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Sahadeb Sarkar
Professor
Indian Institute of Management Calcutta D. H. Road, Joka, P.O. Kolkata 700 104
http://facultylive.iimcal.ac.in/workingpapers

Anirban Banerjee
Doctoral Student, IIM Calcutta, D. H. Road, Joka, P.O. Kolkata 700 104

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Sahadeb Sarkar*
Professor, Operations Management Group
Indian Institute of Management Calcutta, Diamond Harbour Road,
Kolkata- 700104, West Bengal, India

Anirban Banerjee
Doctoral Student, Finance and Control Group
Indian Institute of Management Calcutta, Diamond Harbour Road,
Kolkata- 700104, West Bengal, India

***Corresponding Author (sahadeb@iimcal.ac.in)**

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Abstract

This paper examines the intriguing problem of comparing great batsmen in test cricket across different eras. Traditional method of calculating a batsman's batting average may be justified under the assumption that runs scored in various complete and incomplete innings by a batsman form a random sample from an exponential or a geometric distribution. This assumption, however, leads to undesirably having batting inconsistency or standard deviation uniquely determined by the batting mean. To correct this drawback we propose use of the Weibull distribution model. First, the Weibull model is seen to provide a far superior fit to the test cricket data of our study. Second, the maximum likelihood estimate (MLE) of the batting standard deviation is found to provide a very sensible estimate of batting inconsistency. Third, the resulting MLE of the batting mean in case of Bradman turns out to be 109.42 instead of 99.94. Fourth, we define player longevity as a third criterion, and introduce an index for quality-runs scored as a function of opposition strength and another measure for diversity of opponent teams encountered by a player. Fifth, the Mahalanobis distance is used for overall ranking of a select group of batting greats on the basis of various combinations of these five criteria, without assigning any subjective weights to them. Finally, multivariate statistical outlier detection technique affirms two players as truly outstanding – Bradman for his batting average and quality of runs scored, and Tendulkar for his longevity and opposition diversity he faced. The proposed techniques used here may easily be applied in sports management for ranking players available for procurement, and in investment management for rating various financial assets.

Key words: Batting consistency; Cricket; Exponential Distribution; Maximum Likelihood Estimate; Mahalanobis Distance, Outlier, Ranking, Right-Censored Data; Weibull Distribution

Introduction

The game of cricket is one of the most popular in the world[1], and test cricket as its oldest format is considered to be the best by many players and followers. Achievements of classy batsmen like Bradman, Sobers, Viv Richards, Tendulkar, Lara, Ponting and Dravid are truly enviable. It may be argued that class cannot be compared but one can definitely compare astounding statistics that these batsmen have garnered over the course of their illustrious careers. Comparative analyses of the batting greats are done in many cases by themselves ("Who's the next-best batsman after Bradman?"[2]; "What would Bradman average today?"[3]). While Bradman is almost unanimously considered the best ever, Bradman himself felt he was looking at a 'mirror-image' of himself when he watched Tendulkar play[4], and included the latter in his dream world XI[5] preferring him over other superstars like Lara and Ponting. Naturally delirious Tendulkar fans would like to think he is comparable to Bradman and ahead of all others. The objective of this paper is to do a comparative analysis of great batsmen in test cricket across different eras with innovative use of statistical tools and find out their strengths and weaknesses.

Batting average is the foremost criterion (Rohde, 2011) for comparing performance of different batsmen. Batting consistency, on the other hand, is often ignored as a desirable criterion so much so that popular sources for cricket data such as ESPN cricinfo does not even provide a measure for this concept. The accepted traditional approach, also followed by ESPN cricinfo, is to calculate a batsman's batting average as the total number of runs scored in all batting innings during his career divided by the number of those innings in which he got dismissed or out. One theoretical justification of this procedure may be that the batting average computed this way is the maximum likelihood estimate of the mean under the assumption that runs scored in various innings constitute a random sample of lifetimes from the exponential distribution which is continuous or the geometric distribution which is discrete, where the number of runs scored in a not-out innings is considered to be a right-censored lifetime. However, this assumption implies that two batsmen having similar batting averages would be automatically considered to be similarly consistent or dependable. This seems to be incorrect in many cases. Dravid and Lara, for example, have similar batting averages of 52.3 and 52.9 respectively, and yet Dravid is generally perceived to be more

[1] http://mostpopularsports.net/in-the-world
[2] http://www.espncricinfo.com/magazine/content/story/626396.html
[3] http://www.thehindu.com/sport/cricket/what-would-bradman-average-today/article7464740.ece
[4] http://www.ibnlive.com/cricketnext/news/when-don-bradman-saw-himself-in-sachin-tendulkar-644298.html
[5] http://www.outlookindia.com/website/story/tendulkar-in-bradmans-dream-world-xi/213024

dependable[6] or consistent than Lara. That the exponential or geometric distribution often gives unsatisfactory fit to cricket scores is observed by Danaher (1989), and Kimber and Hansford (1993).

To properly estimate batting consistency we examine the Weibull distribution model that allows for separate measurement of the mean and standard deviation (SD). Some researchers prefer to treat the number of runs scored by a batsman in an innings as a discrete random variable (see Das, 2016). However, quite commonly such innings scores over a long career may as well be treated as a continuous random variable just as, for example, one commonly assumes a normal distribution for examination scores. Under the Weibull model, the likelihood ratio tests (LRT) show that for 29 out of 32 cases considered in our study (Table 2), the Weibull distribution with its shape and scale parameters estimated by the maximum likelihood estimation method provides a much better fit than an exponential distribution at the 5% level. This is also corroborated by the superior P-value for the Pearson chi-square test for goodness-of-fit of the best fitting Weibull distribution to that for the exponential distribution.

One consequence of the fitted Weibull model is that it gives a very sensible estimate of batting inconsistency. For example, for Dravid and Lara, whose reported batting average values are 52.3 and 52.9 respectively, the Weibull model gives the maximum likelihood estimates (MLEs) of their batting mean values as 53.6 and 53.9 respectively and is able to distinguish the two players' inconsistency with estimated values of 61.7 for dependable Dravid and 71.5 for explosive Lara. Another consequence of the Weibull model is that the MLE of the batting mean turns out to be a little higher than that with the traditional approach for all the star players considered in our study. For example, Tendulkar's ESPN cricinfo-reported average of 53.79 becomes 55.59 and Bradman's reported well-known batting average of 99.94 becomes 109.42 – much higher than the coveted 100 which a player of Bradman's caliber deserve to be associated with. Notable big changes in estimated batting mean from the ESPN cricinfo-reported averages happen for quite a few players in our study (see Table 2): for Steve Waugh (51.06 to 57.05), Chanderpaul (51.37 to 55.56), Younis Khan (54.07 to 57.55), Kallis (55.37 to 58.58) and Sobers (57.78 to 60.99).

After obtaining statistically estimated batting mean and consistency we use the concept of Mahalanobis distance (Mahalanobis, 1936) or statistical distance for ranking the batting greats, as it avoids having to assign subjective weights to multiple criteria of interest.

[6] http://www.bbc.com/sport/cricket/17298748

First, using the two criteria batting average and consistency or dependability, we find that as expected Bradman is ranked first, but Tendulkar comes out ranked fifth. This contradicts the fact Bradman saw a lot of himself in Tendulkar and included only Tendulkar in his dream world XI among the recent generations of superstar players like Lara.

We introduce player longevity as a third valuable criterion which is usually neglected (Rohde, 2011). When the third criterion of longevity is added Tendulkar obtains the second rank after Bradman, followed by Chanderpaul and Kallis in third and fourth positions respectively. Third rank of Chanderpaul is a notable surprise.

Next we propose procedures for measuring quality of runs, scored in an innings by taking into account the opponent team strength at that point of time, and evaluating opposition diversity faced by a batsman during his career. When all the above five criteria are considered, Tendulkar again is ranked second to Bradman, followed by Hutton, Barrington and Kallis. One notable finding is that Tendulkar is consistently ranked higher than his illustrious contemporaries Ponting and Lara to whom Tendulkar is always compared by his fans and critics alike. A surprising result, under the Weibull model, is that a low-key player like Chanderpaul has a higher estimated batting mean than the celebrated Lara, Ponting and Dravid, and thereby gets placed in a higher subgroup of players ahead of the latter and consequently receives higher rank. Furthermore, statistical outlier detection techniques in the multi-criteria setting confirm two players as truly exceptional – Bradman for his batting average and quality of runs, and Tendulkar for his longevity and diversity of opposition teams he played against.

Current Ranking Methods

ICC Ranking

The International Cricket Council (ICC) provides two different ranking for test batsmen – one for the current players[7] and one for the 'best ever ratings'[8]. Although the methodology followed by the ICC for ranking current international cricketers is not mentioned in detail, it can be seen that it is a sophisticated moving average method[9]. The methodology considers a number of parameters like runs scored, opponent strength, level of run-scoring, result of match, dismissed or not etc. But the major criticism of this methodology is the subjective choice of weights assigned to various parameters (Rohde,

[7] http://www.relianceiccrankings.com/ranking/test/batting/
[8] http://www.relianceiccrankings.com/alltime/test/
[9] http://www.icc-cricket.com/player-rankings/about

2011). Moreover, higher weightage is given to recent performance in this methodology. These ICC rankings measure the current form and not the overall performance during a player's career. Also cricket is a team game where every player puts in effort to help his team win. The ICC ranking which rates performance for a losing cause lower than that for winning cause is more likely to penalize players playing for a weaker team against a stronger opponent.

The 'Best ever rankings' provided by the ICC, because of the title, may appear to have the same objective as this paper. But on closer observation it may be seen that this ranking system rates players based on their best-ever-points scored at any point of their respective careers. As such it quantitatively captures the best-ever-peak form of players during their career rather than their overall career performance.

Alternatives in Academic Literature

There is a significant amount of academic research on comparing and ranking various cricket players. The work that possibly comes closest to the objective of our paper is that of Rohde (2011). Rohde uses concepts of opportunity cost and economic profit to batting performance to produce a ranking system that uses non-arbitrary weightings to rank players across various time periods using only two criteria – a player's career batting average (called 'intensity' of performance), and career aggregate runs (called 'player longevity'). Our paper does a more rigorous job in this regard by considering five criteria, namely, batting average, consistency or dependability, longevity, quality of runs scored and opposition diversity. Our measure of player longevity considers number of innings played and number of years spanning a career, and not just aggregate number of runs scored in a career as was done by Rhode (2011). To avoid subjective weighting of various criteria we have used the Mahalanobis distance. However, we have formed natural subgroups of players based on their estimated batting mean which is undoubtedly the most important criterion.

Besides the work of Rohde (2011), some other alternatives to the ICC rankings are found in the literature. Borooah and Mangan (2010) rank batsmen based on their adjusted batting average with scores adjusted relative to his team rather than in absolute terms, and batting consistency using Sen's welfare index (Sen, 1976) based on Gini coefficient. Lemmer and Nel (2001) incorporate the inverse of a coefficient of variation as a measure of consistency. Their approach of estimating SD using innings scores irrespective of the scenario whether the player was out or not is not statistically rigorous. In our analysis, we estimate consistency or dependability treating innings scores as a random sample of complete

and incomplete (right-censored) observations from a Weibull distribution. Lemmer (2004) employs a consistency curve method to capture efficiency of the one day international batsmen. To allow for meaningful comparison of player performance over different eras, Brown (2009) calculates Z-score, which is the individual mean less the overall decadal mean divided by the decadal standard error, for each batsmen in each decade. Barr and Kantor (2004) worked on ranking batsmen in one day cricket.

Although primarily based on the premise of one-day variant of the game, Beaudoin and Swartz (2003) try to extend the concept of Duckworth-Lewis method of resetting targets to develop a better test statistic to compare performance of batsmen and bowlers in ODI cricket. Similarly Barr and Kantor (2004) provide a way to rank batsmen in one day cricket using a technique to balance output and the speed of scoring through a parametric index. Alternative approaches like fuzzy cognitive map based cricket player performance evaluator tool (Singh, Bhatia and Singh, 2011) have been also proposed to solve the problem of comparing player performances. Comparing player performances in the recent variant of Twenty 20 cricket has also been carried out (Lemmer, 2008; Sharp et al, 2011). More specific events such as effect of power-play in ODI cricket have also been studied recently (Silva, Manage and Swartz, 2015).

Recently, Das (2016) proposes an alternative approach to the traditional way of computing batting average in cricket using a class of generalized geometric distributions, particularly over short run (series, tournament, calendar year, etc.). Das (2016) improves upon the idea of using Kaplan-Meier estimator (Kaplan and Meier, 1958) for batting average. Das (2016) points out that for a batsman who remained not out in a large proportion of his innings played, the traditional batting average may differ significantly from the true batting average, and in some cases the traditional batting average may even be higher than the highest score of that particular batsman. This problem of the traditional mean differing from the true average on account of large number of not-out innings does not arise in our study as we have considered test batsmen who have scored substantial number of runs over a large period of time.

Data

Using the data available on the ESPN Cricinfo website on batsmen we initially consider a list of 28 players who scored 8000 or more international test runs. However, certain great players such as Bradman, who did not have the opportunity to play sufficient number of tests to score 8000 international runs, got excluded. Therefore, we also included

batsmen who have scored more than 6000 international test runs and have an average over 55. After the modification the number of batsmen under consideration becomes 32, including 5 players still playing test cricket for their respective countries as of 19 July 2015. Table 1 provides list of all these batsmen who have been considered for our analysis. These 32 batsmen have played on an average 124 test matches and scored on an average 9687 test runs. We collected data from the ESPN Cricinfo website[10] on "Statsguru, Cricinfo's searchable cricket statistics database". This database is quite comprehensive and provide innings by innings record for all these players in thirteen columns on runs, minutes, balls faced, 4s, 6s, strike rate, batting position, dismissal, Innings number, opposition, ground, start date, and test number.

Measuring Various Criteria

Batting Mean and Consistency

The histogram of innings-wise scores of a batsman may lead one to use the exponential distribution model. For example, Figure 1(a) shows a histogram of all innings (out as well as not-out) scores of Tendulkar, whereas Figure 1(b) shows a histogram of scores of only those innings where Tendulkar got out. While Figure 1(a) resembles a histogram of data arising from an exponential distribution, it is not so clear in case of Figure 1(b).

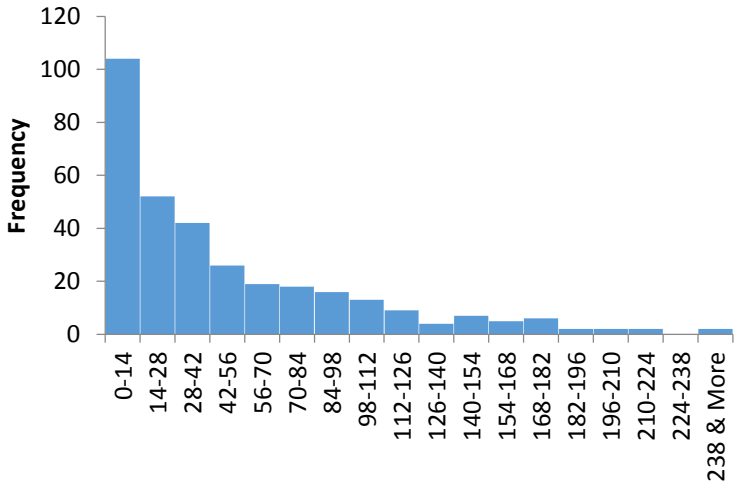

Figure 1(a): Histogram of all innings scores of Tendulkar

[10] ESPN Cricinfo (http://stats.espncricinfo.com/ci/engine/stats/index.html)

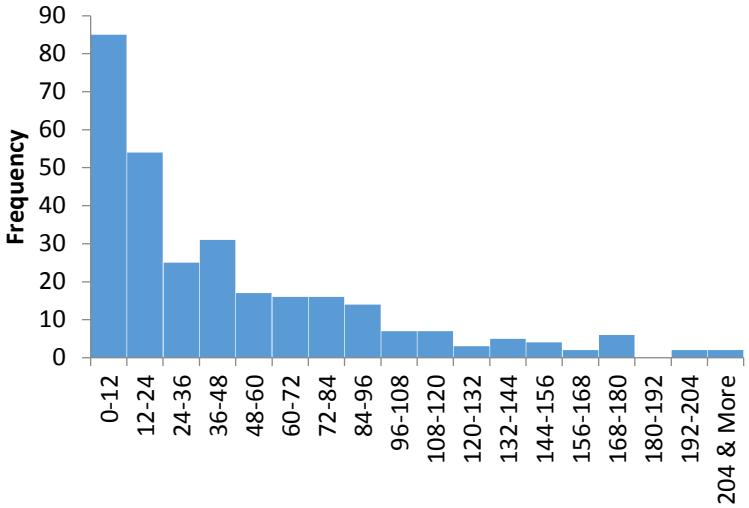

Figure 1(b): Histogram of dismissed innings scores of Tendulkar

When we use the Pearson's chi-square test to check goodness of fit of the exponential distribution, with mean equal to the ESPN cricinfo reported batting average, to scores from Tendulkar's dismissed innings, the P-value comes out to be negligible indicating very poor fit. This exercise repeated for other players show that the exponential model fails to explain the scores data for about 50% of the cases (Table 2). This motivates us to consider the more general family of lifetime distributions, namely, Weibull distributions, denoted by Weibull(α,θ), the probability density function of which is given by

$$f(z) = \left(\alpha \frac{z^{\alpha-1}}{\theta}\right)\left(e^{-\frac{z^{\alpha}}{\theta}}\right), \quad z \geq 0, \ \alpha > 0, \ \theta > 0. \tag{1}$$

When the value of the shape parameter α equals one, one gets the exponential distribution. The θ parameter is called the scale parameter.

Let Z_i denote the runs scored by a player in his i-th innings. Let X denote the runs scored by a player if he was out (dismissed) and Y denote that if he remained not out. Thus $Z_i = X_i$, if the batsman was out in the i-th innings; and $Z_i = Y_i$ otherwise. Suppose $\{Z_i\}$ consists of n $\{X_i\}$ values and m $\{Y_i\}$ values. Assuming that $\{Z_i\}$ constitute a random sample from a Weibull(α,θ) distribution, we compute the maximum likelihood estimates (MLEs) of the parameters for each player. The likelihood function for the (n+m) observations $\{Z_i\}$ is given by

$$L(\alpha,\theta) = \left(\alpha^n \frac{(X_1.X_2 \ldots X_n)^{\alpha-1}}{\theta^n} e^{-\frac{1}{\theta}(\sum_{i=1}^{n} X_i{}^{\alpha} + \sum_{j=1}^{m} Y_j{}^{\alpha})}\right)$$

since contributions of the i-th complete observation X_i and the j-th censored observation Y_j to the likelihood function are respectively

$$\alpha \frac{X_i^{\alpha-1}}{\theta}\, e^{-\frac{X_i^{\alpha}}{\theta}}$$, and $e^{-\frac{Y_j^{\alpha}}{\theta}}$, since $P(Z > z) = e^{-\frac{z^{\alpha}}{\theta}}$.

