

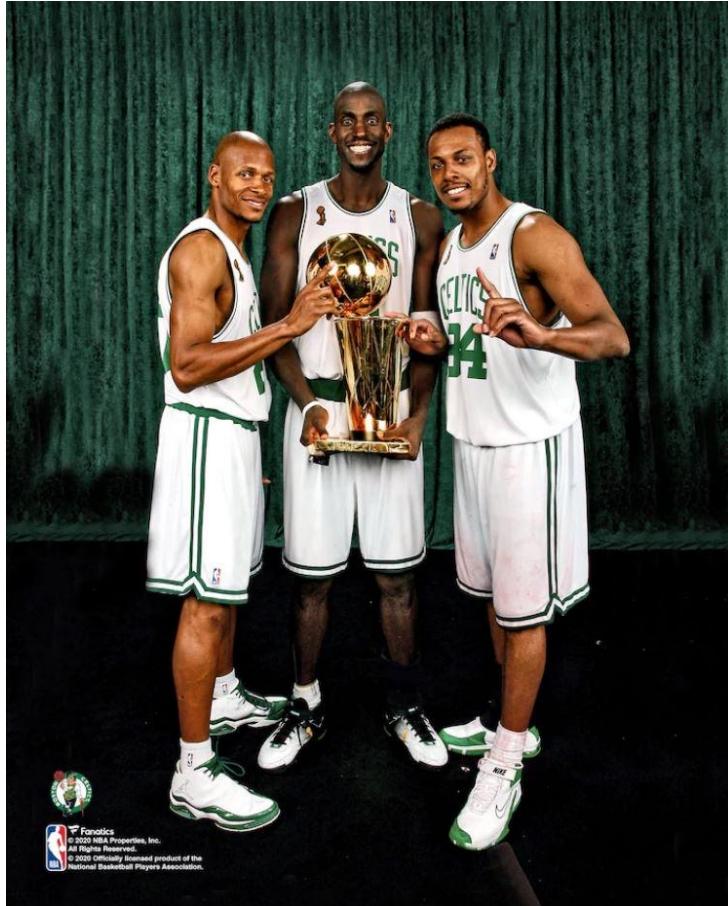
NBA Free Agent Salary Predictor



Metis Regression Module Presentation

Andrei Levin • 7/9/21

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Boston Celtics

From Wikipedia, the free encyclopedia

"Celtics" redirects here. For other uses, see [Celtic](#).

The **Boston Celtics** (/səltɪks/ *SEL-tiks*) are an American professional basketball team based in [Boston](#). The Celtics compete in the [National Basketball Association](#) (NBA) as a member of the league's [Eastern Conference Atlantic Division](#). Founded in 1946 as one of the league's original eight teams, the Celtics play their home games at [TD Garden](#), which they share with the [National Hockey League's Boston Bruins](#). The Celtics are regarded as one of the most successful basketball teams in NBA history; the franchise is tied with the [Los Angeles Lakers](#) for most NBA Championships won with 17 (accounting for 23.6 percent of all NBA championships since the league's founding) and currently holds the record for the most recorded wins of any NBA team.^{[10][11]} The Celtics are one of the two charter BAA franchises (the other is the [New York Knicks](#)) still playing in their original city.

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US NBA OCTOBER 11, 2020 / 10:23 PM / UPDATED 9 MONTHS AGO

Lakers beat Heat to win NBA championship

NETS 123, CELTICS 109

Celtics lose to Nets, bow out of playoffs, and enter an offseason filled with questions

By [Adam Himmelsbach](#) Globe Staff,
Updated June 1, 2021, 10:09 p.m.



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Danny Ainge Retires As Celtics' President Of Basketball Operations

June 2, 2021 at 9:31 am

Filed Under: [Adrian Wojnarowski](#), [Boston Celtics](#), [Danny Ainge](#), [nba](#), [Sports News](#)

Research Question

- Can we predict an NBA Free Agent's salary from his previous season stats and salary?

