

---

# Moreyball – Slam Dunk or Technical Foul?

**Kendell Davis**

Bellevue University  
North Salt Lake, Utah 84054, USA  
akdavis@my365.bellevue.edu

**Doug Marcum**

Bellevue University  
Indianapolis, IN 46240, USA  
cdmarcum@my365.bellevue.edu

**Theodore Thompson**

Bellevue University  
New York City, NY 10473, USA  
tjthompson@my365.bellevue.edu

**Mohamad Quteifan**

Bellevue University  
Dublin, OH 43017, USA  
mquteifan@my365.bellevue.edu

**Abstract**

The world was amazed at the success that advanced data analytics had with the Major League Baseball team the Oakland Athletics in 2002. The success of data analytics used by Billy Beane and the Oakland Athletics has caused ripple effects on other leagues and sports throughout the world. It is no secret that General Managers across all professional sports are utilizing data analytics to enhance their evaluation of talent, most notably by the National Basketball Association (NBA). At the forefront of this

movement is the general manager of the Houston Rockets, Daryl Morey. From the beginning of his tenure in 2007, Morey has been an outspoken advocate for analytical methods in the decision-making process of the sport. Our research will attempt to review the approach used by Morey and his team. In addition, we will compare the results of the Rockets' performance against the league averages of the NBA since the implementation of "Moreyball" to see if the results are well-done or over-done.

**Author Keywords**

National Basketball Association; Daryl Morey; Moreyball; Moneyball; Houston Rockets; James Harden; Advanced Analytics; MIT Sloan Sports Analytics Conference; Shot Selection; NBA Scoring Margin; NBA Winning Percentage.

**ACM Classification Keywords**

G.3 Probability and Statistics: statistical computing, correlation and regression analysis; J.2 Physical Sciences and Engineering: mathematics and statistics; I.5.1 Models: Neural nets, Statistical; I.5.2 Design Methodology: Pattern analysis; I.5.3 Clustering: Algorithms; I.6.4 Model Validation and Analysis.

**Why Is This Data Science**

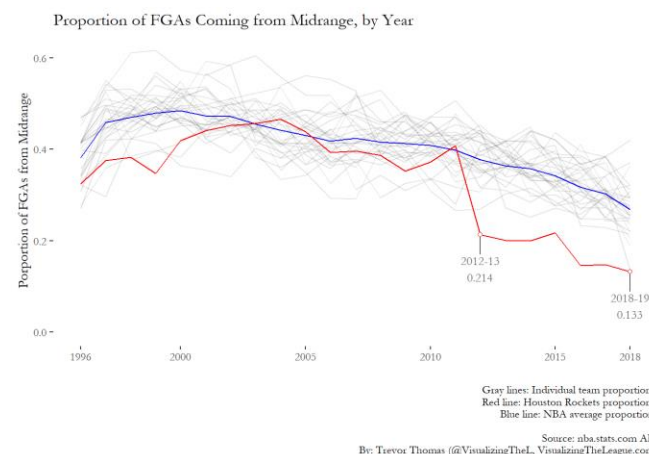
Being young data scientists, we are beginning to understand the value of finding patterns and insight via vast datasets. The industry of professional athletics has been capturing and quantifying data since the moment they began keeping

score. Through the advancements in data collection, the significance of capitalizing on said data has increased drastically. Morey has been at the forefront of this movement, and the analysis being completed by his staff has played a major role in changing the ideas of value within the sport of basketball. By looking at their work, we can see which triggers have been pulled that have had the greatest effects.

## Overview

Since joining the Houston Rockets organization, Morey has been driven to change the landscape of the NBA. From our research, there are three profound areas that Morey has focused his sights upon: the lay-up/dunk, the mid-range shot, and the three-point shot.