Maximizing the log-likelihood function given by

$$\log L(\alpha, \theta) = n \log\left(\frac{\alpha}{\theta}\right) + (\alpha - 1) \sum_{i=1}^{n} \log(X_i) - \frac{1}{\theta}\left(\sum_{i=1}^{n} {X_i}^{\alpha} + \sum_{j=1}^{m} {Y_j}^{\alpha}\right) \quad (2)$$

with respect to α and θ, we obtain the MLEs $\hat{\alpha}$ and $\hat{\theta}$. Let $\Gamma(t) = \int_0^{\infty} x^{t-1} e^{-x} dx,\ t > 0$, denote the gamma function. Since the *r*-th raw moment, for *r*>0, of the Weibull distribution is given by

$$E(Z^r) = \left(\theta^{\frac{r}{\alpha}}\right) \Gamma\left(\frac{r}{\alpha} + 1\right), \quad (3)$$

by the invariance principle, the MLEs of the Weibull distribution mean and variance are given by

$$\widehat{E(Z)} = \left(\hat{\theta}^{\frac{1}{\hat{\alpha}}}\right) \Gamma\left(\frac{1}{\hat{\alpha}} + 1\right) = a\ (say), \quad (4)$$

$$\widehat{V(Z)} = \left(\hat{\theta}^{\frac{2}{\hat{\alpha}}}\right) \Gamma\left(\frac{2}{\hat{\alpha}} + 1\right) - \left(\left(\hat{\theta}^{\frac{1}{\hat{\alpha}}}\right) \Gamma\left(\frac{1}{\hat{\alpha}} + 1\right)\right)^2 = \frac{1}{b^2}\ (say) \quad (5)$$

To statistically test the null hypothesis that the observations come from an exponential distribution, i.e., $H_0: \alpha = 1$ against the alternative hypothesis that it does not come from an exponential distribution, i.e., $H_1: \alpha \neq 1$, the likelihood ratio test (LRT) statistic, $-2 \log_e(\Lambda)$, is used where

$$\Lambda = L(1, \tilde{\theta}) / L(\hat{\alpha}, \hat{\theta}),\ L(\hat{\alpha}, \hat{\theta}) = \mathrm{Sup}_{\alpha,\theta}\, L(\alpha, \theta),\ L(1, \tilde{\theta}) = \mathrm{Sup}_{\theta}\, L(1, \theta), \quad (6)$$

and $\tilde{\theta}$ denotes the MLE under the null hypothesis $H_0: \alpha = 1$. Under the null hypothesis the LRT statistic follows the chi-square distribution with one degree of freedom, denoted by χ_1^2. The Pearson's Chi Square test is also performed to check goodness of fit of the best-fitting Weibull($\hat{\alpha}$,$\hat{\theta}$) distribution using the $\{X_i\}$ values i.e., scores in those innings in which a batsman was dismissed. The range of $\{X_i\}$ values is divided into *K* number of bins or class intervals. The expected number of observations E_k from the Weibull($\hat{\alpha}$,$\hat{\theta}$) distribution falling in the *k*-th bin or interval, say, [*c* to *d*],is given by

$$E_k = \int_c^d \frac{\hat{\alpha}}{\hat{\theta}} x^{\hat{\alpha}-1} e^{-\frac{x^{\hat{\alpha}}}{\hat{\theta}}}\, dx = e^{-\frac{c^{\hat{\alpha}}}{\hat{\theta}}} - e^{-\frac{d^{\hat{\alpha}}}{\hat{\theta}}} \quad (7)$$

Let O_i denote the number of observations in the *k*-th bin. Then, the Pearson's chi-square (PCS) is defined by

$$PCS = \sum_{k=1}^{K} \frac{(O_k - E_k)^2}{E_k} \quad (8)$$

which follows $\chi^2_{(K-3)}$. Similarly, Pearson's chi-square test, to check goodness of fit of the best-fitting exponential ($\tilde{\theta}$) or Weibull(1,$\tilde{\theta}$) distribution using the $\{X_i\}$ observations, follows $\chi^2_{(K-2)}$ distribution.

Longevity

Number of innings played by various players and the number of years in their career span may vary to a great extent. It is difficult to maintain high level of performance over a long period of time and over a large number of innings. Hence players who have performed well over longer period of time and on larger occasions should be ranked higher. Hence the usually-ignored criterion of longevity needs to be incorporated in the ranking analysis (Rohde, 2011). Suppose player i has played for x_i years and has batted in y_i innings, i=1,2,…,n, where n is the total number of players under study (here, n=32). Then the longevity c_i of this player may be defined as

$$c_i = 0.5\left(\frac{x_i}{\frac{1}{n}\sum_{i=1}^{n} x_i}\right) + 0.5\left(\frac{y_i}{\frac{1}{n}\sum_{i=1}^{n} y_i}\right) \quad (9)$$

To make our analysis yet more comprehensive, we next define two more criteria for further study.

Quality of Runs

While it is important to score runs consistently over a long duration and in numerous innings, it is also important to consider the strength of opponents against whom the runs were scored and the venue (home or away) where the runs were scored. It is usually more difficult for a player to score runs in away conditions than in home conditions. As such we define two separate performance indices for players for home and away conditions. We primarily consider the performance of a player relative to his peers against a particular opponent and the strength of that particular opponent during that period. We perform this analysis separately for home and away conditions.

For determining the strength of an opponent team at different points of time, we divide the entire cricket-playing span into periods of five years: 1920 – 24, 1925 – 29, … , 2015 – 2019. For measuring difficulty level of playing against an opponent team, we measure how well the team performed in home and away matches respectively in each of these time periods. We count the number of matches played by each of the test playing countries in home (away) conditions in a particular time period. For a particular team in a specific time period, one point is assigned for a test win, 0.5 point for a drawn test and no point for a test

loss. These points are averaged over the total number of tests played during that time period to provide average strength of a team. Let $Perf_{away,p,t}$ and $Perf_{home,p,t}$ denote the average performance score of a particular opponent p in their away games and home games respectively during time period *t*. Also suppose that the proportion of overall career innings played by a player *i* during that period *t* is $F_{i,t}$. The difficulty level of an opponent *p* for player *i* during his career in his home condition may be defined as

$$DL_{home,i,p} = \sum_t Perf_{away,p,t} \times F_{i,t} \quad (10a)$$

Similarly, for the same opponent *p* with performance score $Perf_{home,p,t}$ in their home games during time period *t*, the difficulty level for the *i*-th player playing away in that opponent's home condition during his entire career is calculated as

$$DL_{away,i,p} = \sum_t Perf_{home,p,t} \times F_{i,t} \quad (10b)$$

Using these values, we are able to determine the difficulty level of playing against a particular opponent for each of these players in home and away conditions separately. The difficulty level values lie between 0 and 1, with value 1 for the toughest opponent who wins all the games and value 0 for the weakest opponent who loses all the matches.

Table 5: Team Performance in Away and Home Matches during 2005-09

Team	Away Matches						Home Matches					
	Played	Won	Drawn	Lost	Points	Points per Game	Played	Won	Drawn	Lost	Points	Points per Game
AUS	28	13	8	7	17	0.61	28	22	3	3	23.5	0.84
ENG	29	5	11	13	10.5	0.36	35	18	11	6	23.5	0.67
PAK	25	5	7	13	8.5	0.34	13	5	7	1	8.5	0.65
SA	23	10	6	7	13	0.57	29	16	3	10	17.5	0.60
SL	23	7	6	10	10	0.43	22	16	4	2	18	0.82
WI	25	1	6	18	4	0.16	22	3	10	9	8	0.36
IND	27	9	11	7	14.5	0.54	24	11	10	3	16	0.67
NZ	16	3	3	10	4.5	0.28	23	8	8	7	12	0.52
ZIM	4	0	1	3	0.5	0.13	4	0	0	4	0	0.00
BAN	13	2	0	11	2	0.15	14	1	3	10	2.5	0.18

We illustrate calculations of $Perf_{away,p,t}$ and $Perf_{home,p,t}$ in Table 5 for t = time period 2005-2009. Australia played 28 tests in away conditions during this period and won 13, lost 7 and drawn 8 of them. As a result, $Perf_{away,Australia,2005-2009}$, denoting the points scored by Australia per away test during this period, is 0.61. Similarly, Australia played 28 tests at home during this period and won 22, lost 3 and drawn 3 of them, and $Perf_{home,Australia,2005-2009}$, denoting the points scored by Australia per home test during this period is 0.84.

Table 6: Proportion of innings played by 6 players over 1985 to 2019.

Name	1985-89	1990-94	1995-99	2000-04	2005-09	2010-14	2015-19
SR Tendulkar	0.02	0.14	0.19	0.24	0.22	0.19	0.00
RT Ponting	0.00	0.00	0.18	0.29	0.35	0.18	0.00
JH Kallis	0.00	0.00	0.18	0.32	0.30	0.20	0.00
R Dravid	0.00	0.00	0.20	0.31	0.32	0.17	0.00
KC Sangakkara	0.00	0.00	0.00	0.32	0.32	0.33	0.03
BC Lara	0.00	0.14	0.34	0.37	0.15	0.00	0.00

Table 6 illustrates calculation of $F_{i,t}$ values, proportion of innings played, for each of six selected players during various 5-year periods of their career spanning over the years between 1985 and 2019. For example, out of the total number of innings Tendulkar played 19% of them are at t = time period 1995-1999, thus giving $F_{Tendulkar,1995-1999}$ = 0.19. Then using formulae (10a) and (10b) we calculate $DL_{away,Tendulkar,Australia}$ = 0.77, and $DL_{home,Tendulkar,Australia}$ = 0.58 (see Tables 7 - 8), and this exercise is repeated for each player against each opposition for home and away conditions.

Next we calculate the relative performance index for home and away for each of the players, compared to others. The average number of runs scored by each of these players against each opponent is first calculated. Tables 9 - 10 tabulate these values. Let $RH_{i,p}$ and $RA_{i,p}$ denote the average of the runs scored by the *i*-th batsmen against the *p*-th opponent in his home and away conditions respectively. Let $n_{home,i,p}$ denote number of players playing against opponent *p* in home condition like player *i*. Similarly, $n_{away,i,p}$ is defined. The relative performance indices for a player *i* against opponent *p* in his home and away conditions may be measured respectively as

$$RPI_{home,i,p} = \frac{RH_{i,p}}{\frac{1}{n_{home,i,p}}\sum_{i=1}^{n_{home,i,p}} RH_{i,p}},\ RPI_{away,i,p} = \frac{RA_{i,p}}{\frac{1}{n_{away,i,p}}\sum_{i=1}^{n_{away,i,p}} RA_{i,p}} \qquad (11)$$

The calculated relative performance indices for each of these players against the various countries in home and away test matches are reported in Tables 11 - 12. We proceed to compute a single composite index for the i-th player in home conditions by calculating a weighted sum of these relative performance scores using the opponent difficulty level values as weights. The composite performance index for *i*-th player, denoted by $CPI_{home,i}$ and $CPI_{away,i}$ for home and away conditions respectively, are defined by

$$CPI_{home,i} = \sum_p RPI_{home,i,p} \times \left(\frac{DL_{home,i,p}}{\sum_p DL_{home,i,p}}\right), \quad (12a)$$

$$CPI_{away,i} = \sum_p RPI_{away,i,p} \times \left(\frac{DL_{away,i,p}}{\sum_p DL_{away,i,p}}\right) \quad (12b)$$

and an overall composite performance index by

$$d_i = 0.5CPI_{home,i} + 0.5CPI_{away,i} \quad (12c)$$

which is taken as a measure of quality-runs scored by a batsman as a function of opposition strength. Runs scored against a stronger opposition are considered to have higher quality. Numbers in Tables 7 – 13 involve calculation of overall composite performance index. There are cases where a batsman's average is very high against a particular opponent but on the basis of a very few innings. To eliminate such anomalies we have modified the value of $RPI_{home,i,p}$ or $RPI_{away,i,p}$ as follows. In case player *i* has played less than 5 innings against opponent p at home (or away) and the calculated value of $RPI_{home,i,p}$ (or $RPI_{away,i,p}$) as obtained by formula (11) comes out to be greater than 2, we have revised it to 1. For example, Chanderpaul scored 378 in his only home innings against Bangladesh, and formula (11) gives his $RPI_{home,Chanderpaul,Bangladesh}$ as 4.22. So we have revised $RPI_{home,Chanderpaul,Bangladesh}$ from 4.22 to 1. On the other hand, Kallis' average is 117.82 against West Indies in his home tests over 11 innings, and formula (11) produces $RPI_{home,Kallis,West\ Indies}$ equal to 2.23. Therefore we have kept $RPI_{home,Kallis,West\ Indies}$ unchanged at 2.23.

Opposition Diversity

We consider next the issue of whether a player played against all possible opposition countries or did he happen to selectively play more often against some particular opponents. It may be argued that the former case is more commendable. There may be various reasons as to why a player has played less number of tests against one or more opponents, it may be

because the team did not play against that opponent during that period and it also may be because the particular player did not play in certain test matches, even though his country did play against that particular opponent. Let the number of test matches played by a team p during period t be denoted by $TH_{p,t}$ played at home and by $TA_{p,t}$ played away. Also let the proportion of test matches played by the i-th player during period t be $G_{i,t}$. Also let $T_{home,i}$ and $T_{away,i}$ denote the total number of test matches played by the i-th player in home and away conditions respectively. Then the expected number of test matches to played by the i-th player against country p in home and away conditions may be computed, respectively, as

$$E_{home,i,p} = T_{home,i} \times \left(\frac{\sum_t TA_{p,t} \times G_{i,t}}{\sum_p (\sum_t TA_{p,t} \times G_{i,t})}\right), \quad (13a)$$

$$E_{away,i,p} = T_{away,i} \times \left(\frac{\sum_t TH_{p,t} \times G_{i,t}}{\sum_p (\sum_t TH_{p,t} \times G_{i,t})}\right) \quad (13b)$$

Let $O_{home,i,p}$ and $O_{away,i,p}$ denote the actual number of test matches played by any player i against a particular opponent p in home and away conditions respectively. Then, as a measure of discrepancy between actual and expected we calculate the Pearson's chi-square values for each player in home and away conditions separately:

$$PCS_{home,i} = \sum_p \frac{(O_{home,i,p} - E_{home,i,p})^2}{E_{home,i,p}} \quad (14a)$$

$$PCS_{away,i} = \sum_p \frac{(O_{away,i,p} - E_{away,i,p})^2}{E_{away,i,p}} \quad (14b)$$

After calculation of the $PCS_{home,i}$ values, we standardize them to a scale of 0 to 1 by dividing all the values by the largest number. Similarly, we do the same exercise for $PCS_{away,i}$ values. The standardized $PCS_{home,i}$ and $PCS_{away,i}$ scores are combined in proportion to the number of test matches played in home and away conditions to arrive at a single opposition diversity index value, denoted by e_i. A lower standardized score indicates that the player has played more exclusively against one or few of the teams and possibly less against other teams. As our appreciation is higher for a player who performs strongly against diverse opponents and conditions, a higher opposition diversity index value is considered better. Numerical results are presented in Tables 14 – 21.

Grouping Batsmen

The estimated batting mean (of the runs distribution) of the batsmen, like the ESPN Cricinfo reported batting average, are expected to vary from batsman to batsman. We construct a stem-leaf diagram of the estimated mean values for the 32 players, and form natural sub-groups or clusters of the batsmen on the basis of large gaps existing in the stem-

leaf diagram values. While forming sub-groups or clusters one may employ a different clustering technique.

Mahalanobis Distance

For player i, let a_i, b_i, c_i, d_i and e_i denote the estimated batting mean, the reciprocal of the estimated SD, longevity of career, quality of runs and opposition diversity faced, respectively. The values a_i and b_i are obtained through equations (4) and (5); c_i, d_i from equations (9) and (12c), and e_i defined after equations (14a) and (14b). Note that a_i, b_i, c_i, d_i and e_i are all nonnegative, and higher value for each criterion would mean better performance. Let *n* be total number of players under consideration (here, *n*=32). Let

$$S_{a,b} = \frac{1}{(n-1)} \sum_{i=1}^{n} \begin{pmatrix} a_i - \bar{a} \\ b_i - \bar{b} \end{pmatrix} (a_i - \bar{a} \quad b_i - \bar{b})$$

denote the 2×2 variance-covariance matrix for data involving batting mean a_i and consistency b_i. Then, for the *i*-th player,

$$D^2_{a,b,i} = (a_i \quad b_i)\, S^{-1}_{a,b} \begin{pmatrix} a_i \\ b_i \end{pmatrix} \tag{15}$$

defines the squared Mahalanobis distance or squared statistical distance of the vector $(a_i \quad b_i)$ from the origin vector $(0 \quad 0)$ in the setting of axes rotated in the direction of correlation between a_i and b_i values. The squared Mahalanobis distance basically adds up squared distances of the transformed uncorrelated variance-normalized features. Computation of the Mahalanobis distance easily extends to the case of more than 2 criteria. For example, for data on batting mean a_i, consistency b_i and longevity c_i, let

$$S_{a,b,c} = \frac{1}{(n-1)} \sum_{i=1}^{n} \begin{pmatrix} a_i - \bar{a} \\ b_i - \bar{b} \\ c_i - \bar{c} \end{pmatrix} (a_i - \bar{a} \quad b_i - \bar{b} \quad c_i - \bar{c})$$

denote the variance-covariance matrix, and for the *i*-th player,

$$D^2_{a,b,c,i} = (a_i \quad b_i \quad c_i)\, S^{-1}_{a,b,c} \begin{pmatrix} a_i \\ b_i \\ c_i \end{pmatrix} \tag{16}$$

defines the squared Mahalanobis distance the vector $(a_i \quad b_i \quad c_i)$ from the origin vector $(0 \quad 0 \quad 0)$.

