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Is It Necessary to Play Well to Get a Higher Salary?

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Abstract: As a business league, there are a lot of business in the NBA, and the most hotly debated one is the salary of NBA players. The difference between one player's salary and another might be like a chasm, even though those players are in the same league. In this paper, we selected over 100 players who play in the NBA league and separated them into two parts by their salaries and performance. We collected different datasets for those players, both on-court and off-court, to find out which factor is highly related to the salary. We aim to help NBA teams and players find the right salary for each one of them. The result of our research is surprising. We found out that factors like age, points per game, and field goal percentage are not quite related to the salary the players get paid, but the real plus-minus and the followers on social media are highly related to the player's salary.

Keywords: salaries, T-test, linear regression

1. Introduction

One of the world's most famous sports business leagues, the National Basketball Association (NBA), has over 400 players. It is found that some players are well paid for brilliant performance while some players are well paid for poor performance. For example, Collins has been on a downward trend over the last two seasons; in 71 games in 2022-23, Collins averaged just 13.1 PTS and 6.5 RPG while Collins still got over 25 million dollars, which was the worst performance since Collins' rookie season [1]. The objective of this study is to identify and compare NBA players who perform poorly and have high player salaries to those who perform great and have high salaries to analyze what factors contribute to differences in salaries. This report will partly help players to purposefully improve their' performance in certain areas of the sport to get a higher salary, and it will also help managers to evaluate the value of a player better to discover potential players in the player market.

Accordingly, the null hypothesis is the factors of game played (GP), minutes per game (MIN), field goal percentage (FG%), 3-point field goal percentage (FG3%), point per game (PTS), usage rate (USG), rebound rate (REBR), real plus/minus (RPM), nationality, ins fans do not affect great performance and poor performance with high salary. The alternative hypothesis is the factors mentioned above affect great performance and poor performance with high salaries [2].

This report begins by analyzing the league's salaries for the 2022-2023 season. The salaries higher than the mean salaries were defined as high salaries, and 33 players who performed well with high salaries and those who performed well with low salaries were selected through random sampling.

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Next, listing the match data, i.e., average point, field goal percentage… of 100 NBA players, finding out their respective nationalities, and the players' number of Instagram followers. Finally, to figure out factors that affect different players' salaries.

2. Methodology

This report utilized Excel to process the data. This report collected salary data for 533 players for the season 2022-2023 [3], then eliminated 9 short-term contracts data and ended up with 524 valid data. By calculating the descriptive statistics of these data above, we obtained his mean: $8,138,313., mode: $1,836,090 and median: $3,518,080. We ended up with a skewed right distribution. Hence the report considered salaries greater than the mean as "High Salaries." The Figure 1 and Table 1 are as follows.

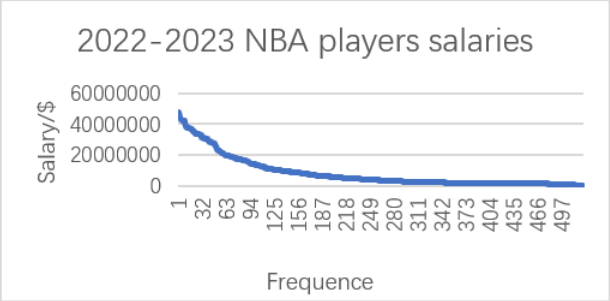

Figure 1: 2022-2023 NBA players' salaries

Table 1: Descriptive statistic of 524 NBA players' salaries

Mean	8138312.948
Median	3518080
Mode	1836090
Minimum	140384
Maximum	48070014
Count	524

Of the 159 players defined as "High Salary", we eliminated invalid data such as data of players without ins, data of players too young, etc., and finally got valid data of 103 players and analyzed the data as follows. According to Sisneros [4], RPM is an essential factor that contributes to court performance. Consequently, this report considered USG greater than and RPM greater than 0 as great performance players. Next, the samples above are divided into two groups: great performance with high-salaried players (G1) and poor performance with high-salaried players (G2). We distinguish player performance by whether the player's RPM value is greater than zero. Group 1 and Group 2 multiple linear regressions were first examined, whose independent variable was PTS, MIN, FG%, FG3%, and FT%, and the dependent variable was NBA players' salaries. Then, the linear regressions of age, RPM, and Ins Fans contributed to salaries and were analyzed separately because what we want to find is which factors influence players' salaries. Some players have high salaries and perform well because they play well and can help the team win the game. The other parts of players who get high salaries but have bad on-court performance may probably benefit the team in another way (sharing experiences with young players, inspiring teammates, gathering fans for the team……). Then, the effect of nationality on salary was studied using a T-test [5]

