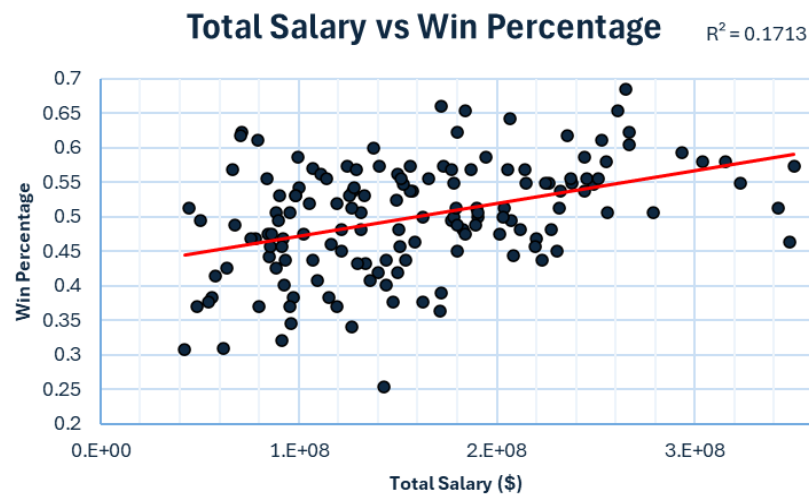Kyle Reardon, Eileen Hu, Daniel Harrer
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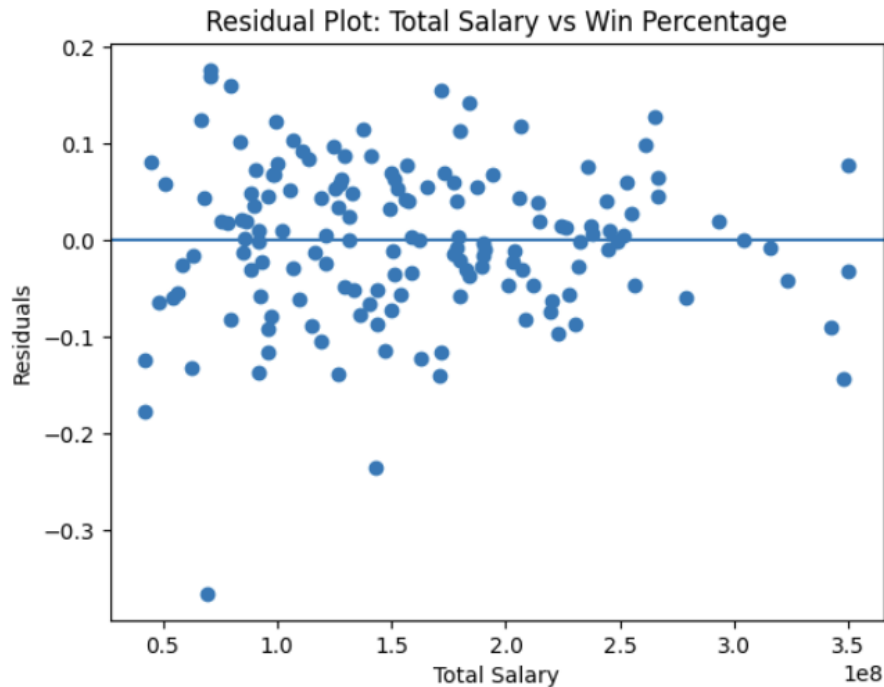
The Relationship Between MLB Total Salary and Win Percentage

Major League Baseball teams spend hundreds of millions of dollars per year in pursuit of success and ultimately the World Series championship. As the only major U.S. sports league without a strict salary cap, fans assume that higher payrolls naturally translate into more wins. With the Los Angeles Dodgers winning the most recent World Series and having the highest total payroll at $350 million, this controversial issue has resurfaced, with fans calling for a strict salary cap. While this belief is intuitively appealing, the purpose of this research is to analyze both the existence and the magnitude of this effect: to what extent does team payroll explain MLB team win percentage?

Total Salary vs Win Percentage $R^2 = 0.1713$

The analysis draws from two sources: Spotrac for team salary information and Baseball reference for win-percentage data. Salary figures were cleaned by removing commas and ensuring uniform formatting. There were no issues with reliability or source credibility. The average salary per team in the dataset was $158,813,159, with a minimum of $42,421,870 and maximum salary of $350,024,106. This had extreme variation, with a standard deviation of $69,324,900. Win-percentage values ranged from a low of 0.253 to a high of 0.685, with a standard deviation of 0.08. These summary statistics demonstrate clear differences in team performance across the league.

A generalized linear model was estimated using a standard linear regression, with win percentage as the dependent variable and team salary as the independent variable. The scatterplot helps visualize the relationship and highlight and outliers in the data. The approach is limited by the assumption of a linear relationship and the absence of additional factors. Therefore, correlation can be established, but not causality.

Residual Plot: Total Salary vs Win Percentage

The model yielded a weak, but positive relationship between total salary and win percentage, with a p-value of approximately 0. The coefficient on salary was also extremely small, at 5×10^{-10}. While this relationship was statistically significant, the size of the effect suggests that salary alone explains little of the variation in team performance. The model is limited due to its weak explanation of win-percentage outcomes and potential omitted variable bias. The residual plot shows a fairly constant spread across all fitted values, which suggests the constant-variance assumption is reasonable. However, the residuals are relatively large and widely scattered. This aligns with the model's low explanatory power, (with an R^2 of 0.1713) indicating that salary explains only a small portion of the variation in MLB win percentage.

Overall, the results suggest that while MLB teams with higher payrolls tend to win slightly more games, salary alone is far from a decisive predictor of success. The model indicates a statistically significant but extremely small relationship, reinforcing the initial hypothesis that spending can positively affect outcomes but does not guarantee strong performance or a championship. Factors not accounted for in the model, such as player development, injuries, managerial decisions, and roster depth—likely explain far more of the variation in team outcomes. As a result, calls for a strict salary cap may be driven more by perception than by clear evidence that payroll directly determines win percentage.

References:
https://www.spotrac.com/mlb/cash
https://www.baseball-reference.com/boxes/index.fcgi