Sports and statistics

Lecture 7: Statistics in basketball

Goals

i) Overview of basketball stats
ii) Possession based metrics

Tools

i) Bivariate tools: scatter plots, *r*
ii) Efficiency & rate statistics
iii) Heat maps
iv) Logistic regression

Overview

1 – Possession based metrics

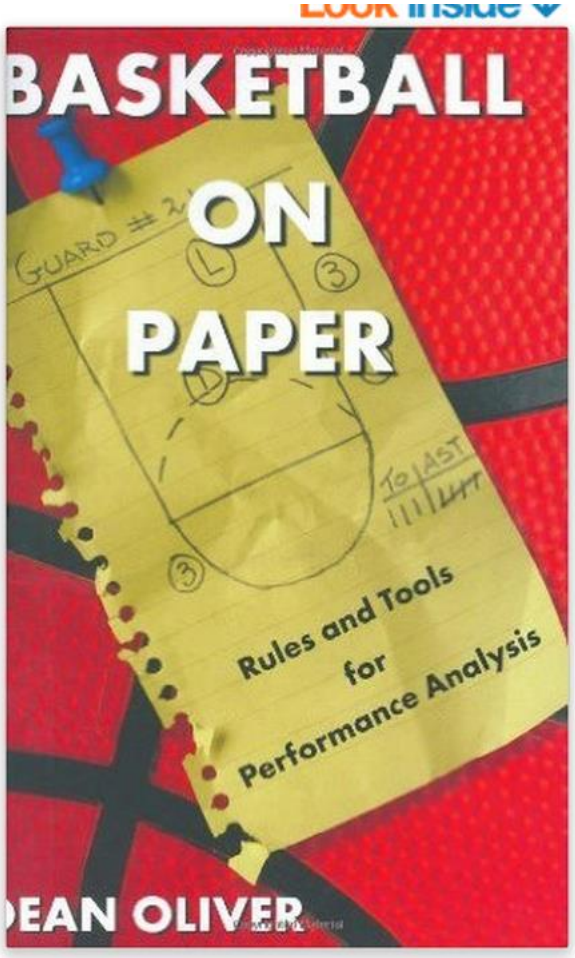
-What's wrong with counting stats?

2 – Shifts in strategy

-Increased use of 3-pointer

3 – Next steps

Overview & (a few) names to know



- Dean Oliver
- Wayne Winston
- John Hollinger
- Roland Beech

Possession Based Metrics

"A starting point for analyzing basketball statistics"

-Kubatko, Oliver, Pelton, Rosenbaum

-How to define a possession? For game *i,*

$Poss_i = FGA_i + 0.44*FTA_i - OREB_i + TO_i$

-More complicated formulas exist: above example shows correlation coefficient of 0.97 with actual possessions

-Average # in a game?

Why possessions

1 – Team-level talent adjustments

-Which is better? A 10-point win in a 100 or 150 possession game?

2 – Player level adjustments

-Easier to score 30 points in a 100 or 150 possession game?

3 – Rates > Counting metrics

-Examples in other sports

Offensive/Defensive ratings

$$(5)\ \textit{Offensive Rating}\ (ORtg_t) = PTS_t/POSS_t \times 100$$
$$(6)\ \textit{Defensive Rating}\ (DRtg_t) = PTS_o/POSS_o \times 100$$

-Reflect both efficiency and pace

2015-2016 Hollinger Team Statistics

Season: 2015-2016 Regular Season

Hollinger Stats - Offensive Efficiency

RK	TEAM	PACE	AST	TO	ORR	DRR	REBR	EFF FG%	TS%	OFF EFF	DEF EFF
1	Golden State	102.4	20.5	13.6	24.0	76.0	51.4	55.9	59.0	**112.1**	100.4
2	Oklahoma City	99.5	16.7	13.9	30.5	75.8	54.3	52.2	56.4	**109.6**	102.9
3	San Antonio	96.4	19.2	12.7	23.0	79.8	52.6	53.2	56.8	**108.7**	95.5
4	Cleveland	95.4	17.3	12.7	25.3	78.6	52.1	51.8	55.2	**107.1**	101.2
	Toronto	95.4	14.9	12.5	24.4	77.6	51.4	50.4	55.4	**107.1**	102.9
6	LA Clippers	98.5	17.3	12.1	20.7	74.9	48.0	52.0	55.3	**106.2**	100.3
7	Portland	97.7	16.1	13.3	26.0	76.5	51.2	51.0	54.3	**105.3**	104.9
8	Dallas	96.5	17.0	11.9	20.3	75.9	48.2	50.0	54.3	**104.5**	104.0
9	Houston	100.0	16.2	14.5	24.7	73.3	48.7	51.0	55.0	**104.2**	106.1
10	Boston	101.3	17.8	12.2	25.1	74.6	49.4	49.0	53.1	**103.9**	100.2
	Minnesota	97.4	17.3	13.9	24.9	75.8	50.5	49.2	54.6	**103.9**	107.0

