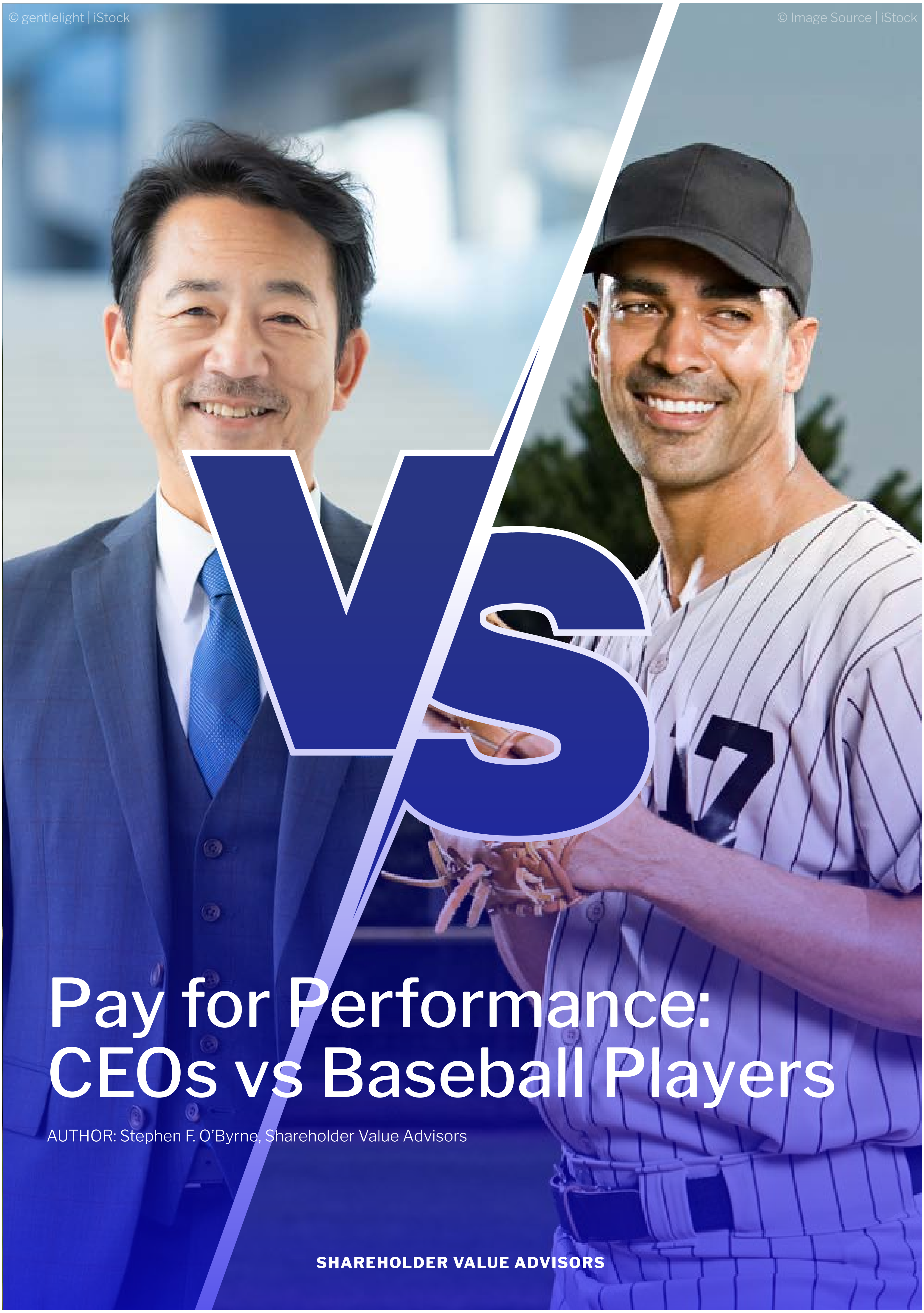

Pay for Performance: CEOs vs Baseball Players

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SHAREHOLDER VALUE ADVISORS

Corporate boards and baseball team owners face some common challenges in managing pay. Both try to create strong incentives for outstanding performance. Both have to balance their desire for strong incentives with the need to retain key talent and control cost. Boards and team owners also have some key differences. Boards make extensive use of equity compensation to tie CEO pay to stock value, while team owners are largely restricted to cash payments that are set before the season begins. Boards are often accused of being too dependent on their CEO and lacking the will to negotiate at arms' length, while team owners are rarely accused of lacking the will to negotiate at arms' length.

In this paper, we'll present a pay vs performance analysis that allows us to make a direct comparison of CEO and baseball player pay dimensions. Our analysis relates relative pay to relative performance to measure four pay dimensions: pay leverage, pay alignment, the pay premium at average performance and relative pay risk. (1) We can measure these pay dimensions at the individual level, the team or company level and the industry level. When we do so, we come to four surprising conclusions. First, teams have more consistent pay leverage than S&P 1500 public companies. Pay leverage is statistically significant for every team and the median t-stat, a measure of internal consistency, is 44% higher for teams than for S&P 1500 companies. This suggests that teams have better tools to link pay to performance. Second, pay leverage is far more consistent across baseball teams than it is across S&P 1500 companies. The pay leverage variation across the median S&P 1500 industry is more than 4 times greater than the variation across baseball teams. This suggests that the better tools have been widely disseminated among teams. Third, baseball, as an industry, has higher pay leverage than 50 of the 58 GICS industries and higher pay alignment than every GICS industry. (2) Relative performance explains 32% of the variation in relative pay in baseball but only 13% for the median GICS industry. Fourth, baseball teams and boards both sacrifice incentive strength for retention, leading them to overpay for performance, but baseball teams are more discriminating about where they overpay and have smaller overpayments. Teams use long-term contracts with fixed pay but they limit their use to a limited group of stars. Companies use competitive pay policy and that leads them to larger overpayments that are concentrated on poor performers.

A fifth conclusion is that most individual CEOs and baseball players don't have statistically significant pay leverage. CEO pay leverage, calculated using the five years of mark to market pay data reported in the new Pay versus Performance (PvP) disclosure, is statistically significant for only 35% of CEOs. For baseball players, pay leverage calculated using five years of data is statistically significant for only 25% of players. For CEOs, who can be paid in stock, there is an easy solution: a change in pay design. A simple pay plan with annual grants of performance shares can provide a perfect, and statistically significant, correlation of relative pay and relative performance over a five year period, like that used in the PvP disclosure, or even a shorter period. This perfect correlation pay plan, as we explain in the Appendix, departs from conventional practice in three ways. For baseball players, as long as league rules prohibit incentive pay tied to performance, it's difficult to achieve statistically significant pay leverage with just five annual pay decisions. But when we look at a large number of team pay decisions, our data clearly shows that baseball teams have been able to achieve consistent, and statistically significant, pay leverage.

