

## Output#

This is a pdf file containing the outputs of each section of VAR\_Analysis.ipynb:

1)

Div		Date	HomeTeam	AwayTeam	FTHG	FTAG	FTR	HTHG	HTAG	\
0	E0	2000-08-19	Charlton	Man City	4	0	H	2	0	
1	E0	2000-08-19	Chelsea	West Ham	4	2	H	1	0	
2	E0	2000-08-19	Coventry	Middlesbrough	1	3	A	1	1	
3	E0	2000-08-19	Derby	Southampton	2	2	D	1	2	
4	E0	2000-08-19	Leeds	Everton	2	0	H	2	0	
..	..	...	...	...	...	...	..	...	...	
318	E0	2024-04-13	Bournemouth	Man United	2	2	D	2	1	
319	E0	2024-04-14	Liverpool	Crystal Palace	0	1	A	0	1	
320	E0	2024-04-14	West Ham	Fulham	0	2	A	0	1	
321	E0	2024-04-14	Arsenal	Aston Villa	0	2	A	0	0	
322	E0	2024-04-15	Chelsea	Everton	6	0	H	4	0	

	HTR	...	AvgC<2.5	AHCh	B365CAHH	B365CAHA	PCAAH	PCAHA	MaxCAHH	\
0	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	D	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
3	A	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
4	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
..	..	...	...	...	...	...	...	...	...	
318	H	...	3.04	-0.25	2.05	1.75	2.12	1.83	2.16	
319	A	...	3.56	-2.00	1.89	2.04	1.87	2.06	1.93	
320	A	...	2.22	-0.25	2.11	1.82	2.14	1.82	2.14	
321	D	...	2.87	-1.75	1.95	1.98	1.96	1.96	1.98	
322	H	...	2.31	-0.75	1.86	2.07	1.86	2.08	1.88	

	MaxCAHA	AvgCAHH	AvgCAHA
0	NaN	NaN	NaN
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	NaN	NaN
4	NaN	NaN	NaN
..	...	...	...
318	1.84	2.08	1.79
319	2.06	1.87	2.00
320	1.83	2.10	1.79
321	2.02	1.91	1.95
322	2.09	1.85	2.02

[9063 rows x 144 columns]

Number of files converted: 24

2)

Number of unparseable dates set as NaT: 0

Div	Date	HomeTeam	AwayTeam	FTHG	FTAG	FTR	HTHG	HTAG	\
0	E0 2000-08-19	Charlton	Man City	4	0	H	2	0	
1	E0 2000-08-19	Chelsea	West Ham	4	2	H	1	0	

2	E0	2000-08-19	Coventry	Middlesbrough	1	3	A	1	1
3	E0	2000-08-19	Derby	Southampton	2	2	D	1	2
4	E0	2000-08-19	Leeds	Everton	2	0	H	2	0
..	..	...	...	...	...	...	..	...	...
318	E0	2024-04-13	Bournemouth	Man United	2	2	D	2	1
319	E0	2024-04-14	Liverpool	Crystal Palace	0	1	A	0	1
320	E0	2024-04-14	West Ham	Fulham	0	2	A	0	1
321	E0	2024-04-14	Arsenal	Aston Villa	0	2	A	0	0
322	E0	2024-04-15	Chelsea	Everton	6	0	H	4	0

	HTR	...	AHCh	B365CAHH	B365CAHA	PCAHH	PCAHA	MaxCAHH	MaxCAHA	\
0	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	D	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
3	A	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
4	H	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
..	..	...	...	...	...	...	...	...	...	
318	H	...	-0.25	2.05	1.75	2.12	1.83	2.16	1.84	
319	A	...	-2.00	1.89	2.04	1.87	2.06	1.93	2.06	
320	A	...	-0.25	2.11	1.82	2.14	1.82	2.14	1.83	
321	D	...	-1.75	1.95	1.98	1.96	1.96	1.98	2.02	
322	H	...	-0.75	1.86	2.07	1.86	2.08	1.88	2.09	

	AvgCAHH	AvgCAHA	VAR
0	NaN	NaN	0
1	NaN	NaN	0
2	NaN	NaN	0
3	NaN	NaN	0
4	NaN	NaN	0
..	...	...	...
318	2.08	1.79	1
319	1.87	2.00	1
320	2.10	1.79	1
321	1.91	1.95	1
322	1.85	2.02	1

[9063 rows x 145 columns]

Number of matches listed as having VAR: 1843

3)

Columns without NaN values: ['Div', 'Date', 'HomeTeam', 'AwayTeam', 'FTHG', 'FTAG', 'FTR', 'HTHG', 'HTAG', 'HTR', 'Referee', 'HS', 'AS', 'HST', 'AST', 'HC', 'AC', 'HF', 'AF', 'HY', 'AY', 'HR', 'AR', 'VAR']

4)

	Season	Total_Home_Fouls	Total_Away_Fouls	Total_Home_Yellows	\
0	2000/2001	4932	5299	512	
1	2001/2002	4891	5221	479	
2	2002/2003	4791	4875	500	
3	2003/2004	4742	5051	481	
4	2004/2005	4730	5186	421	
5	2005/2006	4938	5060	499	
6	2006/2007	4686	4834	530	
7	2007/2008	4570	4696	511	
8	2008/2009	4300	4525	515	

9	2009/2010	4423	4771	526
10	2010/2011	4175	4343	537
11	2011/2012	3830	3908	523
12	2012/2013	3895	4058	515
13	2013/2014	3988	4194	543
14	2014/2015	4273	4349	619
15	2015/2016	3822	4356	550
16	2016/2017	4204	4430	663
17	2017/2018	3883	3982	562
18	2018/2019	3858	3916	580
19	2019/2020	3261	3429	502
20	2020/2021	4988	4753	642
21	2021/2022	3821	3860	628
22	2022/2023	4027	4154	635
23	2023/2024	3484	3686	631

	Total_Away_Yellows	Total_Home_Reds	Total_Away_Reds	\
0	682	32	31	
1	686	32	40	
2	642	27	48	
3	600	20	38	
4	610	27	32	
5	674	27	49	
6	695	17	36	
7	705	31	30	
8	683	26	37	
9	711	23	45	
10	699	29	34	
11	655	25	39	
12	671	26	26	
13	669	16	37	
14	745	26	45	
15	629	25	34	
16	717	21	20	
17	595	17	22	
18	640	18	29	
19	569	18	21	
20	652	23	29	
21	663	19	24	
22	728	18	10	
23	742	24	27	