Player-specific rate statistics

Field goal percentage (*FG%*) does not account for three pointers or free throws, so two common alternatives have been developed: *effective field goal percentage* (*eFG%*) and *true shooting percentage* (*TS%*). These can be measured at the individual or team level.

(10) $FG\% = FGM/FGA.$
(11) $eFG\% = (FGM + 0.5 \times 3PM)/FGA.$
(12) $TS\% = (PTS/2)/(FGA + 0.44 \times FTA).$[16]

- *eFG%* and *TS%* reflect varying shot values (1, 2, 3):
  - Similarities? Differences?

- Similar rate statistics for rebounds

Extensions

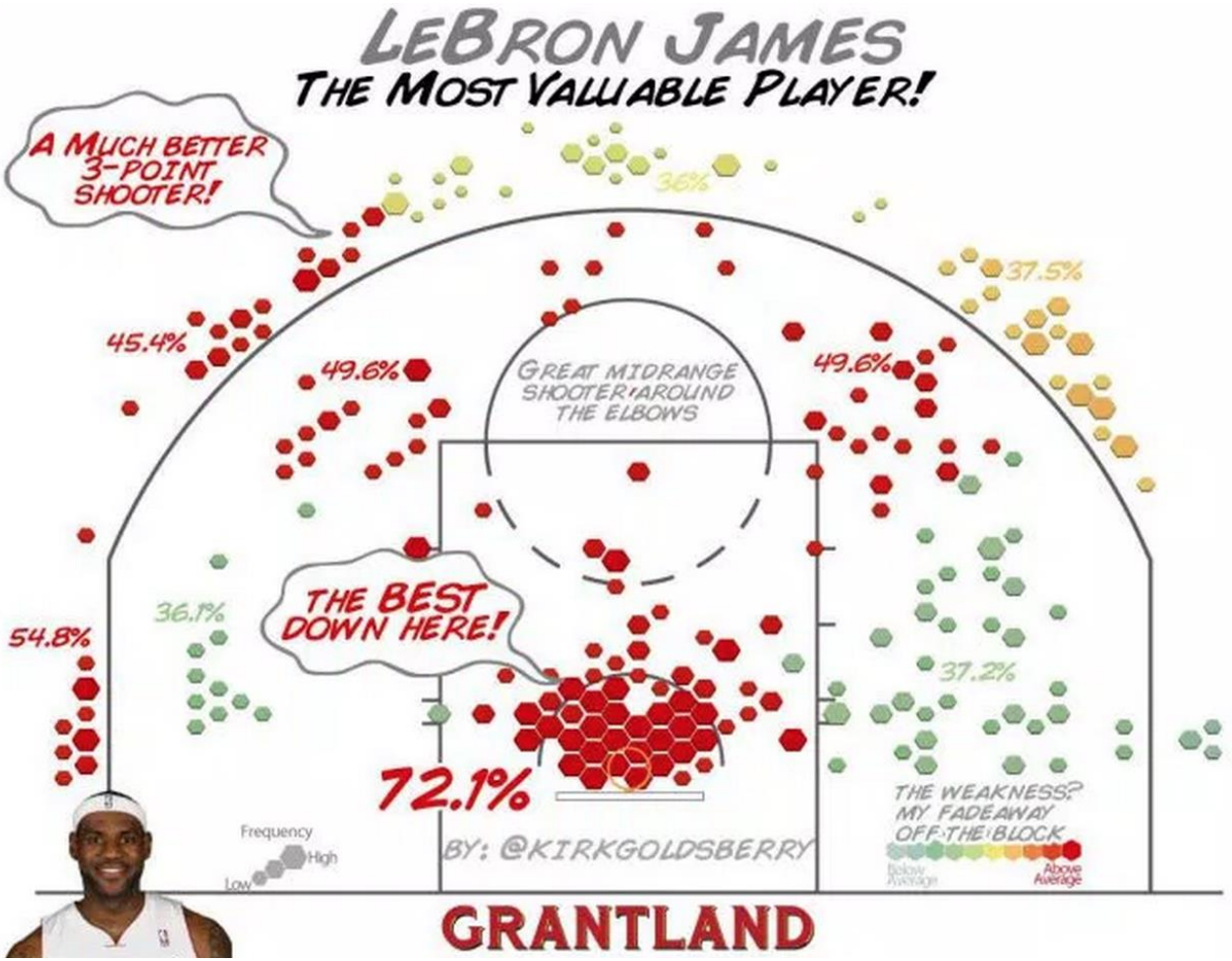
“Four Factors”