Why is pay leverage much more consistent within and across baseball teams than it is within and across public companies? The explanation, I believe, is that there has been an analytics revolution in baseball – often called "sabermetrics" or "moneyball" – over the past thirty years leading to much better measures of player contribution to winning percentage and team value. The work of the Society for American Baseball Research (SABR), found in 1971, led to the term sabermetrics and Michael Lewis's 2003 book Moneyball, highlighting the use of sophisticated analytics at the Oakland Athletics, led to wide use of the term moneyball. (3) A 2014 book estimated that three-quarters of major league teams had full time staff doing baseball analytics. (4) Given this history, it's not surprising that the impact of performance on pay is consistent within and across teams.

Corporate directors need their own analytics revolution. Corporate directors don't use relative pay and relative performance to quantify the four pay dimensions for their CEO and their executive team. The vast majority of directors rely on percent of pay at risk as a proxy for incentive strength and alignment, but percent of pay at risk is not a good proxy for either pay dimension. Directors need to adopt a more rigorous approach to performance measurement and pay design.

The labor market for baseball players

Our analysis of baseball players is limited to hitters in the years 2000-2025. Our full sample is 20,999

Figure 1

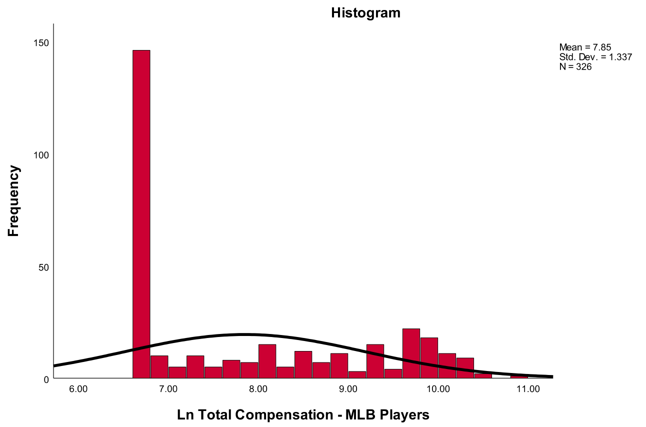
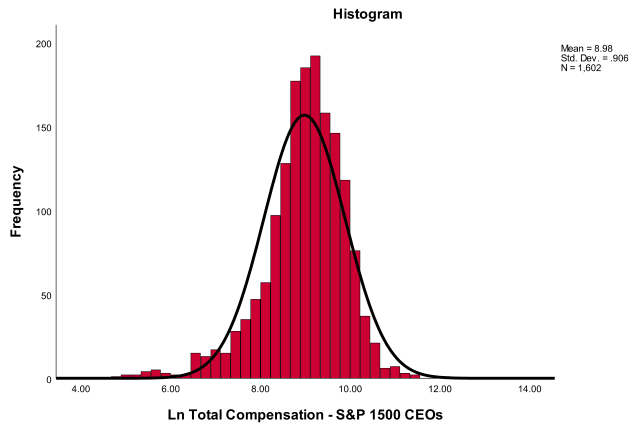


Figure 2



player-years, but we exclude the 60 game pandemic year season (548 player-years in 2020), 590 player-years paid below the league minimum, 12,572 player-years with less than 100 plate appearances and five player-years for pitchers. (5) Our final sample is 7,284 player-years representing 1,851 different players.

The distribution of pay for baseball players is very different than it is for S&P 1500 CEOs. Figure 1 shows a histogram of natural log pay (in thousands of dollars) for the baseball players in our final sample in 2025 while Figure 2 shows a similar histogram for S&P 1500 CEOs. (6) Both graphs show a black line that represents a normal curve with the same mean and standard deviation. The two figures show that log CEO pay is close to a normal distribution, while log baseball player pay is highly skewed. (7) The big bar on the left in Figure 1 includes all the players who receive the league minimum, $760,000 in 2025. Mean log pay for the baseball players is 7.85 vs. 8.98 for the CEOs. Taking the anti-log gives us geometric mean pay. It's $2.6 million for baseball players and $7.9 million for CEOs.

While pay distributions look very different, there are substantial regularities in pay for both groups. For baseball players, a multiple regression model explains 69% of the variation in log inflation adjusted pay across our sample of 7,284 player-years. For S&P 1500 top 5 executives, a multiple regression model explains 61% of the variation in log inflation adjusted pay across a sample of 199,204 executive-years. Figure 3 shows a comparison of the two models.

In these two models, we start with more basic pay factors, i.e., position, pay inflation and service time, and then move to industry, company size and player/company performance. (8) Position, i.e., CEO status and pay rank among the top 5, is much more significant for top 5 executives than defensive position is for baseball players. Position explains 17% of the variation in log pay for top 5 executives, but only 2% for baseball players. The number #2 executive makes only 50% of the CEO's pay, on average, and the #5 executive makes only 30% of the CEO's pay. In baseball, first basemen are paid 13% more than outfielders, on average, and designated hitters are paid 19% less than outfielders, but these differences don't account for a lot of variation in pay. (9)

Pay growth has exceeded CPI inflation by 1.8% a year for baseball players and by 1.2% a year for top 5 executives, but pay inflation does not explain a lot of log pay variance for either group. Having service less than 4 years explains 42% of the variation in baseball player pay but only 1% of the variation for top 5 executive pay. The reason for this huge difference is that players have no right to arbitration until they have completed three years of major league service and no right to negotiate with another team (free agency) until they have completed six years. (10)
In their first three years, their team is required to pay them the league minimum, $760,000 in 2025, but no more than that. The model says that these players are paid only 15% of their expected pay based on

Figure 3

	Variance Explained		
Explanatory Variable	Baseball Player Model	Corporate Executive Model	Explanatory Variable
Position	2%	17%	CEO & pay rank for other top 5
Pay inflation in excess of CPI	0%	2%	
Service less than 4 years	42%	1%	
Service of 4-6 years	9%	1%	
Years of service over 6 years	0%	2%	
		7%	Industry
Market population & team value	1%	31%	Company revenue
Value of expected WAR	14%	0%	Company 3 year relative TSR
Total variance explained	69%	61%	
Total cases	7,284	199,204	
Data years included in the model	2000-2025	2000-2024	