Multivariate Outlier Detection

In order to detect whether one or some of these players were exceptional relative to the others, we try to find out the outliers among the n great players. Let $(\bar{a} \quad \bar{b} \quad \bar{c} \quad \bar{d} \quad \bar{e})$ denote the vector of averages. The variance covariance matrix for the said parameters is calculated as

$$S_{a,b,c,d,e} = \frac{1}{(n-1)} \sum_{i=1}^{n} \begin{pmatrix} a_i - \bar{a} \\ b_i - \bar{b} \\ c_i - \bar{c} \\ d_i - \bar{d} \\ e_i - \bar{e} \end{pmatrix} (a_i - \bar{a} \quad b_i - \bar{b} \quad c_i - \bar{c} \quad d_i - \bar{d} \quad e_i - \bar{e})$$

As an outlier-index, the squared Mahalanobis distance between $(a_i \quad b_i \quad c_i \quad d_i \quad e_i)$, the vector of features for player *i* and $(\bar{a} \quad \bar{b} \quad \bar{c} \quad \bar{d} \quad \bar{e})$, the vector of averages, is calculated as

$$T_i^2 = (a_i - \bar{a} \quad b_i - \bar{b} \quad c_i - \bar{c} \quad d_i - \bar{d} \quad e_i - \bar{e}) \, S_{a,b,c,d,e}^{-1} \begin{pmatrix} a_i - \bar{a} \\ b_i - \bar{b} \\ c_i - \bar{c} \\ d_i - \bar{d} \\ e_i - \bar{e} \end{pmatrix} \qquad (17)$$

approximately has the χ_5^2 distribution (Johnson and Wichern, 2015). A 'large' value of the outlier-index T_i^2, for example, larger than the 90-th percentile of the χ_5^2 distribution would indicate that the *i*-th player's features are significantly unusual compared to other players.

Results

Superior Fit of the Weibull Model

As shown in Table 2, in 18 out of the 32 cases, Pearson chi-square test (see equation (8)) rejects the null hypothesis that the observations are generated by an exponential distribution, using 15 class intervals. Then, we proceed to fit the Weibull distribution model to data. As it can be seen from equation (2), the log likelihood computation requires computing natural logarithm of the runs scored in individual innings. We have converted all the 0 scores to 0.5 (irrespective of whether the batsman was out or not). Table 2 also reports the MLEs of the batting mean and consistency parameters for all the batsmen. Let $\hat{\alpha}, \hat{\theta}$ denote the MLEs under the Weibull(α,θ) model and $\tilde{\theta}$ denote the MLE under the exponential(θ), i.e., Weibull(α=1,θ) model. It can be observed that for players whose $\hat{\alpha}$ values are closer to one, values of estimated mean and estimated SD parameters are also close. This is consistent with the fact that for the exponential distribution, the mean and SD are the same. Due to conversion of the zero scores to 0.5, $\tilde{\theta}$ is a little larger than the Cricinfo-reported batting

average. Incidentally for the selected group of batsmen in our study, the $\hat{\alpha}$ values are smaller than one for each player and the MLE of batting mean is greater than the respective reported batting average. But this need not be true in general. The likelihood ratio test (LRT) also rejects the hypothesis that the observations come from an exponential distribution (in 30 out of 32 cases at 10% level of significance). We also employed the Pearson chi-square test to check goodness of fit of the estimated Weibull distribution. As shown in the last two columns of Table 2, at 10% level of significance, the estimated Weibull model fits much better than the estimated exponential model in 26 out of 32 cases. Therefore, for ranking purposes we use the estimated batting mean obtained under the Weibull model, in place of that provided by the ESPN Cricinfo.

As shown in Table 3, the MLE of batting mean are slightly higher than the reported average in almost all cases. While the estimated batting mean of Bradman is 109.42 much higher than the coveted benchmark of 100, it is 60 or above only for Sobers (60.99), Hammond (59.97), Barrington (59.78), and Sangakkara (59.48). On an average for the 32 players, the estimated Weibull means are greater than the reported average by 3.7%, and the estimated Weibull SD values are greater than the estimated exponential SD values by 26.5%. Under the Weibull model, among the batsmen under study, Steve Waugh's estimated mean increased the most (11.7%), followed by Bradman (9.5%) and Chanderpaul (8.2%). With respect to estimated SD under the Weibull model, it increased the most for Steve Waugh (54.7%), for Bradman (50.2%) and for Younis Khan (46.7%).

As mentioned before, the Weibull model estimates batting mean values of Dravid and Lara with similar values 53.6 and 53.9 respectively but is able to recognize their different degree of inconsistency with an estimate of 61.7 for Dravid and 71.5 for Lara. On the other hand, Steve Waugh and Younis Khan have comparable estimated batting mean of about 57 and have similarly high inconsistency (SD about 79). It is interesting to note that batting consistency of Alec Stewart and David Gower are about two standard deviations above the average consistency of the star players in our study. On the other hand, because of Bradman's very high batting mean his consistency is more than 3 standard deviations below the average consistency.

Approximating the MLEs of Weibull Mean and SD

The ESPN Cricinfo reported average is easy to calculate whereas the estimated mean under the Weibull model involves numerical optimization requiring use of software. Regression of estimated mean under the Weibull model on the reported average for 32

players under consideration gives an excellent fit (adjusted R^2 value = 0.9881, estimated Weibull mean = –5.1271 + 1.1368×reported average). Its residual versus predicted value plot indicates that this regression model underestimate the estimated Weibull mean in case of Steve Waugh (7.8%) and Chanderpaul (4.3%). Thus, although the ESPN Cricinfo reported batting average may not be the best estimate for the selected elite group of players, for great batsmen it may easily be used to approximately calculate the superior MLE of the batting mean under the Weibull model.

On the other hand, regression of estimated SD under the Weibull model on the reported average for 32 players under consideration expectedly gives only a reasonably good fit (adjusted R^2 value = 0.9056, estimated Weibull SD = –20.8318+ 1.6724×reported average). This regression model underestimate the estimated Weibull SD in case of Steve Waugh (18.3%) and Younis Khan (12.3%), and overestimate the estimated Weibull SD in case of Barrington (–17.6%), Hutton (–14.1%) and Gower (–12.7%). It is noted that when regression was done for players with estimated shape parameter value $\hat{\alpha}$ falling in the range of 0.74 to 0.89, the adjusted R^2 value moves up to 0.9641 and the regression equation is given by: estimated Weibull SD = –21.9280 + 1.6952×reported average. But without actually computing the MLE $\hat{\alpha}$, requiring numerical optimization, it is not possible to figure out for which player this second improved equation would be applicable.

Ranking Based on Batting Mean and Consistency

Results are presented in Table 3. We first form groups or clusters of batsmen based on the estimated Weibull mean, putting more emphasis on the batting mean than batting consistency. As can be seen from column titled "Group" in Table 3, Bradman is placed in group 1 all alone as his estimated batting mean of 109.42 is miles apart from that of others. The 2nd group (10 players), 3rd group (12 players), 4th group (5 players) and 5th group (4 players) are then formed by looking at naturally occurring gaps in the estimated batting mean values of the players. The estimated mean ranges from about 55.5 to 61 for the 2nd group, from about 50 to 54 for the 3rd group, from about 47 to 49 for the 4th group and from about 40 to 45 for the 5th group. A player belonging to a group with higher estimated batting mean values receive higher ranks than any player in a group with lower batting mean values. Within a group a player with a higher Mahalanobis distance value is ranked higher. Barrington, Hayden, Cook and Gower have the highest consistency (and lowest coefficient of variation, defined as SD divided by mean, in last column of Table 3) in their respective groups 2, 3, 4 and 5, while Steve Waugh, Lara, Laxman and Mark Waugh are the least

consistent in their respective groups 2, 3, 4 and 5. These results are consistent with the fact that the Mahalanobis distance is a multivariate generalization of the reciprocal of coefficient of variation evaluated in the univariate case.

As shown in Table 3, our proposed method, applied to two criteria of batting mean and consistency, ranks Bradman expectedly at the top. Tendulkar, however, is ranked fifth after Barrington, Hutton and Hammond. After doing the analysis involving all (home and away combined) innings of a player, we have also done the analysis for only-home test innings, only-away test innings. Corresponding to each of the above 3 cases we have also analyzed two other subcases, i.e., all (home and away) first innings, all (home and away) second innings, only-home first innings, only-home second innings, only-away first innings, only-away second innings. Thus, the case presented in Table 3 has 8 subcases and the corresponding calculations are summarized in Tables 3A – 3H. We discuss below some very interesting points observed in these subcases that offer insights into relative strengths and weaknesses of the great batsmen in our study.

First of all, Bradman also leads the rankings in all 8 subcases. That said, we describe the rankings for the remaining batsmen. When only home tests are considered, Miandad is ranked second followed by Sobers, Kallis, Sangakkara and Jayawardene. When only-away tests are considered, Barrington, Hammond, Border, Dravid and Tendulkar are the best in that order. In all (home and away combined) first innings category, Barrington, Hutton and Hammond, Dravid and Tendulkar are seen to excel. In all (home and away combined) second innings category, Hayden, Kallis and Sangakkara seem to be excellent second innings players. In only-home first innings category, Jayawardene, Chanderpaul, Miandad and Sehwag are most effective. Miandad, Richards and Hayden are the best only-home second innings players. In only-away first innings, Barrington, Hammond, Hutton, Border and Tendulkar are ranked the best, whereas in only-away second innings Sangakkara, Kallis, Border, Boycott and Gavaskar are the toppers.

Tendulkar has consistently obtained higher rank than his celebrated contemporaries Ponting and Lara in all 9 cases we considered. However, what is perplexing is that, on the basis of batting mean and consistency, Tendulkar does not come close to Bradman in the nine subcases we considered. Tendulkar's best rank is fifth in overall (home and away combined) category, sixth in away category (Dravid fifth), sixth in overall first innings category (Dravid fifth), sixth in away first innings category (Border fifth), and seventh in home second innings (Kallis sixth). These findings are not consistent with the fact that Bradman saw a lot of himself in Tendulkar and preferred him for selection in his Dream World XI to superstars like

Lara and Ponting. This is probably because we have not so far included player longevity, the hallmark of Tendulkar's career, as a criterion in our analysis. This is what we do next with longevity criterion defined in equation (9) above.

Ranking Based on Batting Mean and Consistency and Longevity

Table 4 presents the longevity data and new ranks. It may be noted that Tendulkar's longevity is 2.9 standard deviations (SDs) above the average longevity of the star batsmen, while Chanderpaul's longevity is about 1.8 SDs above average. Longevity of Kallis, Ponting and Waugh is about 1.2 SDs above average and that of Dravid is 1 SD above average. On the opposite end, longevity of Pietersen is 1.6 standard deviations (SDs) below average, that of Barrington 1.5 SDs below, and that of Clarke, Sehwag and Bradman is about 1 SD below average. Boycott, Sangakkara, Gavaskar, Sobers and Miandad have average or close to average longevity. When the longevity numbers are considered, the ranks change significantly (see last column of Table 4). Bradman still tops the list, but now followed by his favorite Tendulkar in second place, Chanderpaul in third and Kallis in fourth place.

Ranking Based on All Five Criteria

When we recalculate ranks using all five criteria including quality of runs and opposition diversity based on grouping by estimated batting mean and then Mahalanobis distance, Bradman still leads the ranking followed by Tendulkar, Hutton, Barrington and Kallis. The ranking looks quite intuitive as the players considered to be greats occupy the top positions in Table 22.

Some interesting points can be noted from the numbers on quality of runs presented in Table 13. Bradman, Hutton and Gavaskar are great in home tests but greater in away tests. Lara and Sobers are great in away matches and even greater at home. Tendulkar, Ponting, Dravid and Boycott are not so great in home tests but great in away tests. Border and Hayden are poor at home but great in away matches. Clarke and Jayawardene are great in home tests but poor in away tests. Miandad, Sehwag and Chanderpaul are great in home matches but not so great in away matches. While Sangakkara and Steve Waugh's performance is pretty strong at home and abroad respectively, their overall quality of runs was below par.

Regarding career batting average in home matches we note from Table 9 the following: against Australia Chanderpaul (80), Minadad (70), Lara (66) and Tendulkar (57) are best whereas Kallis (37), Viv Richards (36), Sehwag (36) and Dravid (36) are weak;

against England Jayawardene (89), Inzamam-ul-Haq (82), Bradman (78) and Lara (78) are best; against Pakistan Sobers (137), Sehwag (91) and Boycott (87) are great; against South Africa Bradman (202), Clarke (107), Jayawardene (89) and Sehwag (84) are best; against West Indies Kallis (118), Laxman (95) and Hutton (81) are the strongest; and against India Bradman (143), Younis Khan (111), Miandad (91) and Ponting (86) are the best.

Similarly, regarding batting average in away matches from Table 10 we point out some notable performances: against Australia Harrington (70), Hammond (62), Tendulkar (53) and Gavaskar (51) are best, whereas batting averages of Lara (43), Dravid (40), Miandad (38) and Chanderpaul (31) are surprisingly weak; against England Bradman (103), Steve Waugh (71), Dravid (69), Smith (68) and Chanderpaul (67) are best, whereas performance of Inzamam-ul-Haq (43) and Jayawardene (36) are weak; against South Africa among recent players Steve Waugh (58), Tendulkar (51), Lara (50), Ponting (47) and Clarke (46) are best but Inzamam-ul-Haq (31), Dravid (28), Jayawardene (28), Younis Khan (27) and Sehwag (26) are below average; against Pakistan Ponting (104, only 1 test), Hayden (104), Sehwag (92), Boycott (82) and Dravid (79) are great but Tendulkar (40), Viv Richards (43) and Sobers (29) are weak; and against India Sobers (100), Barrington (96), Younis Khan (77), Jayawardene (63), and Kallis (58) are best, and Sangakkara (37), Lara (33) and Ponting (26) are pretty weak.

Note that Australia and South Africa are the toughest opponents to bat against at their home matches where visiting players' batting average is 43.12 and 43.28 respectively for the selected players in our study. Australian bowling is also toughest to score against for a batsman even in his home matches as home batting average of batsmen against Australia is only 45.02. Therefore, one sure sign of a great batsman is the ability to score against these two toughest opponents as hosts, and to score against a visiting Australian team. Tendulkar passes this test with flying colors. The away average against Australia are as follows: Tendulkar's 53, Kallis' 48, Viv Richards' 48, Sober's 46, Lara's only 43, Dravid's 40, Miandad's 38, Chanderpaul's 30, Sangakkara's 22. The away average against South Africa of Tendulkar is 51, Lara's 50, Ponting's 47, Chanderpaul's 40, Sangakkara 36, Dravid's 28, Jayawardene's 28. Next, note the home averages against visiting Australian teams: Lara's 66, Tendulkar's 57, Laxman's 57, Sober's 39, Kallis' 37, Viv Richards' 36, Dravid' 36, Jayawardene's 35, Sangakkara's 30. One may conclude that Tendulkar has overall done better than his illustrious contemporaries Lara, Dravid, Ponting and Kallis.

Tables 14 – 21 refer to calculation of opposition diversity index values. Tables 14 and 15 tabulate the number of test matches played in home and away conditions by various test playing nations. Table 16 tabulates the proportions of test matches played by the various players in different periods as mentioned earlier. Tables 17 and 18 show the actual numbers of test matches played by the players against the various opponents in home and away conditions, whereas Tables 19 – 20 display the expected numbers of test matches against respective opponents that should have been played by each player. Table 21 presents the calculated PCS and standardized PCS values for various players in home and away conditions, and the opposition diversity index in the last column. Table 21 shows that Hammond, Tendulkar and Gavaskar have the three highest opposition diversity index values. Tendulkar has the highest diversity index (0.78) among his contemporaries Ponting (0.37), Kallis (0.45), Dravid (0.65) and Lara (0.39).

Taking the case of Hammond, with largest diversity index of 0.86, we see that actual numbers of home tests played by him against the playing rival teams of his time match pretty closely with the expected values. The actual vs expected numbers look as follows: against Australia 14 vs 15.60, against South Africa 9 vs 10.61, against West Indies 9 vs 9.06, against India 6 vs 4.10 and against New Zealand 6 vs 4.64. On the other extreme, Younis Khan has the lowest diversity index of 0.14 mainly because in away tests during his career he played less against Australia (3 vs 8.70) and England (5 vs 10.00), more against Sri Lanka (16 vs 7.00) and Zimbabwe (5 vs 2.73). Similarly, Michael Clarke has the second lowest diversity index of 0.19 mainly because during his career in away tests he played more against England (19 vs 11.98) and India (13 vs 7.69), less against Pakistan (0 vs 4.04) and Sri Lanka (3 vs 7.63). Diversity index of Kallis, Ponting and Lara suffer on account of their away test matches. For example, Kallis played away tests less against Sri Lanka (5 vs 10.12) and more against West Indies (22, 10.30). Ponting played away matches more against England (20 vs 14.78), less against Pakistan (1 vs 7.01), more against India (14 vs 9.78), more against New Zealand (14 vs 9.28). Similarly, Lara played away tests more against Australia (18 vs 10.54), more against England (15 vs 10.94), less against Sri Lanka (4 vs 7.55) and less against India (3 vs 6.93).

Detecting Truly Exceptional Players

Table 23 tabulates the mean subtracted values (i.e., deviation from the mean) for each of the parameters for all the batsmen and the chi-square statistic as defined in equation (17). As it can be seen from the P-value column, only three batsmen qualify as outliers at 10%

level of significance. With respect to four out of five criteria, Bradman and Tendulkar have above average values. Thus the popular belief that these two players stand out compared to the rest is affirmed – Bradman for his batting average and quality of runs scored, and Tendulkar for his longevity and opposition diversity he faced. Among the players in our study, Younis Khan and Alec Stewart stand out in a negative way having below-average values in four out of five criteria.

Conclusion

ICC or ESPN Cricinfo does not provide an estimate of batting inconsistency of a player. In this paper we have computed a reliable estimate, namely, the MLE of batting inconsistency under the Weibull distribution model. For an elite group of test batsmen who scored a lot of runs over their long career, we have shown that the Weibull distribution model fits the data far better than the traditionally assumed exponential distribution model. The resulting MLE of the batting mean has thrown a sweet surprise in case of Bradman by estimating it as 109.42 instead of the traditionally reported value of 99.94. The MLEs of the batting mean and consistency, along with carefully formulated measures of longevity, quality of runs scored and opposition diversity faced have formed the basis of our comparison of the batting greats using the concept of multivariate statistical distance. Comparative analysis of the players has also been done for eight subcases such as only-home tests, only-away tests, only-first innings, only-second innings etc. This has given insight into the relative strengths and weaknesses of the great batsmen. Surprisingly, Tendulkar's performance, without the longevity factor, seems to always rank quite a bit behind that of Bradman, although Tendulkar appears to be ahead of his distinguished contemporaries Lara and Ponting even without longevity as a criterion. Judging by career records against toughest opponents Australia, both at home and away, and against South Africa at away matches, Tendulkar has outperformed his contemporaries Lara, Ponting, Dravid and Kallis. While Bradman's batting mean is about 5 standard deviations above the average batting mean of the 32 star players considered, Tendulkar's longevity is about 3 standard deviations above their average longevity. Application of multivariate statistical method of outlier detection has statistically confirmed Bradman and Tendulkar as truly exceptional among the batting greats.

Apart from Chanderpaul, another notable surprise has been Viv Richards, Knighted for his contributions to cricket and voted one of the five Cricketers of the Twentieth Century by a 100-member panel of experts in 2000. Richards is famous for his phenomenal aggressive style of play but his rank comes out below average in all categories, except home

test 2nd innings category in which he is ranked 3rd after Bradman and Miandad. Close inspection indicates that quality-runs scored by Richards, as measured by the overall composite performance index value of 0.89, appear to be below average (Table 13). Furthermore, compared to other star players in our study, Richards' batting average appears to be high only against England in both home and away matches, and against New Zealand and India only in home matches (Tables 9 – 10). The hallmark of Richards' fearless style of cricket is his superior batting strike, which usually is not considered very important in test cricket.