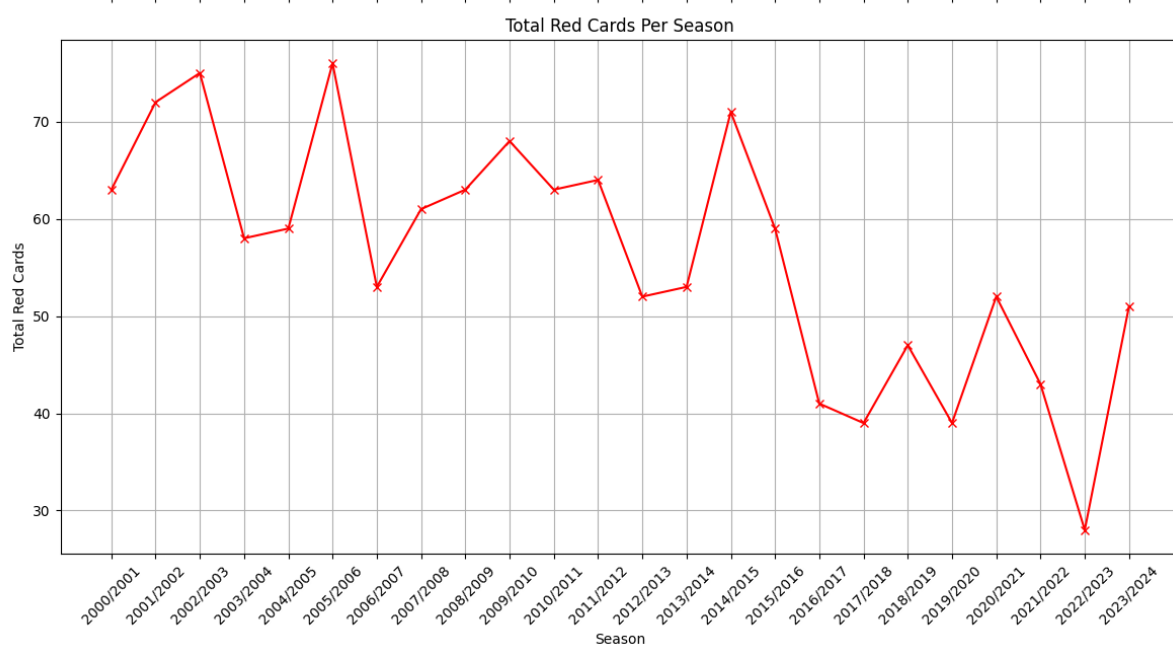
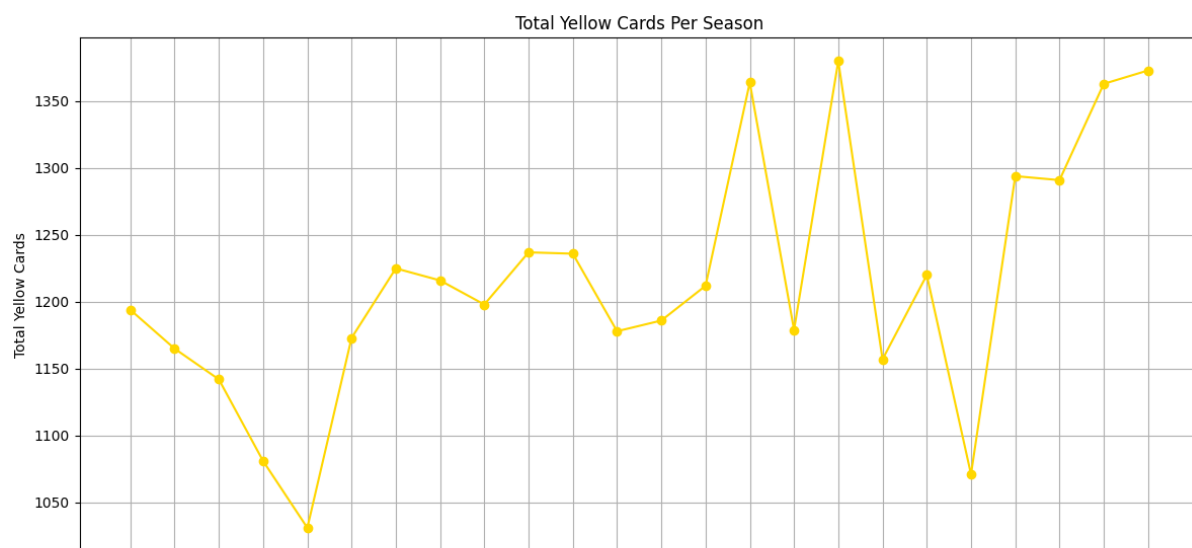
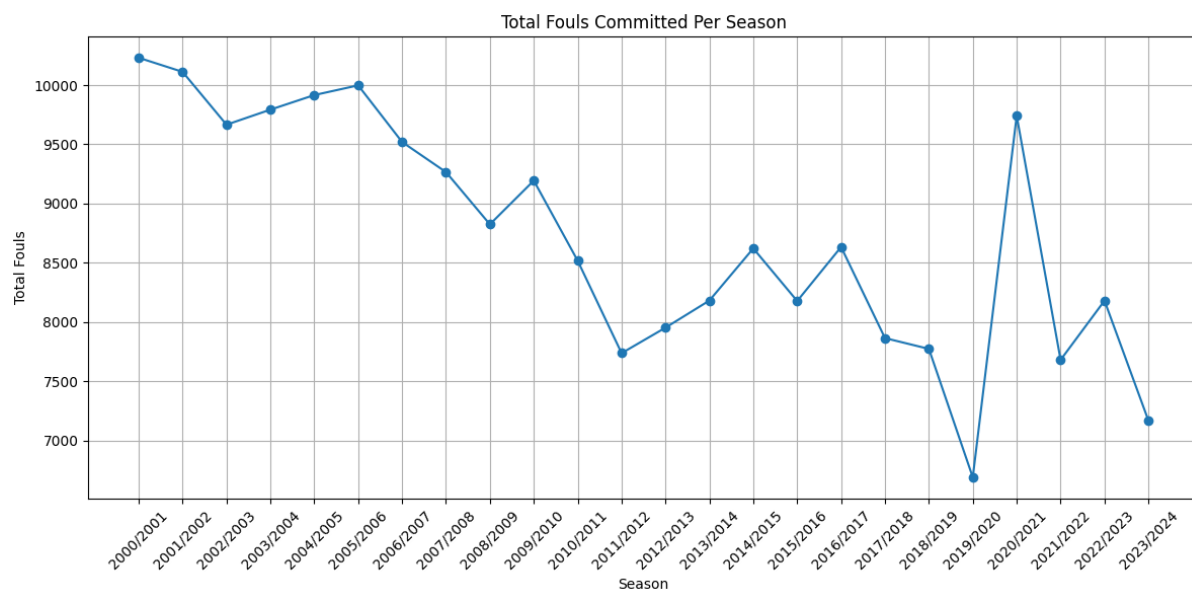
	Total_Home_BookingPoints	Total_Away_BookingPoints	Total_Fouls	\
0	5920	7595	10231	
1	5590	7860	10112	
2	5675	7620	9666	
3	5310	6950	9793	
4	4885	6900	9916	
5	5665	7965	9998	
6	5725	7850	9520	
7	5885	7800	9266	
8	5800	7755	8825	
9	5835	8235	9194	
10	6095	7840	8518	
11	5855	7525	7738	
12	5800	7360	7953	

