VIDYASAGAR UNIVERSITY

ANALYSIS OF SURVIVORSHIP OF CRICKETER'S IN HOME GROUND AND OVERSEAS GROUND

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2 Introduction:

Cricket is one of the more popular spectator sports in the world with viewership in billions spread across the globe. Today, cricket is played in three formats: Test match (Test), Twenty20 (T20) and One Day International (ODI). Like other sports, cricket produces vast amounts of data which has attracted the attention of researchers. In recent times, statistical methods have been extensively used to analyze and assess sports data for developmental and tactical planning. Survival analysis is defined as a set of methods for analyzing the data where we can compare the performance of a cricketer in their home ground and in overseas. In Test match, each team bats twice i.e. there are 4 innings in a test match. A batsman can bat twice in which he got out in some innings or remains not out in some innings. We denote the data as censored data when the cricketer got out in the match and as uncensored data when the cricketer remains not out in the match. By arranging the overall data, we calculate the probability that a batsman will score run more than or equal to x. Now we have to calculate the S(x) in both in home ground and in overseas ground. We use kaplan meier estimator to estimate survivor function.

3 Objective:

- To use the components of life table to compare the survivor function of cricketer's in home ground and in overseas ground.
- To obtain the confidence interval for fixed runs.
- To test log rank test with respect to the data.

4 Collection of Data:

Here we obtained the data of cricketers with columns as different runs in different innings on their home ground and overseas ground on all the test matches they palyed in their career. We have collected the data of Virat Kohli , Steve Smith , Joe Root , Kane Willamson , from the website.

https://stats.espncricinfo.com/ci/engine/player/35320.html?class=1;type=allround;view=innings

5 METHODOLOGY

5.1 Kaplan-Meier Estimator:

The Kaplan–Meier estimator, also known as the product limit estimator, is a nonparametric statistic used to estimate the survival function from lifetime data. Let

$$t1 < t2 < ..... < tk$$

denote the observed k distinct failure times in a censored sample of size n form a homogeneous population with DF: F(t) and SF: S(t). Also let dj be the no. of individuals failed at time tj and cj be the no. of individuals censored. Let nj be the no. of individuals at risk at a time prior to time tj. Assume that the censoring time is independent with failure time. The Kaplan-Meier or product-limit estimator S(t) of the survival function S(t) = Pr(T >t) is

$$\hat{S_{km}}(t) = \prod_{i=1}^{n}(1 - dj/nj$$

(1)

5.2 Greenwood's variance formula:

The purpose here is to derive two approximate 95 percentage confidence intervals for S(t) for a fixed t, in general, (1-a) 100 percentage confidence intervals for S(t). The Greenwood's confidence interval is

(2)

$$\hat{S}(t) \mp t_{a/2}\, V\hat{s}(t)$$

where

$$v(\hat{s}(t)) = s(\hat{t})^2(di/ni(ni - di)) \quad (3)$$

5.3 Log Rank Test:

We have learned how to use the Kaplan-Meier estimator to approximate the true survival function of a population. And we know we can plot multiple curves to compare their shapes.The log-rank test is a statistical test that compares the survival probabilities between two groups. The null hypothesis of the test states that there is no difference between the survival functions of the considered groups. It is a non-parametric test and appropriate to use when the data are right skewed and censored. Let 1,2,...,J be the distinct times of observed events in either group. Let N1j and N2j be the number of subjects "at risk"at the start of period j in the groups, respectively. Let O1j and O2j be the observed number of events in the groups at time j. Finally, define Nj = N1j + N2j and Oj = O1j + O2j The expected value is Eij = Nij (Oj / Nj) and variance is

$$V\,ij = Eij((Nj - Oj/Nj)) * ((Nj–Nij)/(Nj–1)) \quad (4)$$

The Log Rank statistic is

$$Z = \sum_{j=1}^{J}(Oij - Eij)/\sqrt{\sum_{j=1}^{J} Vij}$$

6. Analysis and results:

6.1 <u>SURVIVAL TABLE OF VIRAT KOHLI IN HOME GROUND:</u>

Runs	No. out	Status	Innings	S^(t)	V(s^t)	SD(s^t)	Lower 95%	Upper95%
0	6	1	77	0.9221	0.0009	0.0305	0.8622	0.9820
1	2	1	71	0.8961	0.0012	0.0348	0.8280	0.9643
3	1	1	69	0.8831	0.0013	0.0366	0.8114	0.9549
6	3	1	68	0.8571	0.0018	0.0420	0.7749	0.9394
7	1	1	65	0.8440	0.0019	0.0433	0.7590	0.9289
9	2	1	64	0.8176	0.0021	0.0458	0.7278	0.9074
11	1	1	62	0.8044	0.0022	0.0469	0.7124	0.8964
12	3	1	61	0.7648	0.0025	0.0499	0.6671	0.8626
13	3	1	58	0.7253	0.0027	0.0523	0.6228	0.8277
14	1	0	55	0.7253	0.0029	0.0539	0.6195	0.8310
15	2	1	54	0.6984	0.0030	0.0552	0.5902	0.8066
16	1	1	52	0.6850	0.0031	0.0557	0.5757	0.7942
17	1	1	51	0.6716	0.0032	0.0562	0.5613	0.7818
18	1	1	50	0.6581	0.0032	0.0567	0.5470	0.7692
19	2	1	49	0.6313	0.0033	0.0575	0.5186	0.7439
20	3	1	47	0.5910	0.0034	0.0583	0.4766	0.7053
22	2	1	44	0.5641	0.0034	0.0587	0.4491	0.6791
23	1	1	42	0.5507	0.0035	0.0588	0.4354	0.6659
27	1	1	41	0.5372	0.0035	0.0589	0.4218	0.6527
29	1	1	40	0.5238	0.0035	0.0589	0.4083	0.6393
31	1	0	39	0.5238	0.0037	0.0605	0.4053	0.6423
34	2	1	38	0.4962	0.0036	0.0604	0.3780	0.6145
36	1	1	36	0.4825	0.0036	0.0602	0.3644	0.6005
38	1	1	35	0.4687	0.0036	0.0601	0.3509	0.5864
40	1	1	34	0.4549	0.0036	0.0599	0.3376	0.5722
41	1	1	33	0.4411	0.0036	0.0596	0.3243	0.5579
44	2	1	32	0.4135	0.0035	0.0590	0.2979	0.5291
45	3	1	30	0.3722	0.0033	0.0577	0.2591	0.4853
49	1	0	27	0.3722	0.0035	0.0594	0.2558	0.4886
50	1	1	26	0.3579	0.0035	0.0588	0.2426	0.4731
51	1	0	25	0.3579	0.0037	0.0606	0.2391	0.4767
52	1	1	24	0.3430	0.0036	0.0599	0.2256	0.4604
57	1	1	23	0.3281	0.0035	0.0591	0.2122	0.4439
58	1	1	22	0.3132	0.0034	0.0583	0.1989	0.4274
62	2	1	21	0.2833	0.0032	0.0564	0.1728	0.3939
63	1	1	19	0.2684	0.0031	0.0554	0.1599	0.3770
67	1	0	18	0.2684	0.0033	0.0575	0.1558	0.3810
72	1	1	17	0.2526	0.0032	0.0562	0.1424	0.3628
81	1	1	16	0.2368	0.0030	0.0549	0.1293	0.3444
88	1	1	15	0.2210	0.0029	0.0534	0.1163	0.3258
103	2	1	14	0.1895	0.0025	0.0503	0.0910	0.2880
104	1	0	12	0.1895	0.0028	0.0529	0.0858	0.2931

Runs	No. out	Status	Innings	S(t)	V(st)	SD(st)	Lower95	Upper95
107	1	1	11	0.1722	0.0026	0.0508	0.0727	0.2718
136	1	1	10	0.1550	0.0024	0.0486	0.0598	0.2502
139	1	1	9	0.1378	0.0021	0.0461	0.0474	0.2282
167	1	1	8	0.1206	0.0019	0.0435	0.0354	0.2057
186	1	1	7	0.1033	0.0016	0.0405	0.0239	0.1828
204	1	1	6	0.0861	0.0014	0.0372	0.0131	0.1591
211	1	1	5	0.0689	0.0011	0.0335	0.0032	0.1346
213	1	1	4	0.0517	0.0009	0.0292	-0.0057	0.1090
235	1	1	3	0.0344	0.0006	0.0240	-0.0127	0.0816
243	1	1	2	0.0172	0.0003	0.0171	-0.0163	0.0508
254		0	1	0.0172	0.0003	0.0171	-0.0163	0.0508

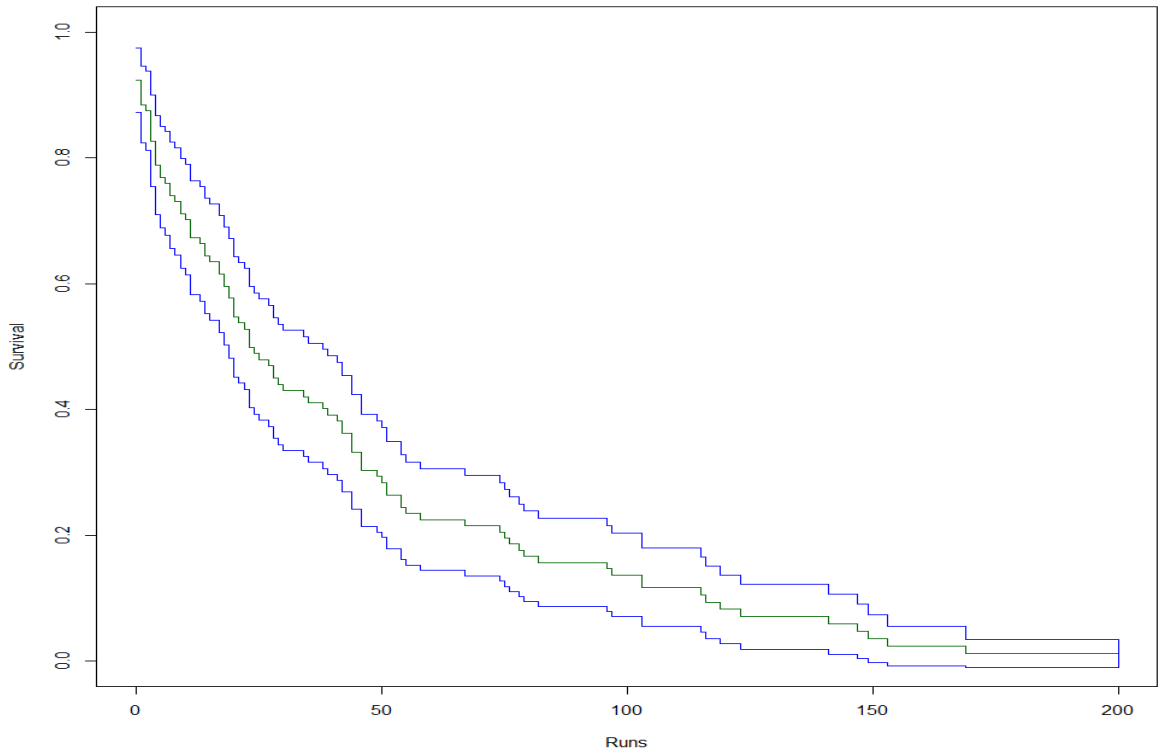
6.2 <u>SURVIVAL TABLE OF VIRAT KOHLI IN OVERSEAS GROUND:</u>

Runs	No.out	Status	Innings	S^(t)	V(st)	SD(s^t)	Lower95%	Upper95%
0	8	1	104	0.9231	0.0007	0.0261	0.8719	0.9743
1	4	1	96	0.8846	0.0010	0.0313	0.8232	0.9460
2	1	1	92	0.8750	0.0011	0.0324	0.8114	0.9386
3	5	1	91	0.8269	0.0014	0.0371	0.7542	0.8996
4	4	1	86	0.7885	0.0016	0.0400	0.7100	0.8670
5	2	1	82	0.7692	0.0017	0.0413	0.6883	0.8502
6	1	1	80	0.7596	0.0018	0.0419	0.6775	0.8417
7	2	1	79	0.7404	0.0018	0.0430	0.6561	0.8246
8	1	1	77	0.7308	0.0019	0.0435	0.6455	0.8160
9	2	1	76	0.7115	0.0020	0.0444	0.6245	0.7986
10	1	1	74	0.7019	0.0020	0.0449	0.6140	0.7898
11	3	1	73	0.6731	0.0021	0.0460	0.5829	0.7632
13	1	1	70	0.6635	0.0021	0.0463	0.5726	0.7543
14	2	1	69	0.6442	0.0022	0.0469	0.5522	0.7362
15	1	1	67	0.6346	0.0022	0.0472	0.5421	0.7272
17	2	1	66	0.6154	0.0023	0.0477	0.5219	0.7089
18	2	1	64	0.5962	0.0023	0.0481	0.5019	0.6905
19	2	0	62	0.5769	0.0023	0.0484	0.4820	0.6719
20	3	1	59	0.5476	0.0024	0.0489	0.4518	0.6433
21	1	1	56	0.5378	0.0024	0.0489	0.4419	0.6338
22	1	1	55	0.5280	0.0024	0.0490	0.4319	0.6241
23	3	1	54	0.4987	0.0024	0.0491	0.4024	0.5950
24	1	1	51	0.4889	0.0024	0.0491	0.3926	0.5852
25	1	1	50	0.4791	0.0024	0.0491	0.3829	0.5754
27	1	1	49	0.4694	0.0024	0.0491	0.3732	0.5656
28	2	1	48	0.4498	0.0024	0.0489	0.3539	0.5457
29	1	1	46	0.4400	0.0024	0.0488	0.3443	0.5358
30	1	1	45	0.4302	0.0024	0.0487	0.3347	0.5258
34	1	1	44	0.4205	0.0024	0.0486	0.3252	0.5157
35	1	1	43	0.4107	0.0023	0.0484	0.3157	0.5056
38	1	1	42	0.4009	0.0023	0.0483	0.3063	0.4955
39	1	1	41	0.3911	0.0023	0.0481	0.2969	0.4853
41	1	1	40	0.3814	0.0023	0.0478	0.2876	0.4751
42	2	1	39	0.3618	0.0022	0.0474	0.2690	0.4546
44	3	1	37	0.3325	0.0022	0.0464	0.2414	0.4235
46	3	1	34	0.3031	0.0021	0.0453	0.2143	0.3920
49	1	1	31	0.2934	0.0020	0.0449	0.2053	0.3814
50	1	1	30	0.2836	0.0020	0.0445	0.1964	0.3707
51	2	1	29	0.2640	0.0019	0.0435	0.1788	0.3493
54	2	1	27	0.2445	0.0018	0.0424	0.1613	0.3276
55	1	1	25	0.2347	0.0017	0.0418	0.1527	0.3167

