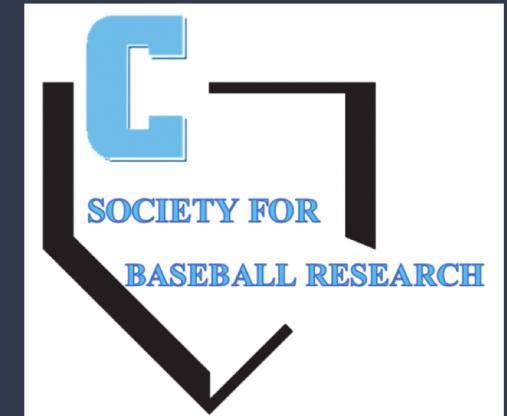


# Diamond Dollars Case Competition: Projecting Player Performance

Anthony Argenziano, Anthony Montes, Charlie  
Orlinsky, Brian O'Sullivan, Drew Posner



# Introduction: Player Evaluation



Pete Alonso, 1B, New York Mets



Aaron Judge, RF, New York Yankees

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# Offensive Valuation: Modeling Decisions

## Question

*Which offensive metrics are the most important when evaluating hitters?*

## Decisions

- Selected fifteen of the most relevant advanced statistics:
  - Mutually Exclusive
  - Available from 2002-2019
- Weighted Statistics vs. Counting Statistics
  - Weighted statistics describe player performance against league average.
  - Valuation of league-weighted metrics more robustly predict future performance and value.

# Primary Offensive Statistics

BB%+	K%+	OBP+
SLG+	WRC+	LD%+
wOBA	HR/FB%+	Hard%+
GB%+	FB%+	BABIP+
O-Swing%	SW-Strike%	Z-Swing%

# Offensive Valuation: Variable Selection

## Question

*Which offensive metrics are the most important in affecting WAR?*

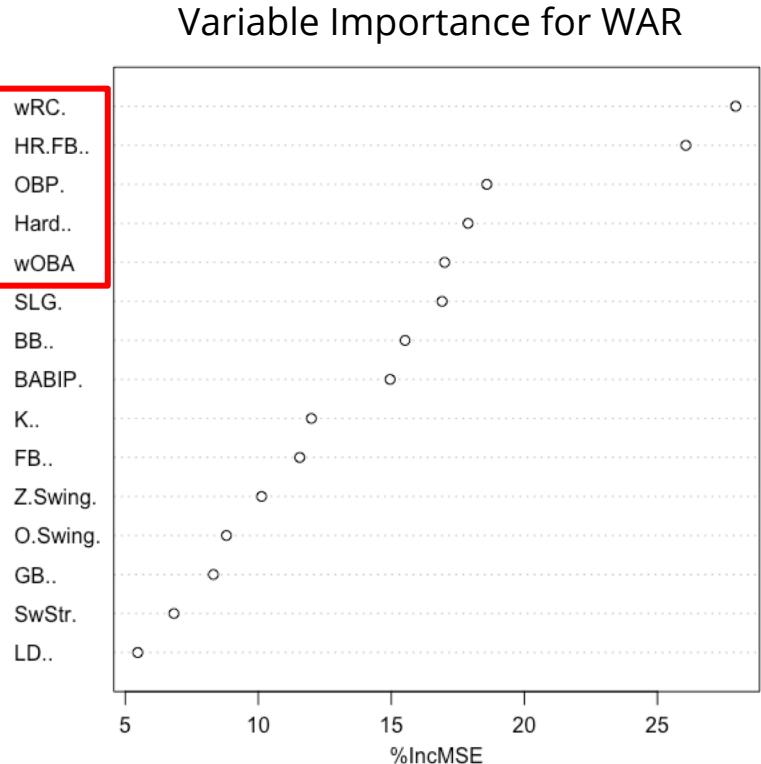
## Decisions

- Variable Selection: Quantitative Rationale
  - Random Forest Regression
    - Variable Importance of 15 Regressors Against WAR
- Random Forest Regression:
  - Selected: wRC+, wOBA, HR/FB%+, Hard%+, OBP+
    - Most important variables when evaluating a hitter.

