Warriors Report: Discussion on Warriors in Season 22-23

Michael Wang

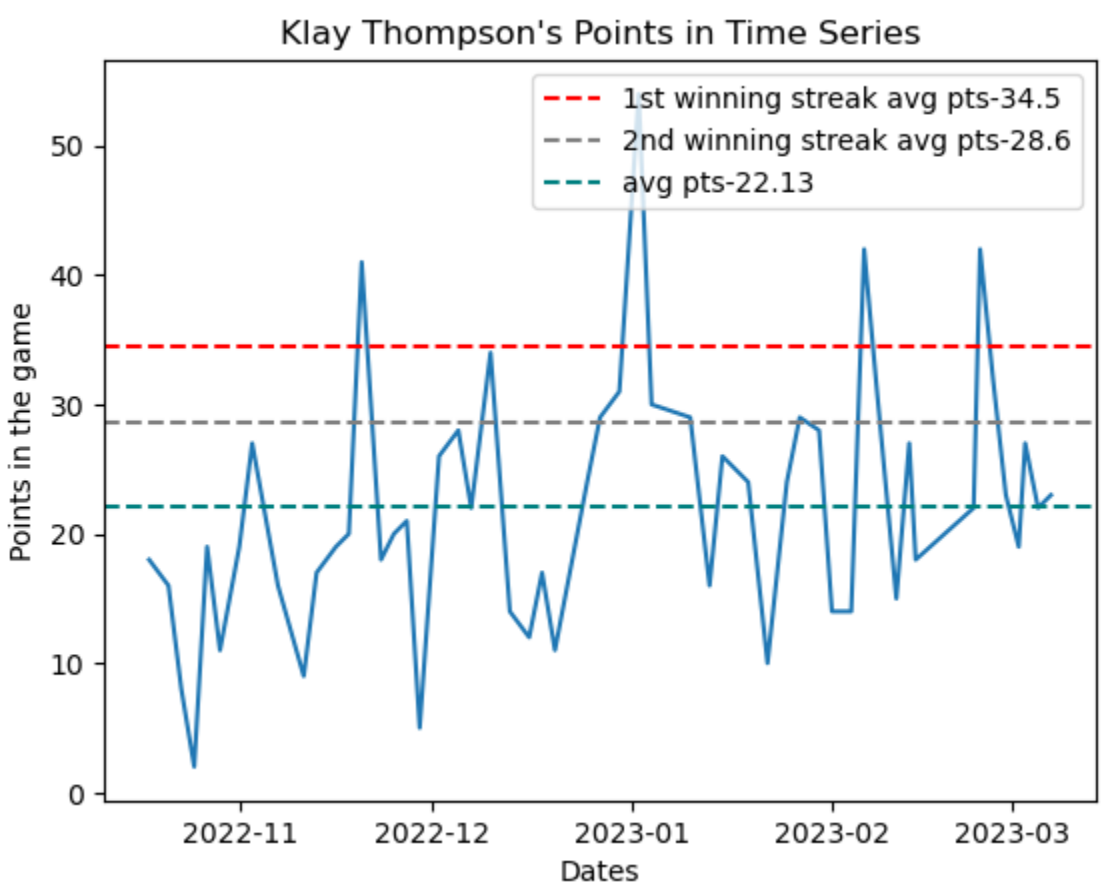
March 10th, 2023

The championship always triggers attention. As the champion last season, Warriors has become the “hotspot” from various aspects since the beginning of the season. But unlike last season, Warriors’ records this season push them on the edge of being eliminated from the playoff, as they’ve experienced fluctuation of personnel, and both winning and losing streaks. At the same time, the west conference becomes even more competitive after the trade deadline, which makes the target of the playoffs harder to achieve. In this report, I will analyze the advantages as well as potential issues that Warriors have or might be facing in the rest of the season from a fan’s standpoint using public data from www.nbastuffer.com and www.pbpstats.com.

This analytical report primarily contains 5 Parts: (1) Klay Thompson in winning streak (2) 1st Quarter Post All-star (3) Linear regression on 3 pct & (Offensive efficiency) or Correlation (4) Starters vs Benches & Personnel changes (5) An critical view on Jordan Poole. The first four sections are analyzed using data before the Mar 9th game. The last topic (5) contains the data updated for Mar 9th game.

