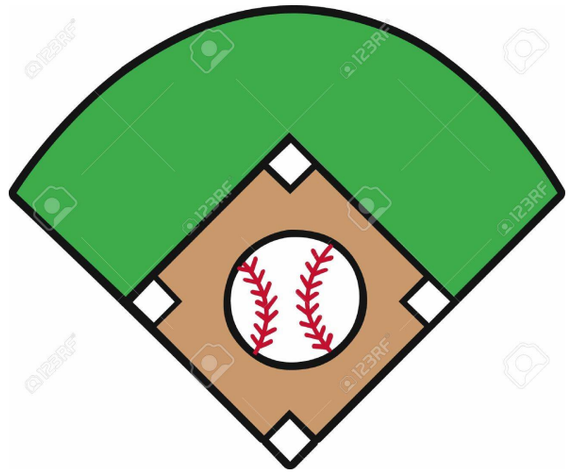


Baseball And Linear Regression

Predicting Wins

Scott Lew

The Goal

Predict a baseball team's wins in a season using a variety of batting & pitching statistics.

Precedent for Predicting Wins: Bill James

- ‘Godfather’ of Sabermetrics
- Statistician and baseball historian
- “Pythagorean Theorem of Baseball” Predicts Win% using Runs scored & Runs allowed

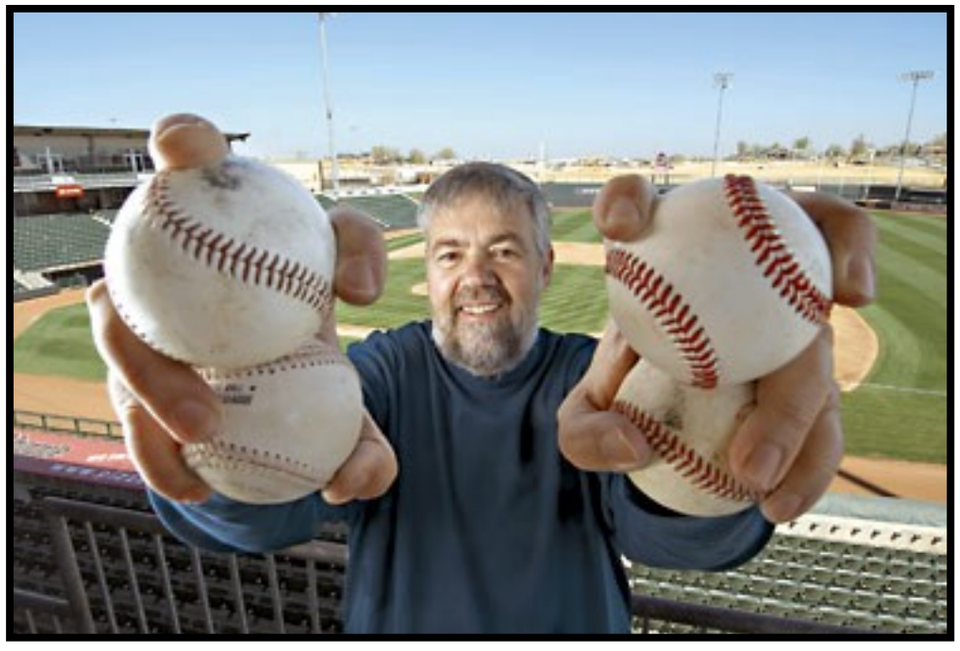


photo:Keith Philpott for TIME magazine

Methodology

- Problem: Predict baseball team wins using batting & pitching stats

- Web scraping to obtain statistics from 1876-2018. Linear Regression Models to predict wins.

- Evaluate Regression Models

- Conclusions: What are some important predictors of wins?

