

The effect of yule's process on the power of \bar{X} -chart

J.R. SINGH* and K. KULKARNI**

**School of Studies in Statistics

Vikram University, Ujjain, M.P. (INDIA)

*jrsingh@gmail.com, **Ketki333@rediffmail.com

(Acceptance Date 2nd April, 2012)

Abstract

An attempt has been made to study the effect of Yule's process on the Power of \bar{X} -chart. Process measurements which are use in construction of \bar{X} -chart involve several of errors. These include the inherent variability in the process and the error due to Yule's process.

Key words: Auto-Regressive Model of order two (*i.e.*,AR-2) or Yule's Model, \bar{X} -Control Chart, Correlation, Auto-Correlation.

1 Introduction

A basic assumption made in most traditional applications of control charts is that the observations from the process are independent. When the mean of observations is being monitored, the mean is assumed to be constant at the target value until a special cause occurs and produces a change in the mean. However, for many processes, such as in the chemical and process industries, there may be correlation between observations that are closely spaced in time. Correlation which is not a significant problem for an FSI chart may become problematic for a VSI chart because some of the observations will be taken using a relatively short sampling interval. The effect of correlated observations on the performance of FSI control charts has been studied by several authors.

Goldsmith and Whitfield³; Johnson and Bagshaw⁵; Bagshaw and Johnson¹; Harris and Ross⁴; Yashchin⁸ and VanBrackle and Reynolds⁷ investigated the effects of correlation observation on CUSUM charts. Harris and Ross⁴ and VanBrackle and Reynolds⁷ also investigated the effects on EWMA charts. Vasilopoulos and Stamboulis (1978); Maragah and Woodall (1992) and Padgett *et al.* (1992) investigated \bar{X} charts with correlated observations, where the control limits are estimated from the data⁶.

The decision - making method is the same for both the first and second steps: if the points fall outside the corresponding control limits, the null hypothesis is rejected. Rejection of at least one of the simple null hypothesis leads to rejection of the general null hypothesis.