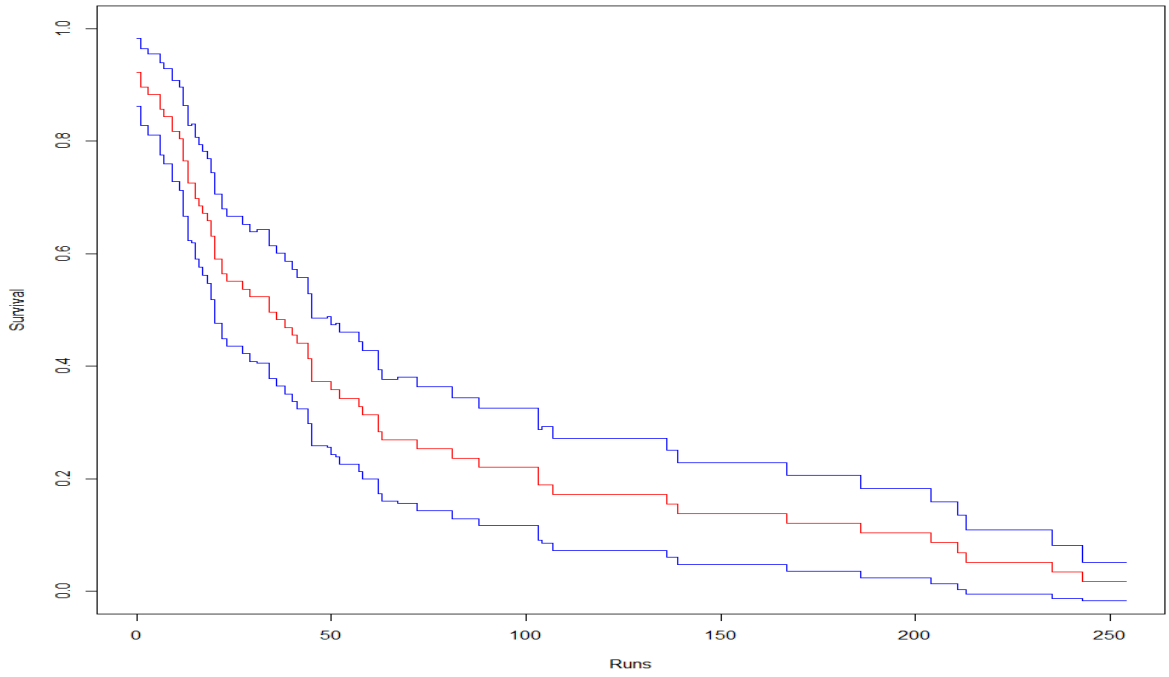
58	1	1	24	0.2249	0.0017	0.0412	0.1441	0.3057
67	1	1	23	0.2151	0.0016	0.0406	0.1356	0.2946
74	1	1	22	0.2053	0.0016	0.0399	0.1272	0.2835
75	1	1	21	0.1956	0.0015	0.0392	0.1188	0.2723
76	1	1	20	0.1858	0.0015	0.0384	0.1105	0.2611
78	1	1	19	0.1760	0.0014	0.0376	0.1023	0.2497
79	1	1	18	0.1662	0.0014	0.0368	0.0942	0.2383
82	1	1	17	0.1565	0.0013	0.0359	0.0861	0.2268
96	1	1	16	0.1467	0.0012	0.0349	0.0782	0.2152
97	1	1	15	0.1369	0.0012	0.0340	0.0703	0.2035
103	2	0	14	0.1173	0.0010	0.0318	0.0550	0.1797
105		0	11	0.1173	0.0010	0.0318	0.0550	0.1797
115	1	1	10	0.1056	0.0009	0.0307	0.0454	0.1658
116	1	1	9	0.0939	0.0009	0.0295	0.0361	0.1516
119	1	1	8	0.0821	0.0008	0.0280	0.0272	0.1370
123	1	1	7	0.0704	0.0007	0.0264	0.0188	0.1221
141	1	1	6	0.0587	0.0006	0.0244	0.0108	0.1066
147	1	1	5	0.0469	0.0005	0.0222	0.0035	0.0904
149	1	1	4	0.0352	0.0004	0.0195	-0.0030	0.0734
153	1	1	3	0.0235	0.0003	0.0161	-0.0082	0.0551
169	1	1	2	0.0117	0.0001	0.0116	-0.0110	0.0344
200	1	1	1	0.0000	0.0000	0.0000	0.0000	0.0000

6.3 ***SURVIVAL CURVE OF VIRAT KOHLI IN HOME AND OVERSEAS GROUND*:**

a.Overseas Ground:



b.Home Ground:



6.4 COMPARISON OF SURVIVAL CURVES OF VIRAT KOHLI:

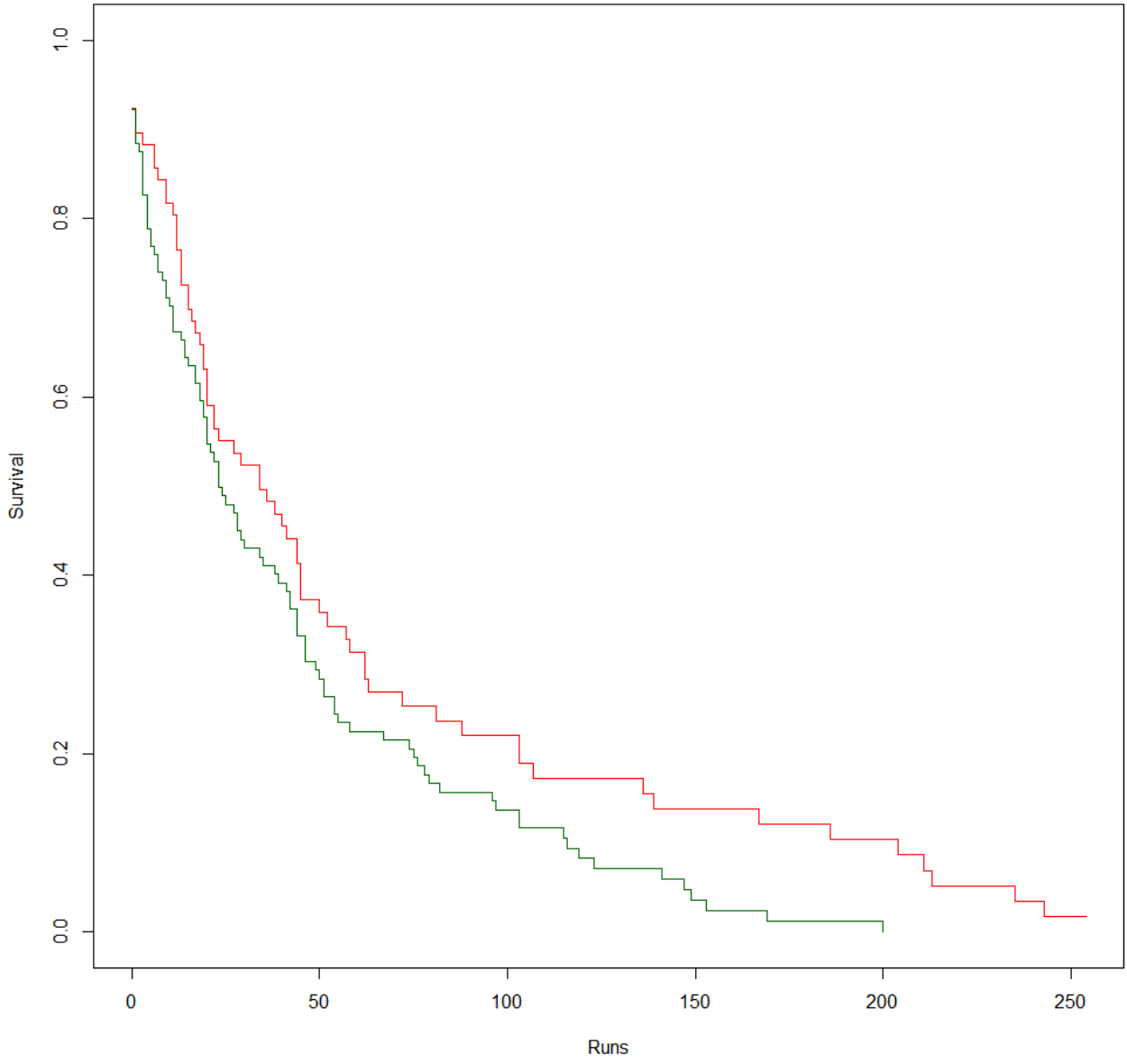


Figure1:Red curve=Home ground, Green curve=Overseas ground

Here we can see that in between the interval 0 to 230 runs the performance of Virat Kohli is far better in home ground than in overseas ground.

6.5 Estimated survival function of Virat Kohli:

Runs	s1 hat	s2 hat
0	0.9221	0.9231
1	0.8961	0.8846
2	0.8961	0.875
3	0.8831	0.8269
4	0.8831	0.7885
5	0.8831	0.7692
6	0.8571	0.7596
7	0.844	0.7404
8	0.844	0.7308
9	0.8176	0.7115
10	0.8176	0.7019
11	0.8044	0.6731
12	0.7648	0.6731
13	0.7253	0.6635
14	0.7253	0.6442
15	0.6984	0.6346
16	0.685	0.6346
17	0.6716	0.6154
18	0.6581	0.5962
19	0.6313	0.5769
20	0.591	0.5476
21	0.591	0.5378
22	0.5641	0.528
23	0.5507	0.4987
24	0.5507	0.4889
25	0.5507	0.4791
27	0.5372	0.4694
28	0.5372	0.4498
29	0.5238	0.44
30	0.5238	0.4302
31	0.5238	0.4302
34	0.4962	0.4205
35	0.4962	0.4107
36	0.4825	0.4107
38	0.4687	0.4009
39	0.4687	0.3911
40	0.4549	0.3911
41	0.4411	0.3814
42	0.4411	0.3618
44	0.4135	0.3325
45	0.3722	0.3325
46	0.3722	0.3031
49	0.3722	0.2934
50	0.3579	0.2836

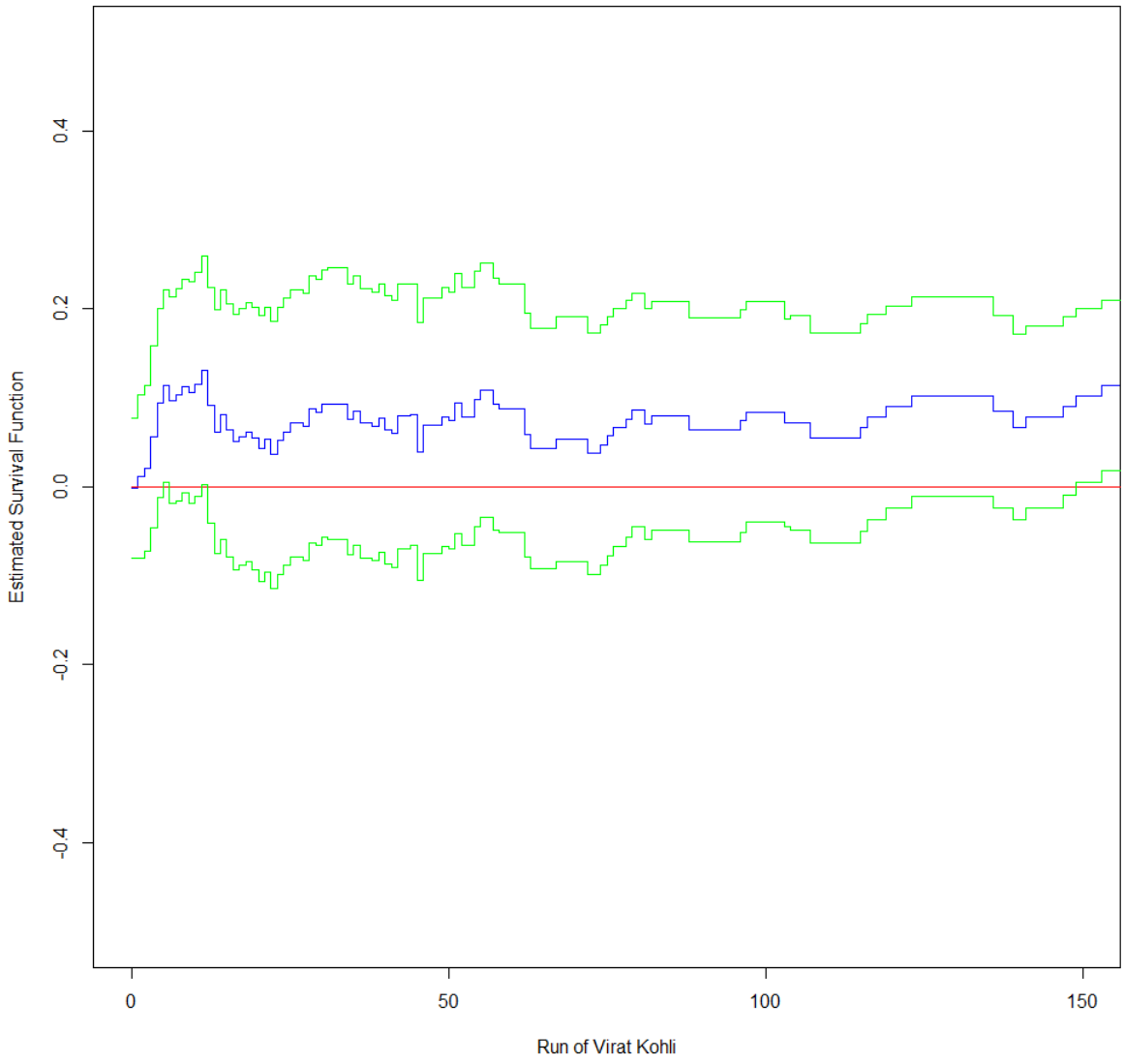
Runs	s1 hat	s2 hat
51	0.3579	0.264
52	0.343	0.264
54	0.343	0.2445
55	0.343	0.2347
57	0.3281	0.2347
58	0.3132	0.2249
62	0.2833	0.2249
63	0.2684	0.2249
67	0.2684	0.2151
72	0.2526	0.2151
74	0.2526	0.2053
75	0.2526	0.1956
76	0.2526	0.1858
78	0.2526	0.176
79	0.2526	0.1662
81	0.2368	0.1662
82	0.2368	0.1565
88	0.221	0.1565
96	0.221	0.1467
97	0.221	0.1369
103	0.1895	0.1173
104	0.1895	0.1173
105	0.1895	0.1173
107	0.1722	0.1173
115	0.1722	0.1056
116	0.1722	0.0939
119	0.1722	0.0821
123	0.1722	0.0704
136	0.155	0.0704
139	0.1378	0.0704
141	0.1378	0.0587
147	0.1378	0.0469
149	0.1378	0.0352
153	0.1378	0.0235
167	0.1206	0.0235
169	0.1206	0.0117
186	0.1033	0.0117
200	0.1033	0
204	0.0861	0
211	0.0689	0
213	0.0517	0
235	0.0344	0
243	0.0172	0
254	0.0172	0

6.6 Confidence interval of Virat Kohli:

Runs	ucl	lcl
0	0.07768	-0.07968
1	0.103238	-0.08024
2	0.114294	-0.07209
3	0.158345	-0.04595
4	0.200867	-0.01167
5	0.22206	0.00574
6	0.21378	-0.01878
7	0.223206	-0.01601
8	0.233499	-0.0071
9	0.231126	-0.01893
10	0.24141	-0.01001
11	0.260059	0.002541
12	0.22472	-0.04132
13	0.198705	-0.07511
14	0.221138	-0.05894
15	0.206152	-0.07855
16	0.193498	-0.0927
17	0.200679	-0.08828
18	0.207634	-0.08383
19	0.201711	-0.09291
20	0.192542	-0.10574
21	0.202342	-0.09594
22	0.185969	-0.11377
23	0.202145	-0.09814
24	0.211945	-0.08834
25	0.221745	-0.07854
27	0.218095	-0.0825
28	0.237445	-0.06264
29	0.23372	-0.06612
30	0.243395	-0.05619
31	0.245825	-0.05862
34	0.227649	-0.07625
35	0.237203	-0.0662
36	0.223198	-0.0796
38	0.218922	-0.08332
39	0.228477	-0.07328
40	0.214371	-0.08677
41	0.209445	-0.09004
42	0.228555	-0.06996
44	0.228117	-0.06612
45	0.184823	-0.10542
46	0.212881	-0.07468
49	0.224743	-0.06714
50	0.218832	-0.07023

Runs	ucl	lcl
51	0.240109	-0.05231
52	0.224096	-0.0661
54	0.24234	-0.04534
55	0.251464	-0.03486
57	0.235281	-0.04848
58	0.228222	-0.05162
62	0.195297	-0.0785
63	0.17882	-0.09182
67	0.191262	-0.08466
72	0.173389	-0.09839
74	0.18239	-0.08779
75	0.1913	-0.0773
76	0.20021	-0.06661
78	0.209131	-0.05593
79	0.218066	-0.04527
81	0.200142	-0.05894
82	0.208868	-0.04827
88	0.190618	-0.06162
96	0.199335	-0.05073
97	0.208178	-0.03998
103	0.188838	-0.04444
104	0.193176	-0.04878
105	0.193176	-0.04878
107	0.172367	-0.06257
115	0.182938	-0.04974
116	0.193439	-0.03684
119	0.203791	-0.02359
123	0.214011	-0.01041
136	0.193003	-0.0238
139	0.171523	-0.03672
141	0.181332	-0.02313
147	0.191187	-0.00939
149	0.200707	0.004493
153	0.210008	0.018592
167	0.188012	0.006188
169	0.197139	0.020661
186	0.174172	0.009028
200	0.18268	0.02392
204	0.159012	0.013188
211	0.13456	0.00324
213	0.108932	-0.00553
235	0.08144	-0.01264
243	0.050716	-0.01632
254	0.050716	-0.01632

6.7 To check if the zero line consist in between the confidence interval:



Hence we can say the zero lies in between the confidence interval.