**Lay-Up/Dunk** - A primary factor in Morey's strategy is the tried-and-true method of "driving it to the paint" – making shots that have a higher probability of success by utilizing layups and slam dunks. This portion of his strategy is not new to the world of the NBA, but Morey's analysis of these shots appears to be purely numeric and probability based, with a slight reference to the possibilities of fouls granting additional points through penalty shots. As such, the less quantifiable factors are not accounted for in Morey's model – in particular, the defensive strategies used by other teams for this common tactic are many and varied, which introduces a plethora of additional variables to the model that call for analysis. As such, we have cause to wonder if Morey's analytics are too focused on variables that are defined in a sterile environment, making the end analysis appear to be rather removed from the whole picture; in addition, Morey's focus on specific variables to the exclusion of others supports the possibility that the current atmosphere of "Moreyball" may include some definite risks of the models and analyses being overfitted.

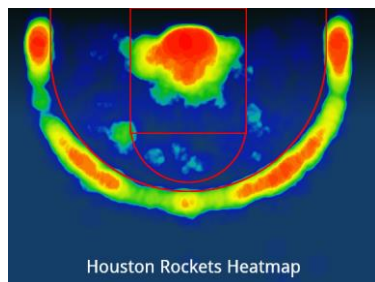


**Figure 1:** Proportion of field goal attempts - midrange

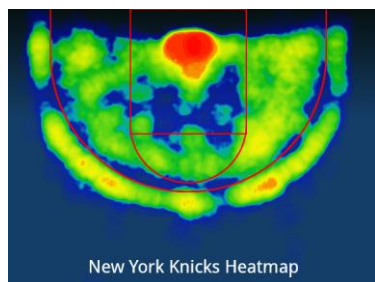
**Mid-Range Shot** - While fans watched the Houston Rockets play in 2018, they may have been shocked by Carmelo Anthony turning to the Rockets' bench and apologizing for scoring a basket from the inside of the 3-point line. If this fan was not aware of the term analytics and the Houston Rockets style of play, they would have been introduced to the term in that preseason game against the Memphis Grizzlies on October 2nd, 2018 [23]. Morey believes that a mid-range shot that gives the player the opportunity to score 2 points is worse than either trying to dribble closer to the hoop to attempt a shot and/or passing to a teammate beyond the 3-point line. This style of play, that shuns mid-range shots, goes against decades of traditional thought in the game play by fans and players.

**Three-Point Shot** – The National Basketball Association (NBA) is often credited with being an innovative league, not bound by traditions of the past. One such change has had immense impact on the game and that is the three-point shot. When first introduced, the shot was viewed as nothing

## Tale of Two Teams



**Figure 2** - Houston Rockets  
Heat Map Shot Selection (2016)



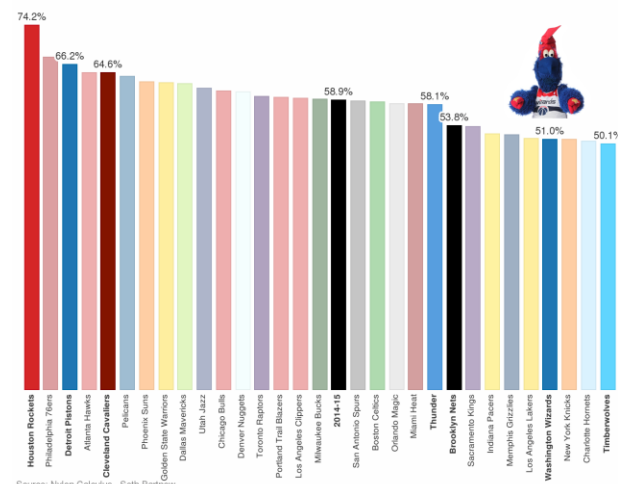
**Figure 3** - New York Knicks  
Heat Map Shot Selection (2016)

more than a gimmick, but slowly gained in popularity. While the shot began an integral component of the game, it was not until Morey saw the true value of taking more three-point shot attempts in a game that it fully opened the style of play.

Morey and his team have run countless simulations to show the gained advantage of taking multiple three-point shots per game in comparison to longer distance two-point shots (as can be seen in the following charts). The probability of scoring increases, even if the percentage of shots made may decrease. A way to see this is from a league wide perspective. The 1999–2000 season had an average 4.8 three-point goals per game and 13.7 attempts (35% effectiveness). The 2009-10 season had an average 6.4 three-point goals per game and 18.1 attempts (36% effectiveness). The 2016–17 season had an average 9.7 three-point goals per game and 27.0 attempts (36% effectiveness) [11].

