Survivor Functions, Hazard Rates, and Median Lifetimes for Olympic Sponsorships

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INTRODUCTION

Most sport organizations rely on sponsorship as an essential funding mechanism for its continued operations.

In the context of Formula One (F1) Racing, more than 70% of the operating budgets of its teams are generated via corporate sponsorship (Cobbs, Groza, & Pruitt, 2012). In another example, more than 44% of the revenue generated by the Olympic movement during the 2005-08 quadrennial resulted from sponsorship (IOC, 2012). This included $866 million in revenue from the International Olympic Committee's (IOC) The Olympic Partners (TOP) program and $1.55 billion in revenue from domestic Organizing Committee for the Olympic Games (OCOG) sponsorship programs (IOC, 2012).

However, despite its importance in the financing of organizations' continuing operations, the accurate forecasting of future sponsorship revenue has been afforded scant attention in the literature. The renewal rate, or the percentage of sponsorships renewed in a particular time period (i.e, Brown, 2002), is the traditional approach utilized to forecast future revenue generated via sponsorship. However, describing the renewal rate of sponsorships utilizing a measure of central tendency is inappropriate, given the presence of censored observations within the dataset (i.e., sponsorships that are currently ongoing). Thus, an argument can be made that the durations of sponsorships have not been empirically investigated utilizing appropriate statistical methods.

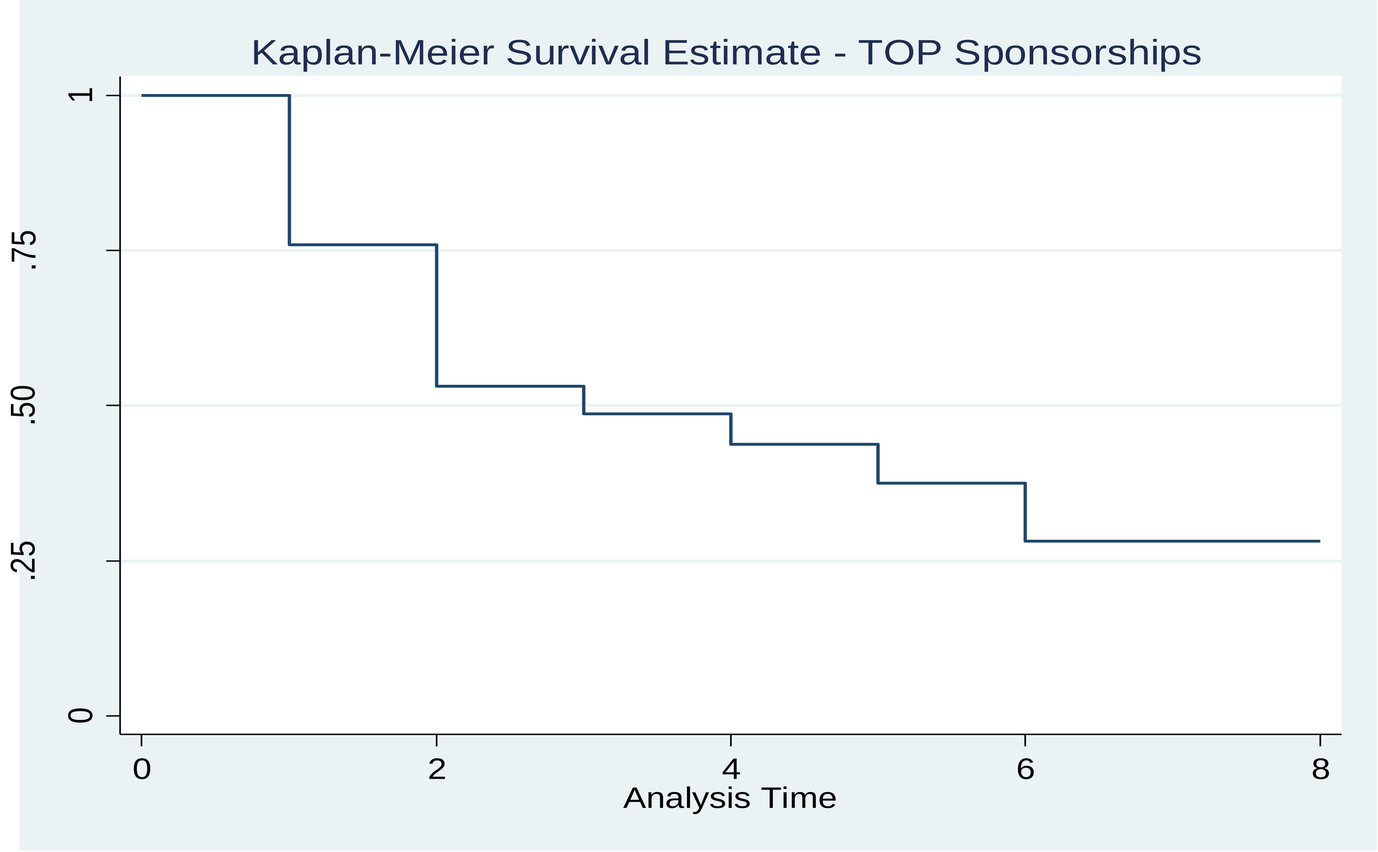
Therefore, this study utilizes event history analysis (EHA) modeling approaches (i.e., survival analysis) to empirically examine the duration of sponsorships. Specifically, this study utilizes what Box-Steffensmeier and Jones (1997) termed a "life-table analysis" to construct life tables for sponsorships, leading to calculations of the survival and hazard functions over discrete time periods.