- *eFG%*
- Turnovers per possession
- Offensive rebounding percentage
- Free throw rate (*FTM/FGA*)

“Plus-minus”

- Points (or rating) when player on the court – Points (rating) when off the court
- Often adjusted for game or teammates
- Real plus-minus (Deadspin article)

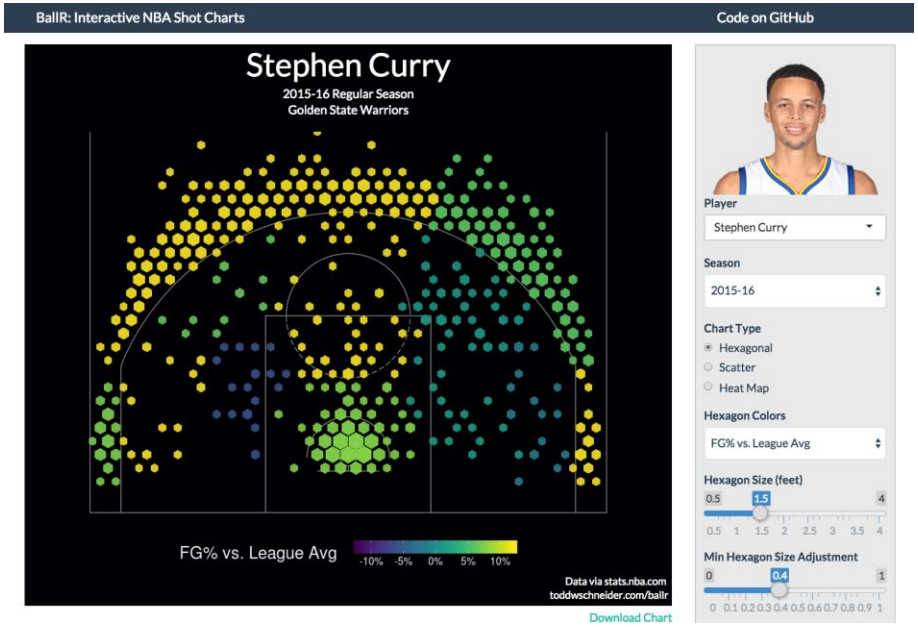
Extensions: shot charts



Extensions

BallR: Interactive NBA Shot Charts with R and Shiny

Make your own shot charts for any NBA player dating back to 1996, code is open-source on GitHub



http://toddwschneider.com/posts/ballr-interactive-nba-shot-charts-with-r-and-shiny/