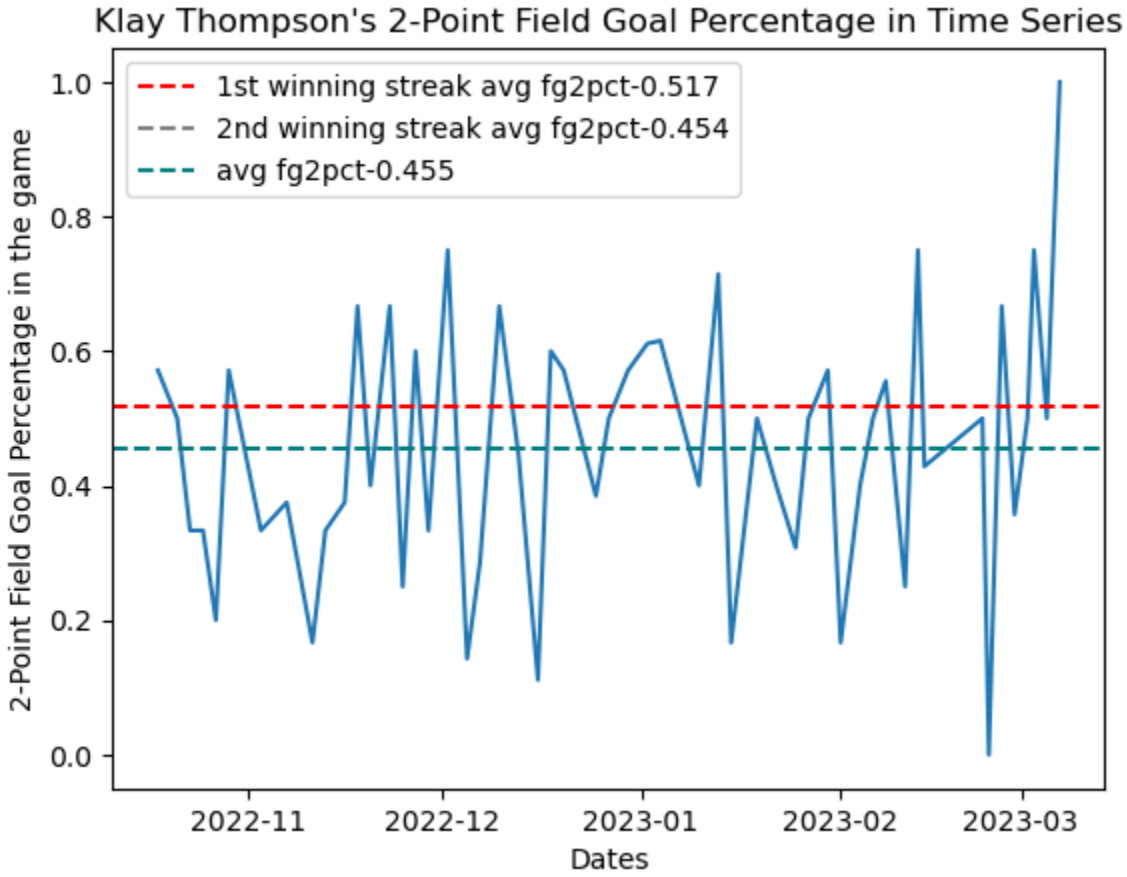
1. Klay Thompson in winning streak

One of the good signals to notice in the season is that warriors had 2 winning streaks even without Stephen Curry, and during those winning streaks, Klay Thompson perfectly took over the offensive side of the game and contributed to the team a lot, which not only proved himself in the game after recovering from injury, but also elevated warriors’ offense to another level. Let's take a look at Klay's performance from the data visualizations:

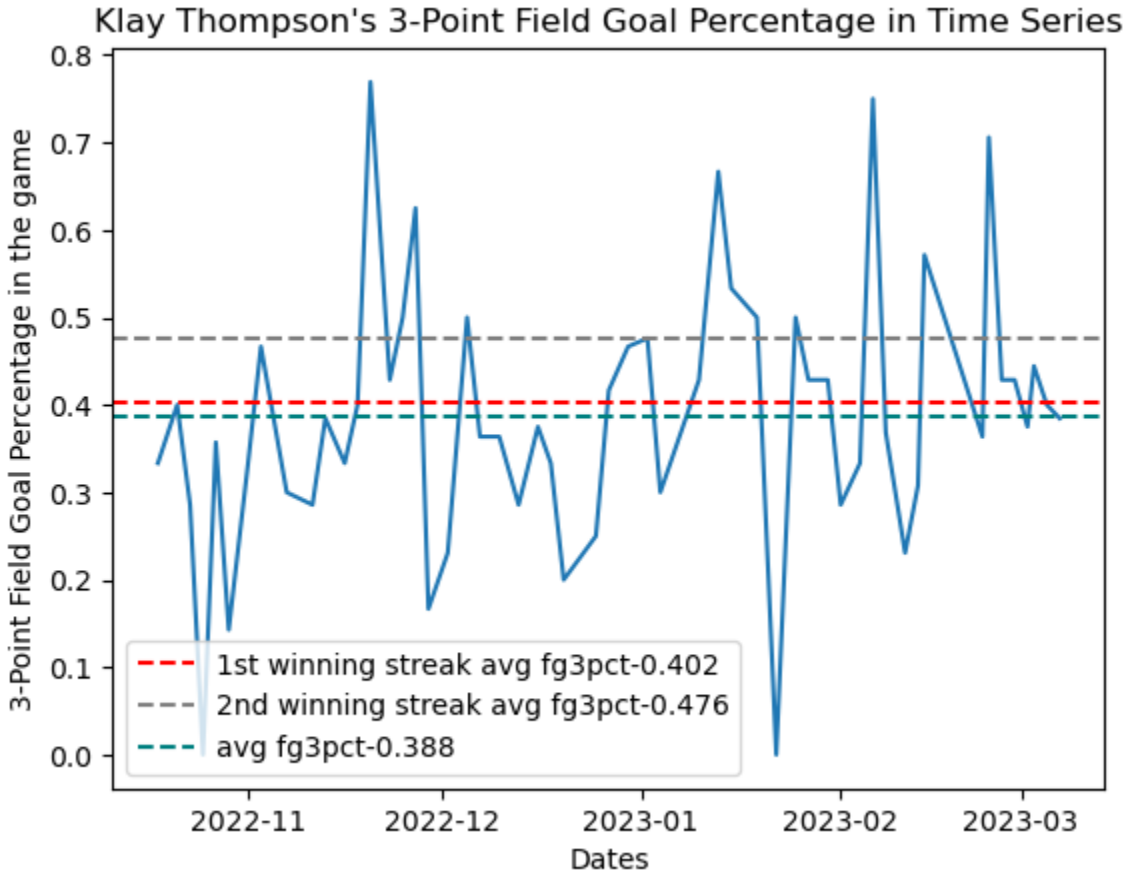


Note: Klay did not play on 2022-12-28 against Jazz

The graph shows that Klay Thompson's Points shifting in time series as well as the average points during the winning streaks. As we can see, in both winning streaks, Klay contributed more to the offensive side than his overall average points: 1st winning streak-34.5 points per game, and second winning streak-28.6 points per game. Also, despite the fluctuation, we still see a growing trend for his scoring ability and his explosiveness of scoring in some games, which is how he contributes toward the offense, especially during the winning streaks.



Note: Klay's the 2nd winning streak avg fg2pct is overlapping with the average fg2pct



Some might argue that Klay simply took too many shots without efficiency to score those points. But the previous two graphs can really dispute the argument. Klay was both exploding and being efficient during winning streaks! He generally had better 2-point and

3-point field goal percentages than his average in those periods (only a slightly lower 2-point fg pct in the 2nd period than average)

2. 1st Quarter Post All-star

Original url for the data used in this section: https://www.pbpstats.com/possession-finder/nba?TeamId=1610612744&Season=2022-23&SeasonType=RegularSeason&OffDef=Offense&StartType=All&FromDate=2023-02-24&ToDate=2023-03-09&Period=1&Table=Scoring

A weird phenomenon happened in the games after the all-star weekend that warriors normally started with a large deficit in points (even larger than 10 points) in the first quarter but they sometimes can still win the game or catch up in the 2nd or 3rd quarter. By filtering out the possessions post all star, we can clearly find out the reason:

Warriors stats when filter out 1st Quarter Offensive Possessions Post All-Star (total & per player)

	Possessions	Pts	Fg2Pct	FG2A	Fg3pct	FG3A
Total	174	173	0.4891	92	0.3088	68

	Possessions	Pts	Fg2Pct	FG2A	Fg3pct	FG3A
Lamb	56	5	0.4000	5	0.0000	4
DiVincenzo	111	9	0.0000	4	0.3000	10
D.Green	64	15	0.5714	7	1.0000	2
J.Green	44	13	0.5000	6	0.6667	3
Kuminga	95	26	0.5000	16	0.3750	8
Poole	126	23	0.3571	14	0.2727	11
Looney	111	22	0.6429	14	0.0000	1
Thompson	139	53	0.5714	21	0.3182	22
Jerome	63	2	0.3333	3	0.0000	4

Note: the players included are with possessions >= 40

From the two tables, we notice that both `Fg2Pct` and `Fg3Pct` is quite low (average 3pt percentage is 36.0% and 2pt percentage is 54.7% in the entire league). And if we take a closer look at specifc players, we can see that Besides Poole and Thompson, there is no other "outside attackers" in team. For DiVincenzo, Lamb, and Jerome, they are indeed participating in most possessions but do not take fair amount of shots. But for Thompson and Poole, they tend to have a "cold hand" in the first quarter, which is revealed by their `Fg3Pct` and might be the reason why warriors tend to start low.