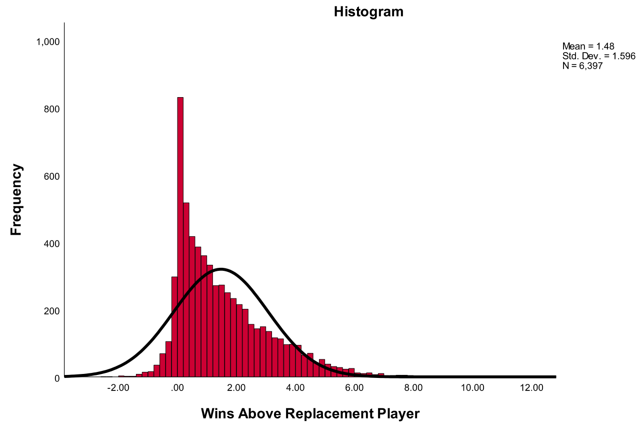
their position, performance, team value and metro area size. When players have 4-6 years of service, they can go to arbitration to seek higher pay but they can only make their case using players with one more year of service (or less). The model says that the pay discount is 66% in year 4, 47% in year 5 and 23% in year 6. These discounts explain another 9% of ln pay variance. Service explains 51% of the variation in log pay for baseball players, but only 4% for top 5 executives.

Industry and company revenue size explain 38% of the variation in log top 5 pay but only 1% of the variation in baseball player log pay. Company performance, measured by relative shareholder wealth, is statistically significant but explains less than 0.5% of the variation in log top 5 pay. A 25% increase in relative shareholder wealth over the past three years increases top 5 pay by only 2.3%. Team value and metropolitan area size explain only 1% of the variation in baseball player pay, but player performance, measured by the monetary value of expected Wins Above Replacement (WAR), explains 14%.

Wins Above Replacement (WAR) is our measure of baseball player performance

Our basic measure of baseball player performance is Wins Above Replacement (WAR). We use the WAR calculation available at BaseballProspectus.com. Wins Above Replacement was an outcome of greatly expanded research on baseball performance measurement in the 1980's and 1990's. The movement got its start with the founding of the Society for American Baseball Research (SABR) in 1971 and grew with the publications of Bill James' Baseball Abstract in 1977 and Pete Palmer and John Thorn's The Hidden Game of Baseball in 1984. The traditional measures of batting performance – batting average, runs and runs batted in – don't do a good job of measuring a hitter's contribution to team success. Batting average treats all base hits the same even though extra base hits are much more likely to lead to a run than a single. It also gives no credit for walks. Runs and runs batted in are heavily biased by factors beyond a player's control, i.e., who bats after you for runs and who bats before you for runs batted in. Prior to WAR, a big improvement in baseball performance measurement came from adding together on-base percentage and slugging percentage, a measure that became known as "OPS" for "on-base plus slugging". (11) WAR is intended to measure a player's contribution to runs scored and runs prevented, taking account of batting, base running and fielding. My analysis shows that the square of OPS times plate appearances explains 68% of the variation in

Figure 4

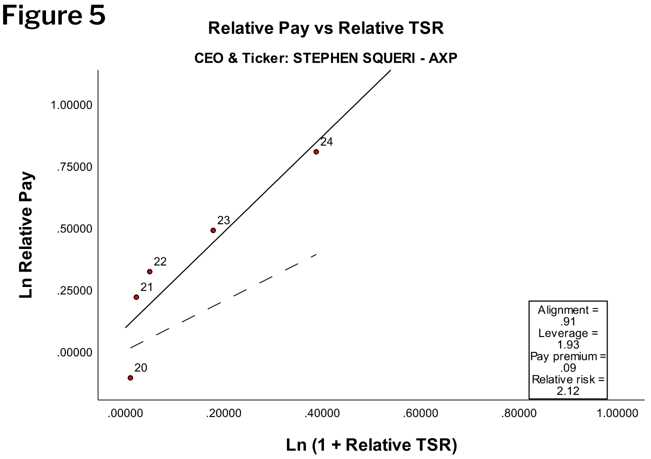


the Baseball Prospectus WAR measure and 66% of the variation in the Baseball Reference WAR measure. Figure 4 shows the distribution of the Baseball Prospectus WAR measure. (12)

WAR, by itself, doesn't provide the performance measure we want to assess the relationship between baseball player pay and performance. Baseball player pay won't necessarily be strongly related to current year WAR because player pay is largely fixed and determined before the season begins. (13) Player pay should be related to the player's expected WAR for the coming year. That means we need to develop a model of expected WAR. But we want to go beyond expected WAR. We want to measure the monetary value of expected WAR to the team and then measure the sensitivity of player pay to the monetary value of expected WAR. This means that we also need to develop a model of the monetary value of expected WAR.

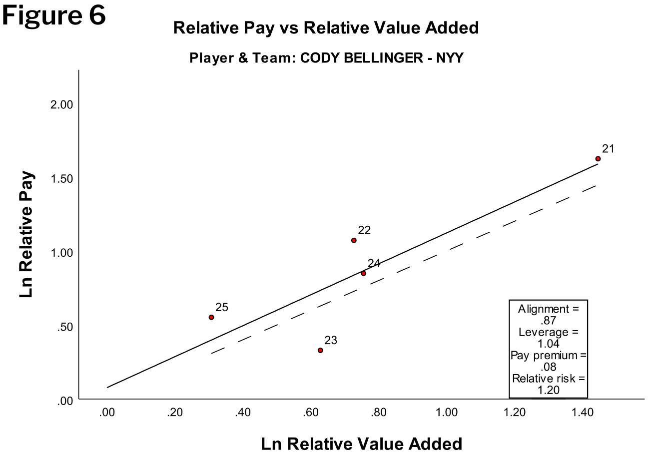
Prior year WAR, that is WAR[-1], has a correlation of 0.6 with current year WAR, so it's a reasonable estimate of expected WAR by itself. However, we can get a more accurate prediction of current year WAR by taking account of WAR[-2], WAR[-3] and player age. The model we use to estimate expected WAR takes account of WAR[-1], WAR[-2], WAR[-3] and age and explains 43% of the variation in current year WAR. (14) To estimate the monetary value of expected WAR, we first develop a model of expected team net wins and then develop a model of inflation adjusted team value as a function of expected net wins. Our model of expected team net wins is based on 750 team seasons. Expected team wins is equal to 0.446 x net wins[-1] + 0.128 x net wins[-2] and explains 30% of the variation in net wins. Our model of the natural log of inflation adjusted team value explains team value as a function of time (years since 1999), metropolitan population size and expected net wins. (15) The model

Figure 5



Solid line is the company trendline. Dashed line is leverage = 1.0 with pay premium of zero

Figure 6



Solid line is the player trendline. Dashed line is leverage = 1.0 with pay premium of zero

explains 81% of the variation in log inflation adjusted team value (largely due to the time trend). The model shows that each additional expected net win increases inflation adjusted firm value by 0.9%. (16) We use this result to estimate the monetary value of individual player expected WAR. The monetary value of expected WAR is inflation adjusted team value x [exp(0.9% x expected WAR) – 1].

