

A Systematic Design Construction and Analysis for Cost-Efficient Order-of-Addition Experiment

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Abstract

An order-of-addition (OofA) experiment aims at investigating how the order-of-factor inputs affect the experimental response, which is recent of great interest among practitioners in clinical trials and industrial processes. Although the initial framework was established more than 70 years, recent studies on the design construction of OofA experiments focused on their properties of algebraic optimality rather than cost-efficiency. The latter is more practical in the sense that some experiments, like cancer treatments, may not easily have an adequate number of observative experiments. In this work, we propose a systematic construction method for designs and the corresponding statistical models of OofA experiments from a cost-efficient perspective. In specific, our designs take the effects of two successive treatments into consideration. To be cost-efficient, each pair of level settings from two different factors in our design matrix appears exactly once. Compared to recent studies on OofA experiments, our designs handle experiments of one-level factors and factors of two or more levels, which has not been thoroughly investigated yet.