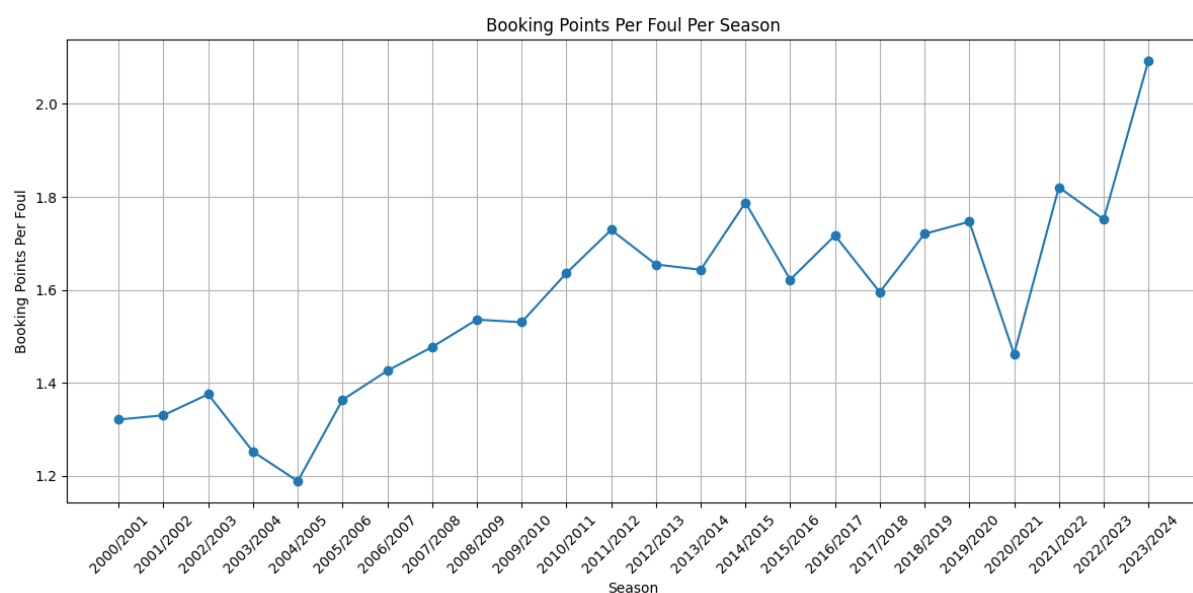
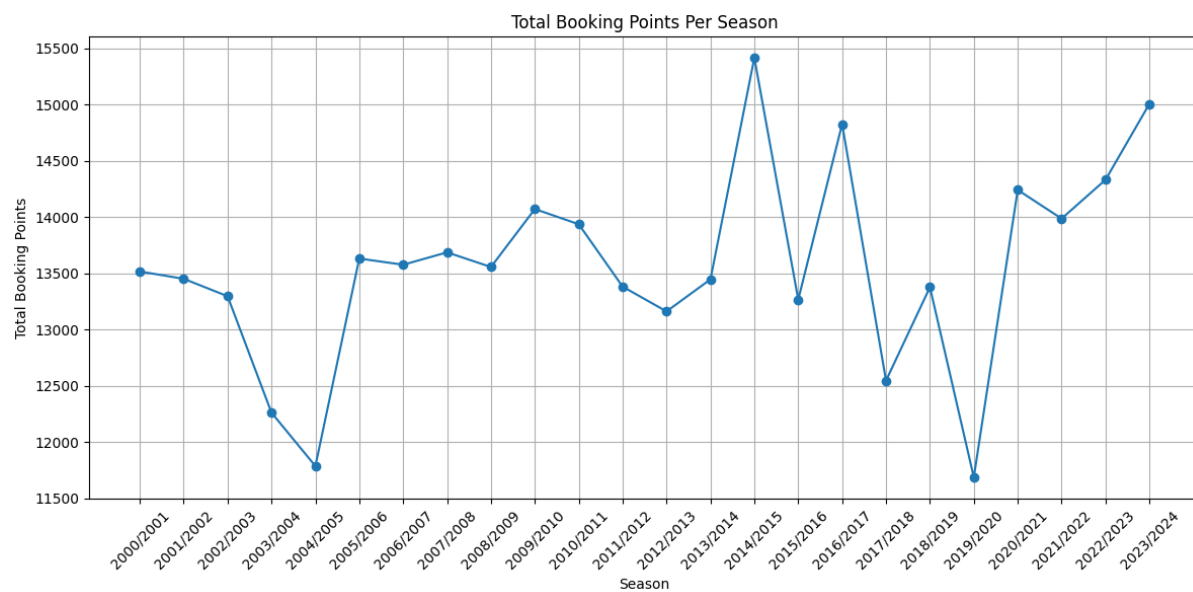
13	5830	7615	8182
14	6840	8575	8622
15	6125	7140	8178
16	7155	7670	8634
17	6045	6500	7865
18	6250	7125	7774
19	5470	6215	6690
20	6995	7245	9741
21	6755	7230	7681
22	6800	7530	8181
23	6910	8095	7170

