Sponsorship Revenue Forecasting for Sport Organizations: A Survival Analysis Approach

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1. Introduction

One of the more important evolutions in the sport industry over the past decade has been the marked increase in the application of advanced methodologies to ascertain patterns in data, or analytics. Numerous new methodological approaches are now being applied to assist sport organizations in decision-making relative to scouting, player development, and resource allocation (Alamar, 2013). These approaches have helped ensure that such important decisions, once made by the gut and in the absence of any methodological rigor, are now informed by data. Slowly, over the past several years these modern statistics-based approaches have increasingly been applied to better inform decisions made off of the field, on the business side of sport organizations. In just one example, many decisions relative to the pricing of tickets were once made in the absence of any empirical data. Changes in ticket prices can now be largely made in real time, with the benefit of dynamic, sophisticated pricing models (Shapiro, & Drayer, 2012). The result assists sport organizations in maximizing revenue, while at the same time improving response to ever-changing consumer demand.

However, one area that has yet to be impacted by this trend in the application of analytics is revenue projections and forecasting. Despite monumental gains in other areas, revenue forecasts for many sport organizations still largely depend on an aggregated measure of central tendency, the renewal rate. The renewal rate reflects the average percentage of buyers who choose to repurchase (i.e, Brown, 2002). The renewal rate is still the prevailing measure in use by sport organizations for sponsorship revenue projections, who forecast future revenue based simply on the historical percentage of sponsors who choose to renew their sponsorships of the organization (Irwin, Zwick, & Sutton, 1999). For example, former IOC marketing director Michael Payne noted that the TOP Olympic sponsorship program historically has enjoyed a renewal rate of greater than 90%, "virtually unheard of within the industry" (Payne, 2012, p. 100).

Most sport organizations rely on sponsorship as an increasingly important means for survival. In the global, ultra-competitive world of F1 Racing, its teams rely on sponsorship for upwards of 70% of their entire operating budgets (Jensen & Cobbs, 2014). This is particularly the case for non-profit organizations, such as the International Olympic Committee (IOC) and the Fédération Internationale de Football Association (FIFA; Cornwell & Maignan, 1998). For 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 IOC's TOP program and $1.55 billion in revenue from domestic Organizing Committee for the Olympic Games (OCOG) sponsorship programs (IOC, 2012). For FIFA, more than 28% of its event-related revenue ($1.09 of $3.89 billion) during the period of 2007-10 was attributable to the sale of sponsorship rights (FIFA, 2011). This revenue can be even more critical for smaller, amateur sport organizations (Maxwell & Lough, 2009).

Despite its importance in the financing of sport organizations' continuing operations, the accurate forecasting of future sponsorship revenue is still reliant on a decades-old methodology. There are several limitations to this oft-utilized approach. As an aggregated measure, the renewal rate simply tells the organization, on average, what percentage of sponsors renew. It tells the organization nothing about the actual duration of the partnerships, nor predicts how long they should be expected to last. Further, the data do not provide any indication when sponsorships may be most susceptible to dissolution (i.e., early, mid-term, or later in the lifetime of a sponsorship). Finally, as a measure of central tendency, the renewal rate is unable to account for censored observations (i.e., those that are currently ongoing) in order to describe the duration of current sponsorships. Thus, an argument can be made that historical sponsorship data has yet to be empirically investigated utilizing appropriate statistical methods. "Traditional statistical methods provide no ready way of simultaneously analyzing observed and censored event times," explained Singer and Willett (2003). "Survival methods do" (p. 325).

Given these challenges, the purpose of this study is to apply advanced methodological approaches to the empirical study of sport sponsorships, in an effort to assist sport organizations in ongoing sponsorship revenue forecasting activities. Rather than simply providing information on how many sponsors typically renew, this approach will provide a variety of additional information, including the probability of a sponsor renewing during a particular time period, how many sponsorships have continued during each discrete time period, and the median lifetime of the sponsorships. Specifically, the study represents the first application of event history analysis (EHA) modeling approaches (i.e., survival analysis) to an empirical investigation of the duration of sponsorships. To begin, the study utilizes what Box-Steffensmeier and Jones (1997) termed a "life-table analysis" to construct life tables for sponsorships. The life table can then be utilized to calculate the survival and hazard functions for sponsorships over discrete time periods. Together, these tools can then be used to determine the median lifetime for a sponsorship of a particular organization. Information will be provided to support the superiority of these approaches in allowing sport organizations to predict future revenues from sponsorships much more accurately than is possible using measures of central tendency (such as the traditional renewal rate).