Resources & Tools

- BeautifulSoup: web scraping
- www.baseball-reference.com: batting & pitching statistics
- scikit learn: regression model
- statsmodel: regression model

Some Potential Batting Stats To Predict Wins

- **Hits (H_x)**: Hits produce runs
- **Runs scored (R_x)**: Runs help win games
- **Batting Average (BA)**: Good batting produces hits
- **On Base Percentage (OBP)**: Getting on base is helpful

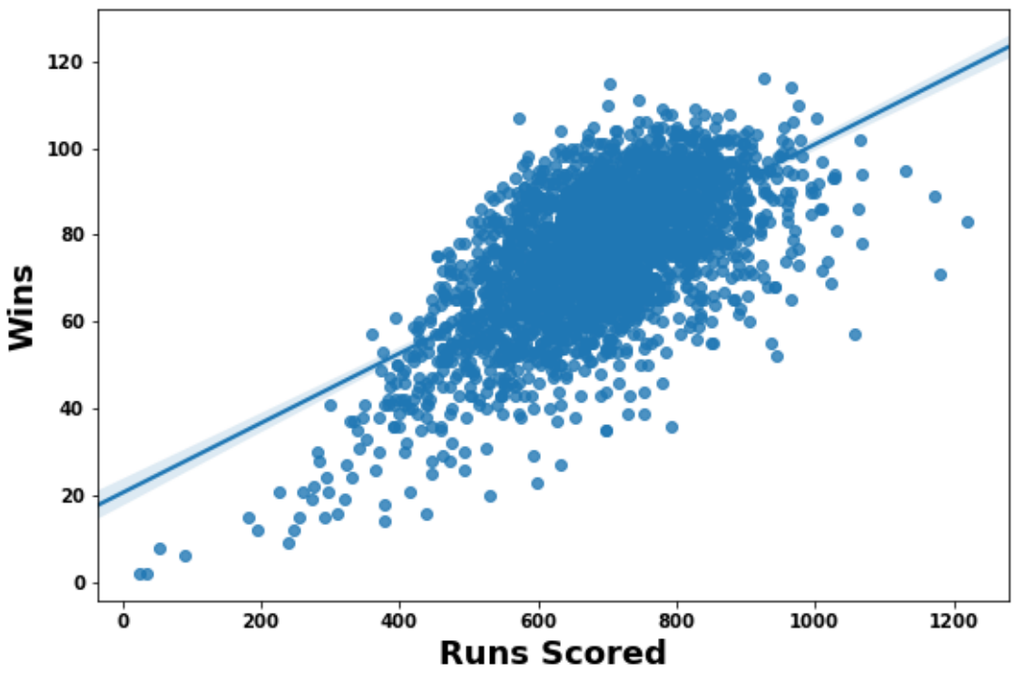
Potential Pitching Stats To Predict Wins

