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New performance measure in Cricket

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Abstract: *Measuring individual performance of players in Cricket is vital for team selection. The number runs scored by batsmen and wickets taken by bowlers serve as a natural way of quantifying the performance of a cricketer. Traditionally the batsmen and bowlers are rated on their batting or bowling average respectively. However in a game like cricket, it is always important the situation in which one scores the runs or claims a wicket. Scoring runs against a strong bowling line-up or taking wickets against a team with strong batting line-up deserves more credit. A player's average is not able to capture this aspect of the game. In this paper we present a refined method to quantify the 'quality' of runs scored by a batsman or wickets taken by a bowler. A new performance measure for batsman takes into account bowling average of bowler i.e. quality of bowlers he is facing and similarly performance measure for bowler takes into account the batting average of batsman i.e. quality of batsman he is bowling to. Aggregate of individual performance of batsman against each bowler is taken as total performance index of the batsman. And aggregate of individual performance of bowler against each batsman is taken as total performance index of the bowler. Player's ranking can be done on the basis of the total performance index of each player.*

Keywords: batting average, bowling average, performance index, player's ranking.

I. Introduction

In recent years there has been an increase in study of quantitative analysis of individual performance involving team sports. Quantifying the individual performance or 'quality' of a player in any sport is a matter of great importance for the selection of team members in competitions. A lot of research and analysis is involved in the process of team-selection.

We take the case of individual performance of batsmen and bowlers in International Cricket matches. Batsmen and Bowlers in Cricket are traditionally ranked according to their batting and bowling average respectively. The question thus naturally arises is whether batting average of batsmen (or bowling average of bowlers) are the best measure for judging the worth of a batsman (or a bowler). It was shown that rankings based on average suffer from two defects - i) Consistency of scores (or wickets) across innings and ii) Value of runs scored(wickets) by the player. However one should also consider the quality of bowling as well. Runs scored against Australian bowlers deserve more credit than runs scored against low bowling attack of Bangladesh or Zimbabwe. On similar arguments the wicket of top-order batsman is valued more than the wicket of a lower-order batsman. If a bowler claims the wicket of Smith, Virat Kohli, or Amla, he should get more credit than if he dismisses any lower-order batsman. Muhammad Daniyal and etal (2012) has analyzed batting performance in Cricket using Individual and Moving Range (MR) Control Charts. Beaudoin D. and Swatz T (2003) has proposed a new statistic for assessing the performance of batsmen and bowler in one day cricket. The statistic they suggested is the ratio of runs scored to resources consumed where resources are defined according to Duckworth-Lewis method of resetting targets. With this background, we propose a measure to quantify the 'quality' of a batsman or bowler. In Section 2 we propose the methodology for performance measure of the batsmen and bowlers. In section 3 we discuss the results and we conclude in Section 4.

II. Methodology

Batting average of a batsman is defined as the total number of runs scored by the batsman divided by the number of times he was dismissed. Thus higher batting average reflects higher 'quality' of a batsman. Similarly, bowling average is defined as the number of runs given by the bowler divided by the number of wickets claimed by him. Thus lower bowling average indicates higher ability of the bowler. This information is used to generate the performance measure of bowlers and batsmen in cricket matches. Lemmer.H. (2008) has suggested an analysis of players' performances in the first cricket twenty20 world cup series. In his paper he showed how batting and bowling performance measures for one-day internationals can be adapted for use in Twenty20 matches, specifically in the case of a very small number of matches played.

We know performance of a batsman should judged by the 'quality' of runs scored and not the number of runs scored. Hence runs scored against a bowler with lower bowling average carries more credit than runs scored against a bowler of less importance. We introduce a performance index of a batsman which considers the

quality of bowler against whom he has scored runs. We introduce a performance index of a batsman *i* against a bowler *j* given as

$$PIB_{ij} = \frac{Batting\ Average\ of\ Batsman\ i\ against\ bowler\ j}{Career\ Bowling\ Average\ of\ bowler\ j} * 100$$

Mathematically, batting average of the batsman is given by the ratio R/d where R is the number of runs scored against a bowler and d is the number of times he was dismissed by the bowler *j*. Hence, if the career bowling average of a bowler is low (indicating a good bowler), PIB_{ij} increases indicating that the batsman scored runs against quality opposition.

