Payroll vs Performance: Examining Team Success in U.S. Sports Leagues

By: Sam Bunten and Matt Thurston

Research Question

What off-field factors impact a team's success?

Problem

- Different cap rules between the big 4 leagues
  - NBA has a soft cap with a luxury tax penalty
  - MLB has no salary cap
  - NFL has a hard cap. Can't exceed otherwise face severe penalties
  - NHL has a hard cap
- These differences provide competitive advantages
- Typically, larger cities or bigger markets do better
- Richer owners can spend more in some circumstances
- All of these combined cause fans to become annoyed with the lack of consistency in American sports

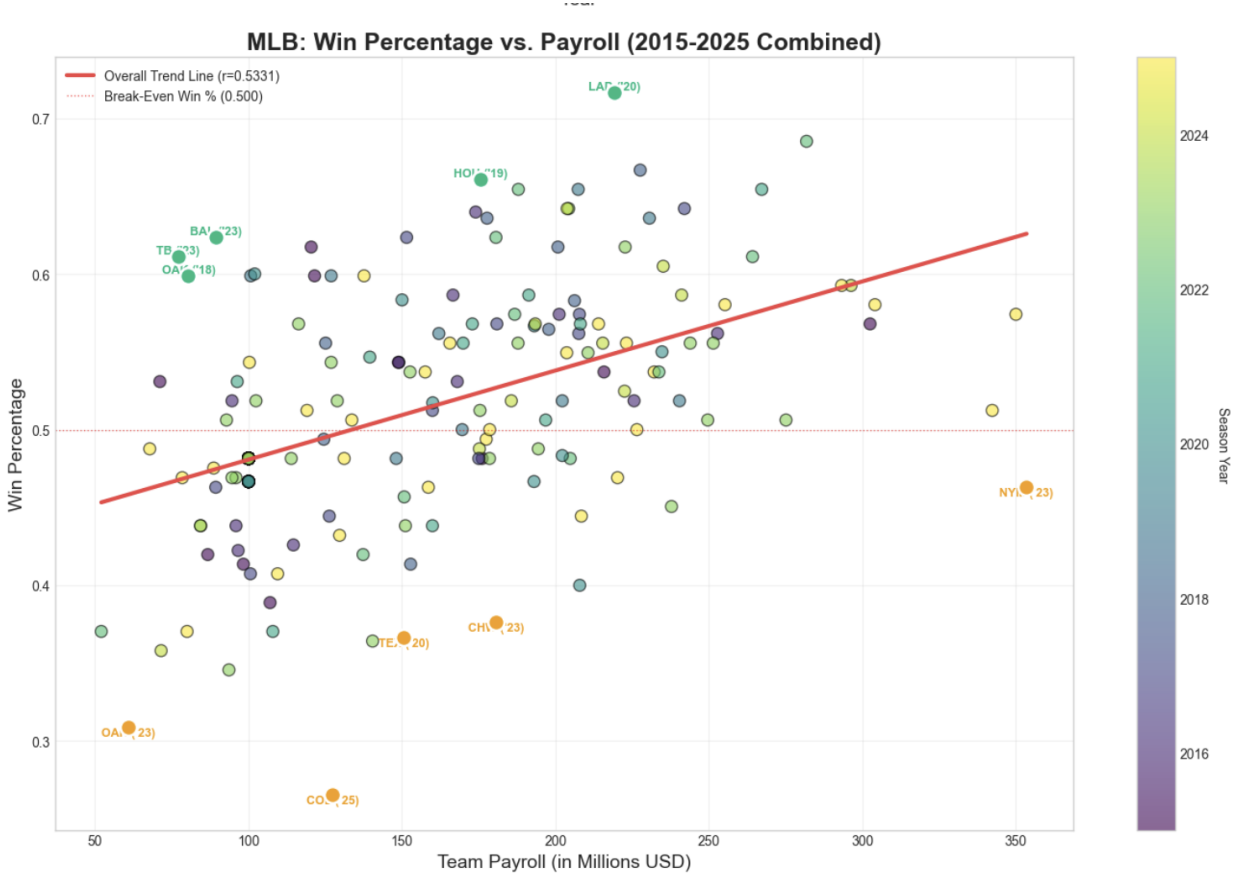
Data Collection

- Salary and team cap information is widely available due to their league wide importance
- We scraped data from Spotrac
  - Largest sports team and player contract resource online
- We scraped from the 2025 season down to the 2015 season
- Collected information on the various cap statistics per team
- Collected the 100 highest paid players per year per team
- This left us with 8 total data sets