A more refined approach than that used here is possible while computing the index for quality of runs scored. For ease of computation, in formula (10a) and (10b) we have used $F_{i,t}$, proportion of overall career innings played by a player *i* during period *t*. As a more refined approach one may use $F_{home,p,i,t}$ and $F_{away,p,i,t}$ in formulae (10a) and (10b) respectively where, for example, $F_{away,p,i,t}$ denotes proportion of away test innings played by player *i* against opponent p during period *t*. We are currently looking into extending our analysis to performance of batsmen in one-day internationals and T20 internationals, and to performance of bowlers, all-rounders and wicket-keepers.

An application of the Mahalanobis distance concept could be in sports management for ranking players available for procurement, for example, for the Indian Premier League (IPL) T20 cricket tournament. Ranking of, for example, cricket all-rounders will require careful consideration of several factors such as the batting average, batting consistency, batting strike rate, bowling average (runs per wicket) and bowling economy rate (runs per over). In such a scenario the Mahalanobis distance based on such multiple factors will produce a single number measure of excellence for each player. Another possible application of the Mahalanobis distance concept could be in investment management for grading different stocks. Consider an investor with a 'long position' in various stocks who will make a profit from a stock if the stock price rises. Given stock-market log-returns data such an investor may like to consider not just first two moments but also third and fourth moments of the log return distribution. Usually, an investor would wish to have a large mean log-return and a small standard deviation (risk). But an investor with a particular level of risk may also like to have a large skewness and a small kurtosis of the log-return distribution as this would lessen chances of extreme negative returns (DeCarlo, 1997). Again the Mahalanobis distance based on the mean, (the reciprocal of) standard deviation, skewness and (the reciprocal of) kurtosis will generate a single number measure of quality for each stock. In both

applications, use of the Mahalanobis distance would help avoid the need for subjective assignment of weights to various factors or criteria.

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Tables

Table 1: List of batsmen considered for analysis

Player	Span	Mat	Innings	Not Out	Runs	Highest Score	Reported Average	No. of 100s	No. of 50s	No. of 0s
SR Tendulkar (IND)	1989-2013	200	329	33	15921	248*	53.78	51	68	14
RT Ponting (AUS)	1995-2012	168	287	29	13378	257	51.85	41	62	17
JH Kallis (SA)	1995-2013	166	280	40	13289	224	55.37	45	58	16
R Dravid (IND)	1996-2012	164	286	32	13288	270	52.31	36	63	8
KC Sangakkara (SL) #	2000-2015	132	229	17	12305	319	58.04	38	52	11
BC Lara (WI)	1990-2006	131	232	6	11953	400*	52.88	34	48	17
S Chanderpaul (WI) #	1994-2015	164	280	49	11867	203*	51.37	30	66	15
DPMD Jayawardene (SL)	1997-2014	149	252	15	11814	374	49.84	34	50	15
AR Border (AUS)	1978-1994	156	265	44	11174	205	50.56	27	63	11
SR Waugh (AUS)	1985-2004	168	260	46	10927	200	51.06	32	50	22
SM Gavaskar (IND)	1971-1987	125	214	16	10122	236*	51.12	34	45	12
GC Smith (SA)	2002-2014	117	205	13	9265	277	48.25	27	38	11
AN Cook (ENG) #	2006-2015	116	208	12	9139	294	46.62	27	43	7
GA Gooch (ENG)	1975-1995	118	215	6	8900	333	42.58	20	46	13
Javed Miandad (PAK)	1976-1993	124	189	21	8832	280*	52.57	23	43	6
Inzamam-ul-Haq (PAK)	1992-2007	120	200	22	8830	329	49.6	25	46	15
Younis Khan (PAK)#	2000-2015	101	180	17	8814	313	54.07	30	29	16
VVS Laxman (IND)	1996-2012	134	225	34	8781	281	45.97	17	56	14
ML Hayden (AUS)	1994-2009	103	184	14	8625	380	50.73	30	29	14
MJ Clarke (AUS) #	2004-2015	112	193	22	8592	329*	50.24	28	27	9
V Sehwag (IND)	2001-2013	104	180	6	8586	319	49.34	23	32	16
IVA Richards (WI)	1974-1991	121	182	12	8540	291	50.23	24	45	10
AJ Stewart (ENG)	1990-2003	133	235	21	8463	190	39.54	15	45	14
DI Gower (ENG)	1978-1992	117	204	18	8231	215	44.25	18	39	7
KP Pietersen (ENG)	2005-2014	104	181	8	8181	227	47.28	23	35	10
G Boycott (ENG)	1964-1982	108	193	23	8114	246*	47.72	22	42	10
GS Sobers (WI)	1954-1974	93	160	21	8032	365*	57.78	26	30	12
ME Waugh (AUS)	1991-2002	128	209	17	8029	153*	41.81	20	47	19
WR Hammond (ENG)	1927-1947	85	140	16	7249	336*	58.45	22	24	4
DG Bradman (AUS)	1928-1948	52	80	10	6996	334	99.94	29	13	7
L Hutton (ENG)	1937-1955	79	138	15	6971	364	56.67	19	33	5
KF Barrington (ENG)	1955-1968	82	131	15	6806	256	58.67	20	35	5

(# indicates playing as of 19 July 2015, * indicates not out)

Table 2: Maximum likelihood estimates of batting mean and standard deviation under the Weibull(α,θ) model

Batsmen	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	$\tilde{\theta}$	LRT P-value	MLE of Mean	MLE of SD	PCS P-value (Weibull)	PCS P-value (Exponential)
SR Tendulkar	53.787	0.829	25.684	53.813	0.000	55.593	67.485	0.27	0.00
RT Ponting	51.853	0.825	24.568	51.890	0.000	53.602	65.330	0.89	0.14
JH Kallis	55.371	0.812	24.847	55.408	0.000	58.584	72.662	0.43	0.04
R Dravid	52.315	0.871	30.157	52.331	0.005	53.598	61.739	0.53	0.15
KC Sangakkara	58.042	0.822	26.318	58.068	0.000	59.480	72.841	0.06	0.01
BC Lara	52.889	0.764	18.592	52.927	0.000	53.921	71.511	0.53	0.17
S Chanderpaul	51.372	0.802	22.770	51.407	0.000	55.559	69.800	0.05	0.01
DPMD Jayawardene	49.848	0.796	20.661	49.880	0.000	51.009	64.634	0.51	0.01
AR Border	50.561	0.858	28.184	50.586	0.004	52.895	61.859	0.37	0.10
SR Waugh	51.061	0.735	16.937	51.112	0.000	57.048	78.989	0.18	0.00
SM Gavaskar	51.121	0.793	20.964	51.154	0.000	53.039	67.539	0.36	0.03
GC Smith	48.255	0.871	27.859	48.286	0.012	48.866	56.270	0.43	0.15
AN Cook	46.628	0.871	26.996	46.645	0.011	47.193	54.359	0.47	0.10
GA Gooch	42.584	0.863	24.102	42.615	0.006	42.981	49.957	0.35	0.00
Javed Miandad	52.571	0.869	30.070	52.592	0.018	53.833	62.121	0.66	0.50
Inzamam-ul-Haq	49.607	0.803	21.697	49.649	0.000	52.064	65.335	0.47	0.05
Younis Khan	54.074	0.738	17.290	54.126	0.000	57.551	79.323	0.75	0.23
VVS Laxman	45.974	0.817	21.837	46.018	0.000	48.517	59.752	0.08	0.06
ML Hayden	50.735	0.878	30.060	50.779	0.028	51.509	58.836	0.07	0.00
MJ Clarke	50.246	0.772	18.988	50.272	0.000	52.639	68.958	0.52	0.02
V Sehwag	49.345	0.787	19.541	49.394	0.000	50.098	64.284	0.13	0.00
IVA Richards	50.235	0.816	22.875	50.265	0.001	51.741	63.835	0.11	0.16
AJ Stewart	39.547	0.889	25.397	39.582	0.028	40.287	45.414	0.57	0.30
DI Gower	44.253	0.946	35.437	44.272	0.331	44.601	47.181	0.38	0.41
KP Pietersen	47.289	0.824	22.427	47.318	0.001	48.297	58.954	0.10	0.02
G Boycott	47.729	0.854	26.065	47.759	0.009	49.352	58.016	0.54	0.23
GS Sobers	57.784	0.807	25.054	57.827	0.001	60.987	76.166	0.61	0.40
ME Waugh	41.818	0.825	20.585	41.870	0.001	43.411	52.954	0.20	0.06
WR Hammond	58.460	0.854	30.706	58.476	0.019	59.971	70.547	0.10	0.04
DG Bradman	99.943	0.741	28.217	99.993	0.001	109.421	150.139	0.81	0.40
Len Hutton	56.675	0.892	35.499	56.695	0.100	57.705	64.792	0.53	0.19
KF Barrington	58.672	0.911	39.886	58.698	0.217	59.778	65.709	0.09	0.11

Table 3: Ranks based on batting mean and batting consistency (all test innings)

Name	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	Estimated Mean	Estimated SD	Estimated Consistency	Squared Mahalanobis Distance	Group	Group Rank	Overall Rank	Coefficient of Variation
DG Bradman	99.943	0.741	28.217	109.421	150.139	0.007	530.293	1	1	1	1.372
KF Barrington	58.672	0.911	39.886	59.778	65.709	0.015	408.466	2	1	2	1.099
Len Hutton	56.675	0.892	35.499	57.705	64.792	0.015	400.463	2	2	3	1.123
WR Hammond	58.460	0.854	30.706	59.971	70.547	0.014	381.785	2	3	4	1.176
SR Tendulkar	53.787	0.829	25.684	55.593	67.485	0.015	370.359	2	4	5	1.214
KC Sangakkara	58.042	0.822	26.318	59.480	72.841	0.014	366.996	2	5	6	1.225
JH Kallis	55.371	0.812	24.847	58.584	72.662	0.014	362.154	2	6	7	1.240
GS Sobers	57.784	0.807	25.054	60.987	76.166	0.013	361.254	2	7	8	1.249
S Chanderpaul	51.372	0.802	22.770	55.559	69.800	0.014	357.476	2	8	9	1.256
Younis Khan	54.074	0.738	17.290	57.551	79.323	0.013	326.943	2	9	10	1.378
SR Waugh	51.061	0.735	16.937	57.048	78.989	0.013	325.194	2	10	11	1.385
ML Hayden	50.735	0.878	30.060	51.509	58.836	0.017	401.925	3	1	12	1.142
R Dravid	52.315	0.871	30.157	53.598	61.739	0.016	393.975	3	2	13	1.152
Javed Miandad	52.571	0.869	30.070	53.833	62.121	0.016	392.835	3	3	14	1.154
AR Border	50.561	0.858	28.184	52.895	61.859	0.016	388.538	3	4	15	1.169
RT Ponting	51.853	0.825	24.568	53.602	65.330	0.015	370.385	3	5	16	1.219
IVA Richards	50.235	0.816	22.875	51.741	63.835	0.016	367.910	3	6	17	1.234
Inzamam-ul-Haq	49.607	0.803	21.697	52.064	65.335	0.015	360.633	3	7	18	1.255
DPMD Jayawardene	49.848	0.796	20.661	51.009	64.634	0.015	358.293	3	8	19	1.267
V Sehwag	49.345	0.787	19.541	50.098	64.284	0.016	354.782	3	9	20	1.283
SM Gavaskar	51.121	0.793	20.964	53.039	67.539	0.015	353.931	3	10	21	1.273
MJ Clarke	50.246	0.772	18.988	52.639	68.958	0.015	343.754	3	11	22	1.310
BC Lara	52.889	0.764	18.592	53.921	71.511	0.014	338.680	3	12	23	1.326
AN Cook	46.628	0.871	26.996	47.193	54.359	0.018	411.946	4	1	24	1.152
GC Smith	48.255	0.871	27.859	48.866	56.270	0.018	405.739	4	2	25	1.152
G Boycott	47.729	0.854	26.065	49.352	58.016	0.017	394.319	4	3	26	1.176
KP Pietersen	47.289	0.824	22.427	48.297	58.954	0.017	380.145	4	4	27	1.221
VVS Laxman	45.974	0.817	21.837	48.517	59.752	0.017	375.539	4	5	28	1.232
DI Gower	44.253	0.946	35.437	44.601	47.181	0.021	475.063	5	1	29	1.058
AJ Stewart	39.547	0.889	25.397	40.287	45.414	0.022	469.535	5	2	30	1.127
GA Gooch	42.584	0.863	24.102	42.981	49.957	0.020	429.480	5	3	31	1.162
ME Waugh	41.818	0.825	20.585	43.411	52.954	0.019	400.607	5	4	32	1.220

Table 3A: Ranks based on batting mean and batting consistency (all home test innings)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	50	4322	98.227	0.751	29.460	0.018	107.449	0.007	1	477.64	1
Javed Miandad	86	4481	61.384	0.935	46.226	0.455	62.193	0.015	2	351.80	2
GS Sobers	75	4075	66.803	0.817	29.801	0.038	71.066	0.011	2	331.52	3
JH Kallis	124	6418	59.981	0.857	32.184	0.043	62.226	0.014	2	324.83	4
KC Sangakkara	120	6735	61.789	0.798	25.086	0.002	64.334	0.012	2	308.92	5
DPMD Jayawardene	129	7167	59.725	0.812	25.738	0.003	61.250	0.013	2	307.92	6
MJ Clarke	79	4259	61.725	0.780	23.155	0.005	64.739	0.012	2	303.96	7
Len Hutton	77	3930	57.794	0.802	24.129	0.014	60.055	0.013	2	302.53	8
S Chanderpaul	138	6326	56.991	0.785	23.160	0.001	63.102	0.012	2	301.94	9
R Dravid	120	5598	51.358	0.922	36.797	0.276	51.898	0.018	3	346.54	10
KP Pietersen	89	4537	52.756	0.894	33.318	0.188	53.246	0.017	3	333.94	11
WR Hammond	68	3004	50.067	0.868	28.638	0.147	51.253	0.017	3	324.57	12
SR Tendulkar	153	7216	52.672	0.865	29.446	0.027	53.834	0.016	3	321.82	13
KF Barrington	73	3347	50.712	0.860	27.989	0.120	51.997	0.016	3	320.71	14
ML Hayden	90	4614	56.268	0.855	29.826	0.064	57.441	0.015	3	319.06	15
BC Lara	113	6260	57.963	0.837	27.955	0.014	58.810	0.014	3	313.51	16
RT Ponting	139	6871	56.785	0.825	26.492	0.006	58.952	0.014	3	309.34	17
IVA Richards	67	3136	49.778	0.826	23.662	0.053	51.150	0.016	3	307.02	18
V Sehwag	89	4656	54.140	0.808	23.105	0.008	54.933	0.015	3	299.77	19
SM Gavaskar	108	5067	50.168	0.799	21.105	0.003	51.624	0.015	3	295.76	20
Younis Khan	74	3873	56.956	0.779	21.382	0.006	58.860	0.013	3	292.97	21
VVS Laxman	91	3767	51.603	0.703	15.028	0.000	59.608	0.012	3	267.54	22
Inzamam-ul-Haq	83	3809	52.178	0.705	14.816	0.000	57.588	0.012	3	264.76	23
AN Cook	112	4726	43.759	0.979	40.075	0.772	43.800	0.022	4	398.38	24
AJ Stewart	126	4650	40.789	0.927	30.479	0.306	41.316	0.022	4	384.27	25
ME Waugh	91	3710	43.647	0.917	31.121	0.327	44.233	0.021	4	364.09	26
DI Gower	113	4454	42.827	0.897	28.102	0.150	43.421	0.021	4	357.25	27
GC Smith	94	3777	43.414	0.857	23.938	0.060	44.124	0.019	4	333.83	28
AR Border	142	5574	45.689	0.852	24.947	0.024	47.501	0.018	4	322.65	29
G Boycott	100	4356	48.400	0.852	26.019	0.050	49.672	0.017	4	319.65	30
GA Gooch	131	5917	46.227	0.835	22.853	0.007	46.739	0.018	4	316.42	31
SR Waugh	129	5282	46.743	0.796	20.203	0.002	49.699	0.016	4	295.34	32

Table 3B: Ranks based on batting mean and batting consistency (all away test innings)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	30	2674	102.85	0.72	26.50	0.03	112.63	0.006	1	295.00	1
KF Barrington	58	3459	69.18	1.02	74.40	0.89	68.96	0.015	2	231.46	2
WR Hammond	72	4245	66.33	0.86	34.48	0.10	68.03	0.013	2	199.18	3
AR Border	123	5600	56.57	0.87	33.22	0.09	59.36	0.015	2	195.37	4
R Dravid	166	7690	53.03	0.84	26.33	0.01	55.09	0.015	2	186.16	5
SR Tendulkar	176	8705	54.75	0.80	23.00	0.00	57.23	0.014	2	178.27	6
JH Kallis	156	6871	51.66	0.78	20.78	0.00	55.58	0.014	2	173.82	7
SR Waugh	131	5645	55.89	0.68	14.64	0.00	66.84	0.010	2	164.25	8
Younis Khan	106	4941	52.01	0.71	15.06	0.00	56.85	0.012	2	158.21	9
DI Gower	91	3777	46.06	1.02	49.73	0.84	45.96	0.022	3	248.75	10
Len Hutton	61	3041	55.29	1.06	70.69	0.61	54.88	0.019	3	240.71	11
ML Hayden	94	4011	45.58	0.91	31.51	0.27	46.04	0.020	3	215.38	12
Inzamam-ul-Haq	117	5021	47.82	0.89	30.64	0.14	48.81	0.018	3	204.95	13
GC Smith	111	5488	52.27	0.89	32.36	0.12	52.77	0.017	3	200.03	14
G Boycott	93	3758	46.98	0.86	26.16	0.09	48.97	0.017	3	194.67	15
Javed Miandad	103	4351	45.80	0.83	22.63	0.02	46.98	0.018	3	190.23	16
KC Sangakkara	109	5570	54.08	0.85	27.86	0.03	54.67	0.015	3	189.47	17
RT Ponting	148	6507	47.50	0.83	23.29	0.01	48.88	0.017	3	187.73	18
S Chanderpaul	142	5541	46.18	0.83	22.73	0.01	48.87	0.017	3	186.24	19
IVA Richards	115	5404	50.50	0.81	22.45	0.00	52.09	0.015	3	180.54	20
GS Sobers	85	3957	50.73	0.81	22.29	0.02	53.01	0.015	3	179.17	21
V Sehwag	91	3930	44.66	0.77	16.96	0.00	45.33	0.017	3	175.53	22
SM Gavaskar	106	5055	52.11	0.79	20.80	0.00	54.56	0.014	3	174.38	23
AN Cook	96	4413	50.15	0.77	18.53	0.00	52.31	0.015	3	169.89	24
BC Lara	119	5693	48.25	0.71	13.46	0.00	49.10	0.014	3	155.35	25
GA Gooch	84	2983	36.83	0.94	28.56	0.46	37.02	0.025	4	261.12	26
VVS Laxman	134	5014	42.49	0.92	30.63	0.25	43.19	0.021	4	225.45	27
AJ Stewart	109	3813	38.13	0.85	20.90	0.04	39.02	0.022	4	216.60	28
DPMD Jayawardene	123	4647	39.72	0.81	17.91	0.00	40.44	0.020	4	196.11	29
MJ Clarke	114	4333	42.48	0.78	17.44	0.00	44.36	0.017	4	179.90	30
KP Pietersen	92	3644	41.89	0.77	16.41	0.00	43.37	0.018	4	178.58	31
ME Waugh	118	4319	40.36	0.77	15.71	0.00	42.89	0.018	4	176.97	32

