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A Linear Programming Approach to Assist Roster Construction Under a Salary Cap

Authors : Alex Contarino

Abstract : Professional sports leagues often have a “free agency” period, during which teams may sign players with expiring contracts.To promote parity, many leagues operate under a salary cap that limits the amount teams can spend on player’s salaries in a given year. Similarly, in fantasy sports leagues, salary cap drafts are a popular method for selecting players. In order to sign a free agent in either setting, teams must bid against one another to buy the player’s services while ensuring the sum of their player’s salaries is below the salary cap. This paper models the bidding process for a free agent as a constrained optimization problem that can be solved using linear programming. The objective is to determine the largest bid that a team should offer the player subject to the constraint that the value of signing the player must exceed the value of using the salary cap elsewhere. Iteratively solving this optimization problem for each available free agent provides teams with an effective framework for maximizing the talent on their rosters. The utility of this approach is demonstrated for team sport roster construction and fantasy sport drafts, using recent data sets from both settings.

Keywords : linear programming, optimization, roster management, salary cap
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