Liverpool 20/21 Overview

Mathematical Modelling of Football - Group 5

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EPL 2021/22 Performance Expectations

Summary

Based on performance metrics from the 2019/20 and 2020/21 seasons, this report suggests that for the 2021/22 season, Liverpool FC have a 7% chance of winning the league, a 62% chance of obtaining champions league football, a 78% chance of obtaining some form of european football and a 16% chance of obtaining no european football.

Targets Metrics - 2021/22 with Home Advantage & VVD Present

Target	Probability	Mean Points	SD Points	Mean Scored	SD Scored	Mean Conceded	SD Conceded	Mean GD	SD GD
Champions	0.07	80.83	4.18	76.03	6.95	37.11	5.69	38.92	6.84
Champions League	0.55	74.20	5.28	71.77	7.79	39.99	5.82	31.78	8.48
Europa League	0.29	65.26	3.33	65.95	7.38	44.04	5.35	21.92	6.74
No Europe	0.16	57.83	3.95	59.92	6.95	47.07	6.37	12.85	7.37

Factors

1000 simulated seasons have been generated to predict LFC's 2021/22 performance. Modellling the 2021/22 season is complicated by the reintroduction of crowds following the restrictions imposed by Covid related lockdowns, which had a detrimental effect on home advantage for all teams. Appendix A shows the decline in Liverpool FC's home scoring rate and increase in away scoring rate, reflecting this effect.

The 2020/21 season was also detrimentally affected by the absence of Virgil Van Dijk for the majority of the season, as shown in Appendix A. The rise in both away and home concession rates for the 2020/21 season compared to the title winning 2019/20 season could be attributed to his absence.

The prediction model for the upcoming season has taken both of these factors into account and has been modified accordingly to include the return of crowds and the presence of Virgil Van Dijk for all 38 games of the upcoming season. Including these factors improves Liverpool FC's title winning probability by 2%, which is not insignificant. Manchester City however, as they win 71.2% of simulated seasons.

Performance Targets

In order to put the team in the statistical range of a title winning performance, the team should meet the following target metrics. The ideal target metrics are the performance targets that result in a statistically equal chance of winning the league versus obtaining a champions league place (2nd-4th). Any performance above this ideal target increases the probability of becoming champions and decreases the probability of coming 2nd-4th. It should be noted that these ideal target metrics were surpassed during the title winning 2019/20 season, suggesting that these are realistic and attainable.

Performace Targets 2021/22

	Minimum	Minimum Rate	Ideal	Ideal Rate
Points	72.5	1.91	76.8	**2.02**
Score	62.1	1.63	72.5	**1.91**
Concede	48.5	1.28	38.5	**1.01**

Comparison to Manchester City

Looking at the table in the last three years, Manchester City was Liverpool's biggest rival. In the 2020/21 season they were above any other team when it comes to goals, goals allowed, xG and xGA. On the other hand LFC had their problems especially in xGA - they were 7th in the league as shown below.

Liverpool stats in 20/21 compared to Man City

- Goals: 68 (3rd in PL)
- Goals allowed: 42 (4th)
- xG: 72.21 (2nd)
- xGA: 47.30 (7th)

- Goals: 83 (1st in PL)
- Goals allowed: 32 (1st)
- xG: 77.72 (1st)
- xGA: 30.61 (1st)

LFC overperformed their xGA, but lacked finishing as their xG shows they should score 4 goals more in this season. This points out two aspects that the team should focus on before next season if they want to improve performance - better finishing and sealing defence.

Improving set pieces

Another factor that could be improved is set pieces efficiency. Liverpool scored only 2 goals on 45 attempts from non-corner set pieces and none from direct free kicks (Appendix B). Total xG from these situation types is 3.19 which is 18th lowest score - only Arsenal and Sheffield United were worse in that matter.

No.	Situation	Shots	G	xG	xG/Sh
1	Open play	466	49	59.45 +10.45	0.13
2	From corner	94	11	9.12 -1.88	0.10
3	Set piece	23	2	1.85 -0.15	0.08
4	Direct free kick	22	0	1.34 +1.34	0.06
5	Penalty	6	6	4.57 -1.43	0.76

Liverpool's shot and goal creation by situation types - 2020/21

After simulating 1000 seasons using xG data from 2020/21 Liverpool had 9.7% chance of winning the league and 72.8% chance of finishing in Top 4 as shown in Appendix A. If LFC's set pieces xG improved by 15% this probability rises to 10.9% and 73.3% respectively.

Penalty "luck"?

Another factor is penalty saving. For 8 conceded penalties by Liverpool's defence in the 2020/21 season, only 4 were successful. What's interesting, only one penalty was in fact saved - 3 of them were missed by takers. After analysis of scores in matches that these unsuccessful penalties occured and assuming that they were converted into a goal, Liverpool would have two points less than they really had or even more, because it could affect teams' attitude even if final outcome was the same as before penalty.

Corners Performance

Liverpool were the corner kings of the Premier League during their title-winning season. As it shows in generalized linear model regression results using Poisson model (full table shows in Appendix), the coefficient values in following figures show whether clubs have significantly more or less corners than Liverpool in season 20/21.