6.8 LOG RANK TEST OF VIRAT KOHLI:

Here we take the null and alternative hypothesis as –

Ho:survival curves are identical or(S1t=S2t) versus H1:the survival curves are not identical or(S1t/=S2t at any time t) (alpha=0.05)

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
group=1	84	76	89.5	2.02	4.39
group=2	104	101	87.5	2.07	4.39

Chisq= 4.4 on 1 degrees of freedom, p= 0.04

The test statistics follows a chi-square distribution.So we find the critical value in the table of critical value of chi-square distribution)for df=k-1=2-1=1 and alpha=0.05.

The critical value is 3.84 and the decision rule is to reject Ho if chi -square>3.84.Hence after we calculate chi-square we reject null as 4.4>3.84.

6.9 <u>SURVIVAL TABLE OF KANE WILLAMSON IN HOME GROUND:</u>

RUNS	NO. OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER95%	UPPER95%
0	3	1	73	0.9589	0.0005	0.0232	0.9134	1.0044
1	6	1	70	0.8767	0.0015	0.0385	0.8013	0.9521
2	3	1	64	0.8356	0.0019	0.0434	0.7506	0.9206
3	2	1	61	0.8082	0.0021	0.0461	0.7179	0.8985
4	4	1	59	0.7534	0.0025	0.0504	0.6545	0.8523
5	1	1	55	0.7397	0.0026	0.0514	0.6391	0.8404
6	1	1	54	0.7260	0.0027	0.0522	0.6237	0.8283
7	2	1	53	0.6986	0.0029	0.0537	0.5934	0.8039
11	1	1	51	0.6849	0.0030	0.0544	0.5784	0.7915
13	1	1	50	0.6712	0.0030	0.0550	0.5635	0.7790
15	1	1	49	0.6575	0.0031	0.0555	0.5487	0.7664
16	1	1	48	0.6438	0.0031	0.0560	0.5340	0.7537
21	2	1	47	0.6164	0.0032	0.0569	0.5049	0.7280
22	2	1	45	0.5890	0.0033	0.0576	0.4762	0.7019
24	1	1	43	0.5753	0.0033	0.0579	0.4620	0.6887
31		0	42	0.5753	0.0033	0.0579	0.4620	0.6887
39	1	1	41	0.5613	0.0034	0.0581	0.4474	0.6752
42	2	1	40	0.5332	0.0034	0.0585	0.4186	0.6479
43	1	1	38	0.5192	0.0034	0.0586	0.4043	0.6341
45	1	1	37	0.5052	0.0034	0.0587	0.3901	0.6202
47	1	1	36	0.4911	0.0034	0.0587	0.3761	0.6062
48	1	1	35	0.4771	0.0034	0.0587	0.3621	0.5921

RUNS	NO. OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	LOWER95	UPPER95
50	1	1	34	0.4631	0.0034	0.0586	0.3482	0.5780
51	1	1	33	0.4490	0.0034	0.0585	0.3344	0.5637
53	1	1	32	0.4350	0.0034	0.0583	0.3207	0.5493
54	2	1	31	0.4069	0.0033	0.0578	0.2936	0.5203
55		0	29	0.4069	0.0033	0.0578	0.2936	0.5203
56	1	1	28	0.3924	0.0033	0.0576	0.2796	0.5053
58	1	1	27	0.3779	0.0033	0.0572	0.2657	0.4901
61	1	1	26	0.3633	0.0032	0.0569	0.2519	0.4748
69	1	1	25	0.3488	0.0032	0.0564	0.2382	0.4594
71	1	1	24	0.3343	0.0031	0.0559	0.2247	0.4439
74	1	1	23	0.3197	0.0031	0.0553	0.2113	0.4282
77	1	1	22	0.3052	0.0030	0.0547	0.1980	0.4124
88	1	1	21	0.2907	0.0029	0.0540	0.1849	0.3965
89	1	1	20	0.2761	0.0028	0.0532	0.1719	0.3804
91	2	1	19	0.2471	0.0026	0.0514	0.1463	0.3479
97	1	1	17	0.2325	0.0025	0.0504	0.1337	0.3313
102	1	0	16	0.2180	0.0024	0.0493	0.1214	0.3147
104		0	14	0.2180	0.0024	0.0493	0.1214	0.3147
108		0	12	0.2180	0.0024	0.0493	0.1214	0.3147
113	1	1	11	0.1982	0.0024	0.0486	0.1028	0.2935
121		0	10	0.1982	0.0024	0.0486	0.1028	0.2935
129	1	1	9	0.1762	0.0023	0.0480	0.0822	0.2702
130	1	1	8	0.1541	0.0022	0.0468	0.0625	0.2458
132	1	1	7	0.1321	0.0020	0.0450	0.0440	0.2203
176	1	1	6	0.1101	0.0018	0.0425	0.0268	0.1934
200		0	5	0.1101	0.0018	0.0425	0.0268	0.1934

RUNS	NO.OUT	STATUS	INNIONGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
215	1	1	4	0.0826	0.0016	0.0398	0.0045	0.1606
238	1	1	3	0.0551	0.0012	0.0348	-0.0131	0.1232
242		0	2	0.0551	0.0012	0.0348	-0.0131	0.1232
251	1	1	1	0.0000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

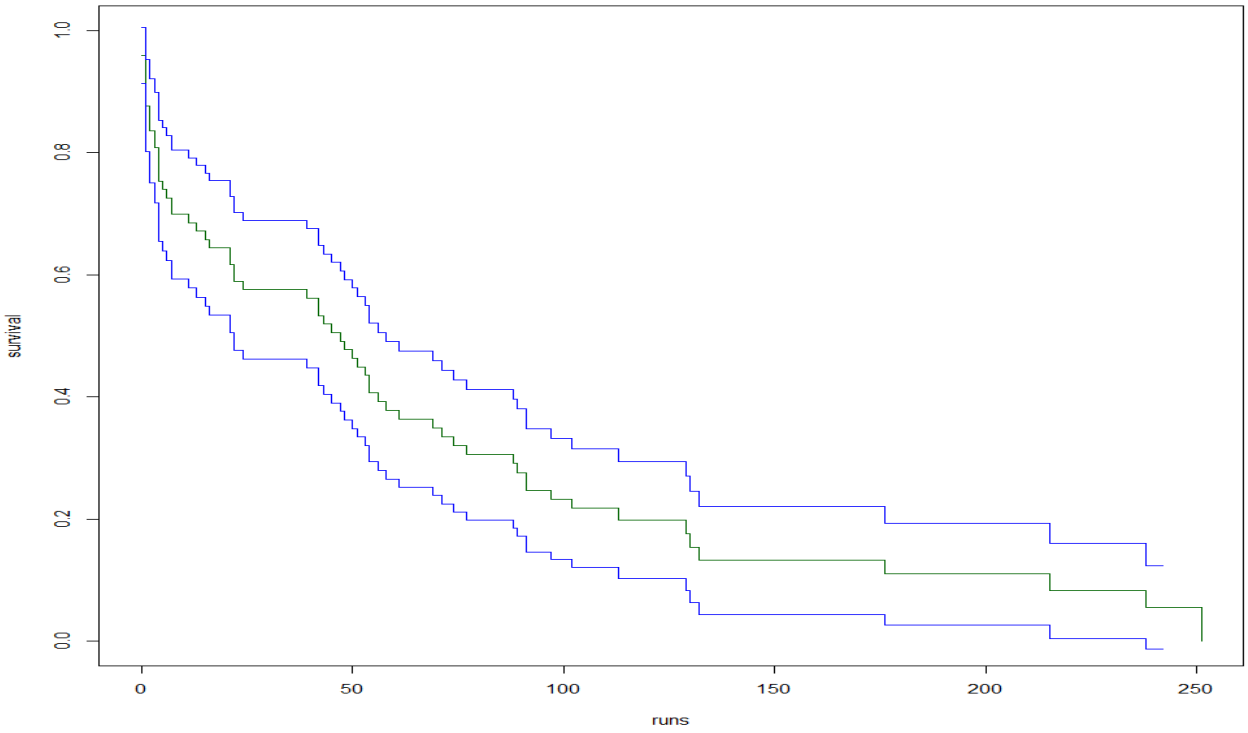
6.10 <u>SURVIVAL TABLE OF KANE WILLAMSON IN OVERSEAS GROUND</u>:

RUNS	NO.OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER 95%	UPPER 95%
0	7	1	78	0.9103	0.0010	0.0324	0.8468	0.9737
1	1	1	71	0.8974	0.0012	0.0344	0.8301	0.9648
2	2	0	70	0.8718	0.0014	0.0379	0.7976	0.9460
3	1	1	67	0.8588	0.0016	0.0395	0.7814	0.9361
4	3	1	66	0.8197	0.0019	0.0436	0.7342	0.9053
5	1	1	63	0.8067	0.0020	0.0448	0.7189	0.8946
6	2	1	62	0.7807	0.0022	0.0470	0.6886	0.8729
8	3	1	60	0.7417	0.0025	0.0498	0.6441	0.8392
9	2	1	57	0.7157	0.0026	0.0513	0.6151	0.8162
10	1	1	55	0.7026	0.0027	0.0520	0.6007	0.8046
11	1	1	54	0.6896	0.0028	0.0526	0.5864	0.7928
13	4	1	53	0.6376	0.0030	0.0547	0.5303	0.7448
14	1	1	49	0.6246	0.0030	0.0551	0.5165	0.7326
15	2	1	48	0.5985	0.0031	0.0558	0.4891	0.7080
17	1	1	46	0.5855	0.0031	0.0561	0.4756	0.6955
18	2	1	45	0.5595	0.0032	0.0566	0.4487	0.6704
19	3	1	43	0.5205	0.0032	0.0569	0.4089	0.6320
20	1	1	40	0.5075	0.0032	0.0570	0.3958	0.6191
22	2	1	39	0.4814	0.0032	0.0569	0.3698	0.5930
24	1	1	37	0.4684	0.0032	0.0569	0.3570	0.5799
25	1	1	36	0.4554	0.0032	0.0568	0.3442	0.5667
27	2	1	35	0.4294	0.0032	0.0564	0.3188	0.5400
31	1	1	33	0.4164	0.0032	0.0562	0.3063	0.5265
32	1	0	32	0.4034	0.0031	0.0559	0.2938	0.5130
34	2	1	30	0.3765	0.0031	0.0553	0.2680	0.4849
36	1	1	28	0.3630	0.0030	0.0550	0.2553	0.4708
41	1	1	27	0.3496	0.0030	0.0545	0.2427	0.4565
42	1	1	26	0.3361	0.0029	0.0541	0.2301	0.4421
43	1	1	25	0.3227	0.0029	0.0536	0.2177	0.4277
48	1	1	24	0.3092	0.0028	0.0530	0.2054	0.4131
49	1	1	23	0.2958	0.0027	0.0524	0.1932	0.3984
52	2	1	22	0.2689	0.0026	0.0509	0.1691	0.3688
59	1	1	20	0.2555	0.0025	0.0501	0.1572	0.3537
60	1	1	19	0.2420	0.0024	0.0493	0.1455	0.3386
62	1	1	18	0.2286	0.0023	0.0483	0.1338	0.3233
68	1	0	17	0.2151	0.0022	0.0473	0.1224	0.3079
69	1	1	15	0.2008	0.0021	0.0463	0.1101	0.2915
74	1	1	14	0.1864	0.0020	0.0451	0.0980	0.2749
75	1	1	13	0.1721	0.0019	0.0439	0.0861	0.2581
77	1	1	12	0.1578	0.0018	0.0425	0.0744	0.2411
91	1	1	11	0.1434	0.0017	0.0410	0.0631	0.2238

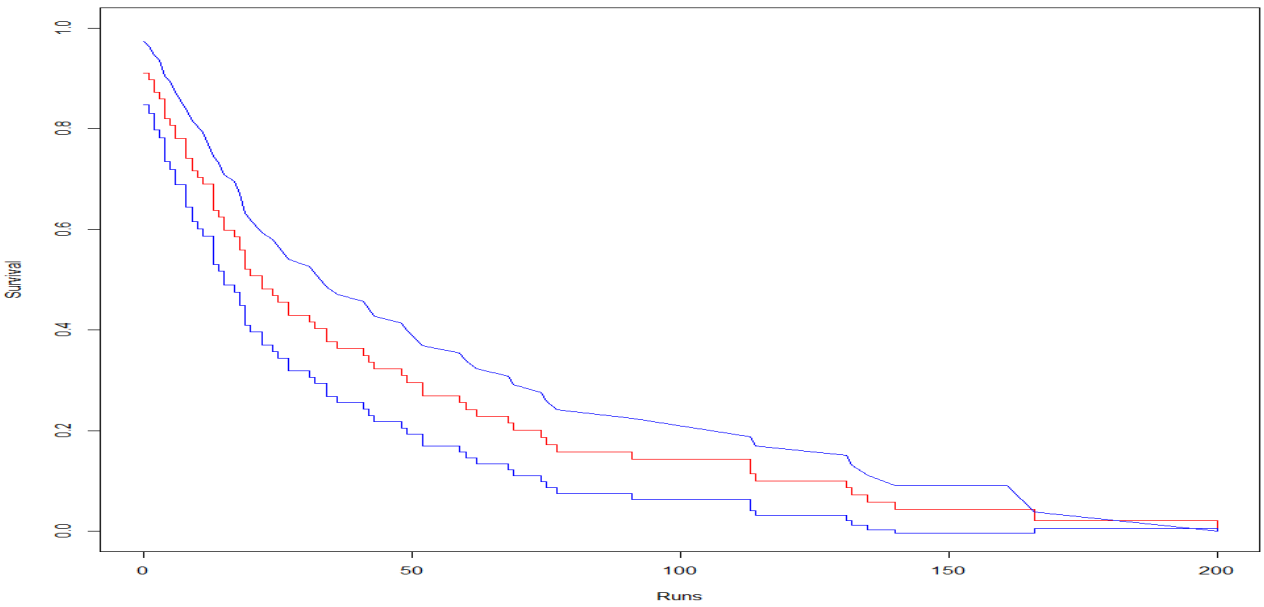
RUNS	NO.OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER 95%	UPPER 95%
113	2	1	10	0.1147	0.0014	0.0375	0.0413	0.1882
114	1	1	8	0.1004	0.0013	0.0354	0.0309	0.1698
131	1	1	7	0.0861	0.0011	0.0331	0.0211	0.1510
132	1	1	6	0.0717	0.0009	0.0306	0.0118	0.1316
135	1	1	5	0.0574	0.0008	0.0276	0.0032	0.1115
140	1	1	4	0.0430	0.0006	0.0242	-0.0043	0.0904
161		0	3	0.0430	0.0006	0.0242	-0.0043	0.0904
166	1	1	2	0.0215	0.0001	0.0085	0.0048	0.0382
200		0	1	0.0000	0.0000	0.0000	0.0000	0.0000

6.11 SURVIVAL CURVE OF KANE WILLAMSON IN HOME AND OVERSEAS GROUND:

a.Home Ground:



b.Overseas Ground:



6.12 COMPARISON OF SURVIVAL CURVE OF KANE WILLAMSON:

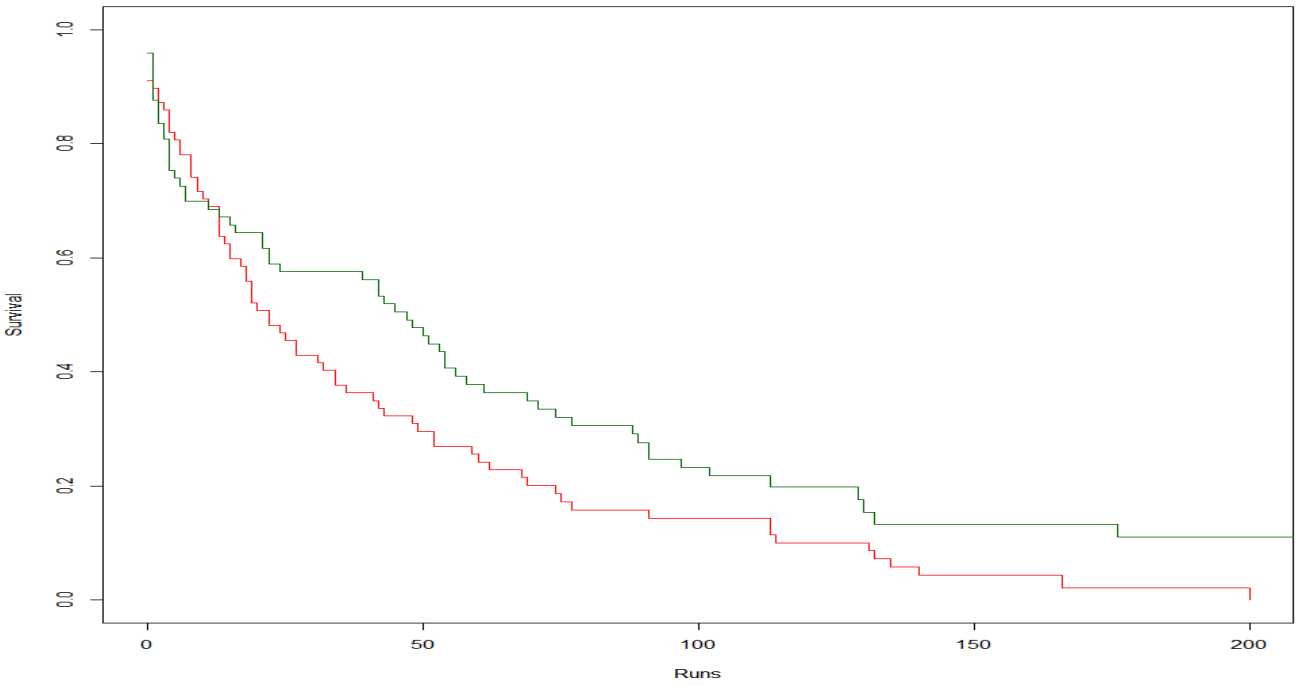


Figure2:Red=Overseas Ground, Green curve=Home Ground

Here we can see that in between the interval 0 to 25 runs the performance of Kane Willamson is better in overseas ground than home ground,but after 25 runs performance is far better in home ground than overseas ground.