Table 3C: Ranks based on batting mean and batting consistency (first innings of all tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	50	4697	97.854	0.757	29.163	0.013	101.761	0.007	1	557.43	1
KF Barrington	82	5069	65.831	0.960	54.972	0.666	66.287	0.014	2	451.37	2
Len Hutton	79	4905	65.400	0.911	43.586	0.299	65.963	0.014	2	431.16	3
WR Hammond	85	5070	64.177	0.850	32.456	0.054	65.247	0.013	2	405.20	4
R Dravid	164	9105	59.123	0.856	31.192	0.014	60.421	0.014	2	397.12	5
SR Tendulkar	197	11300	60.106	0.846	30.220	0.004	61.394	0.014	2	394.74	6
Javed Miandad	123	6504	56.557	0.857	30.093	0.029	57.575	0.015	2	393.80	7
S Chanderpaul	162	7931	58.316	0.834	28.878	0.009	61.989	0.013	2	391.16	8
GS Sobers	93	5109	59.407	0.837	28.805	0.031	60.957	0.014	2	390.12	9
RT Ponting	168	9372	57.497	0.825	26.411	0.000	58.518	0.014	2	381.14	10
BC Lara	130	8249	63.946	0.792	24.465	0.000	64.593	0.012	2	380.43	11
V Sehwag	104	6438	62.505	0.798	24.747	0.003	63.367	0.012	2	379.39	12
KC Sangakkara	131	7794	61.857	0.789	23.735	0.000	63.262	0.012	2	375.68	13
SR Waugh	166	8558	60.695	0.759	21.418	0.000	66.744	0.011	2	374.06	14
DPMD Jayawardene	148	8719	60.131	0.788	23.040	0.000	61.415	0.013	2	370.63	15
JH Kallis	166	8563	54.891	0.791	22.055	0.000	56.995	0.014	2	363.85	16
Younis Khan	99	5338	55.031	0.760	18.865	0.000	56.327	0.013	2	348.81	17
MJ Clarke	112	5951	56.676	0.743	17.970	0.000	58.742	0.012	2	345.68	18
DI Gower	117	5311	46.588	1.008	48.276	0.911	46.592	0.022	3	488.12	19
AN Cook	116	5415	47.087	0.944	37.107	0.426	47.094	0.020	3	448.60	20
G Boycott	108	4795	45.667	0.917	32.286	0.262	45.968	0.020	3	437.05	21
AR Border	154	6803	48.248	0.896	31.321	0.104	49.181	0.018	3	416.07	22
ME Waugh	128	5568	44.903	0.878	27.050	0.000	45.588	0.019	3	415.44	23
VVS Laxman	134	5310	44.250	0.842	23.233	0.017	45.776	0.018	3	394.15	24
ML Hayden	103	5153	50.029	0.842	25.122	0.022	50.296	0.017	3	386.00	25
KP Pietersen	103	5456	53.490	0.834	25.768	0.019	54.212	0.015	3	380.94	26
GC Smith	117	5708	49.635	0.827	23.252	0.006	49.840	0.016	3	378.36	27
IVA Richards	121	6045	50.798	0.824	23.623	0.006	51.483	0.016	3	376.13	28
SM Gavaskar	124	6159	50.901	0.791	20.543	0.001	52.113	0.015	3	359.84	29
Inzamam-ul-Haq	118	5636	51.706	0.785	20.496	0.001	53.946	0.014	3	357.62	30
AJ Stewart	132	5003	39.706	0.897	26.161	0.118	40.106	0.022	4	455.93	31
GA Gooch	118	5002	42.390	0.851	22.660	0.020	42.471	0.020	4	411.56	32

Table 3D: Ranks based on batting mean and batting consistency (second innings of all tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	30	2299	88.423	0.799	34.392	0.165	95.217	0.008	1	448.14	1
ML Hayden	81	3472	51.821	0.938	40.112	0.516	52.619	0.018	2	323.42	2
JH Kallis	114	4726	56.262	0.848	30.286	0.061	60.725	0.014	2	307.94	3
KC Sangakkara	98	4511	52.453	0.887	32.368	0.153	53.579	0.017	2	306.94	4
WR Hammond	55	2179	48.422	0.892	31.151	0.000	50.065	0.018	2	306.43	5
AR Border	111	4371	54.638	0.795	23.819	0.009	61.418	0.013	2	294.40	6
GS Sobers	67	2923	55.151	0.761	20.474	0.012	62.134	0.012	2	286.86	7
Inzamam-ul-Haq	82	3194	46.971	0.820	22.710	0.041	50.196	0.016	2	281.63	8
SM Gavaskar	90	3963	51.468	0.794	21.520	0.009	54.512	0.014	2	278.30	9
IVA Richards	61	2495	48.922	0.796	21.218	0.000	52.717	0.015	2	276.36	10
G Boycott	85	3319	51.062	0.762	19.401	0.005	57.581	0.013	2	274.92	11
VVS Laxman	91	3471	48.887	0.779	19.899	0.006	53.839	0.014	2	272.42	12
Younis Khan	81	3476	52.667	0.705	15.348	0.000	60.337	0.011	2	265.71	13
R Dravid	122	4183	41.830	0.942	33.320	0.471	42.483	0.022	3	335.33	14
GC Smith	88	3557	46.195	0.960	39.246	0.656	46.587	0.021	3	333.70	15
Len Hutton	59	2066	43.042	0.933	33.121	0.550	43.952	0.021	3	327.78	16
Javed Miandad	66	2328	43.925	0.935	34.093	0.550	44.851	0.021	3	326.92	17
AJ Stewart	103	3460	39.318	0.877	24.332	0.122	40.644	0.022	3	312.39	18
GA Gooch	97	3898	42.835	0.880	26.140	0.006	43.548	0.020	3	306.64	19
DI Gower	87	2920	40.556	0.873	24.688	0.134	42.180	0.021	3	306.54	20
KF Barrington	49	1737	44.538	0.884	28.016	0.326	46.154	0.019	3	304.88	21
MJ Clarke	81	2641	40.015	0.865	23.759	0.137	41.847	0.021	3	304.15	22
RT Ponting	119	4006	42.168	0.861	24.521	0.067	44.407	0.019	3	297.77	23
SR Tendulkar	132	4621	42.787	0.834	22.114	0.014	45.050	0.018	3	286.70	24
AN Cook	92	3724	45.975	0.783	18.694	0.004	48.499	0.016	3	267.56	25
S Chanderpaul	118	3936	41.432	0.784	17.851	0.003	45.520	0.017	3	267.14	26
ME Waugh	81	2461	36.191	0.755	14.252	0.003	40.023	0.019	3	260.32	27
V Sehwag	76	2148	30.254	0.887	19.807	0.202	30.748	0.029	4	382.06	28
DPMD Jayawardene	104	3095	33.641	0.896	22.606	0.174	34.279	0.026	4	354.08	29
KP Pietersen	78	2725	38.380	0.840	20.334	0.061	39.596	0.021	4	298.86	30
SR Waugh	94	2369	32.452	0.760	13.548	0.002	36.347	0.021	4	271.91	31
BC Lara	102	3704	38.186	0.771	15.156	0.001	39.592	0.019	4	268.15	32

Table 3E: Ranks based on batting mean and batting consistency (first innings of all home tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	32	2824	94.133	0.740	26.336	0.037	100.363	0.007	1	483.88	1
DPMD Jayawardene	80	5638	71.367	0.864	37.757	0.100	72.150	0.012	2	386.89	2
S Chanderpaul	82	4420	68.000	0.853	36.040	0.118	72.683	0.012	2	384.98	3
Javed Miandad	60	3500	64.815	0.907	42.614	0.348	65.760	0.014	2	384.71	4
V Sehwag	52	3601	69.250	0.873	38.326	0.209	69.553	0.013	2	382.43	5
GS Sobers	44	2796	71.692	0.825	32.215	0.116	74.423	0.011	2	382.06	6
Len Hutton	44	2934	68.233	0.850	34.105	0.168	69.073	0.012	2	373.14	7
BC Lara	65	4284	66.938	0.851	33.465	0.084	67.286	0.013	2	368.57	8
MJ Clarke	48	3175	73.837	0.713	19.377	0.003	79.521	0.009	2	367.02	9
KC Sangakkara	72	4703	69.162	0.810	28.909	0.025	71.312	0.011	2	366.51	10
JH Kallis	78	4555	62.397	0.857	32.982	0.100	63.984	0.013	2	363.08	11
SR Waugh	81	4126	58.113	0.860	31.949	0.121	60.595	0.014	2	358.35	12
RT Ponting	83	5037	62.185	0.814	26.709	0.017	63.256	0.013	2	345.90	13
AN Cook	65	2989	45.985	1.029	52.138	0.759	46.030	0.022	3	452.97	14
DI Gower	65	3038	48.222	0.980	44.383	0.841	48.293	0.020	3	417.79	15
WR Hammond	44	2100	50.000	0.989	47.705	0.924	50.003	0.020	3	417.21	16
R Dravid	70	3907	58.313	0.963	49.540	0.701	58.538	0.016	3	397.09	17
ME Waugh	56	2631	46.982	0.918	33.231	0.440	47.353	0.019	3	388.77	18
SR Tendulkar	94	5035	54.728	0.878	31.884	0.110	55.173	0.016	3	360.80	19
KP Pietersen	53	3012	57.923	0.840	28.397	0.112	58.921	0.014	3	348.20	20
ML Hayden	51	2807	55.039	0.843	27.196	0.101	55.003	0.015	3	346.21	21
G Boycott	57	2711	50.204	0.837	24.886	0.086	51.225	0.016	3	343.60	22
IVA Richards	48	2203	45.896	0.818	21.158	0.077	46.426	0.018	3	340.62	23
GA Gooch	74	3437	46.446	0.815	20.875	0.018	46.585	0.017	3	338.47	24
KF Barrington	46	2475	56.250	0.798	23.137	0.059	58.118	0.014	3	330.72	25
SM Gavaskar	65	3562	55.656	0.783	21.227	0.012	57.006	0.014	3	323.21	26
Younis Khan	40	2208	56.615	0.778	20.710	0.032	56.944	0.014	3	321.08	27
Inzamam-ul-Haq	50	2643	56.234	0.766	20.103	0.018	58.759	0.013	3	319.24	28
VVS Laxman	57	2377	48.510	0.715	14.925	0.002	54.518	0.013	3	292.44	29
AJ Stewart	74	2956	42.841	0.953	35.349	0.612	43.103	0.022	4	425.36	30
AR Border	84	3373	42.163	0.895	27.406	0.213	42.729	0.021	4	393.65	31
GC Smith	56	2399	43.618	0.785	17.486	0.018	44.086	0.018	4	328.15	32

Table 3F: Ranks based on batting mean and batting consistency (second innings of all home tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	18	1498	107.000	0.772	36.323	0.243	122.005	0.006	1	223.76	1
Javed Miandad	26	981	51.632	1.094	74.985	0.636	50.056	0.022	2	139.30	2
IVA Richards	19	933	62.200	0.850	32.754	0.426	66.019	0.013	2	116.19	3
ML Hayden	39	1807	58.290	0.871	33.828	0.344	61.119	0.014	2	113.79	4
GS Sobers	31	1279	58.136	0.818	27.732	0.235	64.649	0.013	2	111.56	5
JH Kallis	46	1863	54.794	0.866	31.674	0.288	58.129	0.015	2	111.14	6
SR Tendulkar	59	2181	48.467	0.848	26.258	0.148	51.300	0.016	2	106.25	7
VVS Laxman	34	1390	57.917	0.682	15.335	0.011	70.983	0.009	2	106.22	8
Younis Khan	34	1665	57.414	0.779	22.091	0.090	61.504	0.013	2	104.32	9
AR Border	58	2201	52.405	0.781	21.619	0.038	58.919	0.013	2	102.31	10
KC Sangakkara	48	2032	49.561	0.805	21.935	0.072	52.343	0.015	2	101.08	11
WR Hammond	24	904	50.222	0.651	12.288	0.017	64.434	0.010	2	94.41	12
Inzamam-ul-Haq	33	1166	44.846	0.623	9.955	0.001	57.428	0.010	2	83.72	13
MJ Clarke	31	1084	41.692	1.055	51.779	0.733	41.272	0.026	3	145.15	14
GC Smith	38	1378	43.063	1.019	46.545	0.892	42.944	0.024	3	135.91	15
KP Pietersen	36	1525	44.853	1.018	48.357	0.896	44.817	0.023	3	133.08	16
AN Cook	47	1737	40.395	0.914	28.554	0.448	40.861	0.022	3	121.38	17
R Dravid	50	1691	40.262	0.908	27.970	0.410	41.001	0.022	3	120.22	18
RT Ponting	56	1834	45.850	0.891	30.099	0.361	48.362	0.018	3	111.93	19
G Boycott	43	1645	45.694	0.883	28.461	0.353	47.081	0.019	3	111.29	20
SM Gavaskar	43	1505	40.676	0.856	22.843	0.218	41.950	0.020	3	110.44	21
GA Gooch	57	2480	45.926	0.865	26.091	0.169	46.757	0.018	3	108.79	22
BC Lara	48	1976	44.909	0.859	25.142	0.208	46.194	0.019	3	108.13	23
Len Hutton	33	996	39.840	0.799	18.483	0.137	43.674	0.018	3	100.44	24
S Chanderpaul	56	1906	41.435	0.740	15.022	0.009	46.731	0.016	3	91.56	25
KF Barrington	27	872	39.636	1.114	61.399	0.552	38.669	0.029	4	163.38	26
ME Waugh	35	1079	37.207	0.950	30.777	0.731	37.782	0.025	4	133.73	27
V Sehwag	37	1055	31.029	0.853	17.955	0.250	32.008	0.027	4	130.63	28
SR Waugh	48	1156	27.524	0.802	13.535	0.067	29.068	0.027	4	129.86	29
AJ Stewart	52	1694	37.644	0.896	25.245	0.355	38.652	0.023	4	121.95	30
DI Gower	48	1416	34.537	0.823	17.628	0.102	36.320	0.023	4	112.60	31
DPMD Jayawardene	49	1529	37.293	0.825	18.953	0.113	39.261	0.021	4	108.31	32

Table 3G: Ranks based on batting mean and batting consistency (first innings of all away tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	18	1873	104.056	0.787	34.991	0.182	104.775	0.007	1	207.56	1
KF Barrington	36	2594	78.606	1.388	457.464	0.038	75.218	0.018	2	211.89	2
WR Hammond	41	2970	80.270	0.758	25.740	0.027	85.475	0.009	2	158.73	3
Len Hutton	35	1971	61.594	1.018	66.649	0.901	61.472	0.017	2	155.24	4
AR Border	70	3430	56.230	0.912	38.723	0.371	57.473	0.016	2	138.69	5
SR Tendulkar	103	6265	65.260	0.820	29.071	0.014	67.730	0.012	2	135.50	6
GC Smith	61	3309	55.150	0.875	31.475	0.162	55.156	0.016	2	132.40	7
SR Waugh	85	4432	63.314	0.683	15.877	0.000	74.194	0.009	2	129.33	8
R Dravid	94	5198	59.747	0.789	23.409	0.004	62.227	0.013	2	125.34	9
BC Lara	65	3965	61.000	0.740	18.450	0.001	61.912	0.012	2	118.66	10
Younis Khan	59	3130	53.966	0.746	17.670	0.004	56.008	0.013	2	114.25	11
V Sehwag	52	2837	55.627	0.740	17.388	0.004	57.114	0.013	2	114.17	12
GS Sobers	49	2313	49.213	0.870	28.266	0.224	49.944	0.017	3	131.49	13
ML Hayden	52	2346	45.115	0.851	24.013	0.142	45.655	0.019	3	130.22	14
AN Cook	51	2426	48.520	0.848	25.122	0.132	48.793	0.017	3	128.12	15
RT Ponting	85	4335	52.866	0.843	26.688	0.049	53.812	0.016	3	127.27	16
IVA Richards	73	3842	54.113	0.831	25.701	0.042	54.893	0.015	3	125.84	17
KP Pietersen	50	2444	48.880	0.832	23.634	0.094	49.307	0.017	3	125.36	18
S Chanderpaul	80	3511	49.451	0.829	24.268	0.046	51.807	0.016	3	124.75	19
Javed Miandad	63	3004	49.246	0.824	23.053	0.046	49.976	0.016	3	123.95	20
Inzamam-ul-Haq	68	2993	47.508	0.823	22.525	0.044	48.892	0.017	3	123.90	21
SM Gavaskar	59	2597	45.561	0.809	20.315	0.039	46.614	0.017	3	122.12	22
MJ Clarke	64	2776	44.774	0.791	18.445	0.014	45.391	0.017	3	119.66	23
KC Sangakkara	59	3091	53.293	0.775	19.468	0.008	53.620	0.014	3	116.95	24
JH Kallis	88	4008	48.289	0.750	16.638	0.001	50.441	0.015	3	112.18	25
DPMD Jayawardene	68	3081	46.682	0.740	15.332	0.001	48.140	0.015	3	110.20	26
G Boycott	51	2084	40.863	1.056	51.373	0.643	40.798	0.026	4	181.50	27
GA Gooch	44	1565	35.568	0.954	29.590	0.693	35.603	0.027	4	175.66	28
DI Gower	52	2273	44.569	1.052	55.376	0.659	44.489	0.024	4	170.87	29
VVS Laxman	77	2933	41.310	0.962	35.434	0.681	41.498	0.023	4	158.53	30
AJ Stewart	58	2047	35.912	0.841	18.900	0.086	36.159	0.023	4	144.29	31
ME Waugh	72	2937	43.191	0.852	23.453	0.095	44.173	0.019	4	131.72	32

Table 3H: Ranks based on batting mean and batting consistency (second innings of all away tests)