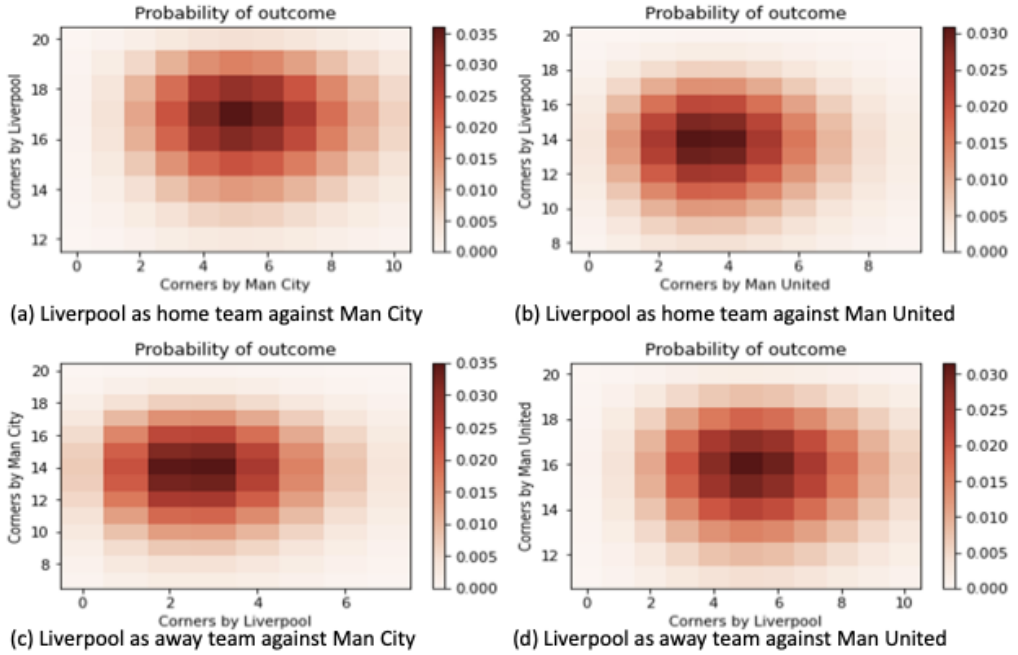
Liverpool had more corners as a home team than other clubs. Only Chelsea, Manchester City, and Wolves have fewer corners as an away team compared to Liverpool. One thing worth mentioning is Manchester City as home team is over performing than Liverpool but underperforming than Liverpool as away team with coefficient -0.481.

	coef	std err	z	P>|z|	[0.025	0.975]
team [T.Man City]	0.1284	0.085	1.508	0.132	-0.038	0.295
opponent [T.Man City]	-0.4810	0.128	-3.745	0.000	-0.733	-0.229

Generally, Liverpool had more corners as a home team than other clubs. Considering the p-value in the fourth column, most of the club statistically underperforms compared to Liverpool when they are the home team. However, Liverpool has weaknesses on corners as an away team. Most of the club statistically over performing compared to Liverpool when they are an away team.

Simulate matches in terms of Corners

From above, it is allowed to predict how many corners Liverpool will have in the next season as home team and away team. Take Manchester City and Manchester United as examples, who are the main competitors of Champion in recent years. In higher probability outcomes shown in subfigure (a) and (b), Liverpool as home team will have 16~18 corners against Manchester United, but as an away team against Manchester City might have only 2~3 corners. As for another opponent in subfigure (c) and (d), Liverpool as home team will have 14 corners against Manchester United at around 0.03 probability, but as an away team against Manchester United might have 4~6 corners, which is higher against Manchester City as away team.



(a) Liverpool as home team against Man City

(b) Liverpool as home team against Man United

(c) Liverpool as away team against Man City

(d) Liverpool as away team against Man United

In conclusion, Liverpool is basically underperforming while away in terms of corners, especially against Manchester City. It is better to find a way to improve attacking set pieces next season if Liverpool are eager to win another championship.

Set Pieces

Comparsion with the other top teams

By going through different types of set pieces, and comparing Liverpool's performance with the other two top 3-teams, Manchester United and Manchester City (figure 1, appendix D), it was possible to get an understanding of Liverpool's strength and weakness, and try to find a reason for these numbers in the data from season 20/21.

Throw-ins and penalties

Since throw-ins didn't give that many goals for the team that used long throw-ins into the penalty area, maximum two for the last season (table 1 and 2 in appendix D), this will not be analyzed further in this report. The penalty kicks gave more goals, and Liverpool did quite well in this discipline, both when it came to won penalties and conceded penalties (table 3 and 4 appendix D). But since penalties don't contain that much information to analyse, this report will not go deeper into this area.

Corners

This leaves us with free kicks and corners. If we start with corners, we could see that Liverpool was very successful at winning corners and also not giving corners away (table 5 and 6 appendix D). They were only outperformed by Manchester City. Liverpool was also good in turning the corners into goals, especially from the left where they scored 7 goals out of 10. At the same time, Liverpool was really bad at defending corners. The challenge is now to try to understand why, based upon the data we have available. First of all, we can start looking at the position of the ball after a corner which gives an overview in the form of a heat map of "successful" corners compared to them that are not leading to a goal or shot (heatmap section 1 in appendix C). Next is to try to describe a corner by a metric that gives an indication of how good the corner kicks are aimed (metric 1 in appendix C). From this we can see that a corner that is put in a location where the total distance to three of your teammates is less than three of the opponent players, has a bigger chance of resulting in a goal. By evaluating the data from season 20/21 we find that a corner that does not result in a goal or a shot, is closer to the attacking team only 20.0% of the times from left, and 18.0% from right, meanwhile a corner that results in a goal, the attacking team is closer 38.9% of the times from left and 26.8% from a right corner.

Another metric for a successful corner could be to look at the ability to be first at the ball when it is played inside the penalty area (metric 2 in appendix D). If we look at goals scored from corners into penalty area, we can see that the attacking team was 49% of the times first to the ball when corner came from left and 60% when it came from the right, meanwhile corners that did not result in any goal or shor the attacking team was only first on 19.0% of the corners from left and 18.0% from right.
How did Liverpool perform according to these metrics?
20.4% of the times they were placing the ball closer to their teammates from left and 25.7% from the right. When defending, the opponents were closer 20% of the time from left corners and 26.3% from right corners. When it comes to being first to the ball in the penalty area, Liverpool was first 29.5% of the time from left corners and 37.2% from right. Here we could also see that they gave their opponents the initiative of the ball in 44% of the corners from the left and 41.3% from right. If we compare that with Manchester City, they only let the opponents to be first in 29.0% of the corners from the left and 21.2% from the right.

