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The Shape of NBA Offense:

Project Report

Historically, the makeup of championship level offenses in the National Basketball Association(NBA) has been discussed like a dominant strategic construction; what has worked in the past is all the only path to constructing a championship level team. From the way pundits approach their analysis, you might be led to believe that the game of basketball is all but solved, no room left for stylistic and strategic innovation. Is there merit to this? Is there a stylistic homogeneity at the top of the offensive totem pole? Or is offense within the context of the NBA open to interpretation and planned strategic employment? Despite what television analysis might lead you to believe basketball is far from a solved game, and two teams with diametrically opposed offensive styles are still capable of winning at the highest level.The data for this study has been taken from NBA.com. Typical statistical measures associated with basketball such as "points per game" will not be used in this study, in favor of lesser known metrics which capture the stylistic dimensionality of any given team in basketball more adeptly.

Analysts and commentators play an integral role in the discourse of their respective sport. Some leagues choose to give such tremendous responsibility to those well versed in the strategic nuances of a game; using the play-by-play announcers and half-time analyst desk to further the spectator's understanding of the game by dissecting the opposing team's respective approaches (source). Other leagues choose to grant this power to Chris Webber. Fans of the NBA often decry the analysis provided by the league's national media team, claiming that they focus too

much on generic (and often grossly inaccurate) conceptualizations of the game like "heart, toughness, and energy" ([source](#)). Their attempts at actual strategic analysis often fall flat, for example take Charles Barkley's ludicrous claim that jump shooting teams can not win championships prior to the 2015 NBA finals. As that same "jump shooting team" went on to win three of the next five titles. In 2019 the media at large started to contribute to the dissemination of misinformation by publicizing claims of another former pro player that the Houston Rockets style of play couldn't win championships ([source](#)). The NBA's official website, however, has a plethora of data ready to be analyzed. In 2014 they introduced tracking stats that attempt to capture the particularities of how each team approaches an offensive possession. How long does a player hold the ball before passing/shooting? How long do their possessions last? All of this and more is available for the public on nba.com. This data was the basis of our analysis for this project, in addition to some long standing measures of a team's offensive prowess.

The first step in dispelling this misconception of a "right way" to play offense is answering this simple question: What makes an offense championship viable? The answer is simple, your offense needs to capably score more points than your opponents. There is no magical separating line that differentiates offenses that are merely "good" and those that are championship viable. Put simply; good offense is good offense is good offense, and good offenses win championships. Offensive Rating (ORTG) is an estimation of how many points a team is expected to score over a period of 100 offensive possessions. Because this measure normalizes possessions played across the league it presents a more complete picture of offensive

strength than an average of points per game does.
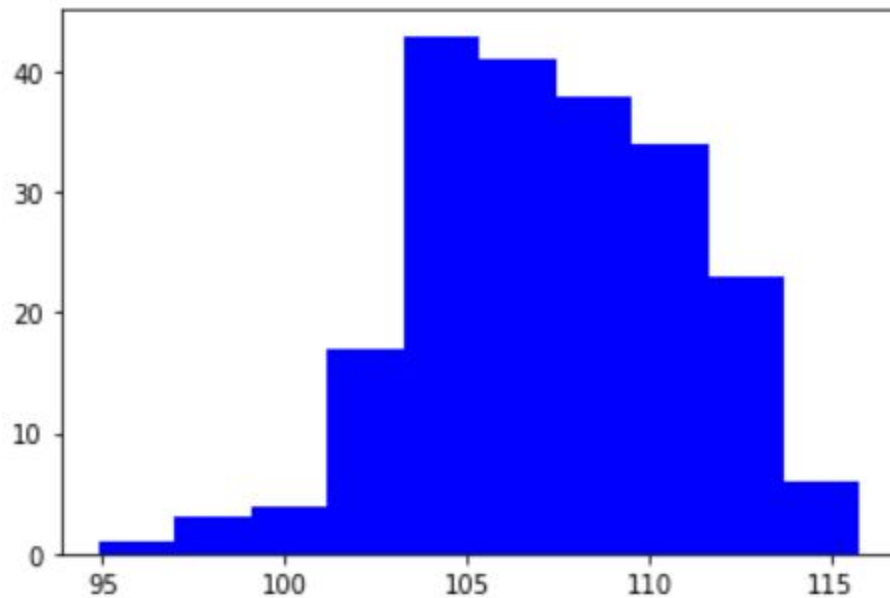
ORTG is normally distributed over the 2014-2020 time period, so it will not be transformed as we begin to construct a model that investigates the relationship between a team's offensive methodology and their strength. We chose to define a team's offensive methodology, or style, by asking four different questions about the game:

1) How fast does the team play?