Another player we tend to neglect is Looney, who is quite important in the lineup as "height" in both offense and defense and is the most efficient inside players (with `Fg2Pct` of 64.3%, more efficient than D.Green, J.Green and Kuminga). On the contrary, we see the most unefficient player is Jordan Poole from his terrible Field Goal Percentage, and I will analyze his plays in section (5)

	Warriors	Lakers	Nuggets	Suns
Total Turnovers in 1 qrt post all star	28.0	19.000	16.00	20.00
Turnovers Per 1 qrt	3.5	2.714	2.28	3.33

One more appropriate indicator of the potential loss in the 1st quarter is the turnovers. By comparing with other teams, including Lakers, Nuggets, and Suns (potential competitors in the West Conference), warriors apparently have too many turnovers in 1st quarters. After the all star, warriors had 28 turnovers in total, 3.5 turnovers per 1st quarter, which is the most among all 4 teams. More turnovers could be converted to less chances to score, which might be a factor to consider while discussing the loss of 1st quarter.

3. Regression Analysis

A great tool to analyze correlations among factors is applying regression. While watching the games, I proposed that warriors relies too much on their shooters and 3pt shots, which is definitely a double-edged sword. If Poole, Curry, or Thompson can't find the "feeling" of shooting and have a really terrible 3pt field goal percentage, then warriors would be very likely to end up with loss. In this section, I primarily analyzed how 3pt field goal percentage correlates with winning or loss, offensive efficiency, and defensive efficiency.

1) 3pt Field Goal Percentage vs Winning or loss

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                  Fg3Pct   R-squared:                       0.129
Model:                             OLS   Adj. R-squared:                  0.115
Method:                  Least Squares   F-statistic:                     9.463
Date:                 Fri, 10 Mar 2023   Prob (F-statistic):            0.00308
Time:                         23:12:24   Log-Likelihood:                 86.981
No. Observations:                   66   AIC:                            -170.0
Df Residuals:                       64   BIC:                            -165.6
Df Model:                            1
Covariance Type:             nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept      0.4071      0.011     36.085      0.000       0.385       0.430
l             -0.0498      0.016     -3.076      0.003      -0.082      -0.017
==============================================================================
Omnibus:                        0.370   Durbin-Watson:                   2.023
Prob(Omnibus):                  0.831   Jarque-Bera (JB):                0.162
Skew:                          -0.121   Prob(JB):                        0.922
Kurtosis:                       3.025   Cond. No.                         2.58
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specifi
ed.
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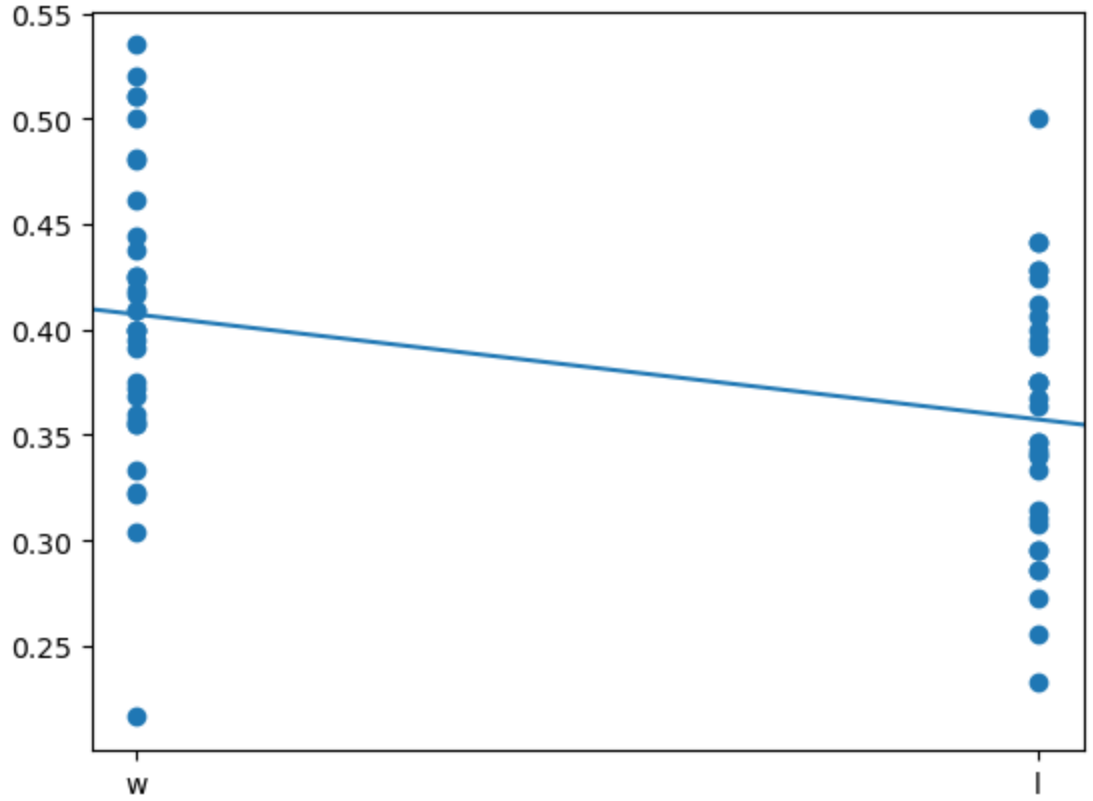
Out[134]: <matplotlib.lines._AxLine at 0x7fc6da5ed9d0>



From the regression plot, we can see that there is still a tendency that for games that warriors won, the average 3pt field goal percentage is slightly higher than the games that warriors lost. Notice the coefficient is -0.05, which means that moving from win to lose, warriors dropped 0.05 on their 3pt field goal percentage. Such a decreasing could potentially change the field goal percentage of team from better than average to below average. The result sounds damaging, but we need more to justify the point.