Free kicks

Here we can start by studying where on the pitch Liverpool got their free kicks. As we can see in heatmap section 2 in appendix D they did get most of their own free kicks down on the defensive half of the pitch and it was also here where they conceded free kicks. One thing that they could try to improve is to get some more free kicks in more dangerous areas, since they are good at turning them into goals . If we then look at the same metrics as we used when studying the corners, we could see that for all free kicks into the penalty area that resulted in a goal for season 20/21, the 3 nearest attackers were closer to the ball

than the 3 nearest defenders in 28.6% of the free kicks. When it did not result in any goal or shots, the attackers were closer only 17.1% of the time. Liverpool did not do any good here, since the Liverpool players were only closer 16.7% of the times in the penalty area. Manchester City were closer 20% of the times. Also when looking at all freekicks during the 20/21 season that resulted in a goal, the attackers were first to the ball in the penalty area 54.2% of the times, meanwhile the free kicks that didn't lead to any shot or goals, the attackers just managed to be first in 7.8% of them. Liverpool was first to the ball 23.1% of the times, but let the opponents be first 25.8% of the free kicks when defending. Comparing again with Manchester City, they were first on the ball 36% of the free kicks when attacking and let their opponents be first only 15.6% of the times when defending.

Conclusion

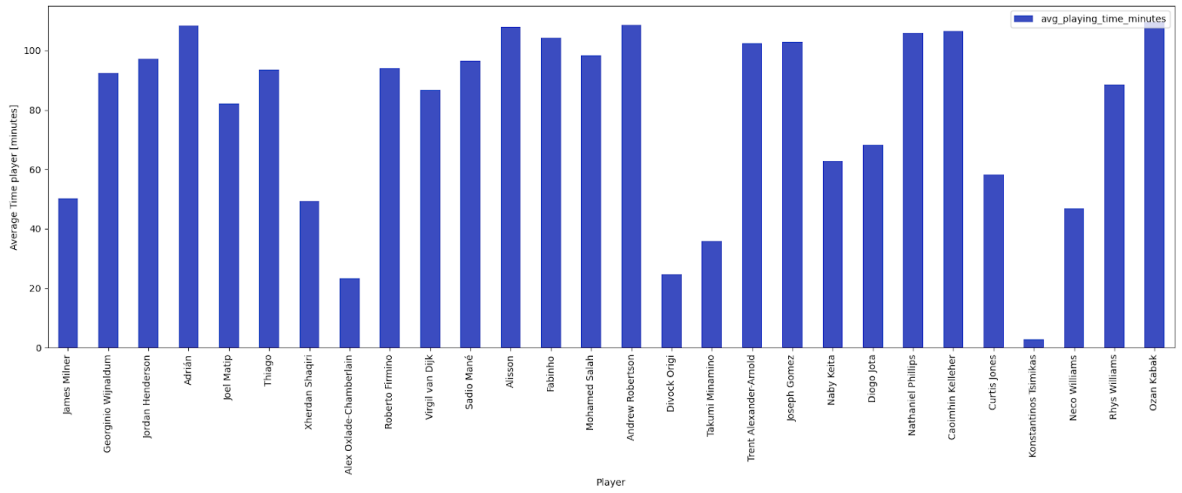
As we can see in figure 1, Liverpool suffer from poor defense of their own penalty area when it comes to corners and free kicks. If they were more alert and quicker on the ball, they should probably decrease the amount of conceded goals from these situations. When attacking, they could improve the precision in their free kicks into the penalty area.

Scouting Metrics of Liverpool's Players

To make a ranking of the players of Liverpool, various simple scouting merics are applied on the given dataset. Understanding how the event data is correlated to the freeze frames was a challenging task. A substantial part of the task is spent on feature creation out of the existing event data. For example, time difference was calculated by subtracting timestamp values between the consecutive events.

Average Time Played

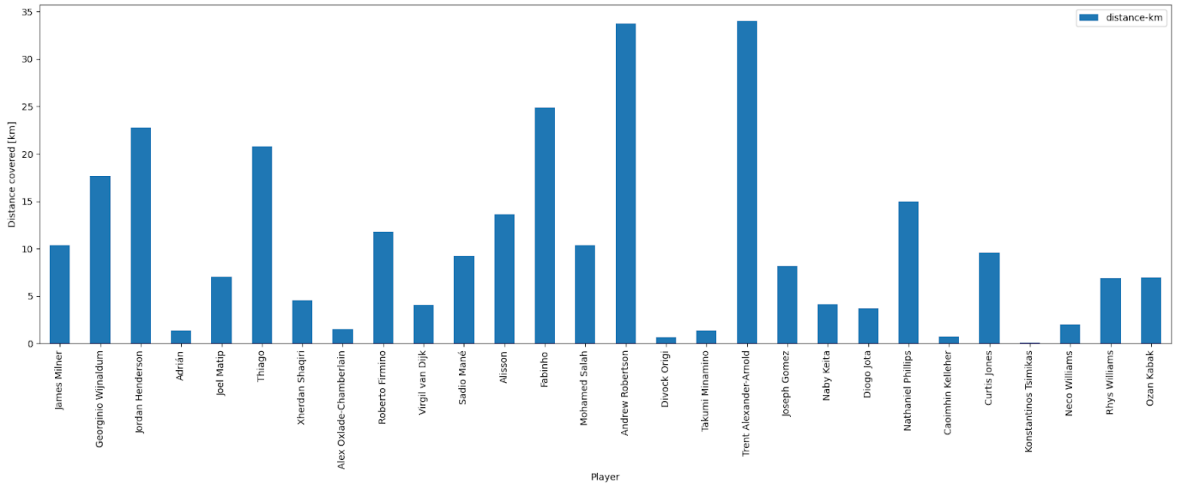
First scouting metrics is average time played where mean of playing time of each player of Liverpool are compared in a bar chart.



Above figure demonstrates that the majority of the players are playing more than 60 minutes on average. Few players like Konstantinos Tsimikas, Divock Origi, Takumi Minamino and Alex Oxlade-Chamberlain are playing for under 40 minutes on average.

