Winning the Draft:

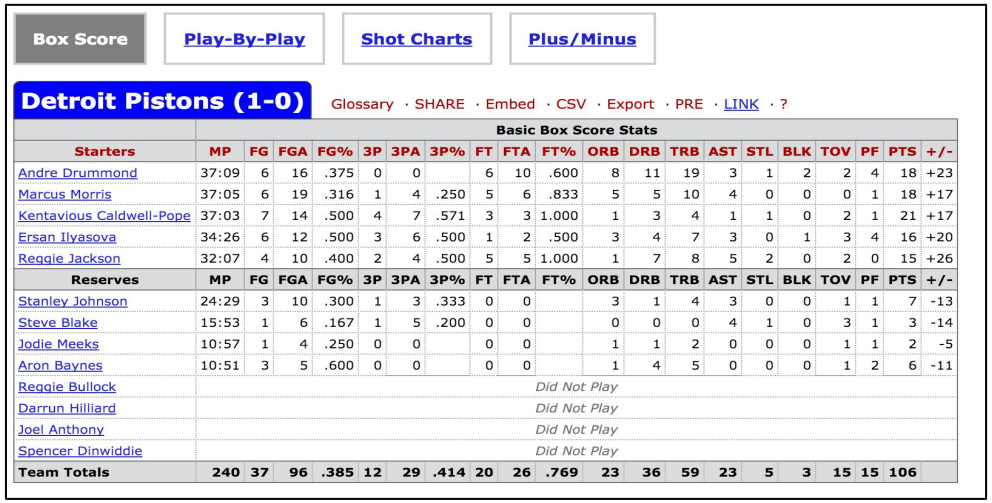
Maximizing Value in Daily Fantasy Sports

By Christopher Barry, Nicholas Canova and Kevin Capiz

Introduction to DFS

- Traditional fantasy sports leagues have been largely slow-paced due to the lack of flexibility of changing players during a season
- Daily Fantasy Sports have boomed in popularity, with DraftKings and FanDuel leading the way
- No draft for player selection -- players pick any team they want so long as it stays within the salary cap
- High frequency player trading -- players can create a new team daily allowing for statistical optimization in gameplay

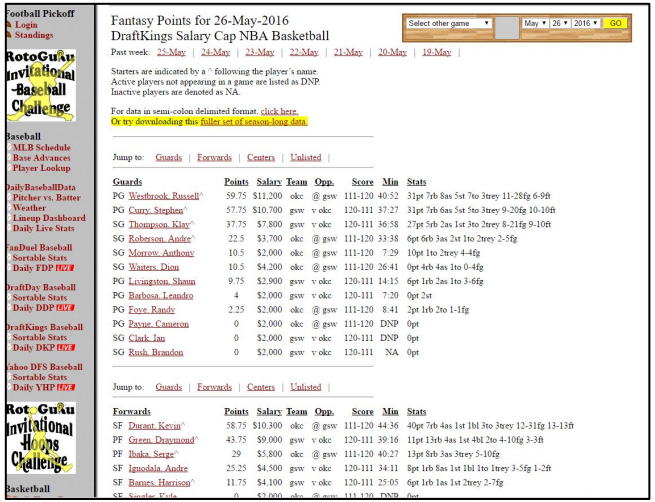
Our Data



Box Score | Play-By-Play | Shot Charts | Plus/Minus

Detroit Pistons (1-0) Glossary · SHARE · Embed · CSV · Export · PRE · LINK · ?