Name	Inn-ings	Total Runs	Reported Average	$\hat{\alpha}$	$\hat{\theta}$	LRT P-value	Estimated Mean	Estimated Consistency	Group	Squared Mahalanobis Distance	Overall Rank
DG Bradman	12	801	100.125	0.590	15.641	0.059	163.195	0.003	1	127.49	1
KC Sangakkara	50	2479	55.089	0.979	50.355	0.859	55.224	0.018	2	54.79	2
JH Kallis	68	2863	57.260	0.836	29.315	0.120	62.636	0.013	2	46.80	3
AR Border	53	2170	57.105	0.812	26.653	0.109	63.974	0.013	2	45.89	4
G Boycott	42	1674	57.724	0.652	14.011	0.003	78.139	0.008	2	44.73	5
SM Gavaskar	47	2458	61.450	0.766	22.082	0.031	66.593	0.011	2	44.42	6
KF Barrington	22	865	50.882	0.731	16.645	0.086	57.125	0.013	2	40.23	7
GS Sobers	36	1644	53.032	0.721	16.432	0.020	59.600	0.012	2	40.22	8
AN Cook	45	1987	52.289	0.683	13.646	0.002	59.487	0.011	2	38.19	9
Younis Khan	47	1811	48.946	0.662	12.376	0.001	59.864	0.011	2	37.21	10
Len Hutton	26	1070	46.522	1.204	105.435	0.000	45.012	0.027	3	79.10	11
WR Hammond	31	1275	47.222	1.159	90.750	0.332	46.453	0.025	3	73.27	12
Inzamam-ul-Haq	49	2028	48.286	1.036	55.928	0.784	47.946	0.022	3	61.99	13
ML Hayden	42	1665	46.250	1.007	47.732	0.955	46.261	0.022	3	61.09	14
R Dravid	72	2492	42.966	0.970	38.291	0.781	43.360	0.022	3	60.69	15
DI Gower	39	1504	48.516	0.968	42.759	0.819	49.005	0.020	3	56.30	16
Javed Miandad	40	1347	39.618	0.865	23.411	0.294	41.175	0.021	3	53.66	17
GC Smith	50	2179	48.422	0.924	35.333	0.514	49.201	0.019	3	53.01	18
AJ Stewart	51	1766	41.070	0.859	23.557	0.213	42.752	0.020	3	51.82	19
RT Ponting	63	2172	39.491	0.837	20.799	0.097	41.276	0.020	3	51.11	20
SR Tendulkar	73	2440	38.730	0.828	19.698	0.052	40.484	0.020	3	50.99	21
VVS Laxman	57	2081	44.277	0.855	24.926	0.182	46.548	0.018	3	49.25	22
S Chanderpaul	62	2030	41.429	0.829	21.390	0.103	44.414	0.019	3	48.36	23
MJ Clarke	50	1557	38.925	0.774	16.317	0.037	42.881	0.018	3	44.81	24
IVA Richards	42	1562	43.389	0.785	18.320	0.071	46.732	0.017	3	44.07	25
SR Waugh	46	1213	39.129	0.717	13.776	0.016	48.163	0.015	3	39.09	26
ME Waugh	46	1382	35.436	0.653	9.379	0.001	41.846	0.015	3	35.85	27
DPMD Jayawardene	55	1566	30.706	0.966	27.030	0.749	30.832	0.031	4	85.23	28
V Sehwag	39	1093	29.541	0.918	21.671	0.502	29.754	0.031	4	81.87	29
GA Gooch	40	1418	38.324	0.915	27.342	0.501	38.813	0.024	4	60.94	30
BC Lara	54	1728	32.604	0.721	10.794	0.002	33.459	0.021	4	47.99	31
KP Pietersen	42	1200	32.432	0.733	11.871	0.016	35.475	0.020	4	46.90	32

Table 4: Ranks based on batting mean, consistency and longevity

Player	Innings	Reported Average	Batting Mean (a_i)	Consistency (b_i)	Longevity (c_i)	Squared Mahalanobis Distance	Group	Group Rank	Overall Rank
DG Bradman	80	99.943	109.421	0.007	0.817	662.467	1	1	1
SR Tendulkar	329	53.787	55.593	0.015	1.533	586.126	2	1	2
S Chanderpaul	280	51.372	55.559	0.014	1.323	536.085	2	2	3
JH Kallis	280	55.371	58.584	0.014	1.229	527.285	2	3	4
Len Hutton	138	56.675	57.705	0.015	0.892	525.794	2	4	5
KF Barrington	131	58.672	59.778	0.015	0.719	513.430	2	5	6
WR Hammond	140	58.460	59.971	0.014	0.959	512.643	2	6	7
KC Sangakkara	229	58.042	59.480	0.014	1.014	502.445	2	7	8
GS Sobers	160	57.784	60.987	0.013	1.007	494.645	2	8	9
SR Waugh	260	51.061	57.048	0.013	1.213	480.311	2	9	10
Younis Khan	180	54.074	57.551	0.013	0.898	440.098	2	10	11
R Dravid	286	52.315	53.598	0.016	1.180	558.449	3	1	12
AR Border	265	50.561	52.895	0.016	1.130	544.648	3	2	13
RT Ponting	287	51.853	53.602	0.015	1.214	535.189	3	3	14
ML Hayden	184	50.735	51.509	0.017	0.907	529.598	3	4	15
Javed Miandad	189	52.571	53.833	0.016	0.982	528.832	3	5	16
DPMD Jayawardene	252	49.848	51.009	0.015	1.131	508.648	3	6	17
IVA Richards	182	50.235	51.741	0.016	0.965	497.267	3	7	18
SM Gavaskar	214	51.121	53.039	0.015	1.010	486.619	3	8	19
Inzamam-ul-Haq	200	49.607	52.064	0.015	0.945	486.048	3	9	20
BC Lara	232	52.889	53.921	0.014	1.052	474.193	3	10	21
V Sehwag	180	49.345	50.098	0.016	0.803	461.523	3	11	22
MJ Clarke	193	50.246	52.639	0.015	0.803	448.535	3	12	23
G Boycott	193	47.729	49.352	0.017	1.022	536.245	4	1	24
GC Smith	205	48.255	48.866	0.018	0.863	528.318	4	2	25
AN Cook	208	46.628	47.193	0.018	0.776	524.572	4	3	26
VVS Laxman	225	45.974	48.517	0.017	1.036	515.856	4	4	27
KP Pietersen	181	47.289	48.297	0.017	0.712	480.139	4	5	28
DI Gower	204	44.253	44.601	0.021	0.923	617.084	5	1	29
AJ Stewart	235	39.547	40.287	0.022	0.965	616.425	5	2	30
GA Gooch	215	42.584	42.981	0.020	1.137	594.347	5	3	31
ME Waugh	209	41.818	43.411	0.019	0.841	519.533	5	4	32

Table 7: Opponent difficulty level for batsmen in home test matches

	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
SR Tendulkar	0.58	0.43	0.47	0.55	0.38	0.30		0.35	0.13	0.08
RT Ponting		0.45	0.44	0.57	0.41	0.24	0.43	0.35	0.13	0.10
JH Kallis	0.60	0.46	0.45		0.40	0.24	0.43	0.36	0.13	0.09
R Dravid	0.60	0.45	0.44	0.56	0.41	0.24		0.35	0.14	0.09
KC Sangakkara	0.59	0.46	0.44	0.58		0.24	0.44	0.35	0.09	0.12
BC Lara	0.62	0.44	0.48	0.53	0.39		0.40	0.37	0.18	0.04
S Chanderpaul	0.59	0.45	0.46	0.57	0.39		0.42	0.36	0.13	0.09
DPMD Jayawardene	0.60	0.46	0.44	0.58		0.25	0.43	0.35	0.11	0.11
AR Border		0.38	0.46	0.14	0.19	0.61	0.38	0.34	0.03	-
SR Waugh		0.42	0.51	0.41	0.32	0.39	0.38	0.39	0.15	0.01
SM Gavaskar	0.38	0.48	0.40	-	0.10	0.63		0.27	-	-
GC Smith	0.59	0.45	0.42		0.41	0.24	0.45	0.34	0.10	0.13
AN Cook	0.52		0.44	0.62	0.38	0.24	0.43	0.32	0.05	0.14
GA Gooch	0.45		0.48	0.19	0.20	0.58	0.37	0.33	0.05	-
Javed Miandad	0.41	0.42		0.10	0.16	0.59	0.38	0.31	0.02	-
Inzamam-ul-Haq	0.61	0.43		0.53	0.39	0.28	0.40	0.36	0.17	0.05
Younis Khan	0.59	0.46		0.58	0.39	0.24	0.44	0.35	0.09	0.12
VVS Laxman	0.60	0.45	0.44	0.57	0.41	0.24		0.35	0.13	0.10
ML Hayden		0.46	0.43	0.53	0.41	0.21	0.48	0.37	0.15	0.09
MJ Clarke		0.44	0.43	0.62	0.39	0.25	0.43	0.33	0.06	0.14
V Sehwag	0.59	0.45	0.42	0.59	0.41	0.24		0.34	0.10	0.12
IVA Richards	0.41	0.43	0.43	0.06	0.15		0.38	0.31	0.01	-
AJ Stewart	0.59		0.52	0.52	0.36	0.36	0.36	0.36	0.18	0.01
DI Gower	0.40		0.43	0.05	0.17	0.63	0.38	0.34	0.01	-
KP Pietersen	0.53		0.40	0.62	0.41	0.25	0.44	0.30	0.07	0.15
G Boycott	0.42		0.36	0.23	0.05	0.62	0.33	0.29	-	-
GS Sobers	0.55	0.53	0.33	0.42	-		0.24	0.32	-	-
ME Waugh		0.41	0.52	0.52	0.36	0.35	0.35	0.36	0.18	0.01
DG Bradman		0.51	-	0.32	-	0.31	0.09	0.35	-	-
KF Barrington	0.55		0.32	0.48	-	0.50	0.11	0.41	-	-
WR Hammond	0.63		-	0.40	-	0.24	0.08	0.28	-	-
Len Hutton	0.75		0.21	0.38	-	0.51	0.23	0.29	-	-

Table 8: Opponent difficulty level for batsmen in away test matches

	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
SR Tendulkar	0.77	0.59	0.61	0.66	0.63	0.52		0.51	0.28	0.10
RT Ponting		0.63	0.59	0.68	0.68	0.46	0.66	0.52	0.23	0.12
JH Kallis	0.80	0.62	0.59		0.67	0.47	0.66	0.52	0.24	0.12
R Dravid	0.80	0.62	0.59	0.69	0.68	0.47		0.52	0.24	0.12
KC Sangakkara	0.78	0.66	0.58	0.68		0.45	0.67	0.54	0.23	0.18
BC Lara	0.80	0.57	0.60	0.69	0.64		0.65	0.50	0.30	0.04
S Chanderpaul	0.78	0.62	0.57	0.69	0.65		0.65	0.53	0.25	0.13
DPMD Jayawardene	0.79	0.65	0.59	0.68		0.46	0.67	0.52	0.25	0.15
AR Border		0.47	0.69	0.15	0.31	0.74	0.59	0.56	0.11	-
SR Waugh		0.49	0.60	0.55	0.59	0.63	0.63	0.51	0.28	0.01
SM Gavaskar	0.57	0.52	0.65	0.15	0.12	0.67		0.52	-	-
GC Smith	0.79	0.67	0.61		0.67	0.44	0.69	0.52	0.21	0.18
AN Cook	0.74		0.56	0.67	0.65	0.43	0.67	0.57	0.19	0.25
GA Gooch	0.60		0.69	0.22	0.34	0.73	0.63	0.53	0.16	-
Javed Miandad	0.57	0.48		0.11	0.26	0.73	0.58	0.55	0.08	-
Inzamam-ul-Haq	0.79	0.57		0.68	0.64	0.53	0.66	0.50	0.28	0.05
Younis Khan	0.77	0.66		0.69	0.64	0.44	0.66	0.55	0.22	0.18
VVS Laxman	0.80	0.64	0.60	0.68	0.68	0.46		0.52	0.22	0.14
ML Hayden		0.65	0.62	0.68	0.69	0.44	0.63	0.51	0.20	0.09
MJ Clarke		0.67	0.58	0.67	0.65	0.44	0.69	0.55	0.21	0.23
V Sehwag	0.79	0.67	0.60	0.67	0.67	0.44		0.52	0.21	0.17
IVA Richards	0.56	0.48	0.67	0.09	0.24		0.55	0.55	0.05	-
AJ Stewart	0.77		0.62	0.68	0.57	0.60	0.70	0.48	0.37	0.01
DI Gower	0.55		0.68	0.06	0.27	0.75	0.53	0.59	0.04	-
KP Pietersen	0.77		0.61	0.64	0.70	0.42	0.71	0.53	0.17	0.23
G Boycott	0.63		0.60	0.43	0.02	0.58	0.46	0.46	-	-
GS Sobers	0.64	0.66	0.50	0.57	-		0.43	0.31	-	-
ME Waugh		0.51	0.60	0.68	0.58	0.60	0.69	0.48	0.36	0.01
DG Bradman		0.56	-	0.42	-	0.55	0.19	0.20	-	-
KF Barrington	0.58		0.45	0.49	-	0.61	0.47	0.31	-	-
WR Hammond	0.61		-	0.42	-	0.47	0.09	0.13	-	-
Len Hutton	0.73		0.02	0.39	-	0.63	0.40	0.21	-	-

Table 9: Batting average of players against respective opponents in home test matches

Country	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
RT Ponting (AUS)		44.35	68.00	47.80	49.80	44.44	86.05	48.36	129.50	10.00
AR Border (AUS)		47.29	57.69	29.20	72.00	33.95	53.40	52.38		
SR Waugh (AUS)		47.48	26.75	49.45	124.75	39.14	37.93	46.17	69.50	
ML Hayden (AUS)		56.81	32.00	53.88	27.33	43.88	71.75	37.00	250.50	11.00
MJ Clarke (AUS)		41.09	24.57	106.56	110.00	45.60	76.93	84.00		
ME Waugh (AUS)		50.75	61.80	40.31	63.75	41.96	22.00	42.25		
DG Bradman (AUS)		78.47		201.50		74.50	143.00			
AN Cook (ENG)	27.74		40.71	40.31	53.58	60.23	48.28	53.33		19.67
GA Gooch (ENG)	33.54		45.80	23.17	80.75	47.61	66.71	58.06		
AJ Stewart (ENG)	29.97		63.93	41.57	58.83	26.93	52.88	34.88	60.50	
DI Gower (ENG)	45.16		36.80		55.00	22.39	52.06	57.76		
KP Pietersen (ENG)	44.09		37.46	58.18	58.00	55.23	79.82	46.50		46.00
G Boycott (ENG)	49.97		87.33	18.75		41.04	64.27	46.06		
KF Barrington (ENG)	59.17		81.00	32.07		23.86	61.91	150.00		
WR Hammond (ENG)	37.87			61.75		42.18	79.29	53.29		
Len Hutton (ENG)	62.90		6.33	48.13		81.30	58.00	54.18		
SR Tendulkar (IND)	56.91	48.00	44.15	36.25	52.50	59.41		44.29	113.00	
R Dravid (IND)	35.71	47.83	42.88	39.25	76.91	51.89		63.79	126.00	
SM Gavaskar (IND)	52.50	35.97	54.40		103.50	61.14		43.17		
VVS Laxman (IND)	57.05	22.50	42.75	34.17	46.25	94.83		82.67	31.00	
V Sehwag (IND)	35.91	30.17	90.67	84.00	78.14	53.10		63.91	74.00	
Javed Miandad (PAK)	69.91	70.00			51.90	26.81	91.43	82.58	28.60	
Inzamam-ul-Haq (PAK)	32.33	81.56		33.13	48.88	65.00	48.43	86.00	30.67	82.75
Younis Khan (PAK)		30.25		66.25	65.18	36.20	110.60	27.00		17.00
JH Kallis (SA)	36.59	54.57	37.75		41.14	117.82	78.27	77.36	58.67	127.00
GC Smith (SA)	25.94	45.79	39.82		29.43	75.33	39.71	24.56	81.00	102.00
KC Sangakkara (SL)	30.45	39.22	76.70	60.13		68.00	74.33	37.56	63.75	114.78
DPMD Jayawardene (SL)	35.27	89.00	29.26	89.07		45.40	70.24	59.57	55.67	79.43
BC Lara (WI)	66.05	77.95	60.78	48.26	69.83		34.96	49.67		86.50
S Chanderpaul (WI)	80.38	35.07	65.88	53.28	43.33		70.32	43.73	41.40	378.00
IVA Richards (WI)	36.14	58.00	41.15				57.24	62.00		
GS Sobers (WI)	38.87	73.37	137.33				72.93	36.14		
Opposition_Average	**45.02**	**52.41**	**53.10**	**55.86**	**63.51**	**52.83**	**66.77**	**56.39**	**80.92**	**89.51**

Table 10: Batting average of players against respective opponents in away test matches

Country	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
RT Ponting (AUS)		41.79	104.33	46.85	48.20	61.05	26.48	59.39	31.00	95.50
AR Border (AUS)		65.06	61.92	38.00	48.33	53.07	51.07	51.40		
SR Waugh (AUS)		71.00	46.23	57.70	16.60	62.33	47.36	41.61		
ML Hayden (AUS)		34.50	104.00	38.13	40.13	49.13	51.35	52.87		35.67
MJ Clarke (AUS)		44.65	14.25	46.18	42.80	35.00	40.50	53.23		25.50
ME Waugh (AUS)		49.54	43.00	39.58	12.08	42.95	43.45	37.43	90.00	
DG Bradman (AUS)		102.85								
AN Cook (ENG)	49.54		26.50	41.00	48.33	54.33	61.86	34.91		114.00
GA Gooch (ENG)	33.00		37.50		26.50	39.27	42.21	32.20		
AJ Stewart (ENG)	31.46		19.80	37.42	26.14	40.90	24.33	65.22	80.33	
DI Gower (ENG)	44.49		112.25		131.00	43.88	37.20	17.25		
KP Pietersen (ENG)	45.76		22.33	25.29	44.00	58.00	43.94	38.22		83.33
G Boycott (ENG)	45.03		82.25	43.50		52.12	47.13	22.38		
KF Barrington (ENG)	69.73		72.50	109.00		45.88	96.29	73.50		84.00
WR Hammond (ENG)	61.91			62.91		25.00		321.00		
Len Hutton (ENG)	48.75			58.77		71.23		30.17		
SR Tendulkar (IND)	53.21	54.31	40.25	51.45	67.94	40.56		49.53	40.00	136.67
R Dravid (IND)	40.21	68.80	78.57	28.16	33.10	64.00		63.83	79.17	62.22
SM Gavaskar (IND)	51.11	41.14	58.88		37.20	70.20		43.56		
VVS Laxman (IND)	44.14	34.47	37.43	34.07	48.18	49.40		40.25	41.50	39.00
V Sehwag (IND)	46.86	27.80	91.50	26.36	69.20	46.25		20.00	51.00	35.20
Javed Miandad (PAK)	38.07	46.62			15.75	33.75	49.89	77.33		
Inzamam-ul-Haq (PAK)	24.75	42.50		31.09	58.67	52.64	54.89	57.00	49.00	136.50
Younis Khan (PAK)	43.17	52.22		26.93	45.08	32.30	76.80	65.29	73.00	100.67
JH Kallis (SA)	48.23	35.33	70.54		35.33	45.85	58.46	59.00	503.00	31.50
GC Smith (SA)	37.40	67.75	55.93		44.75	51.67	35.92	57.20		67.00
KC Sangakkara (SL)	21.75	41.05	72.47	35.75		34.00	36.50	67.00	140.50	78.30
DPMD Jayawardene (SL)	32.00	35.82	37.52	27.88		42.00	62.80	29.08	63.25	59.10
BC Lara (WI)	42.76	48.77	48.15	49.88	100.86		33.00	35.69	55.50	
S Chanderpaul (WI)	30.83	66.62	30.60	39.53	41.33		52.00	44.44	31.00	103.80
IVA Richards (WI)	47.57	64.28	42.77				45.43	19.25		
GS Sobers (WI)	46.35	53.53	28.67				99.89	15.10		37.00
Opposition_Average	**43.12**	**51.76**	**55.39**	**43.28**	**47.02**	**48.03**	**50.78**	**54.01**	**94.88**	**73.61**