Total Distance Covered

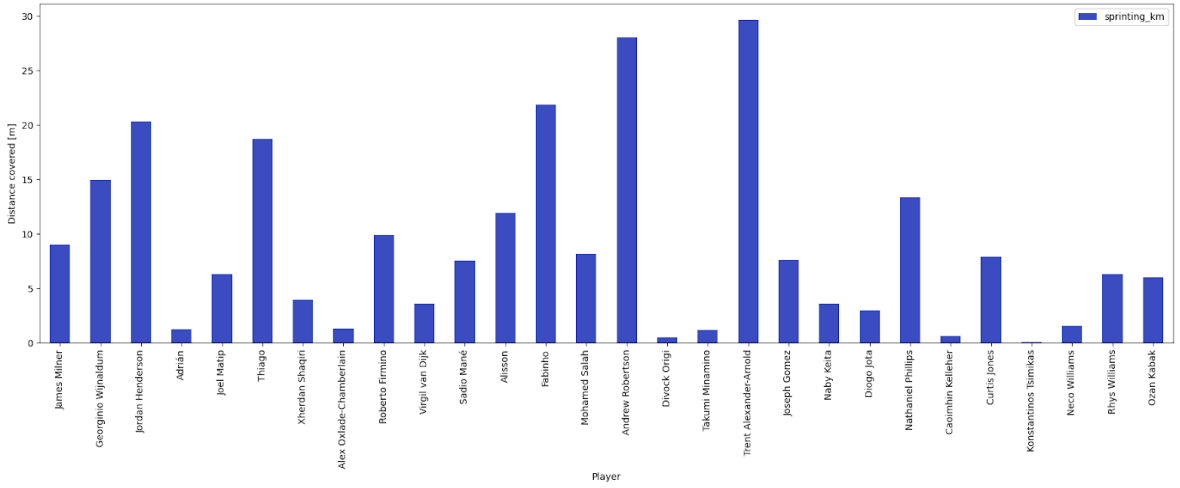
Next metric is to measure how high the distance is covered by the players. A player covering a higher distance is more likely to be more fit than other players.



Above bar chart shows that the top three players in terms of total distance covered are Trent Alexander-Arnold, Andrew Robertson and Fabinho. Interestingly, Trent and Andrew both are the defenders and Fabinho is the midfielder. Players in the forward like Roberto Firmino and Mohamed Salah cover less distance comparatively.

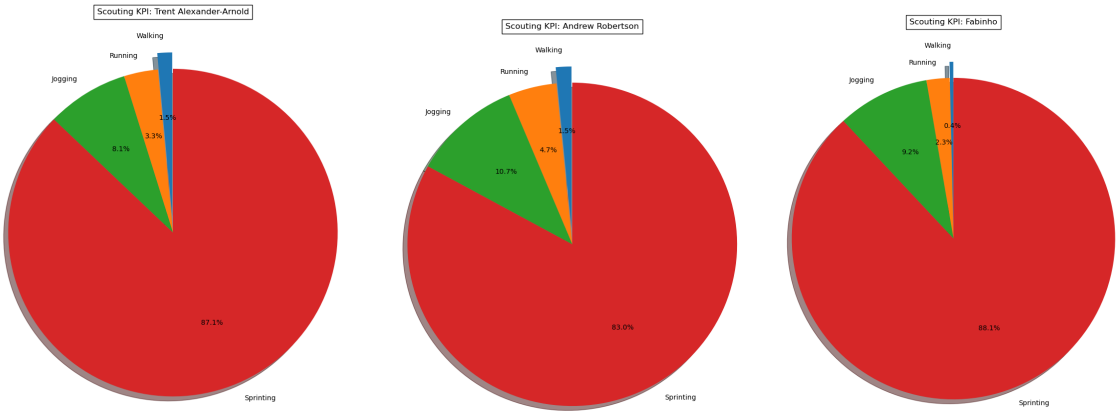
Sprinting

Players ability to sprint is a major metric and the following bar chart shows that Trent Alexander-Arnold, Andrew Robertson and Fabinho do very well on sprinting.



Comparison of top 3 players

From the above KPIs, top 3 players are chosen and compared by using the following pie charts.



Above pie-charts show that Trent Alexander-Arnold covered 87.1% of total distance covered by sprinting, 3.3% running, 8.1% jogging and 1.5% walking. On the other hand, Andrew Robertson covered 83% of total distance covered by sprinting, 4.7% running, 10.7% jogging and 1.5% walking. Lastly, Fabinho covered 88.1% of total distance covered by sprinting, 2.3% running, 9.2% jogging and 0.4% walking.

Conclusion

From the above statistics, it can be concluded that Trent Alexander-Arnold is the top player of Liverpool. For Liverpool to perform better, players in the forward should be more active and try harder to score by covering more distance.

Appendix A

2019/20 Season & Home Advantage

Performance Metrics - 2019/20

Home/Away	Score Rate	SD Score Rate	Concede Rate	SD Concede Rate
Home 2019/20	2.737	1.195	0.842	0.834
Away 2019/20	1.737	1.147	0.895	1.100
Aggregate	2.237	1.171	0.868	0.967

Statistical modelling of this season reveals a significant home advantage ($p<0.05$) and a negative effect of the covid lockdown on scoring rates.

```
Home1                0.229181567 0.06260872  3.66053764 0.0002516866
Lockdown1           -0.006980833 0.07278028 -0.09591654 0.9235868574
```

While there is not enough statistical evidence to prove that lockdown directly had a detrimental effect on Liverpool FC, comparing the team's performance and statistical model of 2020/21, which was effectively plate behind closed doors for the whole season, can be seen.

Performance Metrics - 2020/21

Home/Away	Score Rate	SD Score Rate	Concede Rate	SD Concede Rate
Home 2019/20	1.526	1.349	1.053	1.026
Away 2019/20	2.053	1.615	1.158	1.642
Aggregate	1.789	1.482	1.105	1.334

The 2020/21 season saw a notable drop in the home scoring rate (-44%) compared to 2019/20 and an increase in the away scoring rate (+18.2%). This could be attributed to the lack of crowds being detrimental to the home scoring rate and beneficial to the away scoring rate. The coefficient for home advantage for the 2021 season is lower and incredibly variable.

```
Home1                0.009747   0.062517   0.156 0.876108
`Van Dijk`1          0.629761   0.315925   1.993 0.046219 *
```

The Virgil Van Dijk Effect

Virgil Van Dijk (VVD) played every match of the 2019/20 season. The following season however, saw him only feature in the first six games of the season as he sustained an injury which kept him out of the remainder of the season. Liverpool FC's concession rate both home and away was higher for this season (1.105 GPM vs 0.868 GPM). In order to account for the return of VVD to the first team for the 2021/22 season it is important to attempt to quantify his contribution to the team. The poisson model generated for the 2020/21 season included a binary factor based on whether VVD played; 0 for absent, 1 for selected. The resultant model showed that the presence of VVD had a statistically significant ($p = 0.046219$) positive effect on the scoring rate of the team.