Total performance index of the batsman is the aggregate of PIB_{ij} against each bowler.

$$TPIB_i = \sum_j PIB_{ij}$$

Average performance index of the batsman *i* is given as

$$APIB_i = \frac{TPIB_i}{No.of\ bowlers\ faced}$$

So far, we have concentrated on the performance index of batsmen. One could quantify the overall performance of a bowler based on the dismissal record of batsmen. The wicket of a top-order batsman always deserves more credit than the wicket of a tail-ender. Thus the 'quality' of dismissal serves as a measure for the greatness of a bowler. We define the performance index of bowler *i* against batsman *j* as

$$PIBo_{ij} = \frac{Career\ Batting\ Average\ of\ batsman\ j}{Bowling\ Average\ of\ bowler\ i\ agaisnt\ batsman\ j} * 100$$

Hence, if the career batting average of a batsman is high (indicating a good batsman), $PIBo_{ij}$ increases indicating that the bowler bowled against quality batsman. Greater value of $PIBo_{ij}$ indicates a better quality of a bowler.

Total performance index of the bowler is the aggregate of $PIBo_{ij}$ against each batsman.

$$TPIBo_i = \sum_j PIBo_{ij}$$

Average performance index of the bowler *i* is given as

$$APIBo_i = \frac{TPIBo_i}{No.of\ batsmen\ bowled\ against}$$

III. Results

Let us find the performance index of a batsman A.
Assume that a batsman A has faced only 5 bowlers till now. The career bowling average of each of the five bowlers, batting average of this batsman A against each of the 5 bowlers is recorded. Performance Index of batsman (PIB) A is obtained using the formula

$$PIB_{ij} = \frac{Batting\ Average\ of\ Batsman\ i\ against\ bowler\ j}{Career\ Bowling\ Average\ of\ bowler\ j} * 100$$

Bowler	Career Bowling avg.	Batting avg. of Batsman against each bowler	PIB
1	14.7	28	190.4762
2	20.33	35	172.1594
3	27.23	44	161.5865
4	27.51	39	141.7666
5	24.72	40	161.8123
			TPIB = 827.801

Total performance index of the batsman A is the aggregate of PIB_{ij} against each bowler.

$$TPIB = \sum_j PIB = 827.801$$

Average performance index of the batsman A is given as

$$APIB = \frac{TPIB_i}{No.of\ bowlers\ faced} = \frac{827.801}{5} = 165.5602$$

Let us now find the performance index of a bowler B.
Assume that a bowler has bowled to 5 batsmen till now. The career batting average of each of the five batsmen, bowling average of this bowler against each of the 5 batsmen is recorded. Performance Index of bowler (PIBo) is obtained using the formula

$$PIBo_{ij} = \frac{Career\ Batting\ Average\ of\ batsman\ j}{Bowling\ Average\ of\ bowler\ i\ agaisnt\ batsman\ j} * 100$$

Batsman	Career Batting avg.	Bowling avg. of bowler B against each batsman	PIBo
1	44	25	176
2	40	20	200
3	35	18	194.4444
4	28	27	103.7037
5	30	29	103.4483
			TPIBo = 777.5964

Total performance index of the bowler B is the aggregate of $PIBo_{ij}$ against each batsman.

$$TPIBo = \sum_i PIBo = 777.5964$$

Average performance index of the bowler B is given as

$$APIBo = \frac{TPIBo}{No.of\ batsmen\ bowled\ against} = \frac{777.5964}{5} = 155.5193$$

The above two cases are just to explain how performance index is calculated for a batsman and a bowler. If we are able to fetch player vs player data for each batsman and each bowler, exact average performance index can be obtained.

IV. Conclusion

To summarize, we quantified the performance of batsmen and bowlers considering the bowler's bowling and batsman's batting. An excellent bowling performance on a batsman-friendly pitch holds greater merit than that on pitches which help bowlers. Similarly, scoring runs on difficult tracks always gets more attention than scoring runs on good batting tracks. In our analysis we have not included these factors.

Moreover, owners of the cash rich franchise owners' around world spend lots of money to hire players on a contract basis. The owners along with the coaches can identify talents based on the 'performance index' of a player. Playing eleven can also be picked considering the player's performance against a particular opposition. Potentially our study could identify good batsmen or bowlers, based on complete player-vs-player information, which at present we are unable to identify due to non-availability of data. These measures don't aim at replacing the existing measures but it serves as an additional measure to make the averages more effective and significant.

References

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