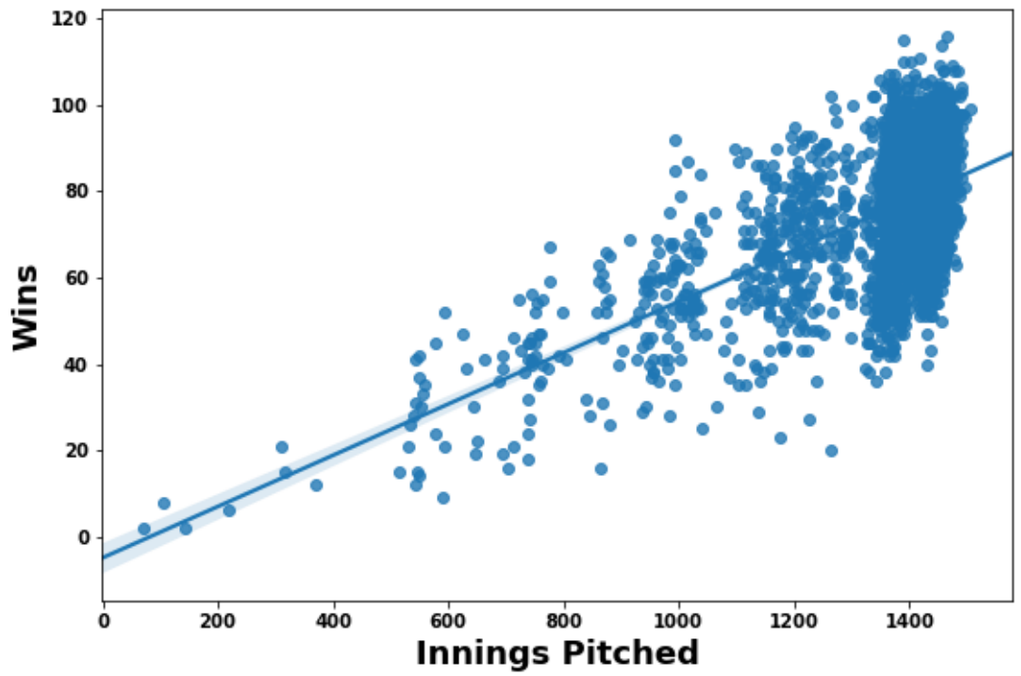
- **Earned Runs Average (ERA)**: metric for pitching, the lower the better…. fewer runs allowed
- **Save (SV)**: A good metric for relief pitchers performance
- **Innings Pitched (IP)**: Another metric for good pitching

Dataset

- MLB Stats from 1876- 2018
- 28 Batting Stats
- 35 Pitching Stats

EDA: Stats With Correlation To Wins





Heatmap: Correlation of Stats with Wins

Runs scored (R_x), Innings Pitched (IP), & Save (SV): all have positive correlation with wins