For the 2021/22 season, two modifications were made to the coefficients of the model. The first was to include VVD in every game by changing all of Liverpool's fixtures to a coefficient of 1 based on his presence. Consequently the model will adjust accordingly and raise Liverpool FC's score rate.

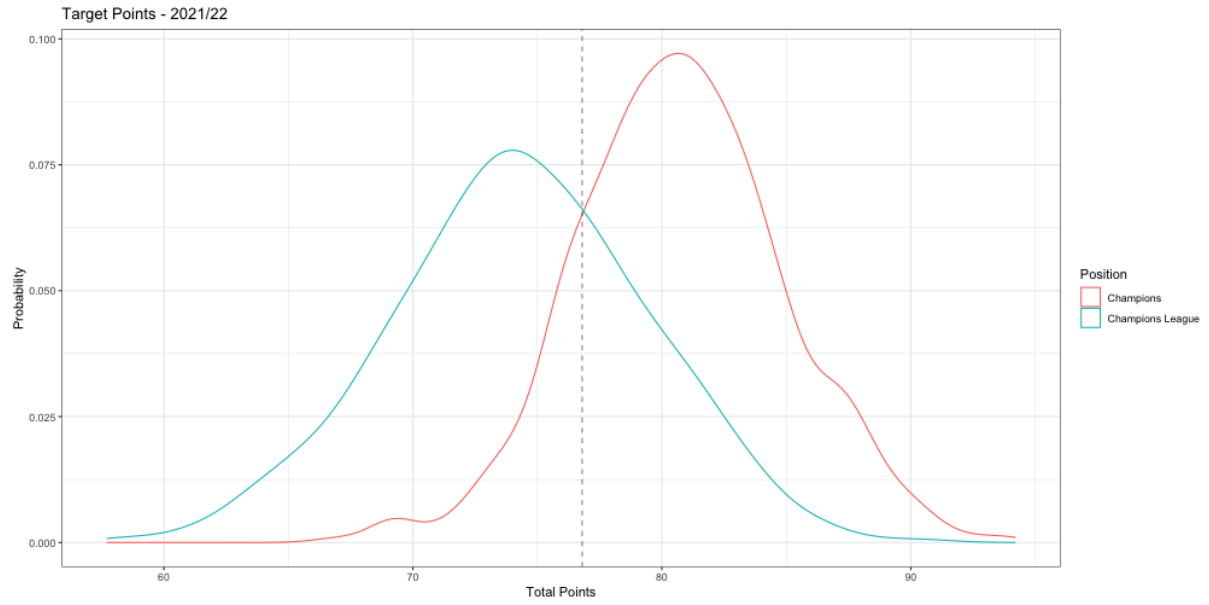
$$\lambda = e^{I}e^{T}e^{O}e^{H_{20/21}}e^{VVD} \times \frac{e^{H_{19/20}}}{e^{H_{20/21}}}$$

The second modification was to replace the home advantage of the 2020/21 season with that of the 2019/20 season. This was done by amending the coefficient for that respective term in the poisson regression model as follows:

where: I = intercept
T = Team
O = Opponent
H_20/21 = Home advantage for 2020/21
H_19/20 = Home advantage for 2019/20

Ideal Performance Targets

The ideal targets discussed in the main section are defined in the following way. The simulated point for the season from 1000 simulations is seen below. At around 70 points, Liverpool begin to win titles. It can be seen however, that for the same points tally, Liverpool FC end up in the Champions League positions (2nd - 4th) instead of champions. The ideal metric is found at the point where the probability of finishing 1st as opposed to 2nd-4th is statistically greater (or equal, at the ideal point). For the case in points, this occurs at around 77, and any further points obtained past this point increase the rate of change of title winning probability while the runner up positions decline further. The same methodology has been applied to goals scored, goals conceded and total goal difference, although they have been omitted here for the sake of brevity.



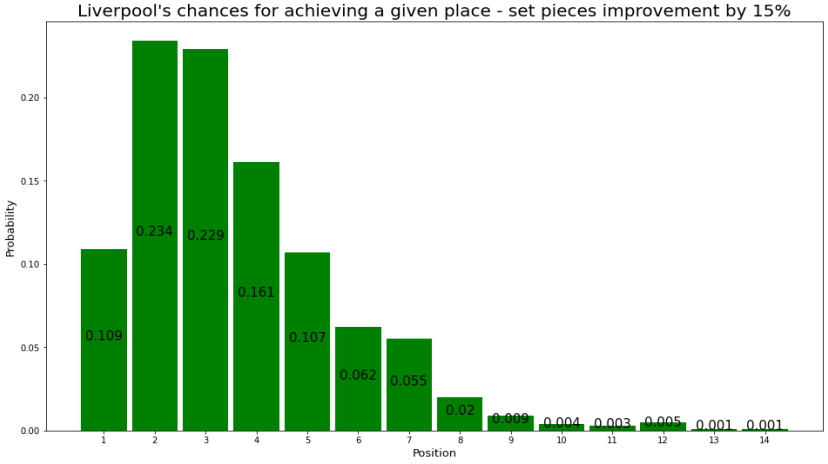
Appendix B

Season simulations with set pieces improvement

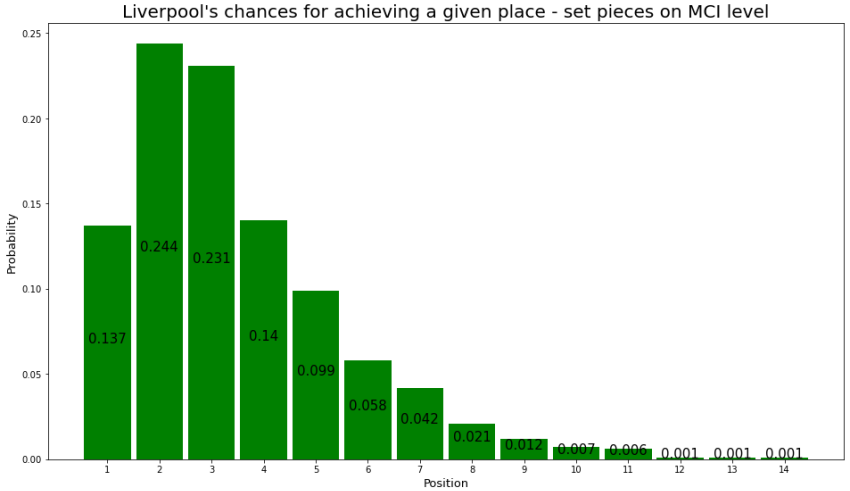
1000 simulations of the 2021/22 season were carried out with Poisson's distribution used in tutorial, but this time xG was used instead of goals. For this, xG data from 20/21 were taken from FBRef.com.