6.14 Estimated survival function of Kane willamson:

Runs	s1 hat	s2 hat
0	0.9589	0.9103
1	0.8767	0.8974
2	0.8356	0.8718
3	0.8082	0.8588
4	0.7534	0.8197
5	0.7397	0.8067
6	0.726	0.7807
7	0.6986	0.7807
8	0.6986	0.7417
9	0.6986	0.7157
10	0.6986	0.7026
11	0.6849	0.6896
13	0.6712	0.6376
14	0.6712	0.6246
15	0.6575	0.5985
16	0.6438	0.5985
17	0.6438	0.5855
18	0.6438	0.5595
19	0.6438	0.5205
20	0.6438	0.5075
21	0.6164	0.5075
22	0.589	0.4814
24	0.5753	0.4684
25	0.5753	0.4554
27	0.5753	0.4294
31	0.5753	0.4164
32	0.5753	0.4034
34	0.5753	0.3765
36	0.5753	0.363
39	0.5613	0.363
41	0.5613	0.3496
42	0.5332	0.3361
43	0.5192	0.3227
45	0.5052	0.3227
47	0.4911	0.3227
48	0.4771	0.3092
49	0.4771	0.2958
50	0.4631	0.2958
51	0.449	0.2958
52	0.449	0.2689
53	0.435	0.2689
54	0.4069	0.2689

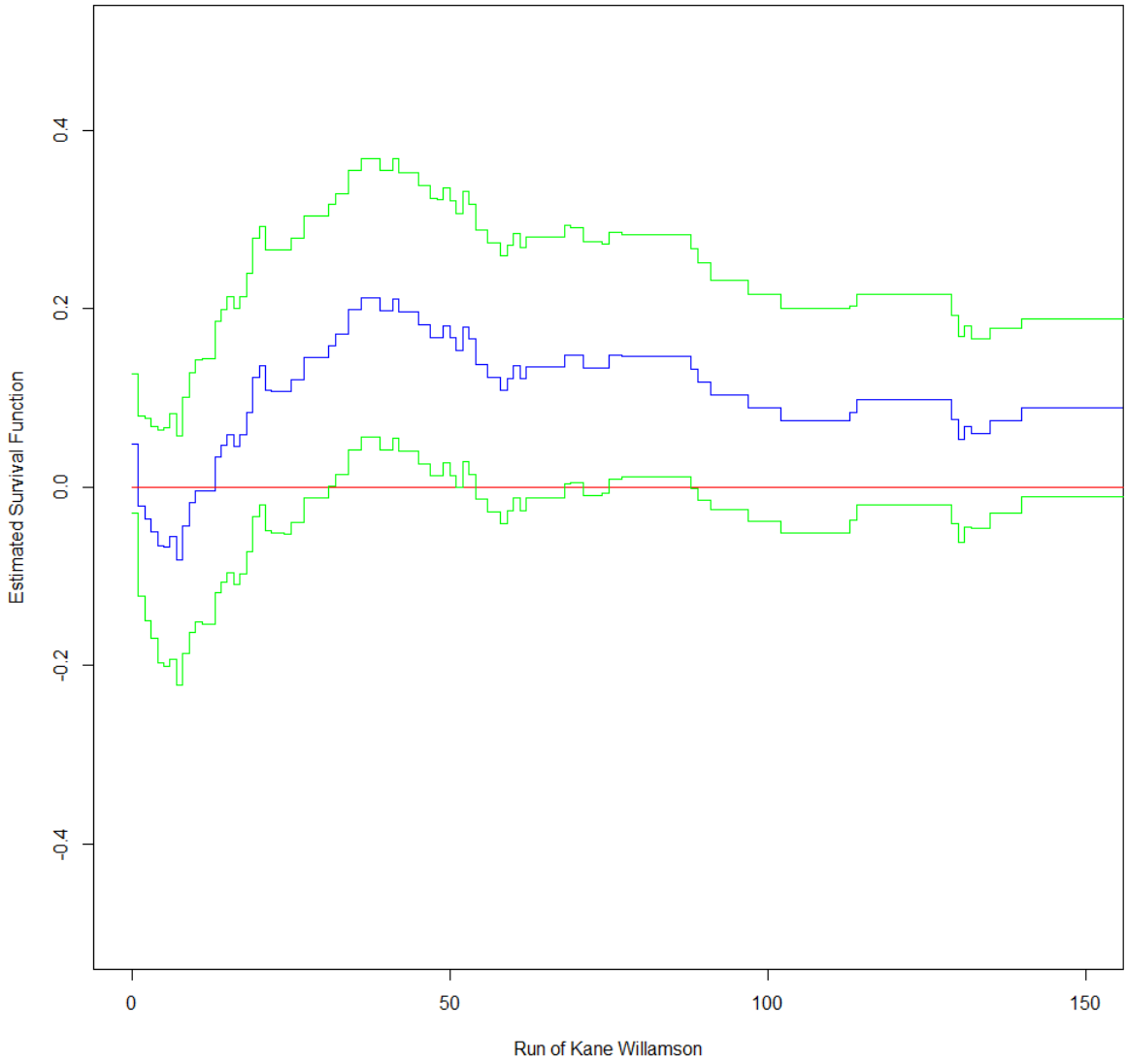
Runs	s1 hat	s2 hat
55	0.4069	0.2689
56	0.3924	0.2689
58	0.3779	0.2689
59	0.3779	0.2555
60	0.3779	0.242
61	0.3633	0.242
62	0.3633	0.2286
68	0.3633	0.2151
69	0.3488	0.2008
71	0.3343	0.2008
74	0.3197	0.1864
75	0.3197	0.1721
77	0.3052	0.1578
88	0.2907	0.1578
89	0.2761	0.1578
91	0.2471	0.1434
97	0.2325	0.1434
102	0.218	0.1434
104	0.218	0.1434
108	0.218	0.1434
113	0.1982	0.1147
114	0.1982	0.1004
121	0.1982	0.1004
129	0.1762	0.1004
130	0.1541	0.1004
131	0.1541	0.0861
132	0.1321	0.0717
135	0.1321	0.0574
140	0.1321	0.043
161	0.1321	0.043
166	0.1321	0.0215
176	0.1101	0.0215
200	0.1101	0
215	0.0826	0
238	0.0551	0
242	0.0551	0
251	0	0

6.15 Confidence interval of runs of Kane Willamson:

Runs	ucl	lcl
0	0.126705	-0.02951
1	0.080494	-0.12189
2	0.076734	-0.14913
3	0.068388	-0.16959
4	0.064318	-0.19692
5	0.06664	-0.20064
6	0.082973	-0.19237
7	0.057772	-0.22197
8	0.100445	-0.18665
9	0.128461	-0.16266
10	0.142512	-0.15051
11	0.143615	-0.15302
13	0.185637	-0.11844
14	0.199191	-0.10599
15	0.213254	-0.09525
16	0.200247	-0.10965
17	0.213663	-0.09706
18	0.240358	-0.07176
19	0.279776	-0.03318
20	0.292916	-0.02032
21	0.266757	-0.04896
22	0.266292	-0.05109
24	0.266011	-0.05221
25	0.278873	-0.03907
27	0.304325	-0.01253
31	0.317052	0.000748
32	0.329643	0.014157
34	0.355729	0.041871
36	0.368823	0.055777
39	0.355107	0.041493
41	0.367835	0.055565
42	0.353275	0.040925
43	0.352156	0.040844
45	0.3383	0.0267
47	0.3242	0.0126
48	0.32291	0.01289
49	0.335524	0.027076
50	0.321378	0.013222
51	0.307132	-0.00073
52	0.332086	0.028114
53	0.317791	0.014409
54	0.288954	-0.01295
55	0.288954	-0.01295
56	0.27416	-0.02716

Runs	ucl	lcl
58	0.259073	-0.04107
59	0.271435	-0.02664
60	0.283907	-0.01211
61	0.268862	-0.02626
62	0.280986	-0.01159
68	0.293225	0.003175
69	0.291022	0.004978
71	0.275765	-0.00877
74	0.273164	-0.00656
75	0.285989	0.009211
77	0.283169	0.011631
88	0.267589	-0.00179
89	0.25176	-0.01516
91	0.232568	-0.02517
97	0.216442	-0.03824
102	0.200277	-0.05108
104	0.200277	-0.05108
108	0.200277	-0.05108
113	0.203816	-0.03682
114	0.215647	-0.02005
121	0.215647	-0.02005
129	0.192698	-0.0411
130	0.168714	-0.06131
131	0.180352	-0.04435
132	0.16706	-0.04626
135	0.178168	-0.02877
140	0.189245	-0.01105
161	0.189245	-0.01105
166	0.20036	0.02084
176	0.17355	0.00365
200	0.1934	0.0268
215	0.160608	0.004592
238	0.123308	-0.01311
242	0.123308	-0.01311
251	0	0

6.16 To check if the zero line consist in between the confidence interval:



Hence we say that the zero line lies in between the confidence interval.

LOG RANK TEST OF KANE WILLAMSON:

Here we take the null and alternative hypothesis as –

Ho:survival curves are identical or(S1t=S2t) versus H1:the survival curves are not identical or(S1t/=S2t at any time t) (alpha=0.05)

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
group=1	74	65	76.7	1.79	4.29
group=2	78	73	61.3	2.24	4.29

Chisq= 4.3 on 1 degrees of freedom, p= 0.04

The test statistics follows a chi-square distribution.So we find the critical value in the table of critical value of chi-square distribution)for df=k-1=2-1=1 and alpha=0.05.

The critical value is 3.84 and the decision rule is to reject Ho if chi square>3.84.Hence after we calculate chi-square we reject null as 4.3>3.84.

6.17 SURVIVAL TABLE OF JOE ROOT IN HOME GROUND:

RUNS	NO.OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER 95%	UPPER95%
0	6	1	117	0.9487	0.0004	0.0204	0.9087	0.9887
1	3	1	111	0.9231	0.0006	0.0246	0.8748	0.9714
2	2	1	108	0.9060	0.0007	0.0270	0.8531	0.9589
3	4	1	106	0.8718	0.0010	0.0309	0.8112	0.9324
4	4	1	102	0.8376	0.0012	0.0341	0.7708	0.9044
5	3	1	98	0.8120	0.0013	0.0361	0.7412	0.8828
6	3	1	95	0.7863	0.0014	0.0379	0.7121	0.8606
8	3	1	92	0.7607	0.0016	0.0394	0.6834	0.8380
9	2	0	89	0.7436	0.0016	0.0404	0.6645	0.8227
11	4	1	86	0.7090	0.0018	0.0420	0.6266	0.7914
13	3	0	82	0.6831	0.0019	0.0431	0.5986	0.7675
14	3	1	78	0.6568	0.0019	0.0440	0.5705	0.7431
15	1	1	75	0.6480	0.0020	0.0443	0.5612	0.7348
16	2	1	74	0.6305	0.0020	0.0448	0.5427	0.7183
17	2	1	72	0.6130	0.0020	0.0452	0.5244	0.7016
19	1	1	70	0.6042	0.0021	0.0454	0.5152	0.6933
21	2	1	69	0.5867	0.0021	0.0458	0.4970	0.6764
22	1	1	67	0.5780	0.0021	0.0459	0.4880	0.6680
23	2	1	66	0.5605	0.0021	0.0462	0.4700	0.6509
26	1	1	64	0.5517	0.0021	0.0463	0.4610	0.6424
28	2	1	63	0.5342	0.0022	0.0464	0.4432	0.6252
29	2	1	61	0.5167	0.0022	0.0465	0.4255	0.6079

RUNS	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
30	1	1	59	0.5079	0.0022	0.0465	0.4167	0.5992
31	3	1	58	0.4816	0.0022	0.0465	0.3904	0.5729
33	1	1	55	0.4729	0.0022	0.0465	0.3817	0.5641
36	1	1	54	0.4641	0.0022	0.0465	0.3731	0.5552
38		0	53	0.4641	0.0022	0.0465	0.3731	0.5552
39	1	1	52	0.4552	0.0022	0.0464	0.3642	0.5462
40	2	1	51	0.4374	0.0021	0.0463	0.3466	0.5281
42	2	1	49	0.4195	0.0021	0.0461	0.3292	0.5098
45	1	1	47	0.4106	0.0021	0.0460	0.3205	0.5007
48	2	1	46	0.3927	0.0021	0.0457	0.3032	0.4822
49	1	1	44	0.3838	0.0021	0.0455	0.2946	0.4730
50	1	1	43	0.3749	0.0021	0.0453	0.2861	0.4637
52	1	1	42	0.3660	0.0020	0.0451	0.2776	0.4543
56	1	1	41	0.3570	0.0020	0.0449	0.2691	0.4450
57	2	1	40	0.3392	0.0020	0.0444	0.2522	0.4261
59	1	1	38	0.3302	0.0019	0.0441	0.2438	0.4167
60	1	1	37	0.3213	0.0019	0.0438	0.2355	0.4072
62	1	1	36	0.3124	0.0019	0.0435	0.2272	0.3976
63	1	1	35	0.3035	0.0019	0.0431	0.2189	0.3880
64	1	1	34	0.2945	0.0018	0.0428	0.2107	0.3784
66	1	1	33	0.2856	0.0018	0.0424	0.2025	0.3687
68	2	0	32	0.2678	0.0017	0.0416	0.1862	0.3493
71	2	0	29	0.2493	0.0017	0.0407	0.1695	0.3291
72	1	1	26	0.2397	0.0016	0.0403	0.1608	0.3186
76		0	25	0.2397	0.0016	0.0403	0.1608	0.3186
77	2	1	24	0.2197	0.0015	0.0393	0.1427	0.2968

RUNS	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
78	1	1	22	0.2097	0.0015	0.0388	0.1338	0.2857
80	2	1	21	0.1898	0.0014	0.0376	0.1161	0.2634
84	1	1	19	0.1798	0.0014	0.0369	0.1075	0.2521
86		0	18	0.1798	0.0014	0.0369	0.1075	0.2521
98	1	1	17	0.1692	0.0013	0.0362	0.0982	0.2402
104	1	1	16	0.1586	0.0013	0.0355	0.0891	0.2281
109	1	1	15	0.1481	0.0012	0.0346	0.0802	0.2159
121	1	1	14	0.1375	0.0011	0.0337	0.0714	0.2036
125	1	1	13	0.1269	0.0011	0.0328	0.0627	0.1911
130	1	1	12	0.1163	0.0010	0.0317	0.0542	0.1784
134	1	1	11	0.1058	0.0009	0.0305	0.0459	0.1656
136	1	1	10	0.0952	0.0009	0.0292	0.0379	0.1525
142		0	9	0.0952	0.0009	0.0292	0.0379	0.1525
149		0	8	0.0952	0.0009	0.0292	0.0379	0.1525
154		0	7	0.0952	0.0009	0.0292	0.0379	0.1525
176	1	1	6	0.0793	0.0008	0.0283	0.0238	0.1349
180	1	0	5	0.0635	0.0007	0.0268	0.0110	0.1159
190	1	1	3	0.0423	0.0006	0.0248	-0.0064	0.0910
200		O	2	0.0423	0.0006	0.0248	-0.0064	0.0910
254	1	1	1	0.0000	0	0	0	0

