Nonparametric Predictive Inference for Age Replacement with a Renewal Argument

P. Coolen-Schrijner* *Pauline.Schrijner@durham.ac.uk*
F.P.A. Coolen *Frank.Coolen@durham.ac.uk*

Department of Mathematical Sciences
University of Durham, Durham, DH1 3LE, UK

Abstract

We consider an age replacement problem with cost function based on the renewal reward theorem. However, instead of assuming a known probability distribution for the lifetimes, we apply Hill's assumption $A_{(n)}$ for predicting probabilities for the lifetime of a future item. Lower and upper bounds for the survival function of a future item are used, resulting in upper and lower cost functions. Minimising these upper and lower cost functions to obtain the optimal age replacement times is simplified due to the special form of these functions.

To discuss some features of our approach, we first study the consequences of using n equally spaced percentiles from a known distribution instead of n observed data. Secondly, we report on a simulation study where the lifetimes are simulated from known distributions, so that the optimal replacement times corresponding to our approach can be compared with the theoretical optimal replacement times.

*Corresponding author