



Measuring batting parameters in cricket: A two-stage regression-OWA method

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ABSTRACT

The selection of cricket players by team selectors and sponsors for endorsement of products is primarily dependent on the performance of players in terms of various parameters in their areas of expertise such as batting or bowling. This paper proposes a two-stage method for measuring and ranking batting parameters in cricket using ordered weighted averaging (OWA) operator and regression. The first stage measures the performance of batsmen using OWA operator followed by ranking of batting parameters using regression. The study reveals that the ranking obtained for batting parameters is not sensitive to changes in the OWA weights. A real dataset of 40 batsmen from Indian Premier League 2011 is considered for analysis purpose. Although this paper focuses only on the batting discipline the results from this paper can be extended to investigate bowling discipline using multiple parameters. These results can be implemented to enhance the quality of decision making.

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1. Introduction

Cricket is a game with huge following in the British Commonwealth Countries as well as some other countries. The game of cricket as played today is more than a century old and the game has evolved through frequent changes over the past few decades. The older versions of cricket are test matches and One Day Internationals (ODIs). Unlike these older formats of cricket, which take longer duration, the latest format of the cricket, Twenty20 game can be completed in shorter period of two and half hours comparable with the time span of other popular team sports. This format was introduced a decade ago in England around 2003 and gained huge popularity among both the spectators on the ground and viewers on the television and resulted in tremendous opportunity gather huge revenue for cricket boards and players. In 2007, the first world cup of Twenty20 was played in South Africa and the cup

was won by India. In June 2009, speaking at the annual Cowdrey Lecture at Lord's, former Australian cricketer Adam Gilchrist pushed for Twenty20 to be made an Olympic sport. Twenty20 attracted millions of spectators and viewers of the game through Indian Premier League (IPL) making it a huge economic and entertainment forum. The first IPL organized in India in the year 2008 can be considered a landmark event and a turning point for the world of cricket. Till date, the IPL Twenty20 games have been highly successful in generating popularity and robust earnings for players and organizers. As of 2011, as many as seventeen countries have participated in Twenty20 tournaments around the world. A summary of International Cricket Council (ICC) sanctioned matches played in various formats is available on www.cricinfo.com. The growth in the number of Twenty20 matches in recent years point towards the success of the adoption of Twenty20 cricket format; however, the deviation from technical aspects or the basics of cricket has become a subject of debate. Usually new talented players believe that Twenty20 is about hitting 6s and 4s and tend to ignore

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the basics of the cricket game. Another concern is the inclination of new talented players to focus on making contracts with Twenty20 format of various countries instead of choosing to represent their countries.

Twenty20 game is similar to ODI and played between two teams, the fundamental difference being each team bats for a maximum of 20 overs. Each team is a combination of 11 players taken from different disciplines such as batting, bowling, all-rounder, and wicket keeper. Each bowler can bowl maximum four overs in a match or a maximum of only one-fifth of the total overs to be played per innings. In other formats of cricket, batsmen arrive from and depart to dressing room whereas in Twenty20 format, batsmen come and go from a “row of chairs” visible from all corners of the playground, similar to association football’s “Technical area” or a baseball “dugout”. In Twenty20 cricket format, the role of a batsman is considered more important in winning the game. It is believed that Twenty20 has tilted the game in favor of batsmen and the scope for bowlers has become more limited in comparison to ODIs. The problem of choosing a set of good batsmen is of paramount importance in all three formats of cricket. We propose a two-stage mathematical procedure using ordered weighted averaging (OWA) operator and regression methods. The first stage measures the performance of players taking five various capabilities such as Highest Score (HS), Average (AVG), Strike Rate (SR), 4s, 6s using OWA operator and then establishes the ranking of parameters using a regression model. The prioritization of various parameters of a player is important for selectors while choosing a set of batsmen for team in any format of the game whereas it is more important in Twenty20 format since the duration of the match is short and the performance expectations from players are high.