BASKETBALL REFERENCE

Enter Person, Team, Section, etc

Kevin Durant

Kevin Wayne Durant • Twitter: [KD'Trey5](#)

(Durantula, KD, Slim Reaper, Easy Money Sniper, The Sir Position: Small Forward, Power Forward, and Shooting 6-10, 240lb (208cm, 108kg)

Born: [September 29, 1988](#) (Age: 32-283d) in Washington

College: [Texas](#)

High School: Montrose Christian School in Rockville, M

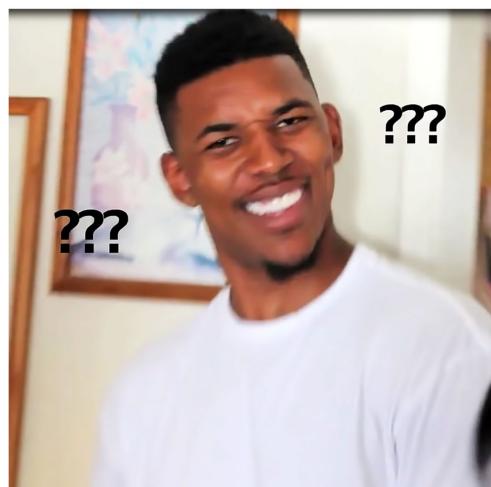
Recruiting Rank: [2006 \(2\)](#)

Draft: [Seattle SuperSonics](#), 1st round (2nd pick, 2nd ov

NBA Debut: [October 31, 2007](#)

Experience: 12 years

11x All Star 4x Scoring Champ 2x NBA Champs
 2007-08 All-Rookie 2x AS MVP 2x Finals
 2007-08 ROY



PAST SALARIES	
SEASON	TEAM
2019/20	Brooklyn Nets
2018/19	Golden State Warriors
2017/18	Golden State Warriors
2016/17	Golden State Warriors
2015/16	Oklahoma City Thunder
2014/15	Oklahoma City Thunder
2013/14	Oklahoma City Thunder
2012/13	Oklahoma City Thunder
2011/12	Oklahoma City Thunder
2010/11	Oklahoma City Thunder
2009/10	Oklahoma City Thunder
2008/09	Oklahoma City Thunder
2007/08	Oklahoma City Thunder
Total	\$232,042,892 (\$249,682,672*)

Per Game

Bold indicates league leader Share & Export ▾ Glossary

Regular Season Playoffs

Season	Age	Team	Lg	Pos	G	GS	MP	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	eFG%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS
2007-08	19	SEA	NBA	SG	80	80	34.6	7.3	17.1	.430	0.7	2.6	.288	6.6	14.5	.455	.451	4.9	5.6	.873	0.9	3.5	4.4	2.4	1.0	0.9	2.9	1.5	20.3
							39.0	8.9	18.8	.476	1.3	3.1	.422	7.6	15.7	.486	.510	6.1	7.1	.863	1.0	5.5	6.5	2.8	1.3	0.7	3.0	1.8	25.3
							39.5	9.7	20.3	.476	1.6	4.3	.365	8.1	16.1	.506	.514	9.2	10.2	.900	1.3	6.3	7.6	2.8	1.4	1.0	3.3	2.1	30.1
							38.9	9.1	19.7	.462	1.9	5.3	.350	7.3	14.4	.504	.509	7.6	8.7	.880	0.7	6.1	6.8	2.7	1.1	1.0	2.8	2.0	27.7
							38.6	9.7	19.7	.496	2.0	5.2	.387	7.7	14.4	.535	.547	6.5	7.6	.860	0.6	7.4	8.0	3.5	1.3	1.2	3.8	2.0	28.0
							38.5	9.0	17.7	.510	1.7	4.1	.416	7.3	13.6	.539	.554	8.4	9.3	.905	0.6	7.3	7.9	4.6	1.4	1.3	3.5	1.8	28.1
							38.5	10.5	20.8	.503	2.4	6.1	.391	8.1	14.8	.549	.560	8.7	9.9	.873	0.7	6.7	7.4	5.5	1.3	0.7	3.5	2.1	32.0
							33.8	8.8	17.3	.510	2.4	5.9	.403	6.4	11.4	.565	.578	5.4	6.3	.854	0.6	6.0	6.6	4.1	0.9	2.7	1.5	2.5	28.4
							35.8	9.7	19.2	.505	2.6	6.7	.387	7.1	12.5	.569	.573	6.2	6.9	.898	0.6	7.6	8.2	5.0	1.0	1.2	3.5	1.9	28.2
							33.4	8.9	16.5	.537	1.9	5.0	.375	7.0	11.5	.608	.594	5.4	6.2	.875	0.6	7.6	8.3	4.8	1.1	1.6	2.2	1.9	25.1
							34.2	9.3	18.0	.516	2.5	6.1	.419	6.7	11.9	.565	.586	5.3	5.9	.889	0.5	6.4	6.8	5.4	0.7	1.8	3.0	2.0	26.4
							34.6	9.2	17.7	.521	1.8	5.0	.353	7.5	12.8	.587	.571	5.7	6.5	.885	0.4	5.9	6.4	5.9	0.7	1.1	2.9	2.0	26.0
							33.1	9.3	17.2	.537	2.4	5.4	.450	6.8	11.8	.577	.608	6.0	6.8	.882	0.4	6.7	7.1	5.6	0.7	1.3	3.4	2.0	26.9
							36.7	9.2	18.6	.494	1.9	4.9	.384	7.3	13.7	.534	.545	6.7	7.6	.883	0.7	6.3	7.1	4.2	1.1	1.1	3.1	1.9	27.0