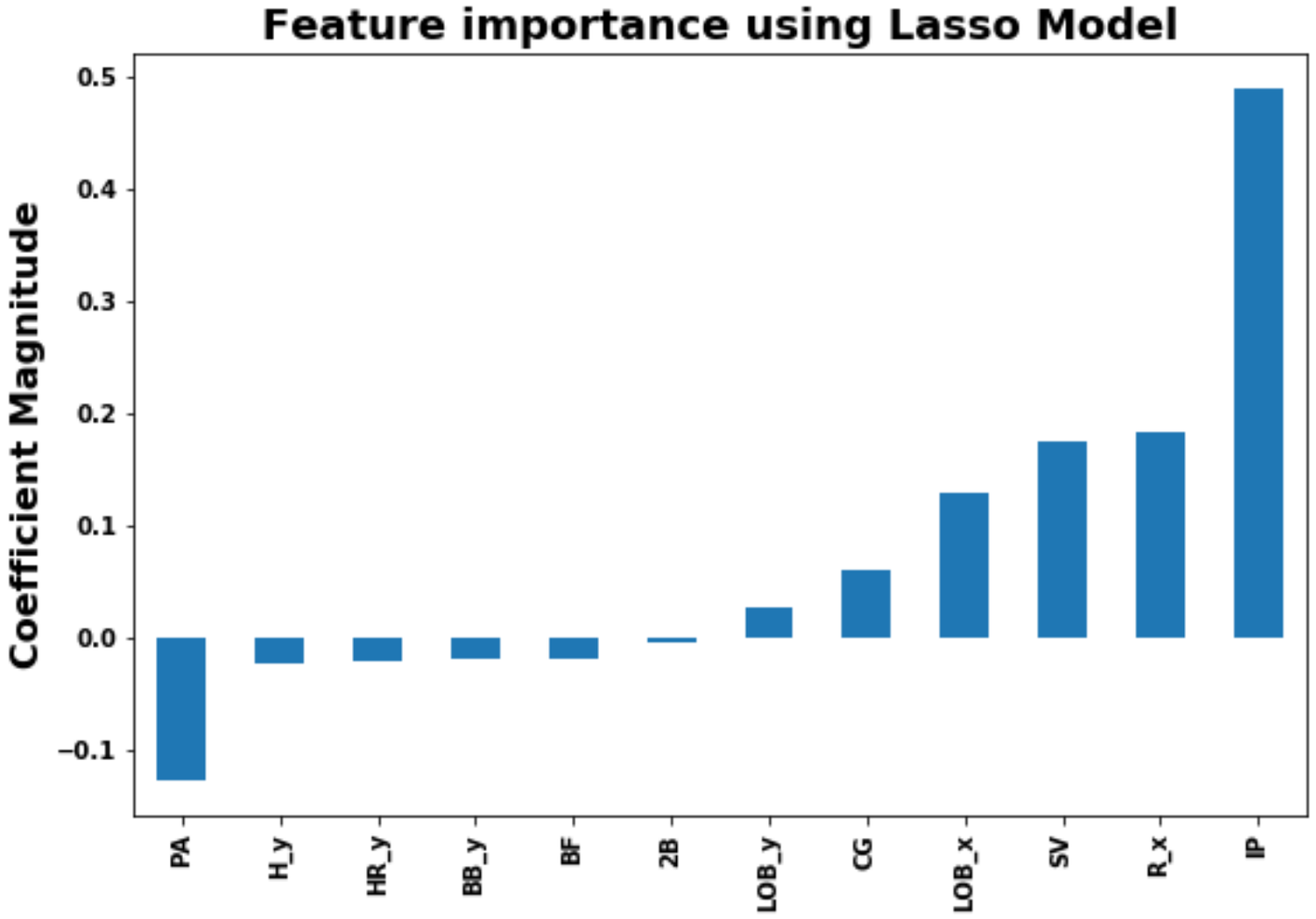
OLS Regression

- Perform multiple linear regression with statsmodels and Scikit Learn using all stats for initial regression model
- Select features with backwards stepwise regression
- Feature selection using LASSO

