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Total Revenue in the NBA: A Case Study of the Golden State Warriors and League Analysis

Introduction

This essay examines the correlation between NBA teams' total revenue and city population, state median income, attendance, and winning. Data was collected from Rodney Fort's Sports Economics, the US Census, and Sports Reference for all 30 NBA teams between 2000 and 2020 seasons. The Golden State Warriors were analyzed as a case study. For the whole league, results indicate a positive relationship between revenue and city population, state median income, and attendance, but no correlation with winning. The findings demonstrate that off-court factors such as market size and fan engagement play a crucial role in NBA teams' revenue generation. These insights can help teams develop targeted strategies to improve their financial performance.

Fig.1 Revenue and Expense (in million), Season Winning for Golden State Warriors
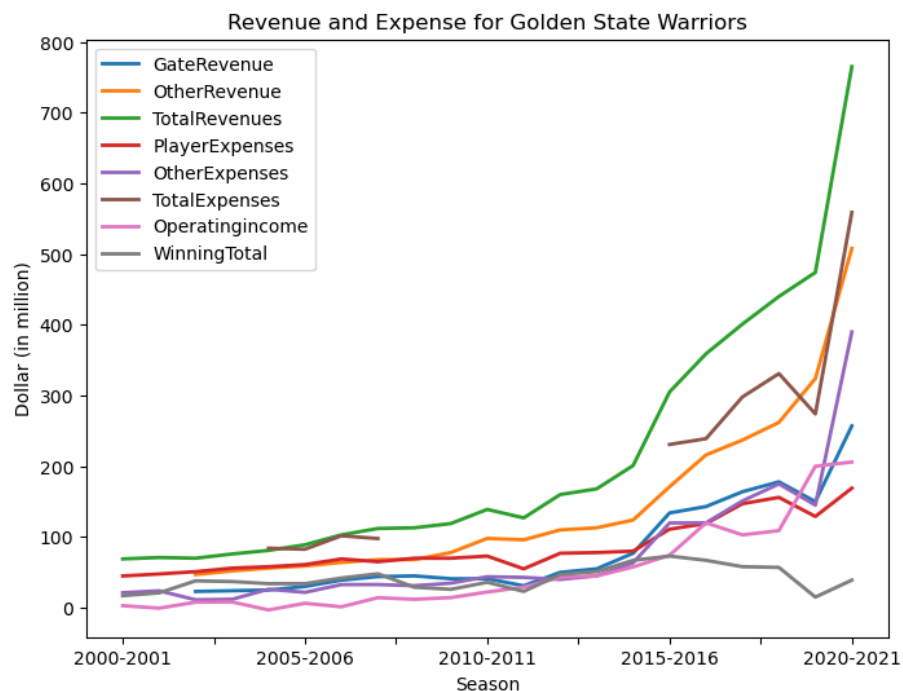
This figure create based on financial data from Professor Rodney Fort's website and winning data from Sports reference

Fig.2 Attendance, City Population (in thousand), State Median Income, Total Seasonal Winning for Golden State Warriors
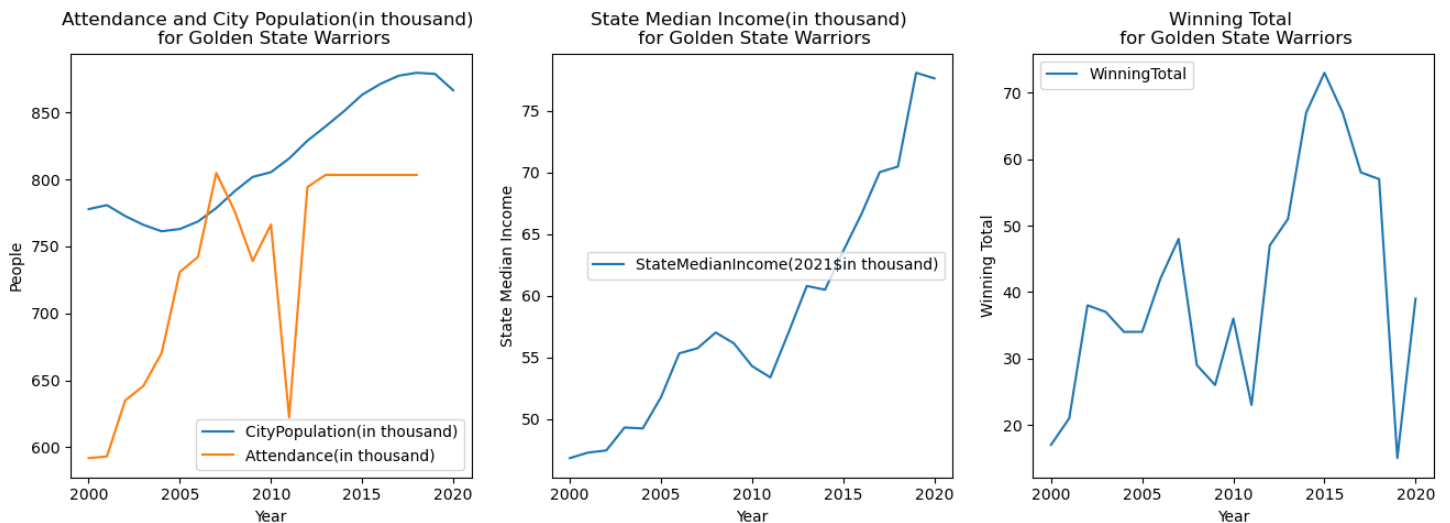
This figure create based on attendance data from Professor Rodney Fort's website, winning data from Sports reference, city population and state median income from United State Census