Share & Export ▾ Glossary

MP	PER	TS%	3PAr	FTr	ORB%	DRB%	TRB%	AST%	STL%	BLK%	TOV%	USG%	OWS	DWS	WS	WS/48	OBPM	DBPM	BPM	VORP	
2768	15.8	.519	.150	.328	2.8	10.9	6.9	12.0	1.4	1.9	12.9	28.1	0.4	1.9	2.3	.040	0.5	-0.7	-0.1	1.3	
2885	20.8	.577	.165	.377	3.0	16.4	9.6	13.5	1.7	1.4	12.2	28.3	5.2	2.7	7.9	.132	3.4	-0.1	3.3	3.8	
3239	26.2	.607	.210	.504	3.8	17.9	11.0	13.5	1.8	1.9	11.7	32.0	11.1	5.0	16.1	.238	6.3	0.8	7.1	7.5	
3038	23.6	.589	.269	.439	2.3	17.7	10.3	13.2	1.5	1.8	10.6	30.6	8.6	3.3	12.0	.189	5.2	-0.3	4.9	5.3	
2546	26.2	6.10	.265	.386	1.9	20.4	11.8	17.5	1.8	2.2	14.0	31.3	8.5	3.7	12.2	.230	6.2	0.8	7.0	5.8	
3119	28.3	.647	.233	.523	1.8	20.3	11.8	21.7	1.9	2.6	13.7	29.8	13.6	5.3	18.9	.291	7.6	1.7	9.3	8.9	
2013-14 ★ 25 OKC	NBA	SF	81	3122	29.8	.635	.291	.477	2.2	18.6	10.8	26.7	1.7	1.5	12.2	33.0	14.8	4.4	19.2	.295	
2014-15 ★ 26 OKC	NBA	SF	27	913	27.6	.633	.340	.366	1.9	18.7	10.4	22.2	1.3	2.2	12.0	29.1	3.8	1.0	4.8	.252	
2015-16 ★ 27 OKC	NBA	SF	72	2578	28.2	.634	.348	.361	2.0	21.8	12.4	24.2	1.3	2.5	13.5	30.6	11.0	3.5	14.5	.270	
2016-17 ★ 28 GSW	NBA	PF	62	2070	27.6	.651	.304	.374	2.2	23.6	13.6	21.1	1.5	3.8	10.4	27.8	8.0	4.0	12.0	.278	
2017-18 ★ 29 GSW	NBA	SF	68	2325	26.0	.640	.338	.331	1.6	19.5	11.2	25.5	1.0	4.0	12.9	30.4	7.5	2.9	10.4	.215	
2018-19 ★ 30 GSW	NBA	SF	78	2702	24.2	.631	.281	.366	1.4	17.5	9.8	26.2	1.0	2.6	12.3	29.0	8.6	2.9	11.5	.204	
2020-21 ★ 32 BRK	NBA	PF	35	1157	26.4	.666	.313	.395	1.3	21.3	11.8	27.5	1.0	3.4	14.5	31.2	3.7	1.2	5.0	.206	
Career	NBA			884	32462	25.2	.615	.262	.410	2.3	18.6	10.8	19.8	1.5	2.3	12.5	30.2	104.7	42.0	146.7	.217