2. Methodology

The methodology applied in this study is event history analysis (EHA), commonly known in the biostatistics field as survival analysis (Box-Steffensmeier & Jones, 2004). While the term survival analysis is typically applied with the lifetime of humans is the duration of interest, the EHA nomenclature utilized in this study is most prevalent in the fields of sociology and demography, where the durations of time periods prior to events occurring are being studied. EHA has been previously utilized to analyze time-to-event duration data ranging from United Nations peacekeeping missions, military interventions, the careers of members of Congress, and marriages (Box-Steffensmeier and Jones, 2004). In other examples, Cooney, Kadden, Litt, and Getter (1991) utilized the technique to examine the duration of after-care programs for alcoholics (with the event in question being a relapse to alcohol use), Bolger, Downey, Walker, and Steininger (1989) examined the duration of time before an undergraduate student ideates about suicide, while Furby, Weinrott, and Blackshaw (1989) investigated recidivism (return to prison) among sex offenders. However, despite its widespread use across several academic fields, EHA has scarcely been utilized to study time-to-event durations in the sport industry. One exception is a prior application analyzing factors impacting a player's career, finding that both draft order (Staw & Hoang, 1995) and race (Hoang & Rascher, 1999) were significant predictors of career longevity.

2.1 Data Analysis Overview

There are three key concepts essential to survival analysis approaches that will be applied in this quantitative evaluation of sport sponsorships: the survivor function, the hazard function, and the median lifetime. 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 in the *j*th time interval, and survives to the end of time period *j*. In other words, the random variable for time (T_i) for individual *i* exceeds *j*. It is important to note that the Kaplan-Meier survivor function is not calculated simply by computing the percentage of (in this context) sponsorships that survive (or conversely, fail) during each time period, and is influenced by each previous computation. The survivor function is defined by the formula below:

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

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). One can easily see why furthering an understanding of the probability of a sponsorship ending during a particular time period would be very appealing for sport organizations. 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:

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

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. To determine the exact median lifetime, the formula provided by Miller (1981) can be utilized to linearly interpolate the exact median lifetime when a survivor function of 0.5 falls between two values of $S(t_j)$. Miller's (1981) formula involves letting m represent the last time interval in which the survivor function is above 0.5, letting $\hat{S}(t_m)$ equal the survivor function in that particular interval and letting $\hat{S}(t_{m+1})$ equal the survivor function for the next interval. The formula is as follows:

$$m + \left[\frac{\hat{S}(t_m) - .5}{\hat{S}(t_m) - \hat{S}(t_{m+1})}\right]((m+1) - m)$$

2.2 Study Contexts

In order to invite comparisons across two different contexts, EHA will be applied in this study to two of the more recognized and influential sponsorship programs, the TOP (i.e., The Olympic Partners) sponsorship program and the sponsors and partners of the FIFA World Cup. There is a basis in the literature for studies utilizing these two important contexts, as these are the same contexts in Mazodier and Quester's (2014) longitudinal analysis of the impact of congruence on brand affect. This study's data spans the entire history of the TOP Olympic sponsorship program, which began in 1985 and continues to this day (Davis, 2012). A global sponsorship of the Olympic

Games provides, among other assets and rights, the ability for a brand to associate itself with one of the most recognized and admired symbols in the world, the Olympic rings (Preuss, 2004). According to IOC research commissioned in 2008, 96% of all people globally can correctly identify the Olympic Rings (IOC, 2012). The second dataset is comprised of the history of both FIFA Global Partners and World Cup Sponsors dating back to 1979 (FIFA, 2013). Staged every four years, the 2010 FIFA World Cup reached more than 3.2 billion people, while more than 2.2 billion watched at least 20 consecutive minutes of coverage (FIFA, 2010).

2.3 Data Preparation

Singer and Willett (2003) established three key steps that are necessary before analyzing data utilizing EHA. These are establishing the target event, specifying the beginning of time, and agreeing on a metric for clocking time. Thus, the first step in preparing a dataset for the use of EHA is to establish the target event, or the event whose occurrence is of interest to the researcher. For this study, the event is the dissolution, or end, of the sponsorship. It is important to note that given the technique's initial application to lifetimes (where the event occurrence is death), one may assume that the event needs to inherently be an unfortunate outcome such as death, incarceration, or a relapse of alcohol or drugs. That is not always the case, as EHA has also been applied to investigate the duration of positive events, such as the birth of a child or a marriage.

The second step that must be undertaken in preparation for EHA is to specify what Singer and Willett (2003) describe as "the beginning of time" (p. 312). For clarity, Box-Steffensmeier and Jones (2004) distinguish between "calendar time" and "clock time" (p. 8). In their example of congressional careers, the start time, or calendar time of careers of members of congress is staggered, given that some are first elected in one year and others in another year. However, while this calendar time can be different (e.g., one politician's congressional career begins in 1992, while another begins in 1994), their "clock time" all begins at the same time, the year of the first election. Similarly, in our analysis of TOP sponsorships, Coca-Cola's sponsorship began at the beginning of TOP I (1985-88), McDonald's began in TOP IV (1997-2000) and Dow's began in TOP VII (2009-12; Ferrand et al., 2012). Therefore, based on the calendar their starting times are all different. However, their clock time all began at the same time, at the beginning of each sponsorship's first quadrennial. For Olympic and World Cup sponsorships, it is possible to research the first event for which the corporation is a sponsor, and establish the beginning of the duration of the sponsorship accordingly.