### MoreyBall % (3s & rim attempts)

Through games of 3/2/15



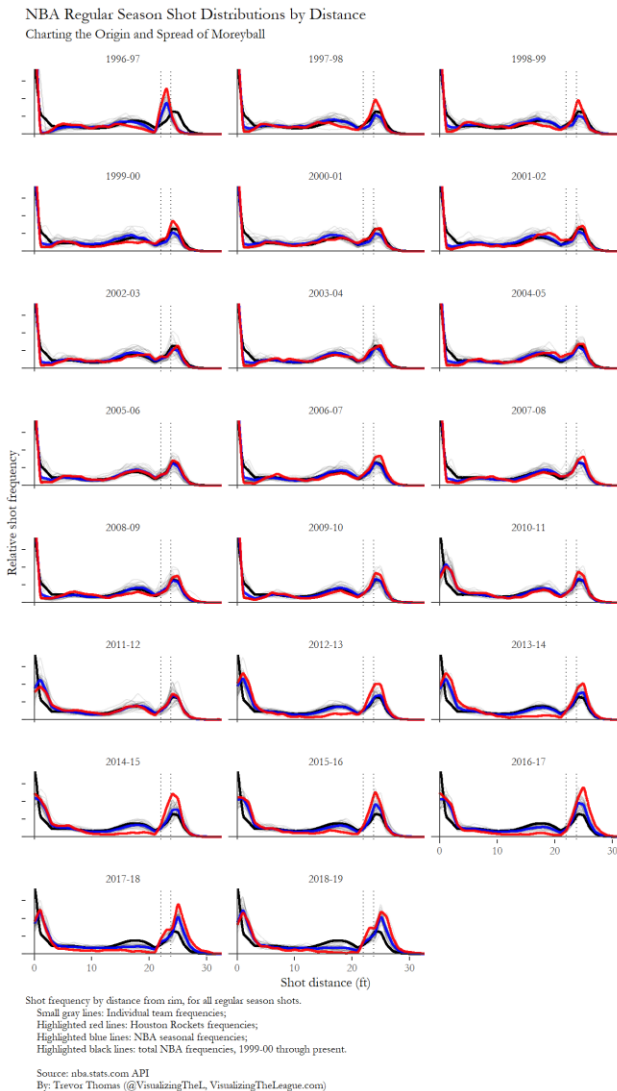
## NBA / Data Science Community and Technology

We are planning to work with a talented group of computer science students from Bellevue University for assistance on data mining throughout the project. Additionally, with the guidance of multiple data scientists throughout the NBA, we anticipate gaining access to data not available to the general public. We are aware many of these may not ultimately provide valuable output. For initial analysis, we do not want to limit ourselves from the onset of the project, even though we are aware many of these may not provide valuable output. With that, we envision our possible list of algorithms to be the following: Support Vector Machine, Logistic Regression, Discrimination Analysis, Random Forest, Linear Regression, Naive Bayes, Nearest Neighbor, and Decision Trees.

## Conclusion

Additional analysis is needed to determine if Morey is overfitting his data. Once he was established as the General Manager in 2010, the Rockets improved in nearly every scoring metric. By comparison to other teams within the league from 2010-2018, the Rockets have consistently ranked in the ten (10) in winning percentage and scoring margin. During the 2017 – 2018, the Rockets ranked first in both scoring margin and winning percentage [11]. Additionally, can be seen in Figure 2, the team has fully embraced Morey's philosophy of removing mid-range shots and focusing on layup/dunks and three-point shots.

While this has afforded the Rockets with regular season success, the team has not achieved the same results in the postseason. During this same period (2010 – 2018), the Rockets have lost in the first round of the playoffs on multiple occasions and have lost in the Western Conference Finals twice (2015, 2018).