S

Scraping Workflow

Prev Year
Salary
(Feature)

2019 Free Agent Tracker

287 Free Agents Share & Export ▾ Glossary

Rk	Player	Pos	Age	Type	OTm	2018-19 Stats	WS	NTm	Terms	Notes
1	Kevin Durant	F-G	32-283	UFA	GSW	26.0 Pts, 6.4 Reb, 5.9 Ast	11.5	BRK	Signed 4-yr \$164.25M contract with GSW as part of sign-and-trade	
2	Nikola Vučević	C	30-258	UFA	ORL	20.8 Pts, 12.0 Reb, 3.8 Ast	10.1	ORL	Signed 4-yr \$100M contract	
3	Kawhi Leonard	F	30-010	UFA	TOR	26.6 Pts, 7.3 Reb, 3.3 Ast	9.5	LAC	Signed 3-yr \$103.13M contract	
4	Kyrie Irving	G	29-108	UFA	BOS	23.8 Pts, 5.0 Reb, 6.9 Ast	9.1	BRK	Signed 4-yr \$136.49M contract	
5	Jimmy Butler	F-G	31-298	UFA	PHI	18.7 Pts, 5.3 Reb, 4.0 Ast	7.9	MIA	Signed 4-yr \$140.79M contract with PHI as part of sign-and-trade	
6	Al Horford	C-F	35-036	UFA	BOS	13.6 Pts, 6.7 Reb, 4.2 Ast	7.5	PHI	Signed 4-yr \$109M contract	
7	Kemba Walker	G	31-062	UFA	CHO	25.6 Pts, 4.4 Reb, 5.9 Ast	7.4	BOS	Signed 4-yr \$140.79M contract with CHO as part of sign-and-trade	

Next Year
Salary
(Target)

Prev Year Stats (Features)

2018/19 NBA Player Salaries

GO IN-DEPTH

- Salaries of players right now
- Salaries of players back in the day
- Ranking agents by wages
- Upcoming free agents
- All NBA awards in history
- NBA 2K ratings
- Re-ordering draft classes
- TV ratings
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PLAYER SALARIES

2018/19

PLAYER	2018/19	2018/19(*)
1. Stephen Curry	\$37,457,154	\$38,320,489
2. Russell Westbrook	\$35,666,000	\$36,487,029
3. LeBron James	\$35,654,150	\$36,475,929
4. Chris Paul	\$35,654,150	\$36,475,929

Enter Person, Team, Section, etc

Kevin Durant

Kevin Wayne Durant • Twitter: [KD Trey5](#)

(Durantula, KD, Slim Reaper, Easy Money Sniper, The Servant, Green Room)
Position: Small Forward, Power Forward, and Shooting Guard • Shoots: Right
6-10, 240lb (208cm, 108kg)

Born: September 29, 1988 (Age: 32-283d) in Washington, District of Columbia

College: [Texas](#)

High School: Montrose Christian School in Rockville, Maryland

Recruiting Rank: [2006](#) (2)

Draft: [Seattle SuperSonics](#), 1st round (2nd pick, 2nd overall), [2007 NBA Draft](#)

NBA Debut: [October 31, 2007](#)

Experience: 12 years

2019/20 NBA Player Salaries

GO IN-DEPTH

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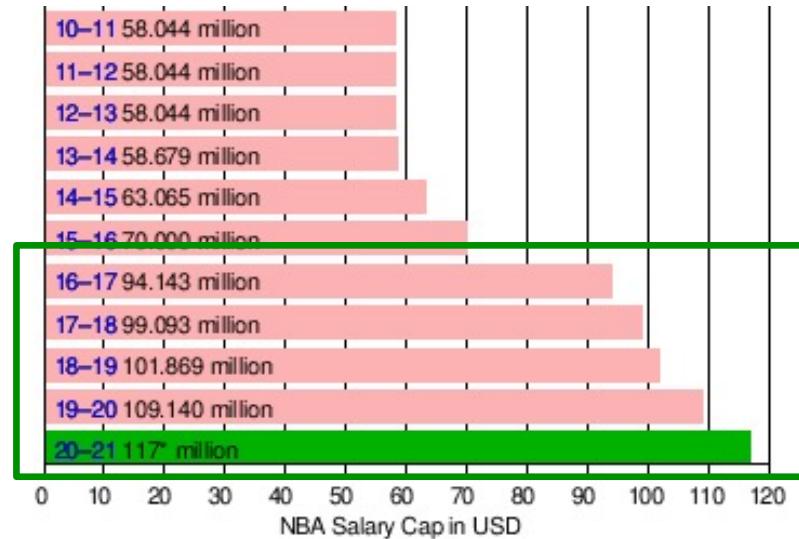
PLAYER SALARIES