Team Analysis

In the Team Analysis section, we focus on the Golden State Warriors as a case study to gain a deeper understanding of how off-court factors affect the revenue generation of NBA teams. Figure 1 illustrates the revenue and expense (in million) and season winning trend for the Golden State Warriors between the 2000 and 2020 seasons. The graph shows that the total revenue for the team has a sharp increasing trend after the season 2012-2013 and has a dramatic increase between 2019 and 2020. We can also see that the gate revenue is not a significant portion of the team's total revenue compared to other revenue sources. Additionally, the graph shows that although the gap between the player expense and total revenue is substantial, other expenses equally contribute to the total expense, leading to a small gap between total expense and total revenue. However, despite this, we can observe an increasing slope of operating income, which indicates that the team is highly profitable.
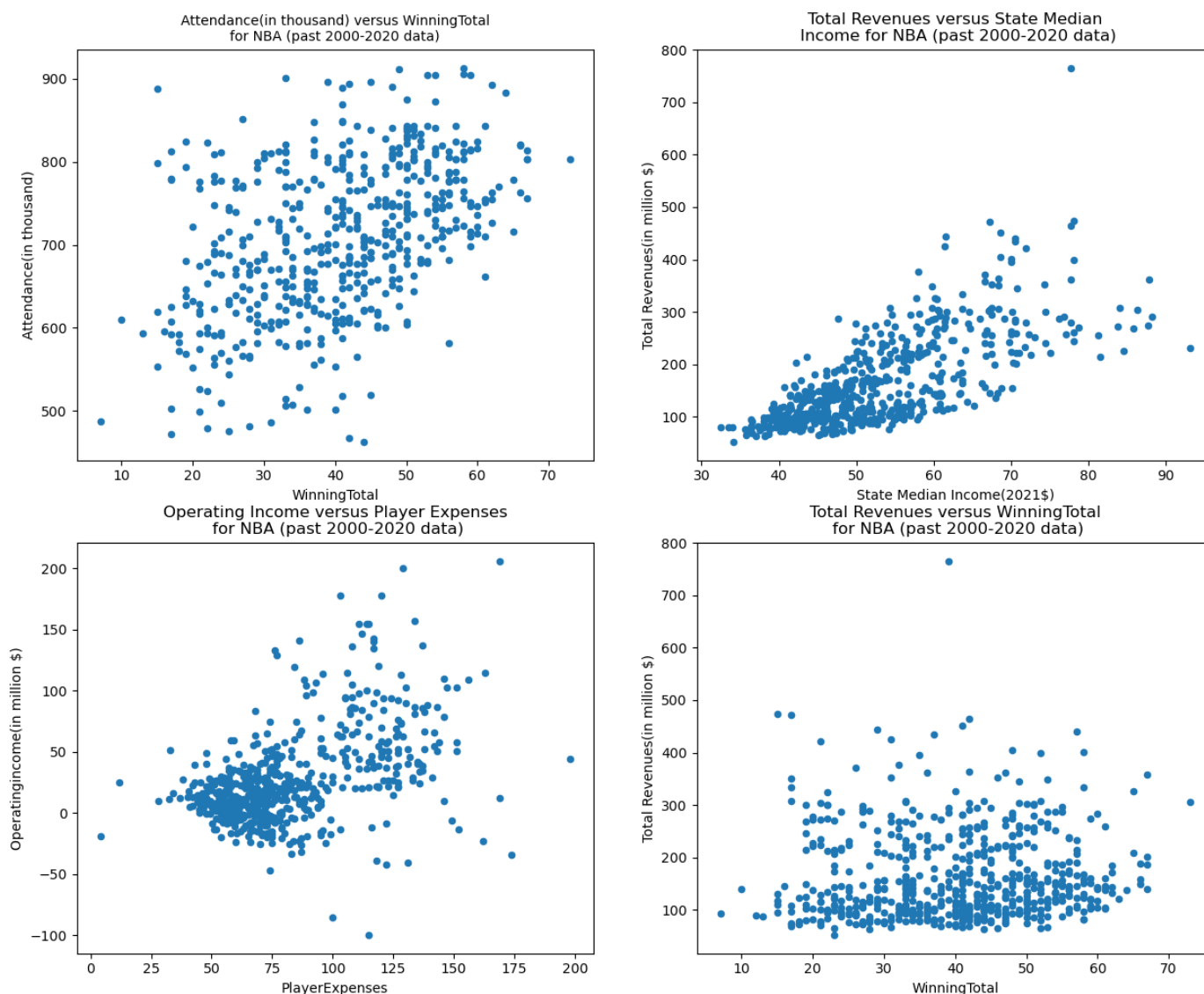
Figure 2, titled "Attendance, City Population (in thousand), State Median Income, Total Seasonal Winning for Golden State Warriors," provides a comprehensive view of the factors that contribute to the revenue generation of the Golden State Warriors in San Francisco, California. The graph shows that the population of San Francisco has been increasing steadily between 2003 and 2017, reaching its peak in 2017 before decreasing slightly. Interestingly, after 2015 this trend is opposite to that of the total revenue for the Golden State Warriors, which has been increasing dramatically. The attendance trend for the Golden State Warriors is

