

DOCTORAL PROGRAMME

EVALUATION OF POLICIES TO AUCTION, RETAIN, AND VALUE
PLAYERS' SERVICES IN IPL AND OTHER SPORTS TOURNAMENTS

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Abstract

In this dissertation, we present our research on policies that are used to allocate players' services, for example, auctions, retention-options, etc. in sports tournaments. We also present a method or technique that can be used to value players' services in these tournaments. We focus on the Indian Premier League (IPL) as it is the most popular sports tournament in India. However, our work is relevant to other sports tournaments as well because they also follow similar arrangements. We present three essays in this dissertation which originate in the context of sports tournaments but are relevant to other areas of management research as well. Broadly, we contribute to the literature of competitive and cooperative game theory, auction theory, and statistics.

In Chapter 2, we examine the auction mechanism that is used to allocate players' services in the Indian Premier League or other sports tournaments of Indian origin. The auction format, which is used to allocate players' services in these tournaments, is sequential English. Although the auctions conducted through this format are administratively easy to manage, they can be quite complicated to study from an academic perspective. This problem emerges more prominently when such an auction format is used to allocate players' services in sports tournaments like IPL. This is because of the presence of the synergistic relationships (complementarity and substitutability) between players whose services are being auctioned.

IPL is a cricket tournament, which is a team sport. Team sports like cricket are multi-dimensional, i.e., a team needs to be proficient in multiple skills to be successful in the tournament. In the context of cricket, the required skills can be batting, bowling, fielding, etc. Since a single player cannot become an expert in every skill, various cricket players specialize in different skills. Subsequently, players with different specialties are treated as complementary, and those who specialize in the same skill are treated as substitutes. For example, a batter¹ can be substituted with another batter in the team, but batters and bowlers are complementary as both are needed for the team's victory. Because of this multiplicity of synergistic relationships between the players, IPL franchises, who compete in this auction, are faced with a tough problem which is described as follows. While bidding, a franchise aims to create a squad of players who specialize in different skills in the presence of multiple players with the same specialty.

¹The more popularly known word is "batsman". However, the gender-neutral word, i.e., "batter" is increasingly being used nowadays.

Similar situations can be observed in other auctions also, for example, flower auctions. In such auctions, the auctioneer is a floriculturist who sells flowers of different breeds and colors. Various florists bid for these flowers in the auction, who create products like bouquets, flower baskets, etc. Since florists require flowers of different breeds and colors in their product, they treat some flowers complementary and other as substitutes. During the auction, bidders or florists aim to create a bundle of flowers which they deem complementary. Hence, this auction is qualitatively similar to that of IPL.

In Chapter 2, we attempt to model the two scenarios mentioned above using a game-theoretic framework. We study a sequential English auction of four non-identical and synergistically related objects. The objects are divided into two categories, with two objects belonging to each category. Here, we define a category as a collection of substitutable items. Additionally, inter-category objects are complements. Objects belonging to the same category are presented consecutively in the auction. Bidders demand one unit from each category and aim to create a bundle of inter-category objects. This setup represents the simplest non-trivial instance of the auction we aim to study. Hence, the conclusions derived from this model can provide insights into the dynamics of much more complex auctions mentioned above. We solve for all possible equilibria of the game with an exogenous order of sale. We establish that the auction mechanism is efficient. The order in which categories are presented does not affect the seller's total expected revenue but may influence the selling prices of the objects. Specifically, a decreasing trend in selling prices is observed in some of the outcomes.

In Chapter 3, we explore the utility of a retention-option in allocating the services of sports players. In the IPL auction, when a franchise wins the services of a player, a contract is signed between the player and the franchise, which is valid for a fixed duration. This contract obliges the player to play only for the franchise that won his services in the auction. During the contract period, the player receives a salary as determined in the auction. Once in every three years, franchises are forced to release most of their players. Subsequently, players are shuffled among the franchises via a mega-auction. However, each franchise is offered a retention-option, which allows it to retain a certain number of its players. If a franchise retains a player, the player continues to play for that franchise. However, the salaries of retained players are determined by the IPL Governing Council (IPL-GC) and are the same for each franchise.

