Bryant University

HONORS THESIS

Actual vs. Perceived Value of Players of the National Basketball Association

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ABSTRACT

Over the past few decades the media has played an increasingly large role in shaping how player effectiveness in the National Basketball Association (NBA) is perceived. Several factors have caused fans, announcers, and even NBA team management to have unintentional bias toward certain players. This study aims to utilize various formulas created by NBA statisticians, called Player Raters, to identify how efficient each NBA player actually is in comparison to the rest of the league. Data from the past 12 seasons was compiled and six Player Raters were used to place values on every NBA player since the 2000-2001 season. MVP voting results for these seasons were also gathered and used to quantify how the public perceives the effectiveness of the top players in the NBA. Correlation tests between Player Rater and MVP voting results revealed players who were overrated because of various "perception factors". A single formula combining the six raters used in this study was also developed. Clearly the application of statistics to NBA data used in this study will be useful to all NBA audiences. It will help fans and announcers become aware of their unintentional bias when judging player effectiveness and also NBA team managers when making important decisions like trades, salary negotiations, and allotting playing time.

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INTRODUCTION

How NBA MVPs Are Determined

My Honors Capstone Project will utilize statistics to determine whether players of the National Basketball Association (NBA) who are perceived to be the most valuable are actually the most effective players in the league. Over the past few decades the NBA's Most Valuable Player (MVP) race seems to have evolved into a popularity contest. The MVP was selected based on votes from a pool of NBA players up until the 1979-1980 NBA season. Since then a panel of 125 sportswriters and broadcasters have done the voting, with each person selecting their top five candidates.

Points are awarded to the players based on their ranking from each of the voters (five points for a first place vote, four points for a second place vote, etc.) The player with the most points is deemed the Most Valuable Player of the respective NBA season. "However, given the nature of this system, it is not clear whether the players are evaluated according to their on-court contribution, or their off court image. Clearly, the democratic method cannot be relied upon to give an objective evaluation of each player's value" (Berri 412). At first glance the best players appear to have been selected, but perhaps those who ended up with the most points from voters were not actually the most effective players for a given season. This study aims to answer this question in addition to devising an accurate method for determining the *actual* efficiency of any NBA player for a given season.

Reason for Selecting This Topic

I chose this topic because I feel NBA statistics can be used more accurately and intensely than popular statisticians have used them in order to derive an accurate rating for every player. I am a firm believer that "the measurement of a professional athlete's productivity is a subject

of numerous academic inquiries" and found it appropriate to apply formulas developed by NBA statisticians to my project. (Berri 411) Fortunately I am a very big fan of the NBA and always stay updated with the latest news and player statistics. Therefore my passion for running statistical tests with raw data (being an Actuarial Mathematics major) combined with my strong interest in the NBA makes this a perfect topic for my Honors Capstone Project.

Significance of This Study

In recent years NBA statisticians have taken on a much larger role in team strategy. They utilize statistics to aid the coaching staff with managing playing time, lineup combinations, and situational strategies. It is clear that statisticians help to manage team rotations more efficiently and more teams are beginning to hire them. "Currently, most team sports organizations employ in-house statisticians and analysts to retrieve meaning and insight for the scouts who evaluate future prospects and talent, the coaches who are in charge of the team on the playing surface, as well as the general managers who are in charge of drafting or signing players" (Solieman 4). John Hollinger, a very popular NBA analyst who worked for ESPN, became the Vice President of Basketball Operations for the Memphis Grizzlies in December 2012. Another example is Wayne Winston, author of Mathletics (a book that focuses partly on the mechanics of several NBA player rater formulas), who was a consultant for the Dallas Mavericks. Roland Beech, creator of 82games.com (a very popular and useful NBA statistics website), became the director of basketball analytics of the Dallas Mavericks in 2009.

Clearly over the past decade NBA franchises have realized the advantage to using statistics when strategizing for each season. "Dean Oliver estimates that between 22 and 24 NBA teams currently employ some form of analytics, with about one-half that number seriously

incorporating their findings into the team's approach to the game" (Schwartz 1). However, "as soon as each statistician joined an NBA squad, sharing in public became off-limits" because revealing formulas to all of the other clubs would destroy a team's competitive advantage. (Schwartz 1) Several basketball statistics websites like Basketballvalue.com and 82games.com have not been updated for several years because of this, and therefore the media has taken over as the driving force for shaping how we perceive NBA players. Unfortunately NBA statisticians are unable to share their findings with each other as well, which has slowed the development of basketball analytics over the past decade. This study will use analytics on modern NBA data, which would not be released to the public if it had been done by an NBA franchise.

The results of this study would be useful for fans that watch the games and have altered perceptions, but would be extremely valuable to coaches and team owners. If it was discovered that some players are falling under the radar in terms of production or are being overrated based on popularity, playing time and salaries could be adjusted to reflect that player's effectiveness. Even if the correlation tests reveal that there is no difference between perceived and calculated player values, the Player Rater formulas can be used for future studies.

Thesis and Minor Hypotheses

In this research project several types of statistical analyses are used to reveal actual NBA player effectiveness for the past 12 seasons. There are many methods of rating player performance that have been developed by basketball statisticians which will be used to assign an efficiency value for each NBA player. Each formula will be investigated to find what types of statistics are valued and how each statistician applied them in his or her rater. The raters

differ from each other in terms of the statistics they place importance on so they all will be used in order to calculate player effectiveness from multiple perspectives. Correlations will then be used to compare this data against actual MVP voting results. In addition to the many Player Raters used to evaluate player performance, another rater will be created which addresses the shortcomings of the other formulas, providing a more accurate method of determining player efficiency.

There are several other hypotheses that will be tested by analyzing the collected raw basketball statistics and MVP voting results. These include whether people perceive players from big market teams to be more valuable than others, whether the star players from the teams receiving the most media coverage are favored in MVP voting, and whether players who accrue more popular stats (points, rebounds, etc.) receive more credit than those who contribute equally in other areas (defensive statistics and shooting percentages). Other tests that will be conducted include finding how much a player contributes to the success of his team (win-share percentage) and testing to see if the star players on teams with the best records receive more recognition for their team's success than they actually contributed. Therefore, many conclusions will be made by using statistical analyzing techniques on NBA players from the 2000 to 2012 seasons, with an ultimate deliverable of an improved Player Rater formula.

PLAYER RATERS AND PERCEPTION FACTORS

Data Collected

In order to conduct this study all raw basketball statistics from every player in the NBA from the 2000-2001 season to the 2011-2012 season were collected from basketball-reference.com.

The basic raw statistics include each player's number of field goals made and attempted, 3-pointers made and attempted, free throws made and attempted, offensive and defensive rebounds, steals, blocks, turnovers, fouls, assists, and points.

Table 1. Statistics and their Abbreviations

Abbreviation	Statistic	Abbreviation	Statistic
FG	Field Goal %	Stl	Steals
3P	Three Point %	Blk	Blocks
FT	Free Throw %	TO	Turnovers
Oreb	Offensive Rebounds	PF	Personal Fouls
Dreb	Defensive Rebounds	PTS	Points
Ast	Assists		

(Loeffelholz 3)

Number of games and minutes played were also used to determine the number of each basic raw statistic each player accrued per game, per minute, per 36 minutes (average starter's minutes), and per 48 minutes (length of regulation). One "important breakthrough for analysis of the NBA was finding that statistics calculated on a per-minute basis tend to be fairly consistent even when a player's minutes played are variable. This allows for direct comparisons of starters and reserves who player fewer minutes (per-minute statistics become unreliable for players who have played very few minutes; generally, 500 or 1,000 minutes played in an NBA season is used as a cut-off point)" (Kubatko: Starting Point 9).