State of current metrics

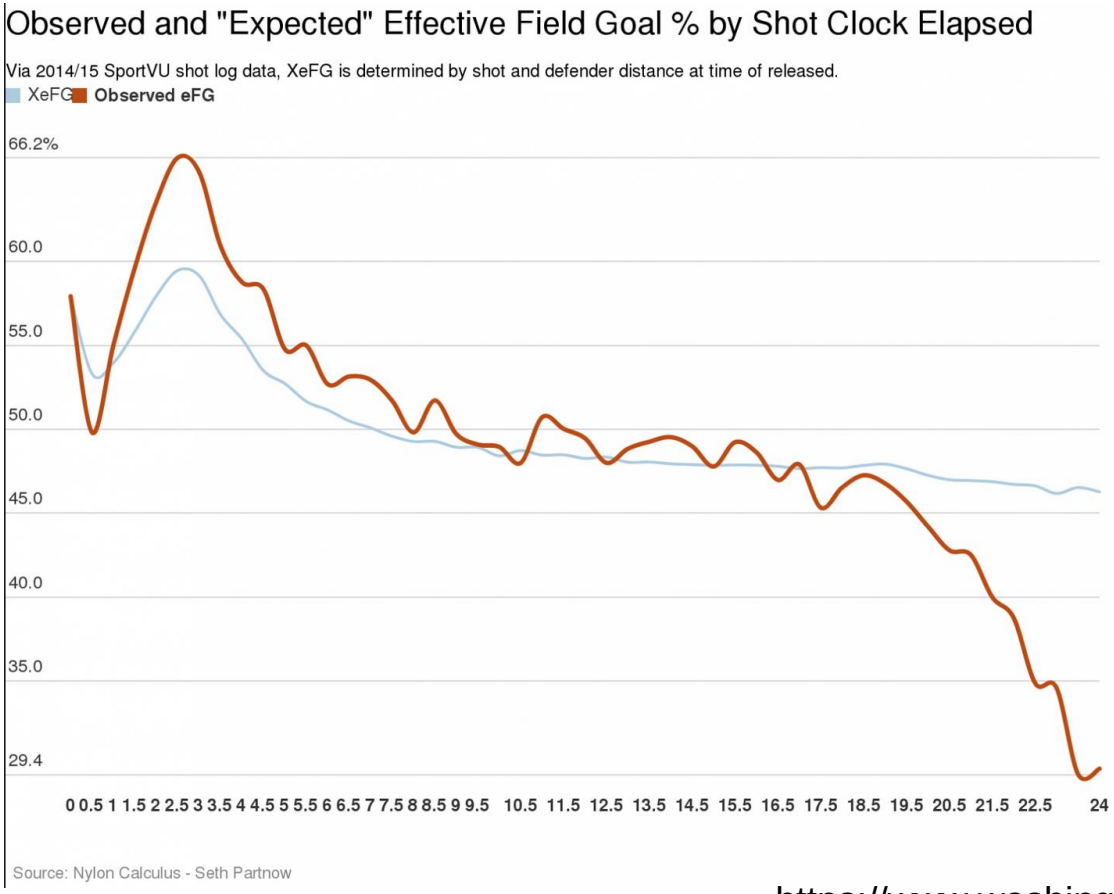
Using metrics on previous slides, consider what's important as far as:

1 – Importance to winning

2 – Player-specific contributions (less team dependent)