Simulations predicted that LFC is most likely to end the season in third place.

Next step was to add into Liverpool's xG stats 15% of their non-corner set pieces (15% of 3.19 = ~0.479). It was distributed equally to all LFC's matches (around 0.0126 more for each match). After that addition, simulations were re-run. Results can be seen below.



Last part was to use non-corner set pieces xG that was gathered by Manchester City throughout the 2020/21 season - 4.92 instead of 3.19. The difference was distributed in the same way as before. It's a 54% difference, so it can be said that this is a very extreme case.



Appendix C

Generalized Linear Model Regression Results

Generalized Linear Model Regression Results

Dep. Variable:	Corners	No. Observations:	760
Model:	GLM	Df Residuals:	720
Model Family:	Poisson	Df Model:	39
Link Function:	log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-1799.8
Date:	Mon, 01 Nov 2021	Deviance:	1066.4
Time:	20:46:24	Pearson chi2:	994.
No. Iterations:	5		
Covariance Type:	nonrobust		

	coef	std err	z	P>|z|	[0.025	0.975]
Intercept	1.5977	0.103	15.455	0.000	1.395	1.800
team[T.Arsenal]	-0.0928	0.091	-1.023	0.306	-0.271	0.085
team[T.Aston Villa]	-0.2340	0.094	-2.480	0.013	-0.419	-0.049
team[T.Bournemouth]	-0.2622	0.095	-2.755	0.006	-0.449	-0.076
team[T.Brighton]	-0.3607	0.098	-3.698	0.000	-0.552	-0.170
team[T.Burnley]	-0.3919	0.099	-3.969	0.000	-0.585	-0.198
team[T.Chelsea]	-0.0507	0.089	-0.569	0.570	-0.225	0.124
team[T.Crystal Palace]	-0.3584	0.098	-3.667	0.000	-0.550	-0.167
team[T.Everton]	-0.2347	0.094	-2.498	0.012	-0.419	-0.051
team[T.Leicester]	-0.1468	0.092	-1.601	0.109	-0.326	0.033
team[T.Man City]	0.1284	0.085	1.508	0.132	-0.038	0.295
team[T.Man United]	-0.2287	0.094	-2.438	0.015	-0.413	-0.045
team[T.Newcastle]	-0.5132	0.103	-5.002	0.000	-0.714	-0.312
team[T.Norwich]	-0.4391	0.100	-4.374	0.000	-0.636	-0.242
team[T.Sheffield United]	-0.1818	0.093	-1.959	0.050	-0.364	0.000
team[T.Southampton]	-0.1900	0.093	-2.041	0.041	-0.372	-0.008
team[T.Tottenham]	-0.2431	0.094	-2.577	0.010	-0.428	-0.058
team[T.Watford]	-0.4255	0.099	-4.279	0.000	-0.620	-0.231
team[T.West Ham]	-0.2914	0.096	-3.044	0.002	-0.479	-0.104
team[T.Wolves]	-0.2940	0.095	-3.086	0.002	-0.481	-0.107
opponent[T.Arsenal]	0.3526	0.103	3.417	0.001	0.150	0.555
opponent[T.Aston Villa]	0.3999	0.102	3.919	0.000	0.200	0.600
opponent[T.Bournemouth]	0.4349	0.101	4.293	0.000	0.236	0.634
opponent[T.Brighton]	0.2228	0.106	2.107	0.035	0.016	0.430
opponent[T.Burnley]	0.3798	0.102	3.713	0.000	0.179	0.580
opponent[T.Chelsea]	-0.1881	0.117	-1.601	0.109	-0.418	0.042
opponent[T.Crystal Palace]	0.3644	0.103	3.551	0.000	0.163	0.566
opponent[T.Everton]	0.1149	0.109	1.059	0.290	-0.098	0.328
opponent[T.Leicester]	0.0805	0.110	0.735	0.462	-0.134	0.295
opponent[T.Man City]	-0.4810	0.128	-3.745	0.000	-0.733	-0.229
opponent[T.Man United]	0.1370	0.108	1.268	0.205	-0.075	0.349
opponent[T.Newcastle]	0.4277	0.101	4.225	0.000	0.229	0.626
opponent[T.Norwich]	0.4848	0.100	4.839	0.000	0.288	0.681
opponent[T.Sheffield United]	0.2982	0.104	2.861	0.004	0.094	0.503
opponent[T.Southampton]	0.3205	0.104	3.088	0.002	0.117	0.524
opponent[T.Tottenham]	0.2432	0.105	2.307	0.021	0.037	0.450
opponent[T.Watford]	0.2052	0.106	1.934	0.053	-0.003	0.413
opponent[T.West Ham]	0.2971	0.104	2.853	0.004	0.093	0.501
opponent[T.Wolves]	-0.0949	0.114	-0.831	0.406	-0.319	0.129
home	0.1577	0.031	5.012	0.000	0.096	0.219

