Advances in Applied Probability
Volume 42, Issue 3, Pages 739-760, 2010

Selecting The Last Consecutive Record in a Record Process

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Abstract

Suppose that $I_1, I_2, \ldots$ is a sequence of independent Bernoulli random variables with $E(I_n) = \lambda/(\lambda + n - 1)$, $n = 1, 2, \ldots$. If λ is a positive integer k, $\{I_n\}_{n\geq 1}$ can be interpreted as a k-record process of a sequence of independent and identically distributed random variables with a common continuous distribution. When $I_{n-1}I_n = 1$, we say that a consecutive k-record occurs at time n. It is known that the total number of consecutive k-records is Poisson distributed with mean k. In fact, for general $\lambda > 0$, $\sum_{n=2}^{\infty} I_{n-1}I_n$ is Poisson distributed with mean λ. In this paper, we want to find an optimal stopping time τ_λ which maximizes the probability of stopping at the last n such that $I_{n-1}I_n = 1$. We prove that τ_λ is of threshold type, i.e. there exists a $t_\lambda \in \mathbf{N}$ such that $\tau_\lambda = \min\{n \mid n \geq t_\lambda, I_{n-1}I_n = 1\}$. We show that t_λ is increasing in λ and derive an explicit expression for t_λ. We also compute the maximum probability Q_λ of stopping at the last consecutive record and study the asymptotic behavior of Q_λ as $\lambda \to \infty$.

Key words: Optimal stopping; Threshold type; Consecutive record; Monotone stopping rule; Record process