ISSN 2278-7763

APPLICATION OF ANALYTICAL HIERARCHY PROCESS FOR FINDING THE BEST TEST BATSMAN

Mayuresh K Vaidya, Aditya Balande

Mayuresh K Vaidya, Bharat Forge Ltd., Pune, India; Aditya Balande, Student at College of Engineering, Pune, India.
E-mail: mayuresh.k.vaidya@gmail.com

Guide: M.P.Khond

M.P.Khond, Professor at College of Engineering, Pune, India.

ABSTRACT

Since last few years, the answer to the question 'Who is the best test batsman?' has always been a highly debatable issue. Each individual has a different opinion for the same. Moreover, the answer has always been influenced by the experts belonging to that particular era. Most of the answers given by the experts are based on the individual records of the player or the overall span of the player's career, but there are certainly some other parameters which should be looked into. Every expert has their own judgement and hence their own criteria which may somewhat always favour the player they want to be the best. Hence, there is a need for an approach which takes into account all of the statistics related to the player and analyses them on a common scale. A unique approach is needed to obtain the results. The model of **ANALYTICAL HIERARCHY PROCESS** can be applied for this purpose. AHP has given solutions in many applications such as selection of facility location for spinning industry, performance evaluation of team work, selecting the optimum replacement policy etc. This paper aims at finding the best test batsman by successfully implementing this technique for the first time in the field of sports. The batsmen averaging more than 50 and having scored more than 10000 runs in their test career are considered here.

Keywords: AHP, Best Test Batsman.

ANALYTICAL HIERARCHY PROCESS

The model used for determining the best test batsman is 'Analytical Hierarchy Process'. AHP handles qualitative as well as quantitative data together.[2][4] It enables the decision makers to represent the interaction of multiple factors in a complex situation. The process requires decision makers to develop a hierarchical structure for the factors which are explicit in the given problem and to provide judgement about relative importance of each of these factors ,specify a preference for each decision alternative with respect to each other factor. It provides a prioritized ranking order indicating the overall preference for each of the decision alternative. The most important advantage of AHP is that it is designed to incorporate tangible as well as non-tangible factors especially where the subjective judgements of different individuals constitute an important part of the decision process. The steps involved are as follows(same as per [4]):

1) Determine the objective and the evaluation factors
2) Construct a pair wise comparison matrix using a scale of relative importance. Assuming N factor(i.e. criteria) the pair wise comparison of factor I with factor J yield a square matrix $A1_{NXN}$ where $\alpha_{ij}=1$ and when i=j and $\alpha_{ij}= 1/\alpha_{ji}$
3) Find the relative normalized weight (W_i) of each factor by
   (a) Calculating the geometric mean of I^{th} row and
   (b)normalizing means of row in the comparison matrix
   $W=GM/\sum GM$

ISSN 2278-7763

4) Calculate matrix A3 and A4 such that A3=A1*A2 and A4=A3/A2, where $A2=[W_1,W_2,.....W_N]^T$
5) Find out the maximum eigen which is the average of matrix A4
6) Calculate the consistency index CI=(λ max-N)/(N-1)
7) Obtain the random index RI for the number used in decision making
8) Calculate the consistency ratio CR=CI/RI. Generally CR of 0.1 or less is considered acceptable [2] [4]

CRITERIA INVOLVED:

1) Average - It indicates the consistency of the player in terms of runs scored
2) Winning 100's as a percentage of total 100's - They show the personal contribution of the player in instances when the team has emerged victorious
3) Winning 50's as a percentage of total 50's - They also show the personal contribution of the player in instances when the team has emerged victorious
4) Ducks(0's)/inning - Minimum of this value shows the success rate of scoring of the player
5) Man of the Match awards/Matches - Instances when the player has fared well in a match helping the team to win and how frequently he has done that
6) 100's/inning - This shows consistency, and focuses on 100's coming at a consistent rate and not much gaps
7) 50's/inning - This shows consistency, and focuses on 50's coming at a consistent rate and not much gaps
8) Away average - It indicates the consistency of the player in terms of runs scored in countries other than the home country of the player
9) Runs/inning Ratio – It doesn't take into account the effect of not outs in a player's career. It should simply be tantamount to the average

PLAYERS CONSIDERED:

All the players who have scored more than 10,000 runs and averaged more than 50 in test matches are considered. The data considered is upto 10th June,2014. There are 11 such players and their list is as follows (in no definite order):[1] [3]