Backwards Stepwise Regression

60 Features → **33 Features**

LASSO Selection



33 Features → **16 Features**

Some Stats Used To Predict Wins

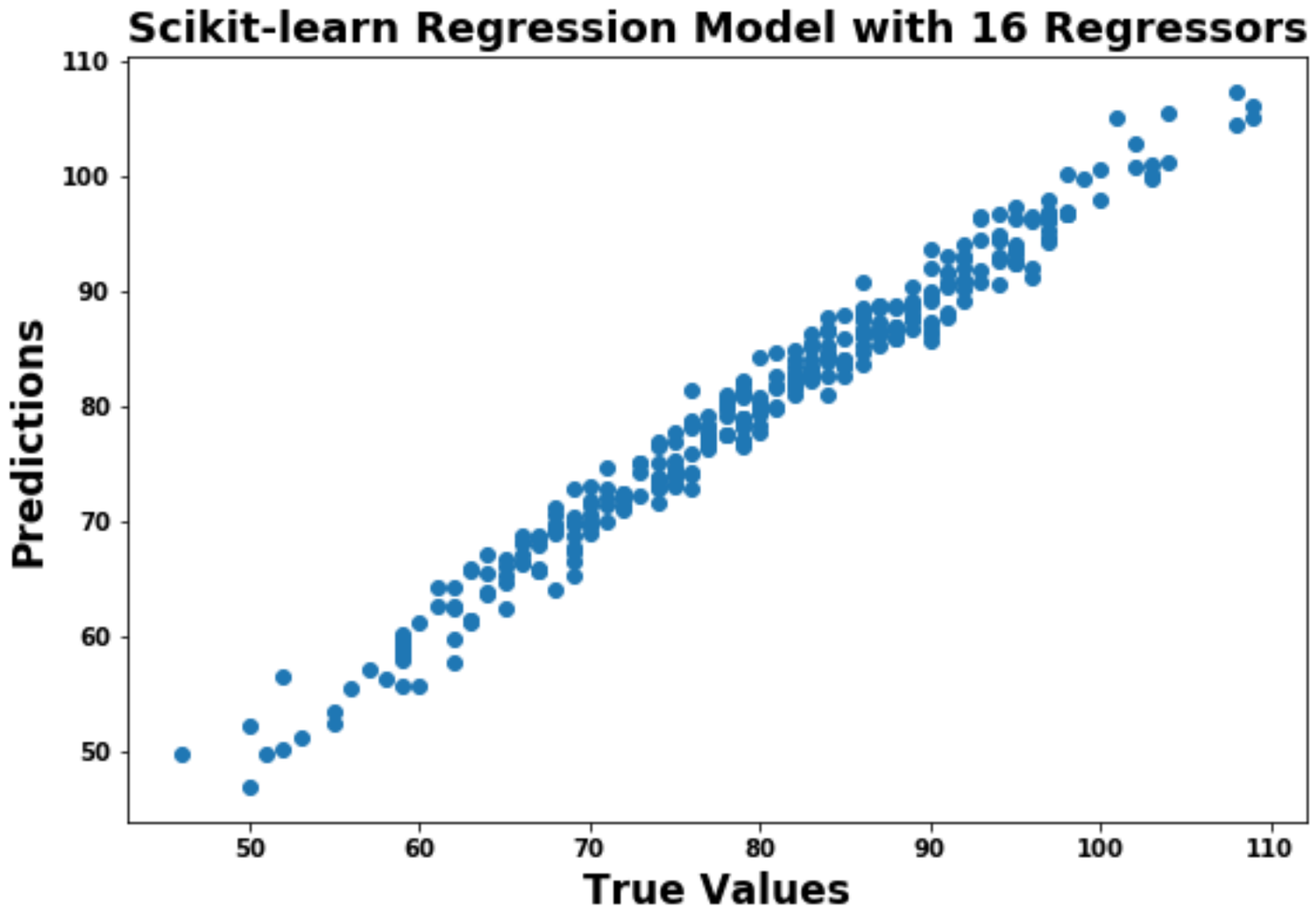
	coef	std err	t	P>|t|	[0.025	0.975]
PA	-0.2743	0.006	-49.435	0.000	-0.285	-0.263
R_x	0.2919	0.004	68.689	0.000	0.284	0.300
LOB_x	0.2771	0.006	48.856	0.000	0.266	0.288
IP	0.6798	0.027	25.344	0.000	0.627	0.732
SV	0.0742	0.012	6.418	0.000	0.052	0.097