Table 11: Relative performance index of players against various opponents in home test matches

Country	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
RT Ponting		0.85	1.28	0.86	0.78	0.84	1.29	0.86	1.60	0.11
AR Border		0.90	1.09	0.52	1.13	0.64	0.80	0.93		
SR Waugh		0.91	0.50	0.89	1.96	0.74	0.57	0.82	0.86	
ML Hayden		1.08	0.60	0.96	0.43	0.83	1.07	0.66	1.00	0.12
MJ Clarke		0.78	0.46	1.91	1.73	0.86	1.15	1.49		
ME Waugh		0.97	1.16	0.72	1.00	0.79	0.33	0.75		
DG Bradman		1.50		1.00		1.41	1.00			
AN Cook	0.62		0.77	0.72	0.84	1.14	0.72	0.95		0.22
GA Gooch	0.75		0.86	0.41	1.27	0.90	1.00	1.03		
AJ Stewart	0.67		1.20	0.74	0.93	0.51	0.79	0.62	0.75	
DI Gower	1.00		0.69		0.87	0.42	0.78	1.02		
KP Pietersen	0.98		0.71	1.04	0.91	1.05	1.20	0.82		0.51
G Boycott	1.11		1.64	0.34		0.78	0.96	0.82		
KF Barrington	1.31		1.53	0.57		0.45	0.93	1.00		
WR Hammond	0.84			1.11		0.80	1.19	0.94		
Len Hutton	1.40		0.12	0.86		1.54	0.87	0.96		
SR Tendulkar	1.26	0.92	0.83	0.65	0.83	1.12		0.79	1.40	
R Dravid	0.79	0.91	0.81	0.70	1.21	0.98		1.13	1.56	
SM Gavaskar	1.17	0.69	1.02		1.63	1.16		0.77		
VVS Laxman	1.27	0.43	0.81	0.61	0.73	1.80		1.47	0.38	
V Sehwag	0.80	0.58	1.71	1.50	1.23	1.01		1.13	0.91	
Javed Miandad	1.55	1.34			0.82	0.51	1.37	1.46	0.35	
Inzamam-ul-Haq	0.72	1.56		0.59	0.77	1.23	0.73	1.52	0.38	0.92
Younis Khan		0.58		1.19	1.03	0.69	1.66	0.48		0.19
JH Kallis	0.81	1.04	0.71		0.65	2.23	1.17	1.37	0.73	1.42
GC Smith	0.58	0.87	0.75		0.46	1.43	0.59	0.44	1.00	1.14
KC Sangakkara	0.68	0.75	1.44	1.08		1.29	1.11	0.67	0.79	1.28
DPMD Jayawardene	0.78	1.70	0.55	1.59		0.86	1.05	1.06	0.69	0.89
BC Lara	1.47	1.49	1.14	0.86	1.10		0.52	0.88		0.97
S Chanderpaul	1.79	0.67	1.24	0.95	0.68		1.05	0.78	0.51	1.00
IVA Richards	0.80	1.11	0.78				0.86	1.10		
GS Sobers	0.86	1.40	2.59				1.09	0.64		

Table 12: Relative performance index of players against various opponents in away test matches

Name	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
RT Ponting		0.8075	1.8836	1.0825	1.0250	1.2712	0.5215	1.0996	0.3267	1.2974
AR Border		1.2571	1.1178	0.8780	1.0279	1.1049	1.0056	0.9517		
SR Waugh		1.3718	0.8346	1.3332	0.3530	1.2978	0.9327	0.7704		
ML Hayden		0.6666	1.8776	0.8809	0.8533	1.0228	1.0112	0.9788		0.4845
MJ Clarke		0.8626	0.2573	1.0671	0.9102	0.7287	0.7975	0.9856		0.3464
ME Waugh		0.9572	0.7763	0.9146	0.2570	0.8943	0.8557	0.6930	0.9486	
DG Bradman		1.9871								
AN Cook	1.1488		0.4784	0.9473	1.0279	1.1313	1.2181	0.6463		1.5487
GA Gooch	0.7652		0.6770		0.5636	0.8177	0.8313	0.5962		
AJ Stewart	0.7296		0.3575	0.8646	0.5560	0.8516	0.4792	1.2076	0.8467	
DI Gower	1.0316		1.0000		1.0000	0.9137	0.7326	0.3194		
KP Pietersen	1.0611		0.4032	0.5843	0.9357	1.2076	0.8652	0.7077		1.1321
G Boycott	1.0443		1.4849	1.0051		1.0852	0.9280	0.4143		
KF Barrington	1.6171		1.3089	1.0000		0.9553	1.8961	1.3609		1.1412
WR Hammond	1.4356			1.4537		0.5205		1.0000		
Len Hutton	1.1305			1.3579		1.4831		0.5585		
SR Tendulkar	1.2338	1.0493	0.7267	1.1889	1.4449	0.8445		0.9170	0.4216	1.8567
R Dravid	0.9324	1.3293	1.4185	0.6506	0.7039	1.3325		1.1819	0.8344	0.8453
SM Gavaskar	1.1852	0.7949	1.0630		0.7911	1.4616		0.8064		
VVS Laxman	1.0236	0.6660	0.6757	0.7873	1.0247	1.0285		0.7452	0.4374	0.5298
V Sehwag	1.0867	0.5371	1.6519	0.6090	1.4716	0.9630		0.3703	0.5375	0.4782
Javed Miandad	0.8829	0.9007			0.3349	0.7027	0.9825	1.4318		
Inzamam-ul-Haq	0.5739	0.8212		0.7184	1.2476	1.0961	1.0809	1.0554	0.5165	1.8544
Younis Khan	1.0010	1.0090		0.6222	0.9586	0.6725	1.5124	1.2088	0.7694	1.3676
JH Kallis	1.1184	0.6827	1.2735		0.7514	0.9547	1.1512	1.0924	1.0000	0.4279
GC Smith	0.8673	1.3090	1.0097		0.9517	1.0757	0.7073	1.0591		0.9102
KC Sangakkara	0.5044	0.7931	1.3084	0.8260		0.7079	0.7188	1.2405	1.4809	1.0637
DPMD Jayawardene	0.7421	0.6920	0.6773	0.6441		0.8745	1.2367	0.5384	0.6667	0.8029
BC Lara	0.9915	0.9423	0.8694	1.1524	2.1449		0.6498	0.6608	0.5850	
S Chanderpaul	0.7150	1.2872	0.5524	0.9133	0.8790		1.0240	0.8229	0.3267	1.4102
IVA Richards	1.1031	1.2420	0.7721				0.8946	0.3564		
GS Sobers	1.0748	1.0343	0.5175				1.9670	0.2796		0.5027

Table 13: Composite performance indices and overall quality of runs scored

Player	Country	Composite Performance Index (Away)	Composite Performance Index (Home)	Overall Composite Performance Index
DG Bradman	Australia	1.9871	1.3114	1.6493
Len Hutton	England	1.2282	1.1261	1.1772
GS Sobers	West Indies	1.0079	1.2892	1.1485
KF Barrington	England	1.3446	0.9387	1.1417
BC Lara	West Indies	1.0421	1.0934	1.0677
SM Gavaskar	India	1.0734	1.0089	1.0411
WR Hammond	England	1.1434	0.9339	1.0386
V Sehwag	India	0.9316	1.1329	1.0323
Javed Miandad	Pakistan	0.9123	1.1374	1.0248
JH Kallis	South Africa	0.9886	1.0450	1.0168
MJ Clarke	Australia	0.7871	1.2458	1.0165
RT Ponting	Australia	1.0493	0.9736	1.0114
SR Tendulkar	India	1.0548	0.9342	0.9945
G Boycott	England	1.0210	0.9651	0.9931
R Dravid	India	1.0317	0.9334	0.9826
Younis Khan	Pakistan	1.0087	0.9464	0.9775
AR Border	Australia	1.0697	0.8577	0.9637
S Chanderpaul	West Indies	0.8705	1.0450	0.9578
KC Sangakkara	Sri Lanka	0.8889	0.9842	0.9366
DPMD Jayawardene	Sri Lanka	0.7715	1.0894	0.9304
SR Waugh	Australia	0.9777	0.8704	0.9241
Inzamam-ul-Haq	Pakistan	0.9066	0.9364	0.9215
ML Hayden	Australia	1.0237	0.8123	0.9180
IVA Richards	West Indies	0.8611	0.9210	0.8911
KP Pietersen	England	0.8353	0.9454	0.8904
VVS Laxman	India	0.8255	0.9252	0.8753
AN Cook	England	0.9872	0.7586	0.8729
GC Smith	South Africa	0.9828	0.7168	0.8498
ME Waugh	Australia	0.7831	0.8377	0.8104
GA Gooch	England	0.7259	0.8897	0.8078
DI Gower	England	0.8244	0.7485	0.7865
AJ Stewart	England	0.7157	0.7898	0.7528

Table 14: Number of home test matches played by different countries over time

Period	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
1920-24	6	10	0	8	0	0	0	0	0	0
1925-29	9	13	0	5	0	0	0	0	0	0
1930-34	15	17	0	5	0	4	3	8	0	0
1935-39	5	18	0	10	0	4	0	0	0	0
1940-44	0	0	0	0	0	0	0	0	0	0
1945-49	10	17	0	6	0	4	5	2	0	0
1950-54	17	22	0	9	0	10	10	6	0	0
1955-59	8	25	15	10	0	10	15	8	0	0
1960-64	16	25	4	7	0	10	21	6	0	0
1965-69	14	28	9	8	0	10	15	13	0	0
1970-74	15	23	3	4	0	20	7	8	0	0
1975-79	28	24	11	0	0	14	27	13	0	0
1980-84	30	28	27	0	5	14	21	14	0	0
1985-89	25	29	16	0	7	16	21	14	0	0
1990-94	26	29	15	9	15	18	11	18	6	0
1995-99	30	28	20	27	15	23	19	22	16	0
2000-04	34	35	21	25	31	29	23	19	18	15
2005-09	28	35	13	29	22	22	24	23	4	14
2010-14	31	36	10	22	22	20	22	21	8	17
2015-19	1	5	0	1	3	5	0	1	0	5

Table 15: Number of away test matches played by different countries over time

Period	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN
1920-24	8	11	0	5	0	0	0	0	0	0
1925-29	5	14	0	5	0	3	0	0	0	0
1930-34	10	23	0	7	0	8	1	3	0	0
1935-39	9	14	0	5	0	3	3	3	0	0
1940-44	0	0	0	0	0	0	0	0	0	0
1945-49	7	15	0	5	0	5	8	4	0	0
1950-54	9	19	9	12	0	11	9	5	0	0
1955-59	24	17	5	5	0	17	10	13	0	0
1960-64	17	28	11	13	0	10	5	5	0	0
1965-69	20	19	6	3	0	19	11	19	0	0
1970-74	17	24	12	0	0	5	11	11	0	0
1975-79	22	24	20	0	0	23	19	9	0	0
1980-84	22	27	16	0	7	32	22	13	0	0
1985-89	21	20	21	0	10	21	17	18	0	0
1990-94	24	23	17	10	14	17	20	18	4	0
1995-99	28	27	24	20	23	23	19	23	13	0
2000-04	25	30	24	31	20	32	29	22	18	19
2005-09	28	29	25	23	23	25	27	16	4	13
2010-14	24	23	33	21	20	20	31	21	6	10
2015-19	5	3	5	2	1	1	2	2	0	0

Table 16: Proportion of test innings played by batsmen in various periods

Name	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	2010-14	2015-19
SR Tendulkar													0.02	0.14	0.19	0.24	0.22	0.19	
RT Ponting															0.18	0.29	0.35	0.18	
JH Kallis															0.18	0.32	0.30	0.20	
R Dravid															0.20	0.31	0.32	0.17	
KC Sangakkara																0.32	0.32	0.33	0.03
BC Lara														0.14	0.34	0.37	0.15	0.00	
S Chanderpaul														0.03	0.19	0.26	0.27	0.22	0.03
DPMD Jayawardene															0.09	0.33	0.30	0.28	
AR Border											0.11	0.33	0.29	0.28					
SR Waugh													0.21	0.20	0.35	0.24			
SM Gavaskar										0.15	0.36	0.35	0.15						
GC Smith																0.25	0.42	0.32	
AN Cook																	0.43	0.50	0.07
GA Gooch											0.13	0.22	0.27	0.36	0.03				
Javed Miandad											0.23	0.32	0.26	0.19					
Inzamam-ul-Haq														0.16	0.33	0.32	0.20		
Younis Khan																0.29	0.33	0.33	0.04
VVS Laxman															0.12	0.31	0.36	0.21	
ML Hayden														0.01	0.05	0.53	0.40		
MJ Clarke																0.07	0.40	0.49	0.04
V Sehwag																0.28	0.41	0.32	
IVA Richards										0.03	0.24	0.34	0.28	0.12					
AJ Stewart														0.35	0.37	0.28			
DI Gower											0.13	0.45	0.32	0.10					
KP Pietersen																	0.55	0.45	
G Boycott								0.04	0.32	0.21	0.19	0.24							
GS Sobers						0.01	0.28	0.21	0.33	0.18									
ME Waugh														0.31	0.47	0.22			
DG Bradman	0.10	0.43	0.19	0.00	0.29														
KF Barrington							0.07	0.58	0.35										
WR Hammond	0.21	0.33	0.37	0.00	0.09														
Len Hutton			0.15	0.00	0.37	0.43	0.04												

Table 17: Numbers of home test matches played by batsmen against respective opponents

Player	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN	Total
SR Tendulkar	19	15	8	10	13	11		13	5	0	94
RT Ponting		17	7	15	4	12	15	9	2	1	82
JH Kallis	13	14	8		10	10	8	8	3	4	78
R Dravid	17	8	9	10	8	6		8	4	0	70
KC Sangakkara	6	11	12	9		7	9	6	3	9	72
BC Lara	12	14	5	10	4		14	4	0	2	65
S Chanderpaul	9	19	6	12	2		17	9	4	4	82
DPMD Jayawardene	9	11	13	9		7	12	9	3	7	80
AR Border		22	13	3	2	21	11	12	0	0	84
SR Waugh		24	6	7	4	18	9	10	2	1	81
SM Gavaskar	9	22	13	0	4	14		3	0	0	65
GC Smith	10	8	7		5	6	8	6	2	4	56
AN Cook	12		8	7	8	9	12	7	0	2	65
GA Gooch	25		7	3	2	15	10	12	0	0	74
Javed Miandad	9	6		0	9	9	15	9	3	0	60
Inzamam-ul-Haq	6	6		4	10	6	5	3	4	4	48
Younis Khan	0	2		2	6	3	3	1	0	1	18
VVS Laxman	14	6	9	9	6	6		5	2	0	57
ML Hayden		10	3	9	2	10	7	6	2	1	50
MJ Clarke		15	5	6	3	4	9	5	0	0	47
V Sehwag	12	11	3	7	5	6		7	1	0	52
IVA Richards	12	12	7	0	0		13	4	0	0	48
AJ Stewart	17		10	13	5	9	6	10	4	0	74
DI Gower	18		14	0	1	10	12	10	0	0	65
KP Pietersen	12		8	6	6	9	7	3	0	2	53
G Boycott	19		3	2	0	15	8	10	0	0	57
GS Sobers	9	15	5	0	0		10	5	0	0	44
ME Waugh		12	4	9	3	15	7	6	0	0	56
DG Bradman		18	0	4	0	5	5	0	0	0	32
KF Barrington	13		7	9	0	7	8	2	0	0	46
WR Hammond	14		0	9	0	9	6	6	0	0	44
Len Hutton	12		2	10	0	6	7	7	0	0	44

Table 18: Numbers of away test matches played by batsmen against respective opponents

Player	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN	Total
SR Tendulkar	20	17	9	13	11	11		11	4	7	103
RT Ponting		20	1	11	9	11	14	14	1	2	83
JH Kallis	15	15	5		5	22	9	8	3	2	84
R Dravid	16	13	6	10	12	18		7	5	7	94
KC Sangakkara	2	11	5	8		4	6	9	2	6	53
BC Lara	18	15	7	8	4		3	8	2	0	65
S Chanderpaul	10	15	6	11	5		8	13	4	6	78
DPMD Jayawardene	4	12	9	8		4	6	7	5	7	62
AR Border		25	9	3	4	10	8	11	0	0	70
SR Waugh		22	8	8	4	14	9	17	1	0	83
SM Gavaskar	11	15	11	0	3	13		6	0	0	59
GC Smith	10	12	4		2	12	7	6	0	4	57
AN Cook	15		0	4	5	8	8	6	0	2	48
GA Gooch	17		3	0	1	11	9	3	0	0	44
Javed Miandad	16	15		0	3	7	13	9	0	0	63
Inzamam-ul-Haq	6	13		6	8	9	5	11	7	3	68
Younis Khan	3	5		7	16	6	6	5	5	6	59
VVS Laxman	15	11	6	9	7	17		5	4	3	77
ML Hayden		10	0	9	4	5	11	9	0	2	50
MJ Clarke		19	0	7	3	8	13	10	0	2	62
V Sehwag	11	6	6	7	6	5		5	2	4	52
IVA Richards	22	24	9	0	0		15	3	0	0	73
AJ Stewart	16		3	8	4	17	3	6	2	0	59
DI Gower	24		3	0	1	9	12	3	0	0	52
KP Pietersen	15		3	4	5	4	9	5	0	2	47
G Boycott	19		3	4	0	15	5	5	0	0	51
GS Sobers	10	21	2	0	0		8	7	0	1	49
ME Waugh		17	6	8	7	14	7	10	1	0	70
DG Bradman		18	0	0	0	0	0	0	0	0	18
KF Barrington	10		1	4	0	11	6	3	0	1	36
WR Hammond	19		0	15	0	4	0	3	0	0	41
Len Hutton	15		0	8	0	8	0	4	0	0	35