One example of raw data manipulation involves shooting percentages. These include Field Goal Percentage, Free Throw Percentage, Effective Field Goal Percentage, and True Shooting Percentage:

- Field Goal % = FGM/FGA
- Free Throw % = FTM/FTA
- Effective Field Goal % = (FGM + 0.5 x 3PM)/FGA

- True Shooting % = (PTS/2)/(FGA + 0.44 x FTA)

Field Goal Percentage incorporates only shots taken from the field while Free Throw Percentage incorporates only shots taken from the free throw line. (3-Pointer Percentage is another statistic which only considers shots taken from beyond the 3-point arc). Effective Field Goal Percentage is a more advanced shooting statistic which incorporates only shots taken from the field and adjusts it for 3-pointer value. True Shooting Percentage incorporates every type of shot attempt by a player to determine a player's true scoring efficiency. "Over the 1996-1997 through 2005-2006 seasons, means and standard deviations for three [of the] measures, measured at the player level, are as follows:" (Kubatko: Starting Point 10).

- Field Goal % = 44.6% (4.7%)
- Effective Field Goal % = 47.9% (4.4%)
- True Shooting %: 52.3% (4.5%)

These manipulated shooting statistics are examples of variables NBA statisticians use in Player Rater formulas.

More advanced statistics that were recorded include Plus-Minus, Win-Shares, and player efficiency ratings using Player Rater formulas developed by NBA statisticians. All of this data, which was collected for every NBA player for the past 12 seasons, was used to measure against the results of MVP voting for each season.

Perception Factors

Fans, announcers, team management, and even coaches at times are misled by various factors when judging the effectiveness of NBA players. These perception factors may include jersey sales, fan support, team heritage, city population, and Fan Cost Index. Even the leading players in terms of jerseys sold each year are not necessarily the most effective players on the

court, and a player's performances in previous seasons can affect these numbers. Fan support includes attendance percentage at a given team's home games and this can affect the amount of media exposure the players on each team receives, regardless of performance. Team heritage is the success of a franchise throughout history in terms of winning percentage, playoff performances, and championships. Another factor is city population, which affects both media coverage and fan support. Fan Cost Index is simply a measure of the average total expenses paid by fans who attend games. All of the factors mentioned effect each other and it is clear that players on bigger market teams receive the most media coverage and therefore are perceived to be more valuable than equally effective players on small market teams. Some of these factors will be addressed in this study when comparing actual MVP rankings with Player Rater values for each season.

Another perception factor is the success, or win-loss, record of a player's team for a given season. Players on more successful teams tend to get more recognition than they deserve and this leads spectators to believe they are the most efficient players in the NBA while this may not always be true. This greatly effects star players on successful teams, who tend receive an extreme amount of praise for their team's success despite the fact that some of their teammates may have been even more beneficial to the team. A player's performances in past seasons also tend to skew perceptions about them. For example, a player could be ineffective yet still receive recognition if they had been playing at a much higher level in previous seasons. One final factor that effects how people view an NBA player is by the number of "popular" statistics they accrue. "As most coaches would agree, statistics themselves can be very misleading. Certain players are able to build impressive stats but have little effect on a game. On the other hand, there are players who make a significant impact on the game

without having impressive statistics" (Solieman 7). For example, a player who scores lots of points despite being ineffective in other aspects of the game tends to receive more recognition from fans than those who score fewer points but are more efficient all-around players. Many of these perception factors were quantified and can be used to explain discrepancies between player efficiency ratings and MVP voting results.

PLAYER RATERS

NBA Efficiency Rating

There were six types of raters used in this study to place numerical values on player performances. Three of them utilize only raw player statistics (ignoring team success). "The most basic rating systems for professional basketball players are simple (or not so simple) functions of 'positive' statistics such as free throw percentage and the number of steals as well as 'negative' statistics like the number of turnovers and personal fouls" (Fearnhead 1). Perhaps the most simplistic of these formulas is the NBA Efficiency Rating, created by Dave Hereen:

Efficiency per game = (points per game) + (rebounds per game) + (assists per game) + (steals per game) – (turnovers per game) – (missed FG per game) – (missed FT per game)

This rater only involves adding or subtracting the most basic basketball statistics depending on whether they are beneficial or harmful to player performance. Although the formula is very easy to understand and accounts for negative actions as well as positive ones, it has many

shortcomings and is far from being the most accurate player rater. First of all, it does not place any weight on each type of statistic, basically stating good statistics are worth +1 and all bad statistics are worth -1. Because points are accrued in greater volumes than other statistics, the formula overrates pure scorers and underrates more efficient and well-rounded players. It is evident that "certain players (such as Carmelo Anthony and Amare Stoudemire) are vastly overrated according to the NBA Efficiency metric" (Winston 196). Not to mention, it completely ignores some of the most basic statistics such as blocks (a key measure of defensive ability) and 3-pointers (players who attempt 3-pointers are more likely to miss field goals and therefore are underrated by this formula). Although there are many flaws in this formula, it does provide a rough measure of player performance.

Hollinger's PER

Another Player Rater using only raw player data is Hollinger's Player Efficiency Rating, commonly referred to as PER. This rater measures a player's per-minute performance, allowing comparison between players who play for most of the game and those who see limited minutes. It accounts for all basic statistics, including field goals, free throws, 3-pointers, assists, rebounds, blocks, and steals. It also incorporates negative actions including turnovers, personal fouls, and missed shots. In addition to being adjusted based on number of minutes played, it also is adjusted based on game pace (number of possessions a player's team and opposing team has per game). The formula is very complex and begins by calculating Unadjusted PER:

$$uPER = \frac{1}{Min} * (3P + [(2/3) * AST] + [(2 - factor * (tmAST/tmFG)) * FG] + [FT * 0.5 * (1 + (1 - (tmAST/tmFG)) + (2/3) * (tmAST/tmFG))] - [VOP * TO] - [VOP * DRBP * (FGA - FG)] - [VOP * 0.44 * (0.44 + (0.56 * DRBP)) * (FTA - FT)] + [VOP * (1 - DRBP) * (TRB - ORB)] + [VOP * DRBP * ORB] + [VOP * STL] + [VOP * DRBP * BLK] - [PF * ((lgFT/lgPF) - 0.44 * (lgFTA/lgPF) * VOP)])$$

Where

- $factor = (2/3) - [(0.5 * (lgAST/lgFG))/(2 * (lgFG/lgFT))]$
- $VOP = [lgPTS/(lgFGA - lgORB + lgTO + 0.44 * lgFTA)]$
- $DRBP = [(lgTRB - lgORB)/lgTRB]$

The Unadjusted PER is then converted to PER by adjusting for team pace, eliminating any statistical advantage that players on faster-paced teams may have:

$$PER = [uPER * (lgPace/tmPace)] * (15/lguPER)$$

An easier method for calculating PER which produces results that are highly correlated with the original formula is:

PER = [(FGM*85.910) + (Steals*53.897) + (3PTM*51.757) + (FTM*46.845) + (Blocks*39.190) + (Offensive_Reb*39.190) + (Assists*34.677) + (Defensive_Reb*14.707) – (Fouls*17.174) – (FT_Miss*20.091) – (FG_Miss*39.190) – (TO*53.897)]*(1/Minutes)

PER has many strengths, including the fact that "an average NBA player [always] has a PER score of 15" (Winston 196). This allows for several benchmarks when assessing player value, and also allows comparisons of player performance across seasons:

PER Benchmarks:

1. A Year for the Ages: 35.0
2. Runaway MVP Candidate: 30.0
3. Strong MVP Candidate: 27.5
4. Weak MVP Candidate: 25.0

5. Bona fide All-Star: 22.5
6. Borderline All-Star: 20.0
7. Solid 2nd option: 18.0
8. 3rd Banana: 16.5
9. Pretty good player: 15.0
10. In the rotation: 13.0
11. Scrounging for minutes: 11.0
12. Definitely renting: 9.0
13. The Next Stop: D-League 5.0

One weakness of this rater is the fact that player ratings in each category depend on other players' performances during that given season. For example, if Player A is head-and-shoulders above the rest in 2007 with 5.0 blocks per game he will receive a very large rating boost in the blocks category; if that same player gets 5.0 blocks/game in 2008 and there are several other players with blocks close to that average, his rating boost in the blocks category will be much smaller. This also can be seen as a strength, depending on how much weight should be given to scarcity in individual categories. However, it does weaken the accuracy of the rater when comparing player performances across seasons.