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3. Result

Table 2: High Salary and Great Performance Players Stats Multiple Linear Regression

Regression Statistics	
Multiple R	0.740366685
R Square	0.548142828
Adjusted R Square	0.505781218
Standard Error	8574355.121
Observations	71

ANOVA

	df	SS	MS	F	Significance F
Regression	6	5.70789E+15	9.51315E+14	12.93961277	1.61608E-09
Residual	64	4.70525E+15	7.35196E+13		
Total	70	1.04131E+16			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-40869314.28	19172495.85	-2.131663743	0.036879575	-79170777.79	-2567850.767	-79170777.79	-2567850.767
PTS	609853.7972	239706.1566	2.54417244	0.013378066	130985.6999	1088721.895	130985.6999	1088721.895
MIN	929725.3303	376819.3253	2.46729737	0.016299518	176942.1897	1682508.471	176942.1897	1682508.471
FG%	432774.3529	216941.0185	1.994894078	0.050316413	-615.1529161	866163.8588	-615.1529161	866163.8588
FG3%	149183.3813	140193.0626	1.064128129	0.291269163	-130884.4571	429251.2198	-130884.4571	429251.2198
FT%	58019.27108	143300.5997	0.404878076	0.68691724	-228256.5864	344295.1285	-228256.5864	344295.1285
GP	-79326.46141	84649.64508	-0.937115109	0.352222311	-248433.5676	89780.64479	-248433.5676	89780.64479

Result: In our research, according to Table 2, we found out that the player who performs well and are paid well is highly connected to their points per game, minutes per game, and field goal percentage; table 3 showed that Instagram fans have a positive relationship with Players' salaries [6].

Table 3: High Salary and Great Performance Players Ins Fans Linear Regression

Regression Statistics	
Multiple R	0.347159294
R Square	0.120519575
Adjusted R Square	0.107773482
Standard Error	11520714.31
Observations	71

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1.25499E+15	1.25499E+15	9.455413064	0.00301567
Residual	69	9.15815E+15	1.32727E+14		
Total	70	1.04131E+16			

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Table 3: (continued)

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	25107542.39	1437852.974	17.46182875	5.05214E-27	22239104.2	27975980.59	22239104.2	27975980.59
Ins Fans	0.224907622	0.07314151	3.074965539	0.00301567	0.078994302	0.370820942	0.078994302	0.370820942

Those players can help their team win games to attract more and more people to purchase shoes, clothes, and other team-related products, which can increase the value of the players' team. As for players who perform badly but get good salaries according to Table 4,

Table 4: High Salary and Poor Performance Players Ins Fans Linear Regression

Regression Statistics	
Multiple R	0.400784596
R Square	0.160628292
Adjusted R Square	0.132649235
Standard Error	7266624.437
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	1	3.03148E+14	3.03148E+14	5.741018808	0.023013103
Residual	30	1.58411E+15	5.28038E+13		
Total	31	1.88726E+15			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	7292980.909	1520256.782	4.797203337	4.1283E-05	4188202.356	10397759.46	4188202.356	10397759.46
Ins Fans	2.054705798	0.85754153	2.396042322	0.023013103	0.303372352	3.806039244	0.303372352	3.806039244

We found out that their Instagram number is highly related to their salaries. This makes sense because the team can also benefit from a player who owns a lot of fans. While the on-court performance seemed to have an impact on these players' salaries.

4. Discussion

Within the group of high performance with salaries players, according to Table 2, this report found out that there are two factors that are strongly related to player salaries: PTS and MIN. One factor's P-value is near 0.05, which is closely related to player salaries, and there are three factors that are not related to player salaries: 3PT%, FT%, and GP. The three-point percentage may not influence a player's salary; it is not necessary for some good-performing players to have a high three-point percentage. Giannis Antetokounmpo is obviously one of the best players in the league; he scored an average of 31.1 points per game, he signed 6th highest contract in the league, he scored most of his points in the paint area, he seldom threw 3 points, which makes 3PT% not influence him to get high paid. Free Throw rate does not closely relate to player salaries because free throw is not the main reason for players to get good performances. Luka Doncic got 32.4 points on average last season, and he has the 17th-highest salary in the league, but he only has a 74.2% free throw shooting percentage. Games played do not influence high-performing players' salaries much because some of them struggle

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with dealing with injuries, which makes them not play many games. Karl-Anthony Towns has the 23rd highest salary in the league, but he only played 29 games last season because he had a serious calf injury; during that time, he could not play for his team. Players born in the US or not are not the factor that can influence players' salary, which is shown in Table 5.

