# Research on the Revenue of Basketball Celebrity Endorsement Brands

## --Based on Regression Model

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*Abstract:* Nowadays, the influence of sports brands is increasing, and many sports brands choose to sign well-known sports stars to enhance their brand influence. Chinese sports brands are also like this, increasing brand awareness by signing a large number of star players, and many of these brands choose to sign NBA stars as spokespersons. But are the profits brought by different levels of basketball stars different? This article will analyze and discuss this. This article uses regression models to analyze the basketball stars at different levels, in order to determine which category of basketball stars can bring the greatest income to the brand. Firstly, this article collected sales data for five players' respective brands: Aaron Gordon, Nikola Jokic, Klay Thompson, Keldon Johnson, and Austin Reaves. And preprocess the five sets of data using Visual Studio Code, integrate the five sets of data and export them to Excel. Then, the data was imported using R studio, analyzed using R language, and four regression models were created. The next step is to determine whether different factors bring good benefits through the significance of their respective factors in each regression model. Finally, by comparing the five players, it can be inferred which level of star is more suitable for brand endorsement and brings the greatest benefits.

Keyword: Regression, basketball star, R language, data analysis.

#### 1. Introduction

In today's society, more and more Chinese brands are signing NBA stars as spokespersons for their brands, which has led to a more diversified sports brand in the basketball field, no longer leaning towards American brands [1]. Chinese sports brands seeking NBA star endorsements can bring multiple benefits, including not only increased brand awareness, but also brand image building, market expansion, and increased product sales. As one of the most influential professional basketball leagues in the world, the NBA has a huge fan base and global influence among its players [2].

There is a close and complex relationship between data analysis and the brand business market. Perform significance tests on each coefficient in the model to determine which factors have a significant impact on the dependent variable. This helps brands to invest resources more accurately in future marketing strategies, for example, endorsements of top basketball stars can significantly increase brand sales and visibility, but the cost is also relatively high [3]. The endorsement of potential

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new stars may have higher cost-effectiveness. This article aims to discuss which level of star players can bring greater profits to Chinese sports brands, compare different star players, analyze their data, and finally draw conclusions.

## 2. Research Method

Due to the crucial role played by regression models in data analysis. By analyzing the relationship between the explanatory variable and the dependent variable, regression models can predict the possible values of the dependent variable given the value of the independent variable [4]. This article takes profit as the dependent variable in the regression model, with all other variables as independent variables, in order to analyze the profit benefits brought to the brand by different factors and levels of star players So, this study chose to use the regression model in R language to analyze the collected data and calculate the best answer, in order to confirm which level of star players can bring the greatest benefits to the brand.

## 2.1. Data Collection

For the convenience of data analysis, this paper collected five brands endorsed by basketball stars. Among them, Aaron Gordon and Nikola Jokic are both spokespersons for 361°, Klay Thompson is a spokesperson for ANTA, Keldon Johnson is a spokesperson for QIAODAN, and Austin Reaves is a spokesperson for RIGORE. This study uses the Octopus app to access it [5]. Data collection: the first 20 pages of data are collected for each star brand on Taobao, but the larger the page, the less accurate the related products. Finally, the collected data are filtered and a total of 1377 entries are found.

## 2.2. Data Preprocessing

Data preprocessing is a crucial step in data analysis for various sports brands. Raw data often contains missing values, outliers, or inconsistent formats, so this study improves data quality by cleaning, filling in missing values, handling outliers, standardizing or normalizing data, and making it more suitable for subsequent analysis

This article uses Visual Studio Code and Excel for data preprocessing. Firstly, import the data collected from Excel into the Visual Studio code. Use the concat function to merge five files into one file and generate a new file (Figure 1).

<pre>df1 = pd.read_excel("E:\datascienceR\R\AG361.xlsx")</pre>
<pre>df2 = pd.read_excel("E:\datascienceR\R\ANTA_KT.xlsx")</pre>
<pre>df3 = pd.read_excel("E:\datascienceR\R\KJ_QiaoDan.xlsx")</pre>
<pre>df4 = pd.read_excel("E:\datascienceR\R\Rigorer_rivers.xlsx")</pre>
<pre>df5 = pd.read_excel("E:\datascienceR\R\Jokic361.xlsx")</pre>
hf = pd.concat([df1,df2,df3,df4,df5], axis=0)

Figure 1: Input data.