Another issue with this rater is the shooting categories are flawed because as long as a player shoots above the league average percentage in one area, the greater volume of shots he takes will continue to increase his rating boost in that category. For example, if in 2007 the league average field goal percentage is 31% and Player A shoots 20 field goals per game at a 32% success rate, he will fare much better in the FGM (field goals made) category on Hollinger's Player Rater than Player B who shoots 10 field goals per game at a 32% success rate. "A

player who shoots more than 30.4% on two-point field goals can increase his PER rating by taking more shots. In addition, a player who shoots more than 21,4% on three-point field goals can increase his PER rating by taking more shots", which is very misleading. (Winston 196) One final criticism of this rater is that it is largely a measure of offensive production in that the only defensive stats accounted for are steals and blocks (along with defensive rebounds, which are included in total rebounds).

Hollinger's Game Score

Hollinger's Game Score is a much more simplified version of his PER formula:

Game Score = Points + (FGM x 0.4) + (FGA x ·0.7) + ((FTA·FTM) x ·0.4) + (OREB x 0.7) + (DREB x 0.3) + STL + (AST x 0.7) + (BLK x 0.7) + (PF x ·0.4) · TO

This rater assigns simple weights to each major basketball statistic and correlates well with Hollinger's PER. "Unlike the NBA Efficiency metric or Hollinger's PER rating, the Linear Weights in the Win Score metric seem much more sensible. For example, to raise his rating by shooting more, a player needs to shoot over 50% on two-point field goals or over 33.33% on three-point field goals" (Winston 199). However, it contains similar flaws in that it implies a player shooting just over 29.2% on two-pointers would increase his Game Score by taking a greater volume of shots. It differs from PER because it does not account for other player performances and also is not adjusted for pace. Dave Berri, an NBA analyst, found a very high correlation between this formula and the NBA Player Efficiency Rating. He concluded that "Hollinger's rankings are simply a minor repackaging of NBA Efficiency" with similar

shortcomings. (Winston 199) The high correlation (99%) between these two formulas is surprising because Game Score incorporates weights while NBA Efficiency Rating does not. Not to mention, NBA Efficiency rating does not account for blocks, personal fouls, and also does not assign different weights for offensive and defensive rebounds while Game Score does.

Wins Produced

Two types of raters used in this study, Wins Produced and Win-Shares, incorporate both player statistics and their team's success. Wins Produced can be *estimated* as follows (the actual formula is much more complex):

Wins Produced = points + rebounds + steals + (0.5*assists) + (0.5*blocked shots) – FG attempts – turnovers – (0.5*FT attempts) – (0.5*personal fouls)

This formula gives equal weight to turnovers and rebounds because a turnover loses the team a possession while a rebound creates a possession for the team. Also, the shooting metrics are adjusted more fairly than the NBA Efficiency Rater or Hollinger's PER Rating. For example, for a player to increase his rating in shooting, he has to shoot more than 50% on two-point field goals or over 33% on three-point field goals. Amazingly, this rater was designed so that the sum of Wins Produced for all players on a given team (once again the formula above is an estimator, not the actual formula) will be almost equal to a team's total wins for a given season!

One criticism of this Player Rater is the fact that Wins Produced for each player does not imply that the team's "wins" are accurately partitioned among the team's players. Win-

Shares, a metric that utilizes an extremely complicated method, more accurately reflects the number of wins each player contributed to his team for a given season. Another downfall of this rater is that it is still based on statistics recorded in a box score, meaning there are many unrecorded statistics that may affect a team's probability of winning. Examples of these statistics include taking a charge, deflecting a pass, boxing out a member of the opposing team from collecting a rebound, the pass before the pass that earns an assist, helping out on defense when a teammate is beaten, and setting a screen that leads to a score. "The activity during at least 80% of any game is not tabulated in a box score" (Winston 201). It should be noted that these statistics are still not calculated even today, so it is impossible to include them in a statistical research project that will span NBA seasons from 2000-2012, but it is worth noting.

Win-Shares

Win-Shares is a formula that finds out how much of a team's success can be attributed to an individual player. "The main obstacle analysts in sports face when evaluating player performance is accounting for interaction effects by fellow teammates, or teamwork" (Piette 1). Like Wins Produced, one team win is equivalent to one Win-Share (divided amongst the players who contributed). Therefore, a team with 50 wins will have a total of approximately 50 Win-Shares between all players on the team. This metric also can account for negative Win-Shares (if a player played so poorly that he essentially took away from wins generated by his teammates). The formula for calculating Win-Shares contains several steps:

→Step 1: obtain initial estimate of player's turnovers:
· 0.0005075172 * (minutes played) * (player age)
· 0.0873982755 * (field goals)
+ 0.0925506598 * (field goal attempts)
+ 0.1566322510 * (free throw attempts)
+ 0.0449241773 * (total rebounds)
+ 0.2321637159 * (assists)
+ 0.2040169400 * (personal fouls)

→Step 2: find sum of estimated turnover for players on the given team

→Step 3: calculate player's share of this total

→Step 4: multiply team's turnover (adjusted for team turnovers) by player's share

Basically, the formula finds a player's contributions on offense and defense that can be attributed to the outcomes of their team's games (wins or losses). However, one criticism is that it is very difficult to investigate with its complex constants. Also, it incorporates a player's age, which is a controversial topic when attempting to solely measure player efficiency for a given season. Age also affects all players differently so multiplying it by a single constant is a flaw. This is especially true when considering the toll age takes on smaller players versus larger players (who can contribute more consistently even at an older age because of their size and the nature of their position). Overall, this formula is still very useful because it provides us with a reasonable estimate of how many wins a player contributes to his team.

Plus-Minus (Pure vs. Adjusted)

The final type of "rater" used in this project is actually a non-manipulated statistic in itself, Plus-Minus. Pure Plus-Minus is found by simply subtracting how many points an opposing

team scores from how many points a player's team scores while that player is on the court. This helps reflect team players, as "the definition of a good player is somebody who makes his team better, not a player who scores 40 points per game" (Winston 202). Another form of this statistic is Adjusted Plus-Minus, which is Pure Plus-Minus adjusted for each player by the ability of the players he is on the court with and the players he plays against. This was developed because "the problem with Pure Plus-Minus statistics is that a player's Pure Plus-Minus statistic depends on the quality of the players he plays with and against" (Winston 202). Obviously, Adjusted Plus-Minus is extremely complicated and uses 38,000 rows of play-by-play data by the end of the season to adjust a single player's rating. An interesting application of Pure Plus-Minus is illustrated in the following chart:

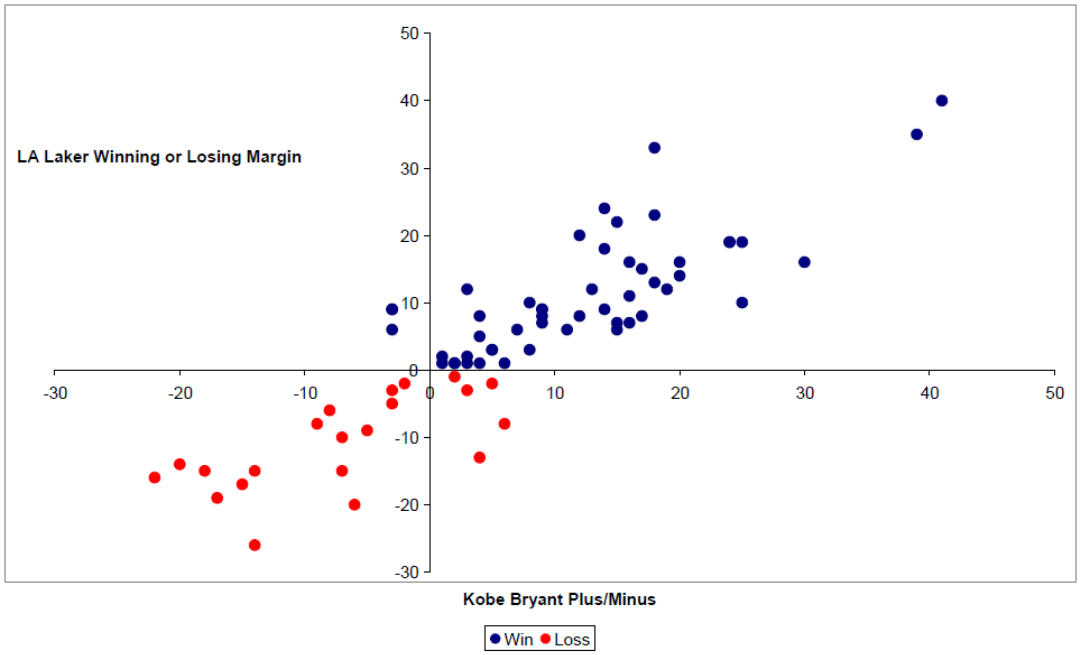

Figure 1. Scatterplot of Los Angeles Laker Winning or Losing Margin vs. Kobe Bryant Plus/Minus: 2009–2010 NBA Regular Season (73 Games)

