Balancing a Better Bracket in Professional Tennis Ladders: The Optimization of Paired-Comparison Matches in Elimination Events

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Tournament theory (Rosen, 1986) rests on three necessary conditions. First, competing individuals are completely informed regarding the prize structure throughout the competition. Professional tennis tournaments fulfill this requirement as total purses and ladder prizes are known to entrants in advance. Second, each competitor must be able to impact his or her probability of winning. Singles matches in professional tennis meet this requirement more specifically than do business competitions because there are no team, market fluctuation or capitalization effects impacting individual performance. Further, dissimilar to hierarchical organizations, competitors in professional tennis are capable of forecasting potential future encounters with other competitors. This endorses agents to predict a cost function of winning (or more importantly losing in round x) based on the probability of success at later rounds. Third, final outcomes of competition rely on ordinal results. Winning a professional tennis match requires only that one win a pre-determined number of sets against an opponent, but no margin of victory is specified.

While professional tennis provides what appears to be an ideal platform to launch an empirical investigation of tournament theory (Gilsdorf and Sukhatme, 2008; Sunde, 2009), if one were to examine all tournaments, a certain loss of precision would occur as local court conditions vary. This fact alters a competitor’s self-evaluation of his or her probability of winning and hence the effort willingly put forth. For this reason, the analysis of a single tournament would avoid such difficulties. Our tournament of choice is the Sony Ericsson Open (SEO), selected for three reasons. First, while not a Grand Slam tournament, it is sufficiently prestigious (sometimes referred to as a fifth major) that it provides a remunerative purse and ladder incentives relative to most venues. Second, it provides a natural experiment frequently missing in empirical sports studies: the tournament purse remained constant for several years, was then raised by a significant amount, and has remained at that higher level since. This allows us to examine the incentive effects round by round given a lower purse value and compare that with incentive effects of the same rounds at the higher purse level. Finally, the SEO unofficially truncates the spring (hard court) season. This scheduling phenomenon provides nontrivial attention in the form of player option value. These conditions provide further player incentive to maximize performance in all rounds.

Empirical testing can proceed along two separate but related lines. First, the effort relative to the reward to each contestant from advancing through the tournament ladders can be estimated. The initial hypothesis to be tested, based on the theoretical prediction of sequential tournament theory, is that effort increases with reward both up the ladders in a given tournament and over time as the tournament purse was increased. However, the greater the talent disparity between contestants (in addition to anticipated next round opponents), the smaller the effort expended to obtain the ladder advancement reward.

The research potential of this topic is enhanced by being able to separately test hypotheses for men and women professionals. Labor market studies convincingly show that women have wage elasticities approximately four times greater than men. Do those relative responses to incentives hold in the professional tennis world (du Bois and Heyndals, 2007; Lallemand, Plasman and Rycs, 2008; del Corral, 2009)? This is one of the more intriguing aspects of the empirical testing associated with this project.

The study gathers tournament data from the Sony Ericsson Open for the years 2007 through 2011. Ladders for each year of the tournament are available from the tournament draw sheets. Player productivity statistics are obtained from the ATP and WTA website databases and tournament ladders are obtained from the tournament itself. Utilizing player productivity measures, the expected winner of each match in each tournament round can be predicted and compared with the actual winner. Whereas pure tournament theory requires homogeneity among contestants, clearly tennis experiences a high degree of heterogeneity among contestants, especially in the lower tournament rounds. For that reason, following Klasson and Magnus (2003), we first utilize official ATP and WTA rankings to determine the tournament round a participant should reach: eRi = 8 – log2(Rio), where eR is the round participant i
should achieve based on his or her official ranking Ro. We then estimate games won by conventional methods, $W = W(eRi, Rio, Prize, X)$, where $X$ is a vector of characteristics of the specific match such as round and year, familiarity with opponent, and the like).

Examining match differences across tournament years and across both tournament allows the determination of not only the relationship between reward and effort expended and subjective probability of winning, but may provide tournament executives with a potentially superior method (to official rankings) for assigning initial matches in a given tournament (Höchtl, Kerschbamer, Stracke and Sunde, 2011). A measure of competitive balance employing all prior information on tournament entrants and where they are predicted to finish can enhance tournament excitement at all rounds. Competitive balance or close probabilities of winning between contestants, draws larger crowds and TV audiences and, concomitantly, larger tournament revenues from ticket sales and media sources. Binary contests such as the professional tennis tournaments require strategic design from principal decision makers to place attention on early stage encounters, such that highly ranked agents put forth similar effort levels at early and latter round competitions.