The third step in the process as described by Singer and Willett (2003) is to agree upon a metric for clocking time, or the scale for which time is measured. This time metric can be continuous (such as seconds or hours), or more discrete (such as in the example of years), as EHA is robust to any potential measure of time. For sponsorships, the metric of time to be utilized in this study was the duration of each sponsorship, which as stated is a period of four years. Though considered a long metric for time when compared to days or months, this approach is analogous to political scientists who utilize a time metric of two years to study the duration of members of Congress or six years for members of the Senate (e.g., Box-Steffensmeier & Jones, 1997). For the most part, these politicians are elected at the beginning of each term and serve for the complete duration of their elected service. Similarly, in all but the rarest of circumstances for global sponsorships of the Olympics and World Cup, the duration of the sponsorship begins at the start of the four-year quadrennial and continues until the end of the quadrennial. The sponsorship then either ends or is renewed. As pointed out by Hill (1996), Olympic etiquette dictates that negotiations for sponsorships for future TOP quadrennials are not permitted to begin until the current period is concluded. This requirement has been relaxed somewhat in recent years, as Coca-Cola, Procter & Gamble and Dow, for example, have been permitted to make commitments for multiple quadrennials in current TOP contracts (Mickle, 2014). However, despite this recent development, the four-year quadrennial remains as an accurate and reliable time metric for Olympic and World Cup sponsorships.

Utilizing this approach, a person-period data set for the complete history of all TOP sponsorships dating back to the initiation of the program in 1985 was constructed. This analysis revealed that the program has encompassed 29 different sponsorships over eight quadrennials (Ferrand et al., 2012; Hill, 1996; IOC, 2012; Payne, 2012; Preuss, 2004). This equates to a total of 88 person-period observations. A history of each corporation that has participated in the TOP program, including the duration of each sponsorship and years of participation, is detailed in Table 1. The same approach was then utilized to reconstruct the history of FIFA World Cup sponsorships, dating back to 1979. The FIFA World Cup sponsorship program has included a total of 42 sponsorships over the past nine World Cup events dating to 1982, for a total of 119 person-period observations (FIFA, 2013). A history of each corporation that has served as either a FIFA Global Partner or World Cup sponsor is included in Table 2.

The final step in data compilation for EHA is to construct the censoring indicator, by indicating both if and when each corporation had experienced the target event (the end of the sponsorship). Therefore, a dichotomous variable (0 = Not Ended, 1 = Ended) indicating whether the sponsorship ended or was censored (i.e., still ongoing) by the end of each four-year period was compiled. There are 12 corporations who are currently still active in the TOP sponsorship program, which results in a total of 17 of the 88 person-period observations indicating that they have experienced the event (given that there are 17 sponsorships which have ended). For the FIFA World Cup sponsorship program, a total of 7 corporations currently serve as sponsors, including 5 FIFA Partners (Adidas, Coca-Cola, Hyundai-Kia Motors, Gazprom, and Visa) and 2 FIFA World Cup sponsors (Anheuser-Busch and McDonald's). This results in 35 of the 119 total observations reflecting that the event (i.e., the end of the sponsorship) has occurred.

3. Results

3.1 Survivor Functions

The first data analysis step in EHA is the construction of a life table, which was developed for the TOP sponsorship program and is depicted in Table 3. Singer and Willett (2003) recommended the construction of life tables as the first step in any event history analysis in which the duration of time before the event in question is of interest. The life table includes a compilation of how many of the observations enter each time interval and how many experienced the target event during each interval (in this case, how many of the sponsorships ended). The life table also includes the hazard function and the survivor function for each period, and is helpful in computing the median lifetime of the sponsorships.

As indicated in Table 1, there have been a total of 29 different sponsors to participate in the TOP program, with a total of 7 ending after the first quadrennial. Thus, a total of 20 TOP sponsorships "survived" past the first time interval, while two (Bridgestone and Toyota) are still currently in their first (i.e., censored). The TOP sponsorships that only lasted one quadrennial were held by Acer, FedEx, Johnson & Johnson, Lenovo, Mars, Ricoh, and the U.S. Postal Service. Therefore, as reflected in Table 3, the survivor function for the first interval for TOP sponsorships is 0.7586. This function can be interpreted as the conditional probability that a TOP sponsorship will continue past the first quadrennial. The standard error for the first survivor function for TOP sponsorships is 0.0795. Conversely, the failure function, or the probability that the sponsorship will end, can also be computed. In this example, it is 0.2414, or 24.14%. As indicated in Table 3, after another four years (eight years total), 12 of the 29 TOP sponsorships have survived, equating to a survivor rate of 0.5310 (the conditional probability of surviving past the second quadrennial is 53.10%). A total of six additional sponsorships ended after two quadrennials, while two (Dow and Procter & Gamble) are censored.