(Okamoto 1)

Plus-Minus is both unique and extremely useful for determining player efficiency because it discovers how a team fares while the player is on the court rather than just focusing on his accrued stats. Also, a common flaw in many raters is that they underrate players who help their team succeed in many ways yet do not receive recognition because they are overshadowed by all-stars playing alongside them. Plus-Minus eliminates this flaw. Adjusted Plus-Minus accounts for all of the talent on the court at any given time, providing much more accuracy regarding an individual player's actual effectiveness while on the floor. However, due to the fact that this statistic is relatively new and has not been calculated for all players it is not used in this study.

As mentioned, Plus-Minus is very different from other rater formulas and could be used in addition to one of the player rater formulas to help make it more accurate in this statistical research project. The only major drawbacks of this statistic are the fact that it is not adjusted for pace and that it is a relatively new measure. Because it is not adjusted for each player based on the minutes they play, the players who receive the most playing time stand out the most. In most cases the star players on the best teams receive the highest total Plus-Minus for a given season while the star players on the worst teams receive the lowest total Plus-Minus. If a player is on an obsolete team and is on the court for most of the game they are more likely to suffer in terms of this statistic. Adjusted Plus-Minus eliminates this problem and that is why it may be the most accurate mechanism for measuring player efficiency. However, Pure Plus-Minus has only been recorded since 2000 and Adjusted Plus-Minus was only beginning to surface in 2006. Perhaps in a decade this statistic will be more widely available for use by NBA statisticians.

PLAYER RATER MISCONCEPTIONS

Defensive Statistics

A common misconception when using raw basketball statistics to develop Player Rater formulas to assign a value to a player's effectiveness for a given season is that defensive statistics are not accounted for. Steals and blocks are two purely defensive statistics that are incorporated into these formulas. Total rebounds also can be divided into offensive and defensive rebounds, which is another way of quantifying defensive production. The Plus-Minus statistic, which is another method of analyzing player performance that is used in this study, also helps determine the effect of a player's presence on both sides of the floor. Personal fouls and turnovers, two commonly overlooked statistics because they yield negative results on both offense and defense, have also been compiled for each player over the past 12 seasons. Therefore, it should be noted that Player Raters account for these defensive statistics and weight them appropriately when calculating player efficiency.

As mentioned, professional statisticians who develop Player Rater formulas tend to appropriately incorporate defensive statistics in their equations so that every player's performance is accurately measured. This study will, however, test for correlation between the raters themselves and also investigate each formula to determine why they differ and if some value certain statistics over others. (Using the pros and cons of each formula it may be possible to develop a new rater or alter one of the raters to increase the measure of player efficiency). However, "flashy" statistics such as points scored, total rebounds, and assists may hold more value than other statistics for viewers. Correlation between raters only including these "flashy" statistics and MVP voting results may be stronger than that of the voting results

and the most accurate player raters. This study will examine this topic and attempt to unveil the basketball categories that viewers subconsciously value the most.

No Playoff Consideration

The NBA playoffs, which span a few months after the conclusion each regular season, are not considered when running the statistical tests in this thesis. This is simply because the MVP each year is determined based solely on regular season performance, and the main hypothesis is to test for correlation between MVP votes (which are based on season performance only) and player efficiency (therefore also based off of raw basketball statistics from the regular season). If playoff performances were included in the MVP discussion there would be several players that would not be considered simply because their team did not make the playoffs (16 out of the 30 teams in the NBA make the playoffs each year). However, star players on teams who make deep playoff runs receive much more media than other players, and this could play a role in how those players are perceived in future seasons. This data could be used to test the influence media has on player perceptions and MVP voting.

RATER COMPARISONS

Correlations

All player data was collected for the past 12 seasons and Player Rater values were derived for Win-Shares, NBA Efficiency, Hollinger's PER, Hollinger's Game Score, Wins Produced, and Pure Plus-Minus. When testing for correlation between results for these raters, Hollinger's Game Score was 99% correlated with NBA Efficiency Rating. All raters with the exception of Plus-Minus had at least a 65% correlation strength with every other rater. As explained, Plus-Minus is unique in that it does not account for raw statistics, but for points scored while a player is on the court. This is why it correlates with the other raters at a strength of only 35%;

this rater will provide another perspective when reviewing the rater values for MVP candidates for the past 12 seasons.

The following tables show the correlation strength between each of the Player Raters used in this study. The first table accounts for rater values of all players in the league over the past 12 seasons. The second table accounts for only rater values of MVP candidates (those players receiving at least one MVP vote) from the 2000-2001 NBA season to the 2011-2012 season. Green boxes indicate a very strong correlation, yellow boxes show a semi-strong correlation, and red boxes indicate a weak correlation.

ALL PLAYERS CORRELATION	*Pts Won*	*Win-Shares*	*NBA Efficiency Rating*	*Hollinger's PER*	*Hollinger's Game Score*	*Wins Produced*	*Plus-Minus*
Pts Won	1						
WS	**0.352533424**	1					
NBA Efficiency Rating	**0.279945826**	0.882582719	1				
Hollinger's PER	**0.222195729**	0.649838865	0.7280068	1			
Hollinger's Game Score	**0.298333331**	0.882241687	0.989026817	0.738149645	1		
Wins Produced	**0.260118703**	0.854253195	0.911159722	0.708550636	0.867100863	1	
Plus-Minus	**0.280933863**	0.529866331	0.300933514	0.260492942	0.307814644	0.338320063	1

MVP CANDIDATE CORRELATION	***Pts Won***	*Win-Shares*	*NBA Efficiency Rating*	*Hollinger's PER*	*Hollinger's Game Score*	*Wins Produced*	*Plus-Minus*
Pts Won	1						
WS	**0.531377302**	1					
NBA Efficiency Rating	**0.495737178**	0.753983422	1				
Hollinger's PER	**0.502987066**	0.70671557	0.849188441	1			
Hollinger's Game Score	**0.495052951**	0.706511718	0.926311011	0.871579554	1		
Wins Produced	**0.324473927**	0.624892667	0.677126608	0.549612561	0.43860697	1	
Plus-Minus	**0.439451584**	0.480913513	0.206181003	0.337346484	0.153630014	0.270234123	1

Obviously, the strength of the correlation between each rater value and MVP points won is weaker when considering all players in the league. This is because a majority of players in the league received zero MVP votes despite the fact that these players had a large variety of Player Rater values. Some values were even outliers due to the nature of some of the formulas. A player with a very small amount of playing time, for example, has an extreme rating depending on his actions during those minutes. The second table expresses a stronger correlation (approximately 50% for each rater) between MVP Points Won and rater values

because it accounts for a much smaller sample size. However, there is a fair amount of disparity in the second table amongst the raters, indicating that not all of them are consistent with each other when placing a numerical value on player efficiency.

Player Raters vs. MVP Voting

As previously mentioned in this paper perception factors result in bias, though it may be unintentional, when determining player efficiency. Once again, the six Player Raters used in this study help eliminate that bias by manipulating a wide range of basketball statistics to come up with values representing player efficiency for every player. MVP voting results were used in this study as a tool for quantifying the perceived value of players receiving votes for each season. For example, the following table contains the 18 players who received at least one MVP vote for the 2001-2002 NBA season. It also lists each player's rank based on the six Player Raters. The rightmost column contains an average of these ranks. Green boxes represent an average player rater rank from 1 to 25, yellow boxes represent an average rank from 25 to 50, and red boxes indicate the average rank is greater than 50.

