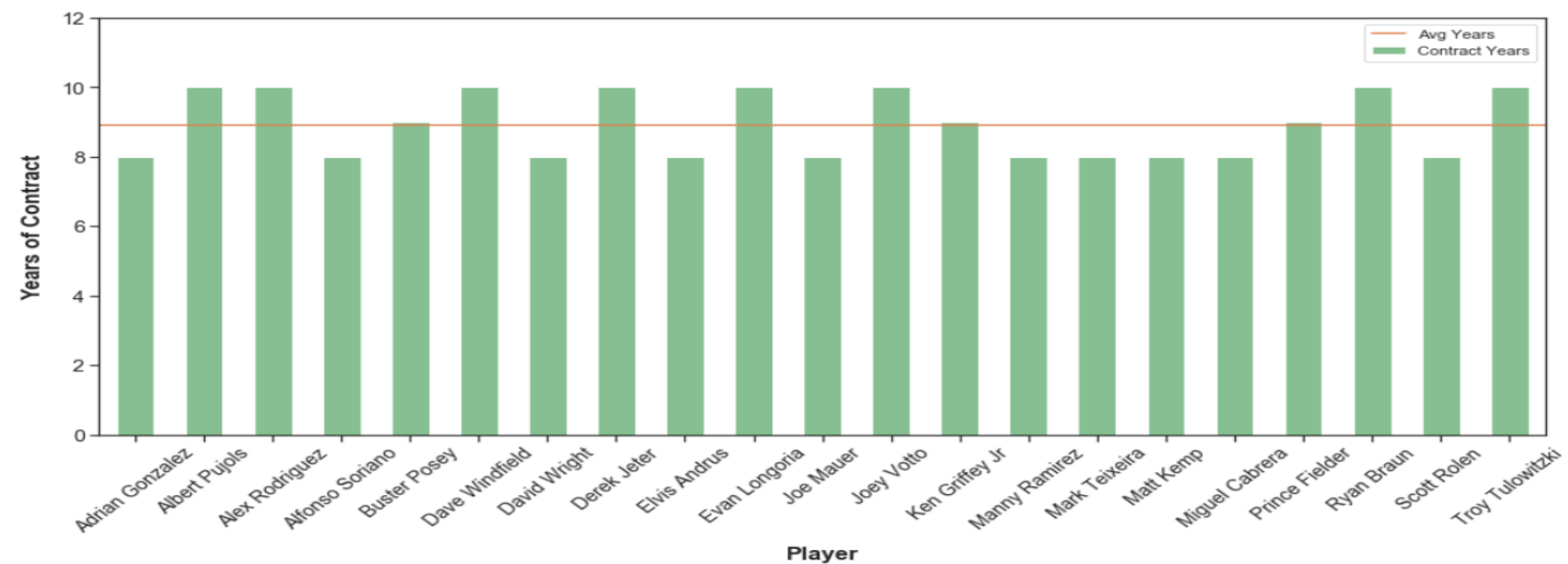
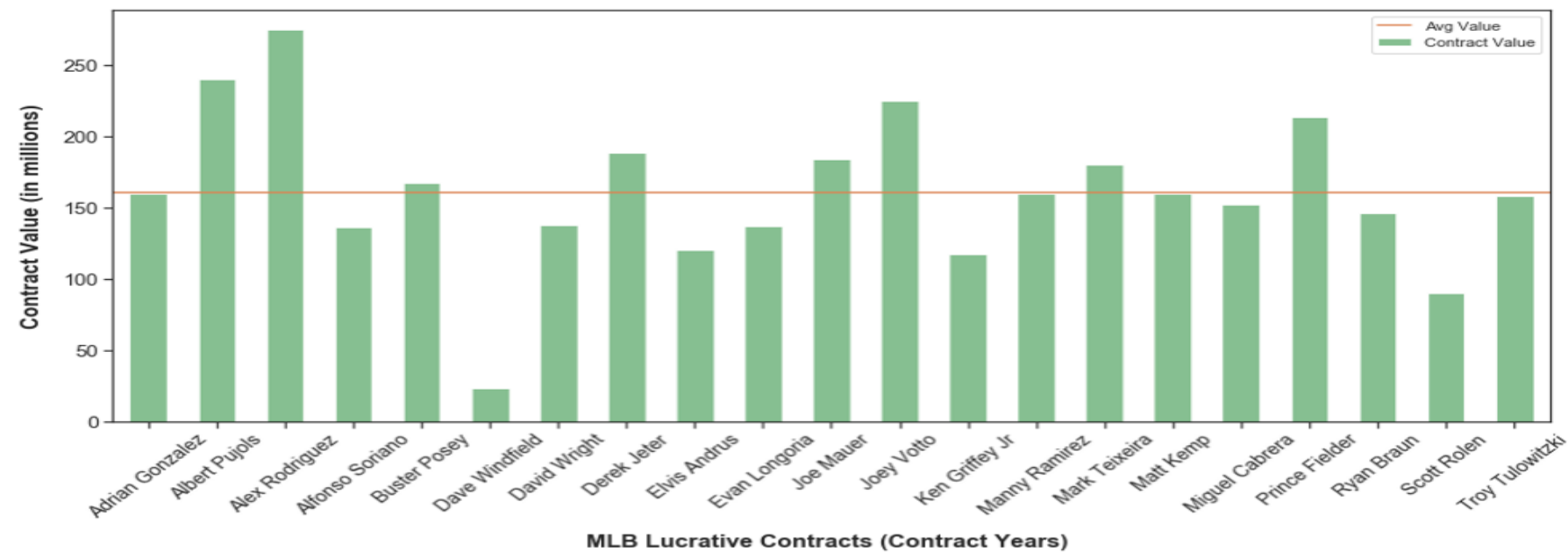


