model for Two-Attribute Warranty Policies

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We discuss the two-attribute warranty policy in which two types of warranty characteristics, such as product age and mileage in the y -year- m -mile protection plan in the automobile industry, are employed simultaneously as criteria in determining the warranty eligibility of a failed product. Based on the Poisson regression model and von Neumann-Morgenstern expected utility theory, we develop two kinds of two-attribute warranty policies: a *fixed* two-attribute warranty policy in which all customers are offered the same warranty plan, and a *flexible* two-attribute warranty policy in which customers are permitted to choose any warranty plan among the numerous plans furnished by the producer. A numerical example is presented to illustrate the procedure for determining the optimal warranty price in the fixed two-attribute warranty model and for generating a set of warranty plans for the same warranty price in the flexible warranty model. It appears desirable from both the producers' and consumers' viewpoints to convert the classical single-attribute warranty policy into a fixed two-attribute policy or, even further, into a flexible two-attribute policy. © 1994 John Wiley & Sons, Inc.

1. INTRODUCTION

A warranty is a contract under which a producer must agree to repair or replace a product if it fails to conform to satisfactory performance. Thus, a warranty can be thought of as a contractual *obligation* [28] or a potential *liability* to the producer [31]. However, the limit of the producer's obligation or liability is usually specified at the time of product sale and the producer is responsible only for the product failures satisfying the prespecified warranty criteria.

One of the most popular warranty criteria used in practice is the *warranty period*, measured from the time of product sale to a certain point in the product lifetime. The popularity of the warranty period as a criterion is twofold. First, the number of failures in most products is a function of time. Second, the time period is easily measurable and thus tends to minimize conflicts between a producer and a consumer on the warranty eligibility of a failed product. Some of the other warranty characteristics which have been used as criteria in practice include hours of operation, mileage, or frequency of product usage.

Under some warranty policies, two or more warranty characteristics are employed simultaneously as criteria in judging the warranty eligibility of a failed product. We call such cases *multiattribute* warranty policies and, among them, we focus in this article on