	Total_Yellows	Total_Reds	Total_BookingPoints	BookingPoints_Per_Foul
0	1194	63	13515	1.320985
1	1165	72	13450	1.330103
2	1142	75	13295	1.375440
3	1081	58	12260	1.251915
4	1031	59	11785	1.188483
5	1173	76	13630	1.363273
6	1225	53	13575	1.425945
7	1216	61	13685	1.476905
8	1198	63	13555	1.535977
9	1237	68	14070	1.530346
10	1236	63	13935	1.635947
11	1178	64	13380	1.729129
12	1186	52	13160	1.654721
13	1212	53	13445	1.643241
14	1364	71	15415	1.787868
15	1179	59	13265	1.622035
16	1380	41	14825	1.717049
17	1157	39	12545	1.595041
18	1220	47	13375	1.720479
19	1071	39	11685	1.746637
20	1294	52	14240	1.461862
21	1291	43	13985	1.820726
22	1363	28	14330	1.751620
23	1373	51	15005	2.092748

Mean yellow cards per season: 1215.25

Mean red cards per season: 56.25





5)

	Season	Total_Home_Goals	Total_Away_Goals	Total_HalfTime_Home_Goals
0	2000/2001	587	405	261
1	2001/2002	557	444	257
2	2002/2003	570	430	253
3	2003/2004	572	440	262
4	2004/2005	570	405	253
5	2005/2006	555	389	272
6	2006/2007	552	379	258
7	2007/2008	581	421	244
8	2008/2009	532	410	233
9	2009/2010	645	408	283
10	2010/2011	617	446	276
11	2011/2012	604	462	267
12	2012/2013	592	471	246
13	2013/2014	598	454	266

14	2014/2015	560	415	277
15	2015/2016	567	459	256
16	2016/2017	607	457	268
17	2017/2018	582	436	231
18	2018/2019	596	476	258
19	2019/2020	465	375	206
20	2020/2021	625	593	313
21	2021/2022	575	496	259
22	2022/2023	621	463	288
23	2023/2024	575	471	234

	Total_HalfTime_Away_Goals	Total_SecondHalf_Home_Goals	\
0	181	326	
1	195	300	
2	182	317	
3	198	310	
4	174	317	
5	170	283	
6	162	294	
7	171	337	
8	165	299	
9	179	362	
10	200	341	
11	197	337	
12	218	346	
13	197	332	
14	185	283	
15	201	311	
16	194	339	
17	196	351	
18	218	338	
19	168	259	
20	271	312	
21	224	316	
22	214	333	
23	194	341	

	Total_SecondHalf_Away_Goals	Home_BookingPoints	Away_BookingPoints	\
0	224	5920	7595	
1	249	5590	7860	
2	248	5675	7620	
3	242	5310	6950	
4	231	4885	6900	
5	219	5665	7965	
6	217	5725	7850	
7	250	5885	7800	
8	245	5800	7755	
9	229	5835	8235	
10	246	6095	7840	
11	265	5855	7525	
12	253	5800	7360	
13	257	5830	7615	
14	230	6840	8575	
15	258	6125	7140	
16	263	7155	7670	
17	240	6045	6500	

18	258	6250	7125
19	207	5470	6215
20	322	6995	7245
21	272	6755	7230
22	249	6800	7530
23	277	6910	8095

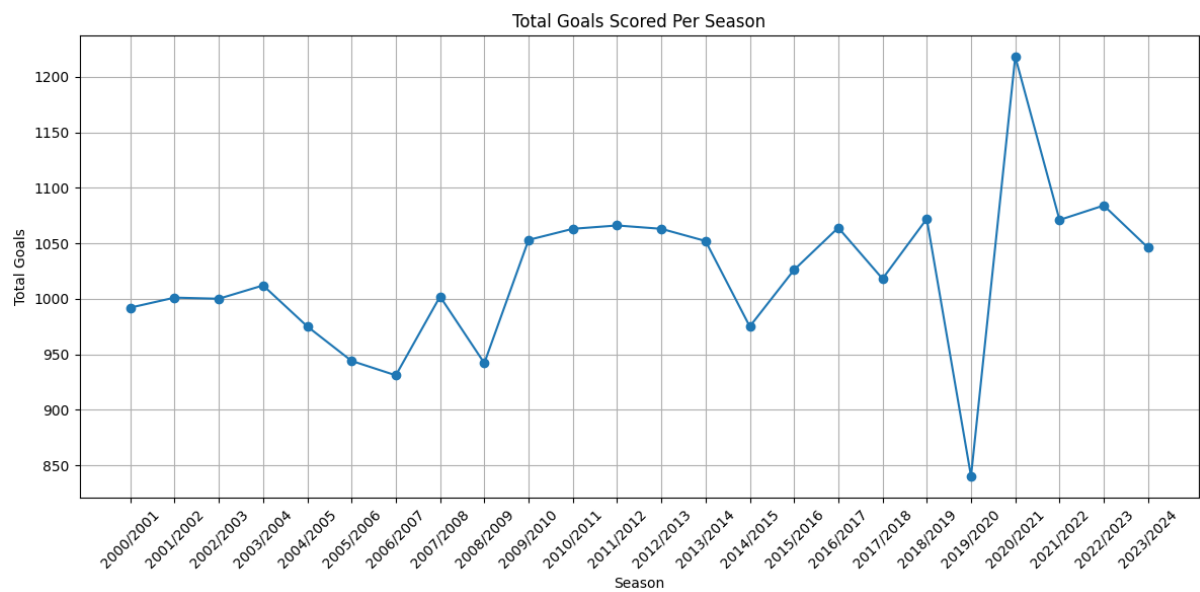
	Total_Home_Fouls	Total_Away_Fouls	Total_Goals	Total_HalfTime_Goals \
0	4932	5299	992	442
1	4891	5221	1001	452
2	4791	4875	1000	435
3	4742	5051	1012	460
4	4730	5186	975	427
5	4938	5060	944	442
6	4686	4834	931	420
7	4570	4696	1002	415
8	4300	4525	942	398
9	4423	4771	1053	462
10	4175	4343	1063	476
11	3830	3908	1066	464
12	3895	4058	1063	464
13	3988	4194	1052	463
14	4273	4349	975	462
15	3822	4356	1026	457
16	4204	4430	1064	462
17	3883	3982	1018	427
18	3858	3916	1072	476
19	3261	3429	840	374
20	4988	4753	1218	584
21	3821	3860	1071	483
22	4027	4154	1084	502
23	3484	3686	1046	428