Baseball Most Talented Players

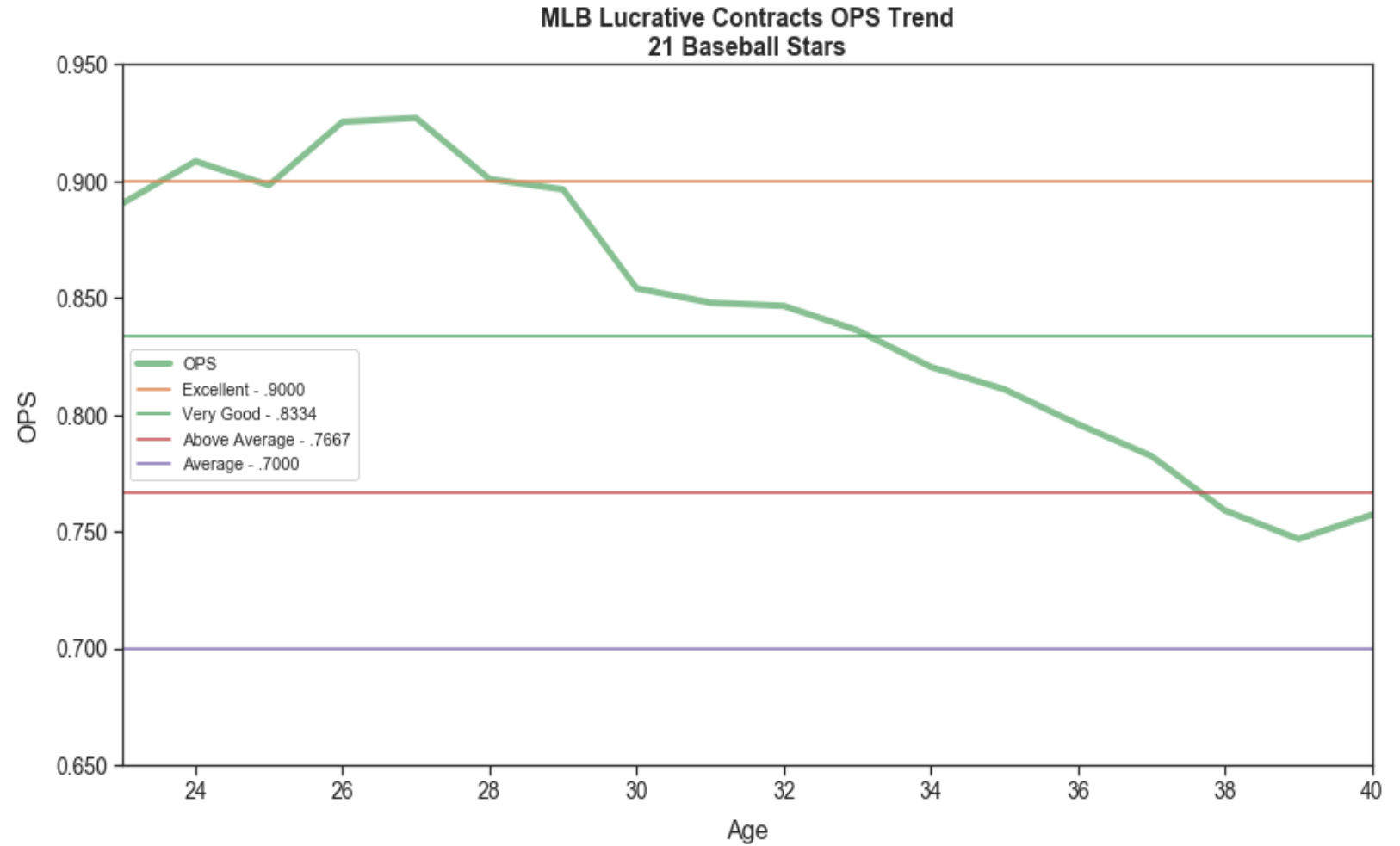
- Big Contracts in Major League Baseball are Good for Players
 - Multi-million-dollar contracts
 - Multi-year contracts
- Are They Good for the Owners of Baseball
 - Is there a Return on Investment
 - What is their Future Yearly Performance

Baseball Most Lucrative Contracts



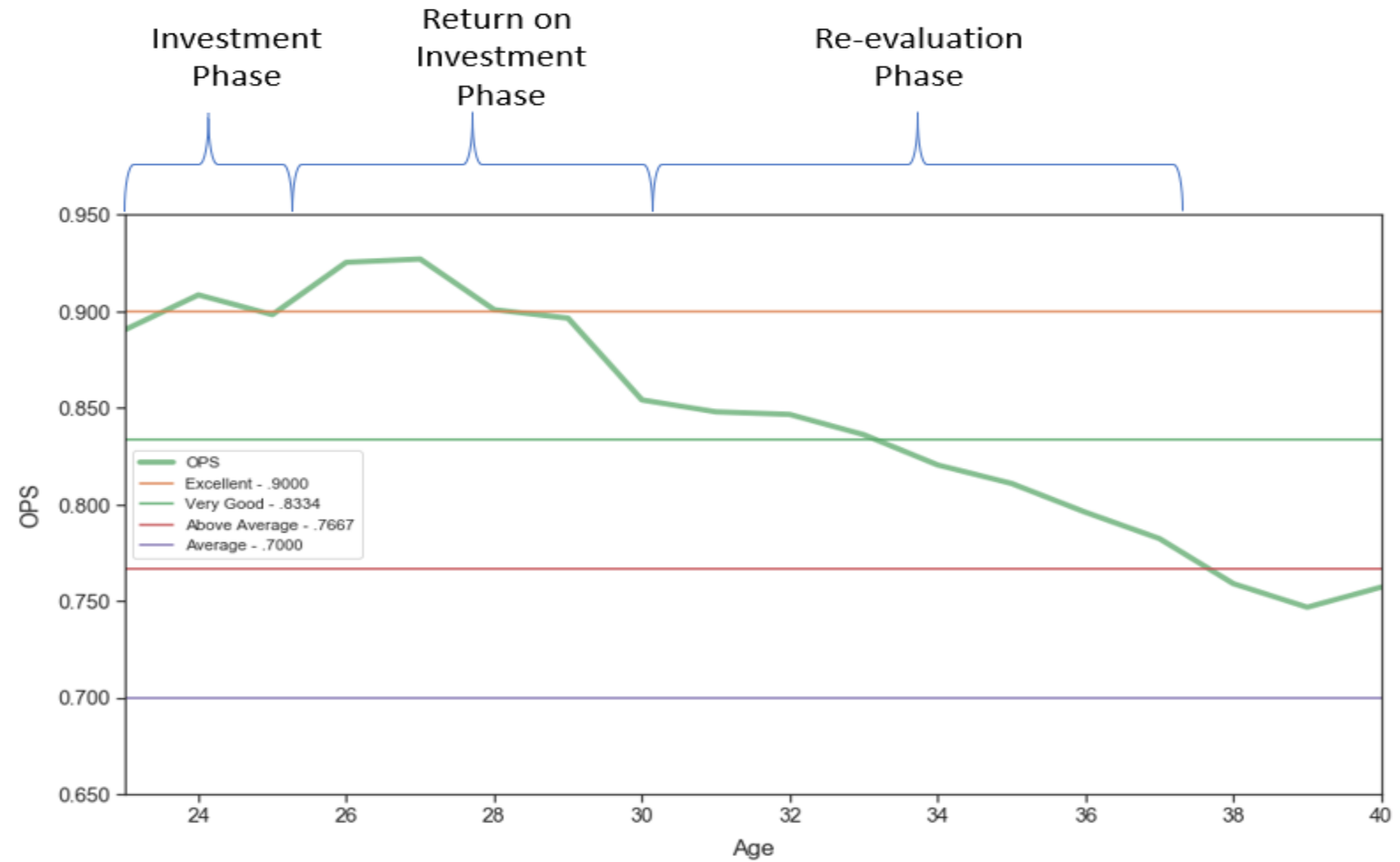
Combined Player Performance

- Average Signing Age: 28
- Average Contract Years: 8.9
- Average Contract Value: \$160 million
- Performance Declines at Age 28
- Continues to Decline Rapidly