2019/20

PLAYER	2019/20	2019/20(*)
1. Stephen Curry	\$40,231,758	\$40,491,547
2. Chris Paul	\$38,506,482	\$38,755,131
2. Russell Westbrook	\$38,506,482	\$38,755,131
4. John Wall	\$38,199,000	\$38,445,683

Data Cleaning

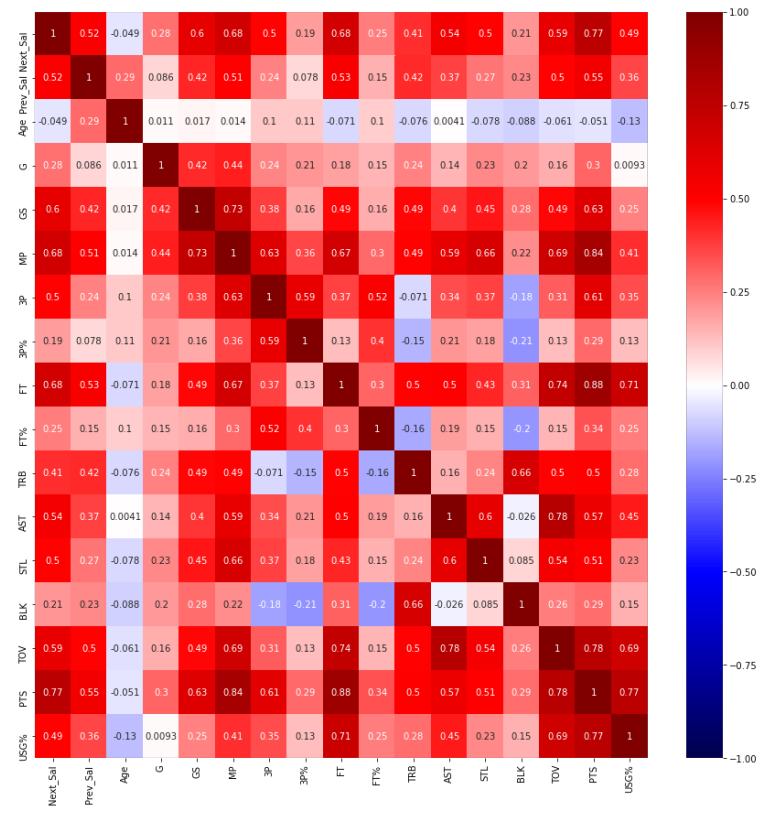
- Removed players who didn't play previous year or next year
 - Normalized salaries to 2020 salary cap
 - Free agent years: 2017, 2018, 2019, 2020



- Final Table: 381 rows, ~30 features

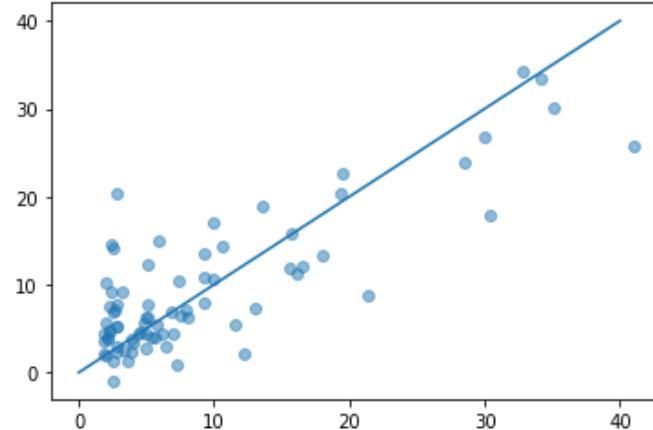
Feature Engineering

- Looked at **correlation matrix**, **p-values** , and **pair plots** for inspiration
- Removed several unimportant features
- Added polynomial terms:
 - (Minutes per game)²
 - (Points per game)²
 - (3-point %age)*
(3-pointers per game)
- Added ratio terms:
 - Games Started/Played
 - Turnovers/Assists
- High multicollinearity present
(based on condition number)