2) How much do they move the ball?

3) How much do they move around?

4) What kind of shots do they shoot?

These dimensions of the game have more concise names; pace of play, shot selection, ball movement, and player movement. These four concepts capture the majority of how a team plays offense without stepping into the bounds of more objective measurements of offensive quality.

For pace of play, NBA.com has an estimate of this exact concept already within their database. It estimates how many possessions a team is expected to play over the course of 48 minutes based upon their average offensive possession length. This variable is also normally distributed about the mean, and will be the first dependent variable in our model.
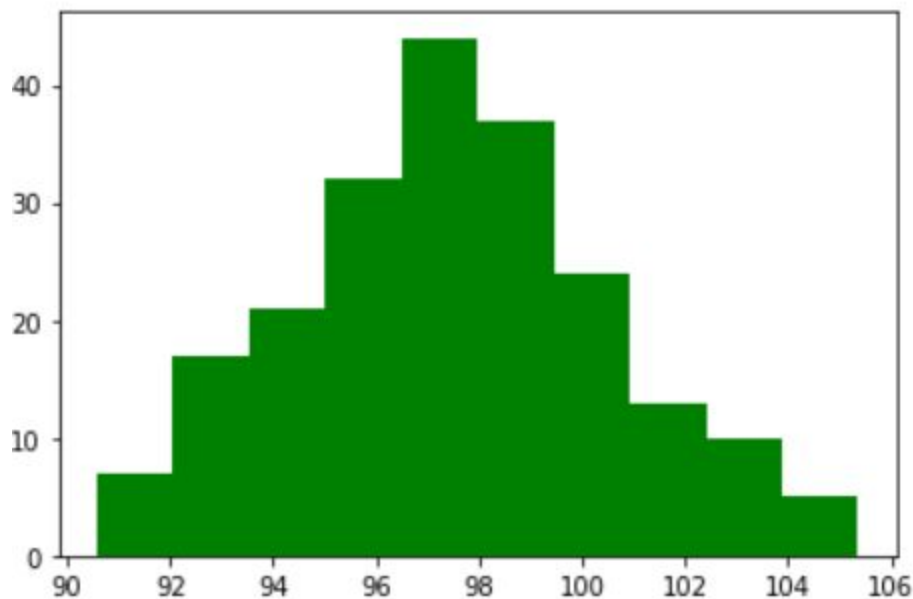

Shot selection and ball movement are not so clearly defined within NBA.com's database. However, thanks to the recently implemented tracking stats, we can use their Average Time of Possession, which refers to the average time a player holds the ball before losing possession, and Average Offensive Player Distance provide answers to questions (2) and (3), and thus serve as

our representative metric for ball and player movement.
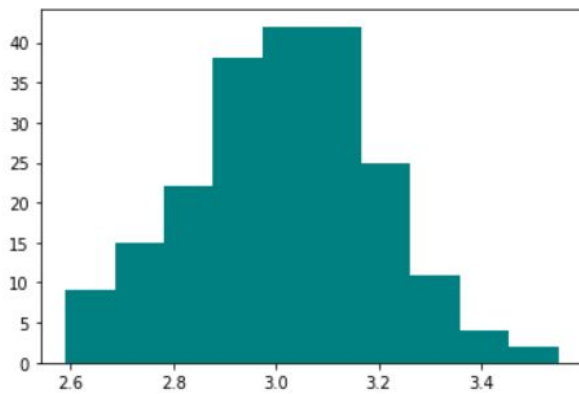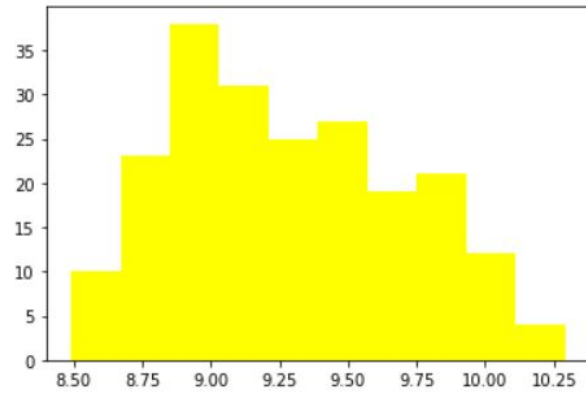

Ball movement   Player Movement

Both variables are distributed normally about the mean.