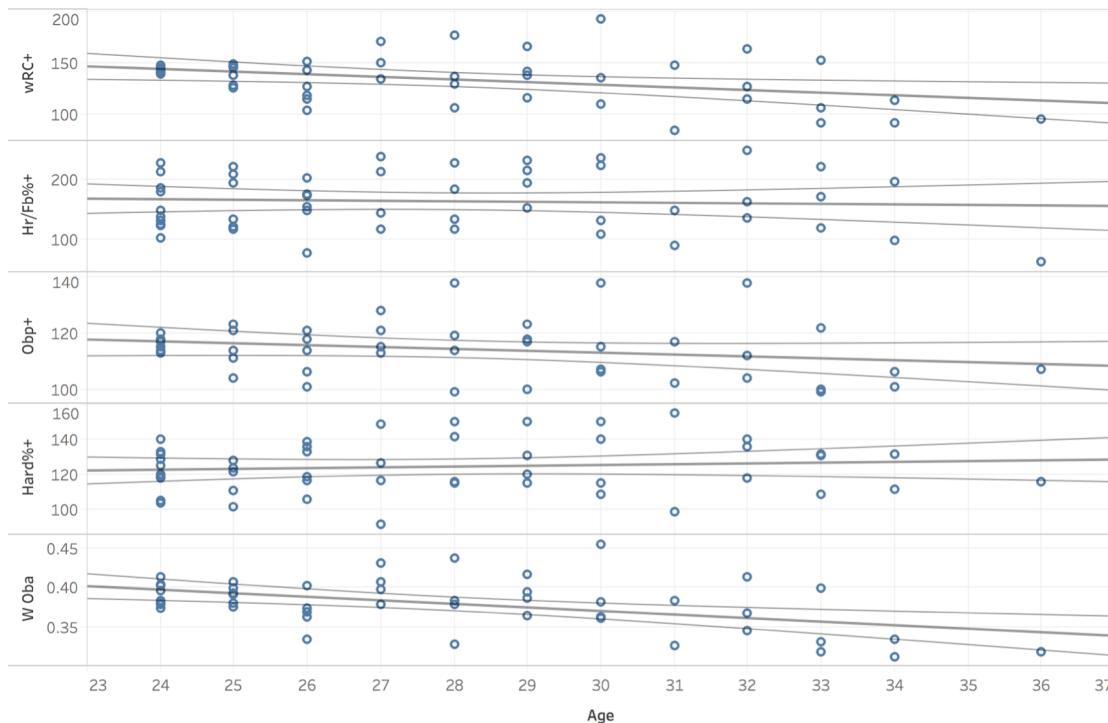
# Random Forest Regression: Variable Importance for WAR (2002-2019)

By sorting and plotting the importances of each variable found by our Random Forest model, the five most impactful predictors of WAR are, in order:

1. wRC+
2. HR/FB%+
3. OBP+
4. Hard Hit %
5. wOBA



# 5-Year Projection: Results for Pete Alonso



- Pete Alonso's performance matched to 10 nearest players at age 24.
- Each player's performance mapped out by age to help predict how Alonso will perform each year.
- Players used for comparison:
  - Adam Dunn
  - Alex Avila
  - Austin Meadows
  - Carlos Gonzalez
  - Freddie Freeman
  - Hanley Ramirez
  - Jose Ramirez
  - Kris Bryant
  - Miguel Cabrera
  - Yoan Moncada

# Projections for Pete Alonso

<b>Age</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>
<b>wRC+</b>	141.92	139.36	136.80	134.24	131.68
<b>HR/FB%+</b>	165.49	164.62	163.75	162.88	162.01
<b>OBP+</b>	116.36	115.69	115.02	114.35	113.68
<b>Hard%+</b>	123.30	123.75	124.19	124.64	125.08
<b>wOBA</b>	0.392	0.388	0.384	0.379	0.375