Cross-Validated OLS vs LASSO

OLS Predicted vs Actual Salary(\$M), Test Set



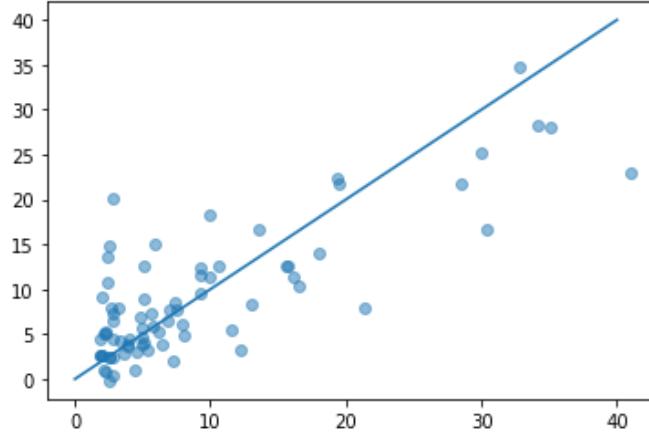
OLS R2 Train 0.736610775968946

OLS R2 Test 0.6648322578341601

OLS MAE Test 3.710527757807454 (\$M)

OLS RMSE Test 5.2519191522377735 (\$M)

LASSO Predicted vs Actual Salary(\$M), Test Set



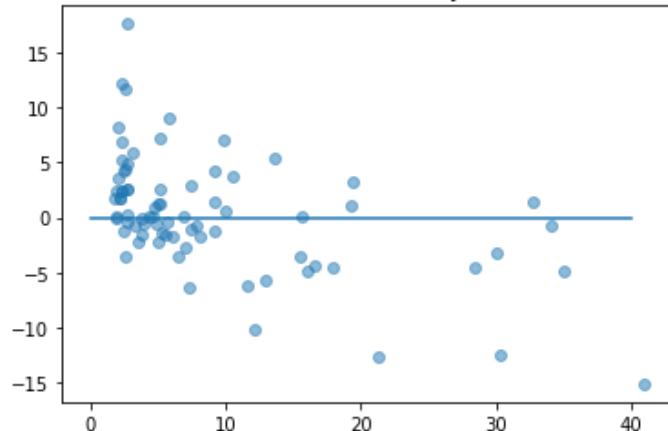
LASSO R2 Train 0.7064959438335627

LASSO R2 Test 0.6405916368164155

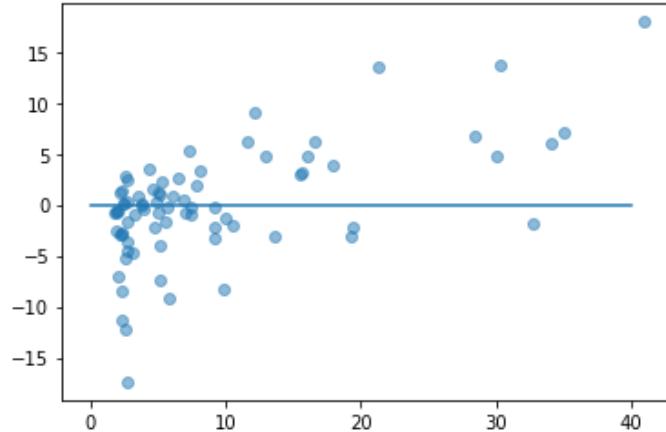
LASSO MAE Test 3.7738943842347004 (\$M)

LASSO RMSE Test 5.438523561429468 (\$M)