Shot selection is a bit trickier than the other three to pin down into one singular metric, so we borrowed an idea from 538 called Morey Score which is a measure of what percentage of a team's total points come from 3 pointers and free throws. All of these individual pieces are available on NBA.com, so a simple transformation provides the Morey Score piece of our data.
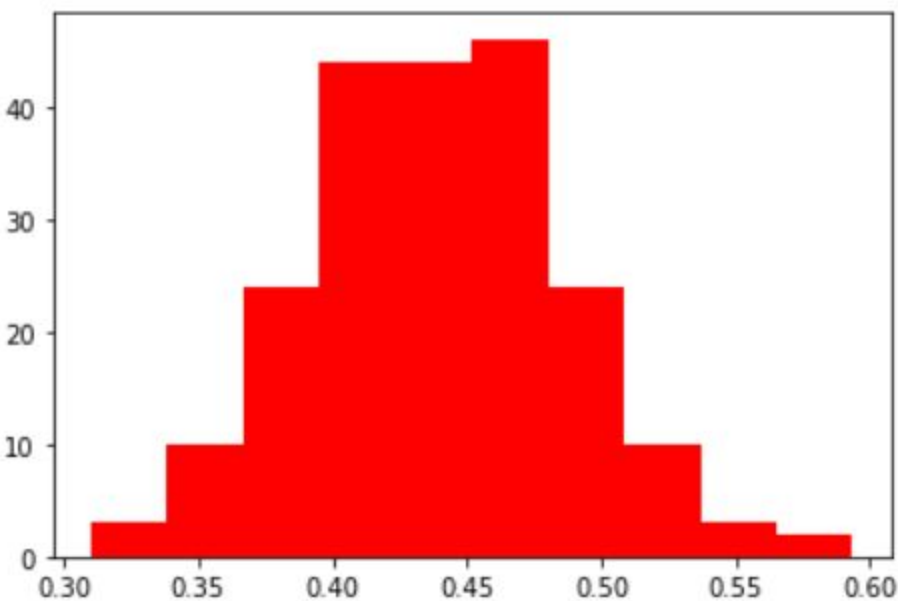
We then determined how these 4 variables correlate to offensive rating in isolation to see if there's any base for a predictive model.

```
print(corr['ORTG'])

ORTGRank        -0.823889
ORTG             1.000000
Morey            0.545056
Pace             0.417175
BallMove         0.107043
PlayerMove       0.138066
MoreyRank       -0.350153
PaceRank        -0.080757
BallRank        -0.103615
Player Rank      0.299199
Year             0.488746
Name: ORTG, dtype: float64
```

Morey Rating and Pace seem to have a strong relationship to offensive rating. But how does the model perform?

	Coefficient
Morey	28.274019
Pace	0.353137
BallMove	4.209053
PlayerMove	-1.131052

These are the model coefficients, Morey Score and Pace have high predictive power in isolation, but for some reason they become less predictive of ORTG when used together.