Table 5: High Salary and Great Performance Players Age Linear Regression

	Foreign players	native players
Mean	26067625.9	26647396.72
Variance	1.20674E+14	1.63157E+14
Observations	21	50
Hypothesized Mean Difference	0	
df	43	
t Stat	-0.193154914	
P(T<=t) one-tail	0.42387356	
t Critical one-tail	1.681070703	
P(T<=t) two-tail	0.84774712	
t Critical two-tail	2.016692199	

This makes sense because nationality does not influence players' market value. There are many players who perform well and were born in the US, like Lebron James and Stephen Curry, etc. Also, there are many foreign players who perform well, like Luka Doncic, Nikola Jocic, ext. These players come from another great market size economy that could also bring a decent salary. International players from large economies have the advantage of receiving a wage premium brought on by foreign market effects [7]. Table 6 represents the number of RPMs positively related to the players' salaries.

Table 6: High Salary and Great Performance Players Real Plus/Minus Linear Regression

Regression Statistics	
Multiple R	0.422096992
R Square	0.178165871
Adjusted R Square	0.166255231
Standard Error	11136748.31
Observations	71

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1.85527E+15	1.85527E+15	14.95854779	0.000245948
Residual	69	8.55787E+15	1.24027E+14		
Total	70	1.04131E+16			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	18209746.66	2512924.125	7.24643712	4.74781E-10	13196600.2	23222893.12	13196600.2	23222893.12
RPM	2277976.895	588985.4931	3.867628187	0.000245948	1102982.986	3452970.804	1102982.986	3452970.804

However, Table 7 shows that the salary of players is not related to age.

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Table 7: High Salary and Great Performance Players Age Linear Regression

Regression Statistics	
Multiple R	0.159374636
R Square	0.025400275
Adjusted R Square	0.011275641
Standard Error	12127728.35
Observations	71

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2.64497E+14	2.64497E+14	1.798296172	0.184316478
Residual	69	1.01486E+16	1.47082E+14		
Total	70	1.04131E+16			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	12248160.12	10706945.94	1.143945266	0.256599439	-9111612.586	33607932.82	-9111612.586	33607932.82
Age	485192.4167	361812.3565	1.341005657	0.184316478	-236603.4849	1206988.318	-236603.4849	1206988.318

For example, Stephen Curry has the highest salary in the league, but he is now over 35 years old. From the same table, it can be found that many players who perform well and earn high salaries are paid according to the number of Instagram fans they have. The number of followers on Instagram fans is positively correlated with the salary of players. It also found that for every additional 1 million social media followers a player had, Players tended to get nearly $400,000 more [8].

Within the group of poor performance with high salaries players, Tables 8 and 9 showed that all seven factors (Age, PTS, MIN, FG%, FG3%, FT% and RPM) that we found on ESPN Stats are not related to their salaries, one of the main reasons is their performance decreased after they signed a nice contract.

Table 8: High Salary and Poor Performance Players Real Plus/Minus Linear Regression

Regression Statistics	
Multiple R	0.191529054
R Square	0.036683378
Adjusted R Square	0.004572824
Standard Error	7784667.697
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	1	6.92312E+13	6.92312E+13	1.142408763	0.293669101
Residual	30	1.81803E+15	6.06011E+13		
Total	31	1.88726E+15			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	11530211.13	2545704.834	4.52928045	8.76924E-05	6331188.27	16729234	6331188.27	16729234
RPM	960172.9358	898335.7797	1.068835237	0.293669101	-874473.4835	2794819.355	-874473.4835	2794819.355

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Table 9: High Salary and Poor Performance Players Stats Multiple Linear Regression