	NAME	COUNTRY	SPAN OF CAREER
PLAYER 1	KC SANGAKKARA	SRILANKA	2000-2014
PLAYER 2	S CHANDERPAUL	WEST INDIES	1994-2013
PLAYER 3	RT PONTING	AUSTRALIA	1995-2012
PLAYER 4	JH KALLIS	SOUTH AFRICA	1995-2013
PLAYER 5	SR TENDULKAR	INDIA	1989-2013
PLAYER 6	BC LARA	WEST INDIES	1990-2006
PLAYER 7	R DRAVID	INDIA	1996-2012
PLAYER 8	SM GAVASKAR	INDIA	1971-1987
PLAYER 9	SR WAUGH	AUSTRALIA	1985-2004
PLAYER 10	AR BORDER	AUSTRALIA	1978-1994
PLAYER 11	DPMD JAYAWARDENE	SRILANKA	1997-2014

ISSN 2278-7763

STATISTICS (Based on the original stats of these players):[1] [3]

	AVG	WINNING 100's	WINNING 50's	0's/INNING	MOM/ MATCHES	100/INNING	50/INNING	AWAY AVG	RUNS/INNING
PLAYER 1	58.07	51.42	37.77	4.3	13.11	16.74	21.53	51.55	53.35
PLAYER 2	51.93	34.48	19.35	5.36	6.53	11.11	23.75	47.31	42.98
PLAYER 3	51.85	73.17	67.74	5.92	9.52	14.28	21.6	45.81	46.61
PLAYER 4	55.37	48.88	48.27	5.71	13.85	16.07	20.71	53.80	47.46
PLAYER 5	53.78	39.21	35.29	4.25	7	15.50	20.66	54.74	48.39
PLAYER 6	52.88	23.52	33.33	7.32	9.16	14.65	20.68	47.80	51.52
PLAYER 7	52.31	41.66	36.50	2.79	6.7	12.58	22.02	53.03	46.46
PLAYER 8	51.12	17.64	15.55	5.60	4	15.88	21.02	51.11	47.29
PLAYER 9	51.06	78.125	50	8.46	8.33	12.30	19.23	55.85	42.02
PLAYER 10	50.56	18.51	36.50	4.15	7	10.18	23.77	56.57	42.16
PLAYER 11	50.30	51.51	34.78	5.83	8.39	13.75	19.16	41.43	47.16

(ALL FIGURES ARE IN % EXCEPT AVG, AWAY AVG AND RUNS/INNING)

SCALE OR VALUE OF DIFFERENT CRITERIA:

Now the scale or the value of different criteria of different players are decided (They are scaled on values from 5 -10):

1) Average :
Range is 50.30-58.07. Dividing this into equal intervals, we get the following values :

RANGE	50-52	52-54	54-56	56-58	ABOVE 58
VALUE	6	7	8	9	10

Similarly for other criteria, the total range and then give the corresponding values according to the appropriate scale are found out. They are shown below:

ISSN 2278-7763

2) Winning 100's

RANGE	15-25	25-35	35-45	45-55	55-65	ABOVE 65
VALUE	5	6	7	8	9	10

3) Winning 50's

RANGE	15-25	25-35	35-45	45-55	55-65	ABOVE 65
VALUE	5	6	7	8	9	10

4) Ducks/inning-This percentage should be less. So, higher value is given to the lowest percentage and so on.

RANGE	8-9	7-8	6-7	5-6	4-5	BELOW 4
VALUE	5	6	7	8	9	10

5) Man of the match/Matches

RANGE	4-6	6-7	7-8	8-9	9-10	ABOVE 10
VALUE	5	6	7	8	9	10

6) 100/inning

RANGE	10-11	11-12	12-13	13-14	14-15	ABOVE 15
VALUE	5	6	7	8	9	10

7) 50/inning

RANGE	19-20	20-21	21-22	22-23	23-24
VALUE	6	7	8	9	10

8) Away average

RANGE	41-44	44-47	47-50	50-53	53-56	ABOVE 56
VALUE	5	6	7	8	9	10

9) Runs/inning

RANGE	42-44	44-46	46-48	48-50	50-52	ABOVE 52
VALUE	5	6	7	8	9	10

ISSN 2278-7763

Table 2.Values of different criteria of all players:

CRITERIA	AVG	WINNING 100's(%)	WINNING 50's(%)	0's/INNING	MOM/ MATCHES	100/INNING	50/INNING	AWAY AVG	RUNS/INNING
PLAYER 1	10	8	7	9	10	10	8	8	10
PLAYER 2	6	6	5	8	6	6	10	7	5
PLAYER 3	6	10	10	8	9	9	8	6	7
PLAYER 4	8	8	8	8	10	10	7	9	7
PLAYER 5	7	7	7	9	7	10	7	9	8
PLAYER 6	7	5	6	6	9	9	7	7	9
PLAYER 7	7	7	7	10	6	7	9	9	7
PLAYER 8	6	5	5	8	5	10	8	8	7
PLAYER 9	6	10	8	5	8	7	6	9	5
PLAYER 10	6	5	7	9	7	5	10	10	5
PLAYER 11	6	8	6	8	8	8	6	5	7