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Appendix D

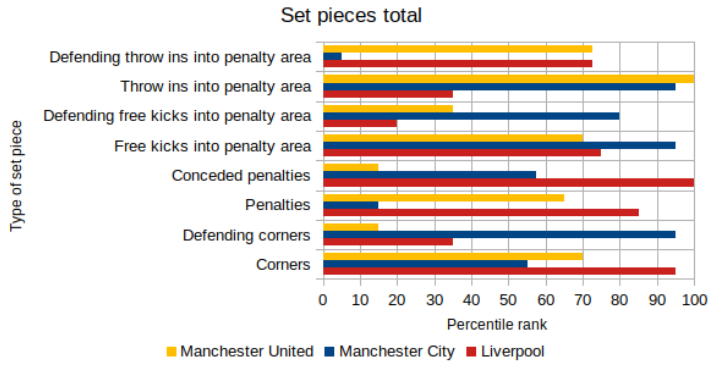


Figure 1

Throw ins into the penalty area, that lead to goals and shots within 30 seconds after the throw in:

Team	Total	Goals	Shots	Goal ratio	Shot ratio
Manchester United	10	2	2	0.200	0.200
Manchester City	7	1	1	0.143	0.143
Newcastle United	18	1	7	0.056	0.389
West Ham United	53	2	11	0.038	0.208
Fulham	30	1	5	0.033	0.167
Sheffield United	32	1	5	0.031	0.156
West Bromwich Albion	83	2	22	0.024	0.265
Wolverhampton Wanderers	5	0	1	0.000	0.200
Brighton and Hove Albion	39	0	10	0.000	0.256
Crystal Palace	4	0	2	0.000	0.500
Southampton	12	0	2	0.000	0.167
Leeds United	17	0	4	0.000	0.235
Liverpool	**28**	**0**	**7**	**0.000**	**0.250**
Leicester City	11	0	1	0.000	0.091
Everton	16	0	7	0.000	0.438
Chelsea	10	0	0	0.000	0.000
Aston Villa	28	0	6	0.000	0.214
Tottenham Hotspur	11	0	4	0.000	0.364
Arsenal	14	0	3	0.000	0.214
Burnley	6	0	1	0.000	0.167

Table 1

Conceded throw ins into the penalty area that lead to goals and shots within 30 seconds after the throw in:

Team	Total	Goals	Shots	Goal ratio	Shot ratio
Manchester United	19	0	1	0.000	0.053
Sheffield United	16	0	5	0.000	0.313
Brighton and Hove Albion	17	0	8	0.000	0.471
Crystal Palace	22	0	3	0.000	0.136
West Ham United	25	0	9	0.000	0.360
Southampton	20	0	8	0.000	0.400
Fulham	27	0	5	0.000	0.185
Leicester City	27	0	6	0.000	0.222
Liverpool	**19**	**0**	**4**	**0.000**	**0.211**
Arsenal	18	0	5	0.000	0.278
Leeds United	32	0	6	0.000	0.188
Everton	33	0	9	0.000	0.273
Chelsea	29	1	5	0.034	0.172
Tottenham Hotspur	28	1	5	0.036	0.179
West Bromwich Albion	23	1	4	0.043	0.174
Wolverhampton Wanderers	19	1	2	0.053	0.105
Aston Villa	24	2	6	0.083	0.250
Newcastle United	22	2	7	0.091	0.318
Burnley	8	1	1	0.125	0.125
Manchester City	6	1	2	0.167	0.333

Table 2

Penalties

Team	Total	Goals	At home	Frame	Missed	Saved	Goal ratio	Home ratio
Burnley	3	3	1	0	0	0	1.000	0.333
Liverpool	**6**	**6**	**4**	**0**	**0**	**0**	**1.000**	**0.667**
Arsenal	6	6	3	0	0	0	1.000	0.500
Wolverhampton Wanderers	4	4	1	0	0	0	1.000	0.250
Tottenham Hotspur	5	5	3	0	0	0	1.000	0.600
West Bromwich Albion	4	4	1	0	0	0	1.000	0.250
Leeds United	4	4	3	0	0	0	1.000	0.750
Manchester United	11	10	6	0	0	1	0.909	0.545
Newcastle United	7	6	5	0	0	1	0.857	0.714
Leicester City	12	10	4	0	0	2	0.833	0.333
Aston Villa	6	5	3	1	0	0	0.833	0.500
Southampton	6	5	2	0	0	1	0.833	0.333
Everton	5	4	2	0	0	1	0.800	0.400
Chelsea	10	8	4	0	0	2	0.800	0.400
Crystal Palace	4	3	2	0	0	1	0.750	0.500
Sheffield United	4	3	2	0	0	1	0.750	0.500
Brighton and Hove Albion	9	6	6	2	1	0	0.667	0.667
Manchester City	9	5	6	0	3	1	0.556	0.667
West Ham United	4	2	2	1	0	1	0.500	0.500
Fulham	6	3	1	1	1	1	0.500	0.167

Table 3

Conceded penalties

Team	Total	Goals	At home	Frame	Missed	Saved	Goal ratio	Home ratio
Liverpool	**8**	**4**	**4**	**0**	**3**	**1**	**0.500**	**0.500**
West Ham United	5	3	3	1	0	1	0.600	0.600
West Bromwich Albion	11	7	4	3	0	1	0.636	0.364
Arsenal	3	2	1	0	0	1	0.667	0.333
Sheffield United	4	3	1	1	0	0	0.750	0.250
Chelsea	4	3	4	0	0	1	0.750	1.000
Everton	4	3	3	0	1	0	0.750	0.750
Crystal Palace	4	3	2	0	0	1	0.750	0.500
Newcastle United	5	4	2	0	0	1	0.800	0.400
Manchester City	10	8	3	0	0	2	0.800	0.300
Aston Villa	6	5	2	0	0	1	0.833	0.333
Brighton and Hove Albion	7	6	3	0	1	0	0.857	0.429
Wolverhampton Wanderers	8	7	3	0	0	1	0.875	0.375
Leeds United	9	8	7	0	0	1	0.889	0.778
Southampton	9	8	5	0	0	1	0.889	0.556
Manchester United	4	4	1	0	0	0	1.000	0.250
Leicester City	4	4	1	0	0	0	1.000	0.250
Tottenham Hotspur	10	10	7	0	0	0	1.000	0.700
Fulham	7	7	4	0	0	0	1.000	0.571
Burnley	3	3	1	0	0	0	1.000	0.333