6.18 <u>SURVIVAL TABLE OF JOE ROOT IN OVERSEAS GROUND:</u>

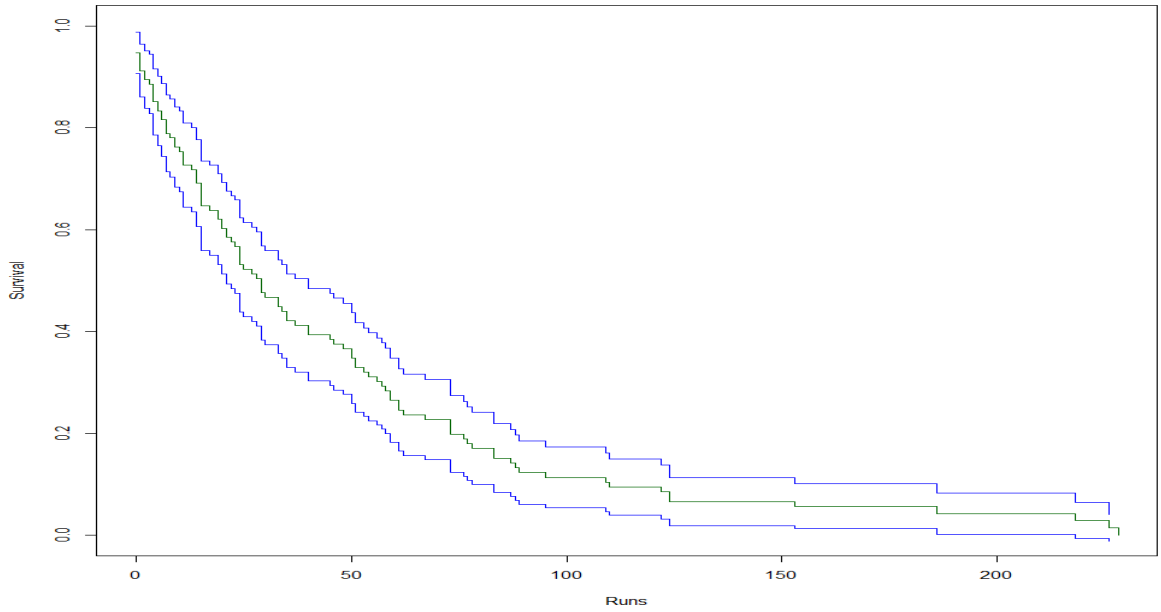
RUNS	NO.OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER95%	UPPER95%
0	6	1	114	0.9474	0.0004	0.0209	0.9064	0.9884
1	4	1	108	0.9123	0.0007	0.0265	0.8604	0.9642
2	2	1	104	0.8947	0.0008	0.0287	0.8384	0.9511
3	1	1	102	0.8860	0.0009	0.0298	0.8276	0.9443
4	4	0	101	0.8509	0.0011	0.0334	0.7855	0.9163
5	2	1	96	0.8332	0.0012	0.0349	0.7647	0.9016
6	2	1	94	0.8154	0.0013	0.0364	0.7441	0.8867
7	3	1	92	0.7888	0.0015	0.0383	0.7138	0.8639
8	1	1	89	0.7800	0.0015	0.0389	0.7038	0.8562
9	2	1	88	0.7622	0.0016	0.0400	0.6839	0.8406
10	1	1	86	0.7534	0.0016	0.0405	0.6741	0.8327
11	3	1	85	0.7268	0.0018	0.0419	0.6448	0.8088
13	1	1	82	0.7179	0.0018	0.0423	0.6351	0.8008
14	3	1	81	0.6913	0.0019	0.0434	0.6063	0.7764
15	5	1	78	0.6470	0.0020	0.0449	0.5590	0.7351
17	1	1	73	0.6382	0.0020	0.0452	0.5496	0.7267
19	2	1	72	0.6204	0.0021	0.0456	0.5310	0.7098
20	2	0	70	0.6027	0.0021	0.0460	0.5125	0.6929
21	2	1	67	0.5847	0.0021	0.0464	0.4939	0.6756
22	1	1	65	0.5757	0.0022	0.0465	0.4846	0.6669
23	1	1	64	0.5667	0.0022	0.0466	0.4753	0.6581
24	4	1	63	0.5307	0.0022	0.0470	0.4386	0.6229
25	1	1	59	0.5217	0.0022	0.0471	0.4295	0.6140
26		0	58	0.5217	0.0022	0.0471	0.4295	0.6140

RUNS	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
27	1	1	57	0.5126	0.0022	0.0471	0.4202	0.6050
28	1	1	56	0.5034	0.0022	0.0472	0.4110	0.5959
29	3	1	55	0.4760	0.0022	0.0472	0.3835	0.5685
30	1	1	52	0.4668	0.0022	0.0472	0.3744	0.5593
33	2	1	51	0.4485	0.0022	0.0471	0.3563	0.5407
34	1	1	49	0.4394	0.0022	0.0470	0.3473	0.5314
35	2	1	48	0.4211	0.0022	0.0468	0.3294	0.5127
37	1	1	46	0.4119	0.0022	0.0466	0.3205	0.5033
40	2	1	45	0.3936	0.0021	0.0463	0.3028	0.4844
45	1	1	43	0.3844	0.0021	0.0461	0.2940	0.4749
46	1	1	42	0.3753	0.0021	0.0459	0.2852	0.4653
48	1	1	41	0.3661	0.0021	0.0457	0.2765	0.4558
50	2	1	40	0.3478	0.0020	0.0452	0.2592	0.4365
51	2	1	38	0.3295	0.0020	0.0447	0.2420	0.4171
53	1	1	36	0.3204	0.0020	0.0444	0.2334	0.4073
54	1	1	35	0.3112	0.0019	0.0440	0.2249	0.3975
56	1	1	34	0.3021	0.0019	0.0437	0.2165	0.3877
57	1	1	33	0.2929	0.0019	0.0433	0.2080	0.3778
58	1	0	32	0.2838	0.0018	0.0429	0.1997	0.3678
59	2	1	30	0.2648	0.0018	0.0421	0.1824	0.3473
61	2	1	28	0.2459	0.0017	0.0411	0.1653	0.3266
62	1	1	26	0.2365	0.0017	0.0406	0.1568	0.3161
67	1	1	25	0.2270	0.0016	0.0401	0.1484	0.3056
73	3	1	24	0.1986	0.0015	0.0383	0.1236	0.2737
76	1	1	21	0.1892	0.0014	0.0376	0.1155	0.2629
77	1	1	20	0.1797	0.0014	0.0369	0.1074	0.2520

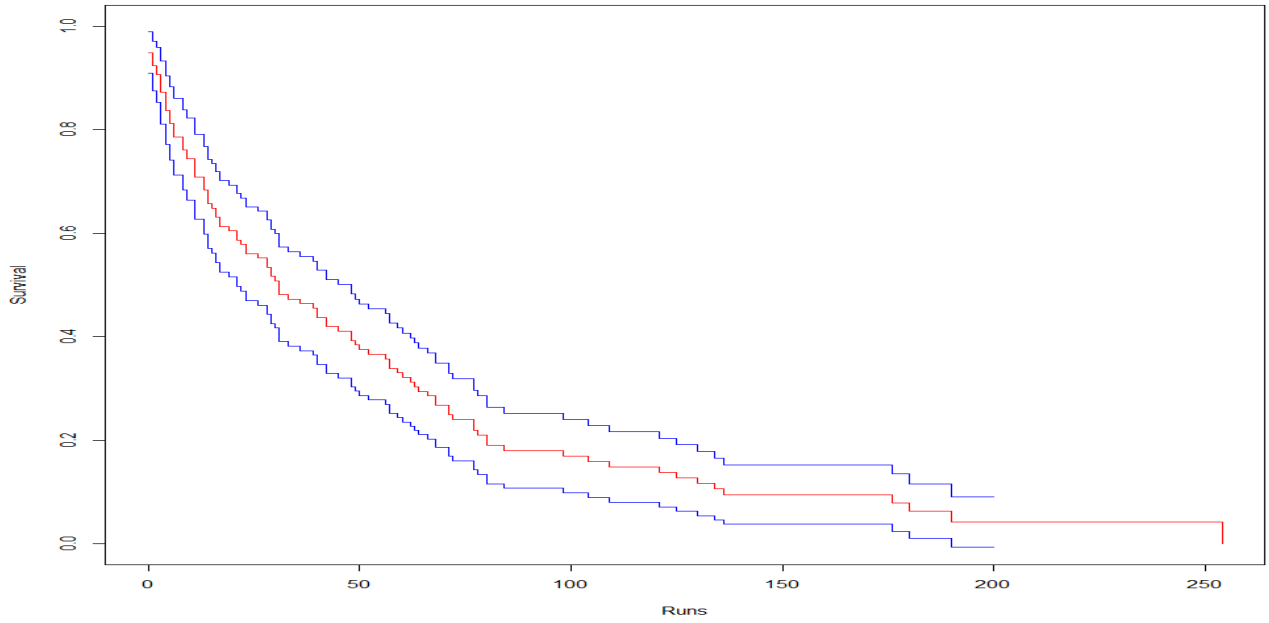
RUN	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
78	1	1	19	0.1703	0.0013	0.0361	0.0994	0.2411
83	2	1	18	0.1513	0.0012	0.0345	0.0837	0.2190
87	1	1	16	0.1419	0.0011	0.0336	0.0760	0.2078
88	1	1	15	0.1324	0.0011	0.0327	0.0683	0.1965
89	1	1	14	0.1230	0.0010	0.0317	0.0608	0.1851
95	1	1	13	0.1135	0.0009	0.0306	0.0535	0.1735
109	1	1	12	0.1040	0.0009	0.0295	0.0462	0.1619
110	1	1	11	0.0946	0.0008	0.0283	0.0391	0.1501
122	1	1	10	0.0851	0.0007	0.0270	0.0322	0.1381
124	2	1	9	0.0662	0.0006	0.0241	0.0190	0.1134
153	1	1	7	0.0568	0.0005	0.0224	0.0128	0.1007
155		0	6	0.0568	0.0005	0.0224	0.0128	0.1007
182		0	5	0.0568	0.0005	0.0224	0.0128	0.1007
186	1		4	0.0426	0.0004	0.0208	0.0017	0.0834
218	1		3	0.0284	0.0003	0.0181	-0.0071	0.0638
226	1		2	0.0142	0.0002	0.0135	-0.0123	0.0407
228	1		1	0.0000	0	0	0	0

6.19 SURVIVAL CURVE OF JOE ROOT IN HOME AND OVERSEAS GROUND:

a.Overseas Ground:



b.Home Ground:



6.20 COMPARISON OF SURVIVAL CURVE OF JOE ROOT:

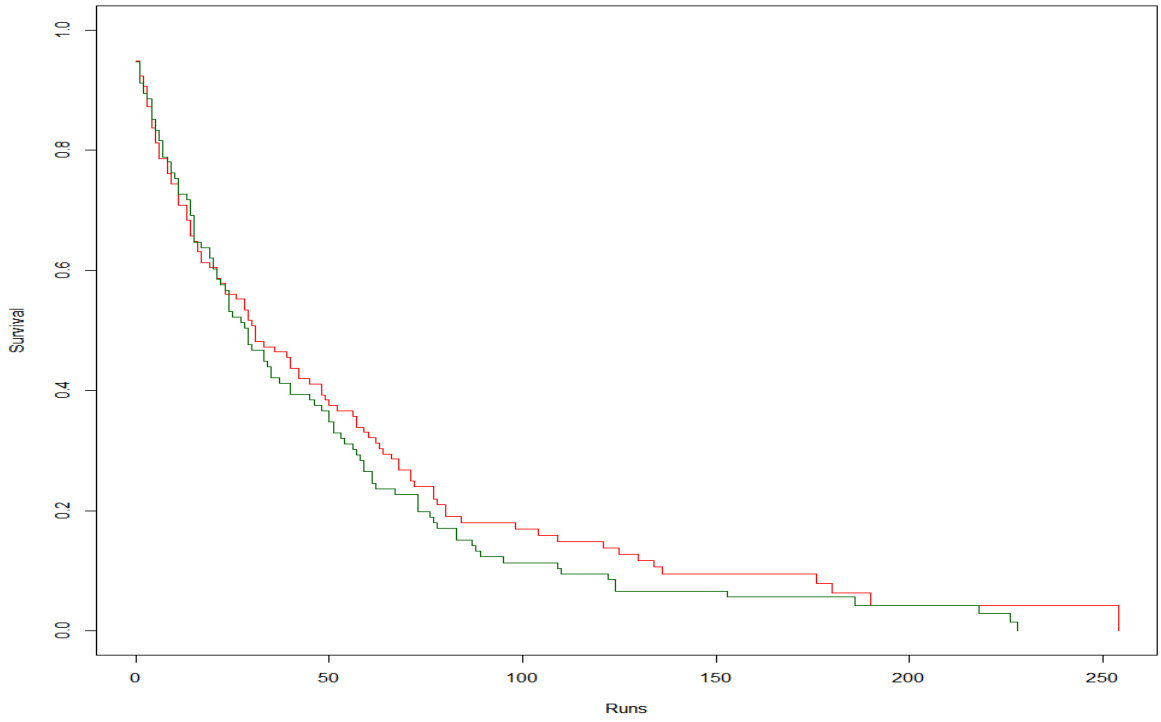


Figure3: Red curve=home ground,Green curve=overseas ground

Here we can see that in between 0 to 40 runs interval the performance of Joe root is approximately same,but after 40 runs the performance is better in home ground than in overseas ground.