A total of 10 TOP sponsorships survived past the third quadrennial, with only one (Xerox) ending at this juncture (a pattern which will continue). There is one current sponsor whose sponsorship currently has a duration of three quadrennials (General Electric), which consequently adjusts the survivor function to 0.4868. Once again, only one sponsorship ended at the conclusion of the fourth quadrennial (John Hancock/Manulife), while two (Omega and Atos) are censored. This equates to an updated survivor function of 0.4381. Of the seven sponsorships that survived into five quadrennials, again only one ended during that interval (Time, Inc.), while there are two current sponsorships with a duration of five quadrennials (McDonald's and Samsung). This equates to a survivor function of 0.3755 after five intervals. Only one of the four sponsorships to have survived into the sixth interval ended at this point (Kodak), adjusting the survivor function down to 0.2816 after six quadrennials. As stated previously, there are three TOP sponsorships that were initiated at the program's inception, have continued into the seventh and eighth quadrennial, and remain active to this day (Coca-Cola, Panasonic and Visa). Thus, the final survivor function remains at 0.2816. Given the smaller sample size, the standard error increases to 0.1120 (up from 0.0795).

A similar analysis can be performed for the FIFA World Cup sponsorship program. As indicated in Table 4, a total of 15 of the 42 historical sponsorships ended after their first World Cup, while one (Gazprom) is considered censored. This equates to a survivor function of 0.6429 (SE = 0.0739), more than 10% larger than that of the TOP program. After two World Cups, a total of 26 of the original sponsorships have survived, for a 0.3709 survivor function (SE = 0.0755), compared to 0.5310 for the TOP program. This pattern continues until the seventh iteration, where the survivor function decreases to 0.0910 (SE = 0.0554), indicating that a total of only one of the original 42 sponsorships (Coca-Cola) have continued through seven World Cups.

The results above are also reflected in the graph of the survivor functions for both sponsorship programs (Figure 1). The graph indicates a fairly steep drop through the first two time intervals (first eight years) for both sponsorship programs. However, the FIFA World Cup program's drop is steeper, as a larger percentage of the sponsorships have ended. The function for both then flattens out with much smaller drops through the next several intervals, as fewer and fewer of the surviving sponsors experience the event (the end of the sponsorship).

3.2 Hazard Functions

The life table for TOP sponsorships (Table 3) includes the previously defined hazard function during each time interval, as well as the cumulative hazard function for the entire sample ($H(t)$). The hazard function for the TOP sponsorship program's first quadrennial is 0.2414, given that 7 of 29 TOP sponsorships ended after one quadrennial. The hazard function for the second quadrennial increases to .3000, given that 6 of the 20 sponsorships that survived the first time interval ended at this point. The hazard function drops to 0.0833 in the third quadrennial as only 1 of the 12 sponsorships that had survived ended during the interval. The hazard function in the fourth quadrennial is .1000, given that in the history of the TOP sponsorship program only one ended after this interval. The function increases to 0.1429 over the next interval (with one of seven

sponsorships ending) and 0.2500 for quadrennial six (one of four sponsorships ending). Similarly, the hazard function for the FIFA World Cup sponsorship program begins at 0.3571, given that 15 of the 42 sponsorships ended after one World Cup. The hazard function increases to 0.4231, given that an additional 11 sponsorships ended after just two World Cups. The function then continues to decrease, from 0.2000 after three World Cups, to 0.0909 after four and 0.1000 after five.
Of utmost importance is the overall, cumulative hazard function for the entire history of both sponsorship programs. As reflected in Tables 3 and 4, these are 0.1932 for TOP and 0.2941 for FIFA. These functions can be interpreted as the cumulative probability that a sponsorship ends during each quadrennial. As indicated, FIFA World Cup sponsorships are more than 10% more likely to end after each event, when compared to TOP sponsorships.

Similar to the approach utilized by Ampaw and Jaeger (2012), it is also possible to graphically depict the hazard rate of a sponsorship ending. For both Olympic TOP and FIFA World Cup sponsorships (Figure 2), the hazard rate of a TOP sponsorship ending decreases as a function of time in a fairly linear fashion. For TOP, there is a slight increase in the hazard between the third and fourth time interval (between 12-16 years), and another slight increase between 16-20 years. For FIFA sponsorships, the slope decreases continuously over time. The overall shape of both graphs can be interpreted that the longer a sponsorship continues, the probability that the sponsorship will end also decreases. In other words, the longer a TOP or FIFA sponsor remains a sponsor, the less probability that the sponsorship will end.

