

# Risk-Adjusted Sequential Probability Ratio Test

## Control Charting Procedures

### Abstract

In the manufacturing setting, charting procedures are used to monitor consistent quality of products and have recently been adapted to monitor surgeon-specific mortality rates. While raw materials can be reasonably considered as homogeneous, patients have heterogeneous preoperative risk levels. Current literature propose an array of risk-adjusted procedures in order to account for this difference in mortality risk. Another important consideration would be to account for different grades of recovery. It is naive to overlook the difference between a patient who enjoys full recovery, and a patient who survives but is bed-ridden as a result of the surgery. As such, we will discuss the implementation of the risk-adjusted sequential probability ratio test based on multi-responses. A topic of interest when designing such a test would be the expected number of surgeries a surgeon would have to perform before an inference can be made. In this paper, we will develop an exact method to determine the average stopping time of a risk-adjusted sequential probability ratio test and propose 2 design procedures based on prespecified design requirements.

**KEY WORDS:** Average stopping time; Odds ratio; Collocation method; Parsonnet scores; Proportional odds logistic regression; Surgical outcomes.