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2001_Tim Duncan	1	1	3	2	2	2	1		1.8
2001_Jason Kidd	2	15	33	22	15	19	23		21.2
2001_Shaquille O'Neal	3	4	2	1	5	1	4		2.8
2001_Tracy McGrady	4	6	5	3	10	27	11		10.3
2001_Kobe Bryant	5	9	9	10	42	5	7		13.7
2001_Gary Payton	6	7	11	9	28	51	8		19.0
2001_Chris Webber	7	3	4	4	7	8	27		8.8
2001_Dirk Nowitzki	8	5	6	7	6	7	3		5.7
2001_Allen Iverson	9	13	19	5	141	33	48		43.2
2001_Ben Wallace	10	33	42	44	1	65	10		32.5
2001_Paul Pierce	11	10	10	8	21	22	5		12.7
2001_Kevin Garnett	12	2	7	6	3	17	6		6.8
2001_Michael Jordan*	13	32	31	27	131	146	145		85.3
2001_Steve Nash	14	27	20	25	55	23	17		27.8
2001_Jerry Stackhouse	15	44	43	34	155	84	71		71.8
2001_Mike Bibby	16	87	111	71	135	11	61		79.3
2001_Elton Brand	17	8	8	11	4	167	2		33.3
2001_Peja Stojakovic	18	26	23	18	32	12	16		21.2

This visual makes it easy to see that most of the candidates for NBA MVP in the 2000-2001 season had average rater ranks between 1 and 25. Once again, this means that according to a combination of the six raters most of the players who received MVP votes were in fact among the top 25 in terms of player efficiency for this season. In fact, Tim Duncan, the MVP winner for this season, had a rater rank of three or better for *every* rater. However, the rightmost column is an unweighted average of each of the raters, and the Player Raters are not equally correlated with each other. For this reason it should be noted that the rater average was only used in this exercise as a rough guide for finding players that should *not* have received MVP votes. As you can see, Michael Jordan, Jerry Stackhouse, and Mike Bibby all have average rater values exceeding 50. The large difference between the three leftmost rater values and the three rightmost rater values should also be noted. Specific examples of players across the past 12 seasons will be researched in the next section to determine the effect perception factors may have had on their MVP candidacy.

SPECIFIC PLAYER EXAMPLES

2001-2002: Michael Jordan

MVP Rank: 13; Average Player Rater Rank: 85.3

Many sources have declared Michael Jordan to be the best basketball player of all time, and it is obvious that his past performances helped him gather MVP votes for this particular season. In fact, Jordan returned from retirement this season to play for the Washington Wizards and his success playing with the Chicago Bulls during the 1990s drove the hype surrounding him. Despite the fact that he led the Wizards in scoring, assists, and steals this season (all "flashy" statistics) he was not nearly as efficient as he had been in his past. Clearly, past performance

and media hype played a large role in boosting Michael Jordan's perceived efficiency for this season.

2003-2004: LeBron James

MVP Rank: 9; Average Player Rater Rank: 111.2

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2003_Kevin Garnett	1	1	1	1	1	1	1		1.0
2003_Tim Duncan	2	2	2	3	2	2	3		2.3
2003_Jermaine O'Neal	3	21	22	19	23	9	24		19.7
2003_Peja Stojakovic	4	5	9	5	14	12	2		7.8
2003_Kobe Bryant	5	8	5	4	29	27	10		13.8
2003_Shaquille O'Neal	6	7	3	6	4	11	15		7.7
2003_Ben Wallace	7	42	71	48	3	10	12		31.0
2003_Jason Kidd	8	15	34	21	24	21	48		27.2
2003_LeBron James	9	33	53	18	86	387	90		111.2
2003_Sam Cassell	10	14	11	15	62	3	4		18.2
2003_Baron Davis	11	19	26	11	81	48	47		38.7
2003_Dirk Nowitzki	12	4	8	8	9	15	6		8.3
2003_Andrei Kirilenko	13	22	14	14	13	79	5		24.5
2003_Carmelo Anthony	14	46	59	34	114	96	69		69.7
2003_Yao Ming	15	24	19	32	17	41	7		23.3
2003_Michael Redd	16	34	29	17	63	302	16		76.8

The MVP voting results of the 2003-2004 NBA season reveal that LeBron James, who finished ninth in voting, was not nearly as efficient as most perceived him to be. Perception factors which helped him gather MVP votes include the fact that he set many records as a rookie and there was a large amount of media hype surrounding him. Some of these records include becoming the youngest player (at age 19) to score at least 40 points in a game and joining Michael Jordan and Oscar Robertson by averaging 20-5-5 (20 points, 5 rebounds, and 5 assists) per game as a rookie. It is also important to notice the dominant season Kevin Garnett had and the fact that he deserved to win the MVP. Impressively, he ranked first in *all* of the player raters!

2004-2005: P.J. Brown

MVP Rank: 14; Average Player Rater Rank: 137

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2004_Steve Nash	1	14	11	19	28	3	15		15.0
2004_Shaquille O'Neal	2	13	5	10	8	11	13		10.0
2004_Dirk Nowitzki	3	3	7	4	3	6	2		4.2
2004_Tim Duncan	4	10	6	13	4	1	10		7.3
2004_Allen Iverson	5	5	10	2	81	157	22		46.2
2004_LeBron James	6	2	8	1	9	55	4		13.2
2004_Tracy McGrady	7	9	18	7	31	29	7		16.8
2004_Dwyane Wade	8	12	13	9	56	20	14		20.7
2004_Amare Stoudemire	9	4	3	5	7	5	3		4.5
2004_Ray Allen	10	29	35	20	80	31	16		35.2
2004_Kevin Garnett	11	1	4	3	1	60	1		11.7
2004_Gilbert Arenas	12	16	27	11	54	86	9		33.8
2004_Vince Carter	13	20	15	15	61	122	20		42.2
2004_P.J. Brown	14	62	142	82	26	460	50		137.0
2004_Marcus Camby	15	56	41	69	10	82	67		54.2
2004_Shawn Marion	16	7	16	14	2	4	5		8.0

In the 2004-2005 NBA season P.J. Brown of the Charlotte Hornets finished 14th in MVP voting, but as the rater rankings suggest, he was not as valuable as he was perceived to be. Media hype once again played a role in this decision, as P.J. Brown was the recipient of several NBA Sportsmanship Awards over the course of his career in addition to being on the NBA All-Defensive Team three times. His defensive abilities explain the Wins Produced rater ranking him highest (his presence was valuable to his team's success), but the other raters suggest he did not contribute enough in other areas to be a worthy member of the MVP candidate list for this season.

2006-2007: Shaquille O'Neal

MVP Rank: 12; Average Player Rater Rank: 84.7

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2006_Dirk Nowitzki	1	3	3	5	8	2	1		3.7
2006_Steve Nash	2	7	6	10	20	3	5		8.5
2006_Kobe Bryant	3	2	2	1	23	67	4		16.5
2006_Tim Duncan	4	12	5	17	6	1	3		7.3
2006_LeBron James	5	6	12	3	22	18	2		10.5
2006_Tracy McGrady	6	26	16	18	64	17	28		28.2
2006_Chris Bosh	7	8	17	11	10	44	21		18.5
2006_Gilbert Arenas	8	9	10	4	48	42	12		20.8
2006_Carlos Boozer	9	5	7	19	4	50	18		17.2
2006_Kevin Garnett	10	1	11	6	1	155	13		31.2
2006_Chauncey Billups	11	36	31	28	45	19	8		27.8
2006_Shaquille O'Neal	12	71	25	60	60	115	177		84.7
2006_Amare Stoudemire	13	18	8	25	16	14	10		15.2
2006_Dwyane Wade	14	4	1	2	26	71	25		21.5
2006_Carmelo Anthony	15	13	13	7	68	79	40		36.7
2006_Baron Davis	16	24	18	21	55	34	60		35.3
2006_Tony Parker	17	46	27	38	86	9	20		37.7