3.3 Median Lifetimes

After the life tables for sponsorships (including the survivor and hazard functions for each time interval) have been constructed, it is possible to compute the median lifetimes for both sponsorship programs. As stated, the median lifetime is the point in time where exactly half of the observations have experienced the event, while half have not (Singer & Willett, 2003). The process starts by examining the survivor functions in Table 3. For TOP sponsorships, the survivor function for the second time interval is above .5 (0.5310), while the function for the third interval is below .5 (.4868). This indicates that half of TOP sponsorships end somewhere between the second and third time interval, or between eight and 12 years. Plugging these values into the aforementioned equation from Miller (1981) results in a median lifetime of 2.70 time periods (or 10.81 years) for TOP Olympic sponsorships. For FIFA World Cup sponsorships, as indicated in Table 4 the survivor function for the second time interval is under 0.5 (0.3709). This indicates that the median lifetime is less than two intervals. Utilizing Miller's (1981) formula, we find that the median lifetime for FIFA World Cup sponsorships is 1.53 (6.12 years), less than one full quadrennial less than TOP sponsorships.

4. Discussion and Implications

The implications of utilizing EHA methods in describing sponsorships can be borne out by applying various other approaches, and examining the results. For example, **i**f EHA was not utilized to investigate the duration of sponsorships, standard estimates of central tendency would be utilized (such as the aforementioned renewal rate). However, how would the sponsorships whose durations were not finalized be handled? In one approach, since the final duration of censored observations (in this study, sponsorships that were currently ongoing) was yet unknown, these sponsorships of unknown duration could simply be omitted from the analysis. This was the approach utilized by Abedi and Benkin (1987) in their analysis of the various demographic, academic, and financial variables that might influence the time for doctoral students to earn their

PhD. Their sample included a total of 4,255 students who earned their doctorate between the years 1976 and 1985, and did not include any data on those students who were still currently pursuing their doctorate or students who began but failed to eventually earn their doctorate (i.e., right censored observations). In a similar time-to-degree study, Siegfried and Stock (2001) investigated 618 students who had earned their doctorates in economics. One can easily see how students who earn a doctorate may be different than those who failed to do so, and how the results of these studies are therefore biased based on the exclusion of those students who have yet to receive their doctorate (and those who never finished). In the end, Abedi and Benkin (1987) computed a mean time to doctorate of 8.7 years. It is highly likely that had the researchers computed a median (rather than mean) lifetime that accounted for the censored observations (those who are currently students or who had dropped out), the results could have been far different. It is also likely that a median lifetime (rather than the mean lifetime that Abedi and Benkin computed) is a more accurate description of the actual time it may take for a student to earn a doctorate, because it accounts for all students who begin doctoral studies (and not just those who finish).

If one were to utilize the approaches of Abedi and Benkin (1987) and Siegfried and Stock (2001), the dataset would be restricted to just those sponsorships that have ended (similar to their analysis of only those who completed their degree). As indicated in Table 1, if this approach were utilized to examine the length of sponsorships for the TOP program, there would be a loss of 12 of the 29 TOP historical sponsorships. This approach would also result in the omission of some of the longest-running sponsorships, including those of Coca-Cola, Panasonic and Visa (which have spanned eight quadrennials thus far). Calculating the mean lifetime of TOP sponsorships omitting the censored observations results in a mean duration of 2.11 intervals (8.44 years) for the TOP program, and 2.25 intervals (9 years) for the FIFA World Cup program.

Given that it is unwise 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). For sponsorships, this approach would involve assigning a duration for the sponsorships that are currently ongoing equal to the time they possess at the end of data collection (which for this study is 2015). This was the approach utilized by Frank and Keith (1984) in their study of differences in the abilities of teachers who continue in the special education field for up to five years, compared to those who do not. Their study simply assigned a career duration of five years for those teachers who were still teaching (i.e., censored) after the five-year period. The utilization of this approach yields a mean lifetime of 3.03 (12.14 years) for TOP sponsorships and 2.81 (11.24 years) for FIFA sponsorships.

In the end, it is apparent that the calculation of mean lifetimes utilizing two different approaches results in decidedly different results. For example, it results in a shorter duration for TOP sponsorships utilizing one approach (omitting censored observations), and a longer duration utilizing another (truncating at present day). Further, the differences were fairly dramatic. In the example of the TOP program, the first approach yielded a duration of 2.11 time periods, while the second resulted in 3.03. The median lifetime fell in the middle, at 2.70.

A difference of nearly one time interval (which in the case of this study is one quadrennial, or four years) may not seem like much. 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 this difference of one time interval in the two durations, for just one sponsor, equates to a difference of $87 million over four years. For five sponsors (less than half of the current total of 12), a duration of one time interval would equate to $435 million in revenue for the IOC. These figures illustrate the implications of determining the most accurate method for computing the historical lifetime for global sponsorships, in particular for organizations on the property side of the sponsor-property relationship seeking to forecast revenues as accurately as possible.