Table 19: Expected numbers of home matches to have been played the players against respective opponents

Player	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN	Total
SR Tendulkar	13.32	13.76	12.87	11.20	10.43	12.44		10.35	4.84	4.79	94
RT Ponting		11.76	10.95	10.31	9.11	10.88	11.33	8.40	4.25	5.01	82
JH Kallis	10.39	10.99	10.32		8.49	10.25	10.67	7.99	4.17	4.74	78
R Dravid	9.50	10.04	9.31	8.83	7.77	9.32		7.25	3.77	4.21	70
KC Sangakkara	9.13	9.69	9.75	8.85		9.07	10.30	6.98	3.28	4.94	72
BC Lara	9.15	9.67	8.05	8.02	7.17		8.34	7.25	4.25	3.10	65
S Chanderpaul	11.18	11.65	11.16	10.10	9.04		11.35	8.61	4.25	4.66	82
DPMD Jayawardene	10.26	10.89	10.62	9.85		10.21	11.12	7.92	3.97	5.16	80
AR Border		17.45	13.42	2.04	6.70	17.59	14.58	11.39	0.82	0.00	84
SR Waugh		12.77	11.02	8.29	8.92	11.81	10.62	10.39	4.88	2.31	81
SM Gavaskar	13.42	15.55	11.18	0.00	2.49	14.71		7.65	0.00	0.00	65
GC Smith	7.39	7.78	7.78		6.06	7.16	8.20	5.45	2.33	3.86	56
AN Cook	9.14		10.34	7.70	7.49	7.81	10.21	6.57	1.77	3.97	65
GA Gooch	14.61		11.89	2.67	6.38	14.43	12.60	10.27	1.16	0.00	74
Javed Miandad	11.62	12.46		1.00	3.96	12.71	10.31	7.55	0.40	0.00	60
Inzamam-ul-Haq	6.79	7.12		5.77	5.30	6.49	6.14	5.26	2.91	2.21	48
Younis Khan	2.38	2.51		2.28	1.93	2.33	2.67	1.81	0.83	1.27	18
VVS Laxman	7.68	8.15	7.68	7.23	6.28	7.58		5.79	2.90	3.70	57
ML Hayden		7.16	5.94	6.58	5.20	6.96	6.72	4.78	2.91	3.74	50
MJ Clarke		6.52	7.29	5.64	5.31	5.73	7.30	4.75	1.50	2.97	47
V Sehwag	6.97	7.37	7.34	6.62	5.71	6.83		5.18	2.29	3.69	52
IVA Richards	9.91	10.80	8.35	0.52	3.07		8.79	6.34	0.21	0.00	48
AJ Stewart	11.27		9.43	8.58	8.32	10.25	9.70	9.18	4.93	2.34	74
DI Gower	12.99		10.82	0.61	4.63	15.28	11.75	8.68	0.24	0.00	65
KP Pietersen	7.51		8.19	6.34	6.21	6.52	8.25	5.23	1.40	3.34	53
G Boycott	13.70		8.52	1.02	1.14	13.34	10.15	9.13	0.00	0.00	57
GS Sobers	11.41	12.20	4.52	3.00	0.00		5.45	7.42	0.00	0.00	44
ME Waugh		8.79	7.27	6.41	6.51	7.68	7.15	7.07	3.76	1.36	56
DG Bradman		16.13	0.00	5.21	0.00	5.08	2.93	2.66	0.00	0.00	32
KF Barrington	12.56		5.99	6.06	0.00	9.25	5.05	7.09	0.00	0.00	46
WR Hammond	15.60		0.00	10.61	0.00	9.06	4.10	4.64	0.00	0.00	44
Len Hutton	9.48		4.40	8.56	0.00	8.33	8.26	4.97	0.00	0.00	44

Table 20: Expected numbers of away matches to have been played the players against respective opponents

Player	AUS	ENG	PAK	SA	SL	WI	IND	NZ	ZIM	BAN	Total
SR Tendulkar	16.51	18.07	8.79	12.65	11.83	12.53		11.32	5.84	5.45	103
RT Ponting		14.78	7.01	11.43	10.18	10.40	9.78	9.28	4.79	5.36	83
JH Kallis	13.23	14.53	6.97		10.12	10.30	9.59	9.06	4.91	5.30	84
R Dravid	14.53	15.94	7.73	12.36	11.03	11.34		10.02	5.40	5.66	94
KC Sangakkara	8.23	9.42	3.88	6.73		6.30	6.10	5.59	2.64	4.11	53
BC Lara	10.54	10.94	6.41	8.29	7.55		6.93	7.06	4.66	2.62	65
S Chanderpaul	12.28	13.54	6.37	10.16	9.18		8.77	8.47	4.45	4.77	78
DPMD Jayawardene	9.66	10.80	4.81	7.96		7.44	7.06	6.55	3.37	4.34	62
AR Border		18.16	12.16	1.60	5.03	10.12	12.18	9.68	1.07	0.00	70
SR Waugh		15.85	9.71	9.15	9.07	11.60	9.91	9.91	5.90	1.91	83
SM Gavaskar	15.57	15.38	9.52	0.35	1.64	8.99		7.55	0.00	0.00	59
GC Smith	8.88	10.28	4.09		7.07	6.73	6.73	6.21	2.57	4.43	57
AN Cook	8.05		3.09	6.87	6.03	5.78	6.22	5.97	1.67	4.33	48
GA Gooch	10.82		7.05	1.59	3.51	6.50	7.26	6.23	1.04	0.00	44
Javed Miandad	15.12	15.16		0.94	3.47	8.42	11.26	8.00	0.63	0.00	63
Inzamam-ul-Haq	10.71	11.25		8.46	7.60	8.46	7.08	7.30	4.47	2.67	68
Younis Khan	8.70	10.00		7.13	7.00	6.66	6.46	5.94	2.73	4.38	59
VVS Laxman	11.85	13.24	6.06	10.04	9.22	9.21		8.18	4.12	5.09	77
ML Hayden		8.62	4.41	6.62	6.57	6.42	5.75	5.18	3.03	3.40	50
MJ Clarke		11.98	4.04	8.45	7.63	7.27	7.69	7.29	2.36	5.30	62
V Sehwag	7.99	9.21	3.72	6.70	6.39	6.08		5.55	2.39	3.97	52
IVA Richards	17.34	17.37	11.46	0.73	3.42		13.31	8.94	0.44	0.00	73
AJ Stewart	10.61		6.62	7.20	6.96	8.19	6.19	7.06	4.67	1.50	59
DI Gower	13.66		9.94	0.46	2.98	7.42	10.22	7.04	0.30	0.00	52
KP Pietersen	7.82		3.11	6.90	5.86	5.63	6.16	5.89	1.54	4.09	47
G Boycott	13.10		7.70	2.33	0.75	8.69	10.92	7.51	0.00	0.00	51
GS Sobers	8.08	15.95	5.27	4.77	0.00		9.20	5.74	0.00	0.00	49
ME Waugh		12.68	7.93	8.92	7.84	9.67	7.39	8.55	5.66	1.37	70
DG Bradman		9.07	0.00	3.36	0.00	1.95	1.47	2.15	0.00	0.00	18
KF Barrington	8.06		3.56	4.13	0.00	5.46	10.10	4.70	0.00	0.00	36
WR Hammond	16.39		0.00	11.89	0.00	5.43	2.48	4.81	0.00	0.00	41
Len Hutton	11.13		0.60	7.38	0.00	6.27	6.25	3.37	0.00	0.00	35

Table 21: Opposition diversity index

Player	Home Tests		Away Tests		No. of Tests		Opposition Diversity Index
	PCS	Standardized PCS	PCS	Standardized PCS	Home	Away	
WR Hammond	1.69	0.95	4.77	0.77	44	41	0.8604
SR Tendulkar	10.78	0.66	2.09	0.90	94	103	0.7848
SM Gavaskar	8.21	0.74	5.15	0.75	65	59	0.7449
Len Hutton	3.88	0.88	8.84	0.57	44	35	0.7412
GC Smith	1.49	0.95	10.82	0.47	56	57	0.7109
DPMD Jayawardene	2.87	0.91	11.28	0.45	80	62	0.7090
AR Border	7.34	0.77	7.52	0.63	84	70	0.7074
KC Sangakkara	5.91	0.81	9.51	0.54	72	53	0.6963
V Sehwag	13.25	0.58	4.00	0.81	52	52	0.6939
Inzamam-ul-Haq	8.08	0.75	7.06	0.66	48	68	0.6931
R Dravid	11.99	0.62	6.78	0.67	70	94	0.6494
KF Barrington	7.54	0.76	10.20	0.50	46	36	0.6487
GS Sobers	8.79	0.72	9.28	0.55	44	49	0.6307
S Chanderpaul	16.23	0.49	5.42	0.74	82	78	0.6092
AN Cook	4.79	0.85	14.75	0.28	65	48	0.6080
KP Pietersen	6.73	0.79	12.46	0.39	53	47	0.6023
DG Bradman	4.63	0.85	17.71	0.14	32	18	0.5962
VVS Laxman	10.84	0.66	10.55	0.49	57	77	0.5594
IVA Richards	7.48	0.76	13.07	0.36	48	73	0.5224
ME Waugh	17.83	0.44	9.55	0.53	56	70	0.4918
G Boycott	8.45	0.73	16.10	0.22	57	51	0.4891
DI Gower	8.60	0.73	17.72	0.14	65	52	0.4659
Javed Miandad	31.74	0.00	2.32	0.89	60	63	0.4543
JH Kallis	3.39	0.89	19.64	0.04	78	84	0.4525
GA Gooch	14.45	0.54	15.49	0.25	74	44	0.4331
ML Hayden	9.38	0.70	18.01	0.12	50	50	0.4136
BC Lara	15.82	0.50	15.01	0.27	65	65	0.3852
AJ Stewart	10.70	0.66	20.36	0.01	74	59	0.3725
RT Ponting	14.51	0.54	16.50	0.20	82	83	0.3685
SR Waugh	21.03	0.34	17.29	0.16	81	83	0.2466
MJ Clarke	18.19	0.43	20.37	0.01	47	62	0.1885
Younis Khan	12.54	0.60	20.53	0.00	18	59	0.1414

Table 22: Ranking through grouping and Mahalanobis distance based on five criteria

Name	Tests	Yrs	Reported Average	Inns	Batting Mean	Batting Consistency	Longevity	Quality of Runs	Oppo. Diversity	Group	Squared Mahalanobis Distance	Rank
DG Bradman	52	20	99.94	80	109.421	0.007	0.817	1.649	0.596	1	780.323	1
SR Tendulkar	200	24	53.79	329	55.593	0.015	1.533	0.995	0.785	2	716.589	2
Len Hutton	79	18	56.68	138	57.705	0.015	0.892	1.177	0.741	2	706.475	3
KF Barrington	82	13	58.67	131	59.778	0.015	0.719	1.142	0.649	2	664.250	4
JH Kallis	166	18	55.37	280	58.584	0.014	1.229	1.017	0.452	2	650.714	5
S Chanderpaul	164	21	51.37	280	55.559	0.014	1.323	0.958	0.609	2	648.677	6
GS Sobers	93	20	57.78	160	60.987	0.013	1.007	1.149	0.631	2	643.862	7
WR Hammond	85	20	58.46	140	59.971	0.014	0.959	1.039	0.860	2	621.307	8
KC Sangakkara	132	15	58.04	229	59.480	0.014	1.014	0.937	0.696	2	581.369	9
SR Waugh	168	19	51.06	260	57.048	0.013	1.213	0.924	0.247	2	580.393	10
Younis Khan	101	15	54.07	180	57.551	0.013	0.898	0.978	0.141	2	552.482	11
R Dravid	164	16	52.32	286	53.598	0.016	1.180	0.983	0.649	3	690.425	12
RT Ponting	168	17	51.85	287	53.602	0.015	1.214	1.011	0.369	3	687.269	13
Javed Miandad	124	17	52.57	189	53.833	0.016	0.982	1.025	0.454	3	676.929	14
AR Border	156	16	50.56	265	52.895	0.016	1.130	0.964	0.707	3	668.743	15
ML Hayden	103	15	50.74	184	51.509	0.017	0.907	0.918	0.414	3	648.266	16
BC Lara	131	16	52.89	232	53.921	0.014	1.052	1.068	0.385	3	635.249	17
SM Gavaskar	125	16	51.12	214	53.039	0.015	1.010	1.041	0.745	3	630.050	18
DPMD Jayawardene	149	17	49.85	252	51.009	0.015	1.131	0.930	0.709	3	624.597	19
V Sehwag	104	12	49.35	180	50.098	0.016	0.803	1.032	0.694	3	611.540	20
IVA Richards	121	17	50.24	182	51.741	0.016	0.965	0.891	0.522	3	597.447	21
MJ Clarke	112	11	50.25	193	52.639	0.015	0.803	1.017	0.189	3	597.227	22
Inzamam-ul-Haq	120	15	49.61	200	52.064	0.015	0.945	0.922	0.693	3	589.042	23
G Boycott	108	18	47.73	193	49.352	0.017	1.022	0.993	0.489	4	695.766	24
AN Cook	116	9	46.63	208	47.193	0.018	0.776	0.873	0.608	4	637.616	25
VVS Laxman	134	16	45.97	225	48.517	0.017	1.036	0.875	0.559	4	627.362	26
GC Smith	117	12	48.26	205	48.866	0.018	0.863	0.850	0.711	4	624.772	27
KP Pietersen	104	9	47.29	181	48.297	0.017	0.712	0.890	0.602	4	587.712	28
AJ Stewart	133	13	39.55	235	40.287	0.022	0.965	0.753	0.373	5	741.850	29
DI Gower	117	14	44.25	204	44.601	0.021	0.923	0.787	0.466	5	729.720	30
GA Gooch	118	20	42.58	215	42.981	0.020	1.137	0.808	0.433	5	724.241	31
ME Waugh	128	11	41.82	209	43.411	0.019	0.841	0.810	0.492	5	631.622	32

Table 23: Detecting outliers among the great batsmen considered

Name	Tests	Span	Yrs	Reported Average	Inns	Deviation from the Average over Players					Outlier Index	P-Value
						Batting mean	Batting Consistency	Longevity	Quality of Runs	Opposition Diversity		
DG Bradman	52	1928-1948	20	99.943	80	55.198	-0.009	-0.183	0.668	0.044	28.318	0.00
SR Tendulkar	200	1989-2013	24	53.787	329	1.370	-0.001	0.533	0.013	0.233	10.433	0.06
Len Hutton	79	1937-1955	18	56.675	138	3.482	0.000	-0.108	0.196	0.189	7.015	0.22
KF Barrington	82	1955-1968	13	58.672	131	5.555	0.000	-0.281	0.160	0.096	4.320	0.50
JH Kallis	166	1995-2013	18	55.371	280	4.361	-0.002	0.229	0.035	-0.100	2.418	0.79
S Chanderpaul	164	1994-2015	21	51.372	280	1.336	-0.001	0.323	-0.024	0.057	3.664	0.60
GS Sobers	93	1954-1974	20	57.784	160	6.764	-0.003	0.007	0.167	0.078	2.450	0.78
WR Hammond	85	1927-1947	20	58.460	140	5.748	-0.002	-0.041	0.057	0.308	4.214	0.52
KC Sangakkara	132	2000-2015	15	58.042	229	5.257	-0.002	0.014	-0.045	0.144	6.325	0.28
SR Waugh	168	1985-2004	19	51.061	260	2.825	-0.003	0.213	-0.057	-0.306	8.403	0.14
Younis Khan	101	2000-2015	15	54.074	180	3.328	-0.003	-0.102	-0.004	-0.411	9.524	0.09
R Dravid	164	1996-2012	16	52.315	286	-0.625	0.001	0.180	0.001	0.097	1.670	0.89
RT Ponting	168	1995-2012	17	51.853	287	-0.621	0.000	0.214	0.030	-0.184	3.928	0.56
Javed Miandad	124	1976-1993	17	52.571	189	-0.389	0.000	-0.018	0.043	-0.098	1.401	0.92
AR Border	156	1978-1994	16	50.561	265	-1.328	0.000	0.130	-0.018	0.155	1.370	0.93
ML Hayden	103	1994-2009	15	50.735	184	-2.714	0.001	-0.093	-0.063	-0.139	1.242	0.94
BC Lara	131	1990-2006	16	52.889	232	-0.302	-0.002	0.052	0.086	-0.167	4.457	0.49
SM Gavaskar	125	1971-1987	16	51.121	214	-1.184	-0.001	0.010	0.060	0.193	2.955	0.71
Jayawardene	149	1997-2014	17	49.848	252	-3.214	0.000	0.131	-0.051	0.157	1.871	0.87
V Sehwag	104	2001-2013	12	49.345	180	-4.125	0.000	-0.197	0.051	0.142	4.955	0.42
IVA Richards	121	1974-1991	17	50.235	182	-2.482	0.000	-0.035	-0.090	-0.030	1.584	0.90
MJ Clarke	112	2004-2015	11	50.246	193	-1.584	-0.001	-0.197	0.035	-0.364	7.484	0.19
Inzamam-ul-Haq	120	1992-2007	15	49.607	200	-2.159	0.000	-0.055	-0.060	0.141	2.525	0.77
G Boycott	108	1964-1982	18	47.729	193	-4.870	0.002	0.022	0.012	-0.063	2.690	0.75
AN Cook	116	2006-2015	9	46.628	208	-7.030	0.003	-0.224	-0.108	0.056	2.738	0.74
VVS Laxman	134	1996-2012	16	45.974	225	-5.706	0.001	0.036	-0.106	0.007	0.628	0.99
GC Smith	117	2002-2014	12	48.255	205	-5.357	0.002	-0.137	-0.132	0.159	3.752	0.59
KP Pietersen	104	2005-2014	9	47.289	181	-5.926	0.001	-0.288	-0.091	0.050	4.013	0.55
AJ Stewart	133	1990-2003	13	39.547	235	-13.935	0.006	-0.035	-0.229	-0.180	8.833	0.12
DI Gower	117	1978-1992	14	44.253	204	-9.622	0.006	-0.077	-0.195	-0.086	7.540	0.18
GA Gooch	118	1975-1995	20	42.584	215	-11.242	0.004	0.137	-0.174	-0.119	4.928	0.43
ME Waugh	128	1991-2002	11	41.818	209	-10.812	0.003	-0.159	-0.171	-0.060	2.354	0.80