Retention-options are also used to determine the allocation of leases to exploit natural resources. Governments in many countries auction the leases to exploit natural resources like coal, oil, and other mines. However, in some countries like India, the government offers the retention-option to current leaseholders once their leases expire. This option allows the leaseholders to renew their lease by paying a fixed price to the government for renewal. We describe this price as the retention-price. Leases that are not renewed are re-allocated via auction. Hence, this study is also

relevant to lease auctions of natural resources. The questions that we address in this essay are as follows. How do leaseholders take decisions when they are offered a retention-option? How does a retention-option affect the lessor's (in this example, the government's) revenue?

To answer the questions mentioned above, we study three game-theoretic models. In each model, a lessor owns a few objects but leases them for a fixed duration. Leases pertaining to the previous allocation expire at the beginning of the game. To re-allocate the leases, lessor chooses whether to offer the retention-option to the current leaseholders. If the lessor does not offer the retention-option, all leases are auctioned via sequential English format. In contrast, if it offers the retention-option, each leaseholder gets the option to retain the lease it held in the previous allocation. If some leaseholders do not take the retention-option, the relevant leases are re-allocated via sequential English auction. We find that offering the retention-option increases lessor's revenue when competition among the leaseholder is low. Otherwise, an auction is more suitable to fetch a higher revenue.

Sports franchises need to assess the value or worth of their players to make several crucial decisions regarding them. These decisions may be related to players' future inclusion or exclusion in the team, financial compensation, bids during the auction, etc. While evaluating the policies that are used in IPL to allocate players' services in Chapters 3 and 4, we assumed that a franchise knows the values of its players. However, this assumption may not be reasonable in real-life. Hence, in Chapter 4, we develop a technique to evaluate the value of a player for his franchise in team sports. However, in a team sport, this task is very difficult. This is because, in a team sport, different players of the team specialize in different skills and contribute differently towards team's success. Hence, individual performance measures cannot directly be used to assess and compare the performances of players who specialize in different skills. For example, in the context of cricket, the runs scored by a batter and the wickets taken by a bowler cannot directly be used to compare their performances. However, franchises frequently need to make such comparisons, for example, while deciding their players' financial compensation.

The synergistic relationships between the members of a team further complicate the assessment of a player's value for his franchise. For example, consider a cricket team that has too many batters and a few bowlers. Such a team is less likely to be successful as it lacks in the bowling department. Consequently, the value of a batter for this team will be low as his skills are not useful for the team's victory even if he is a good batter and has a good record of individual performance. Therefore, in a team sport, a player's value or worth cannot be judged in isolation. Because of this reason also, individual performance measures are not suitable to assess the value of a player in a team sport.

In Chapter 4, we resolve both of these problems by measuring the value of a player in terms of how his inclusion in the team affects the team's probability of winning. Specifically, we first calculate the average probability of a team's victory,

given that the player being evaluated is included in the team. Subsequently, we calculate the average probability of the team's victory, given that the player in consideration is not included in the team. Finally, we provide the value of the player as the difference between these two probabilities. This method provides a single index as a player's value, and hence, can be used to compare the performances of players across specializations.

To illustrate the technique, we take the Indian Premier League (IPL) as an example. We calculate the values of all players who participated in any season of the IPL between 2015 and 2019. We also study the relationship between players' values and their salaries. We find that a few popular players earn disproportionately more than others which cannot be justified by their batting or bowling performance. However, this disproportionality in income is not necessarily irrational and can be attributed to other factors that are not included in our method, for example, leadership, brand-value, etc. Although we take cricket as an example to illustrate our technique, the technique itself is flexible enough to be used in other team sports with some minor but necessary adjustments.

In Chapter 5, we summarize the results derived from our research in Chapters 2, 3, and 4, and conclude the dissertation.