	Basic Box Score Stats																		
Starters	**MP**	**FG**	**FGA**	**FG%**	**3P**	**3PA**	**3P%**	**FT**	**FTA**	**FT%**	**ORB**	**DRB**	**TRB**	**AST**	**STL**	**BLK**	**TOV**	**PF**	**PTS**	**+/-**
Andre Drummond	37:09	6	16	.375	0	0		6	10	.600	8	11	19	3	1	2	2	4	18	+23
Marcus Morris	37:05	6	19	.316	1	4	.250	5	6	.833	5	5	10	4	0	0	0	1	18	+17
Kentavious Caldwell-Pope	37:03	7	14	.500	4	7	.571	3	3	1.000	1	3	4	1	1	0	2	1	21	+17
Ersan Ilyasova	34:26	6	12	.500	3	6	.500	1	2	.500	3	4	7	3	0	1	3	4	16	+20
Reggie Jackson	32:07	4	10	.400	2	4	.500	5	5	1.000	1	7	8	5	2	0	2	0	15	+26
Reserves	**MP**	**FG**	**FGA**	**FG%**	**3P**	**3PA**	**3P%**	**FT**	**FTA**	**FT%**	**ORB**	**DRB**	**TRB**	**AST**	**STL**	**BLK**	**TOV**	**PF**	**PTS**	**+/-**
Stanley Johnson	24:29	3	10	.300	1	3	.333	0	0		3	1	4	3	0	0	1	1	7	-13
Steve Blake	15:53	1	6	.167	1	5	.200	0	0		0	0	0	4	1	0	3	1	3	-14
Jodie Meeks	10:57	1	4	.250	0	0		0	0		1	1	2	0	0	0	1	1	2	-5
Aron Baynes	10:51	3	5	.600	0	0		0	0		1	4	5	0	0	0	1	2	6	-11
Reggie Bullock	*Did Not Play*																			
Darrun Hilliard	*Did Not Play*																			
Joel Anthony	*Did Not Play*																			
Spencer Dinwiddie	*Did Not Play*																			
Team Totals	**240**	**37**	**96**	**.385**	**12**	**29**	**.414**	**20**	**26**	**.769**	**23**	**36**	**59**	**23**	**5**	**3**	**15**	**15**	**106**	



Fantasy Points for 26-May-2016
DraftKings Salary Cap NBA Basketball

Past week: 25-May | 24-May | 23-May | 22-May | 21-May | 20-May | 19-May

Starters are indicated by a ^ following the player's name.
Active players not appearing in a game are listed as DNP.
Inactive players are denoted as NA.

For data in semi-colon delimited format, click here.
Or try downloading this fuller set of season-long data.

Jump to: Guards | Forwards | Centers | Unlisted

Guards	Points	Salary	Team	Opp.	Score	Min	Stats
PG Westbrook, Russell^	59.75	$11,200	okc	@ gsw	111-120	40:52	31pt 7rb 8as 5st 7to 3trey 11-28fg 6-9ft
PG Curry, Stephen^	57.75	$10,700	gsw	v okc	120-111	37:27	31pt 7rb 6as 5st 5to 3trey 9-20fg 10-10ft
SG Thompson, Klay^	37.75	$7,800	gsw	v okc	120-111	36:58	27pt 5rb 2as 1st 3to 2trey 8-21fg 9-10ft
SG Roberson, Andre^	22.5	$3,700	okc	@ gsw	111-120	33:38	6pt 6rb 3as 2st 1to 2trey 2-5fg
SG Morrow, Anthony	10.5	$2,000	okc	@ gsw	111-120	7:29	10pt 1to 2trey 4-4fg
SG Waiters, Dion	10.5	$4,200	okc	@ gsw	111-120	26:41	0pt 4rb 4as 1to 0-4fg
PG Livingston, Shaun	9.75	$2,900	gsw	v okc	120-111	14:15	6pt 1rb 2as 1to 3-6fg
PG Barbosa, Leandro	4	$2,000	gsw	v okc	120-111	7:20	0pt 2st
PG Foye, Randy	2.25	$2,000	okc	@ gsw	111-120	8:41	2pt 1rb 2to 1-1fg
PG Payne, Cameron	0	$2,000	okc	@ gsw	111-120	DNP	0pt
SG Clark, Ian	0	$2,000	gsw	v okc	120-111	DNP	0pt
SG Rush, Brandon	0	$2,000	gsw	v okc	120-111	NA	0pt