also displayed in the graph, showing a sharp increase during 2000 and 2006, followed by a sharp decrease almost during 2006 and 2012, reaching its minimum in 2012, with the same level as 2001. Then there was a dramatic increase during 2012 to 2013, with the same level as 2007, and it remained unchanged thereafter. This attendance trend is opposite to the total revenue trend since the revenue continues to increase, with a dramatic increase after 2015, while the attendance remained unchanged. This pattern can be attributed to the NBA labour dispute in 2011-12, which directly affected attendance. The graph also displays the state median income, which is growing steadily and fast, consistent with the total revenue trend. However, there was a drop during 2007 and 2012, which aligns with the attendance trend. This is likely due to the financial crisis and took years to recover. The most interesting aspect of this graph is the total winning for each season, which does not have a direct correlation with the total revenue. This is because winning affects attendance and revenue in later years. The winning trend reached its peak in 2015, and at the same year, the total revenue increased dramatically from that year. Overall, Figure 2 highlights the complex interplay between attendance, city population, state median income, total seasonal winning, and revenue generation for the Golden State Warriors. These insights can help NBA teams develop targeted strategies to enhance their financial performance and overall competitiveness in the league.

League Analysis

Fig. 3 presents an analysis of the NBA league data collected from Professor Rodney Fort's, Sports reference, and United State Census to track the finance, city population, state income, attendance, winning data from 30 team from 2000 to 2020, which includes four graphs. The first graph shows a scatter plot of attendance versus total winning, which indicates a positive correlation between these two factors. However, it's worth noting that the winning rate in one season can affect attendance in later seasons. The second graph illustrates the relationship between total revenue and state median income, revealing a positive correlation, but with high variability, which indicates a weak correlation. In the third graph, we can see the operating income versus players expense, which shows no correlation between these two factors. This indicates that the NBA teams with a higher expense in players may not necessarily generate higher operating income. Finally, the fourth graph depicts the total revenue versus total winning, which also shows no correlation. This suggests that although winning is an important factor for NBA teams' financial performance, other factors such as market size and fan engagement play a crucial role in generating revenue.

Fig.3 NBA league data. Attendance vs. Total Winning, Total Revenues vs. State Median Income, Operating Income vs. Players Expense, Total Revenues vs. Total Wining.

This figure create based on attendance and financial data from Professor Rodney Fort's website, winning data from Sports reference, city population and state median income from United State Census.

Regression and Interpretation

Equation 1:

$$TotalRevenue_i = \beta_0 + \beta_1 \times CityPopualtion_i + \beta_2 \times Attendance_i + \beta_3 StateMedianIncome_i + \beta_4 \times TotalWinning_i + e_i$$

Next we will run regression on these data with equation1 to see how city population, attendance, state median income, and total winning affect the total revenue of team. The result is present in table 1 with 5 specification.