**Figure 4** - Distribution of field goal attempts by season

Moreyball is also having an impact on the entire league. The pace of play has increased, and numerous teams have adapted to the style initiated by Morey. The Golden State Warriors run a similar playbook and have been able to win the NBA championship in 2015, 2017, and 2018.

With further analysis into the analytics Morey has his team working on today, the picture will become clearer if Morey is overfitting the data.

## Acknowledgments

We would like to thank and acknowledge all the data scientists and NBA fans putting in the hours to breakdown the numbers behind each NBA game. Additionally, we would like to thank Daryl Morey, the Houston Rockets, the National Basketball Association, the MIT Sloan Sports Analytics Conference, and Billy Beane for their contributions to this topic and the advancement of data science in today's modern arena of professional sports.

## References

1. Benjamin. F. (2019) Analytics for the Front Office: Valuing Protections on NBA Draft Picks MIT Sloan Sports Conference.  
[http://www.sloansportsconference.com/wp-content/uploads/2019/02/ValuingProtectionsonNBADraftPicks\\_Sloan\\_2\\_18\\_2019.pdf](http://www.sloansportsconference.com/wp-content/uploads/2019/02/ValuingProtectionsonNBADraftPicks_Sloan_2_18_2019.pdf).
2. Bornn, L., (2019). Training Schedule Confounds the Relationship between Acute: Chronic Workload Ratio and Injury. MIT Sloan Sports Conference.  
<http://www.sloansportsconference.com/wp-content/uploads/2019/02/Training-Schedule-Confounds-the-Relationship-between-Acute-Chronic-Workload-Ratio-and-Injury.pdf>.

3. Cervone, D. (2014)) POINTWISE: Predicting Points and Valuing Decisions in Real Time with NBA Optical Tracking Data. MIT Sloan Sports Conference. [http://www.lukebornn.com/papers/cervone\\_ssac\\_2014.pdf](http://www.lukebornn.com/papers/cervone_ssac_2014.pdf). (paper was cited 92 times).
4. Cervone, D. (2016). NBA Court realty: The Basketball Court is a Real Estate Market. MIT Sloan Sports Conference. [http://www.xyresearch.com/pdfs/court\\_realty.pdf](http://www.xyresearch.com/pdfs/court_realty.pdf).
5. Drakos, M. (2010). Injury in the National Basketball Association A 17-Year Overview. National Institute of Health. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445097/>.
6. Durbin, J. "Nearly every team is playing like the Rockets. And that's hurting the Rockets." FiveThirtyEight. December 20, 2018. <https://fivethirtyeight.com/features/nearly-every-team-is-playing-like-the-rockets-and-thats-hurting-the-rockets/>.
7. Frei, F. and Perlberg, M. Discovering Hidden Gems: The Story of Daryl Morey, Shane Battier, and the Houston Rockets (A). September 24, 2010. Harvard Business School Technology & Operations Mgt. Unit Case No. 610-038. <https://ssrn.com/abstract=2025179>.
8. Fry, M. and Ohlmann, J. Introduction to the Special Issue on Analytics in Sports, Part I: General Sports Applications. April 1, 2012. INFORMS Journal on Applied Analytics. <https://pubsonline.informs.org/doi/full/10.1287/inte.1120.0633>.
9. <http://www.sloansportsconference.com/people/daryl-morey/>
10. <https://digital.hbs.edu/platform-digit/submission/moreyball-the-houston-rockets-and-analytics/>
11. [https://www.basketball-reference.com/leagues/NBA\\_stats\\_per\\_game.html](https://www.basketball-reference.com/leagues/NBA_stats_per_game.html)
12. Lewis, M. "Basketball's Nerd King." Slate. December 6, 2016. [http://www.slate.com/articles/arts/books/2016/12/how\\_daryl\\_morey\\_used\\_behavioral\\_economics\\_to\\_revolutionize\\_the\\_art\\_of\\_nba.html](http://www.slate.com/articles/arts/books/2016/12/how_daryl_morey_used_behavioral_economics_to_revolutionize_the_art_of_nba.html).
13. Lewis, M. Moneyball: The Art of Winning an Unfair Game. New York: W.W. Norton, 2003.
14. Lopshire, K. (2016). NBA Team Synergy and Style of Play Analysis. University of California Los Angeles. <https://www.bruinsportsanalytics.com/assets/researchpapers/pdfs/synergy.pdf>.
15. Lu, K. The Valuation of Shots in the NBA. Pomona College. April 25, 2015. <http://economics-files.pomona.edu/GarySmith/Econ190/Econ190%202015/Kevin%20Lu.pdf>.
16. Maese, R. "NBA embraces advanced analytics as Moneyball movement sweeps pro basketball." Washington Post. October 25, 2013. <https://www.washingtonpost.com>.