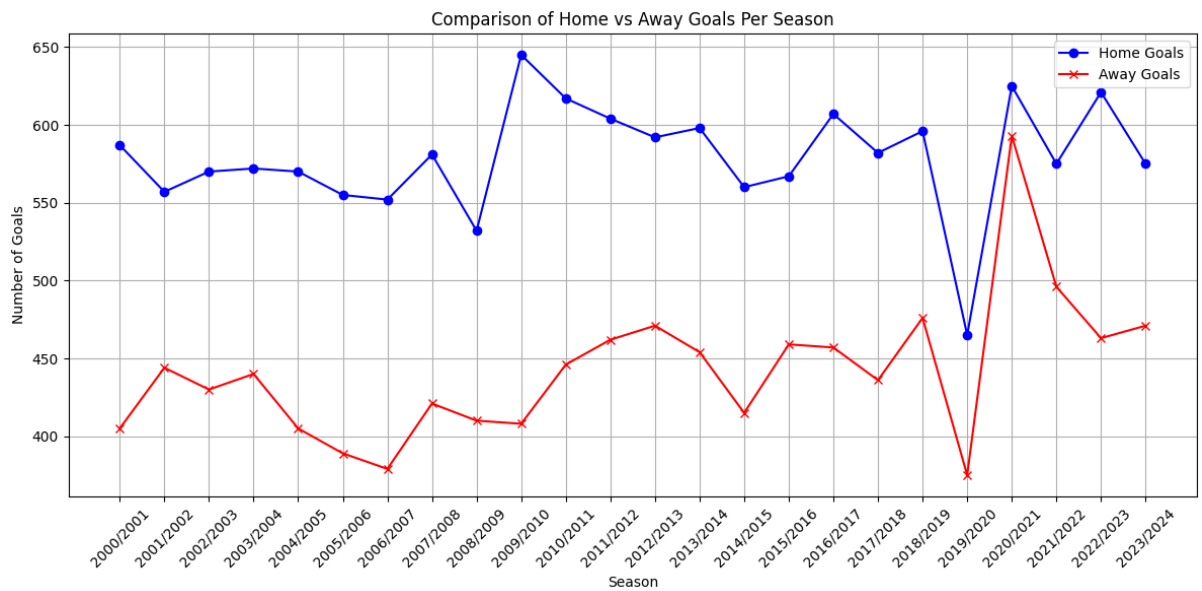
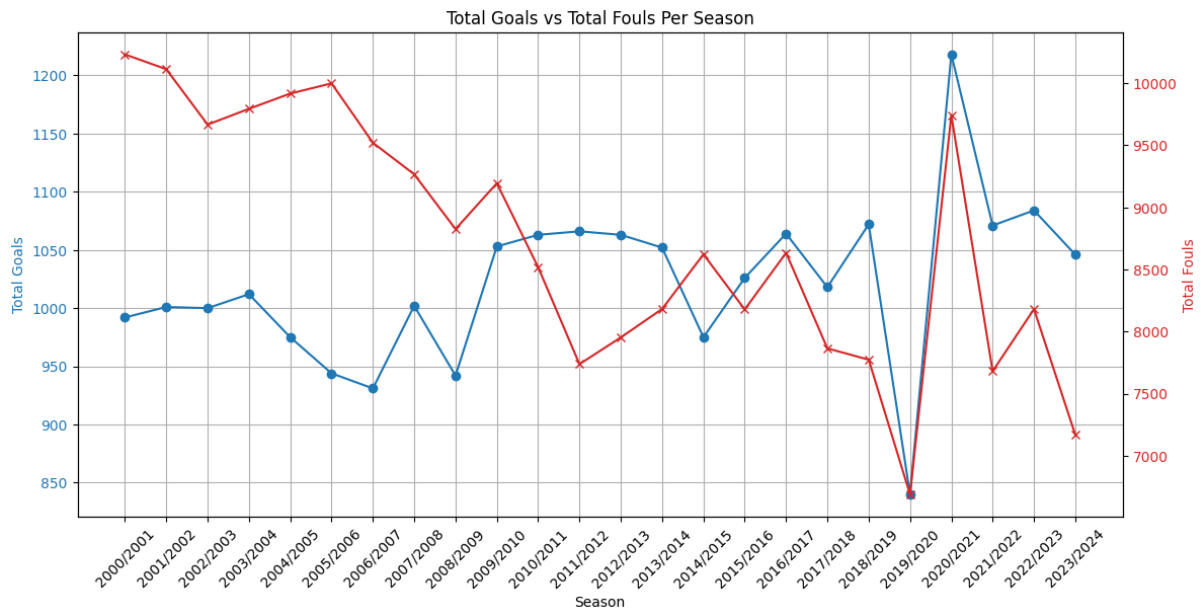
	Total_SecondHalf_Goals	HalfTime_SecondHalf_Goal_Diff \
0	550	108
1	549	97
2	565	130
3	552	92
4	548	121
5	502	60
6	511	91
7	587	172
8	544	146
9	591	129
10	587	111
11	602	138
12	599	135
13	589	126
14	513	51
15	569	112
16	602	140
17	591	164
18	596	120
19	466	92
20	634	50
21	588	105