Approach

- After collection, we had to clean the datasets
- A lot of the leagues had unnecessary data that we had to cut
  - Examples: Duplicate team name columns and row of totals,
- The scraping only provided us with a team's record
  - We had to convert this into win percentage for analysis
- After we cleaned the data, we calculated correlation coefficients to gain a better understanding on the relationship between spending and wins
- We also wanted to create initial visualizations to help guide our future analysis

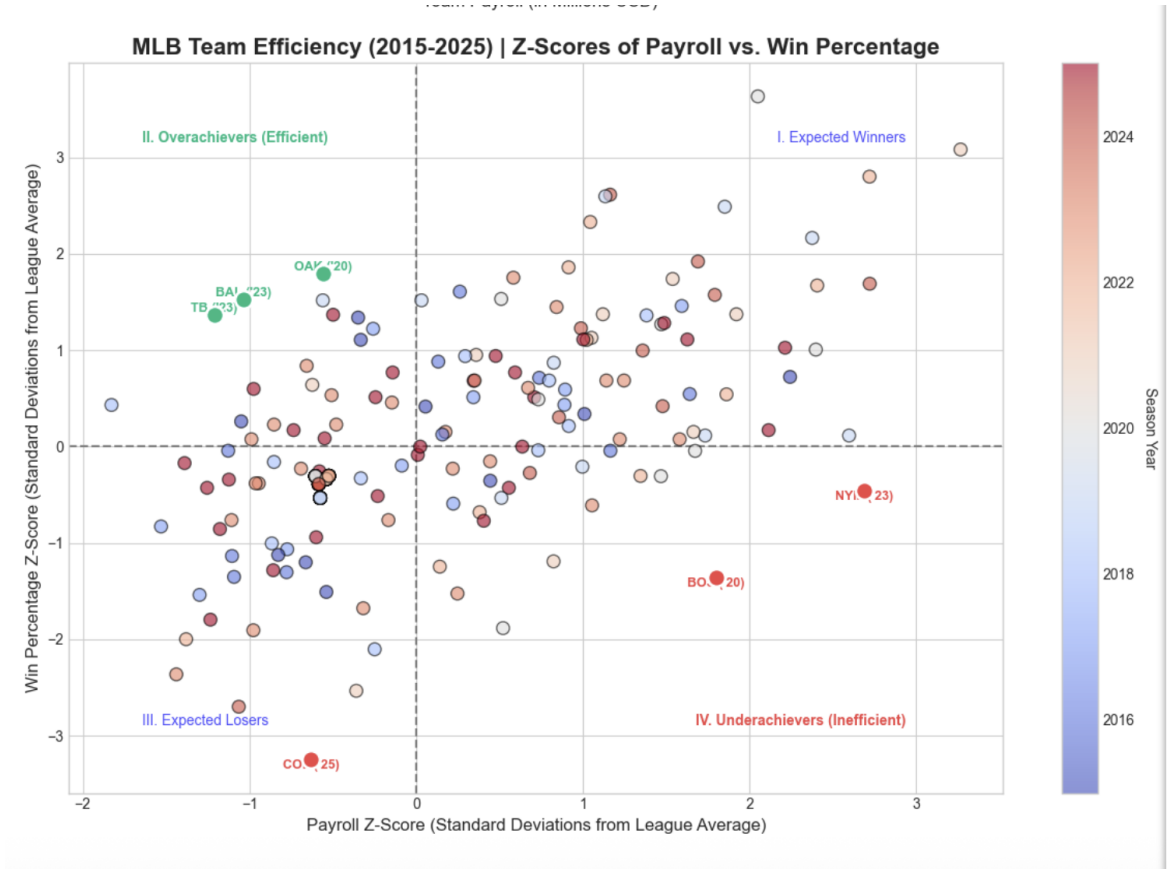
Exploratory Data Analysis for MLB

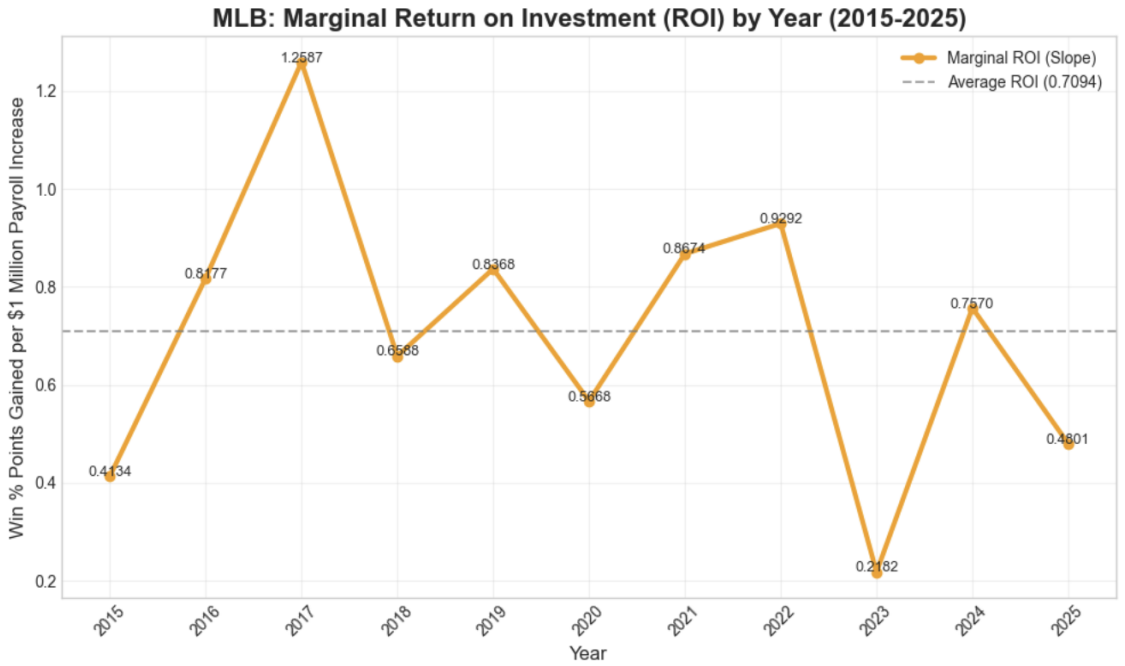


Correlation Coefficient by Year:

Year	
2015	0.3621
2016	0.6359
2017	0.7862
2018	0.4134
2019	0.0375
2020	0.0398
2021	0.6852
2022	0.7844
2023	0.1911
2024	0.8247
2025	0.5208