In terms of this study's context, the analysis of hazard rates, survivor functions, and median lifetimes yields several interesting insights for those who are tasked with selling and managing global sponsorships, further illustrating the implications of the methodology. For example, the hazard rate for TOP sponsorships (.1932), defined as the conditional probability that the sponsorship will end in any given time period, indicates that managers should budget and prepare for the possibility in any given quadrennial (four-year period) that roughly 20% of its partners will end the relationship. As the TOP sponsorship program for the current quadrennial (2012-16) includes 12 sponsors, based on this analysis the IOC should be prepared for at least 2 (and perhaps 3) of these current sponsors not renewing beyond 2016. Given that TOP sponsors paid an average of $87 each during the most recently completed quadrennial (IOC, 2012), two sponsors failing to renew equates to a total loss of revenue of between $160-$200 million, illustrating the importance of increasing the accuracy with which the duration of sponsorships is measured.

Hazard rates during specific time periods indicate that the probability of a TOP sponsorship ending is highest during the second quadrennial (.3000). Similar results were found for the FIFA World Cup program, with a hazard function of 0.4231 after two events. For both, the hazard rate after 3 time periods is reduced considerably, down to 0.0833 and 0.2000, respectively. This result indicates that both IOC and FIFA managers should devote greater resources towards ensuring sponsors are reaching their stated objectives during the early years of a TOP sponsorship, if they hope to increase the chances of the relationship continuing for years to come. This analysis also demonstrates that if a sponsor can be convinced to continue on after two quadrennials, it is highly likely that they will remain a sponsor for another 8-12 years.

Finally, the median lifetime for Olympic TOP sponsorships was found to be 10.81 years, and 6.12 years for FIFA World Cup sponsorships. Given this finding, the result of analyzing the durations of 71 different sponsorships dating back 30 years, it would be unwise for those in the business of managing global sponsorship programs to expect that (and more importantly, budget and forecast for) sponsorships lasting beyond twelve years (two to three quadrennials).

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Table 1.
History of Olympic (TOP) Sponsors (1985-2015)

Corporation	Years	Duration	Product Category
3M	1985-92	2	Office Material
Acer	2009-12	1	Computer
Atos*	2001-16	4	Information Technology
Bausch & Lomb	1989-96	2	Optical Products
Bridgestone*	2015-24	1	Tires, Seismic Isolation Bearings & Bicycles
Brother	1985-92	2	Typewriters
Coca-Cola*	1985-2016	8	Non-Alcoholic Beverages
Dow*	2009-16	2	Official Chemistry Company
FedEx	1985-88	1	Express Mail/Package Delivery
GE*	2005-16	3	See Below
IBM	1993-2000	2	Information Technology
John Hancock	1993-2008	4	Life Insurance
Johnson & Johnson	2005-08	1	Health Care
Kodak	1985-2008	6	Film/Imaging
Lenovo	2005-08	1	Computer
Mars	1989-92	1	Snacks
McDonald's*	1997-2016	5	Retail Food Services
Omega*	2001-16	4	Timing, Scoring & Venue Results Services
Panasonic*	1985-2016	8	TV/Audio/Video Equipment
Philips	1985-92	2	Lighting
Procter & Gamble*	2009-16	2	Personal Care/Household Products
Ricoh	1989-92	1	Document Processing
Samsung*	1997-2016	5	Wireless Communication Equipment
Time, Inc.	1985-2004	5	Publications
Toyota*	2015-2024	1	Mobility
UPS	1993-2000	2	Express Mail/Package Delivery
U.S. Postal Service	1989-92	1	Express Mail/Package Delivery
Visa*	1985-2016	8	Payment Services
Xerox	1993-2004	3	Document Processing

* Denotes sponsorships currently ongoing (i.e., censored)
Sources: Ferrand et al. (2012), Hill (1996), & Preuss (2004)
Note: GE's exclusive product or service categories are Energy Generation Systems, Energy Distribution Systems, Healthcare: Diagnostic Imaging, Monitoring and Electronic Medical Records Technology, Lighting Fixtures & Systems, Aircraft Engines, Rail Transportation, Water Treatment Facilities & Services, Equipment & Transportation Management (IOC, 2012)

Table 2.
History of FIFA Partners/World Cup Sponsors (1979-2015)