Second, reorder the file using the reset\_index() function.

Next, rename each label to simplify the subsequent operation of the regression model in R language (Figure 2).

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Figure 2: Reset data title.

Finally, export the processed data to Excel and perform another round of process. In Excel, for the convenience of subsequent data analysis, this study calculated the profits of each data and labeled the brand name. The above is the entire process of data preprocessing.

#### 2.3. Basic Data Analysis

After data processing, this article continues to calculate descriptive statistics on the existing data, which is the basic data analysis. Statistics such as mean and median can be used to describe the central tendency of average selling price, average sales volume, or consumer evaluation of product categories in the sports brand market. These indicators help brands understand the overall level of the market and consumer acceptance.

Firstly, import the data into R language, export the dataset that has just been calculated in VScode, and use the summary() function in R language to calculate the descriptive statistics of the dataset.

price	Number_of_payers	profits
Min. : 15.5	Min. : 0.0	Min. : 0
1st Qu.: 129.0	1st Qu.: 0.0	1st Qu.: 0
Median : 249.0	Median : 6.0	Median : 1095
Mean : 285.4	Mean : 117.2	Mean : 42148
3rd Qu.: 399.0	3rd Qu.: 68.0	3rd Qu.: 14022
Max. :1599.0	Max. :20000.0	Max. :9380000

Figure 3: Summary statistics.

From Figure 3, descriptive statistics for three indicators can be obtained: price, purchase quantity, and revenue. In price, the minimum value is 15.5, the median is 249, the average is 285.4, and the maximum value is 1,599. In the indicator of purchase quantity, the minimum value is 0, the median is 6, the average value is 117.2, and the maximum value is 20,000. In the indicator of income, the minimum value is 0, the median is 1095, the average is 42,148, and the maximum value is 9,380,000. From this, we can see that the fluctuations in various indicators are relatively large, but the prices of domestic brands are relatively low, the customer purchase volume is moderate, and the short-term returns are average.

#### 3. Regression Model

#### 3.1. The First Regression

Firstly, this article takes profit as the dependent variable and different brands as independent variables for regression analysis, in order to calculate the differences between different sports brands.

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Call: lm(formula = profit:	s ~ +brand_nu	Cmr	
Residuals:			
Min 1Q Me	dian 3Q	Max	
-144702 -52974 -2	8993 -3901	9326487	
Coefficients:			
ES	timate Std. E	Error t value	Pr(> t )
(Intercept)	53513	9525 5.618	2.33e-08 ***
brand_numKT	-24520 1	L8316 -1.339	0.1809
brand_numQiaodan	91190 5	58312 1.564	0.1181
brand_numRigorer	-49612 2	21538 -2.304	0.0214 *
Signif. codes: 0 '	***' 0.001 '*	**' 0.01 '*' 0	0.05 '.' 0.1 ' ' 1

Figure 4: The first regression.

According to the calculation results of the equation (Figure 4), the 361° brand is taken as the baseline, so we compared the other three brands with 361°. As a result, it can be found that the p-value of the RIGORER brand in this regression model is 0.0214, which is less than 0.05, indicating significance. Therefore, the RIGORER brand has a larger market share compared to the 361° brand, while the market share of KT and QIAODAN is slightly less than 361°. The reason why RIGORER [6] has a larger market share is mainly because they focus more on the youth or adult market, while the target audience of the other three sports brands may be more concentrated on children.

#### 3.2. The Second Regression

In the second regression (Figure 5), this article takes customer purchase volume as the dependent variable and price and brand category as independent variables to study whether different factors have an impact on customer purchase volume.