Is There a Better Way

- Investment Period
 - Initially Sign 2 to 4 Years
 - Track Performance
- Return On Investment Period
 - Sign to Multi-Year Contract
 - Sign to Multi-Million Dollar Contract
 - Less Dollar Value but Substantial
 - Sign During Optimal Years
- Re-Evaluate Contract
 - Declining Years
 - Still May be Value



Keys to Success

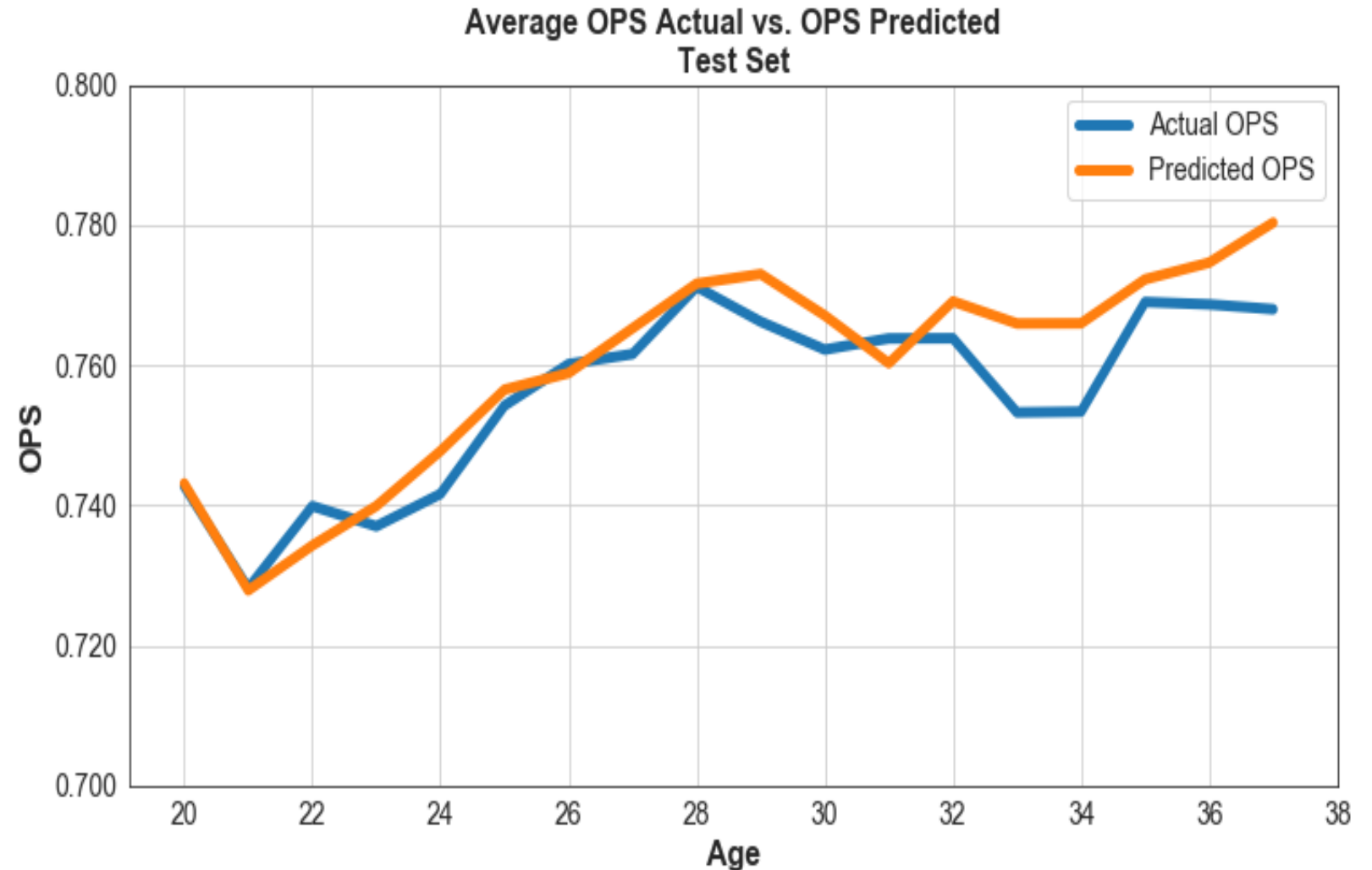
- Predict Performance
 - Predict ROI Period – Five Years
 - Given 2 to 4 Years of Known Performance
- Create Baseline Predictive Model
 - OPS Predictive Model
 - Career OPS Predictive Model
 - One Year Look Ahead
- Create Five Year Projections
 - Explore Techniques
 - Input into Predictive Model
 - Analyze Results

Process

- Acquire and Process Data
 - Lahman Baseball Statistics Data
 - Yearly Baseball Statistics
 - 1871 to 2018
 - Format Data into Usable Format
 - Validate Data Against FanGraphs
- Perform Exploratory Data Analysis
 - Understand the Data
 - Look for Insight in Data
- Statistical Analysis
 - What Does Performance Data Look Like Statistically
 - Helps to Better Understand Data
 - Use Statistical Techniques
- Predictive Models
 - Predict OPS (On Base Plus Slugging)
 - Predict Career OPS