Shaquille O'Neal's 2006-2007 NBA season with the Miami Heat is a great example of how multiple perception factors affect how a player is viewed by several audiences. Past performance plays a large role in this case, as O'Neal had multiple historical seasons with the Los Angeles Lakers in prior seasons which will help him go down as one of the greatest NBA Centers of all time. He put up considerably lower numbers than he did with the Lakers in prior seasons, when he deserved to be on this list. He

2006 Attendance		Home			
RK	TEAM	GMS	TOTAL	AVG	PCT
1	Heat	41	818,149	19,954	**101.8**
2	Spurs	41	770,677	18,797	**101.6**
3	Pistons	41	905,116	22,076	**100**
4	Hornets	41	744,920	18,168	**100**
	Kings	41	709,997	17,317	**100**
6	NY Knicks	41	776,176	18,931	**98.2**
7	Lakers	41	774,189	18,882	**97.9**
8	Bulls	41	868,720	21,188	**97.6**
9	Thunder	41	664,157	16,198	**94.9**
10	Cavaliers	41	792,391	19,326	**94**
11	Suns	41	730,179	17,809	**93.6**
12	Warriors	41	749,185	18,272	**93.2**
13	Jazz	41	751,621	18,332	**92.1**
14	Celtics	41	692,873	16,899	**90.7**
15	Magic	41	638,005	15,561	**90.2**
16	Bucks	41	681,337	16,617	**88.8**
17	Pacers	41	663,368	16,179	**88.2**
18	Raptors	41	699,332	17,056	**86.1**
19	Grizzlies	41	647,533	15,793	**85.8**
20	Timberwo	41	662,167	16,150	**85**
21	Nets	41	691,543	16,866	**84.4**
22	Rockets	41	636,110	15,514	**83.9**
23	76ers	41	677,278	16,518	**80.8**
24	Trail Blaze	41	617,019	15,049	**75.3**
25	Hawks	41	617,942	15,071	--
	Mavericks	41	824,693	20,114	--
	Nuggets	41	702,645	17,137	--
	Clippers	41	712,409	17,375	--
	Wizards	41	705,062	17,196	--
	Bobcats	41	671,011	16,366	--

also finished ninth in jersey sales during this season, which is reflective of the hype surrounding him throughout his career due to his previous dominance and his unique personality.

As shown in the table above, the Miami Heat also finished first in Fan Support during the 2006-2007 season. The extreme attendance rates were another perception factor propelling O'Neal's MVP campaign even though his efficiency during the season was nowhere near that of the other players who received MVP votes.

2007-2008: Tracy McGrady

MVP Rank: 8; Average Player Rater Rank: 62.8

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2007_Kobe Bryant	1	4	6	3	24	5	4		7.7
2007_Chris Paul	2	2	5	2	14	12	1		6.0
2007_Kevin Garnett	3	8	7	13	6	2	6		7.0
2007_LeBron James	4	1	4	1	8	85	2		16.8
2007_Dwight Howard	5	5	15	9	1	13	8		8.5
2007_Amare Stoudemire	6	3	3	4	4	23	3		6.7
2007_Tim Duncan	7	13	11	17	9	20	13		13.8
2007_Tracy McGrady	8	51	56	38	109	46	77		62.8
2007_Steve Nash	9	15	19	21	31	6	14		17.7
2007_Manu Ginobili	10	32	13	27	41	18	12		23.8
2007_Dirk Nowitzki	11	7	8	6	16	10	7		9.0
2007_Deron Williams	12	17	23	14	55	19	11		23.2
2007_Carmelo Anthony	13	12	14	8	37	80	36		31.2
2007_Carlos Boozer	14	6	17	16	12	21	15		14.5
2007_Antawn Jamison	15	21	41	24	20	67	23		32.7
2007_Paul Pierce	16	33	38	35	47	1	9		27.2
2007_Rasheed Wallace	17	87	104	86	56	15	45		65.5

Tracy McGrady is another example of a player who received too much recognition based on his play in previous seasons. He was voted an All-Star seven times throughout his career and also led the league in points in the 2003-2004 season. During the 2007-2008 season he clearly was slipping out of his prime, but his past legacy along with the fact that he played with international sensation Yao Ming helped maintain his popularity. All of the raters ranks are higher than 37, and he clearly should not have finished eighth in the MVP race this season.

Not to mention, he finished in the top 15 in jersey sales this season, as he had done in the past few seasons as well.

2010-2011: Stephen Jackson

MVP Rank: 15; Average Player Rater Rank: 189.5

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2010_Derrick Rose	1	13	11	5	60	10	5		17.3
2010_Dwight Howard	2	3	3	2	2	11	3		4.0
2010_LeBron James	3	2	2	1	6	1	1		2.2
2010_Kobe Bryant	4	18	7	12	69	17	14		22.8
2010_Kevin Durant	5	6	8	3	24	35	7		13.8
2010_Dirk Nowitzki	6	10	6	14	20	8	10		11.3
2010_Dwyane Wade	7	8	5	4	28	4	6		9.2
2010_Manu Ginobili	8	46	19	31	63	6	18		30.5
2010_Amare Stoudemire	9	12	10	7	33	124	30		36.0
2010_Blake Griffin	10	4	15	8	5	382	20		72.3
2010_Rajon Rondo	11	31	85	42	48	15	50		45.2
2010_Tony Parker	12	37	27	30	85	24	27		38.3
2010_Chris Paul	13	9	13	15	23	41	4		17.5
2010_Chris Bosh	14	24	47	25	27	2	13		23.0
2010_Stephen Jackson	15	78	164	69	174	429	223		189.5
2010_Joe Johnson	16	59	101	53	138	111	117		96.5

The table suggests that there had to have been multiple perception factors involved when Stephen Jackson was awarded MVP votes. He was a valuable member of the San Antonio Spurs for multiple seasons and played well in the playoffs to help them win a championship. He also had a memorable playoff run with the Golden State Warriors in 2007. However, MVP voting (along with player efficiency for this table) is based only on in-season performances. Playoffs receive much more media attention than season games and Stephen Jackson greatly benefitted from this even though his statistics for this season were certainly not worthy of an MVP vote.

2010-2011: Derrick Rose

MVP Rank: 1; Average Player Rater Rank: 17.3

Another example from the 2010-2011 NBA season is Derrick Rose, who was declared the MVP of the season and became the youngest player to ever receive this award at the age of

22. According to the Player Raters there were several players who were more efficient than Rose this season, but various perception factors helped him receive votes that should not have been his. This was a breakout season for Rose, who quickly became a media favorite as he led the Chicago Bulls to 62 wins in the regular season, the first time this franchise had recorded more than 60 wins since the 1997-1998 season. The Bulls, however, had many great players who were a solid supporting cast to Rose in his MVP season. It appears that all of the success this team had was attributed to Rose by the media, as no other Bulls player received a single MVP vote.

Derrick Rose also was a shoot-first Point Guard, meaning he looks to attack the basket as his first option and scored many points as a result. Because of this he became the third player in the past thirty seasons to record more than 2,000 points and 600 assists in an NBA season, joining LeBron James and Michael Jordan (two of the best players to ever play the game). His assists total was impressive, but the fact that he scored so many points (the most overrated basketball statistic by the media) as a Point Guard helped him receive even more media attention and therefore more MVP votes.

<u>2011-2012: Kobe Bryant</u>

MVP Rank: 4; Average Player Rater Rank: 40.3

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares		
2011_LeBron James	1	1	1	1	3	1	1		1.3
2011_Kevin Durant	2	3	4	2	8	7	3		4.5
2011_Chris Paul	3	4	3	4	15	12	2		6.7
2011_Kobe Bryant	4	12	20	6	93	74	37		40.3
2011_Tony Parker	5	28	17	20	90	2	22		29.8
2011_Kevin Love	6	2	6	3	2	162	4		29.8
2011_Dwight Howard	7	5	8	5	1	54	16		14.8
2011_Rajon Rondo	8	20	85	34	45	49	61		49.0
2011_Steve Nash	9	27	38	35	46	56	47		41.5
2011_Dwyane Wade	10	13	5	7	40	10	15		15.0
2011_Derrick Rose	11	18	14	8	82	17	41		30.0
2011_Dirk Nowitzki	12	17	25	19	35	27	18		23.5
2011_Russell Westbrook	13	15	15	10	85	6	13		24.0
2011_Tim Duncan	14	35	11	41	20	14	45		27.7
2011_Joe Johnson	15	50	67	33	86	32	32		50.0

One of the most recent examples of perception factors affecting how a player's efficiency is viewed is Kobe Bryant during the 2011-2012 NBA season. Bryant has been one of the most well-known players in the league for over a decade and is one of the best scorers in the league. He has won multiple championships with the Los Angeles Lakers and receives a substantial amount of media attention.