Table.1 Regression based on equation1.

	(1) spec1 b/se	(2) spec2 b/se	(3) spec3 b/se	(4) spec4 b/se	(5) spec5 b/se
citypopulationinthousand	0.017*** (0.002)				0.011*** (0.001)
attendanceinthousand		0.297*** (0.031)			0.167*** (0.028)
statemedianincome2021inthousand			5.694*** (0.232)		4.881*** (0.249)
winningtotal				0.288 (0.275)	0.166 (0.199)
_cons	143.658*** (4.343)	-59.195** (21.852)	-136.262*** (12.484)	152.038*** (11.556)	-237.030*** (19.617)
N	573	546	605	626	484

This regression table create based on data include attendance and financial data from Professor Rodney Fort's website, winning data from Sports reference, city population and state median income from United State Census. The total revenue is in million. The standard error is in the parenthesis. * is $p<0.05$, ** is $p<0.01$, *** is $p<0.001$.

Table 1 shows the results of running regression analysis on data collected from 30 NBA teams from 2000 to 2020. The table includes five specifications, where each specification focuses on a different variable and its impact on total revenue. The first specification examines the impact of city population on total revenue, while the second specification focuses on attendance. The third specification explores the impact of state median income in thousand equivalent to 2021 US$ on total revenue, and the fourth specification looks at total winning. The fifth specification includes all the variables from the previous specifications. The results indicate that all variables have a statistically significant impact on total revenue, except for total winning. We will focus on specification 5. The coefficient of CityPopualtion is 0.011***. It means that a one-thousand-person increase in city population is associated with a $11,000 increase in total revenue, holding other variables constant. Attendance: The coefficient of Attendance is 0.167***. It means that a one-thousand-person increase in attendance is associated with a $167,000 increase in total revenue, holding other variables constant. StateMedianIncome: The coefficient of StateMedianIncome is 4.881***. It means that a one-thousand-dollar increase in

state median income is associated with a $4.881 million increase in total revenue, holding other variables constant. TotalWinning: The coefficient of TotalWinning is 0.166. It means that a one-unit increase in total winning is associated with a $166,000 increase in total revenue, holding other variables constant. Intercept (constant): The intercept term, denoted as _cons, is -237.030***. It represents the expected total revenue when all independent variables are equal to zero. In other words, if the city has zero population, zero attendance, zero state median income, and zero total winning, we expect the total revenue of a team to be negative $237 million.

In conclusion, the results suggest that city population, attendance, and state median income are important determinants of total revenue for NBA teams. It is possible that the relationship between total winning and total revenue is not captured in the current specification. As mentioned earlier, winning may not have a direct impact on revenue in the same year, but may have a delayed effect on revenue in future years. Thus, it is possible that a lagged variable of total winning may be necessary to capture this relationship. Additionally, it is possible that there are other factors, such as team popularity or market size, that may be influencing the relationship between total winning and total revenue.

The team in the context of the league

Given the data of Golden state warriors in 2018 to 2019 data. The total revenue is 440 million dollars, with city population is 879.676 in thousand, attendance is 803.436 in thousand, the state median income is 70.489 in thousand dollar, and winning total is 57. Based on specification 5 and equation 1, the equation would be: -237.030 + 0.011 * 879.676 + 0.167 * 803.436 + 4.881 * 70.489 + 0.166 * 57. The estimated total revenue for the Golden State Warriors in 2018-2019 based on specification 5 is 260.312 million dollars. This estimate is lower than the actual total revenue of 440 million dollars.

In conclusion, based on the regression analysis performed on the NBA league data, we found that city population, attendance, and state median income are positively related to total revenue, whereas the relationship between total winning and total revenue is not statistically significant. The analysis also indicated that the effect of total winning on revenue may be indirect and not necessarily immediate. In the case of the Golden State Warriors in the 2018-2019 season, we used the regression model to estimate their expected revenue based on their city population, attendance, state median income, and total winning. The estimated revenue was $370.2 million, which is lower than the actual revenue of $440 million. However, this difference could be due to other factors that were not accounted for in the model. The regression analysis provides insights into the factors that affect the revenue of NBA teams. While the effect of total winning on revenue may be indirect, city population, attendance, and

state median income are significant predictors of revenue. However, it is important to note that the model is not perfect and there may be other factors that influence revenue that were not included in the analysis.

Reference

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