Regression Statistics	
Multiple R	0.434664773
R Square	0.188933465
Adjusted R Square	-0.005722503
Standard Error	7824821.082
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	6	3.56567E+14	5.94278E+13	0.970601963	0.465140796
Residual	25	1.5307E+15	6.12278E+13		
Total	31	1.88726E+15			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	6680904.824	14098263.7	0.473881392	0.63969698	-22355012.79	35716822.44	-22355012.79	35716822.44
PTS	474909.1885	744459.5211	0.637924797	0.529322957	-1058333.896	2008152.273	-1058333.896	2008152.273
MIN	257245.0734	330704.0884	0.777870859	0.443944886	-423852.7462	938342.893	-423852.7462	938342.893
FG%	101956.7059	172190.5882	0.59211544	0.55909086	-252676.4489	456589.8607	-252676.4489	456589.8607
FG3%	-159764.7947	150644.2173	-1.060543827	0.299036227	-470022.368	150492.7785	-470022.368	150492.7785
FT%	-116359.4294	146163.0268	-0.796093458	0.433472556	-417387.818	184668.9592	-417387.818	184668.9592
GP	145221.156	200768.7473	0.723325507	0.476193695	-268269.8192	558712.1312	-268269.8192	558712.1312

For many players, it's hard to keep on performing well; some players played well and signed a 4-year high salary contract, and then they became less competitive after it. The other reason that Shaquill O'Neal mentioned is players are now more clever than ever in negotiating a better and more valuable contract, even though these players do not deserve it [9]. From Table 10, we found that nationality is not related to players who perform poorly but have high salaries because their nationality didn't influence them to sign their high-salary contracts. For example, Rudy Gobert, who is a France center, owns the 11th highest salary in the league, but he only scored 12.5 points per game.

Table 10: High Salaries Poor Performance Nationality T-test

	Foreign players	native players
Mean	11792442.25	8390651.042
Variance	9.38575E+13	5.04707E+13
Observations	8	24
Hypothesized Mean Difference	0	
df	10	
t Stat	0.914567937	
P(T<=t) one-tail	0.190970863	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.381941726	
t Critical two-tail	2.228138852	

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Referring to Table 11, there is another factor that is not highly related to a poorly performed player's salary, which is age. This finding surprised us because what we thought was age was the main reason influencing players' salaries. Then we find out there are some players who own a high-salary contract but perform badly. Cris Paul is an iconic one; he owns a 28M contract at the age of 38. He owns his high contract by his high basketball IQ and he an inspire his teammates because he is an experienced veteran.

Table 11: High Salary and Poor Performance Players Age Linear Regression

Regression Statistics	
Multiple R	0.008365
R Square	7E-05
Adjusted R Square	-0.03326
Standard Error	7931227
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1.32E+11	1.32E+11	0.002099	0.96376
Residual	30	1.89E+15	6.29E+13		
Total	31	1.89E+15			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8683163	12258119	0.70836	0.48419	-1.6E+07	33717582	-1.6E+07	33717582
Age	18617.26	406345.7	0.045816	0.96376	-811251	848485.9	-811251	848485.9

There are still some limitations in this report. First of all, some rookies have great performances in their first season in the NBA, and the limitations of rookie contracts result in players not being able to get higher-priced contracts. Also due to the NBA's salary cap, there is a limit to the top salary of each team, which cause players with shinning game stats are not able to get a higher salary. Finally, this report only lists the amount of Instagram fans and the value of endorsement contracts to reflect an NBA player's market value; in fact, there are many other factors that affect the value of a player's market value.

5. Conclusion

This report started by raising the query of whether it is necessary to play well to get a higher salary, with the aim of analyzing what factors influence players who are well-paid to perform well and those who are well-paid to perform poorly respectively. The paper was found through data analysis in Excel. Both types of players' salaries are positively correlated with the number of players' Instagram followers, while on-court performance (points per game, minutes played per game) is even more influenced by highly paid, high-performing players. In our research, we still have some problems not solved. We analyzed about 110 players' game data in one season, which may not convincing enough. Also, we didn't do any research on players who get poorly paid, so we cannot find out what factor made the player's salary drop. In the NBA, they have a complex contract law; we put all the rookies out because their contract was signed before they played in the league, which needs further study. To summarize, NBA players who want to boost their salaries, especially those who are already receiving higher salaries, should not only focus on performing well on the court but also boost their social

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media attraction, which may bring more revenue to themselves and their teams and will, in turn, boost their own revenue as well.

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