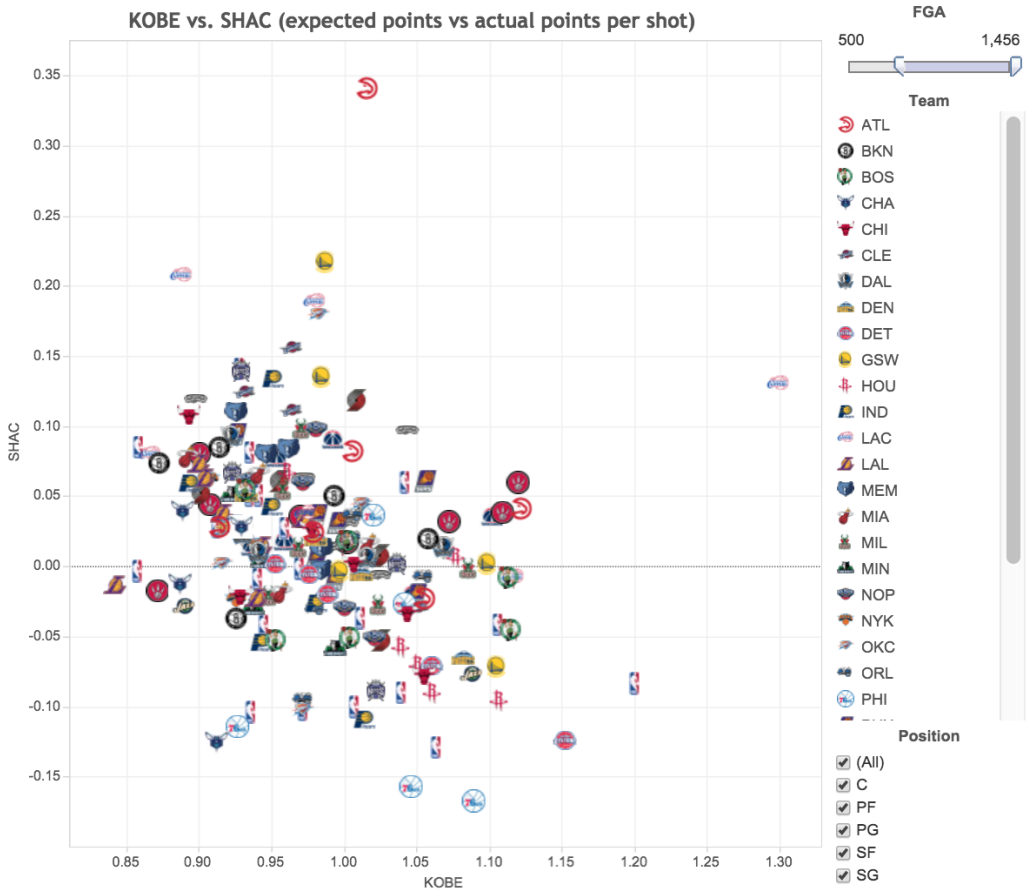
3 – Repeatability

Adjustments: by shot time



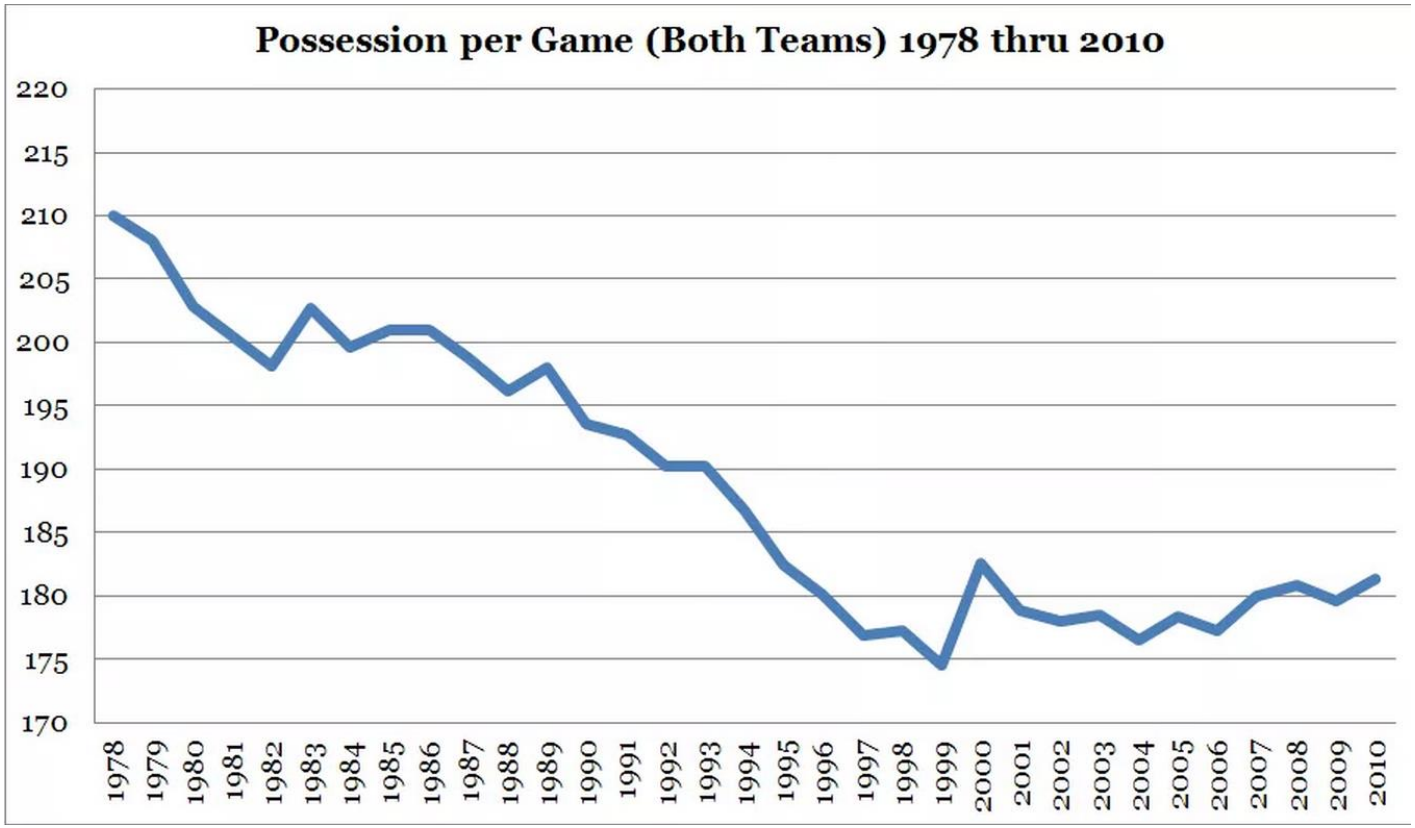
https://www.washingtonpost.com/news/fancy-stats/wp/2015/08/28/ty-lawson-will-help-rockets-rely-less-on-james-harden/