2) Warriors vs Nuggets: 3pt Field Goal Percentage vs Offensive Efficiency

```
                            OLS Regression Results
==============================================================================
Dep. Variable:         Off_efficiency   R-squared:                       0.528
Model:                            OLS   Adj. R-squared:                  0.521
Method:                 Least Squares   F-statistic:                     71.68
Date:                Fri, 10 Mar 2023   Prob (F-statistic):           4.87e-12
Time:                        23:12:25   Log-Likelihood:                 79.542
No. Observations:                  66   AIC:                            -155.1
Df Residuals:                      64   BIC:                            -150.7
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept      0.7310      0.051     14.385      0.000       0.630       0.833
Fg3Pct         1.1056      0.131      8.466      0.000       0.845       1.367
==============================================================================
Omnibus:                        0.844   Durbin-Watson:                   2.041
Prob(Omnibus):                  0.656   Jarque-Bera (JB):                0.842
Skew:                          -0.063   Prob(JB):                        0.656
Kurtosis:                       2.461   Cond. No.                         16.5
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specifi
ed.
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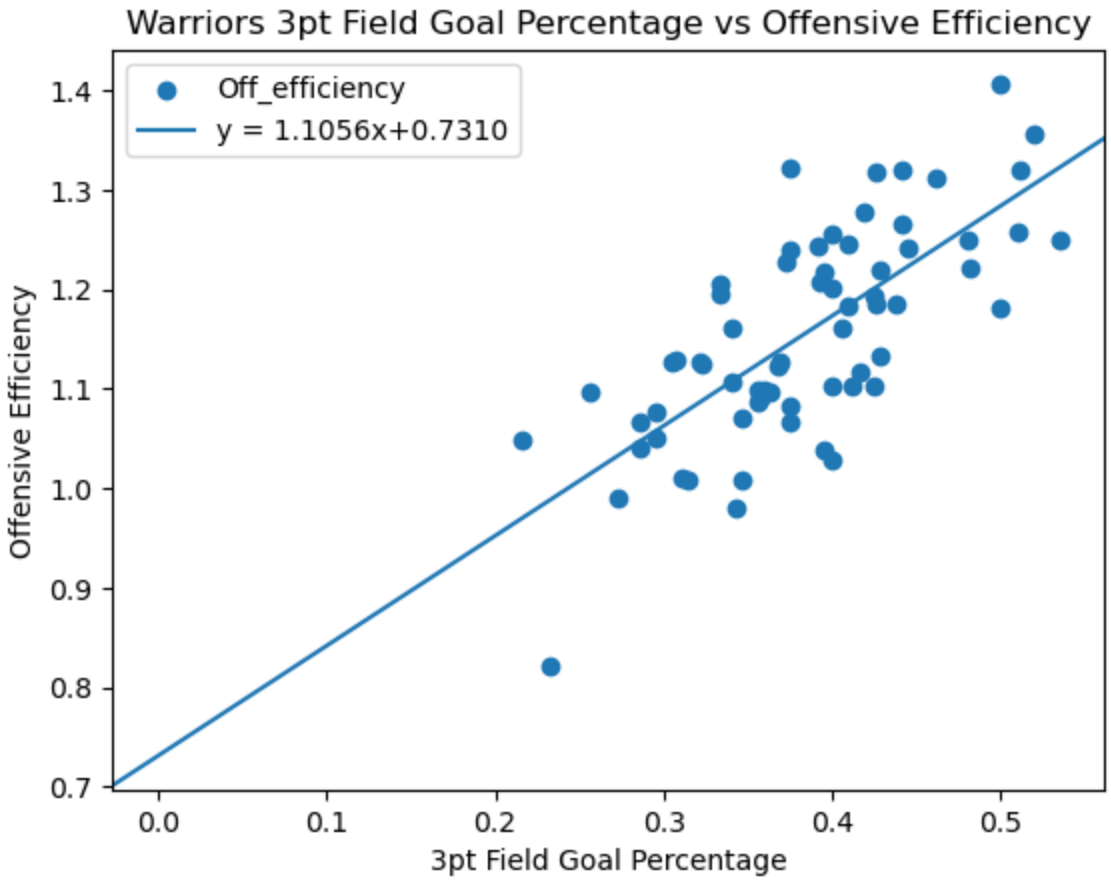


Note: Offensive Efficiency is defined as Points/Possession *100 or the points in 100 possessions

This regression plot seems more neat and illustrative. From the coefficient, we analyze that if warriors increase by 0.1, the offensive efficiency would increase by 0.11056, which represents approximately 11 more points in 100 possessions. It sounds like a astounding value, 11 more points in 100 possessions, but his number standing on its own is probably not illustrative enough. So, a comparison to another team, nuggets (solid 1st place in west), would be appropriate here.

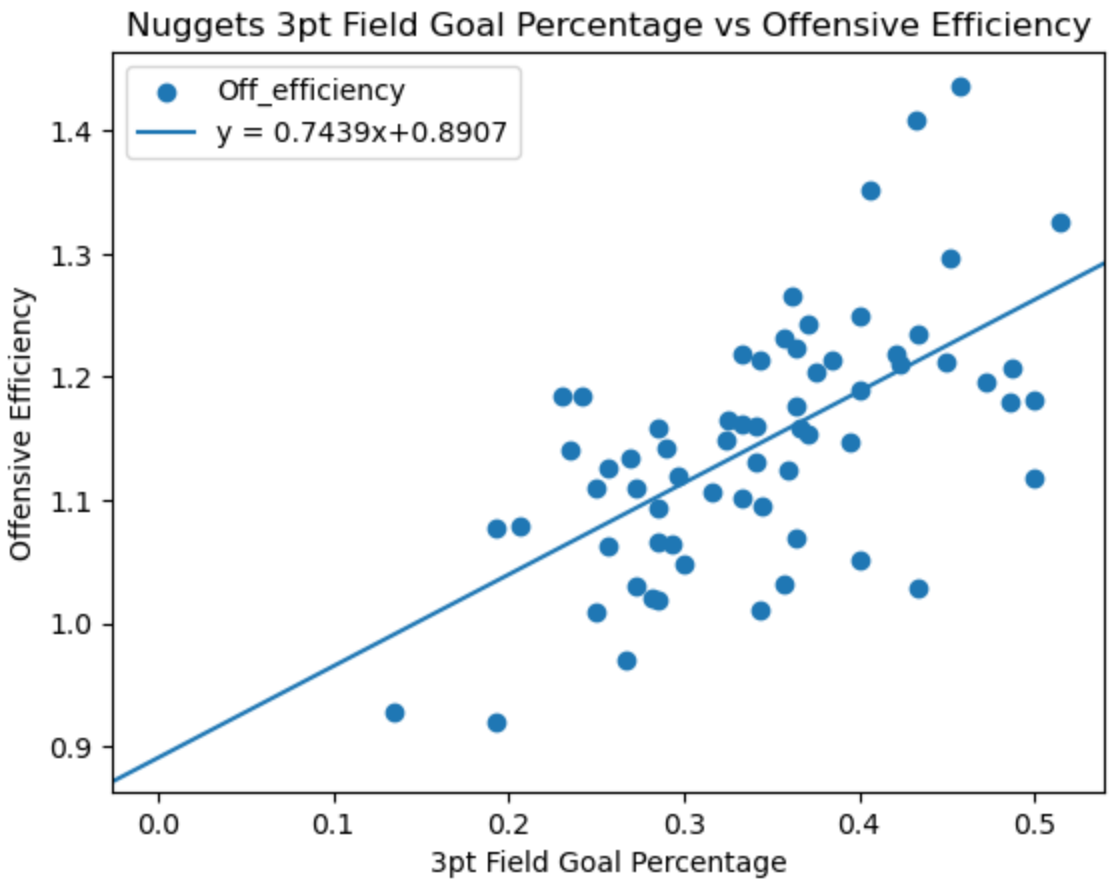
OLS Regression Results

Dep. Variable:	Off_efficiency	R-squared:	0.383
Model:	OLS	Adj. R-squared:	0.373
Method:	Least Squares	F-statistic:	39.71
Date:	Fri, 10 Mar 2023	Prob (F-statistic):	3.07e-08
Time:	23:12:26	Log-Likelihood:	74.296
No. Observations:	66	AIC:	-144.6
Df Residuals:	64	BIC:	-140.2
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.8907	0.042	21.356	0.000	0.807	0.974
Fg3Pct	0.7439	0.118	6.301	0.000	0.508	0.980

Omnibus:	0.647	Durbin-Watson:	2.529
Prob(Omnibus):	0.724	Jarque-Bera (JB):	0.274
Skew:	0.142	Prob(JB):	0.872
Kurtosis:	3.138	Cond. No.	13.5

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.



Now, examining the analysis on Nuggets, we see that the coefficient is only 0.7439, which means that for 0.1 more 3pt field goal percentage, the offensive efficiency would be increasing by 0.074, converted to 7.4 more points in 100 possessions.

There is no doubt that a higher 3pt field goal percentage normally correlates with higher offensive efficiency. But apparently, GSW seems to depend more on 3 point shot than nuggets for their offense. This could be quite dangerous if all shooters in warriors lose their feelings.

One more thing to consider is the lack of players, especially Wiggins. He is an efficient player who could help the team rely less on purely 3pt shots by playing isolation, driving/ cutting easier in paint, and catching rebound (second chance offense). The personnel issue will be discussed deeper in the next section.

3) Warriors 3pt Field Goal Percentage vs Defensive Efficiency

OLS Regression Results

Dep. Variable:	Def_efficiency	R-squared:	0.016
Model:	OLS	Adj. R-squared:	0.000
Method:	Least Squares	F-statistic:	1.013
Date:	Fri, 10 Mar 2023	Prob (F-statistic):	0.318
Time:	23:12:27	Log-Likelihood:	54.227
No. Observations:	66	AIC:	-104.5
Df Residuals:	64	BIC:	-100.1
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.0747	0.075	14.411	0.000	0.926	1.224
FG3PCT_War	0.1929	0.192	1.007	0.318	-0.190	0.576

Omnibus:	0.959	Durbin-Watson:	1.798