Rank	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
1	Dwyane Wade	Kobe Bryant	Kevin Garnett	Kobe Bryant	Kobe Bryant	LeBron James	Derrick Rose	LeBron James
2	LeBron James	Dwyane Wade	Kobe Bryant	LeBron James	LeBron James	Kobe Bryant	Jeremy Lin	Kevin Durant
3	Allen Iverson	LeBron James	Allen Iverson	Chris Paul	Dwight Howard	Rajon Rondo	Kobe Bryant	Kobe Bryant
4	Kobe Bryant	Allen Iverson	LeBron James	Kevin Garnett	Derrick Rose	Amar'e Stoudemire	LeBron James	Carmelo Anthony
5	Stephon Marbury	Carmelo Anthony	Steve Nash	Allen Iverson	Dwyane Wade	Derrick Rose	Carmelo Anthony	Derrick Rose
6	Shaquille O'Neal	Steve Nash	Dwyane Wade	Dwyane Wade	Kevin Garnett	Dwayne Wade	Dwyane Wade	Rajon Rondo
7	Tracy McGrady	Vince Carter	Gilbert Arenas	Paul Pierce	Chris Paul	Kevin Durant	Dirk Nowitzki	Dwyane Wade
8	Carmelo Anthony	Gilbert Arenas	Dirk Nowitzki	Nate Robinson	Paul Pierce	Carmelo Anthony	Kevin Durant	Blake Griffin
9	Vince Carter	Shaquille O'Neal	Stephon Marbury	Pau Gasol	Shaquille O'Neal	Dwight Howard	Blake Griffin	Dwight Howard
10	Ben Wallace	Stephon Marbury	Carmelo Anthony	Dwight Howard	Pau Gasol	John Wall	Rajon Rondo	Chris Paul
11	Tim Duncan	Dirk Nowitzki	Kevin Durant	Derrick Rose	Carmelo Anthony	Blake Griffin		Deron Williams
12	Dirk Nowitzki	Tracy McGrady	Paul Pierce	Ray Allen	Steve Nash	Shaquille O'Neal		Russell Westbrook
13	Paul Pierce	Paul Pierce	Tracy McGrady	Steve Nash	David Lee	Ray Allen		Steve Nash
14	Steve Nash	Chris Paul	Dwight Howard	Shaquille O'Neal	Allen Iverson	Paul Pierce		Paul Pierce
15	Amar'e Stoudemire	Tim Duncan	Chris Paul	Carmelo Anthony	Kevin Durant	Kevin Garnett		Dirk Nowitzki

The table above reveals that Kobe Bryant jerseys have been among the most popular for many seasons. The team heritage (win-loss record) of the Los Angeles Lakers franchise, as shown in the table below, reveals that the Lakers have been one of the most successful franchises in NBA history:

Franchise	Lg	From	To	Yrs	G	W	L	W-L% ▼	Plyfs	Div	Conf	Champ
Los Angeles Lakers	NBA/BAA	1949	2013	65	5070	3139	1931	0.619	59	32	18	16
Boston Celtics	NBA/BAA	1947	2013	67	5178	3081	2097	0.595	50	30	9	17
San Antonio Spurs	NBA/ABA	1968	2013	46	3678	2164	1514	0.588	40	18	4	4
Phoenix Suns	NBA	1969	2013	45	3589	1998	1591	0.557	29	6	2	0
Utah Jazz	NBA	1975	2013	39	3098	1684	1414	0.544	25	8	2	0
Portland Trail Blazers	NBA	1971	2013	43	3423	1823	1600	0.533	29	4	3	1
Philadelphia 76ers	NBA	1950	2013	64	5005	2659	2346	0.531	47	11	5	3
Oklahoma City Thunder	NBA	1968	2013	46	3669	1941	1728	0.529	25	8	4	1
Milwaukee Bucks	NBA	1969	2013	45	3587	1871	1716	0.522	26	13	2	1
Orlando Magic	NBA	1990	2013	24	1866	971	895	0.52	14	5	2	0
Chicago Bulls	NBA	1967	2013	47	3750	1945	1805	0.519	31	9	6	6
Houston Rockets	NBA	1968	2013	46	3670	1872	1798	0.51	26	4	4	2
Miami Heat	NBA	1989	2013	25	1946	985	961	0.506	16	9	3	2
Indiana Pacers	NBA/ABA	1968	2013	46	3676	1861	1815	0.506	29	7	1	3
Dallas Mavericks	NBA	1981	2013	33	2604	1312	1292	0.504	18	3	2	1
Denver Nuggets	NBA/ABA	1968	2013	46	3678	1836	1842	0.499	32	10	0	0
New York Knicks	NBA/BAA	1947	2013	67	5176	2582	2594	0.499	41	7	4	2
Atlanta Hawks	NBA	1950	2013	64	5004	2477	2527	0.495	41	10	0	1
Detroit Pistons	NBA/BAA	1949	2013	65	5071	2491	2580	0.491	40	11	5	3
New Orleans Hornets	NBA	1989	2013	25	1948	940	1008	0.483	12	1	0	0
Sacramento Kings	NBA/BAA	1949	2013	65	5069	2355	2714	0.465	29	5	0	1
Golden State Warriors	NBA/BAA	1947	2013	67	5175	2371	2804	0.458	28	7	1	3
Cleveland Cavaliers	NBA	1971	2013	43	3426	1568	1858	0.458	18	3	1	0
Washington Wizards	NBA	1962	2013	52	4149	1847	2302	0.445	25	7	4	1
Brooklyn Nets	NBA/ABA	1968	2013	46	3676	1596	2080	0.434	23	5	2	2
Toronto Raptors	NBA	1996	2013	18	1375	556	819	0.404	5	1	0	0
Minnesota Timberwolves	NBA	1990	2013	24	1864	744	1120	0.399	8	1	0	0
Los Angeles Clippers	NBA	1971	2013	43	3424	1269	2155	0.371	8	0	0	0
Memphis Grizzlies	NBA	1996	2013	18	1372	509	863	0.371	5	0	0	0
Charlotte Bobcats	NBA	2005	2013	9	668	236	432	0.353	1	0	0	0

Not to mention, with a population of almost 18 million Los Angeles is the second most populated city in the country that hosts an NBA team. All of these factors have caused Kobe Bryant to receive a significant amount of media attention over the years along with multiple MVP votes. The Player Raters suggest that he should not have finished fourth in the MVP race for the 2011-2012 NBA season.

Improved Rater

It has been proven through several examples that in many cases over the past 12 seasons NBA players are inaccurately judged because of exterior factors. Once again, a variety of perception factors cause bias when determining player efficiency. It should be realized that in many of the individual examples that were explored in this report that there was a large difference in some of the rater ranks. It was previously explained that NBA Efficiency Rating, Hollinger's PER, and Hollinger's Game Score all focus solely on individual statistics. Wins Produced and Win-Shares use complex formulas to determine how much a player contributed to his team's success. Plus-Minus is a unique statistic that finds the net points scored (difference between own team and opposition) while a player is on the floor.

All of the Player Raters address a different dimension of the game, though they do have their own shortcomings. Plus-Minus, for example, can rank a very efficient player very poorly if he plays for a majority of each game on a weak team. Wins Produced and Win-Shares also hurt players who play for weaker teams. NBA Efficiency Rating, Hollinger's PER, and Hollinger's Game Score are accurate in terms of individual player statistics, but do not account for the overall impact of the player for his team. It is common for NBA statisticians to divide themselves when discussing which player rater formulas are more appropriate for judging player effectiveness, but this experiment has proven that all six of these raters are truly needed to get a full measure of NBA player efficiency.