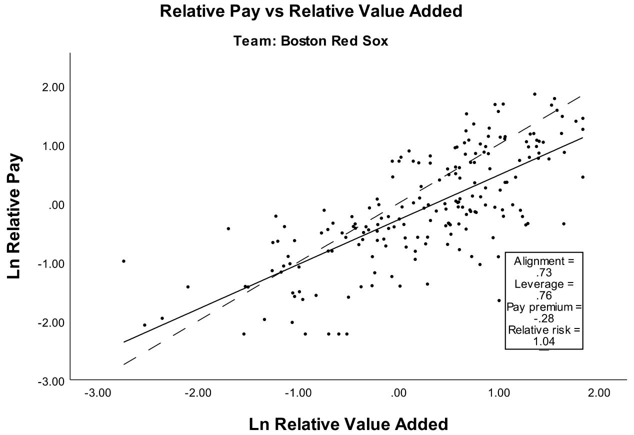
The performance variable in our multiple regression model of baseball player pay (Figure 3) is the natural log of (inflation adjusted team value x [exp(0.9% x expected WAR) – 1]). The coefficient of the performance variable is 0.62. This implies that a 25% increase in value added increases pay by 14.8%. (17) As we saw above, a 25% increase in relative shareholder wealth increases top 5 grant date pay by only 2.3%. This comparison suggests that baseball player pay is a good deal more sensitive to performance than top 5 executive pay. But this comparison just reflects average sensitivity to performance and, for top 5 executives, only reflects grant date pay, not mark to market pay. We want to look at pay for performance at the individual level and at the company/team level and also take account of mark to market pay for CEOs to capture the incentive provided by changes in the value of unvested equity.

How we measure pay dimensions

To measure pay dimensions at the individual, team/company and industry levels, we use a regression relating log relative pay to log relative performance. Figure 5 shows this regression for American Express CEO Stephen Squeri, based on mark to market pay for 2020-2024, and Figure 6 shows a similar regression for 2021-2025 for outfielder Cody Bellinger of the New York Yankees. Relative pay is actual pay divided by market pay. Relative performance for Squeri is relative shareholder wealth, i.e., American Express cumulative shareholder wealth since the start of 2020 divided by cumulative shareholder wealth assuming investment in the S&P Financials Index. The S&P Financials is the peer group used by American Express in its 2025 Pay versus Performance disclosure. Relative performance for Bellinger is relative value added, that is, the monetary value of expected WAR divided by the competitive monetary value of expected WAR. The competitive monetary value of expected WAR is, as we show in the Appendix, the average monetary value of expected WAR for players with the same position, service time, market size and team value.

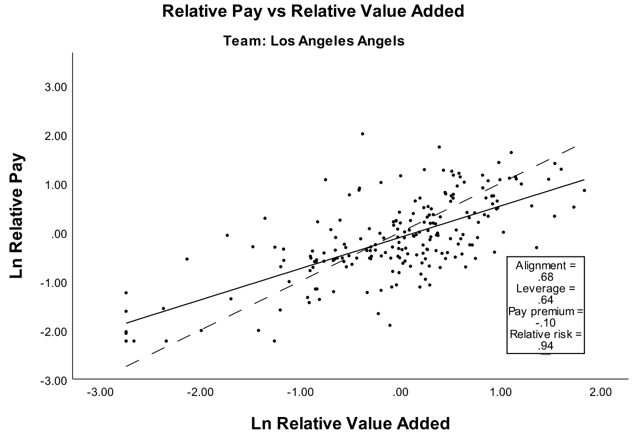
The regression of ln relative pay on ln relative performance quantifies four pay dimensions. The slope of the trendline is a measure of incentive strength, what we call pay leverage. Squeri's pay leverage is 1.93. This tells us that a 1% increase in relative shareholder wealth increases his relative pay by 1.93%. Bellinger's pay leverage is 1.04. This tells us that a 1% increase in relative value added increases his relative pay by 1.04%. The correlation, what we call pay alignment, is 0.91 for Squeri and 0.87 for Bellinger. The squared correlation, what we call pay alignment (r-sq), tells us the percentage of the variation in relative pay that's explained by relative performance. Pay alignment (r-sq) is 83% for Squeri and 76% for Bellinger. The intercept is the ln pay premium at average performance. For Squeri, average performance is the TSR of the S&P Financials Index. His ln pay premium of 0.09 is also a percentage pay premium of 9%. For Bellinger, average performance is the competitive monetary value of expected WAR for the year. His ln pay premium is 0.08. This implies a percentage pay premium of 8%. The fourth dimension is relative pay risk. It's equal to the slope divided by the correlation. It tells us the ratio of relative pay variability to relative performance variability. It's 2.12 for Squeri and 1.20 for Bellinger.

Figure 7



Solid line is the team trendline. Dashed line is leverage = 1.0 with pay premium of zero

Figure 8



Solid line is the team trendline. Dashed line is leverage = 1.0 with pay premium of zero

The regression provides a common framework for measuring pay dimensions but there are some differences in the underlying data used in the two regressions. For Squeri, pay is cumulative mark to market pay from the start of 2020. The point labelled "20" is based on one year pay valued at the stock price at the end of 2020. The pointed labelled "21" is based on two year pay valued at the stock price at the end of 2021. The point labelled "24" is based on five year pay valued at the stock price at the end of 2024. We use cumulative pay for CEOs because the timing of value creation is dependent on investors' recognition of the value of the CEO's leadership; focusing on cumulative pay and cumulative shareholder wealth reduces the impact of the precise timing of investors' recognition of value. For Bellinger, pay is annual pay for each year from 2021 to 2025. We know the timing of expected player performance and we can estimate its impact on team value, so don't need to use cumulative pay to capture pay for performance.

The Appendix explains how we calculate market pay, relative pay and relative performance for Bellinger.

Both Squeri and Bellinger have high and statistically significant pay leverage, but that's unusual. Squeri's pay leverage is above the 90th percentile and Bellinger's pay leverage is above the 75th percentile. Median pay leverage is only 0.46 for CEOs and only 0.35 for baseball players. The t-statistics for pay leverage are 2.8 for Squeri and 2.4 for Bellinger, well above the 1.96 needed for statistical significance at the conventional 5% level. But only 35% of CEOs and only 25% of baseball players have statistically significant pay leverage.

Team pay leverage is remarkably consistent

Let's now shift to measuring team, company and industry pay leverage. Figure 7 shows ln relative pay vs ln relative value added for the years 2000-2025 for the Boston Red Sox while Figure 8 shows the same graph for the Los Angeles Angels.