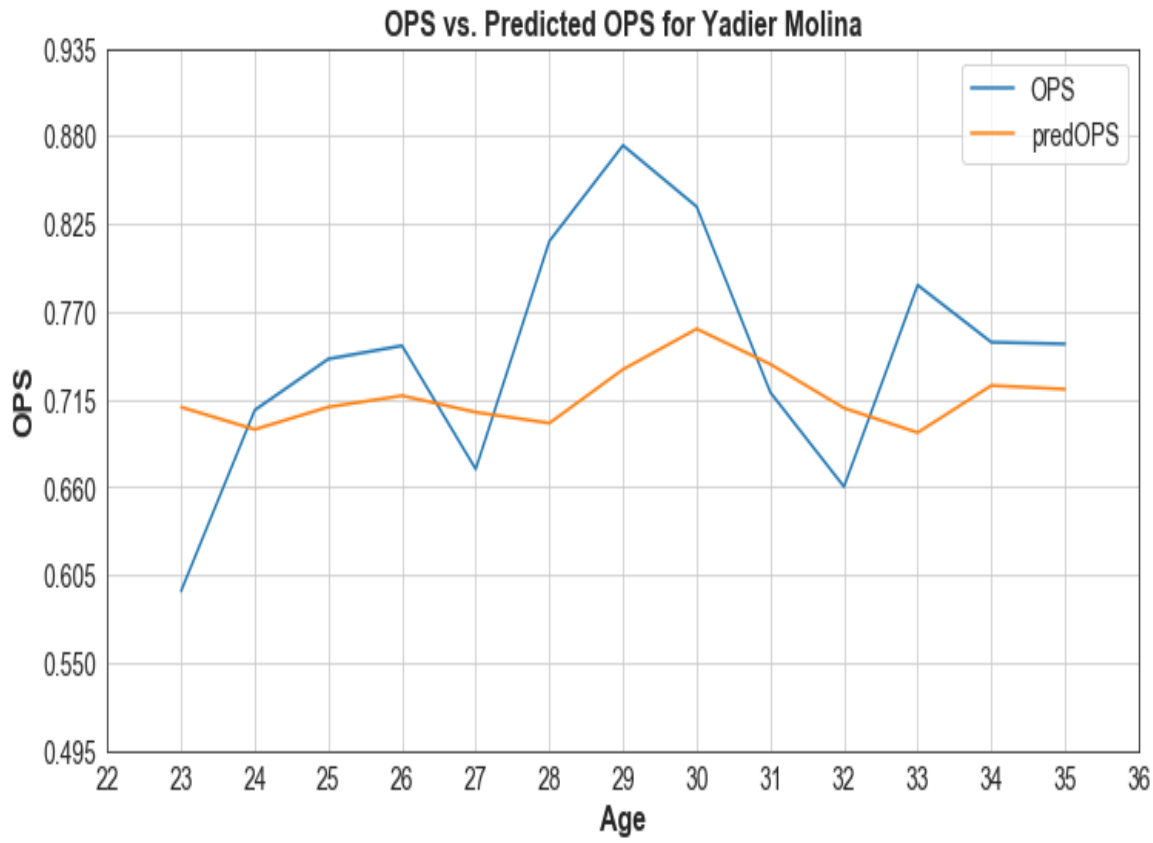
OPS Predictive Results - Charts

- One Year Predictions (only)
- Averaged Over All Players
- Sample Required 300+ Yearly At Bats
- Later Years Have Greater Variation
- Easier To Predict Early Years

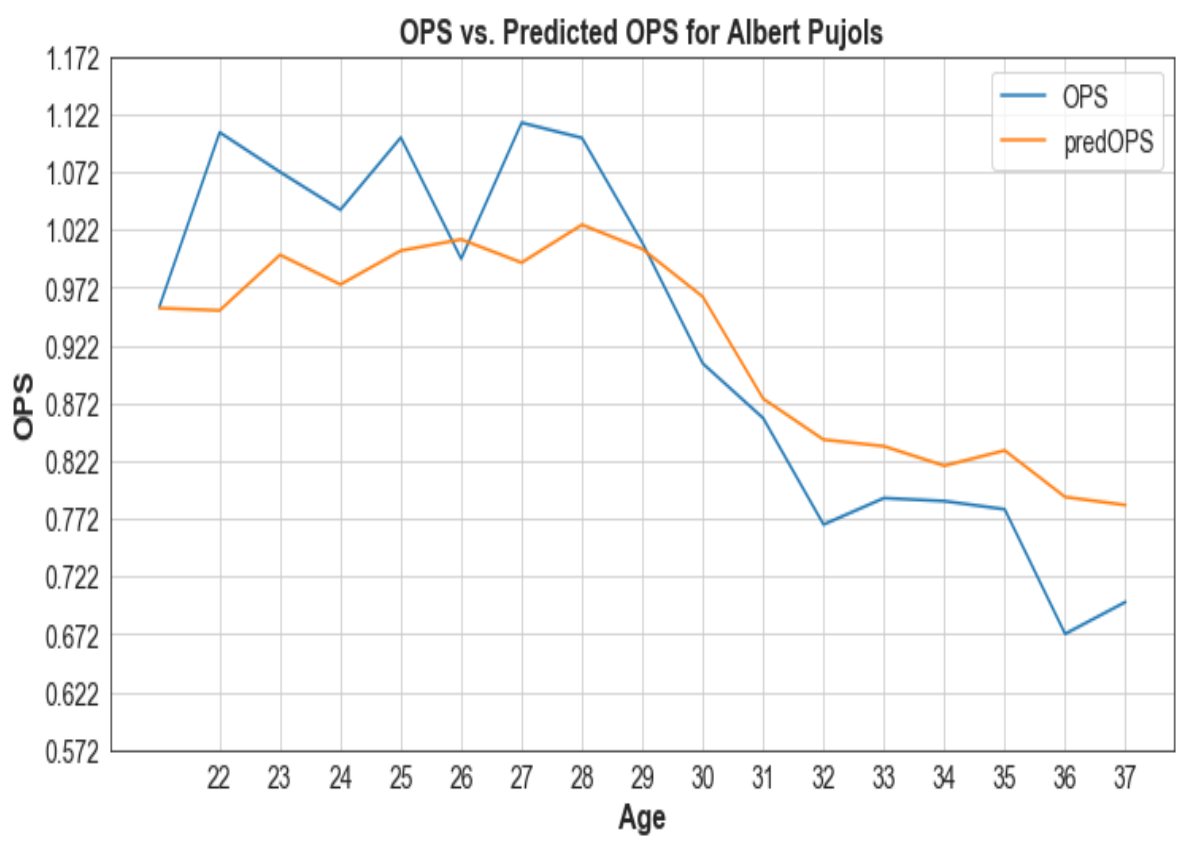


OPS Predictive Results – Selected Players

Player Name: Yadier Molina
Avg Actual OPS 0.743
Avg Predicted OPS 0.717
Pct Error 3.5