THE SURVIVOR FUNCTION

The Kaplan-Meier (1958) survivor function estimate, $S(t_{ij})$, is defined by Singer and Willett (2003) as the "probability that individual *i* will survive past time period *j*" (p. 334). For this to occur, the individual i cannot experience the event occurrence (i.e., the end of the sponsorship being the event occurrence of interest) in the *j*th time interval, and survives to the end of time period *j*.

The survivor function is defined by the formula below, and depicted graphically as well:

$$S(t_{ij}) = \Pr[T_i > j]$$

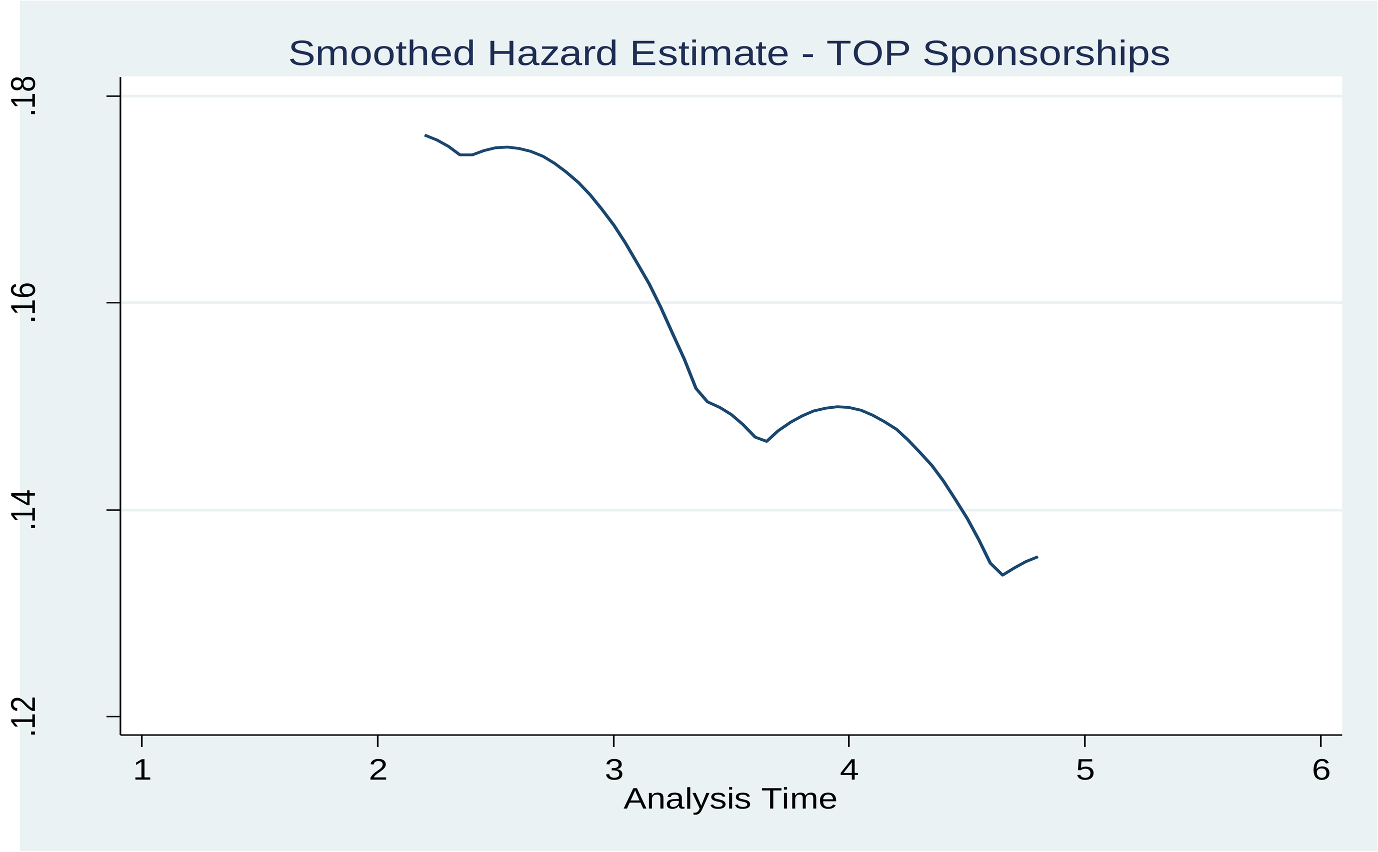


THE HAZARD FUNCTION

Of arguably more utility than the survivor function in EHA is the hazard function, or hazard rate. The hazard rate is defined as the rate in which the duration or event ends (i.e., the event has been experienced), given that the target event or the duration has not ended prior to that particular time interval (Box-Steffensmeier, & Jones, 1997).

Given that T_i represents the time period *T* for individual *i*, according to Singer and Willett (2003) the discrete-time hazard function can be represented as follows, and is graphically depicted below:

$$h(t_{ij}) = \Pr[T_i = j | T_i \geq j]$$



An analysis utilizing the example of the TOP sponsorship program results in a cumulative (overall) hazard function of 0.1977. This function, which can be interpreted as a probability of 19.77% that a TOP sponsorship will end during each quadrennial, is significantly different than Payne's (2012) stated renewal rate of greater than 90% for TOP sponsorships.

THE MEDIAN LIFETIME

The median lifetime is defined by Singer and Willett (2003) as "that value of *T* for which the value of the estimated survivor function is .5." (p. 337). In the example of this study, the median lifetime is the point in which exactly half of the sponsorships have ended and half have survived.