```
Prob(Omnibus):                  0.619   Jarque-Bera (JB):                 0.878
Skew:                           0.273   Prob(JB):                         0.645
Kurtosis:                       2.854   Cond. No.                          16.5
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specifi
ed.
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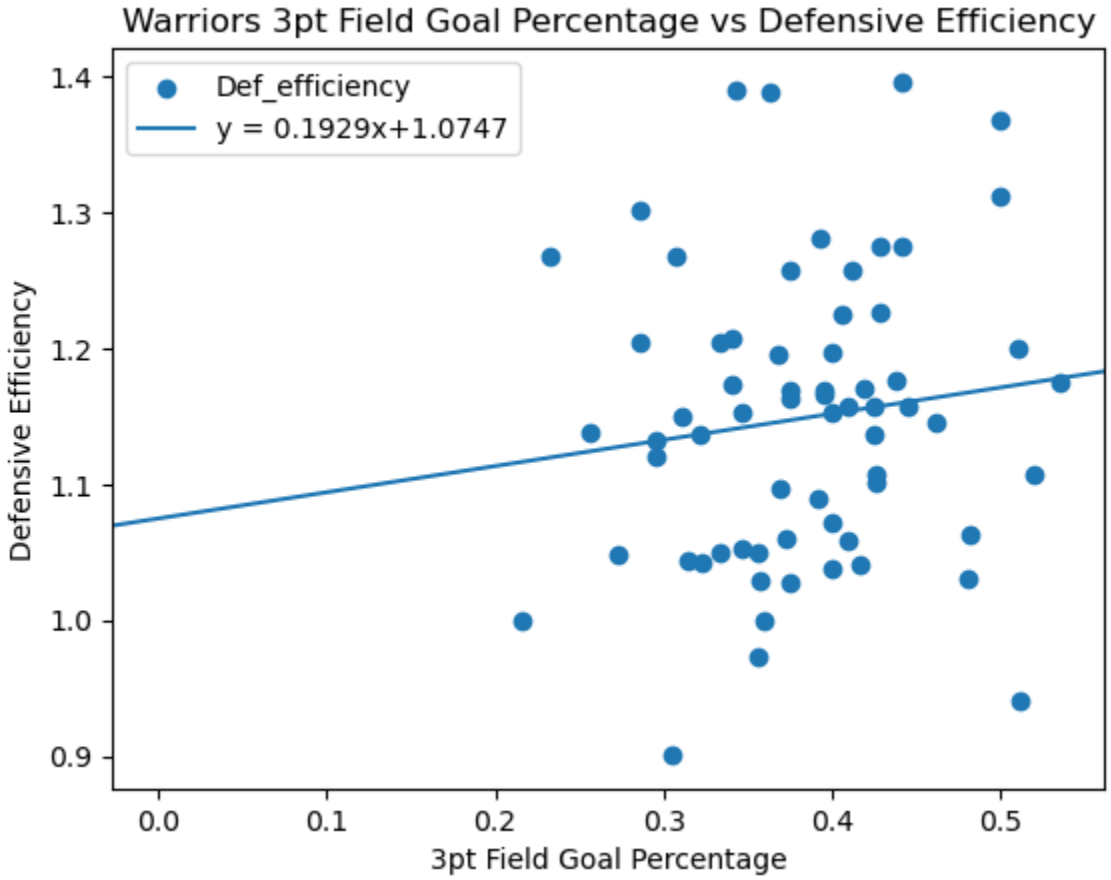


After looking at how 3pt field goal percentage impacts the offensive efficiency, I feel interesting to look at how it impacts the defensive efficiency or if there is an impact. So from the analysis, when warriors increase their 3pt FGpct by 0.1, their defensive efficiency actually slightly increases by 0.02. Such change is not significant, so we can't conclude something substantial, such as why team has better 3pt Fgpct but allows more points to their opponents.

