**Game of Trades: Using simulation to get an edge in the NBA trade market**

Basketball

ID: 5643

1. **Abstract**

In this paper I present a method to evaluate the impact of trades for NBA teams by simulating different scenarios. Assessing the potential impact of trades is a complex task as it affects not only the composition of the teams involved but also the rest of the league. For instance, the Kyrie Irving – Isaiah Thomas trade not only affects the number of wins for Cleveland and Boston but also for any team playing against these 2 teams.

The main idea is to estimate the offensive and defensive power for each team given a team roster and players’ usage. Assuming a Normal distribution in teams’ scored points, these powers serve as estimated means while the variance for both models is estimated from empirical data. Once the probability distribution is known, I can calculate the probability of any matchup and thus the number of wins in the regular season.

I will show how this model has implications beyond the trade market evaluation.[[1]](#footnote-1)

1. **The Data**

For the main model and further analysis I used the following data variables available from basketballreference.com:

"Age" "G" "GS" "MP" "FG" "FGA" "FG." "X3P"

"X3PA" "X3P." "X2P" "X2PA" "X2P." "eFG." "FT" "FTA" "FT." "ORB" "DRB"

"TRB" "AST" "STL" "BLK" "TOV" "PF" "PTS" "Season"

Once the column stats have been adjusted to per minute stats, I use the following nomenclature:

"Age" "Exp" "FGPer" "FG3Per" "FG2Per"

"effFGPer" "FTPer" "effMin" "effFG" "effFGA" "eff3PM" "eff3PA" "eff2PM" "eff2PA"

"effFTM" "effFTA" "effORB" "effDRB" "effTRB" "effAST" "effSTL" "effBLK" "effTOV"

"effPF" "effPTS"

1. **The Model**

The model consists of 2 Neural Networks used to estimate team powers: One for Offense (points scored), one for Defense (points against). Inputs are players' projected per minute stats weighted by their share of minutes of play.

Steps:

* Read historical players: From Season 1979-1980 when the 3 point shoot was established. (write\_playersHist.R) (data: playersHist.csv)
* Differentiate players with the same name by adding a number after the name in ascending order by decreasing age. (.rename\_PlayerName\_Duplicates.R). Example: Tim Hardaway who played in the 90s and Tim Hardaway 2 (current NYK player) as basketballreference does not differentiate them and I use Player as primary key.
* Calculate stats per minute of play: effStat = Stat/MP. And effMinutes as Minutes played over total possible minutes: 82 games \* 48 minutes per game. effMin = MP/3936 (.team\_prepareAll() in prepare\_rosters.R)

• A Normal distribution is centered around each team’s estimated power (offense and defense) and a fixed common variance (based on empirical data). With the full probability distribution I can simulate any matchup.

• Player similarity by age is computed using t-SNE algorithm which also allows for 2-D visualization of the data..

As conference policy, we do not support LaTeX, so we ask that you use this template instead. We understand that math typesetting can be more cumbersome in MS Word, but we suggest using MS Word’s equation editor. Equations will look like this:

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|  |  | (1) |

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|  |  | (2) |

This is a reference to equation (1) that updates after fields are updated. Notice that each equation is contained in its own table, and the equation numbers are inserted using fields. See [this tutorial](https://www.youtube.com/watch?v=wM57WvO20KA) for more information on this technique.

We do not insist on any specific conventions related to figures, tables, and captions.

1. **Section**

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1. **Section**
   1. **Subsection (Cambria, Bold, 12pt)**

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* + 1. **Sub-subsection (Cambria, Bold, 12pt)**

This is the first paragraph of the body of text under the first subsection of the first main section. Subsections can be nested as far as you want, though the font for the subsection headers remain the same (Cambria, 11pt).

* 1. **Subsection**

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**References**

[1] Reference #1 cited using any mainstream citation style (e.g. APA, MLA).

[2] Reference #2

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[n] Reference #n

**Appendix**

An appendix is not required, but if you have one please include it here.

1. Footnotes are permitted and should be formatted as shown here (Cambria, 11pt). [↑](#footnote-ref-1)