Adjustments: by shot quality



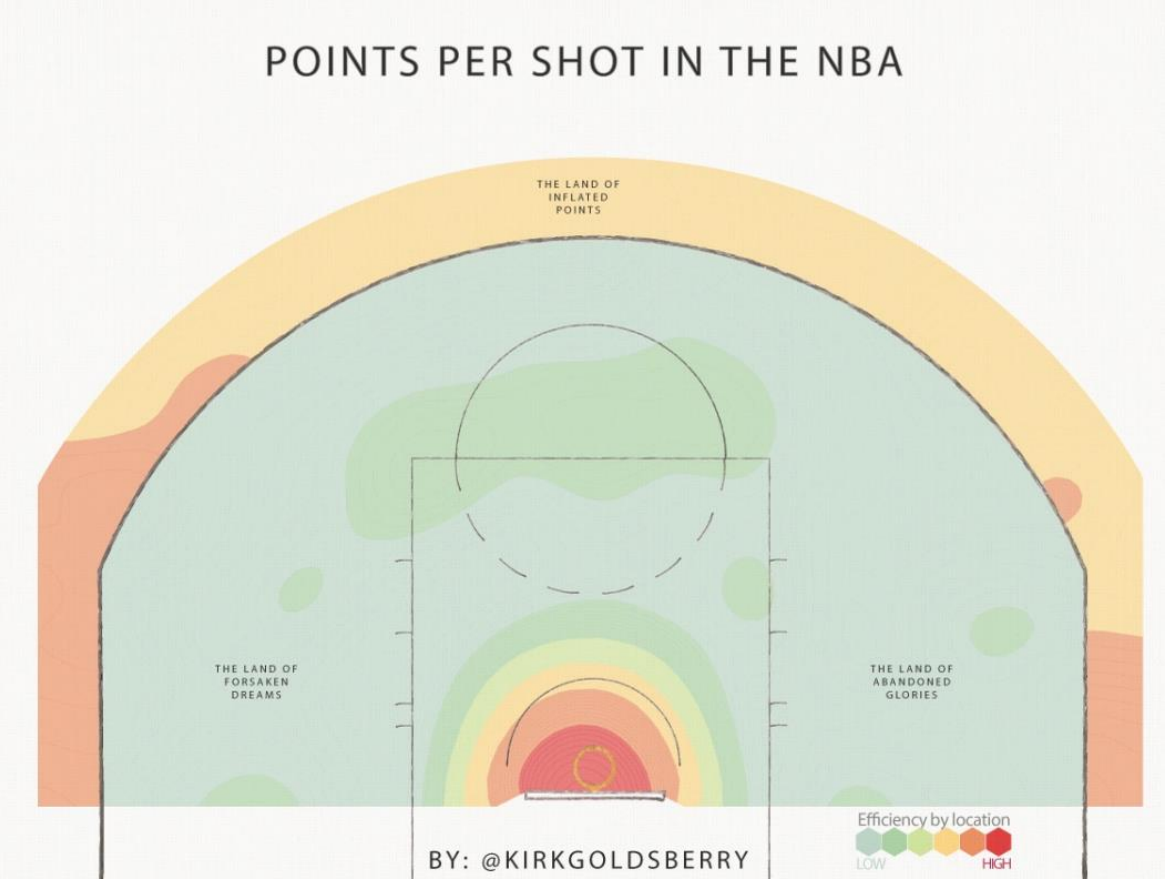
http://nyloncalculus.com/2015/09/28/introducing-kobe-a-measure-of-shot-quality/