4. Starters vs Benches & Personnel Changes

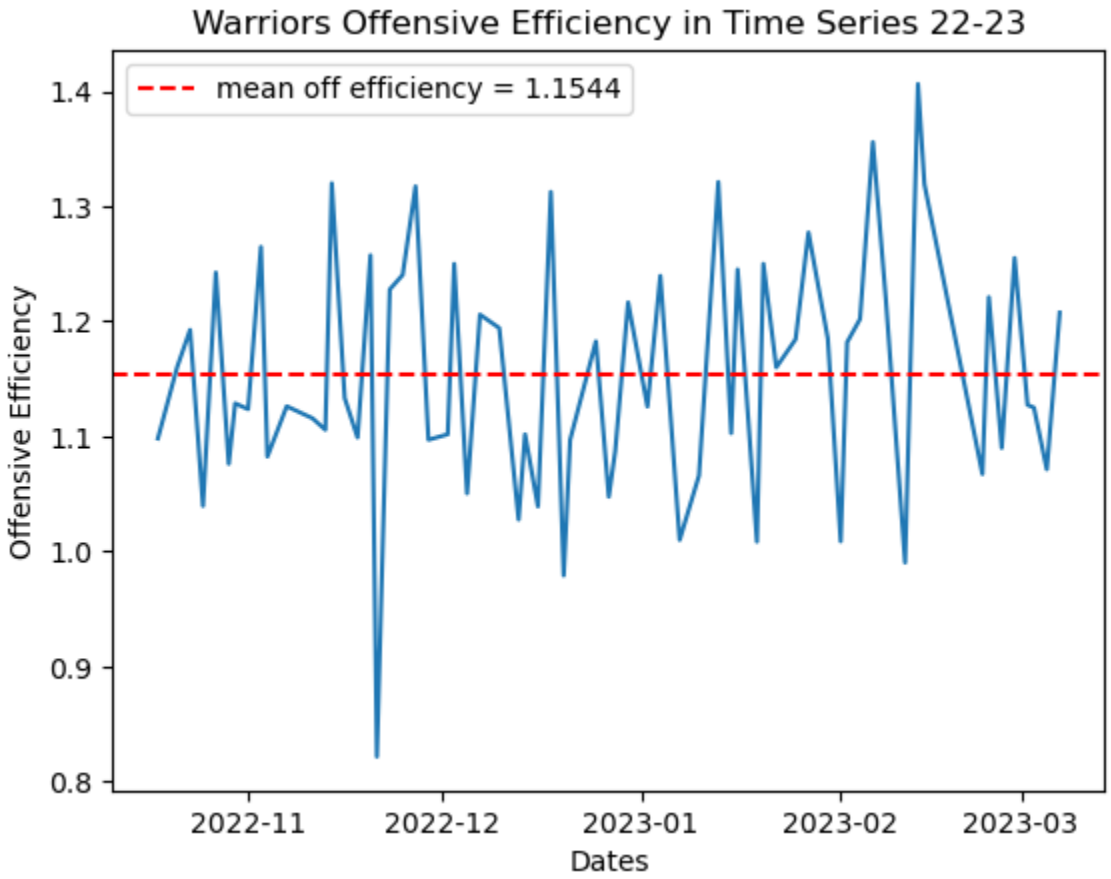
Since achieving the championship, warriors have experienced a lot of changes in players, including Toscano Anderson, Damian Lee, James Wiseman, Gary Payton II, etc. At the same time, due to injuries and other issues, Curry and Wiggins have not been playing consistently, making the team "disintegrated". In this section, I analyzed how lineup & player changes actually affect warriors.

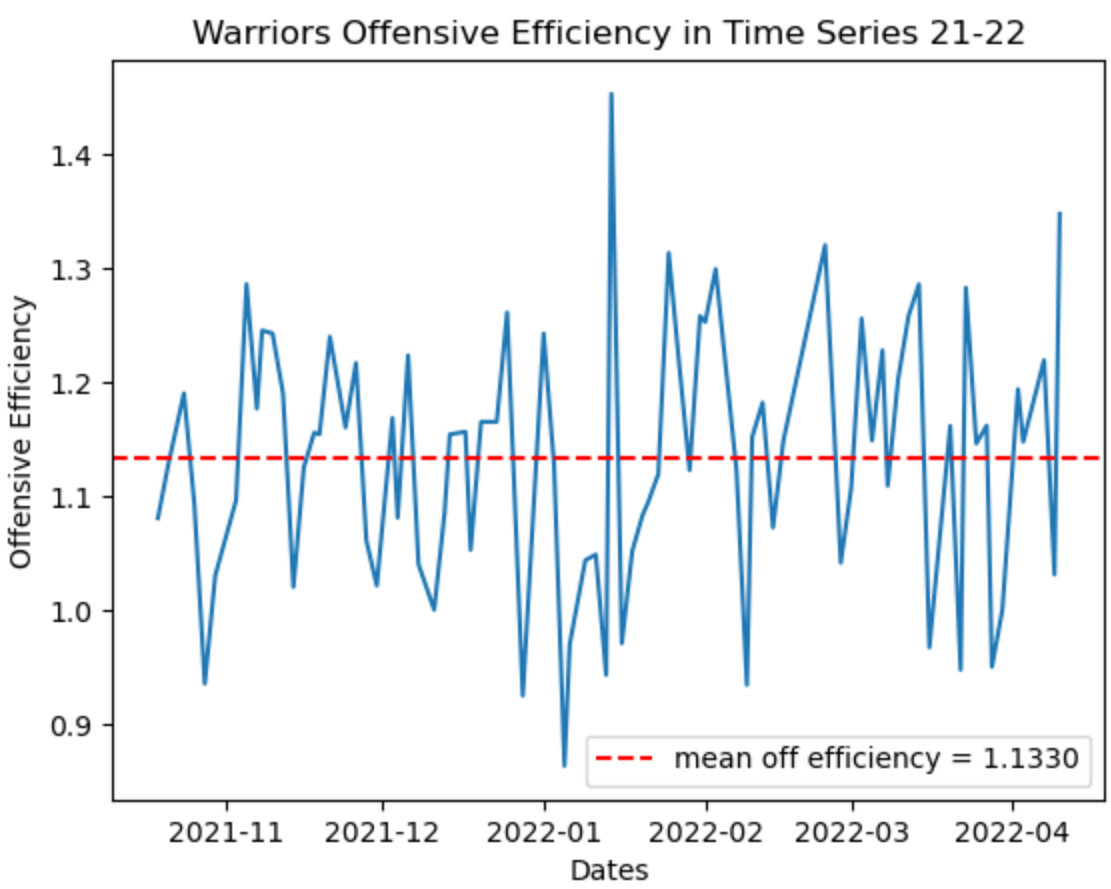
The first thing to look at, and also, the most relevant and popular thing to look at is the plus and minus, as it's a good indicator on how players contribute toward the games, whether they are winning or losing points while the players are on the court.

