Does MLB Payroll Correlate to Win Percentage?

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Introduction

In this year's greatest stage of baseball, the World Series, the Los Angeles Dodgers squared off against the Tampa Bay Rays. The Dodgers total payroll was $108.4 Million while the Rays total payroll was only $28.3 Million. This brings up the question that so many have asked over the years about baseball: Does team payroll have a correlation with a team's success?

Major League Baseball is the only major sport that doesn't set a salary cap. This allows teams with more money, more revenue, and a bigger market to spend more. As a result, we see a wide discrepancy in team payroll. Does having a higher payroll increase the chance of success? Do teams with small markets and less money have an unfair advantage to the team with more money?

A sample was taken from the years 2017-2020 using data found from Spotrac.com and Baseball-Reference.com. The variables used were 'Active-man Payroll' and 'Winning Percentage'. Active Payroll is defined as 'the combined payroll salaries of the 28-man or 25-man active roster'. Winning percentage is used instead of 'games won' because in 2020 the season was cut in half to 60 games compared to the standard 162-game season. However, we convert winning percentages to games won based on a 162-game season to describe the effect of the variables.

Descriptive Statistics

In 2020, the mean payroll decreased significantly, which can be directly attributed to COVID-19 and the season being cut from 162 games to 60 games. For example, the New York Yankees and Chicago Cubs had the highest payrolls in 2019. The Yankees payroll went from $176 million in 2019 to $77 million in 2020 and the Cubs payroll went from $198 million to $66 million. In the years 2017-2019, the average payroll was around 100 million across the league while only $40 million in 2020. In 2021, my prediction is the payroll will rise and return closer to normal levels but not make a full recovery.

After calculating some fields, each team was assigned a percentile of their active payroll. In 2015-2019, 40 teams fell lower than the 25th percentile. Out of those 40 teams, only 2 made the playoffs, which means a team has a 5% chance on making the playoffs if their Active Payroll is lower than the 25th percentile. Conversely, in the years 2015-2019, 40 teams landed above the 75th percentile, and 27 of those teams made the playoffs. If a team is above the 75th percentile in Active Payroll, there is a 68% that team would've made the playoffs in those years.

Percentage of teams **below** the Active Payroll **25th** percentile that made the playoffs:

Year	Percentage
2019	13%
2018	13%
2017	0%
2016	0%
2015	0%

Percentage of teams **above** the Active Payroll **75th** percentile that made the playoffs:

Year	Percent
2019	50%
2018	75%
2017	75%
2016	75%
2015	63%

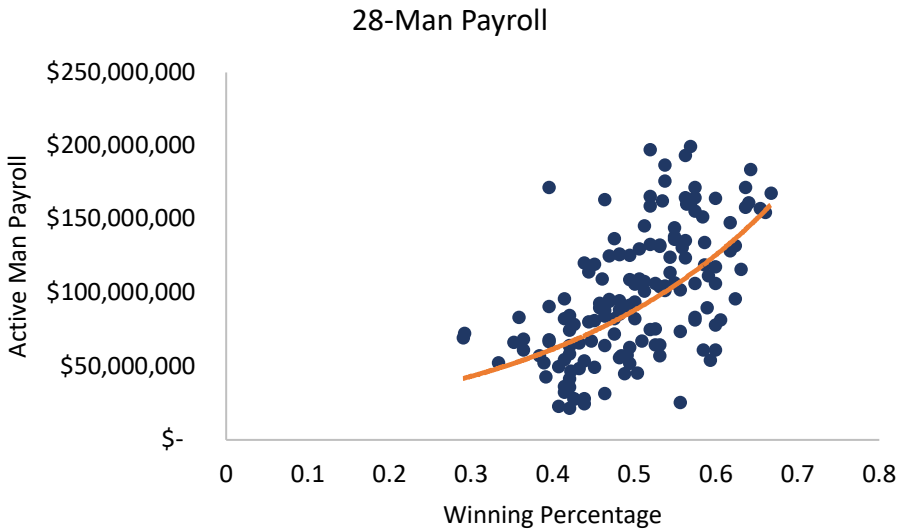
Regression Analysis

In this study I performed regression analysis to help show the relationship between Active-Man Payroll and Win Percentage. I used 3 key metrics in the analysis to test correlation: R-square, coefficients and p-values. R-square shows whether or not the model is a good fit for measuring the relationship to the dependent variable, Win Percentage. The R-square is 34% for the years 2015-2020, with 2016 being the highest at 56%. This means that in 2016, 56% of the variation in Win Percentage was caused by the variation in Active-Man Payroll.