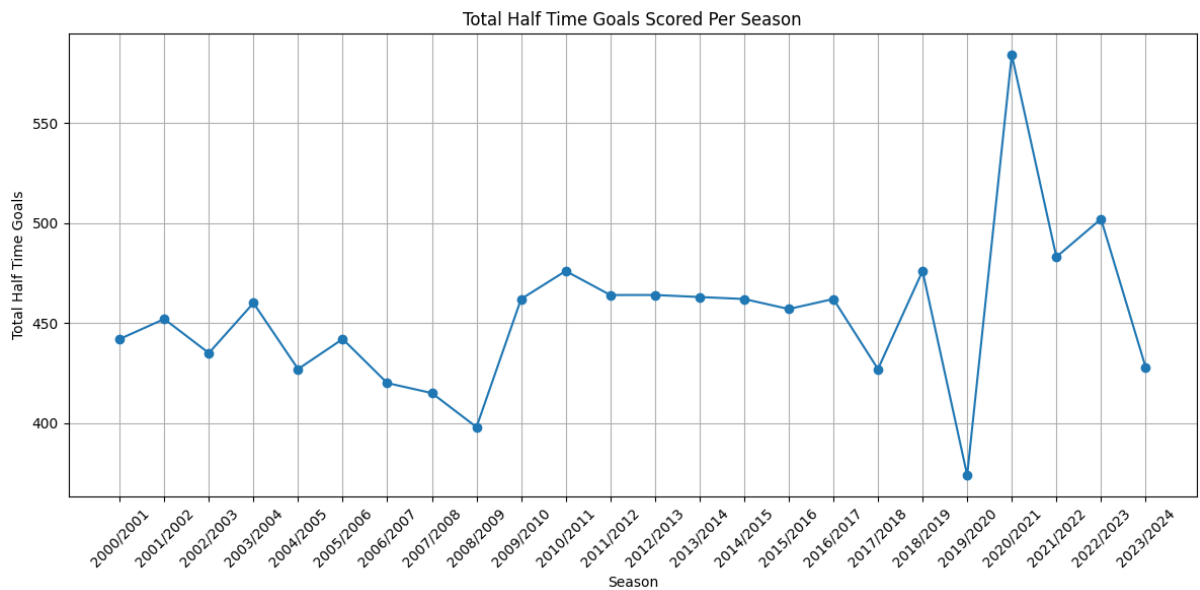
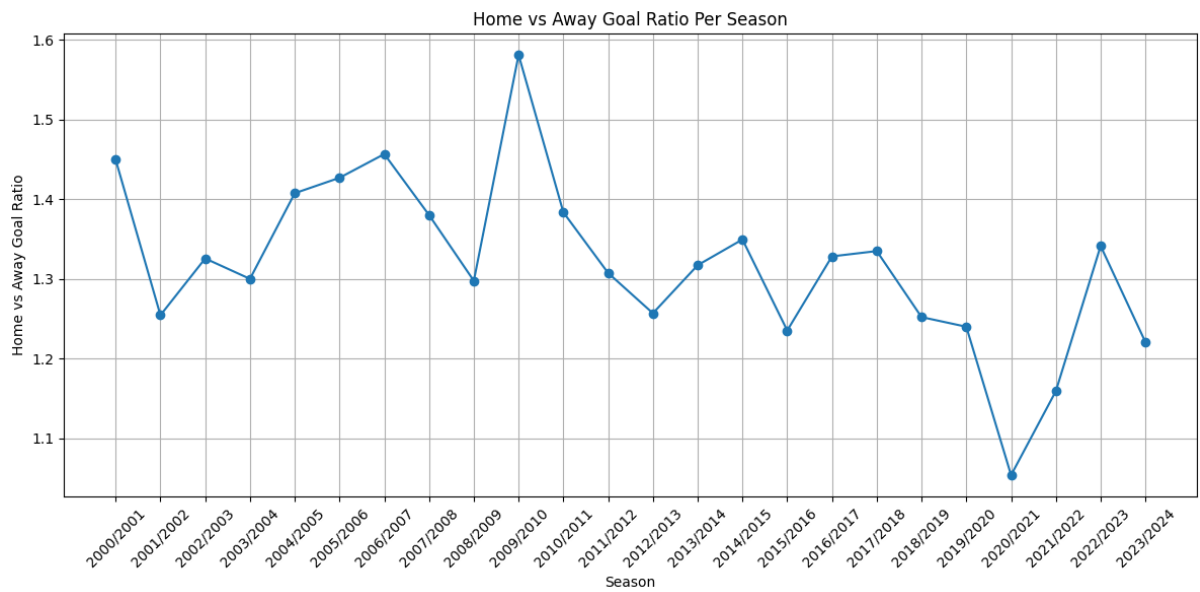
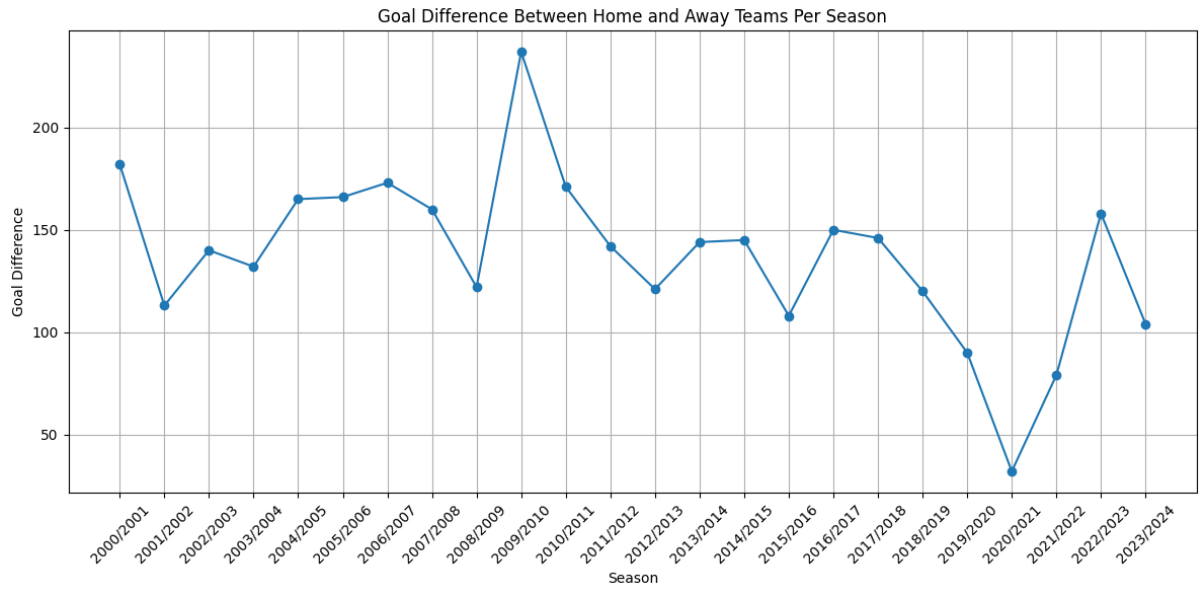