6.21 Estimated survival function of Joe Root:

Runs	s1 hat	s2 hat
0	0.9487	0.9103
1	0.9231	0.8974
2	0.906	0.8718
3	0.8718	0.8588
4	0.8376	0.8197
5	0.812	0.8067
6	0.7863	0.7807
8	0.7607	0.7417
9	0.7436	0.7157
10	0.7436	0.7026
11	0.709	0.6896
13	0.6831	0.6376
14	0.6568	0.6246
15	0.648	0.5985
16	0.6305	0.5985
17	0.613	0.5855
18	0.613	0.5595
19	0.6042	0.5205
20	0.6042	0.5075
21	0.5867	0.5075
22	0.578	0.4814
23	0.5605	0.4814
24	0.5605	0.4684
25	0.5605	0.4554
26	0.5517	0.4554
27	0.5517	0.4294
28	0.5342	0.4294
29	0.5167	0.4294
30	0.5079	0.4294
31	0.4816	0.4164
32	0.4816	0.4034
33	0.4729	0.4034
34	0.4729	0.3765
36	0.4641	0.363
38	0.4641	0.363
39	0.4552	0.363
40	0.4374	0.363
41	0.4374	0.3496
42	0.4195	0.3361
43	0.4195	0.3227
45	0.4106	0.3227
48	0.3927	0.3092
49	0.3838	0.2958
50	0.3749	0.2958

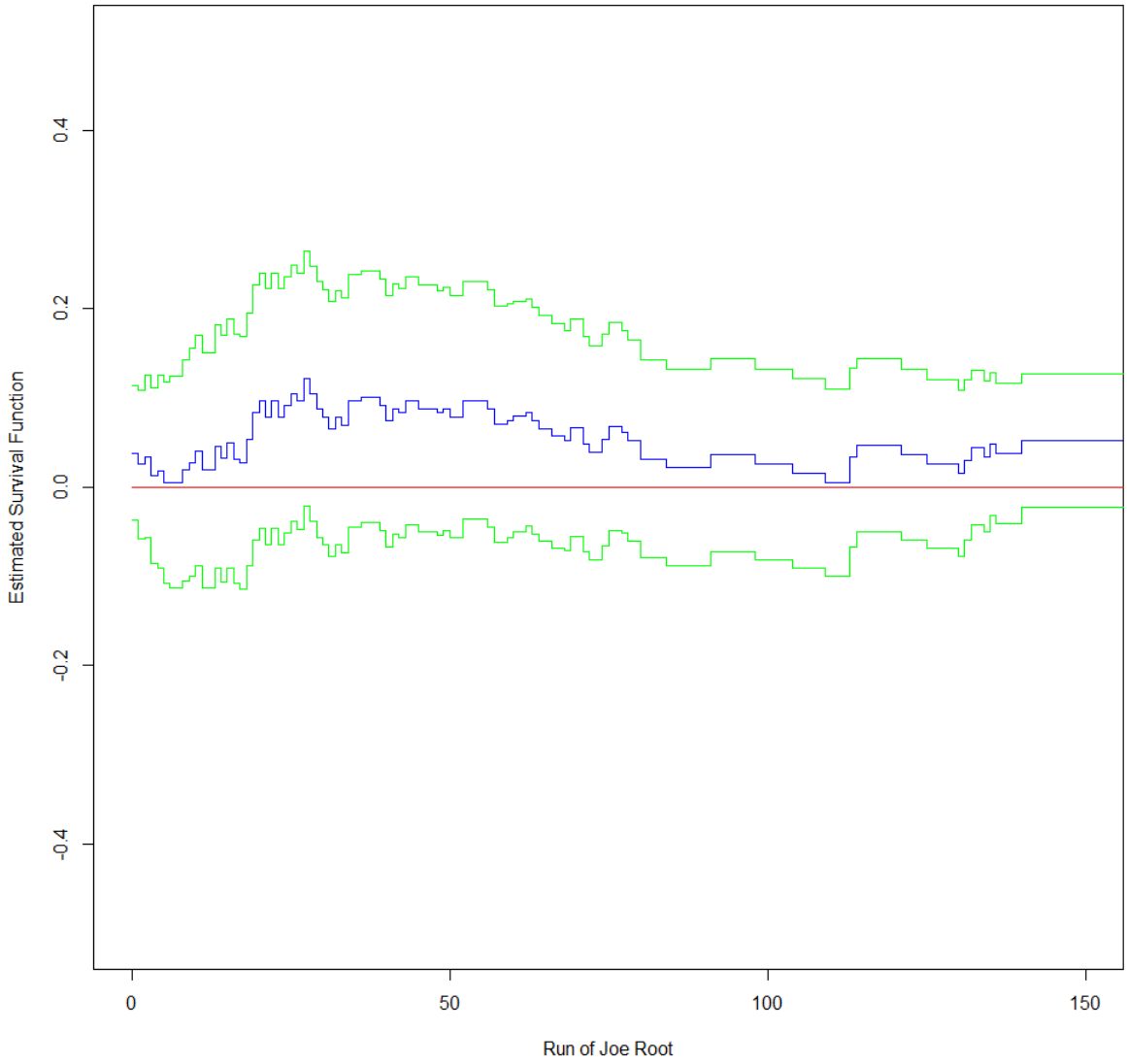
Runs	s1 hat	s2 hat
52	0.366	0.2689
56	0.357	0.2689
57	0.3392	0.2689
59	0.3302	0.2555
60	0.3213	0.242
62	0.3124	0.2286
63	0.3035	0.2286
64	0.2945	0.2286
66	0.2856	0.2286
68	0.2678	0.2151
69	0.2678	0.2008
71	0.2493	0.2008
72	0.2397	0.2008
74	0.2397	0.1864
75	0.2397	0.1721
76	0.2397	0.1721
77	0.2197	0.1578
78	0.2097	0.1578
80	0.1898	0.1578
84	0.1798	0.1578
86	0.1798	0.1578
91	0.1798	0.1434
98	0.1692	0.1434
104	0.1586	0.1434
109	0.1481	0.1434
113	0.1481	0.1147
114	0.1481	0.1004
121	0.1375	0.1004
125	0.1269	0.1004
130	0.1163	0.1004
131	0.1163	0.0861
132	0.1163	0.0717
134	0.1058	0.0717
135	0.1058	0.0574
136	0.0952	0.0574
140	0.0952	0.043
142	0.0952	0.043
149	0.0952	0.043
154	0.0952	0.043
161	0.0952	0.043
166	0.0952	0.0215
176	0.0793	0.0215
180	0.0635	0.0215
190	0.0423	0.0215
200	0.0423	0

6.22 Confidence interval of runs of Joe Root:

Runs	ucl	lcl
0	0.113443	-0.03664
1	0.10859	-0.05719
2	0.125407	-0.05701
3	0.111295	-0.08529
4	0.126389	-0.09059
5	0.118068	-0.10747
6	0.123939	-0.11274
8	0.143462	-0.10546
9	0.155884	-0.10008
10	0.170065	-0.08807
11	0.151329	-0.11253
13	0.181994	-0.09099
14	0.170404	-0.106
15	0.189144	-0.09014
16	0.172256	-0.10826
17	0.168705	-0.11371
18	0.19547	-0.08847
19	0.226374	-0.05897
20	0.239527	-0.04613
21	0.222517	-0.06412
22	0.239887	-0.04669
23	0.222757	-0.06456
24	0.235757	-0.05156
25	0.248605	-0.0384
26	0.239928	-0.04733
27	0.265322	-0.02072
28	0.247946	-0.03835
29	0.230571	-0.05597
30	0.221771	-0.06477
31	0.208168	-0.07777
32	0.220716	-0.06432
33	0.212016	-0.07302
34	0.238014	-0.04521
36	0.242264	-0.04006
38	0.242264	-0.04006
39	0.233238	-0.04884
40	0.215311	-0.06651
41	0.227963	-0.05236
42	0.222712	-0.05591
43	0.235368	-0.04177
45	0.22634	-0.05054
48	0.220665	-0.05366
49	0.224019	-0.04802
50	0.214862	-0.05666

Runs	ucl	lcl
52	0.230392	-0.03619
56	0.221132	-0.04493
57	0.202686	-0.06209
59	0.205519	-0.05612
60	0.208555	-0.04995
62	0.211202	-0.0436
63	0.201779	-0.05198
64	0.192388	-0.06059
66	0.182969	-0.06897
68	0.176162	-0.07076
69	0.188997	-0.055
71	0.169325	-0.07233
72	0.159209	-0.08141
74	0.171845	-0.06525
75	0.184402	-0.0492
76	0.184402	-0.0492
77	0.175356	-0.05156
78	0.164693	-0.06089
80	0.14322	-0.07922
84	0.132316	-0.08832
86	0.132316	-0.08832
91	0.144513	-0.07171
98	0.133	-0.0814
104	0.121497	-0.0911
109	0.109851	-0.10045
113	0.133406	-0.06661
114	0.144721	-0.04932
121	0.132897	-0.0587
125	0.121089	-0.06809
130	0.109037	-0.07724
131	0.120029	-0.05963
132	0.130957	-0.04176
134	0.11878	-0.05058
135	0.129023	-0.03222
136	0.116552	-0.04095
140	0.126532	-0.02213
142	0.126532	-0.02213
149	0.126532	-0.02213
154	0.126532	-0.02213
161	0.126532	-0.02213
166	0.133308	0.014092
176	0.115716	-0.00012
180	0.097107	-0.01311
190	0.072184	-0.03058
200	0.090908	-0.00631

6.23 To check if the zero line consist in between the confidence interval:



Hence we say that the zero line lies in between the confidence interval.

6.24 LOG RANK TEST OF JOE ROOT:

Here we take the null and alternative hypothesis as –

Ho:survival curves are identical or(S1t=S2t) versus H1:the survival curves are not identical or(S1t/=S2t at any time t) (alpha=0.05)

	N	Observed	Expected	(O-E)^2/E	(O-E)^2/V
group=1	117	105	111.3	0.358	0.781
group=2	112	106	99.7	0.400	0.781

Chisq= 0.8 on 1 degrees of freedom, p= 0.4

The test statistics follows a chi-square distribution.So we find the critical value in the table of critical value of chi-square distribution)for df=k-1=2-1=1 and alpha=0.05.

The critical value is 3.84 and the decision rule is to reject Ho if chi square>3.84.Hence after we calculate chi-square we accept null as 0.8<3.84.

6.25 <u>SURVIVAL TABLE OF STEVE SMITH IN HOME GROUND:</u>

RUNS	NO.OUT	STATUS	INNINGS	S^(t)	V(st)	SD(st)	LOWER 95%	UPPER 95%
0	5	1	81	0.9383	0.0007	0.0267	0.8859	0.9907
1	2	0	76	0.9136	0.0010	0.0312	0.8524	0.9748
4	1	1	73	0.9011	0.0011	0.0332	0.8360	0.9661
6	5	1	72	0.8385	0.0017	0.0410	0.7581	0.9189
7	3	1	67	0.8009	0.0020	0.0446	0.7136	0.8883
8	1	1	64	0.7884	0.0021	0.0456	0.6991	0.8778
10	1	1	63	0.7759	0.0022	0.0465	0.6847	0.8671
12	1	1	62	0.7634	0.0023	0.0474	0.6704	0.8564
14	2	1	61	0.7384	0.0024	0.0491	0.6422	0.8346
15	1	1	59	0.7259	0.0025	0.0498	0.6282	0.8235
16	2	1	58	0.7008	0.0026	0.0511	0.6006	0.8011
18	1	1	56	0.6883	0.0027	0.0517	0.5869	0.7897
19	1	1	55	0.6758	0.0027	0.0523	0.5733	0.7783
20		0	54	0.6758	0.0027	0.0523	0.5733	0.7783
23	1	0	53	0.6630	0.0028	0.0528	0.5595	0.7666
24	1	1	51	0.6500	0.0028	0.0534	0.5454	0.7547
27	2	1	50	0.6240	0.0030	0.0543	0.5176	0.7305
28	1	1	48	0.6110	0.0030	0.0547	0.5038	0.7183
31	2	1	47	0.5850	0.0031	0.0554	0.4765	0.6936
34	1	1	45	0.5720	0.0031	0.0557	0.4629	0.6812
35	1	1	44	0.5590	0.0031	0.0559	0.4495	0.6686
36	4	1	43	0.5070	0.0032	0.0564	0.3964	0.6176
38	1	1	39	0.4940	0.0032	0.0565	0.3834	0.6047
40	2	1	38	0.4680	0.0032	0.0564	0.3575	0.5786

RUNS	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
43	1	1	36	0.4550	0.0032	0.0563	0.3447	0.5654
48	1	0	35	0.4420	0.0032	0.0562	0.3319	0.5521
52		0	33	0.4420	0.0032	0.0562	0.3319	0.5521
53	1	1	32	0.4282	0.0031	0.0561	0.3183	0.5382
54		0	31	0.4282	0.0031	0.0561	0.3183	0.5382
55	1	1	30	0.4139	0.0031	0.0560	0.3042	0.5237
59	2	1	29	0.3854	0.0031	0.0557	0.2763	0.4945
63	2	1	27	0.3568	0.0030	0.0551	0.2489	0.4648
67	1	1	25	0.3426	0.0030	0.0547	0.2354	0.4498
70		0	24	0.3426	0.0030	0.0547	0.2354	0.4498
71	1	1	23	0.3277	0.0029	0.0543	0.2212	0.4341
76	1	1	22	0.3128	0.0029	0.0538	0.2072	0.4183
81	1	1	21	0.2979	0.0028	0.0533	0.1934	0.4024
83	1	1	20	0.2830	0.0028	0.0527	0.1797	0.3862
85	2	1	19	0.2532	0.0026	0.0512	0.1529	0.3535
93	1	1	17	0.2383	0.0025	0.0503	0.1398	0.3369
102		0	16	0.2383	0.0025	0.0503	0.1398	0.3369
104	1	1	15	0.2224	0.0024	0.0494	0.1256	0.3192
111	1	1	14	0.2065	0.0023	0.0483	0.1118	0.3013
115	1	1	13	0.1907	0.0022	0.0472	0.0982	0.2831
117	1	1	12	0.1748	0.0021	0.0458	0.0849	0.2646
130	1	1	11	0.1589	0.0020	0.0443	0.0720	0.2458
131	1	1	10	0.1430	0.0018	0.0426	0.0594	0.2266
133	1	1	9	0.1271	0.0017	0.0408	0.0472	0.2070
134		0	8	0.1271	0.0017	0.0408	0.0472	0.2070
138	1	1	7	0.1089	0.0015	0.0388	0.0329	0.1849

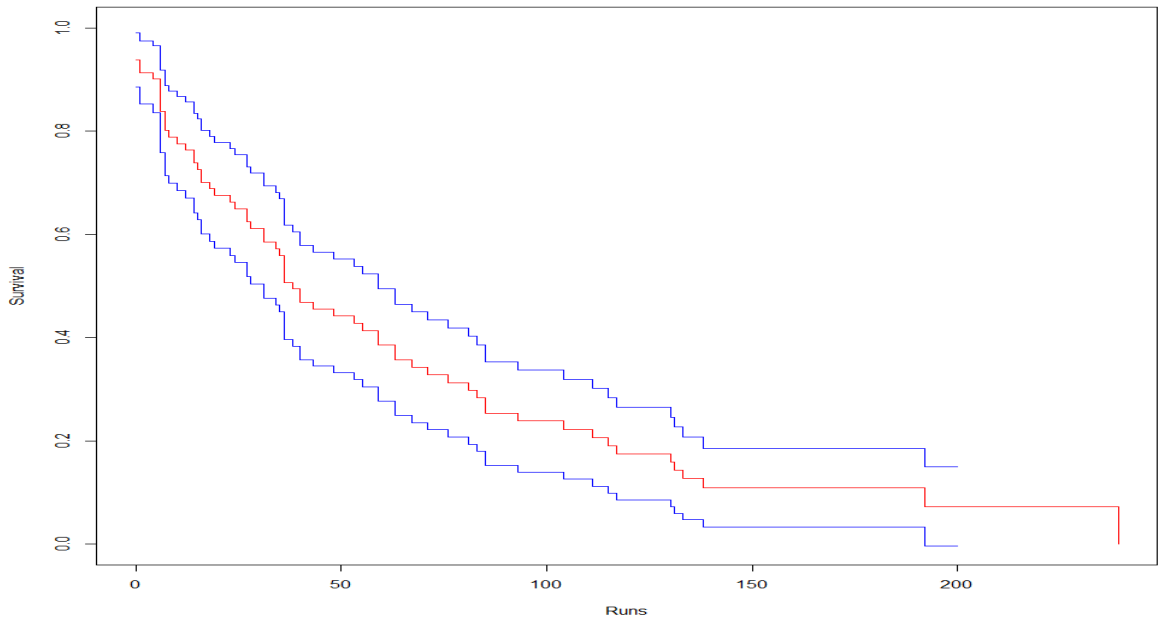
RUNS	NO.OUT	STATUS	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
141		0	6	0.1089	0.0015	0.0388	0.0329	0.1849
162		0	5	0.1089	0.0015	0.0388	0.0329	0.1849
165		0	4	0.1089	0.0015	0.0388	0.0329	0.1849
192	1	1	3	0.0726	0.0015	0.0393	-0.0045	0.1497
200		0	2	0.0726	0.0015	0.0393	-0.0045	0.1497
239	1	1	1	0.0000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