The Boston Red Sox have slightly higher pay leverage than the Los Angeles Angels, 0.76 vs 0.64. This means that a 1% increase in relative value added results in 0.76% higher pay at the Red Sox and 0.64% higher pay at the Angels. Alignment (r-sq) is 53% for the Red Sox and 46% for the Angels. The log pay premium at zero relative value added is negative for both teams, -0.28 for the Red Sox and -0.10 for the Angels. The percentage pay "premiums" at average performance are -24% and -10%.

The total sample for our analysis of pay for performance in baseball is 7,284 player years. 1,044 of those player-years represent players in the second or later year of a multi-year contracts. We exclude those 1,044 player-years from our team pay for performance regressions because their pay for the coming year is already fixed, and hence, including them doesn't tell us anything about a team's ability to tie pay to expected performance at the start of the year. Later on, we'll look closely at long-term contracts as a retention device and measure the pay vs performance premium received by players with long-term contracts.

Two striking results of our 30 team pay for performance regressions are that (1) the teams have very consistent pay leverage and (2) all of the pay leverage trendlines are highly significant. Team pay leverage has a mean of 0.55 with a standard deviation of only 0.09, so the coefficient of variation is only 0.16. The lowest team leverage, 0.36, is at the Miami Marlins, and the highest team leverage, 0.76, is at the St. Louis Cardinals. The Marlins have the lowest t-stat, 4.95, and the average t-stat is 9.2.

Figure 9

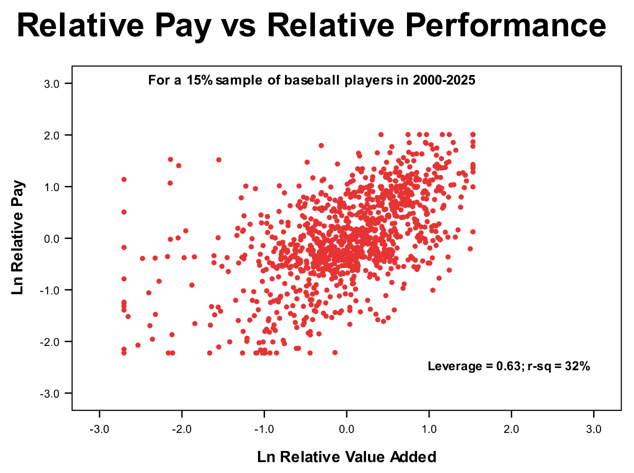
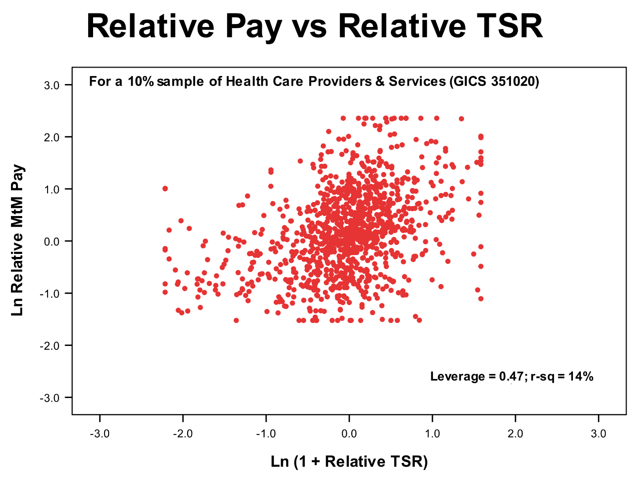


Figure 10



The consistency of baseball team pay leverage is even more striking when we compare it with the consistency of S&P 1500 public company executive pay leverage over the years 2000-2024. We compute public company executive pay leverage using all the relative pay and relative performance observations for the CEO and the other 4 executives for the years 2000-2024. [18] We limit the analysis to companies with at least 50 observations. This gives us pay leverage for 2,255 companies. Mean mark to market pay leverage is 0.51, quite similar to mean baseball team pay leverage, but the standard deviation is 0.45, so the coefficient of variation is 0.88, more than 5 times greater than the baseball team coefficient of variation. Public company executive pay leverage ranges a high of 3.57 to a low of -2.42. If we calculate the coefficient of variation by GICS industry group, the lowest coefficient of variation is 0.60 in Consumer Durables & Apparel. This is more than 3 times greater than the baseball team coefficient of variation.

Baseball pay leverage and alignment is much higher than almost all GICS industries

We can extend the baseball team pay leverage analysis to include all 7,284 player-years in our sample. This adds back 1,044 player-years in the second or later year of a multi-year contract. This provides industry average pay leverage and alignment. When we do the same analysis for S&P 1500 companies, we get a comprehensive picture of the differences in pay leverage and alignment for baseball players vs public companies top 5 executives. Figure 9 shows pay vs performance for a 15% sample of our 7,284 baseball player-years. The pay leverage, 0.63, and pay alignment (r-sq), 32%, are for the full sample. There are 58 GICS industries with data for 2000-2024. The median mark to market pay leverage of the 58 industries is 0.49. Eight of the 58 have higher pay leverage than we see in baseball. [19] The median pay alignment (r-sq) of the 58 industries is 15% and the maximum is 30% (in Wireless Telecommunications Services 501020). Figure 10 shows pay vs performance for a 10% sample of companies in Health Care Providers & Services (GICS 351020). This industry is close to the industry median values for both leverage and alignment (r-sq). The pay leverage (0.47) and alignment (r-sq) (14%) shown are for the full Health Care Providers & Services sample. These comparisons show that pay for performance is much stronger in professional baseball than in S&P 1500 public companies. Pay alignment (r-sq) is higher in baseball than it is in all 58 GICS industries and pay leverage is higher in baseball than it is in 50 of the 58 GICS industries.