Table 3.Scale of relative importance:

RELATIVE IMPORTANCE	DESCRIPTION
1	EQUAL IMPORTANCE OF I AND J
3	MODERATE IMPORTANCE OF I OVER J
5	STRONG IMPORTANCE OF I OVER J
7	VERY STRONG IMPORTANCE OF I OVER J
2,4,6,8	INTERMEDIATE VALUES

ISSN 2278-7763

Table 4.Value of random indices: [4]

No of factor	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

CALCULATION OF $A1_{7*7}$, GM , W , A3 AND A4:

CRITERIA	1	2	3	4	5	6	7	8	9	GM	W	A3	A4
1	1	3	3	5	6	3	3	1	1	2.378	0.207	1.88	9.082
2	0.33	1	1	4	5	1	1	0.33	0.33	0.964	0.083	0.765	9.216
3	0.33	1	1	4	5	1	1	0.33	0.33	0.964	0.083	0.765	9.216
4	0.2	0.25	0.25	1	2	0.33	0.33	0.2	0.2	0.363	0.031	0.293	9.459
5	0.16	0.2	0.2	0.5	1	0.25	0.25	0.16	0.16	0.262	0.022	0.214	9.727
6	0.33	1	1	3	4	1	1	0.33	0.33	0.911	0.079	0.712	9.012
7	0.33	1	1	3	4	1	1	0.33	0.33	0.911	0.079	0.712	9.012
8	1	3	3	5	6	3	3	1	1	2.378	0.207	1.88	9.082
9	1	3	3	5	6	3	3	1	1	2.378	0.207	1.88	9.082
∑										11.509			82.886

In the above table, in the first row and first column (1 = AVG, 2 = WINNING 100's, 3 = WINNING 50's, 4 = 0's/INNING, 5 = MOM/MATCHES, 6 = 100's/ INNING, 7 = 50's/INNING, 8 = AWAY AVG, 9 = RUNS/INNING)

CALCULATIONS:

Maximum eigen is the average of matrix A4

λ max= 82.886/9=9.209

CI=(9.209-9)/(9-1)=0.026

RI=1.45

CR=CI/RI=0.026/1.45=0.018 which is less than 0.1 and hence acceptable. Thus there is a good consistency in the judgement made in this example.

ISSN 2278-7763

Final values are obtained by multiplying Table 2 by W which are as follows-

PLAYER	1	2	3	4	5	6	7	8	9	10	11
FINAL RATING	8.962	6.283	7.382	8.107	7.906	7.321	7.629	6.957	6.992	6.961	6.418

CONCLUSION:

Hence, we observe that Sangakkara is the best test batsman who fits in the criteria of 10000+ runs and 50+ average. Further, the list in the descending order is as follows:

1.SANGAKKARA 2.KALLIS 3.SACHIN 4.DRAVID 5.PONTING 6.LARA 7.WAUGH 8.BORDER 9.GAVASKAR 10.JAYAWARDENE 11.CHANDERPAUL

The rating found out above can be further enhanced by taking into account more criteria like strike rate, kind of opposition, pitches etc. AHP has been useful in many applications consisting of qualitative as well as quantitative data. It has been used in many applications such as selection of facility location for spinning industry, performance evaluation of team work, selecting the optimum replacement policy etc. This is the first time that AHP has been applied to the field of sports and a successful result is obtained by considering all the given criteria and players. Thus AHP can be used in different sports like cricket, football, hockey etc. for analysing the players, pitches, finding out the best country among playing teams etc.

FUTURE SCOPE:

We have not considered the players having average less than 50 or runs less than 10000, with the inclusion of these players, the scales for the criteria have to be changed accordingly and it will result in an exhaustive amount of data. This can solved by using C programming where we can design a program for this process and include any number of criteria as well as players. Also, this technique can be extensively used in different sports for finding the related statistics.

REFERENCES:

[1] www.espncricinfo.com

[2] Dr M P KHOND, GOVIND INGALE, “SELECTION OF FACILITY LOCATION FOR SPINNING INDUSTRY”, UDYOG PRAGATI, VOL.36, No.2, APRIL-JUNE, 2012

[3] www.howstat.com

[4] M P KHOND, Dr B M DABADE, ”PERFORMANCE EVALUATION OF TEAM WORK BY ANALYTICAL HIERARCHY PROCESS”, INDUSTRIAL ENGINEERING JOURNAL, VOL 36, NO 06, JUNE 2007