Although the R-square value is moderate to low, the model shows a significant relationship. The coefficients describe the relationship between the independent variable, Active-Man Payroll, and the dependent variable, Win Percentage. The coefficients show a

positive relationship between the win percentage and Active-Man Payroll which means as Active-Man Payroll increases, so does winning percentage.

This scatter plot shows data from teams 2015 to 2019:



This regression shows for every $10 Million spent on Active-Man Payroll, on average, a team will win 1.69 more games (in a 162-game season). To put this into context, in 2019, the Chicago Cubs spent up to $200 million on their active man roster, while their division rival, the Pittsburgh Pirates, spent just under $30 million on their Active-Man roster. The Pittsburgh Pirates would need to spend $170 million to catch up to the Cubs, and our model estimates that an additional $170 million would help the Pirates win 29 more games (17 * 1.69 games). In 2019, Pittsburgh finished last in the NL central, and winning 29 more games would put them in first place with a secured playoff spot.

The p-values indicate whether the relationship between Win Percentage and Active-Man Payroll is statistically significant. The p-value in all the data comparing Win Percentage to Active-Man Payroll, is less than 0.01 in every single year from 2015 to 2020. Therefore, we can conclude that Active-Man Payroll has a statistically significant effect on Win Percentage.

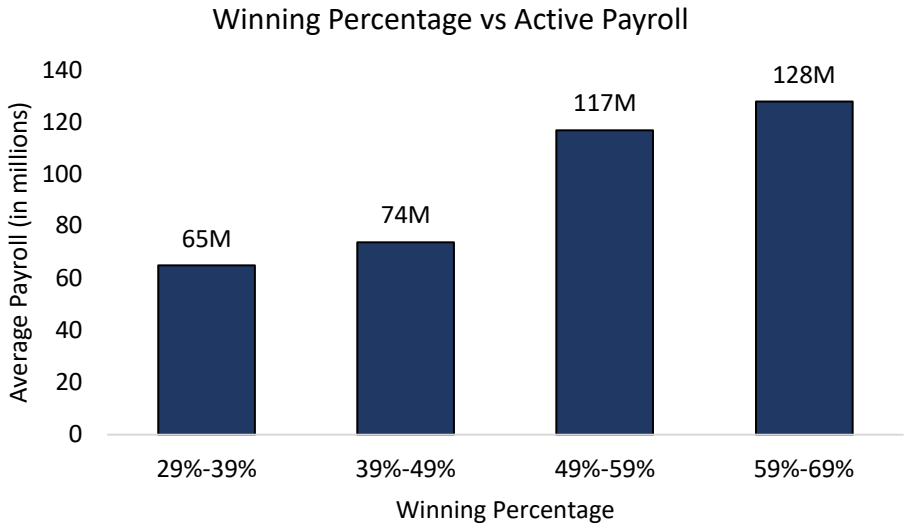
Shortcomings That Comprised the Study

One big shortcoming of this study is the accuracy of the payroll and reported financial data. Salary data was obtained from a reliable source, Spotrac.com, but because teams are not public, they are not required to release financial data, so payrolls are estimated using other measures such as players salaries. The other shortcoming of this study was there was only access to 8 seasons of financial data.

The other shortcoming of the study is success can be defined as a few different ways. Some teams define success as a world series, while others view success as making the playoffs, winning a division, or making a certain revenue. The largest shortcoming was not having access to the financial data of MLB teams to breakdown revenue and help understand why teams have such big discrepancies in payroll.