However, how would the sponsorships whose durations are not finalized be handled? In one approach, since the final duration of censored observations is yet unknown, these sponsorships of unknown duration could simply be omitted from the analysis. If this approach were utilized to examine the duration of sponsorships for the TOP program, this would result in the loss of 10 of the 27 TOP historical sponsorships.

Calculating the mean lifetime of TOP sponsorships omitting the censored observations results in a duration of 2.18 intervals (or 8.72 years, given the four-year duration of the Olympic quadrennial). Given that it is not wise to omit observations from a sample, a more widely-used approach is to simply truncate the duration of censored observations at a point in time (most likely the present day). This approach results in a mean lifetime of 3.19 (12.76 years) for TOP sponsorships. Utilizing a life table to calculate the median lifetime of a TOP sponsorship results in a median lifetime of 2.43 time periods, or 9.72 years.

Thus, the range of lifetimes generated by the three approaches (from 2.18 to 3.19 time periods) equates to one time interval. This may not seem like much. However, in the most recently completed Olympic quadrennial (2009-2012), the 11 TOP sponsors yielded a total of $957 million in revenue for the IOC, an average of $87 million per sponsor (IOC, 2012).

Therefore, for the period of 2009-2012 a difference of one time interval, for just one sponsor, would equate to a difference of $87 million over four years. For five sponsors (half of the current total of 10 TOP sponsors), a duration of one time interval would equate to $435 million in revenue for the IOC.

DISCUSSION

These figures illustrate the importance of determining the most accurate method for computing the historical lifetime for sponsorships, in order to develop consistently accurate revenue forecasts. Future research intends to showcase other uses for EHA modeling procedures across various sport contexts, such as the potential effect of explanatory variables on the durations of sponsorships.