Adjustments: by era



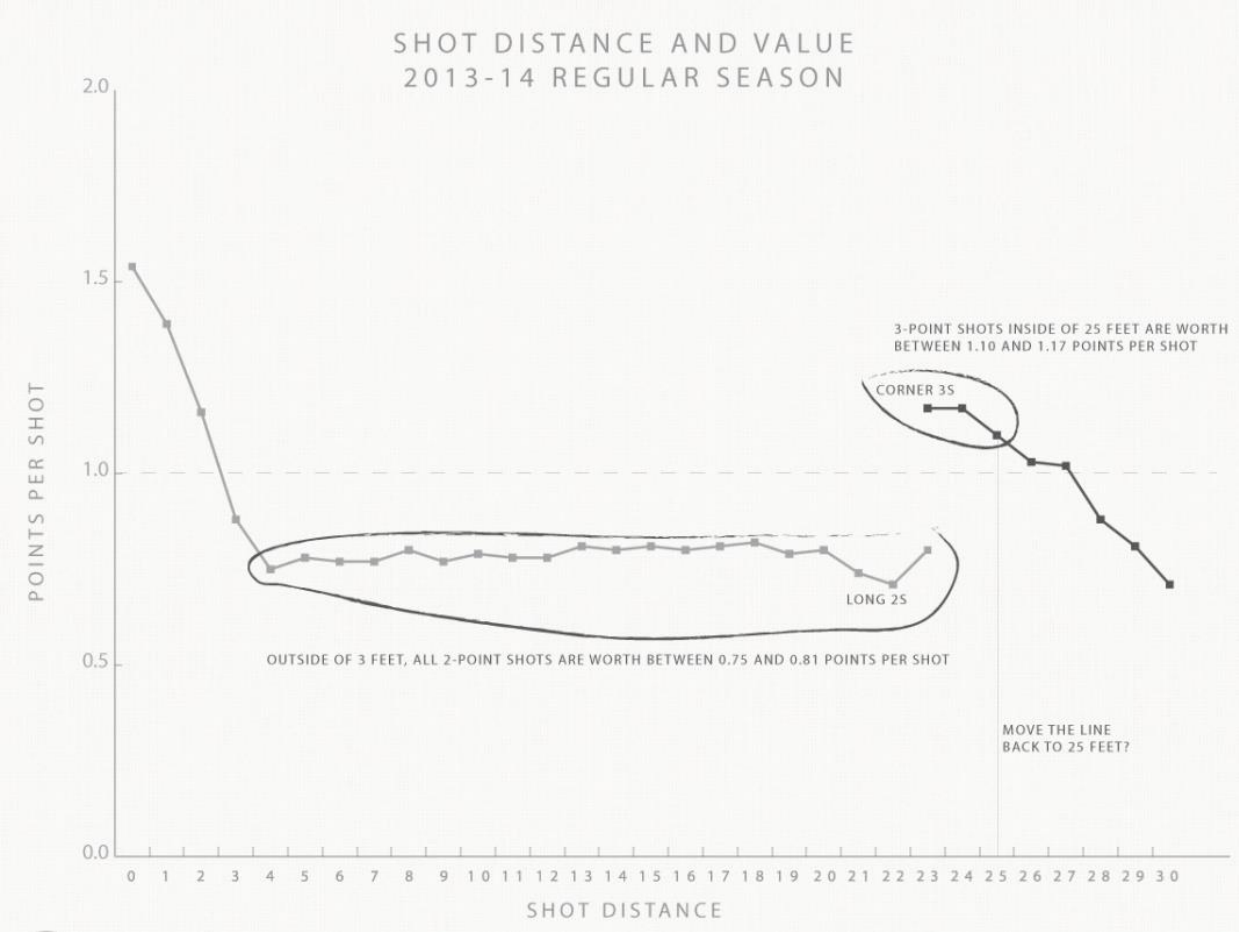
http://basketballnumbers.com/2010/07/19/measuring-the-quality-of-basketball-in-the-nba-part2-adjusting-for-pace/