Teams and companies sacrifice pay leverage to limit retention risk

Baseball teams and companies both sacrifice pay leverage to limit retention risk. Baseball teams sacrifice pay leverage when they sign players to multi-year contracts. [20] Long-term contracts eliminate pay leverage because expected performance does not affect pay after the first year of the contract. Companies sacrifice pay leverage when they adopt competitive pay policy. Competitive pay policy sets target pay at a percentile of peer company pay, typically the 50th percentile, regardless of past performance. Competitive pay policy reduces pay leverage because it creates a "performance penalty." When the stock price increases, equity grant shares are reduced to avoid exceeding target dollar pay, and when the stock price declines, equity grant shares are increased to maintain target dollar pay. [21]

We can assess the cost of long-term contracts by comparing the pay of the players with long-term contracts with their team's trendline pay using the team's pay leverage trendline. Our baseball player sample of 7,284 player-years includes 1,044 player-years for players who are in the second, or later, year of a long-term contract. For the 6,240 player-years used for team pay leverage trendlines, the mean difference between actual and predicted log pay is 0.00, but for the 1,044 long-term contract player-years the mean difference between actual and predicted log pay is 0.64. A log difference of 0.64 corresponds to a percentage difference of +90%. [22]

While the mean difference between actual and predicted log pay is 0.00 for the 6,240 player-years used for the team pay leverage trendlines, mean dollar pay for these cases, $4.565 million, is 32% higher than the mean anti-log of predicted log pay, $3.446 million. Log models of pay commonly result in "payroll shrinkage" and the shrinkage is larger in highly skewed pay distributions, like the one we find among baseball players. [23] For the 1,044 player-years in the second, or later, year of a long-term contract, mean dollar pay is $14.723 million, 88% higher than the mean anti-log of predicted log pay, $7.840 million. If we adjust the long-term contract premium for the pay premium in our model sample, the true premium for the long-term contract player-years is 42%. [24] When we take account of total payroll of each group, we conclude that the average cost of baseball's retention device – long term contracts – is only 12% of payroll. [25]

Companies sacrifice pay leverage when they adopt competitive pay policy. We can estimate the cost of competitive pay policy by doing simulations of competitive pay policy and comparing the results with the perfect correlation pay plan (explained in the Appendix). The perfect correlation pay plan makes cumulative mark to market pay equal to the [cumulative future value of market pay x (1 + relative TSR)]. [26] The perfect correlation pay plan always makes relative pay equal to relative TSR, so it doesn't underpay below average performers, it pays them fairly. The cost of the retention incentive created by competitive pay policy is aggregate pay in excess of the perfect correlation plan pay.

We did a simulation of competitive pay policy using 3,033 five year histories of shareholder return drawn from S&P 1500 companies. We simulated annual equity grants using competitive pay policy and then calculated pay dimensions for each five year history. Competitive pay policy substantially reduces pay leverage and alignment. Median pay leverage for the 3,033 five year periods is 0.53, 47% less than the 1.00 leverage provided by the perfect correlation pay plan. Median pay alignment (r-sq) is 27%, 73% less than the 100% alignment (r-sq) provided by the perfect correlation pay plan. To measure the cost of using competitive pay policy to provide additional retention incentive, we use the five year histories where competitive pay policy leads to pay that's higher than the pay provided by the perfect correlation pay plan, that is, [the cumulative future value of market pay x (1 + relative TSR)]. In 1,666 (55%) of the 3,033 five year histories, competitive pay policy leads to higher pay than the perfect correlation pay plan. In these cases, the pay premium is 32% of the cumulative future value of market pay. When we look at the pay premium as a percent of the cumulative future value of market pay for all five year histories, the pay premium is 17%. [27]

Conclusion

Our analysis in this paper leads us to four surprising conclusions. First, baseball teams have more consistent pay leverage than public companies achieve for their top 5 executives. Second, pay leverage is far more consistent across baseball teams than it is across public companies. Third, baseball, as an industry, has higher pay leverage than 50 of the 58 GICS industries and higher pay alignment than every GICS industry. Fourth, baseball teams have more efficient retention incentives than companies. Teams pay a premium to retain their stars while companies adopt competitive pay policies that provide premium pay for poor performers.

One big difference between teams and companies is that teams are trying to make money off their players while directors see their job as providing competitive pay and reasonable incentives for better performance. I'm not aware of any public company directors who have calculated our four pay dimensions – pay leverage, pay alignment, the pay premium at industry average performance and relative pay risk – much less tried to use them, and stock ownership, to estimate the impact of their CEO's pay package on future shareholder wealth. [28] Baseball has gone through an analytics revolution that has led to much better estimates of player contribution to winning percentage and firm value. Corporate directors need their own analytics revolution.

APPENDIX

Our calculations of relative pay and relative performance for Cody Bellinger

To calculate relative pay, we need to calculate market pay. We use the factors from the model shown in Figure 3, except expected performance (the monetary value of expected WAR), to estimate market pay. Excluding performance from market pay makes baseball player market pay comparable to CEO market pay, i.e., it reflects position, experience and team/company size, but not player or CEO performance. The dependent variable in the model is the natural log of inflation adjusted pay. To make the predicted values easier to understand, we express our explanatory variables as differences from the population mean, so it's easy to see where a player is above or below average and how that affects the market rate.

When we take the anti-log of log predicted pay, we can express the estimated market value as the product of geometric mean pay and a series of multipliers that reflect the planatory variables. If a player is average on every dimension, all the multipliers are 1.0 and market pay is the geometric mean pay. When a multiplier is greater than 1, it tells us the factor is raising the player's market rate above average and when the multiplier is below 1, it tells us that the factor is pushing the player's market rate below average. Figure 11 shows the calculation of market pay for Cody Bellinger. His market rate of $14.4 million is the product of the geometric mean pay, $2.6 million, and five multipliers. His position as an outfielder raises his market rate by 15.7%, his long service of 7 years raises his market rate by 156%, the effect of pay inflation in excess of CPI inflation raises his market rate by 11.6%, playing for a high value team, the Yankees, raises his market rate by 63.8% and the size of the New York metro market raises his market rate by another 1.6%. When we divide his actual inflation adjusted pay of $25.0 million by his market rate of $14.4 million and take the log, we get his ln relative pay for 2025, 0.55.

To calculate relative performance, we need to estimate expected WAR, the monetary value of expected WAR and the peer average, or competitive, monetary value of expected WAR for each player. Figure 12 shows our estimate of expected 2025 WAR for Bellinger, our estimate of the monetary value of his estimated 2025 WAR and the calculation of his relative performance for 2025. Figure 13 shows our estimate of the competitive monetary value of expected WAR for Bellinger.

We use a three year history of WAR and player age to estimate expected 2025 WAR for Bellinger. Figure 12 shows that our estimate is 2.15 WAR, about 20% less than Bellinger's 2024 WAR of 2.70. A model of inflation adjusted team value as a function of net wins (and other factors) tells us that each additional win increases team value by 0.9%. We use that, and the inflation adjusted Forbes estimate of the New York Yankees market value, $8.4 billion, to estimate the monetary value of Bellinger's expected WAR, $158 million. When we divide the monetary value of Bellinger's expected WAR, $158 million, by our estimate of the competitive monetary value of expected WAR, $116 million, and take the log, we get Bellinger's expected ln relative performance for 2025, 0.31.