Jump to: Guards | Forwards | Centers | Unlisted

Forwards	Points	Salary	Team	Opp.	Score	Min	Stats
SF Durant, Kevin^	58.75	$10,300	okc	@ gsw	111-120	44:36	40pt 7rb 4as 1st 1bl 3to 3trey 12-31fg 13-13ft
PF Green, Draymond^	43.75	$9,000	gsw	v okc	120-111	39:16	11pt 13rb 4as 1st 4bl 2to 4-10fg 3-5ft
PF Ibaka, Serge^	29	$5,800	okc	@ gsw	111-120	40:27	13pt 8rb 3as 3trey 5-10fg
SF Iguodala, Andre	25.25	$4,500	gsw	v okc	120-111	34:11	8pt 1rb 8as 1st 1bl 1to 1trey 3-5fg 1-2ft
SF Barnes, Harrison^	11.75	$4,100	gsw	v okc	120-111	25:05	6pt 1rb 1as 1st 2trey 2-7fg

- Utilized box score data from the 2015-2016 season from basketball-reference.com
- Scraped historical DraftKings Salary data from rotoguru.net
- Created an index of every player's stats and player values for each day of the season

Our Objective

- Analyze NBA players to construct our own fantasy basketball projections
- Compare our projections vs. those of DraftKings
- Identify overvalued or undervalued players
- Create our projections using ridge-regression techniques that improve upon the estimates for player performance implied by DraftKing's salaries
- Gain an advantage against other DFS players

ROTOGRINDERS OVERALL RANKING

	Player	Points
1	saahilsud	2,754,024
2	BirdWings	1,129,835
3	ehafner	837,475
4	youdacao	835,367
5	csuram88	710,527

Basic Estimate

Variables: Standard DraftKings Set

- Point = +1 point = PT
- Made 3pt. Shot = +0.5 points = 3PT
- Rebound = +1.25 points = RB
- Assist = +1.5 points = AST
- Steal = Block = +2 points = STL, BLK
- Turnover = -0.5 points = TO
- Double-double = +1.5 points (max 1 per player) = DD
- Triple-double = +3 points (max 1 per player) = TD

$$\widehat{F_N} = \frac{1}{(N-1)} \sum_{i=1}^{N-1} PT_i * 1 + \frac{1}{(N-1)} \sum_{i=1}^{N-1} 3PT_i * 0.5 + \ldots + \frac{1}{(N-1)} \sum_{i=1}^{N-1} TD_i * 3$$

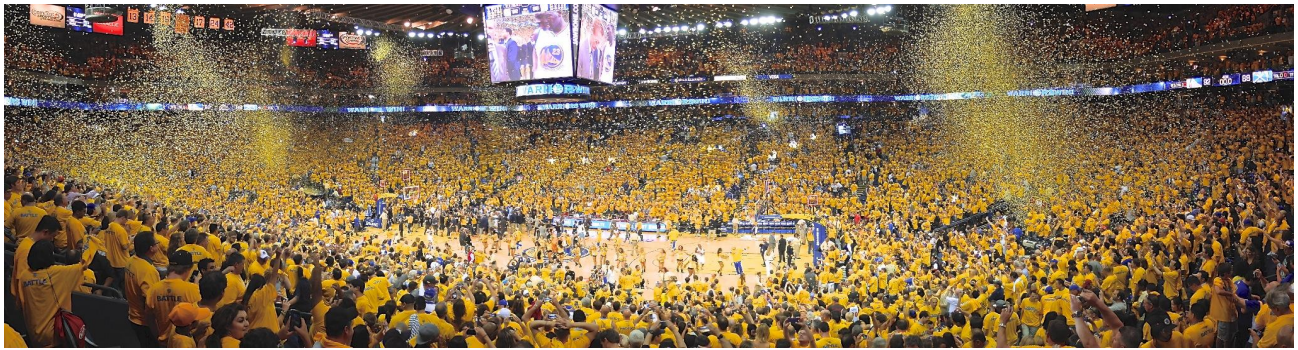
Errors

- Expecting performance throughout the season to remain constant
- Not accounting for home-court advantage
- Mean absolute error: **7.414**, RMS error: **9.585**

Additional Variables

Other Variables We Consider to Be Valuable for this Model:

- The opposing team's defensive statistics
- The opponent's opposing players (by position) defensive statistics
- The number of rest days since the team's previous games
- A player's recent performance
- Whether the player's team has home court advantage



