

迴歸容忍區間應用在一批產品符合規格的研究與新方法

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摘 要

容忍區間長久以來被當做廠商(製造者)驗證一批產品是有某比例符合規格上下限且具有相當信心的工具。這篇論文正式地把一產品的”信心”描述成產品特性分配之參數的函數。藉由這個說明，對於提供製造者的信心的預測的任何技術皆可能評估其效率，而且它也為未知的信心提供統計推論的一個寬闊的空間。我們研究容忍區間用來檢定製造者信心之檢定力。我們發現，當在分配的參數已知的時候，此一方法將太過樂觀的預測其信心且當在分配的參數是未知的時候，預測製造者的信心比真實的信心低時則太保守。無效率的結果來自「容忍區間不使用統計模型中的產品大小的資料其代表一輔助統計量」的事實。對於這個未知的信心的統計推論，我們介紹點估計技巧，包含檢定力的比較結果似乎對製造者提供有意義的數字。

關鍵字:信賴區間; 假設檢定; 線性迴歸; 檢定力; 品質管制; 容忍區間。

A Study for Application of Regression Tolerance Interval
for Lot Productions Conforming To Specifications and A New Approach

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Abstract

The tolerance interval has long been a technique for manufacturer to verify if there is a reasonably large value confidence that ensures a proportion of production lot conforming to specification limits. This paper formally formulate this interest of “confidence” in terms of lot size and parameters involved in the underlying distribution of a product’s characteristic. With this formulation, any technique for prediction of manufacturer’s confidence may be evaluated for its efficiency and it also provides a wide room for this prediction through statistical inferences for the unknown confidence. We then study the power of the tolerance interval in detecting if there is a reasonably large manufacturer’s confidence for the production. We found that when the parameters involved in the distribution are known, the predicted manufacturer’s confidence is too optimistic in a value much more higher than the true confidence and when the parameters involved in the distribution are unknown, the predicted manufacturer’s confidence is too conservative in a value much lower than the true one. The inefficiency partly comes from the fact that tolerance interval does not use the information of lot size which is an ancillary statistic in the considered statistical model. For statistical inference of this unknown confidence, we introduce a point estimation technique that its results including a power comparison seems to be very promising for the manufacturer.

Key words : Confidence interval; hypothesis testing; linear regression; power; quality control; tolerance interval.

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