	ShortName	PlusMinus
0	Looney, Curry, Thompson, Green, Wiggins	145
5	DiVincenzo, Poole, Kuminga, Thompson, Green	30
10	DiVincenzo, Poole, Kuminga, Lamb, Green	27
3	Looney, DiVincenzo, Poole, Kuminga, Thompson	22
6	Looney, Poole, Curry, Green, Wiggins	20

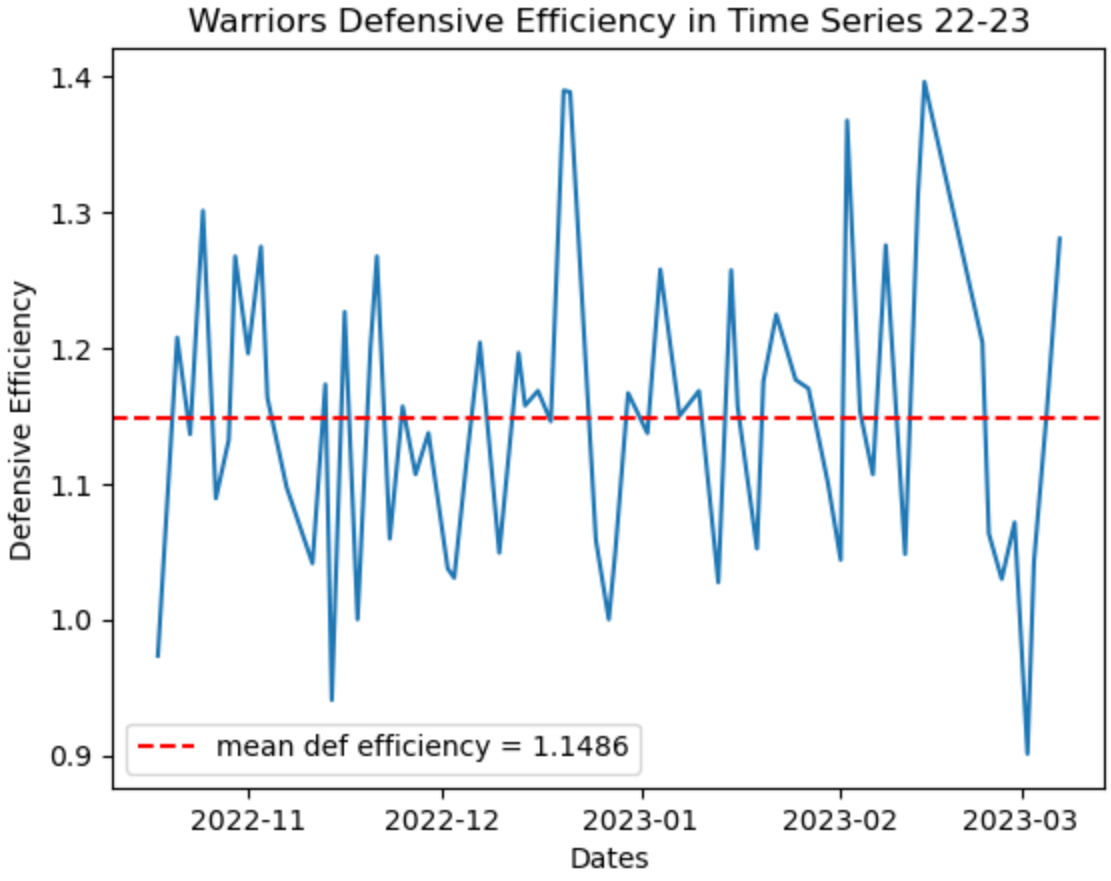
The table above shows the Plus or Minus value respective to different lineups. Even though it seems exaggerated, but the "full starters" (Looney, Curry, Thompson, Green, Wiggins), which is also the best with 145 plus or minus, are separated from other lineups. The lineup on the second place only has a plus or minus of 30. The big difference really illustrate the point that many bench players are destroying the effort for the five starters, and no other players/ lineup combinations can match the power of the five starters, which is fairly dangerous when warriors are experiencing lineup changing and starter player injuries.

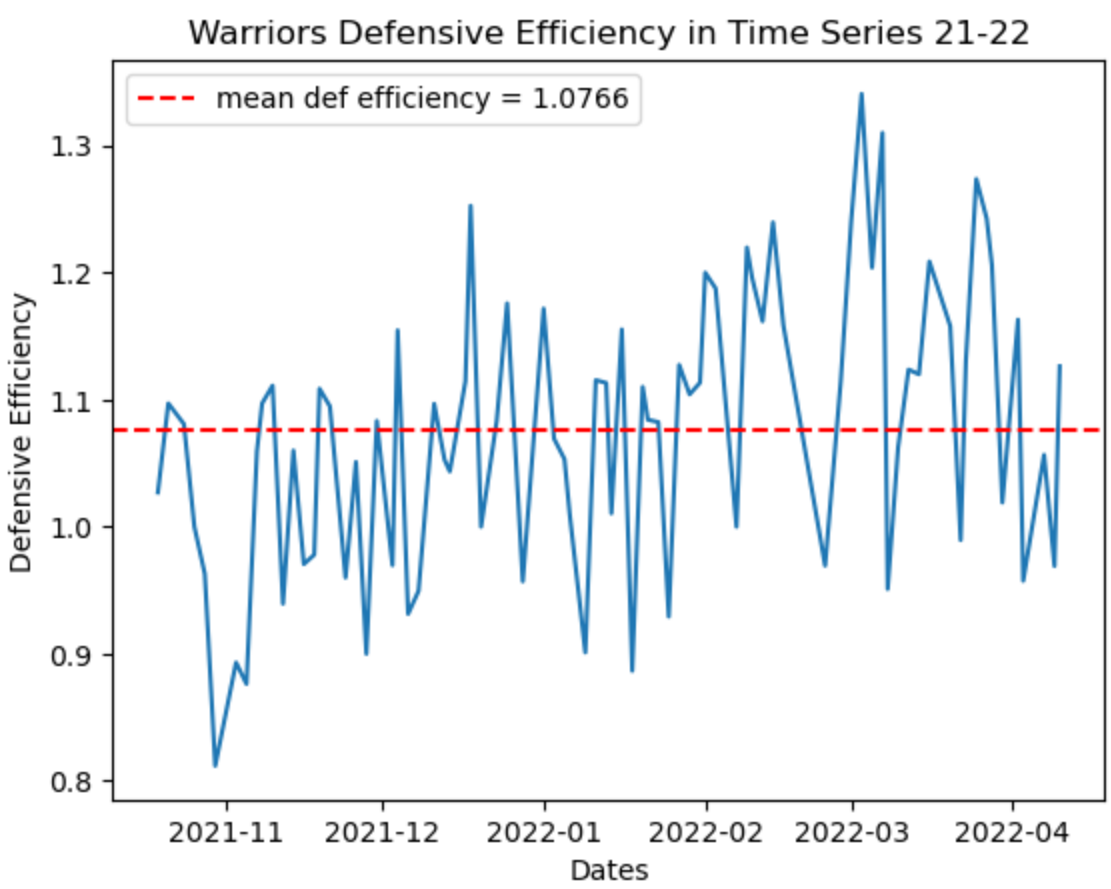
To examine how warriors have changed from a champion to a moderate team, I look at how their offensive and defensive efficiency changed in two years using time series plots:





Comparing two graphs, we can't tell a really big change on offensive side, as the mean offensive efficiencies are relatively similar (1.133 in 21-22, 1.1544 in 22-23). Also the frequent fluctuation exists in both plots, which is also a similar aspect. But some changes happen on the defensive side if we look at the comparison for defensive efficiencies:





Looking at the two plots for defensive efficiency, we see that the mean defensive efficiency really increases a lot this season. In season 21-22, the mean is 1.0766 (about 107.66 points allowed in 100 possessions), where as this season, the mean is 1.1486 (about 114.86 points allowed in 100 possessions). Such a comparison really shows a huge decrease in warriors' defensive ability. At the same time, the fluctuation/ magnitude for the plot in 21-22 seems restricted between 1.2 and 0.9, but the fluctuation/ magnitude in 22-23 seems to be larger and overall in a higher interval, between 1.35-1.4 and 1.0, which is another signal for a worse defense.

If we think about the missing players, both Gary Payton II and Wiggins are incredibly important on the defensive side. Without them, it will be really hard to play defense if they totally rely on Draymond (Klay also, but his injury limit some of his defensive abilities). Fortunately enough, GPII can be back soon, and hopefully Wiggins can also be back.

5. Jordan Poole is Good?

When the proposed salary was reported, people were discussing whether Poole really values that much. Indeed, JP, who was a key contributor from the bench last season, was improving and exploding during last playoffs, which helps him win the salary. But is he actually still that good consistently in this season?

	NAME	GP	2P%	3P%	PPG	RPG	APG
2	Jordan Poole	67	0.529	0.326	20.7	2.8	4.6

Looking at some basic stats, 52.9% 2pt field goal percentage, 32.6% 3pt field goal percentage, 20.7 points per game, I would not say that's a bad player. But there are more to explore to find out the truth. In the following, I look at Individual Offensive Rating (the number of points produced by a player per 100 total individual possessions), Individual Defensive Rating (points the player allowed per 100 possessions he individually faced while staying on the court), Turn Over Rate (a metric that estimates the number of turnovers a player commits per 100 possessions), and Usage Rate (an estimate of the percentage of team plays used by a player while he was on the floor) for all warriors

players provided by www.nbastuffer.com. The following table is an example for the first five rows for the dataset of the four stats I mentioned:

	NAME	TEAM	USG%	TO%	ORtg	DRtg
0	Stephen Curry	Gol	31.0	14.1	124.1	111.3
1	Klay Thompson	Gol	26.9	8.8	109.2	114.0
2	Jordan Poole	Gol	29.2	16.7	107.1	111.5
3	Andrew Wiggins	Gol	21.5	8.3	112.4	109.5
4	Jonathan Kuminga	Gol	19.8	17.4	106.9	106.9
5	Donte DiVincenzo	Gol	14.7	16.5	116.4	110.3
6	Draymond Green	Gol	12.9	29.3	115.6	106.1
7	Ty Jerome	Gol	15.0	11.2	126.6	111.7
8	Anthony Lamb	Gol	13.9	15.0	118.6	106.9
9	Kevon Looney	Gol	10.5	11.0	150.5	102.4
10	James Wiseman	Gol	20.0	12.9	123.2	101.6
11	JaMychal Green	Gol	18.2	18.8	115.1	103.1
12	Patrick Baldwin Jr.	Gol	23.2	9.1	99.9	111.2
13	Moses Moody	Gol	14.7	14.0	109.8	114.7
14	Ryan Rollins	Gol	26.1	43.9	70.1	101.8
15	Andre Iguodala	Gol	8.8	44.4	85.9	110.7

With the dataset, I examine Poole's position/ rank for all four stats among all warriors players and the result is provided:

```
Jordan Poole Offensive Rate Rank in warriors is 12 - 107.1
Jordan Poole Defensive Rate Rank in warriors is 13 - 111.5
Jordan Poole Turnover Rate Rank in warriors is 6 - 16.7
Jordan Poole USG Rate Rank in warriors is 2 - 29.2
```

Note: When sorting defensive rate, I made it ascending order, which means players with more points allowed for the opponents (worse defenders) are coming at the end.

The result is pretty illustrative with the meaning behind those stats: Poole has used up 29.2 plays while he's on the floor, and in 100 possessions, he can get 107.1 points (12nd in team), allow 111.5 points (13rd in the team), and turnover approximately 16.7 plays (6th in team). Taking too many possessions on his hand, poole can't convert them into points well and efficiently but can convert about 1/6 plays to turnovers, and he also allows too many points for his opponents.

Besides looking his stats in the context of warriors, I also examine them in a broader context of the NBA league, and here is the result:

```
Jordan Poole Offensive Rate Rank in NBA is 398
Jordan Poole Defensive Rate Rank in NBA is 410
Jordan Poole Turnover Rate Rank in NBA is 142
Jordan Poole USG Rate Rank in NBA is 32
```

In the data set I used here from www.nbastuffer.com, it contains 580 rows, and all those rankings can be considered with a denominator of 580. So a similar illustration would be: JP uses 32nd highest possessions among the entire league, but has a fairly low offensive rate at 398th place and 142nd highest turnover rate. At the same time, his defensive ability is ranked at 410th highest in the entire NBA out of 580!

This is really an astounding found that JP is actually harming the team a lot. Regardless his magical perfomances sometimes, it's reasonable to say that there is much more on both offense and defense that Poole has to improve. At the same time, Coach Kerr should make appropriate adjustments on tactics and time splitting for each players and try to control the possessions that Poole takes over.

6. Conclusion

Given issues identified, including weird start, dependent on 3 point shots, players changes, weak bench players, and inappropriate plays from Poole, I can think about several solutions: 1) wait for valuable players coming back, such as Wiggins and GPII. 2) Adjust the game tactics from Coach's end. 3) Enhance the defensive intensity.