Call: lm(formula = Number\_of\_payers ~ price + brand\_num) Residuals: Min 1Q -464.1 -123.4 1Q Median 30 Max -82.7 -9.9 19836.0 Coefficients. Estimate Std. Error t value Pr(>|t|) 
 (Intercept)
 58.87673
 37.21328

 price
 0.22409
 0.09622

 brand\_numKT
 2.64814
 40.46766

 brand\_numQiaodan
 203.49686
 127.76320
1.582 0.114 2.329 0.020 \* 0.065 0.948 1.593 0.111 brand\_numRigorer -65.13819 49.33848 -1.320 0.187 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Figure 5: The second regression.

From this regression equation, it can be concluded that the impact of each brand on customer sales is not significant, so the impact of these four brand categories on customer sales is not prominent. However, price shows a significant effect on customer sales, with a p-value of 0.02, which is less than 0.05, indicating significance. Moreover, for every unit increase in price, customer sales increase by 0.224 units. However, prices cannot continue to rise, there must be a limit value. Based on the descriptive statistics mentioned earlier, it can be inferred that the prices set by these domestic brands should be around 285.4, and the third percentile of the price factor is 399. Therefore, this article speculates that if the pricing of domestic brands is between 285 and 399, it can achieve maximum customer sales.

#### 3.3. The Third Regression

The third regression equation, this article attempts to use customer sales as the dependent variable and different celebrity endorsements as independent variables, with a total of five sets of data for regression analysis (Figure 6).

Call: lm(formula = Number_of_payers	~ Brand_Ide	entity)			
Residuals: Min 10 Median -356.2 -117.4 -68.1 -29	3Q Max .1 19791.7				
Coefficients:					
	Estimate Sto	I. Error	t value	Pr(> t )	
(Intercept)	70.12	27.72	2.529	0.011543	*
Brand_Identity361Jokic	138.17	41.86	3.301	0.000989	***
Brand_IdentityANTA-KT	49.30	43.96	1.121	0.262303	
Brand_IdentityQIAODAN-KJ	286.10	128.48	2.227	0.026122	*
Brand_IdentityRigorer-Rivers	-39.05	50.43	-0.774	0.438867	
Signif. codes: 0 '***' 0.001	· *** ' 0.01 '	*' 0.05	'.' 0.1	''1	

Figure 6: The third regression.

From the regression model, we found that using 361°AG as the baseline and comparing it with the other four brands, the results showed that 361°AG itself was significant. Compared to the brand 361° AG, 361°Jokic was more significant, while ANTA-KT and RIGORER\_Rivers did not show significant differences. However, QIAODAN\_Johnson showed a slightly significant difference compared to 361°AG.

By comparing five sets of data, this article can infer that different basketball stars do have different impacts on the sales of endorsed brand products. Therefore, this article will continue to compare them to infer the different benefits that different levels of basketball stars bring to endorsed brands.

#### 3.4. The Fourth Regression

In the fourth regression (Figure 7), this article takes profits as the dependent variable and different levels of star endorsements and prices as independent variables to discuss the significant benefits that different levels of star endorsements can bring to endorsed brands.

Call: lm(formula = profits ~ Brand_Identity + price)
Residuals: Min 1Q Median 3Q Max -289423 -54258 -12643 11003 9267689
Coefficients:
Estimate Std. Error t value Pr(> t )
(Intercept) -24503.18 17057.51 -1.437 0.15109
Brand_Identity361Jokic 63304.70 20883.31 3.031 0.00248 **
Brand_IdentityANTA-KT 13006.97 19944.76 0.652 0.51441
Brand_IdentityQIAODAN-KJ 103569.12 58860.69 1.760 0.07870.
Brand_IdentityRigorer-Rivers 2294.69 23133.40 0.099 0.92100
price 156.74 47.91 3.271 0.00110 **
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 7: The fourth regression.

From the regression results, it can be concluded that the regression takes 361° AG as the baseline. Therefore, compared with 361° AG, the p-value of 361° Jokic is 0.0248, which is less than 0.05, indicating that the result is more significant. However, compared with 361° AG, ANTA-KT [7] and RIGORER\_Rivers have relatively larger p-values, so they are not significant. However, the p-value of QIAODAN\_Johnson is 0.0787, which is less than 0.1, indicating that it tends to be significant but not completely significant.