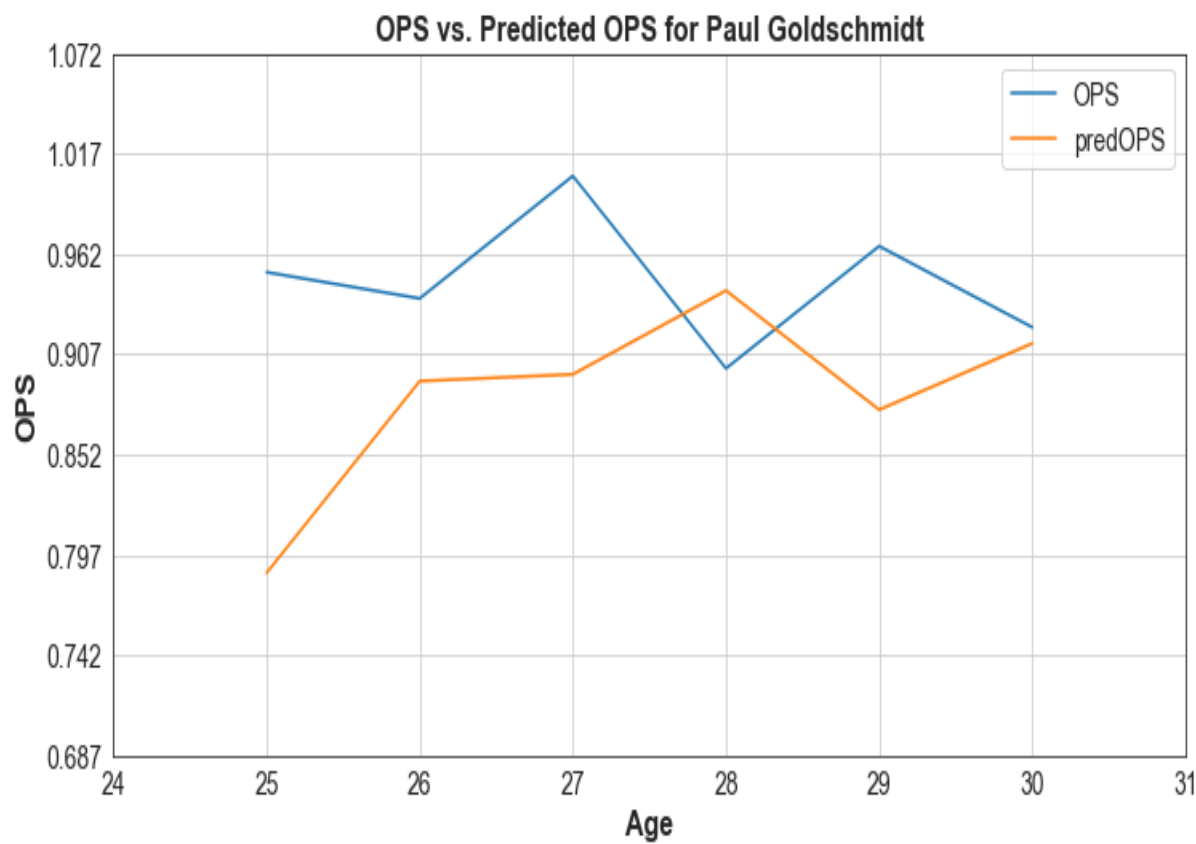
Player Name: Albert Pujols
Avg Actual OPS 0.927
Avg Predicted OPS 0.921
Pct Error 0.6



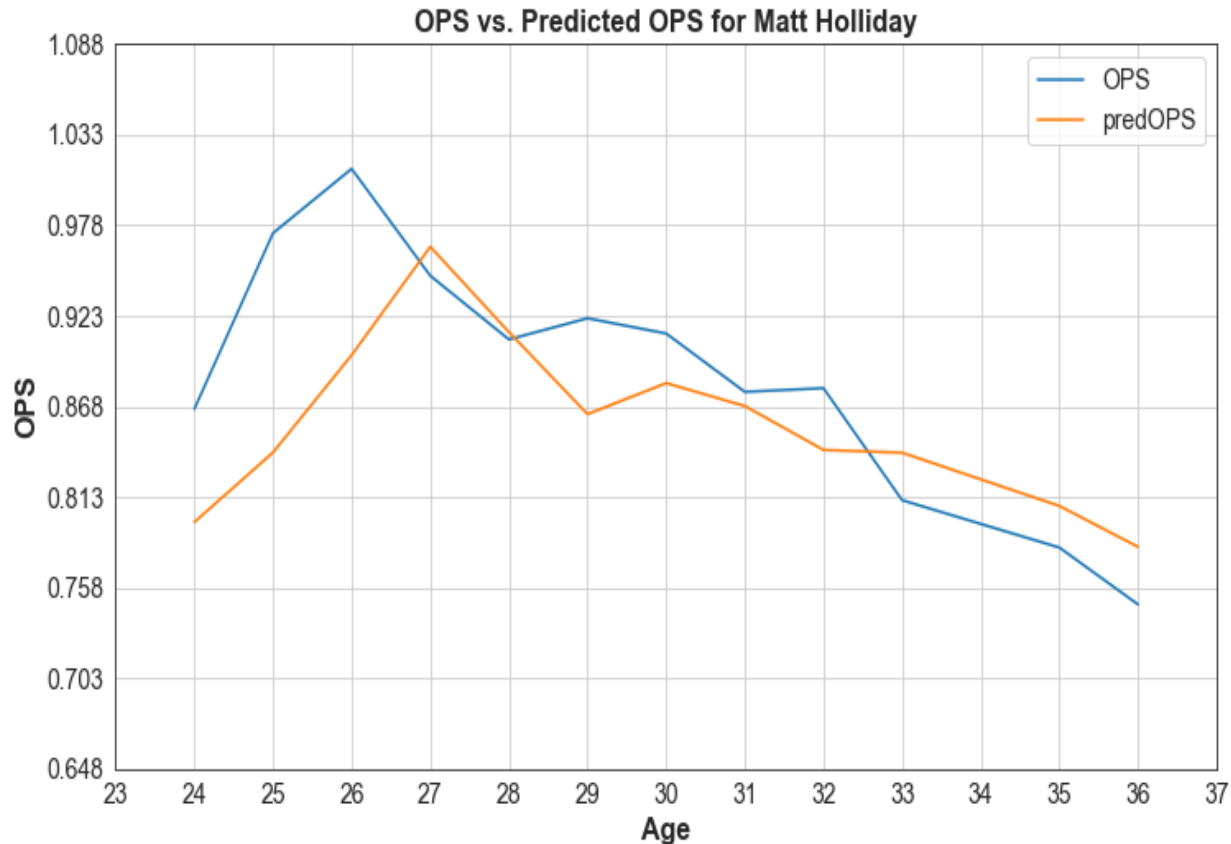
Some players can reasonably be predicted. Some are not.