Figure 13 shows how we estimate competitive WAR value for Bellinger. We develop a model, using the natural log of the inflation adjusted monetary value of estimated WAR as our dependent variable, and the same explanatory variables as we did in estimating market pay. As before, we express our explanatory variables as differences from the population mean, so it's easy to see where a player is above or below average and how that affects the the competitive monetary value of expected WAR. When we take the anti-log of the predicted value, we can express the competitive monetary value of expected WAR as the product of the geometric mean value and multipliers capturing the impact of five factors – position, service, pay inflation in excess of CPI, inflation adjusted team value and metro population size. Figure 13 shows that the $8.4 billion value of the New York Yankees has a huge effect on the competitive monetary value of expected WAR for Bellinger, providing a multiplier of 10.8, while the other four factors, in the aggregate, change the competitive monetary value of expected WAR by less than 1%. The competitive monetary value of expected WAR for Bellinger at the Yankees in 2025 is $116 million. In 2024, when he played for the Chicago Cubs, his competitive monetary value of expected WAR was only $58 million.

CEO pay leverage and alignment could be high, even with only 5 observations

While only 35% of CEOs have statistically significant pay leverage, the individual CEO analysis is very useful because it leads us to ask, is there a pay plan that would provide a perfect correlation of relative

Figure 11

	Bellinger Value	Mean Value	Coefficient	Pay Impact Multiple	Market Pay Components
Geometric mean inflation adjusted pay					2,611,438
First base position	0	0.11	0.11	0.99	
Second base position	0	0.11	-0.19	1.02	
Third base position	0	0.10	0.00	1.00	
Shortstop position	0	0.10	-0.05	1.00	
Catcher position	0	0.15	-0.46	1.07	
Designated hitter position	0	0.11	-0.55	1.07	
Impact of position					1.157
Service less than 4 years	0	0.37	-2.02	2.10	
Service equal to 4 years	0	0.12	-1.11	1.14	
Service equal to 5 years	0	0.10	-0.58	1.06	
Service equal to 6 years	0	0.08	-0.22	1.02	
Service years greater than 6	1	1.19	0.05	0.99	
Impact of service					2.557
Years since 1999 (pay inflation)	26	14.37	0.009	1.12	1.116
Log inflation adjusted team value	9.04	6.99	0.241	1.64	1.638
Log metro area population	9.96	8.44	0.013	1.02	1.019
Inflation adjusted market pay					14,404,655
Inflation adjusted actual pay					25,000,000
Ln relative pay					0.55

Figure 12

	Bellinger Value	Coefficient	Expected WAR Value Components
Expected WAR constant			0.93
WAR[-1]	2.70	0.75	2.01
WAR[-2] - WAR[-1]	0.10	0.21	0.02
WAR[-3] - WAR[-1]	-1.80	0.13	-0.23
Years from age 21	8.00	-0.07	-0.59
Expected WAR			2.15
Value coefficient of expected WAR			0.009
Inflation adjusted team value ($mil)			8,436
Monetary value of expected WAR ($mil)			157.6
Competitive monetary value of WAR ($mil)			115.9
Ln relative performance			0.31

Figure 13

	Bellinger Value	Mean Value	Coefficient	Pay Impact Multiple	Competitive WAR Value Components
Geometric mean inflation adjusted expected WAR value					10,751,439
First base position	0	0.11	-0.02	1.00	
Second base position	0	0.11	-0.08	1.01	
Third base position	0	0.10	0.00	1.00	
Shortstop position	0	0.10	0.01	1.00	
Catcher position	0	0.15	-0.57	1.09	
Designated hitter position	0	0.11	-0.55	1.06	
Impact of position					1.168
Service less than 4 years	0	0.37	-0.15	1.06	
Service equal to 4 years	0	0.12	-0.02	1.00	
Service equal to 5 years	0	0.10	0.09	0.99	
Service equal to 6 years	0	0.08	0.06	1.00	
Service years greater than 6	1	1.19	-0.03	1.01	
Impact of service					1.052
Years since 1999 (pay inflation)	26	14.37	-0.012	0.86	0.865
Log inflation adjusted team value	9.04	6.99	1.163	10.82	10.816
Log metro area population	9.96	8.44	-0.042	0.94	0.938
Competitive value of WAR					115,879,042

pay and relative TSR? There is a simple pay plan with annual grants of performance shares that provides a perfect correlation. [29] It differs from conventional practice in three ways. First, target pay is market pay adjusted for trailing relative TSR, not market pay regardless of pay performance. Second, vesting takes out the industry component of the stock return. The vesting multiple is 1/(1 + the industry return from the date of grant), not (1 + relative TSR). The conventional vesting multiple, 1 + relative TSR, leverages industry performance instead of removing industry performance. [30] Third, all cash paid out prior to retirement is treated as a draw against the value of the performance shares. This means that the performance shares are all held through year five. They don't vest in three years as is common practice.

The perfect correlation pay plan helps us understand why companies don't achieve high alignment

In the perfect correlation pay plan, relative grant date pay is perfectly correlated with relative TSR and has pay leverage of 1.0. The difference between relative mark to market pay and relative grant date pay is also perfectly correlated with relative TSR and has pay leverage of 1.0. We can use these two benchmarks to gain more insight on why the median CEO has pay leverage of only 0.46 and pay alignment (r-sq) of only 35%. In our sample of 955 companies with the same CEO for the five years 2020-2024, there are 110 companies (12%) that do a good job of managing CEO pay. These companies have alignment (r-sq) of 50%+ and a pay premium at industry average performance within +/- 25%. When we look at these 110 companies as a group, pay leverage x ln(1 + relative TSR) explains 77% of the variation in relative CEO pay. The median pay leverage of these 110 companies is 0.81. By contrast, when we look at the remaining 845 companies, those where pay alignment (r-sq) is less than 50% or the pay premium at industry average performance is greater, in absolute value, than 25%, ln(1 + relative TSR) explains only 3% of the variation in relative pay (and pay leverage x ln(1 + relative TSR) explains even less). For these companies, median pay leverage is only 0.42. [31]

When we compare the good companies with the others, we find that ln relative grant date pay has 7x greater sensitivity to MtM pay leverage x ln(1 + relative TSR), 0.371 vs 0.052, and that post-grant date value changes are 4x more sensitive to pay leverage x ln(1 + relative TSR), 0.597 vs 0.151. This data shows that the good companies are much less devoted to competitive pay policy than the others and do a better job of getting vested pay value change to track relative TSR. Nonetheless, the good companies are still a good ways from perfect alignment. Grant date pay sensitivity is 0.371, but should be 1.000, and post-grant value change sensitivity is 0.597, but should be 1.000.

1. Pay leverage is the slope of the regression trendline relating ln relative pay to ln relative performance.

2. GICS is the Global Industry Classification System.

3. Michael Lewis (2003), Moneyball: The Art of Winning An Unfair Game, W. W. Norton & Company, New York, NY.

4. Benjamin Baumer and Andrew Zimbalist (2014), The Sabermetric Revolution: Assessing the Growth of Analytics in Baseball, University of Pennsylvania Press, Philadelphia, PA, p. ix.