Perhaps, there is no direct publication for measuring and ranking batting parameters in the cricket literature. However, in recent years some authors have paid attention in different domains of cricket statistics. Kimber and Hansford [11] discussed statistical analysis of batting in cricket. This study was extended by Barr and Kantor [4] by suggesting a mathematical method for comparing and selecting batsmen in cricket. Sharp et al. [17] revisited a partial mathematical approach proposed in Barr and Kantor [4] to choose batsmen based on the average and strike rate of a batsman with subjective choice of a parameter. Sharma et al. [16] discussed how to choose best cricket batsman using ordered weighted averaging. Lemmer [12] proposed a single match approach to strike rate adjustments in batting performance measures for ODI in cricket. [13] suggested a hedonic model of players’ wage determination for IPL based on various cricket parameters. Multivariate statistical method such as factor analysis has been employed in Twenty20 cricket by Sharma [15]. For cricket team selection using different mathematical models see Iyer and Shadra [10], Amin and Sharma [3]. The proposed DEA method in Amin and Sharma [3] is used to evaluate cricket players in different abilities for a team selection whereas the current study focuses on ranking batting parameters. In fact, their proposed DEA method cannot be used for the purpose of the current study, as each DEA model for individual batsman assigns different

importance weights for the batting parameters. As discussed in Cook et al. [6], DEA is an effective method when decision making units (DMUs) can be viewed as production systems where multiple resources (or inputs) are consumed to produce multiple outputs (or products); however, in all cases defining the actual inputs and outputs may not be easy. Another problem encountered when using DEA is the generation of different importance weight vector for the batting parameters for each batsman which might fail in case of unique ranking.

Among the cricket experts and fans, strike rate is considered as an important measure for good batsmen in Twenty20 format but there is no scientific evidence to support this measure in the literature. This paper is an attempt to provide a scientific basis to prove that strike rate is an important measure for good batsmen in shorter version of cricket using OWA and regression methods.

This paper suggests a new method for measuring batting parameters in cricket using OWA operator and regression methods for prioritizing batting parameters. The OWA operators, originated in Yager [19], represent an aggregation method that maps $\mathbf{x} = (x_1, \dots, x_n)$ to $F(\mathbf{x}) = \mathbf{w}\mathbf{y} = \sum_{i=1}^n w_i y_i$, where y_i is the i th largest value ($i = 1, \dots, n$) of components of $\mathbf{x}$ and $\mathbf{w} = (w_1, \dots, w_n)$, $w_i \geq 0$ $i = 1, \dots, n$ and $\sum_{i=1}^n w_i = 1$, are the associated weights. Recent years have seen successful applications of OWA in different areas. For example, Tesfamariam and Sadiq [18] used OWA operators for probabilistic risk analysis. Emrouznejad [7] introduced the most preferred OWA operator for considering the role of data in the process of aggregation. Amin and Sadeghi [2] proposed an application of OWA for a metasearch aggregation. Yager and Beliakov [22] developed the use of OWA operators for regression problems. Also, Chang and Cheng [5] suggested an OWA based method for the risk failure analysis.

In this paper we propose a new method for measuring and ranking batting parameters in cricket using OWA and regression. It is shown that for different generated OWA weights, corresponding to various uncertainty levels, the ranking obtained for batting parameters is not sensitive to the change of these weights. The result of this paper can be developed for any other format of cricket and capabilities with multiple parameters. The remainder of this paper is organized as follows: Section 2 gives the concept of OWA operator. Data for 40 IPL batsmen is explained in Section 3. Section 4 gives a method for measuring batting parameters. Conclusion and directions for further research are presented in Section 5.

2. Basic concepts: OWA operators

In OWA operator there are two important measures, the dispersion (or entropy) and the orness, defined as follows, Yager [19].

$$\text{Disp}(w_1, \dots, w_n) = -\sum_{i=1}^n w_i \ln(w_i)$$

$$\text{Orness}(w_1, \dots, w_n) = \frac{1}{n-1} \sum_{i=1}^n (n-i)w_i$$

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