OPS Predictive Results – Selected Players

Player Name: Paul Goldschmidt
Avg Actual OPS 0.947
Avg Predicted OPS 0.885
Pct Error 6.6



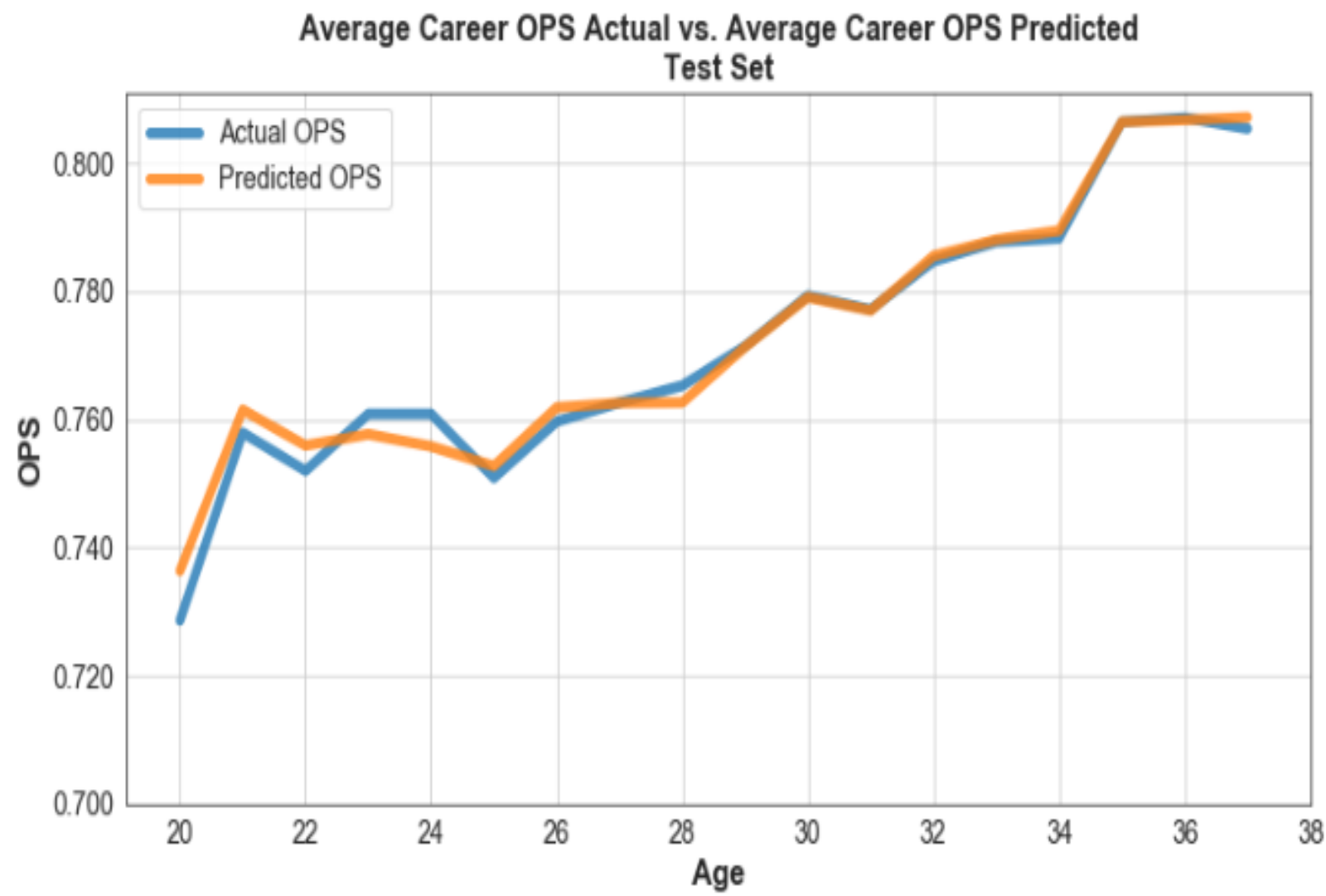
Player Name: Matt Holliday
Avg Actual OPS 0.887
Avg Predicted OPS 0.858
Pct Error 3.2



Some players can reasonably be predicted. Some are not.