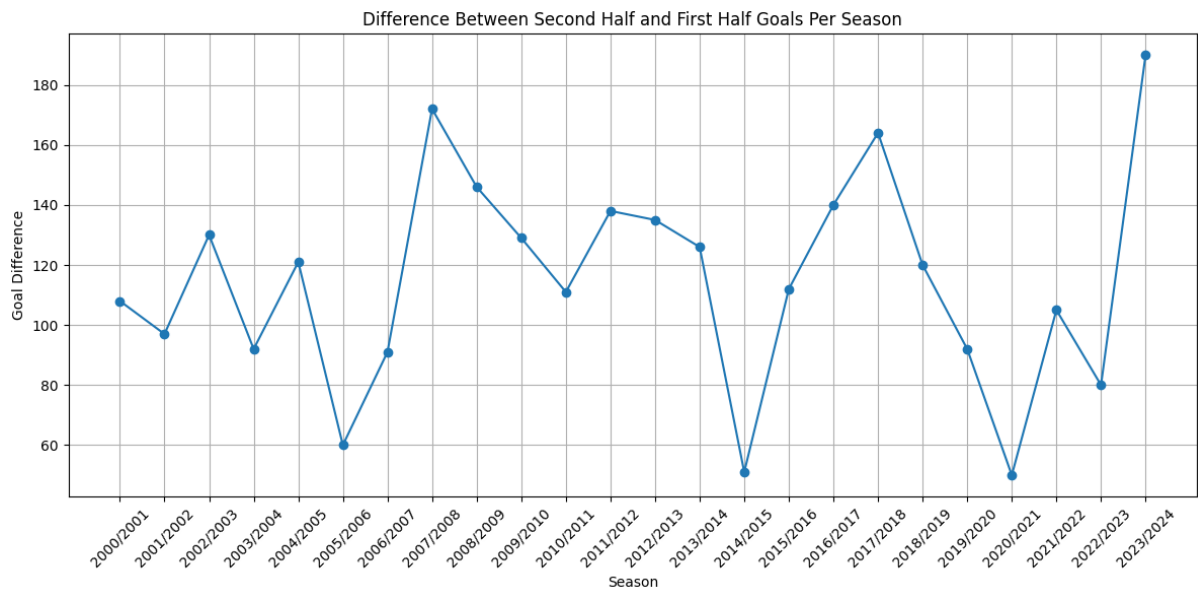
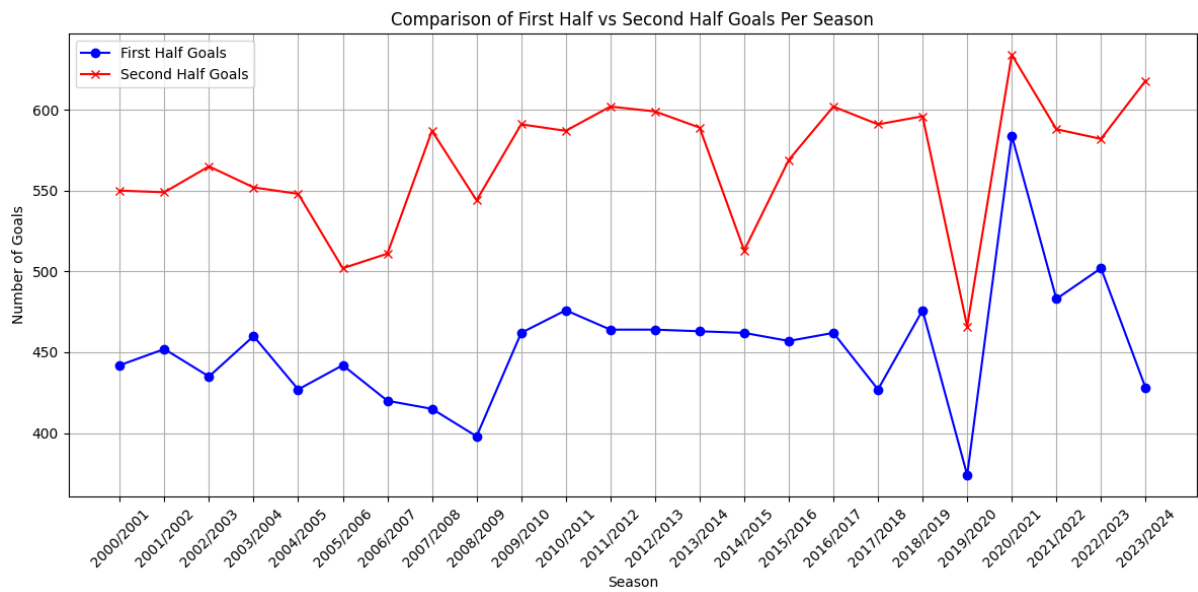
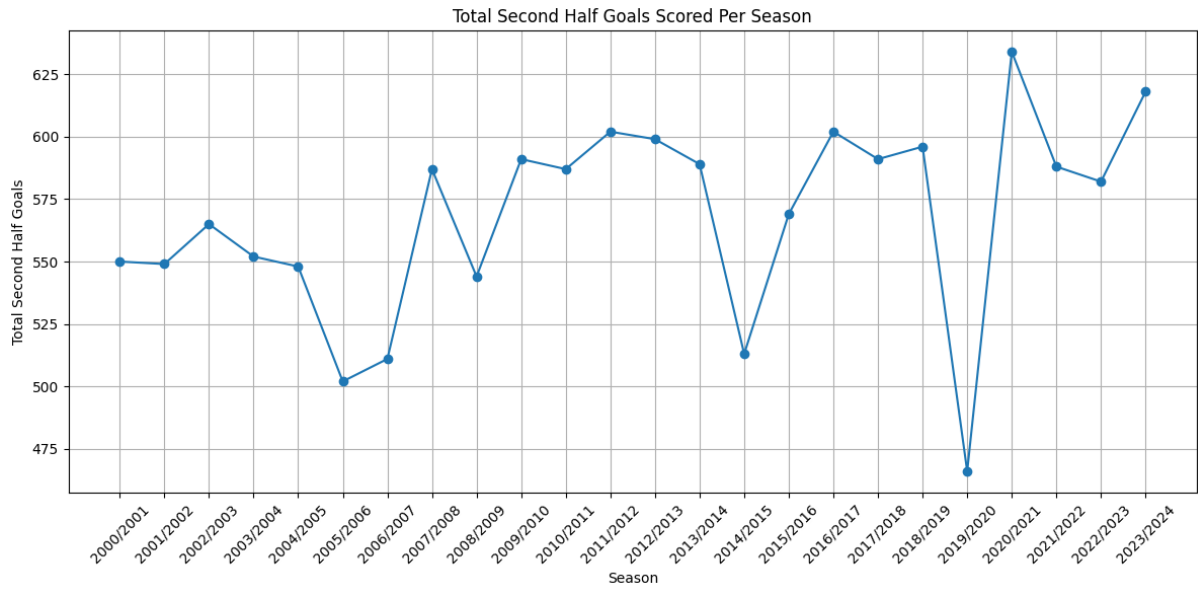
22	582	80
23	618	190