Statsmodel OLS
All the above features are significant in predicting wins

Linear OLS Model

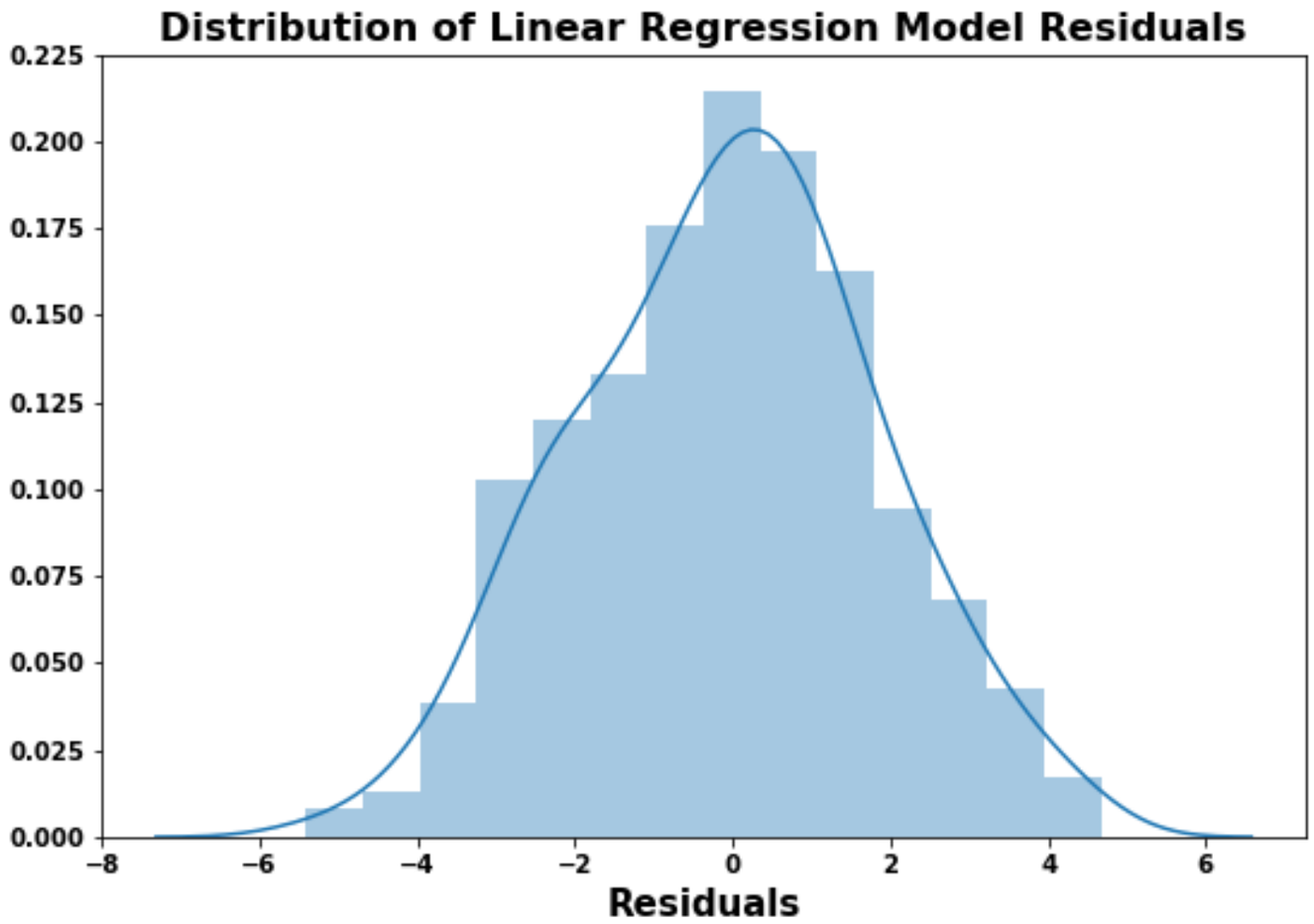
- 16 Batting & Pitching stats used to predict wins.
- RMSE of 1.9 for test data
- R^2 of 99%
- However, multicollinearity exists in the model with these predictors

OLS Model Predictions

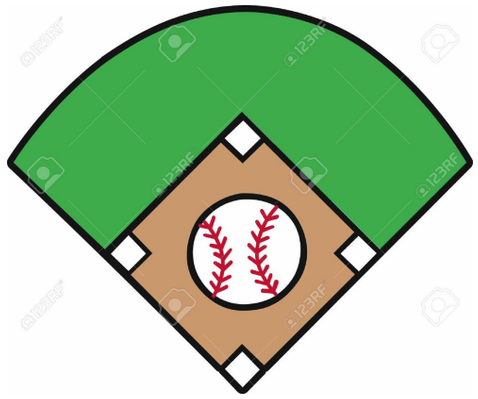


Residual Analysis

Normal Distribution of Residuals



CONCLUSIONS



- ***Team Runs scored (R_x), Innings Pitched(IP), LOB_x & SV are good predictors of wins.***

- ***Good batting & pitching are always useful in baseball.***

- ***Future Work: Incorporate Financial Stats such as average team salary and/or Fielding Stats into regression models.***

THANKS!