6.26 <u>SURVIVAL TABLE OF STEVE SMITH IN OVERSEAS GROUND:</u>

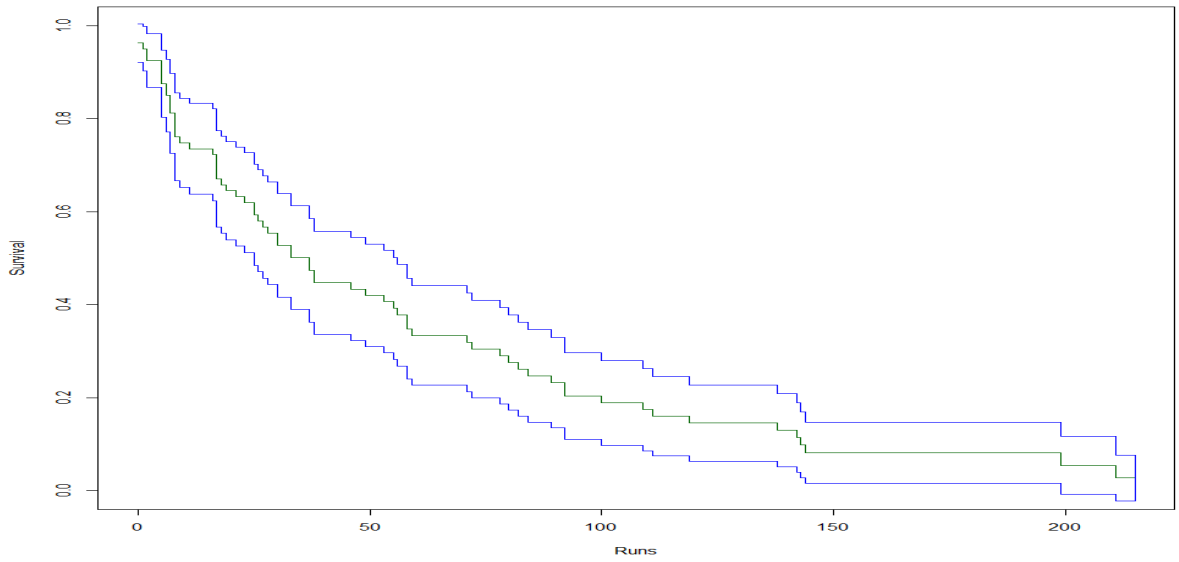
RUN	NO.OUT	INNINGS	S^(t)	V(st)	SD(s^t)	LOWER 95%	UPPER 95%
0	3	80	0.9625	0.0005	0.0212	0.9209	1.0041
1	1	77	0.9500	0.0006	0.0244	0.9022	0.9978
2	2	76	0.9250	0.0009	0.0294	0.8673	0.9827
5	4	74	0.8750	0.0014	0.0370	0.8025	0.9475
6	2	69	0.8496	0.0016	0.0400	0.7712	0.9281
7	3	67	0.8116	0.0019	0.0438	0.7257	0.8975
8	4	64	0.7609	0.0023	0.0479	0.6670	0.8547
9	1	60	0.7482	0.0024	0.0487	0.6527	0.8437
10		59	0.7482	0.0024	0.0487	0.6527	0.8437
11	1	58	0.7353	0.0025	0.0496	0.6381	0.8324
16	1	57	0.7224	0.0025	0.0503	0.6237	0.8211
17	4	56	0.6708	0.0028	0.0530	0.5670	0.7746
18	1	52	0.6579	0.0029	0.0535	0.5531	0.7627
19	1	51	0.6450	0.0029	0.0540	0.5392	0.7508
21	1	50	0.6321	0.0030	0.0544	0.5255	0.7387
23	1	49	0.6192	0.0030	0.0548	0.5118	0.7266
25	2	48	0.5934	0.0031	0.0555	0.4847	0.7021
26	1	45	0.5802	0.0031	0.0558	0.4709	0.6895
27	1	44	0.5670	0.0031	0.0561	0.4571	0.6769
28	1	43	0.5538	0.0032	0.0563	0.4435	0.6641
30	2	42	0.5275	0.0032	0.0566	0.4165	0.6384
33	2	40	0.5011	0.0032	0.0568	0.3898	0.6123
36		38	0.5011	0.0032	0.0568	0.3898	0.6123
37	2	37	0.4740	0.0032	0.0568	0.3626	0.5854
38	2	35	0.4469	0.0032	0.0567	0.3357	0.5581
46	1	33	0.4334	0.0032	0.0566	0.3224	0.5443
49	1	32	0.4198	0.0032	0.0564	0.3092	0.5304
53	1	31	0.4063	0.0032	0.0562	0.2961	0.5165
54		29	0.4063	0.0032	0.0562	0.2961	0.5165
55	1	28	0.3918	0.0031	0.0560	0.2819	0.5016
56	1	27	0.3773	0.0031	0.0558	0.2679	0.4867
58	2	26	0.3482	0.0030	0.0552	0.2401	0.4564
59	1	24	0.3337	0.0030	0.0547	0.2264	0.4410
71	1	23	0.3192	0.0029	0.0542	0.2129	0.4256
72	1	22	0.3047	0.0029	0.0537	0.1995	0.4099
78	1	21	0.2902	0.0028	0.0531	0.1862	0.3942
80	1	20	0.2757	0.0027	0.0524	0.1731	0.3783
82	1	19	0.2612	0.0027	0.0516	0.1601	0.3623
84	1	18	0.2467	0.0026	0.0507	0.1473	0.3461
89	1	17	0.2322	0.0025	0.0498	0.1346	0.3297
92	2	16	0.2031	0.0023	0.0476	0.1099	0.2964
100	1	14	0.1886	0.0021	0.0463	0.0978	0.2795

RUNS	NO.OUT	INNINGS	S(t)	V(st)	SD(st)	UPPER95%	LOWER95%
109	1	13	0.1741	0.0020	0.0450	0.0859	0.2623
111	1	12	0.1596	0.0019	0.0435	0.0743	0.2449
119	1	11	0.1451	0.0018	0.0419	0.0630	0.2272
138	1	10	0.1306	0.0016	0.0402	0.0519	0.2093
142	1	8	0.1143	0.0015	0.0383	0.0392	0.1894
143	1	7	0.0979	0.0013	0.0361	0.0271	0.1688
144	1	6	0.0816	0.0011	0.0336	0.0158	0.1475
145		5	0.0816	0.0011	0.0336	0.0158	0.1475
178		4	0.0816	0.0011	0.0336	0.0158	0.1475
199	1	3	0.0544	0.0010	0.0316	-0.0074	0.1163
211	1	2	0.0272	0.0006	0.0249	-0.0216	0.0760
215	1	1	0.0000	0.0000	0.0000	0.0000	0.0000

6.27 SURVIVAL CURVE OF STEVE SMITH IN HOME AND OVERSEAS GROUND:



a.Home ground



b.Overseas ground

6.28 COMPARISON OF SURVIVAL CURVE OF STEVE SMITH:

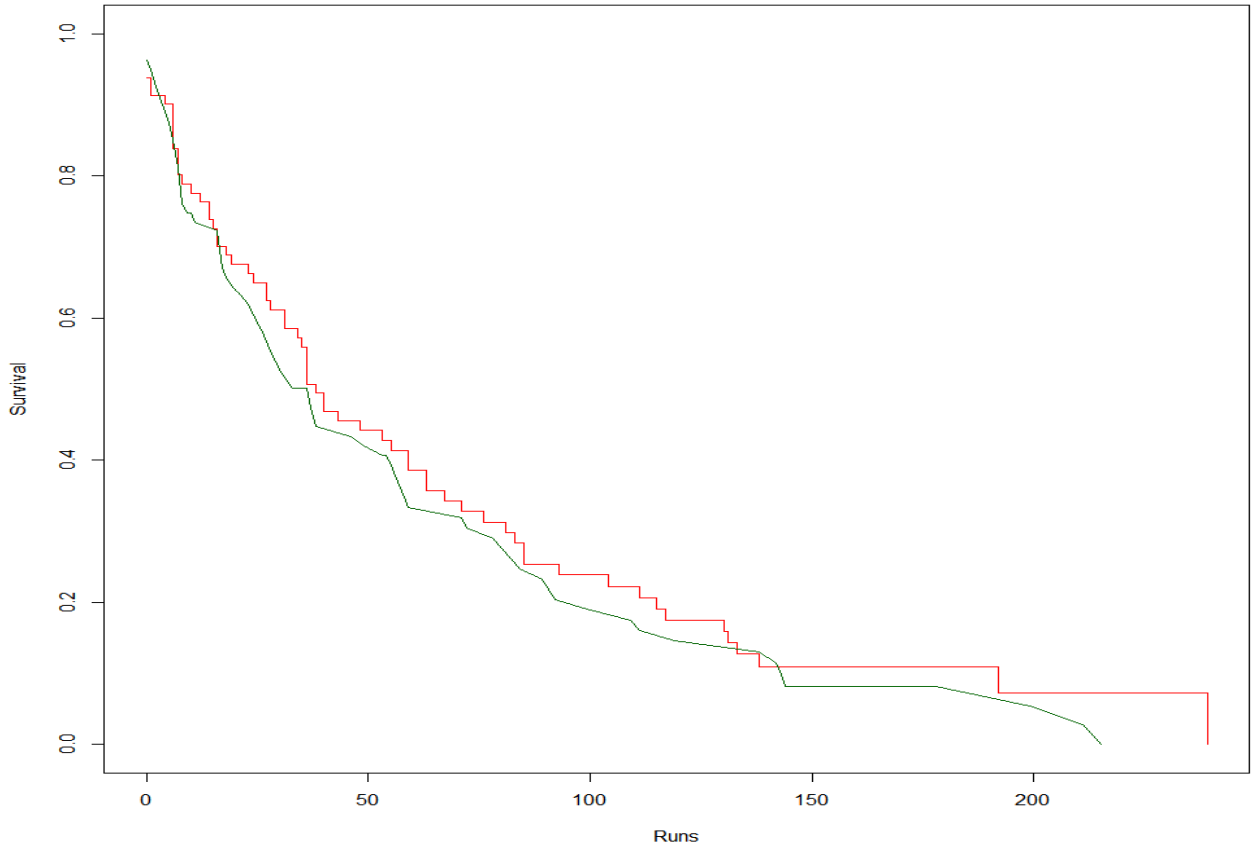


Figure3:Red curve=Home ground,Green curve=Overseas ground

Here we can see that in between the interval 0 to 200 runs the performance of Steve Smith is better in home ground than in the overseas ground.

6.29 Estimated survival function of Steve Smith:

Runs	s1 hat	s2 hat
0	0.9383	0.9103
1	0.9136	0.8974
2	0.9136	0.8718
3	0.9136	0.8588
4	0.9011	0.8197
5	0.9011	0.8067
6	0.8385	0.7807
7	0.8009	0.7807
8	0.7884	0.7417
9	0.7884	0.7157
10	0.7759	0.7026
11	0.7759	0.6896
12	0.7634	0.6896
13	0.7634	0.6376
14	0.7384	0.6246
15	0.7259	0.5985
16	0.7008	0.5985
17	0.7008	0.5855
18	0.6883	0.5595
19	0.6758	0.5205
20	0.6758	0.5075
22	0.6758	0.4814
23	0.663	0.4814
24	0.65	0.4684
25	0.65	0.4554
27	0.624	0.4294
28	0.611	0.4294
31	0.585	0.4164
32	0.585	0.4034
34	0.572	0.3765
35	0.559	0.3765
36	0.507	0.363
38	0.494	0.363
40	0.468	0.363
41	0.468	0.3496
42	0.468	0.3361
43	0.455	0.3227
48	0.442	0.3092
49	0.442	0.2958
52	0.442	0.2689
53	0.4282	0.2689
54	0.4282	0.2689
55	0.4139	0.2689
59	0.3854	0.2555

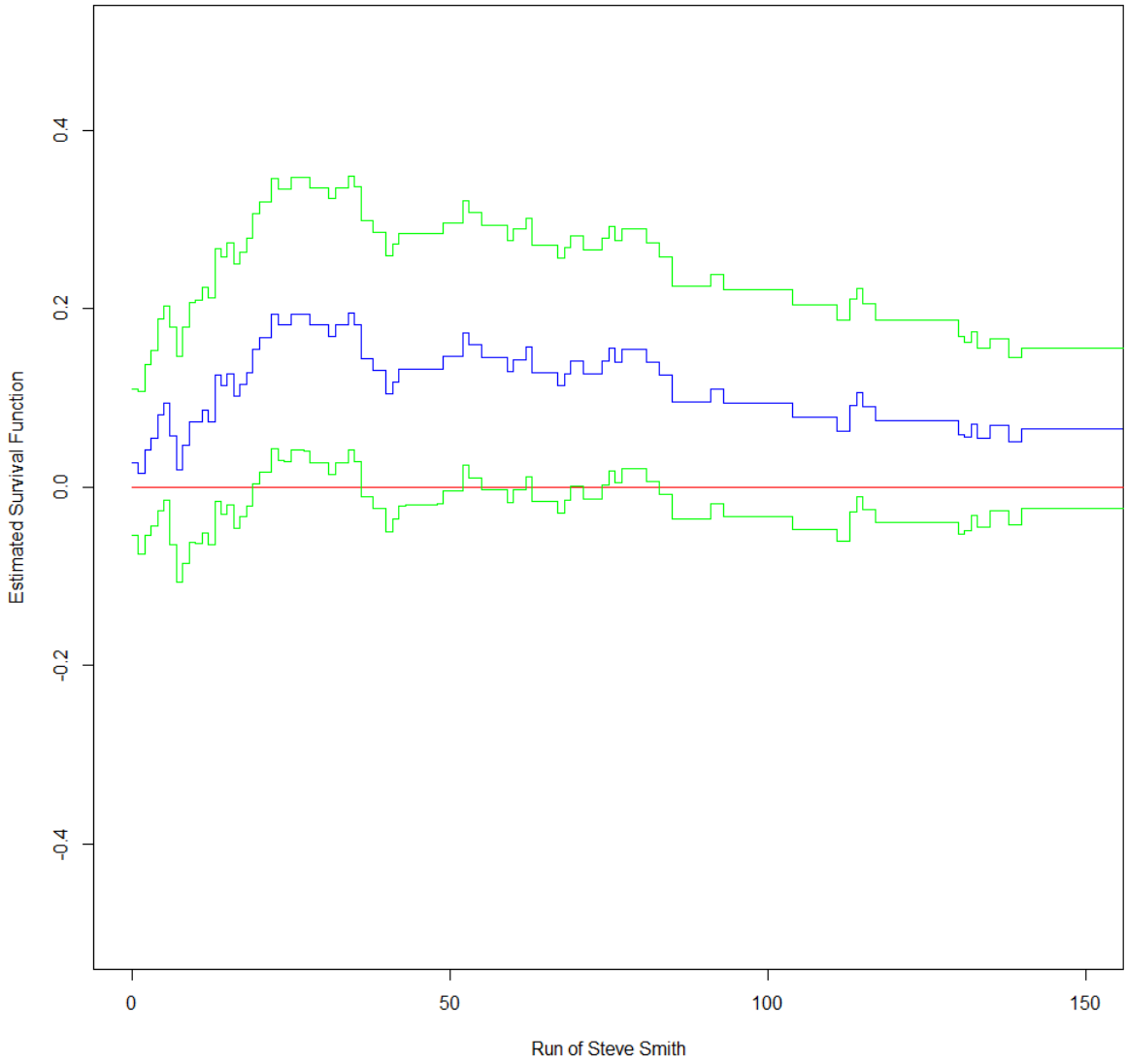
Runs	s1 hat	s2 hat
60	0.3854	0.242
62	0.3854	0.2286
63	0.3568	0.2286
67	0.3426	0.2286
68	0.3426	0.2151
69	0.3426	0.2008
70	0.3426	0.2008
71	0.3277	0.2008
74	0.3277	0.1864
75	0.3277	0.1721
76	0.3128	0.1721
77	0.3128	0.1578
81	0.2979	0.1578
83	0.283	0.1578
85	0.2532	0.1578
91	0.2532	0.1434
93	0.2383	0.1434
102	0.2383	0.1434
104	0.2224	0.1434
111	0.2065	0.1434
113	0.2065	0.1147
114	0.2065	0.1004
115	0.1907	0.1004
117	0.1748	0.1004
130	0.1589	0.1004
131	0.143	0.0861
132	0.143	0.0717
133	0.1271	0.0717
134	0.1271	0.0717
135	0.1271	0.0574
138	0.1089	0.0574
140	0.1089	0.043
141	0.1089	0.043
161	0.1089	0.043
162	0.1089	0.043
165	0.1089	0.043
166	0.1089	0.0215
192	0.0726	0.0215
200	0.0726	0
239	0	0

6.30 Confidence interval of runs of Steve Smith:

Runs	ucl	lcl
0	0.110289	-0.05429
1	0.107225	-0.07483
2	0.138017	-0.05442
3	0.153458	-0.04386
4	0.188811	-0.02601
5	0.203691	-0.01489
6	0.180045	-0.06444
7	0.147195	-0.10679
8	0.179046	-0.08565
9	0.207229	-0.06183
10	0.210027	-0.06343
11	0.223906	-0.05131
12	0.21258	-0.06498
13	0.267665	-0.01606
14	0.258453	-0.03085
15	0.27399	-0.01919
16	0.250599	-0.046
17	0.264033	-0.03343
18	0.27905	-0.02145
19	0.306778	0.003822
20	0.319922	0.016678
22	0.345878	0.042922
23	0.333743	0.029457
24	0.334545	0.028655
25	0.347402	0.041798
27	0.34805	0.04115
28	0.335595	0.027605
31	0.323274	0.013926
32	0.335856	0.027345
34	0.349339	0.041661
35	0.336618	0.028382
36	0.298405	-0.0104
38	0.285545	-0.02355
40	0.259405	-0.0494
41	0.272122	-0.03532
42	0.285078	-0.02128
43	0.28466	-0.02006
48	0.284208	-0.01861
49	0.296804	-0.0044
52	0.321715	0.024485
53	0.30777	0.010831
54	0.30777	0.010831
55	0.293324	-0.00332
59	0.276737	-0.01694

Runs	ucl	lcl
60	0.289193	-0.00239
62	0.301301	0.012299
63	0.271815	-0.01541
67	0.257026	-0.02903
68	0.269236	-0.01424
69	0.282262	0.001338
70	0.282262	0.001338
71	0.266765	-0.01296
74	0.27965	0.00295
75	0.292459	0.018741
76	0.276799	0.004601
77	0.289381	0.020619
81	0.273713	0.006487
83	0.257896	-0.0075
85	0.22582	-0.03502
91	0.238362	-0.01876
93	0.22209	-0.03229
102	0.22209	-0.03229
104	0.204828	-0.04683
111	0.187276	-0.06108
113	0.211651	-0.02805
114	0.223472	-0.01127
115	0.20594	-0.02534
117	0.187857	-0.03906
130	0.169645	-0.05265
131	0.162638	-0.04884
132	0.174104	-0.0315
133	0.15536	-0.04456
134	0.15536	-0.04456
135	0.166247	-0.02685
138	0.144826	-0.04183
140	0.155528	-0.02373
141	0.155528	-0.02373
161	0.155528	-0.02373
162	0.155528	-0.02373
165	0.155528	-0.02373
166	0.165252	0.009549
192	0.129909	-0.02771
200	0.149628	-0.00443
239	0	0

6.31 To check if the zero line consist in between the confidence interval:



Hence we say that the zero line lies in between the confidence interval.