# “Impact Comparisons”: Pete Alonso vs. 2019 1B

2020



2021



2022



2023



2024



WAR: 4.0

.293/.405/.520

WAR: 4.0

.293/.389/.545

WAR: 2.5

.277/.367/.569

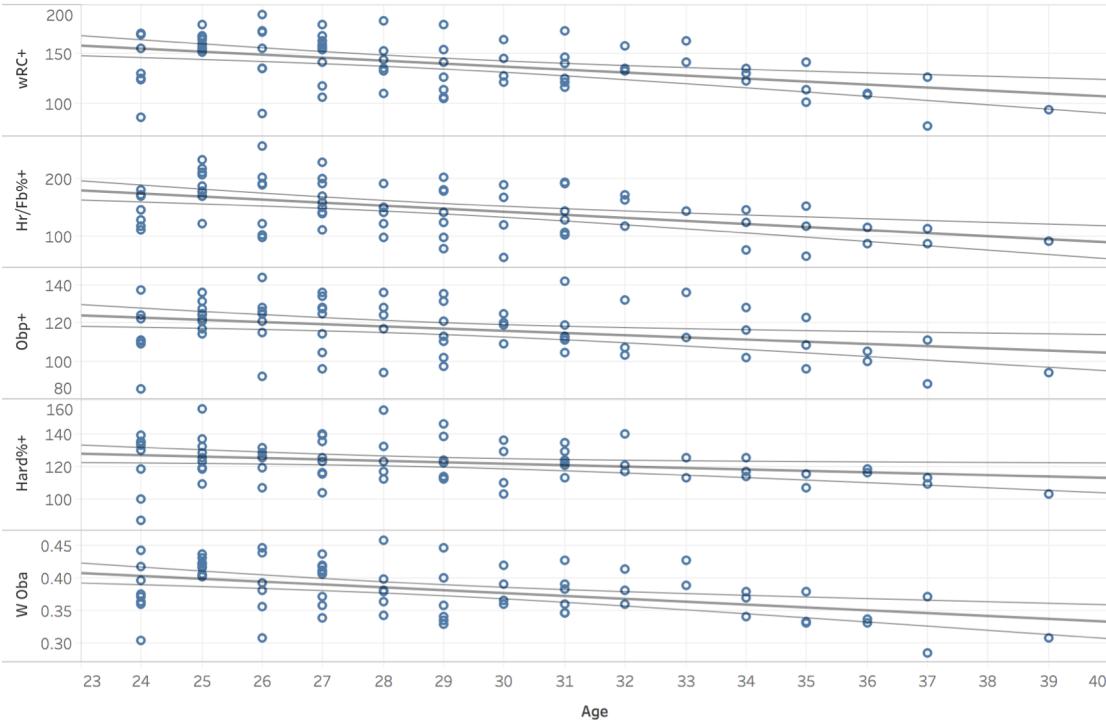
WAR: 4.8

.251/.374/.515

WAR: 3.2

.298/.343/.541

# 5-Year Projection: Results for Aaron Judge



- Aaron Judge's performance matched to 10 nearest players at age 25. (Note that this season was the best one to use for comparison.)
- Each player's performance mapped out by age to help predict how Judge will perform each year.
- Players used for comparison:
  - Adrian Beltre
  - Albert Pujols
  - Alex Bregman
  - Andrew McCutchen
  - Buster Posey
  - Carlos Quentin
  - Joey Votto
  - Mike Trout
  - Paul Goldschmidt
  - Prince Fielder

# Projections for Aaron Judge

Age	28	29	30	31	32
wRC+	143.26	140.24	137.21	134.18	131.16
HR/FB%+	153.01	147.62	142.24	136.85	131.47
OBP+	118.03	116.88	115.73	114.58	113.43
Hard%+	123.26	122.40	121.53	120.66	119.80
wOBA	0.386	0.381	0.377	0.373	0.368

# “Impact Comparisons”: Aaron Judge vs. 2019 OE

2020



2021



2022



2023



2024



WAR: 4.0  
.291/.374/.568

WAR: 3.2  
.304/.383/.557

WAR: 3.6  
.265/.354/.569

WAR: 4.2  
.311/.372/.503

WAR: 3.2  
.314/.377/.503

# Risk Assessment: Outperformance Probability

- Distribution around mean for each regression is given by the confidence bands in the regression output.
- As age increases, the confidence bands for the mean response becomes wider.
- Alonso and Judge will continue to perform at a high level, but the certainty for Judge is higher because of the difference in R-squared.