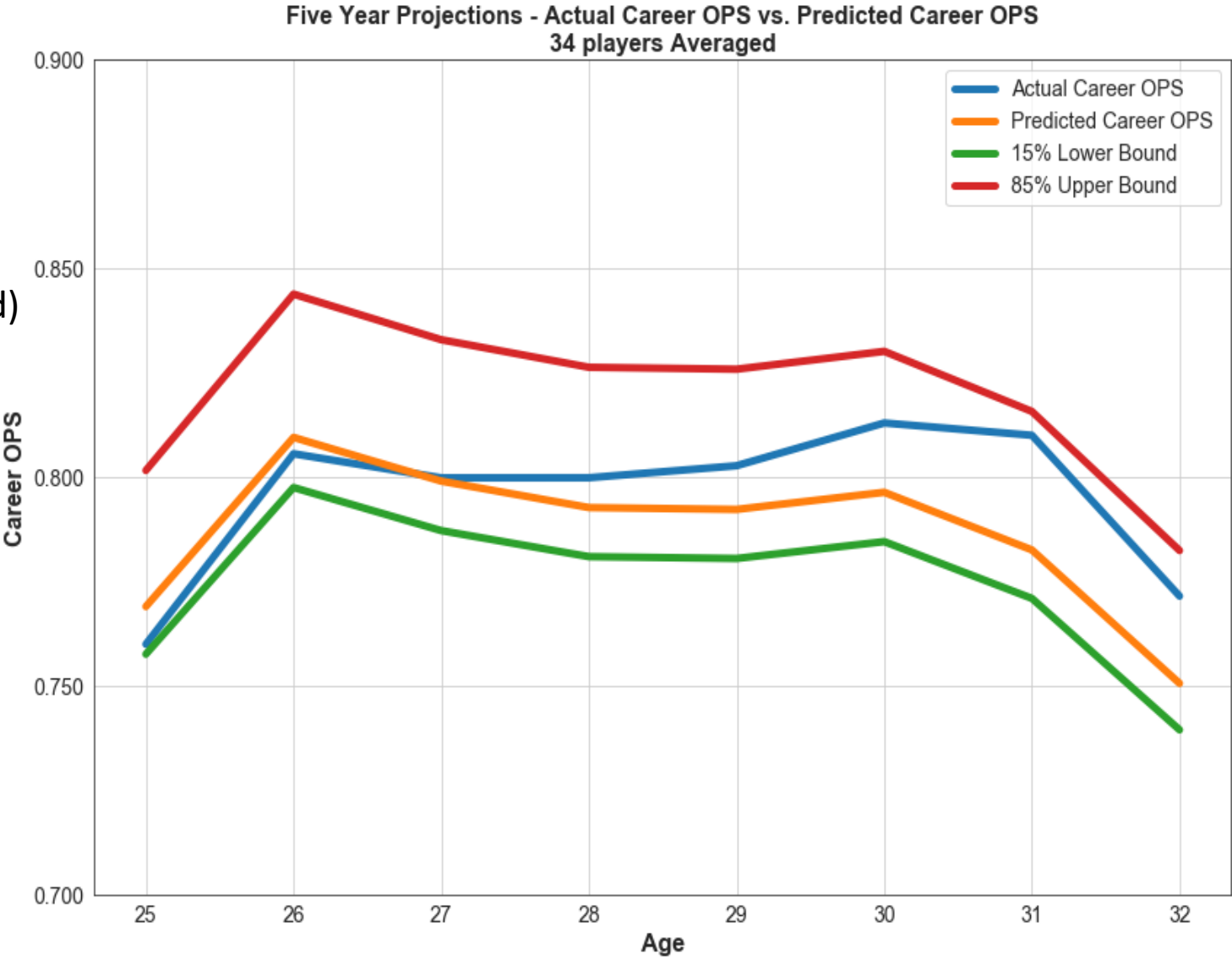
Career OPS Predictive Results - Charts

- One Year Predictions
- Averaged Over all Players
- Sample Required 300+ At Bats
- Low Variability
- Stable Model



Career OPS Five Year Predictive Results - Charts

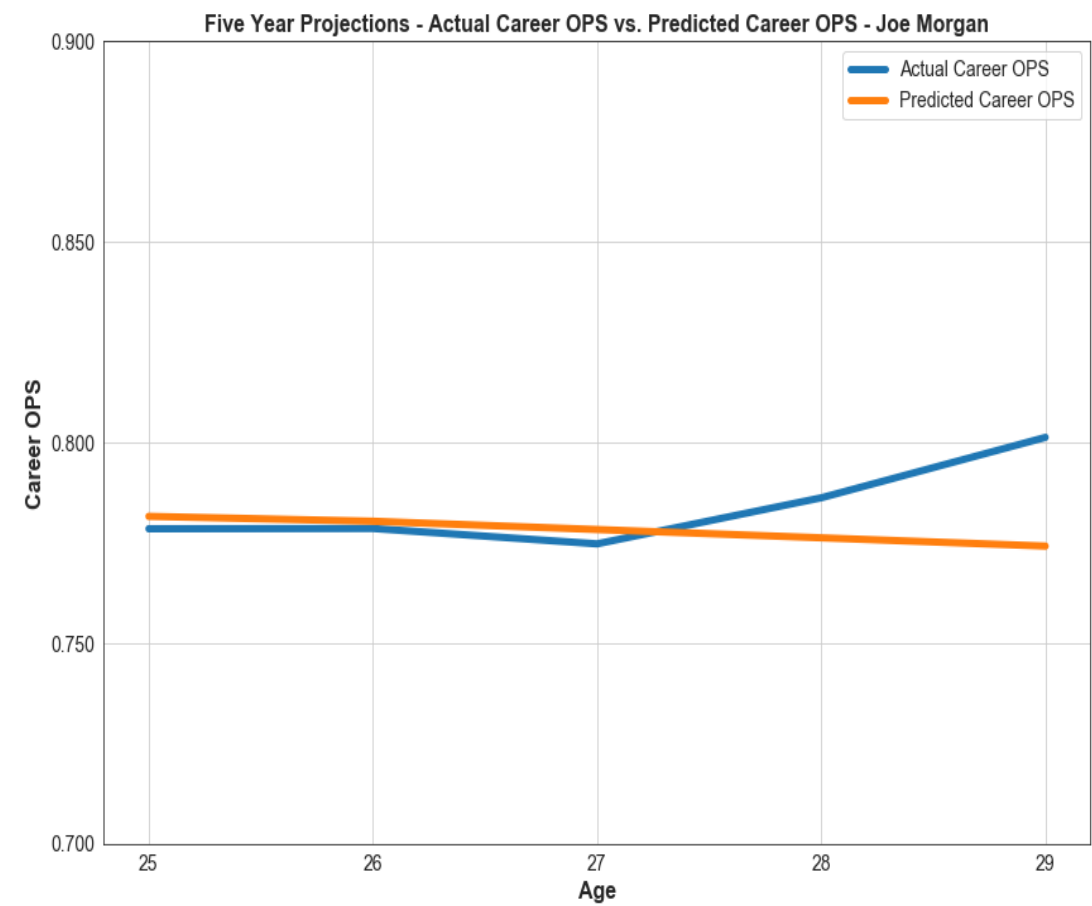
- Five Year Predictions
- Averaged Over 34 Players (randomly selected)
- Sample Required 300+ Yearly At Bats
- Prediction Capability
 - Good for 70% Certainty
 - Early Years Are More Accurate
- Works for Two Known Years of Performance