Table 4

Corners, goals and shots within a time frame of 30 seconds after the corner

Team	Total	Goals	Shots	Goal ratio	Shot ratio
Everton	116	7	44	0.060	0.379
Liverpool	**171**	**10**	**66**	**0.058**	**0.386**
Crystal Palace	108	6	37	0.056	0.343
Southampton	127	7	41	0.055	0.323
Sheffield United	129	7	39	0.054	0.302
Newcastle United	113	6	51	0.053	0.451
Manchester United	125	6	53	0.048	0.424
Chelsea	147	7	63	0.048	0.429
Aston Villa	149	7	65	0.047	0.436
Manchester City	178	8	56	0.045	0.315
Leeds United	163	7	59	0.043	0.362
West Ham United	122	5	50	0.041	0.410
Tottenham Hotspur	122	5	47	0.041	0.385
Arsenal	157	6	49	0.038	0.312
Burnley	133	5	50	0.038	0.376
West Bromwich Albion	109	4	36	0.037	0.330
Wolverhampton Wanderers	144	5	56	0.035	0.389
Leicester City	148	4	48	0.027	0.324
Brighton and Hove Albion	154	4	60	0.026	0.390
Fulham	119	2	50	0.017	0.420

Table 5

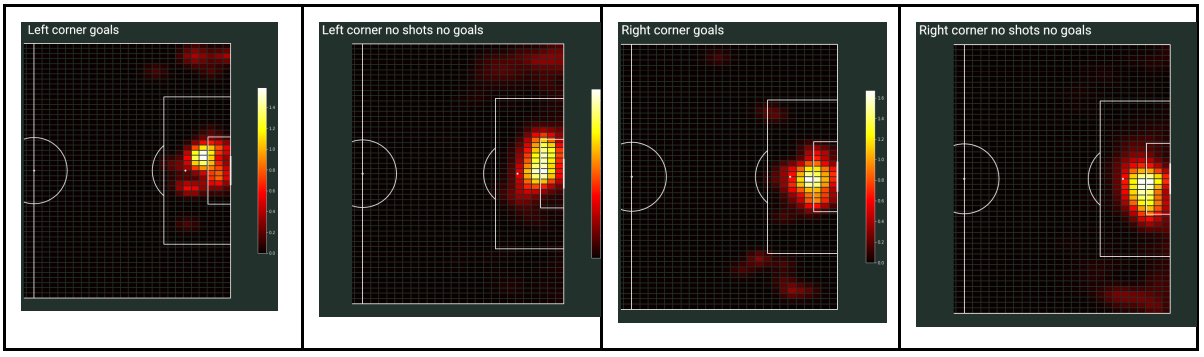
Conceded corners, goals and shots within a time frame of 30 seconds after the corner

Team	Total	Goals	Shots	Goal ratio	Shot ratio
Sheffield United	157	1	76	0.006	0.484
Manchester City	73	1	24	0.014	0.329
Aston Villa	133	3	51	0.023	0.383
Southampton	144	4	41	0.028	0.285
Newcastle United	164	5	68	0.030	0.415
Tottenham Hotspur	150	5	61	0.033	0.407
Fulham	141	5	60	0.035	0.426
Everton	150	6	65	0.040	0.433
Arsenal	120	5	48	0.042	0.400
Wolverhampton Wanderers	140	6	49	0.043	0.350
West Bromwich Albion	180	8	62	0.044	0.344
Crystal Palace	169	8	62	0.047	0.367
Burnley	160	8	66	0.050	0.413
Liverpool	**94**	**5**	**31**	**0.053**	**0.330**
Brighton and Hove Albion	130	7	38	0.054	0.292
Chelsea	123	7	41	0.057	0.333
West Ham United	133	8	36	0.060	0.271
Manchester United	112	7	37	0.063	0.330
Leeds United	127	9	51	0.071	0.402
Leicester City	134	10	53	0.075	0.396

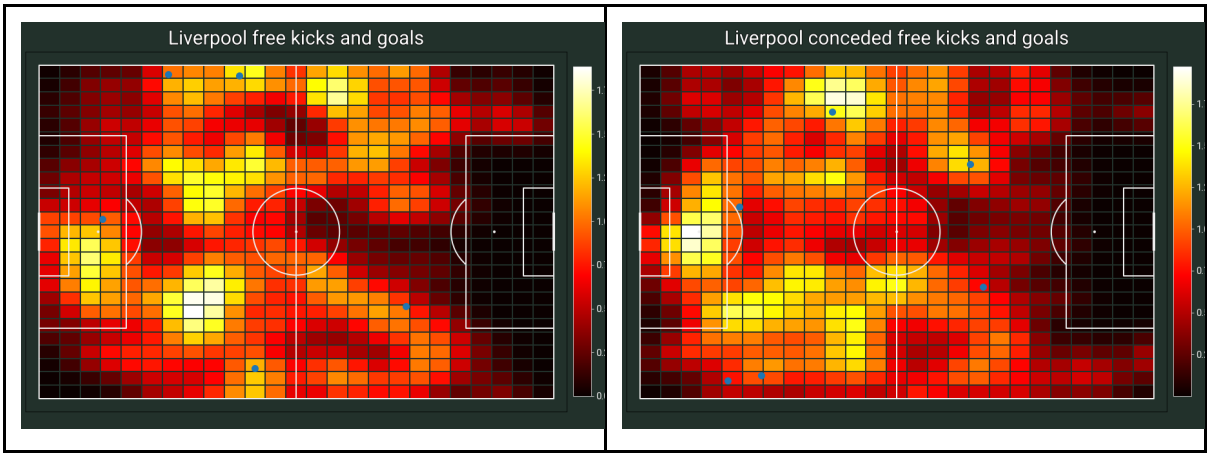
Table 6

Free kicks into the penalty area within a time frame of 30 seconds after free kick	Conceded free kicks into the penalty area within a time frame of 30 seconds after free kick

Heatmaps section 1



Heatmaps section 2



Metric 1:

This metric is based on the total distance from the 3 nearest attacking players position when a free kick or a corner is taken, to the position where the ball ends up. This distance is then compared to the total

distance of the 3 nearest defenders. With this I am trying to describe the precision of the free kick or corner.

Metric 2:
Here I look at the event after the corner or free kick, and which team this event belongs to, and if the outcome is successful or not to describe the alertness when attacking and defending in the penalty area.