Corporation	Years	Duration	Product Category
Adidas*	1995-15	6	Athletic Apparel
Alfa Romeo	1987-90	1	Automobile
Anheuser-Busch	1983-90	2	Malt Beverages
Anheuser-Busch*	1995-2015	6	Malt Beverages
Avaya	1999-2006	2	Information Technology
Bata	1983-86	1	Footwear
Canon	1979-98	5	Photographic/Photocopying
Castrol	2007-14	2	Lubricants
Cinzano	1983-86	1	Alcoholic Beverages
Coca-Cola*	1979-2015	10	Non-Alcoholic Beverages
Continental	2003-14	3	Tires
Deutsche Telecom	2003-06	1	Telecommunications
Emirates	2003-14	3	Airlines
Energizer	1991-94	1	Batteries
Fuji Xerox	1999-02	1	Document Services
Fujifilm	1979-2006	7	Photographic Film
Gazprom	2015	1	Oil and Gas
Gillette	1979-2006	7	Personal Care
Hyundai-Kia*	1999-2015	5	Automobiles
Iveco	1979-82	1	Manufacturing
Johnson & Johnson	2011-14	1	Healthcare
JVC	1979-2002	6	Consumer Electronics
Korea Telecom/NTT	1999-02	1	Telecommunications
Mars	1987-98	3	Confections
MasterCard	1991-2006	4	Payment Systems
McDonald's*	1991-2015	7	Restaurant
Metaxa	1979-82	1	Alcoholic Beverages
MTN	2007-10	1	Telecommunications
Oi	2011-14	1	Telecommunications
Opel	1983-86	1	Automobile
Opel	1991-98	2	Automobile
Philips	1983-2006	6	Consumer Electronics
RJReynolds	1983-86	1	Tobacco
Satyam	2007-10	1	Information Technology
Seara	2010-14	2	Uncooked Meat & Frozen Food
Seiko	1979-86	2	Timekeeping
Sony	2007-14	2	Consumer Electronics
Toshiba	1999-06	2	Consumer Electronics
Vini d'Italia	1987-90	1	Publishing
Visa*	2007-15	3	Payment Services
Yahoo!	1999-2006	2	Information Technology
Yingli Solar	2010-14	2	Renewable Energy

* Denotes sponsorships currently ongoing (i.e., censored)
Sources: FIFA (2015)

Table 3.
Life table describing duration of TOP sponsorships

Period	Time interval	Beginning total	Ended during period	Censored at end of period	Hazard function	Survivor function
0	[0, 1)	29	---	---	---	1.0000
1	[1, 2)	29	7	2	0.2414	0.7586
2	[2, 3)	20	6	2	0.3000	0.5310
3	[3, 4)	12	1	1	0.0833	0.4868
4	[4, 5)	10	1	2	0.1000	0.4381
5	[5, 6)	7	1	2	0.1429	0.3755
6	[6, 7)	4	1	0	0.2500	0.2816
7	[7, 8)	3	0	0	0.0000	0.2816
8	[8, 9)	3	0	3	0.0000	0.2816
Overall hazard rate					0.1932	

Note: Survivor function is calculated over full data and evaluated at indicated times; it is not calculated from aggregates shown at left.

Table 4.
Life table describing duration of FIFA World Cup sponsorships

Period	Time interval	Beginning total	Ended during period	Censored at end of period	Hazard function	Survivor function
0	[0, 1)	42	---	---	---	1.0000
1	[1, 2)	42	15	1	0.3571	0.6429
2	[2, 3)	26	11	0	0.4231	0.3709
3	[3, 4)	15	3	1	0.2000	0.2967
4	[4, 5)	11	1	0	0.0909	0.2967
5	[5, 6)	10	1	1	0.1000	0.2428
6	[6, 7)	8	2	2	0.2500	0.1821
7	[7, 8)	4	2	1	0.5000	0.0910
8	[8, 9)	1	0	0	0.0000	0.0910
9	[9, 10)	1	0	0	0.0000	0.0910
10	[10, 11)	1	0	1	0.0000	0.0910
Overall hazard rate					0.2941	

Note: Survivor function is calculated over full data and evaluated at indicated times;
it is not calculated from aggregates shown at left.