17. Maymin, P. Acceleration in the NBA: Towards an Algorithmic Taxonomy of Basketball Plays. January 13, 2013. MIT Sloan Sports Analytics Conference 2013. <https://ssrn.com/abstract=2200560>.
18. Miller, A. (2017). Possession Sketches: Mapping NBA Strategies. MIT Sloan Sports Conference. <https://andymiller.github.io/docs/acm-possession-sketches-final.pdf>.
19. Mills, J. (2015) Decision-Making in the NBA: The Interaction of Advanced Analytics and Traditional Evaluation Methods. (Unpublished thesis). University of Oregon. Eugene, OR. <https://scholarsbank.uoregon.edu/xmlui/handle/1794/19127>.
20. Nistala, A (2019). Using Deep Learning to Understand Patterns of Player Movement in the NBA. Retrieved from, Using Deep Learning to Understand Patterns of Player Movement in the NBA. MIT Sloan Sports conference. <http://www.sloansportsconference.com/wp-content/uploads/2019/02/Using-Deep-Learning-to-Understand-Patterns-of-Player-Movement-in-the-NBA.pdf>.
21. O'Connor, K. "Under the Influence of Moreyball." The Ringer. December 8, 2018. <https://www.theringer.com/2016/12/8/16076984/under-the-influence-of-moreyball-1ea4ba34b85c>.
22. Schnitzer, K. (2018). Carmelo had to apologize during enlightening Rockets debut. New York Post. <https://nypost.com/2018/10/03/carmelo-had-to-apologize-during-enlightening-rockets-debut/>.
23. Shea, S., and Christopher E. Baker. Basketball Analytics: Objective and Efficient Strategies for Understanding How Teams Win. Lake St. Louis, MO: Advanced Metrics, LLC, 2013.
24. Thomas, T. A Graphical History of Moreyball. Visualizing the League. December 16, 2018. <https://visualizingtheleague.com/post/a-graphical-history-of-moreyball/>
25. Wigmore, T. "Moreyball: How data 'idiots' took over the Houston Rockets and revolutionized basketball." Inews.co.uk. September 6, 2019. <https://inews.co.uk/sport/moreyball-how-data-idiotstook-over-the-houston-rockets-and-revolutionised-basketball-516337>.
26. Yang, N. "At Sloan Sports Analytics Conference, Rockets General Manager Daryl Morey will be at home." Boston Globe. February 27, 2019. <https://www.boston.com/sports/media/2019/02/27/daryl-morey-sloan-sports-analytics-conference>.
27. Yuanhao, Y. (2015). Predicting Regular Season Results of NBA Teams Based on Regression Analysis of Common Basketball Statistics. University of California Berkley, Department of Statistics, Student Thesis. [https://webcache.googleusercontent.com/search?q=cac he:2XOKa6C0Q5EJ:https://www.stat.berkeley.edu/~aldous/Research/Ugrad/Stanley\\_Yang%2520\\_Thesis.pdf+&cd=12&hl=en&ct=clnk&gl=us](https://webcache.googleusercontent.com/search?q=cac he:2XOKa6C0Q5EJ:https://www.stat.berkeley.edu/~aldous/Research/Ugrad/Stanley_Yang%2520_Thesis.pdf+&cd=12&hl=en&ct=clnk&gl=us).