Linear Regression Model
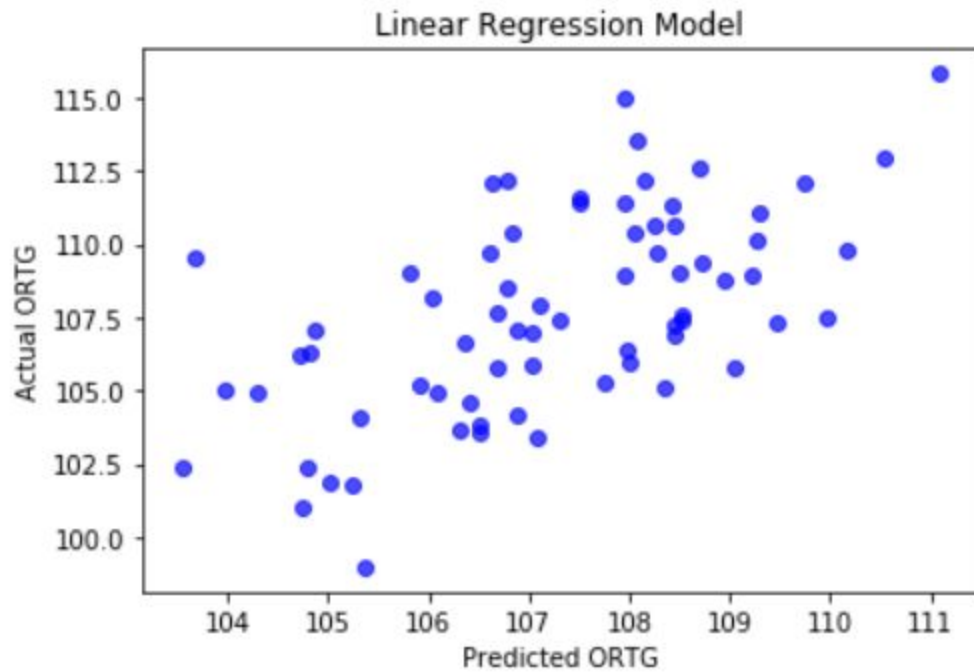
R^2 = .333

Player and ball movement contribute almost nothing to the model, but pace and shot selection seem to be strong indicators in isolation.

But offenses are more dynamic than that, take a look at the two best offenses of the past decade: The Golden State Warriors and The Houston Rockets

Golden State Warriors:

Ball Movement

Player Movement — Pace

Shot selection

Houston Rockets:

Ball Movement

Player Movement — Pace
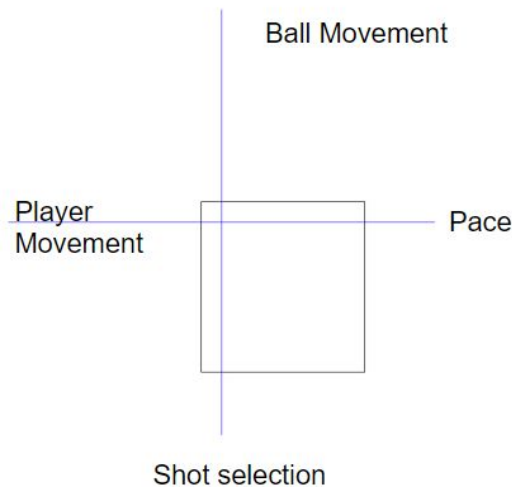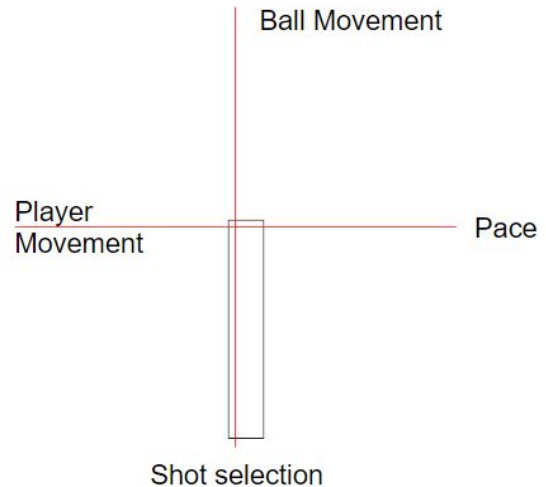
Shot selection

These dimensions reflect each team's individual placing (1-30) in each of these metrics. The Farther out, the better you were. The Rockets emphasized shot selection while playing one of the slowest games in the league. The Warriors played faster and did not emphasize "smart" shots as heavily as the Rockets did. Ultimately what both these teams did better than any other over this time period was play to their roster's strengths; there is no "right way" to play offense. How teams construct their offense should be dependent upon what each individual team does best. In future studies we would make more robust graphical analysis of each team, similar to the graph above. Additionally, further investigation of how these variables correlate to ORTG would be interesting. How does the data perform when transformed logarithmically? Are there other factors worth examining? Perhaps we could delve into predicting what particular style would work best for a given team using entity fixed effects.