The three pointer



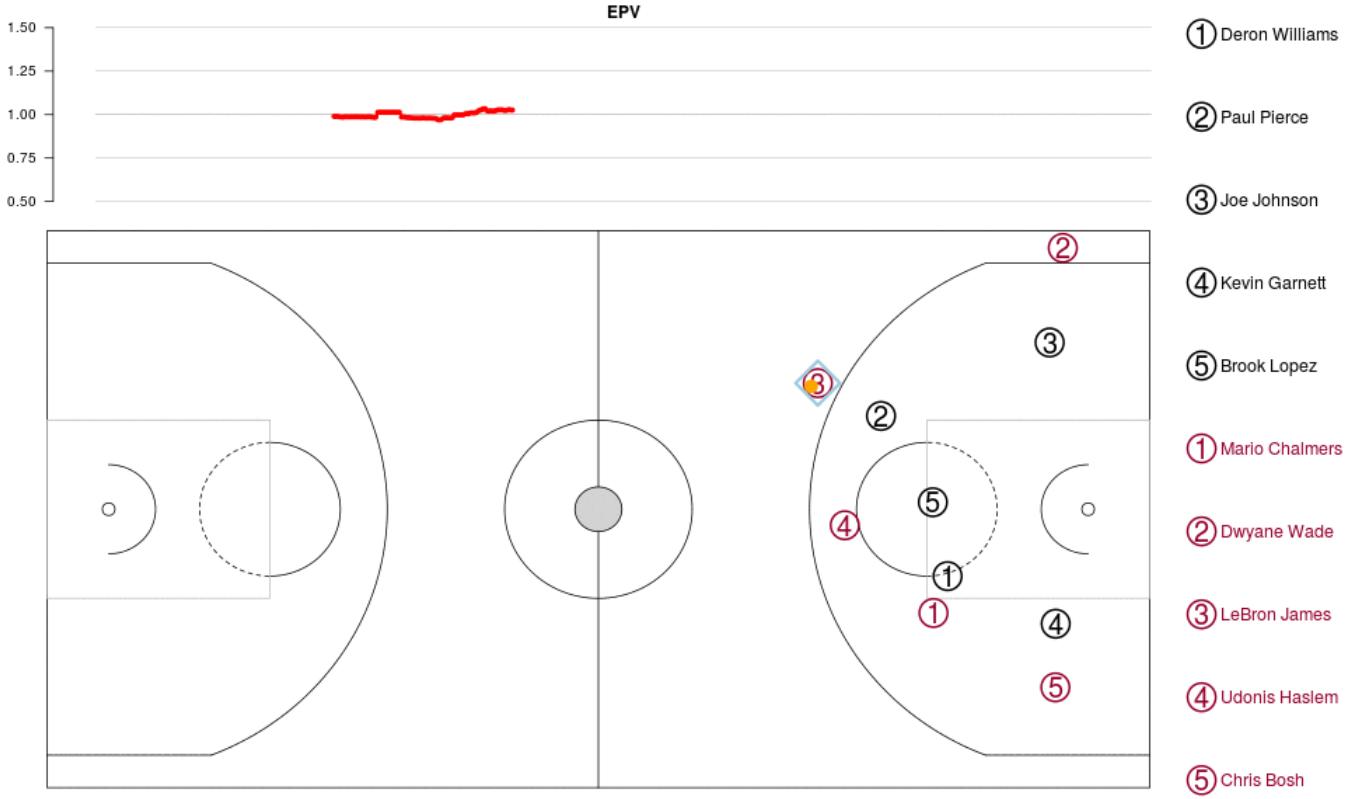
http://grantland.com/the-triangle/is-it-time-to-move-the-nba-3-point-line-back/

The three pointer



http://grantland.com/the-triangle/is-it-time-to-move-the-nba-3-point-line-back/

The future



https://github.com/dcervone/EPVDemo/blob/master/EPV_demo.pdf