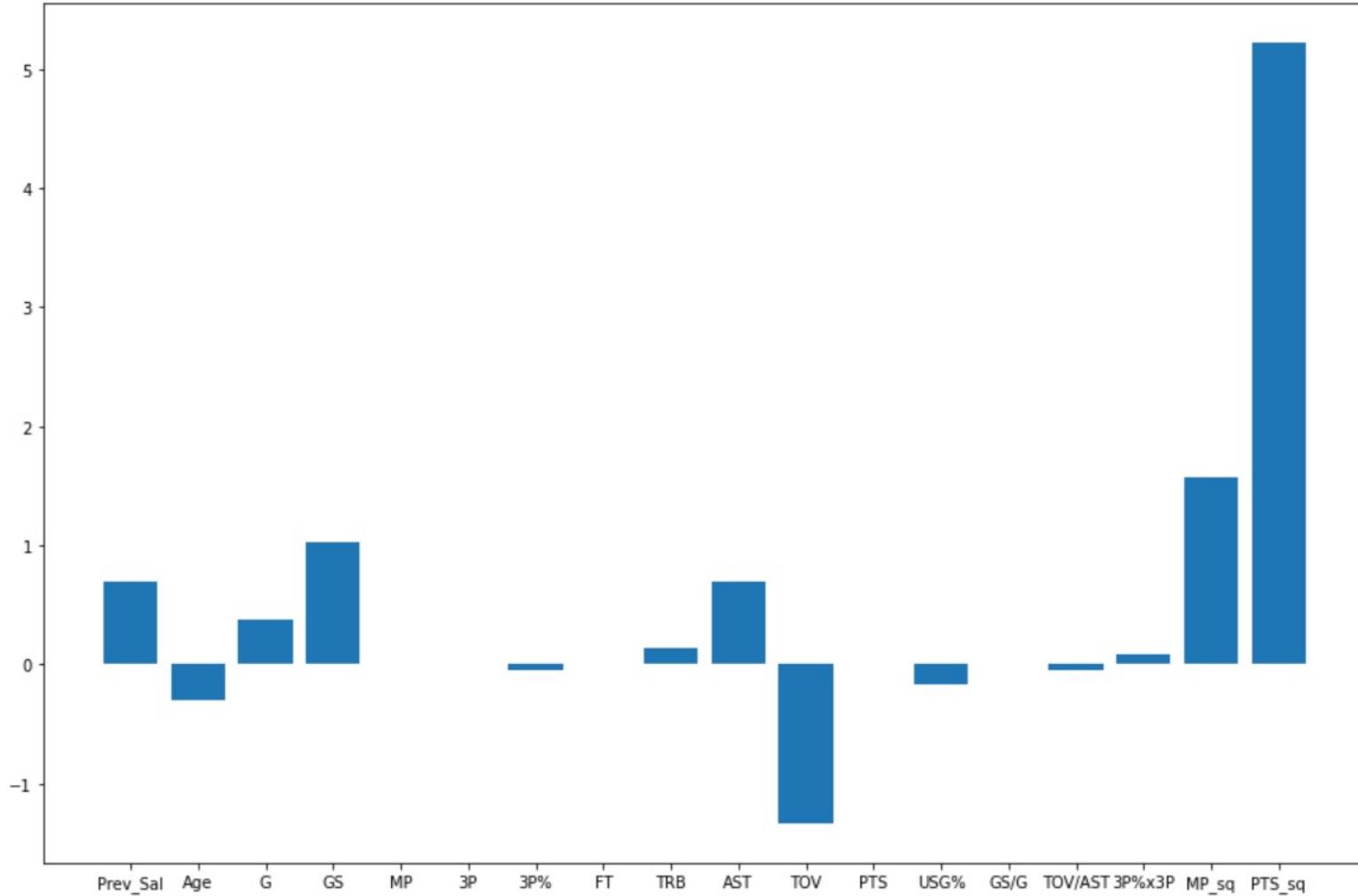
OLS Residuals vs Actual Salary(\$M), Test Set



LASSO Residuals vs Actual Salary(\$M), Test Set



LASSO Coefficients



Musings



Potential Pitfalls

- Lack of injury history info
- Lack of multi-year history info
- Lack of playoff stats
- Max and min salary rules

Further Study

- Add “Position” category, study interaction with height, 3p%, etc.
- Age vs. experience; Draft pick status
- Is “betting on yourself” a good strategy?



LASSO Takeaway