First Evolution: Regression for Improved Coefficients

Variables

- Using same 8 variables from basic estimate -- modifying with ridge regression for improved coefficients over DraftKings' variables

$$\widehat{F_N} = Intercept + \frac{1}{(N-1)} \sum^{N-1} PT_i * \beta_1 + \frac{1}{(N-1)} \sum^{N-1} 3PT_i * \beta_2 + \ldots + \frac{1}{(N-1)} \sum^{N-1} TD_i * \beta_p$$

Variable	Ridge Coefficients
(Intercept)	2.117
PTS	0.833
3PT	0.837
TRB	0.886
AST	1.143
STL	2.506
BLK	2.396
TOV	0.443
DBDB	6.126
TBDB	10.316

Errors

- Similarly, not accounting for other additional factors
- Mean absolute error = 7.045; RMS error = 9.034

Second Evolution: Fatigue, Streaks, and Fans

Variables

- Days of rest
- Weighting recent games
- Home court advantage

Errors

- Rest due to injury or illness
  - Indicator variable for injuries?
- Valuing momentum correctly by player
- Uniformity of home court
- Mean absolute error = 6.61; RMS error = 8.56

Variable	Ridge Coefficients
(Intercept)	1.385
PTS	0.847
3PT	1.046
TRB	0.977
AST	1.224
STL	2.653
BLK	2.390
TOV	0.057
DBDB	6.422
TBDB	7.081
HOME	0.431
REST	-0.064

Game Num	Weight	Weight
1	1/55	1.8%
2	2/55	3.6%
3	3/55	5.5%
4	4/55	7.3%
5	5/55	9.1%
6	6/55	10.9%
7	7/55	12.7%
8	8/55	14.5%
9	9/55	16.4%
10	10/55	18.2%
		100.0%

A player's Xth game is always weighted X times greater than his first game

Third Evolution: Impact of Opponents

Variables

- Opponent's overall defense
- Opponent's defense against a specific position

Errors

- Not taking team playing styles into account
- Are all point guards created equal?
- Resting starters against bad teams
- The effect of mid-season acquisitions
- Mean absolute error = 6.60; RMS error = 8.54

Variable	Ridge Coefficients
(Intercept)	-6.798
PTS	0.846
3PT	1.053
TRB	0.981
AST	1.214
STL	2.633
BLK	2.384
TOV	0.080
DBDB	6.401
TBDB	6.978
HOME	0.425
FAT	0.037
FAP	0.007
REST	-0.066
MP_PM	0.014

Ricky Rubio (above) and Reggie Jackson (below) have very different play styles

Additional Results

Player	Average
Jordan Hamilton	6.322
Briante Weber	6.135
Michael Kidd-Gilchrist	5.841
Zaza Pachulia	5.404
T.J. McConnell	5.386
Jordan Farmar	5.377
Michael Beasley	5.353
Jerryd Bayless	5.345
Rajon Rondo	5.275
Andre Drummond	5.267
Manu Ginobili	5.249
Mason Plumlee	5.224
Pau Gasol	5.216
Marcus Smart	5.216
Draymond Green	5.216
Kyle Lowry	5.205
Dwight Howard	5.196
Will Barton	5.176
Brook Lopez	5.166
Eric Bledsoe	5.153
Greg Monroe	5.147
C.J. Miles	5.137
Matthew Dellavedova	5.137
Russell Westbrook	5.123
Paul Millsap	5.120

Most efficient players (Expected Fantasy Points / $1,000 of salary)

We were able to identify “efficient players” (season average)

Michael Kidd-Gilchrist (top left), Rajon Rondo (right), and Pau Gasol (bottom left) were among the most “efficient” performers

Going Forward

Player Rest

- Athletes who don't play have no impact on our model
- Coming off the bench for a game could make a difference
- Starters / Reserves
- Weighting specific match-ups
- Creating a "Starter's Coefficient"
- Injury Data
- Indicating a player is at full strength

"Streakiness" Coefficients

- Changing the weighting of recent games

The Denver Nuggets' injury prone Danilo Gallinari has historically bounced back slowly after time off

Conclusion

Were we successful in improving DraftKings' model?

- Yes, marginally
- Reduced mean absolute error from 7.41 to 6.56
- Greatest improvement came from including rest and home court advantage, and weighting recent games
- Unexpectedly, accounting for opponent's defense made little improvement