	Home_Away_Goal_Ratio	Goal_Diff	Total_BookingPoints	Total_Fouls
0	1.449383	182	1351.5	10231
1	1.254505	113	1345.0	10112
2	1.325581	140	1329.5	9666
3	1.300000	132	1226.0	9793
4	1.407407	165	1178.5	9916
5	1.426735	166	1363.0	9998
6	1.456464	173	1357.5	9520
7	1.380048	160	1368.5	9266
8	1.297561	122	1355.5	8825
9	1.580882	237	1407.0	9194
10	1.383408	171	1393.5	8518
11	1.307359	142	1338.0	7738
12	1.256900	121	1316.0	7953
13	1.317181	144	1344.5	8182
14	1.349398	145	1541.5	8622
15	1.235294	108	1326.5	8178
16	1.328228	150	1482.5	8634
17	1.334862	146	1254.5	7865
18	1.252101	120	1337.5	7774
19	1.240000	90	1168.5	6690
20	1.053963	32	1424.0	9741
21	1.159274	79	1398.5	7681
22	1.341253	158	1433.0	8181
23	1.220807	104	1500.5	7170

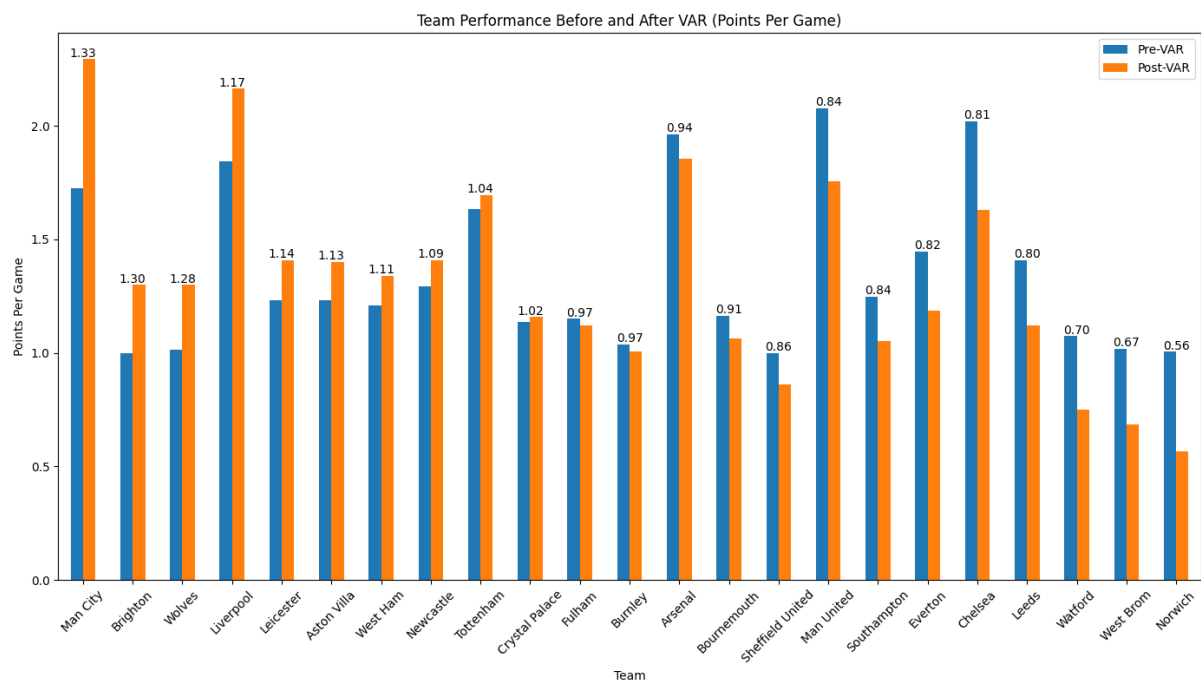








6)



7)

IProgress not found. Please update jupyter and ipywidgets. See [https://ipywidgets.readthedocs.io/en/stable/user\\_install.html](https://ipywidgets.readthedocs.io/en/stable/user_install.html)  
The CATE is estimated to be: 0.2255061182320472  
saving the CATE variable...  
Saving the CATE variable to a file...  
CATE variable saved to file.

8)

Number of valid data points: 50  
Mean value: 0.1836  
Standard Deviation: 0.0416  
95% Confidence Interval: (0.17209626037573605, 0.1951643071179957)  
Min CATE: 0.10071708016917981, Max CATE: 0.28927828538016265  
Percentiles (25%, 50%, 75%): [0.14754394 0.18342544 0.21548481]  
IQR: 0.0679408686932998  
Skewness: 0.15084151234684898  
Kurtosis: -0.48194819972482295