By examining the significance of the above data, we can determine whether different levels of basketball stars can bring different benefits to the brand. From this, it can be seen that Jokic and Gordon are both spokespersons for the same brand, but their respective shoe sales are different, so the benefits brought to the brand by different levels of basketball stars are different. Based on the regression models of the above groups, we can infer that stars like Jokic can bring greater benefits to the brand, while stars like Gordon bring much less benefits to the brand than stars like Jokic.

#### 4. Star Level Comparison

There are significant differences in the revenue brought by different levels of basketball stars to the brand, mainly reflected in multiple aspects such as brand awareness, market penetration, consumer loyalty, and sales growth [8].

Among the five players selected in this article, Jokic averaged 26.4PTS(Points)+12.4REB(Rebound)+9AST(Assists) per game in the 2023-2024 NBA season and won the MVP of the season [9]. He led the team to win the championship in the 2022-2023 season [10]. Jokic's career honors include 2 MVPs, 1 FMVP, 1 championship, 5 All Star, and 5 All Star awards, so Jokic is classified as a superstar level player.

And another spokesperson for 361°, Aron Gordon, averaged 13.9 PTS+6.5 REB+3.5 AST per game in the 2023-2024 season and won a championship with the team in the 2022-2023 season, so Gordon can only be considered a starting level player.

ANTA spokesperson Klay Thompson averaged 17.9 PTS+3.3 REB+2.3 AST per game in the 2023-2023 season, which may indicate that he is an excellent athlete based on data. However, compared to his performance in previous seasons, Klay Thompson's form has declined significantly. Despite Klay Thompson's rich career honors, including four NBA championships, five selections to the NBA All Star team, two selections to the NBA All NBA Third Team, one selection to the NBA All Defensive Second Team, and the 2016 All Star Three Point Game championship. However, as he ages, he is unable to bring more revenue to the brand, and even the revenue may continue to decline.

The remaining two spokespersons, Austin Reaves and Keldon Johnson, received 15.9PTS+4.3REB+5.5AST and 15.7PTS+5.5REB+2.8AST respectively in the 2023-2024 season. Due to their young age, these two players have not received any good honors, but they have great potential for the future. Therefore, it is very cost-effective for brand merchants to sign rookie contracts for young and promising players.

After comparing five groups of players, we can infer that signing popular superstar level players like Jokic would bring significant benefits to the brand, greatly increasing brand awareness, expanding the market, and enhancing consumer loyalty and identification with the brand. In addition, signing players like Gordon does not effectively increase brand awareness and market penetration; And older players like Thompson's poor performance on the court may affect the brand's revenue, making it difficult to match their large contracts. However, signing young players like Rivers and Johnson carries risks as their future is uncertain, so offering them big contracts may not be a wise choice.

## 5. Conclusion

Players of different levels bring different profits to the brand, and the differences are significant. Superstars can reach a wider consumer base, helping brands quickly enter and occupy new markets. Their influence can attract a large number of fans and consumers to purchase endorsed products, thereby driving a significant increase in brand sales. Although ordinary basketball stars may not have the same global influence as top-tier stars, they still have a high level of recognition and fan base in their respective regions or specific groups, providing valuable promotional opportunities for brands. However, the effectiveness of endorsement cooperation is often difficult to directly quantify and evaluate. Endorsement cooperation requires brands to invest a certain amount of funds, which may be a significant expense for small and medium-sized enterprises or emerging brands, and the input-output ratio needs to be carefully evaluated. Compared to top-tier players at their peak, the influence

of outdated players usually decreases. Their exposure and attention may not be sufficient to attract enough consumers to pay attention to endorsed products or brands. This may lead to unsatisfactory endorsement results and fail to achieve the expected market effect. Young players (Rivers and Johnson) are in the rising stage of their careers and have enormous growth potential. Brands can invest in their future achievements through foresight, and as players rise, brand exposure and influence will also increase. Due to the relatively low achievements and popularity of young players in the professional sports field, they may not be able to immediately bring significant market effects to the brand.

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