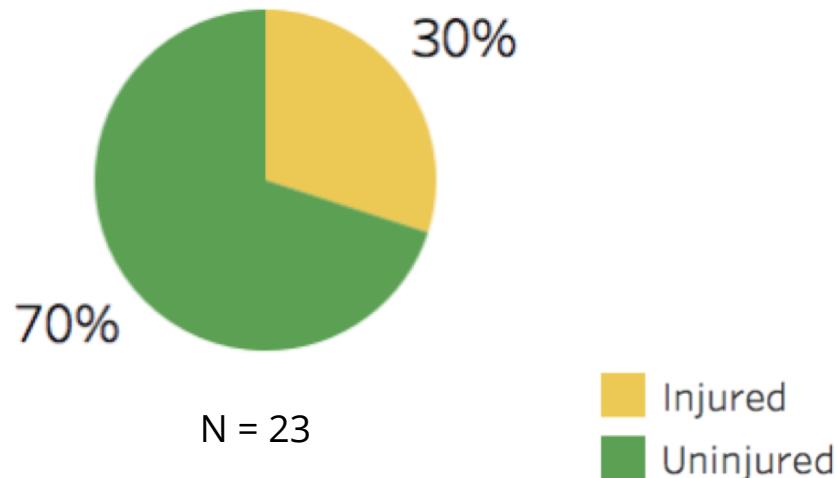
*Tradeoff between predicted performance and variance of prediction*

	Predicted Performance	Variance of Prediction
Alonso	Higher	Higher
Judge	Lower	Lower

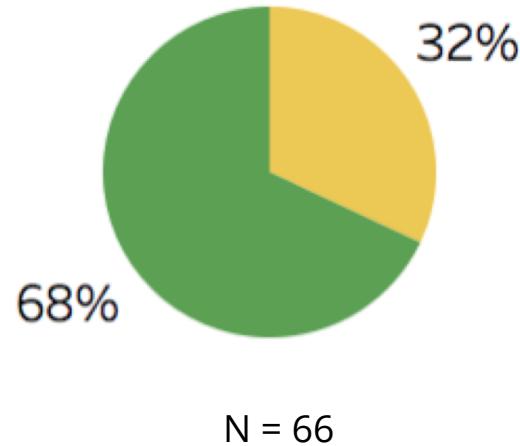
Season	2020	2021	2022	2023	2024
Higher Performing Player	Judge 50.48%	Judge 50.36%	Judge 50.19%	Alonso 50.03%	Alonso 50.31%

# Risk Assessment: Positional Injury

**1B Injuries  
(2018-2019)**



**OF Injuries  
(2018-2019)**



# Recommendations: Arbitration Projection

## ***Steps for Determining Projected Salary***

- 2015 arbitration salaries based on Career WAR
  - Inflated by 13.5% to calculate arbitration salary today
- Used to find arbitration salary for Judge and Alonso

$$\text{Salary} = (\$1,139,338) * (1.135) * (e^{(0.1223)*\text{WAR}})$$

\*Model adapted from Alex Chamberlain and Sean Dolinar (fangraphs.com) with an adjustment for inflation by our team



# Projected Salary Commitments

Player	2020	2021	2022	2023	2024
Aaron Judge	\$11.5M*	\$19.0M	\$31.0M	~\$30.0M	~\$30.0M
Pete Alonso	\$0.63M	\$5.0M	\$8.0M	\$15.0M	\$27.5M

Judge paid a total of ~\$121.5M over 5 years

Average wRC+ above the league average/ \$Million:  $37.2/\$121.5M = \underline{0.31}$

Alonso paid a total of ~\$56.1M over 5 years

Average wRC+ above the league average/ \$Million:  $36.8/\$56.1M = \underline{0.66}$

Pre-Arb	Arb	FA Deal
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\*MLB Trade Rumors projects \$6.4M, but our exponential model projects the above

# Contract Recommendations

Player	Context	Recommendation
Aaron Judge (New York Yankees)	Arb 1/3 (3 years control)	<i>Give him a “saver” based on his injury risk (~3yr/\$50M)</i>
Pete Alonso (New York Mets)	Pre-Arb 2/2 (5 years control)	<i>Buy out pre-arbitration year, because he is likely to qualify as a Super 2 (~6yr/\$71M)</i>

# Conclusions

- Statistically, Aaron Judge is more appealing in the short term
- However, with financial implications and Judge's prior injury history, Pete Alonso emerges as the more controllable, cost-effective of the two.



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