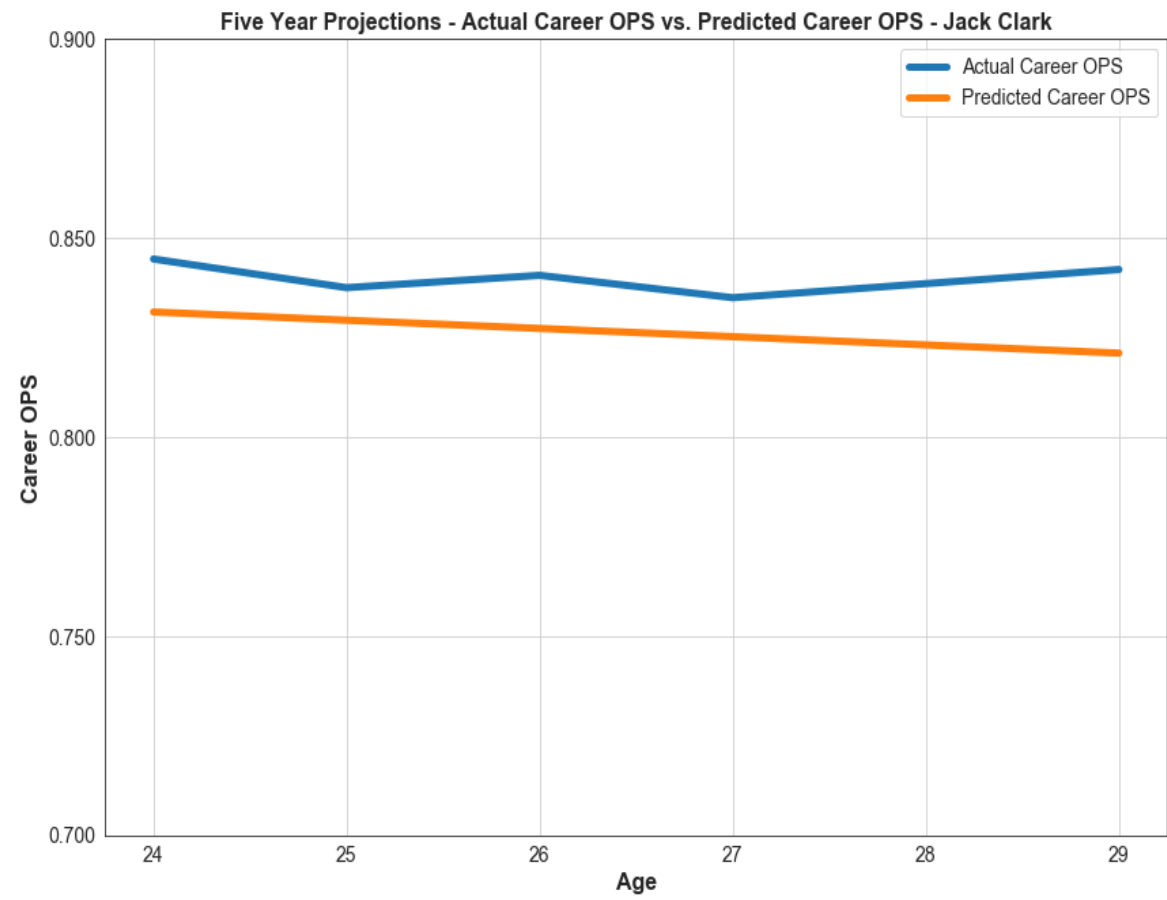
Career OPS Predictive Results – Selected Players

Five Year Projections – Two Known Years

Player Name: Joe Morgan
Avg Actual Career OPS 0.784
Avg Predicted Career OPS 0.778
Pct Error 0.8



Player Name: Jack Clark
Avg Actual Career OPS 0.840
Avg Predicted Career OPS 0.827
Pct Error 1.5

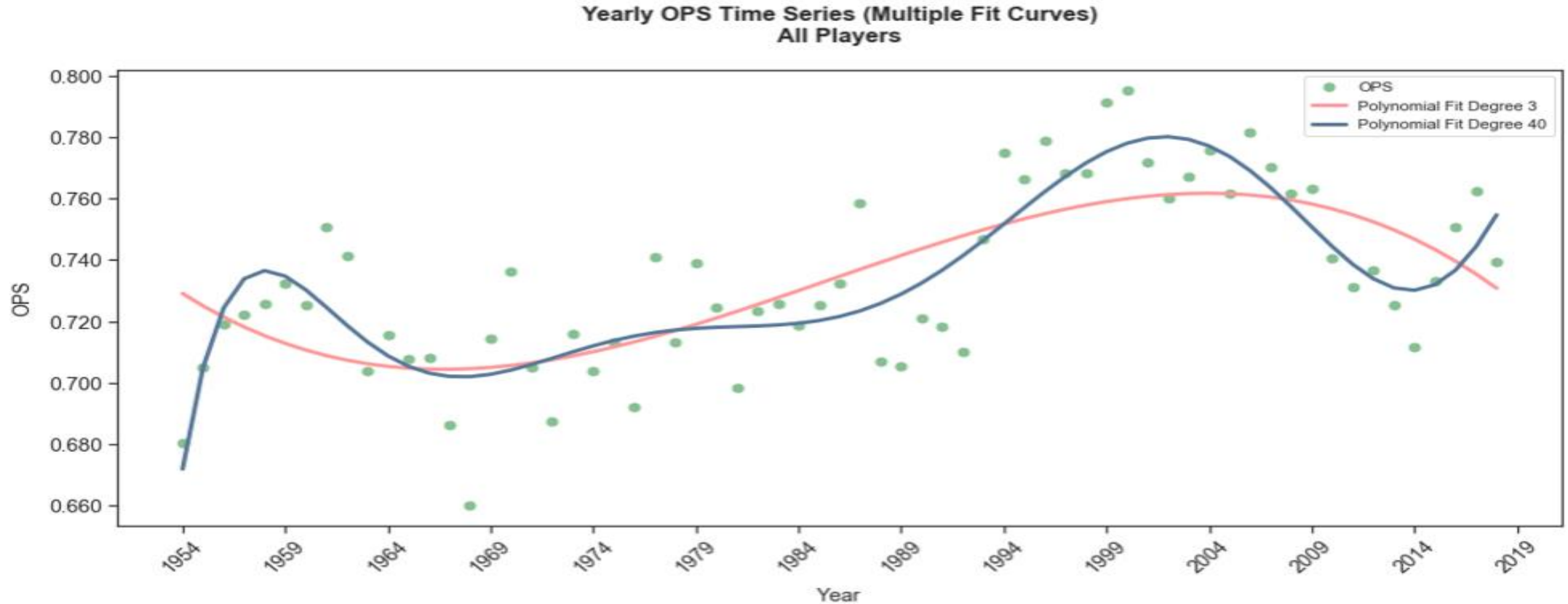


Note that the average five-year career OPS actual vs. predicted error is as good as one year for OPS.

Steroid Era in Baseball

- Steroid Era Timeframe
 - ESPN says Late 1980's to Mid 2000
 - Other Definitions 1994 to 2004
 - Steroid Testing Implemented in 2004
- Was There Benefit
 - Did Players Benefit From Steroids
 - Is There Clear Evidence

Steroid Era in Baseball



- Two Curves Charted (one properly fitted, one overfitted)
- Trend Shows OPS Performance Increase Starting in Late 1960's, Early 1970's
- Continues to Trend Upward Through Early 2000's
- Cannot Say Conclusively Steroid Era Benefited Players Compared to Other Timelines
- More Research Necessary

Thank You!