5. We use BasballProspectus.com for batting data, BaseballCube.com for pay and contract data and BaseballReference.com for position data. We also use data from Forbes magazine for team values. We weren't able to find Forbes estimates for 2003, 2008 and 2021 and their team values at year 2025 were not published when this paper was written. We interpolated, using attendance, values for the missing years.

6. CEO pay in Figure 2 is grant date pay, that is, total compensation with equity grants included based on their value at the date of grant. The number of "S&P 1500" CEOs is greater than 1,500 because S&P Global includes some former S&P 1500 members in its Execucomp database.

7. The coefficient of variation, that is, the standard deviation divided by the mean, is 70% higher for baseball players than it is for CEOs.

8. The variables are entered into the multiple regression model in the order shown.

9. The market rate model (Figure 11) shows much larger discounts for designated hitters and catchers. These discounts decline substantially when we take account of player performance. The coefficient for designated hitters increases from -0.553 to -.214 and the coefficient for catchers increases from -0.459 to -0.109.

10. J.C. Bradley (2011), Hot Stove Economics: Understanding Baseball's Second Season, Copernicus Books, New York, NY, pp. 6-7.

11. On-base percentage is [hits + walks + hit by pitch]/plate appearances. Slugging percentage is [total bases/at bats] where total bases is 1 x singles + 2 x doubles + 3 x triples + 4 x home runs.

12. Figure 4 shows Baseball Prospectus WAR for 6,397 player-years; for the other 887 player-years in our sample (7,284 player-years) we estimate WAR using the square of OPS x plate appearances.

13. Major League Baseball prohibits incentive pay based on performance. It only allows incentive pay based on playing time and awards, such as Most Valuable Player.

14. The formal for expected WAR is 0.935 + 0.407 x WAR[-1] + 0.211 x WAR[-2] + 0.127 x WAR[-3] - .074 x [age – 21].

15. Much of the prior literature relates team revenue dollars to net wins or win percentage. See, for example, Gerald W. Scully (1989), The Business of Major League Baseball, University of Chicago Press, Chicago, IL, p. 154. We find that a log model fits the data better than a model that is linear in dollars. We relate team wins to team value so we can measure pay leverage to team/company value for both baseball players and CEOs.

16. Solow and Krautmann have a similar model in which they use current year and lagged team wins to predict log team revenue. The sum of the coefficients on current and lagged wins is .0073. John L. Solow and Anthony C. Krautmann (2020), "Do You Get What You Pay For? Salary and Ex Ante Player Value in Major League Baseball", Journal of Sports Economics, Vol 21 (7), pp. 705-722; p. 712.

17. (1.25)^0.62 – 1 = .148.

18. This analysis is based on estimated mark to market pay. I use the grant data reported in S&P Global's Execucomp database to estimate five year cumulative mark to market pay for all top 5 executives for five year periods ending in 1996-2024. The analysis provides five observations for the CEO and five observations for the sum of the other 4 executives for the five year period ending in each year. These represent relative pay and relative TSR for the past 1, 2, 3, 4 and 5 years. The maximum observations for the twenty five years 2000-2024 is 250 (= 2 x 5 x 25).

19. The eight industries, their GICS codes and their pay leverages are Gas Utilities 551020 (0.80), Aerospace & Defense 201010 (0.78), Industrial Conglomerates 201050 (0.74), Electric Utilities 551010 (0.72), Consumer Staples Distribution & Retail 303010 (0.70), Multi-utilities 551030 (0.67), Professional Services 202020 (0.66) and Hotels, Restaurants & Leisure 253010 (0.64).

20. Andrew Zimbalist notes that in 1985 former New York Yankees general manager "Lee MacPhail…was one of the first to call to the owners' attention the possible negative performance effects of guaranteed, multi-year contracts. MacPhail claimed that players with three-year contracts and up experienced an average decline of nearly 20 points in their batting average and an increase of almost 50 percent in the amount of time spend no the disabled list." Andrew Zimbalist (1992), Baseball and Billions: A probing look inside the big business of our national pastime, Basic Books, New York, NY, p. 88.

21. The performance penalty also applies to bonus awards. When profitability improves, target profit is increased without increasing the target bonus. This reduces the bonus share of profit.

22. Exp(0.64) – 1 = .90.

23. See Naihua Duan (1983), "Smearing Estimate: A Nonparametric Retransformation Method", Journal of the American Statistical Association, Vol 78, No 383 (Sep).

24. 42% = [(1 + 88%)/(1 + 32%)] – 1.

25. The aggregate dollar premium is 1,044 x $7.840 million x (1 + 32%) x 42%. Total payroll, before the premium, is [(6,240 x $4.565 million) + (1,044 x $7.840 million x (1 + 32%))].

26. Market pay is the executive's opportunity cost. When it would be paid in stock, it would grow each year by the stock's expected return. We use a 10% expected return, the median stock return for 2000-2024, to estimate the future value of market pay.

27. Our simulation assumes that 100% of pay is in equity and we apply the 10% future value adjustment to 100% of market pay. The median percent of pay at risk for CEOs in 2000-2024 is 77%. If we assumed that 77% of pay is in equity, we would only apply the 10% future value adjustment to 77% of market pay, so the pay premium, assuming 77% of pay in equity, might still be close to 17%.

28. It's possible to estimate the impact of CEO pay dimensions and stock ownership on future shareholder wealth gains. See Stephen F. O'Byrne, "CEO Pay Has A Big Impact on Future Stock Returns", available at OpenAccessGovernment.org.

29. I first discovered this plan in 2012. See Stephen F. O'Byrne (2012), "Achieving Pay for Performance", Conference Board Director Notes, Vol 4, No 24, December.

30. The conventional vesting multiple, 1 + rTSR, makes the vesting stock value equal to beginning stock value x (1 + iTSR) x (1 + rTSR) x (1 + rTSR) = beginning stock value x (1 + iTSR) x (1 + rTSR)^2 where rTSR is the relative TSR and iTSR is the industry TSR. The conventional vesting multiple does not eliminate the industry return, (1 + iTSR), it leverages the industry return by a factor of (1 + rTSR)^2.

31. Pay versus performance graphs, based on four years of data, for good and bad companies, defined the same way, are shown in Stephen F. O'Byrne (2025), "How and why U.S. executive pay should change", available at OpenAccessGovernment.org. In this analysis, there are 165 good companies with 83% alignment (Figure 8) and 932 bad companies with 6% alignment (Figure 9).

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