A Note on a Journal Selection Problem

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Abstract: This note explores the convergence properties of certain sequences of conditional probabilities arising in a journal selection problem, where the probabilities of interest are decreasing in either a deterministic or stochastic fashion. We prove the convergence to a non-extreme value of the probability of an eventual event for any choice of problem parameters within the open unit interval. Computational results illustrate the convergence properties.

Key words: Conditional probability, limit probability, myopic strategy.

1 Introduction

Traditional models in elementary probability typically illustrate the inevitability of an eventual event. Consider the classic coin that has probability $p$, $0 < p < 1$, of turning up tails. The probability of tossing at least one head in $n$ flips is $1 - p^n$, which goes to 1 in the limit as $n$ goes to infinity. As another example, tail events relative to a sequence of independent random variables have probability either 0 or 1. Our interest, however, is on simple conditions that will guarantee convergence of the probability of an eventual event to a non-extreme value. This has been motivated by an interest in models for the spread of diseases in which relative immunity is obtained after exposure to the disease. For purposes of exposition, the situation we wish to analyze can best be described in the context of the journal selection problem (Aczel 1989): the choice of that journal which provides the best opportunity for publication. If the initial submission of a paper is rejected, a choice must be made between modifying the paper for resubmission and submission to a different journal. This leads to the sequential decision problem of maximizing the current acceptance probability conditioned on the history of past rejections. Our interest is in the limiting value of the resulting sequence of products of conditional probabilities. The probability of eventual

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acceptance, and the choice of journal for resubmission, will be shown to be computable once assumptions are made concerning acceptance policies of the available journals.

2 Single Journal Problem

We first consider the single journal scenario. A journal will frequently make available to authors their typical rejection rate for initial submissions (e.g., 65% of all papers submitted are initially rejected). Less well known but equally important is the effect on acceptance of reworking and resubmitting the paper to the same journal (e.g., 15% reduction in acceptance each time the paper is resubmitted after being rejected).

Formally, let

\[ A_i = \text{event that paper is accepted on resubmission } i \]  \( (i = 0 \text{ denotes initial submission}) \)

\[ R_i = \text{event that paper is rejected on resubmission } i \]

\[ a = \text{probability that paper is initially accepted } P(A_0) \]

\[ b = \text{reduction of acceptance probability after a rejection} \]

Then, letting \( P(A_k | R_i, i < k) \) denote the conditional probability of acceptance on the \( k \)th resubmission given rejections on all prior submissions, we have

\[
P(A_0) = a \\
P(A_1 | R_0) = ab \\
\ldots \\
P(A_k | R_i, i < k) = ab^k
\]

(1)

and the conditional probability of rejection on the \( n \)th resubmission given all prior submissions are rejected is

\[
P(R_n | R_i, i < n) = 1 - ab^n
\]

The \( n \)th-rejection probability is given by

\[
P \left( \bigcap_{j=0}^n R_j \right) = \prod_{j=0}^n P(R_j | R_i < j) \\
= \prod_{j=0}^n (1 - ab^j)
\]

(2)