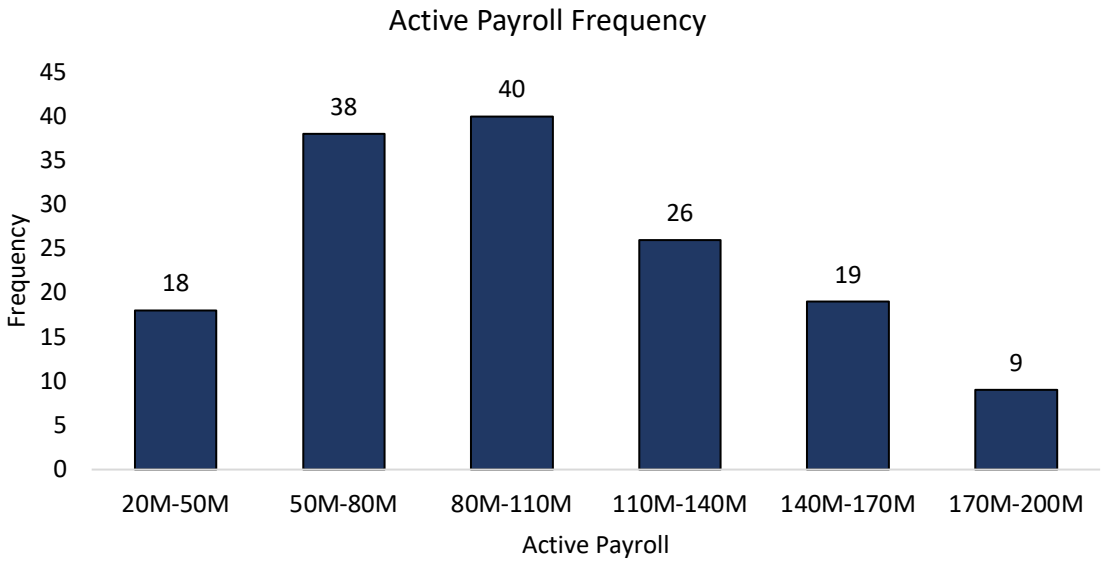
Test Conclusion/Significant Findings

As stated from our regression analysis, there is enough significant evidence to conclude that an increase in funding for team's Active Payroll will increase a team's chance to win. By glancing at the table below, *Win Percentage vs Active Payrolls,* we can see that teams with lower winning percentages generally had lower payrolls and teams with higher winning percentages on average had a higher payroll.



This portrays a significant range in performance between the highest paying teams and the lowest paying teams. It can be suggested from this figure that the more funds a team has access to and therefore spend on their team, the more they are able to increase their chances for winning games in the year.

Regarding the figure below *Active Payroll Frequency*, most team's payroll was between $50 and $100 million. A very small fraction of teams spends over 170 million, despite the correlation between payroll and winning.



As we have noted that the higher a team's payroll is, the higher their odds are in winning, we can conclude that these few top paying teams are presented with a far greater advantage, which some may say is unfair. MLB is the only major sport with no salary cap, which allows teams to spend as much money as they choose. This gives an advantage to the teams with a bigger market, higher revenue, and more money. We see time and time again it is the same teams leading the league in spending, the Boston Red Sox, New York Yankees, LA Dodgers, and it's highly correlated with their success. The controversy if MLB should include a salary cap (like all other sports) to prevent this unfair advantage is a controversy that is still talked about today and for a long period to come.

Appendix

Regression

2015-2019
SUMMARY
OUTPUT

Regression Statistics	
Multiple R	0.5802628
R Square	0.336704917
Adjusted R Square	0.332192705
Standard Error	10.38020785
Observations	149

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	8040.297431	8040.29743	74.6208197	8.78618E-15
Residual	147	15839.0611	107.748715		
Total	148	23879.35853			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	64.31361517	2.108491291	30.5021963	1.8515E-65
Active Man Payroll	1.69718E-07	1.96471E-08	8.63833431	8.7862E-15