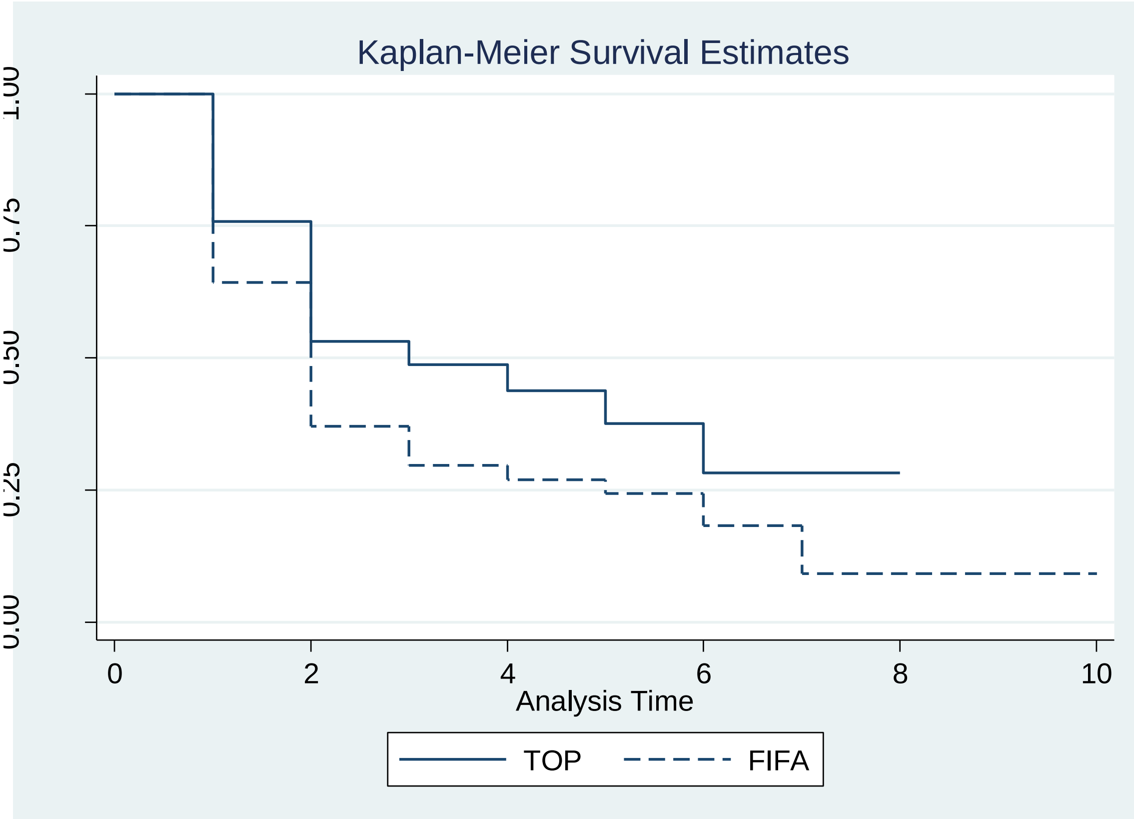

Figure 1. Graph of survivor functions for both TOP and FIFA World Cup sponsorships

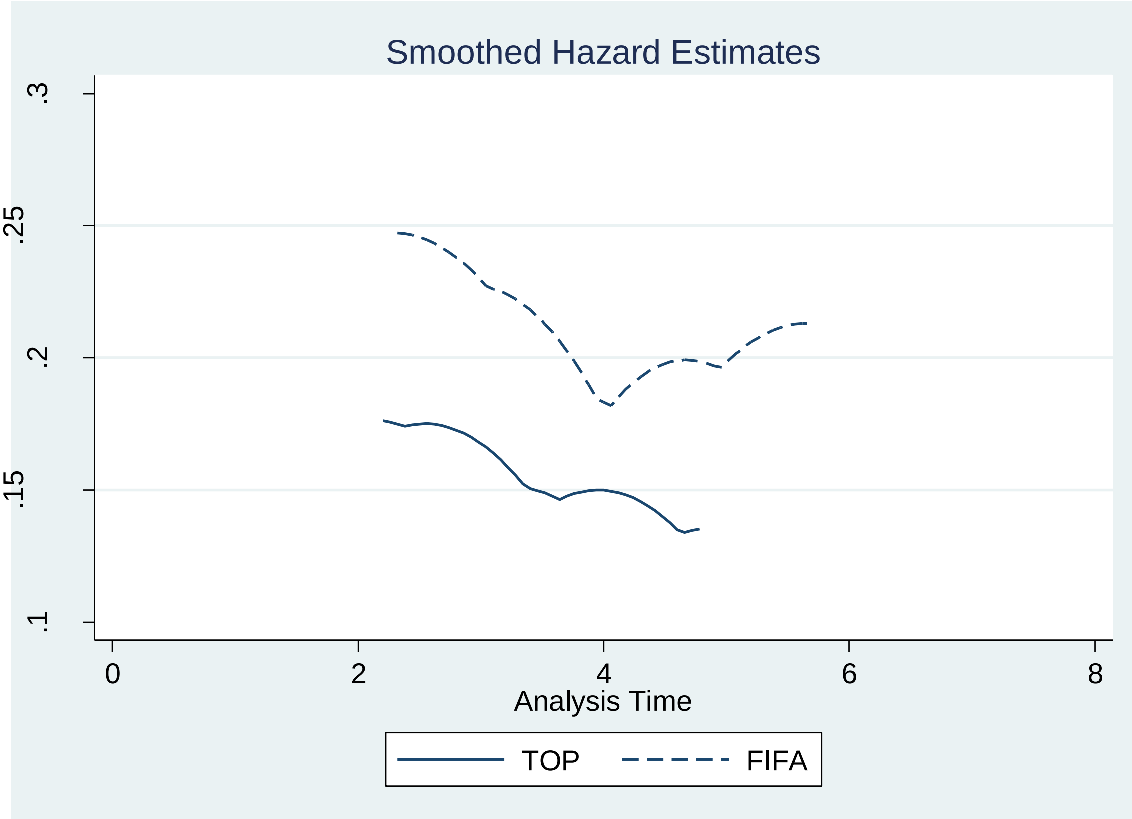

Figure 2. Graph of smoothed hazard functions for both TOP and FIFA World Cup sponsorships