Numerical Method for an Optimal Repair Replacement Model in Mathematical Economics

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Abstract

The optimal replacement model can be represented as a nonlinear Volterra integral equation with unknown functions in both the integrand and the upper limit of integration as the following form:

$$\int_t^{x_t^{-1}} e^{-ru}[(b(t,u)) - b(x(u),u)]du = e^{-rt}p(t) \tag{1}$$

In this paper, we are interested in numerical analysis of the state-dependent delay integral equation (1) using an iterative decomposition algorithm to find the optimal sequence of the lifetime of machine.

As , we restrict the model to the more real case in which the technological progress and capital deterioration are exponential function with respect to t.

Our strategy for determining the optimal time for replacing the machine with new one consists of two steps: In the first step, we construct a proper initial function $x(t) = m(t)$ on the interval $[x(t_1), t_1]$ by using the ADM method. In the second step, we apply the recursive formula to find $x(t)$ on the interval $[t_0, x(t_0)]$. The asymptotic behavior of the solution by the proposed method is also investigated.

Keywords and phrases: Optimal Replacement, Delay Integral Equation, Numerical Treatment, Mathematical Economics.

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