6.32 LOG RANK TEST OF STEVE SMITH:

Here we take the null and alternative hypothesis as –

Ho:survival curves are identical or(S1t=S2t) versus H1:the survival curves are not identical or(S1t/=S2t at any time t) (alpha=0.05)

```
         N Observed Expected (O-E)^2/E (O-E)^2/V
group=1 81       68     71.3     0.151     0.319
group=2 80       71     67.7     0.159     0.319

 Chisq= 0.3  on 1 degrees of freedom, p= 0.6
```

The test statistics follows a chi-square distribution.So we find the critical value in the table of critical value of chi-square distribution)for df=k-1=2-1=1 and alpha=0.05.

The critical value is 3.84 and the decision rule is to reject Ho if chi square>3.84.Hence after we calculate chi-square we accept null as 0.3<3.84.

6.33 Comparison of survival curve of different players' in home ground:

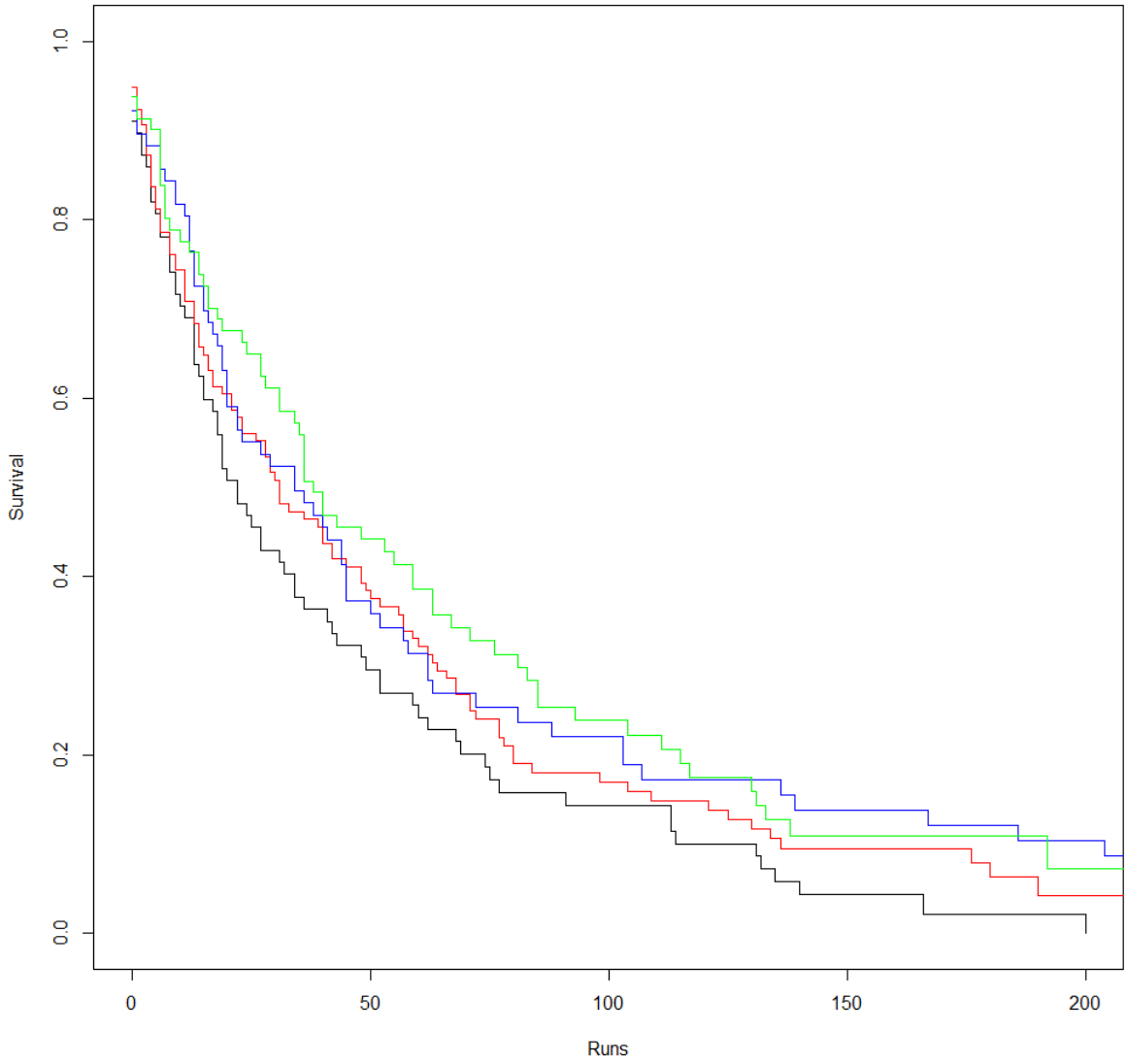


Figure:In the above figure Green=Steve Smith, Blue=Virat Kohli, Red=Joe Root, Black=Kane Willamson.

Comparison of survival curve of different players' in overseas ground:

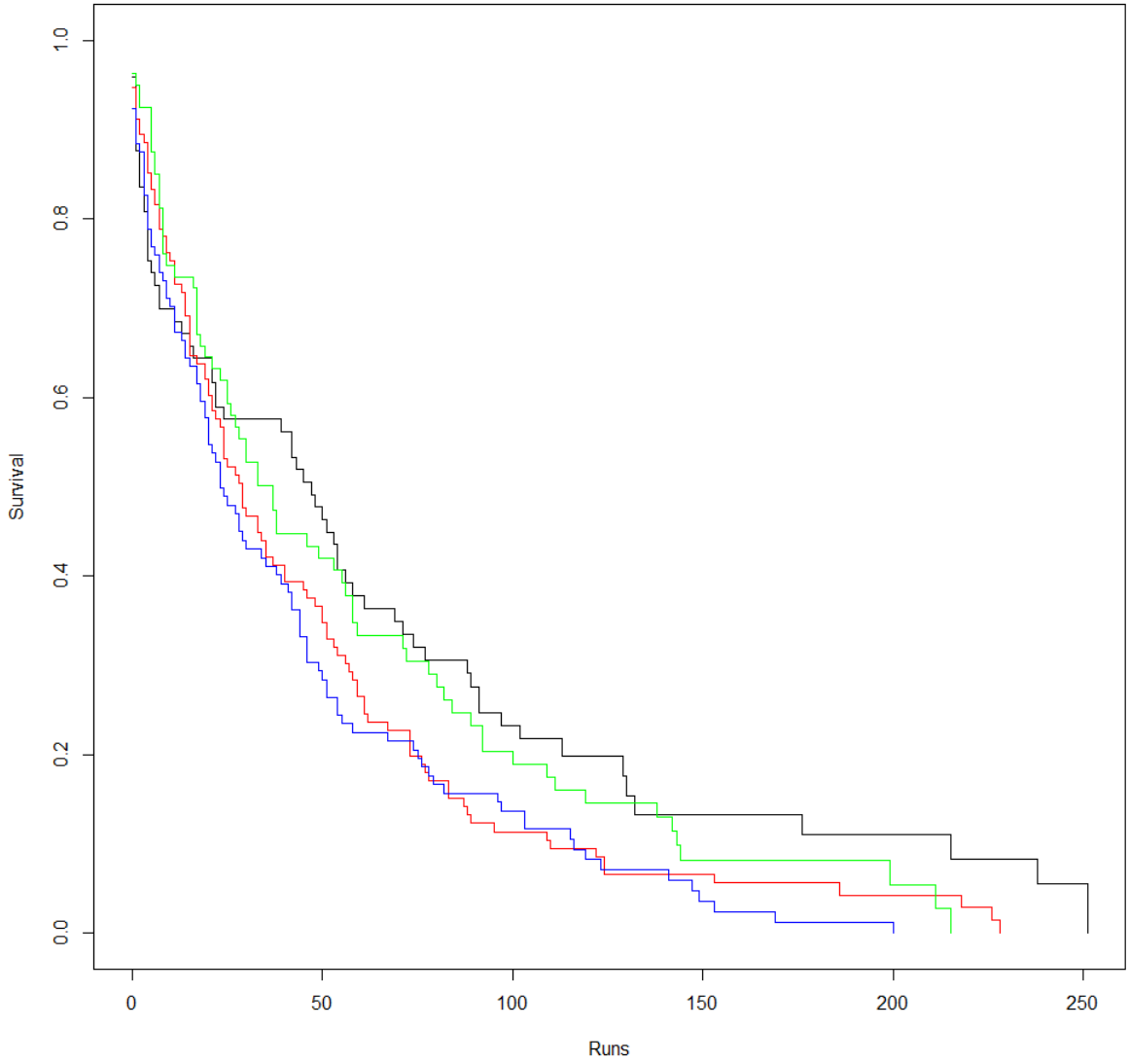


Figure:In the above figure Green=Steve Smith, Blue=Virat Kohli, Red=Joe Root, Black=Kane Willamson.

Conclusion:

From the above analysis now we can easily say that in Home ground the performance of Steve Smith is more better than Virat Kohli,Joe Root,Kane Willamson.We can also arrange the players according to their performance in home ground Steve Smith>Virat Kohli>Joe Root>Kane Willamson.

Similarly we can easily say that in overseas ground the performance of Kane Willamson is more better than Steve Smith,Virat Kohli,Joe Root.We can also arrange the player's according to their performance in overseas ground Kane Willamson>Steve Smith>Joe Root>Virat Kohli.

Appendix

Appendix 1

```
getwd("Virat Kohli Data") setwd("C:/Users/Sourav/Desktop/Sem 6
project/New")

rd<-read.table("Virat Kohli Data.txt", header=FALSE) rd run = rd[,1]; status = rd[,2]
library("survival") fit1<-survfit(Surv(run, status)~1) print(fit1) summary(fit1)
plot(fit1, col="blue", lwd=2, xlab = "Score or Run", ylab = "Survival Curve")
```

Appendix 2

```
getwd(" Willamson home data") setwd("file
location") x<-read.csv("Willamson home
data.csv") x x1<-x$time x1 l1<-length(x1) l1
s1<-x$survival s1 y<-read.csv("Willamson
overseas data.csv") y y1<-y$time y1 l2<-
length(y1) l2 s2<-y$survival s2 z<-c(x1,y1)
sort(z) n=l1+l2 w<-unique(sort(z)) w l<-
length(w)
l
s1hat=rep(0,l);s2hat=rep(0,l)
s1atw=0;s2atw=0
for(i in 1:l) {   t<-
w[i]   for(j in 1:l1)
```

```
{   if (x1[j]<=t) {s1atw=s1[j]}
else {s1hat[i]=s1atw     break
    }
   s1hat[i]=s1atw
  } }    for(i in 1:l)
{
  t<-w[i]   for(j in
1:l2)
  {     if (y1[j]<=t) {s2atw=s2[j]}
else {s2hat[i]=s2atw     break
    }
   s2hat[i]=s2atw
  } } output1=data.frame(w, s1hat, s2hat)
output1 diff=s1hat-s2hat zeroline=rep(0,l)
s3<-x$std.err s3 s4<-y$std.err s4 z<-
c(x1,y1) sort(z) n=l1+l2 w<-unique(sort(z))
w l<-length(w)
l
s3hat=rep(0,l);s4hat=rep(0,l)
s3atw=0;s4atw=0
for(i in 1:l)
{
  t<-w[i]   for(j in
1:l1)
```

```
  {     if (x1[j]<=t) {s3atw=s3[j]}
else {s3hat[i]=s3atw     break
    }
   s3hat[i]=s3atw
  } }    for(i in 1:l) {
t<-w[i]   for(j in 1:l2)
  {     if (y1[j]<=t) {s4atw=s4[j]}
else {s4hat[i]=s4atw     break
    }
   s4hat[i]=s4atw
  } } output2=data.frame(w, s3hat, s4hat)
output2 c<-output1$s1hat c d<-
output1$s2hat d

q<-1.96 v1<-output2$s3hat v1 v2<-output2$s4hat ucl<-
(c-d)+q*sqrt((v1^2)+(v2^2))   #s1hat-s2hat ucl lcl<-(c-
d)-q*sqrt((v1^2)+(v2^2))   #s1hat-s2hat lcl j<-
data.frame(w,lcl,ucl)
j
zeroline=rep(0,l) plot(w, diff, xlim=c(0,150), ylim=c(-0.5,0.5), xlab="Run of Virat ",
ylab="Confidence interval",type="s", col="blue") lines(w, zeroline, col="red", lty=1)
lines(w,lcl,type="s", col="green") lines(w,ucl,type="s", col="green") getwd("Virat
two grounds censored data") setwd("file location") rd<-read.table("Virat two grounds
censored data.txt", header=FALSE) rd run = rd[,1]; status = rd[,2];group=rd[,3]
library("survival") survdiff(formula = Surv(run,status) ~ group, data =rd)
```

Appendix 3

```
getwd("Root home data") setwd("file location")
x<-read.csv("Root home data.csv") x x1<-
```

```
x$time x1 l1<-length(x1) l1 s1<-x$survival s1
y<-read.csv("Root overseas data.csv") y y1<-
y$time y1 l2<-length(y1) l2 s2<-y$survival s2
z<-c(x1,y1) sort(z) n=l1+l2 w<-unique(sort(z))
w l<-length(w)
l
s1hat=rep(0,l);s2hat=rep(0,l)
s1atw=0;s2atw=0
for(i in 1:l) {   t<-
w[i]   for(j in 1:l1)
  {
   if (x1[j]<=t) {s1atw=s1[j]}     else
{s1hat[i]=s1atw     break
    }
   s1hat[i]=s1atw
  } }    for(i in 1:l) {
t<-w[i]   for(j in 1:l2)
  {     if (y1[j]<=t) {s2atw=s2[j]}
else {s2hat[i]=s2atw     break
    }
   s2hat[i]=s2atw
  } } output1=data.frame(w, s1hat, s2hat) output1 diff=s1hat-s2hat zeroline=rep(0,l)
plot(w, diff, xlim=c(0,320), ylim=c(-0.5,0.5), xlab="Run of Root",
ylab="Estimated Survival Function",type="s", col="blue")

lines(w, zeroline, col="red", lty=1)
```