Exploratory Analysis for MLB



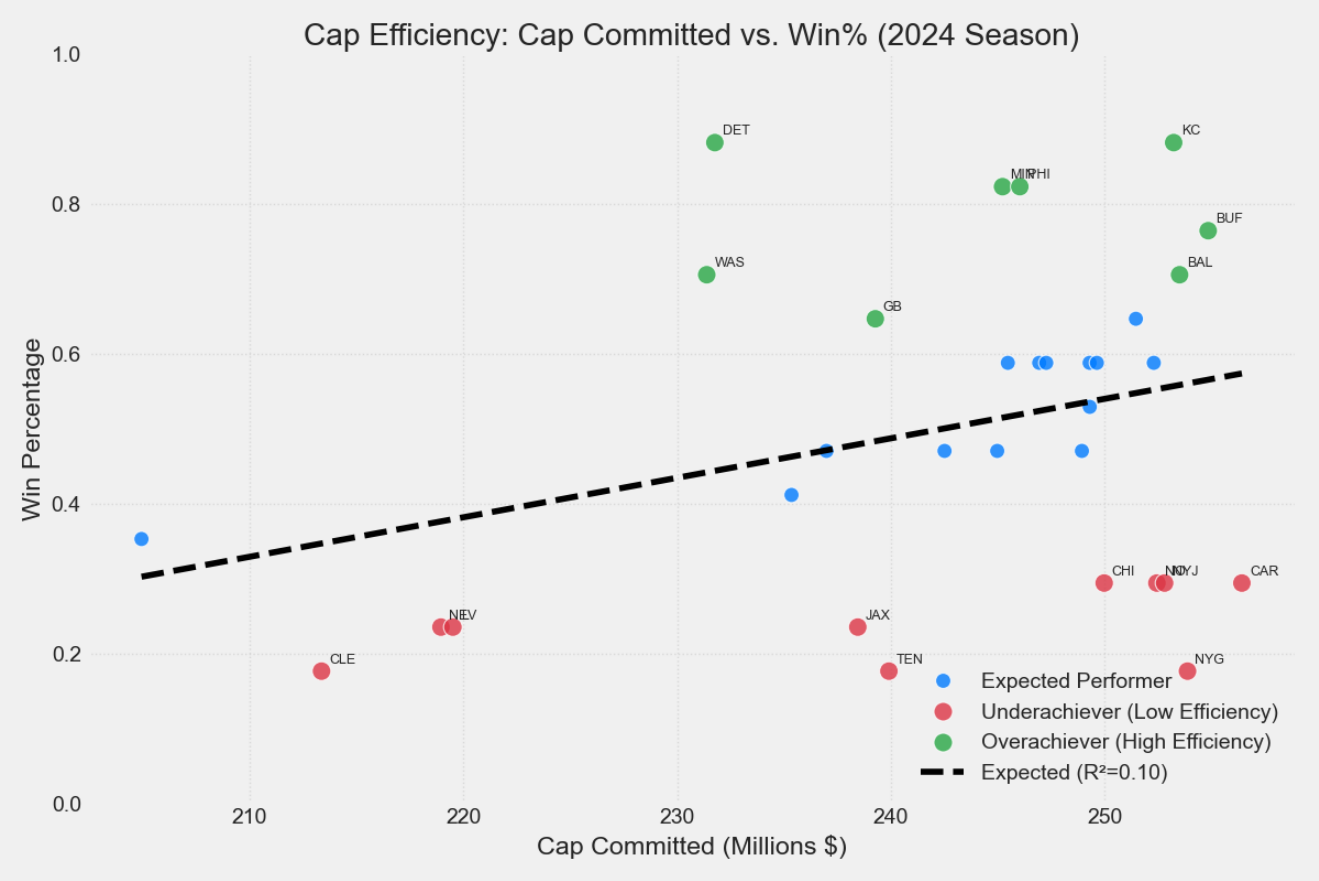


Exploratory Analysis for NFL

--- Correlation Analysis: Cap Commitment vs. Win Percentage (by Year) ---

Year	Correlation_Coefficient
2025.0000	0.0267
2024.0000	0.3104
2023.0000	-0.1067
2022.0000	0.1631
2021.0000	0.3157
2020.0000	0.4249
2019.0000	0.1330
2018.0000	0.0716
2017.0000	0.4099
2016.0000	0.5041
2015.0000	0.5291

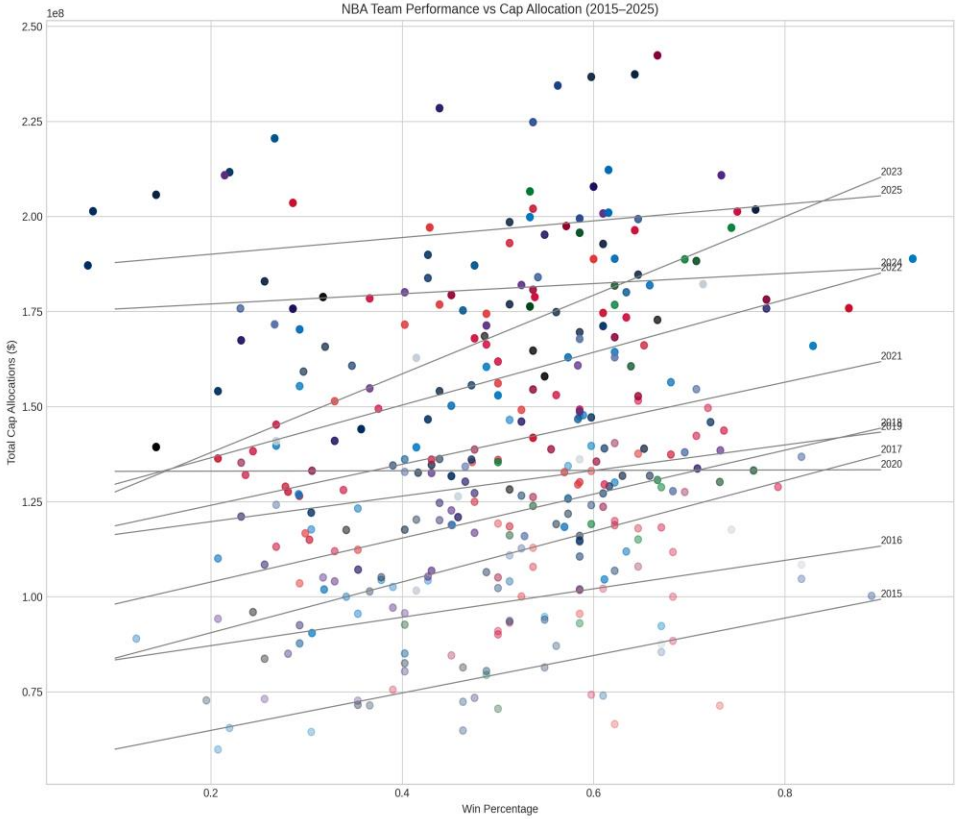
Exploratory Analysis for NFL

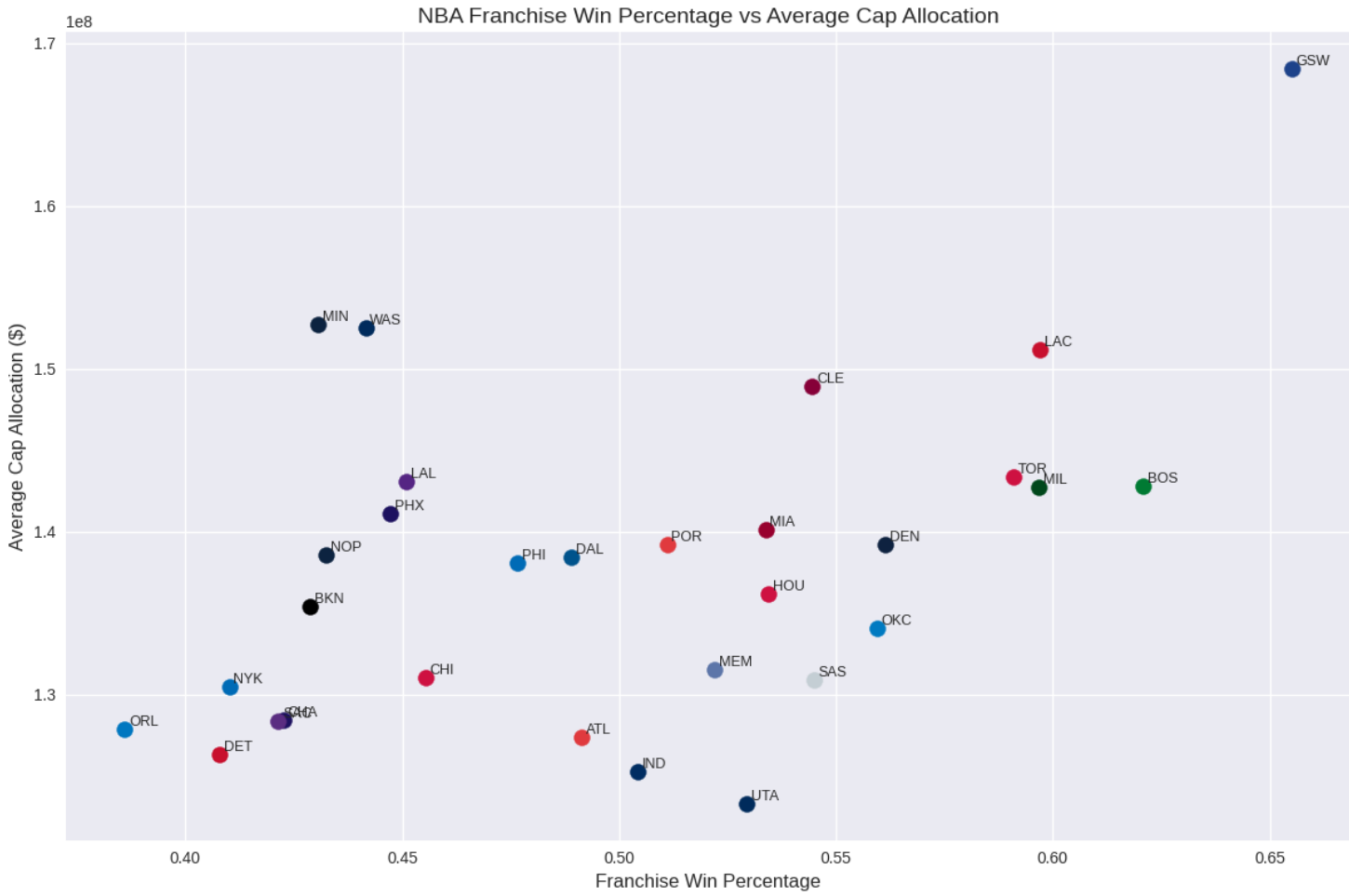


--- 5. Top 5 Most Cap-Efficient Teams (2015-2024 Average) ---
Teams with the best Cap Efficiency (Avg Win % per Avg Cap Used %):

Team	Avg_Win_Pct	Avg_Cap_Used_Pct	Cap_Efficiency_Index
KC	0.75	96.9231	0.0077343
PIT	0.62	96.1046	0.00648611
BUF	0.62	96.3956	0.00641505
GB	0.61	96.0924	0.00637981
PHI	0.59	93.8443	0.00630542

Exploratory Analysis for NBA





Correlation (Wins vs. Cap Allocations)

2015: .42	2021: .33
2016: .51	2022: .41
2017: .47	2023: .36
2018: .39	2024: .49
2019: .44	2025: .31
2020: .28	

Implications

- Owners would want to look at our data to understand what could be the optimal amount to spend on a team
- Players would like to see this information during contract discussion
  - For example: Some players take a pay cut to improve odds of winning
- Are the highest paid players the ones driving their team's performance or is it the underpaid ones

Ethics

- Unfair Advantages: League structure differences allows different owners and markets to dominate over time
- Fan Frustration: Fans are becoming annoyed with "super teams" and losing players to larger markets
- Sporting Integrity: Why would fans watch if results are too easily predicted by spending
- Are leagues taking advantage of their players or on the flip side, paying them too much

Extensions and Future Plans

- Expand to more players per league
- Include more variables like population of the city
- Look at average age of a team
- Goal: Create a linear regression for each league and see what variables impact the number of wins that a team has in any given season

Conclusion

- Payroll and cap information for a team clearly has a relationship with win percentage
- Other factors are at play though
- We need to look into and research more off the field variables that could be impacting it
- Sports analytics is already huge within the leagues themselves, but this form of analysis isn't typically available to the average fan