In the tables expressing Player Rater ranks for each of the MVP candidates a simple average was used for simplicity. This helped to determine individual players who did not belong in the MVP race for specific NBA seasons and also helped explain what perception factors affect the voting. In order to combine all six of the raters accurately, a form of a weighted average

needs to be used. The table below contains correlation values for each of the six Player Raters used in this study.

ALL PLAYERS CORRELATION	*Win-Shares*	*NBA Efficiency Rating*	*Hollinger's PER*	*Hollinger's Game Score*	*Wins Produced*	*Plus-Minus*
Win-Shares	1					
NBA Efficiency Rating	0.882582719	1				
Hollinger's PER	0.649838865	0.7280068	1			
Hollinger's Game Score	0.882241687	0.989026817	0.738149645	1		
Wins Produced	0.854253195	0.911159722	0.708550636	0.867100863	1	
Plus-Minus	0.529866331	0.300933514	0.260492942	0.307814644	0.338320063	1

The rater values used to find these correlation values were gathered from the raw statistics of *all* NBA players for the past 12 seasons (approximately 5400 players). Therefore the sample size is extremely large and it would be reasonable to expect any individual NBA season to contain very little variation from these correlation results. As you can see, the correlation between Hollinger's Game Score and NBA Efficiency Rating is higher than the correlation between any other pair, so weighting all raters equally would simply favor these two raters more heavily.

It also should be noted that the raters have different scales (it is reasonable to assume Plus-Minus to span anywhere from -700 to +700 in a season while other raters do not tend to exceed a rating of 30). Therefore in addition to weighting the rater values based on correlation among them, the value used for each of them needs to be on the same scale. An appropriate method for doing this is finding the number of standard deviations each value lies from the mean of its corresponding rater. In order to appropriately weight the Player Raters to arrive at a Final Combined Player Rater Value, the standard deviation values for each rater will be applied to an altered form of the correlation table and a final sum will be calculated.

The altered form of the correlation table will simply be each of the values subtracted from 1. (Basically, if two values had a correlation of 1 then they are the same number and this value

should only be used once. Because 1 minus 1 equals 0, it will be multiplied by 0 when getting to this step). The top half of the table was also populated with correlation values and the diagonal was removed because those values are equal to zero.

1 - ALL PLAYERS CORRELATION	*Win-Shares*	*NBA Efficiency Rating*	*Hollinger's PER*	*Hollinger's Game Score*	*Wins Produced*	*Plus-Minus*	***SUM***
Win-Shares		0.117417281	0.350161135	0.117758313	0.145746805	0.470133669	**0.731084**
NBA Efficiency Rating	0.117417281		0.2719932	0.010973183	0.088840278	0.699066486	**0.489224**
Hollinger's PER	0.350161135	0.2719932		0.261850355	0.291449364	0.739507058	**1.175454**
Hollinger's Game Score	0.117758313	0.010973183	0.261850355		0.132899137	0.692185356	**0.523481**
Wins Produced	0.145746805	0.088840278	0.291449364	0.132899137		0.661679937	**0.658936**
Plus-Minus	0.470133669	0.699066486	0.739507058	0.692185356	0.661679937		**3.262573**

The values in the rightmost column are the sum of the correlation "coefficients" which will be used for the final calculation. The z-scores of the player raters for each player will be multiplied by its corresponding coefficient (in the rightmost column of the above table). These values will then be added together to arrive at a final Combined Player Rater Value (CPRV). The means, variances, and standard deviations of player rater values for the entire population of approximately 5400 NBA players over the past 12 seasons is shown in the table below.

	Mean	**Variance**	**Standard Deviation**
Win-Shares	2.73744673	9.587230316	3.096325292
NBA Efficiency Rating	8.59751454	35.40657223	5.950342194
Hollinger's PER	12.4525014	33.02083153	5.746375513
Hollinger's Game Score	6.024262774	21.43893469	4.630219723
Wins Produced	3.418911689	8.571512385	2.927714533
Plus-Minus	-0.047804336	28731.712	169.5043126

To arrive at a z-score for each rater value, the z-score formula will be applied:

$$z = \frac{x - \mu}{\sigma}$$

X = Player Rater Value

μ = Mean

σ = Standard Deviation

Each player rater z-score will be multiplied by its corresponding correlation sum and the final sum of these six values is the Combined Player Rater Value (CPRV).

The Combined Player Rater is a very complex process, and Kevin Garnett's 2003-2004 season statistics will be used as an example. His Player Rater values are as follows:

	PLAYER RATER VALUES
Win-Shares	18.3
NBA Efficiency Rating	30.96341463
Hollinger's PER	27.47923832
Hollinger's Game Score	22.19390244
Wins Produced	16.86585366
Plus-Minus	614

These values were modified using each rater's mean and standard deviation to arrive at a z-score for each individual rater:

	Mean	Variance	Standard Deviation	Z-Score
Win-Shares	2.73744673	9.587230316	3.096325292	**5.026136404**
NBA Efficiency Rating	8.59751454	35.40657223	5.950342194	**3.758758633**
Hollinger's PER	12.4525014	33.02083153	5.746375513	**2.6149939**
Hollinger's Game Score	6.024262774	21.43893469	4.630219723	**3.492197051**
Wins Produced	3.418911689	8.571512385	2.927714533	**4.592982622**
Plus-Minus	-0.047804336	28731.712	169.5043126	**3.62260874**

The z-scores were then multiplied by their corresponding correlation sums:

	Correlation Sum	Z-Score	CS * Z-Score
Win-Shares	0.731083535	5.026136404	3.674525568
NBA Efficiency Rating	0.489223941	3.758758633	1.838874713
Hollinger's PER	1.175454054	2.6149939	3.073805181
Hollinger's Game Score	0.523480989	3.492197051	1.828098765
Wins Produced	0.658935583	4.592982622	3.026479682
Plus-Minus	3.262572506	3.62260874	11.81902367

The final sum of the rightmost column is the Combined Player Rater Value (CPRV), which in this case is:

COMBINED PLAYER RATER VALUE:
25.26080758

Combined Player Rater Application

The following tables contain the top ten most efficient players for the past 12 NBA seasons, based on the Combined Player Rater. The Actual MVP Rank column indicates how the player's rank in the MVP voting process; if there is no rank listed then the player did not receive any MVP votes. Players highlighted in green have the highest Combined Player Rater Value for the corresponding season and therefore should have been recognized as the MVP.

2000-2001 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Tim Duncan	22.37186644	2
Shaquille O'Neal	21.32959987	3
Dirk Nowitzki	19.24151806	
David Robinson*	18.04284684	10
Derek Anderson	17.09674788	
John Stockton*	16.86497175	16
Chris Webber	16.41756073	4
Karl Malone*	16.23533885	7
Kobe Bryant	15.18556762	9
Ray Allen	14.86069121	11

2001-2002 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Tim Duncan	23.12696533	1
Shaquille O'Neal	22.32945768	3
Dirk Nowitzki	17.64139924	8
Kevin Garnett	16.76494438	12
Chris Webber	16.71905116	7
Kobe Bryant	16.46369999	5
Tracy McGrady	14.65171953	4
Paul Pierce	14.28759642	11
David Robinson*	13.9767903	
Peja Stojakovic	13.40669505	18
Vlade Divac	13.3215167	

2002-2003 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Dirk Nowitzki	25.84378015	7
Tim Duncan	22.21576578	1
Kevin Garnett	20.38259182	2
Shaquille O'Neal	18.53405782	5
Jason Kidd	17.10364261	9
Steve Nash	16.87649836	12
Michael Finley	16.52217191	
Tracy McGrady	15.67102179	4
Kobe Bryant	15.39641561	3
Chris Webber	14.32687092	10
Peja Stojakovic	14.02700117	

2003-2004 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Kevin Garnett	25.25896734	1
Tim Duncan	20.39952598	2
Sam Cassell	16.97367889	10
Shaquille O'Neal	16.92096434	6
Peja Stojakovic	16.72687278	4
Brad Miller	16.61087897	
Dirk Nowitzki	15.81947957	12
Ben Wallace	14.38835494	7
Jermaine O'Neal	14.36453137	3
Kobe Bryant	13.41351083	5
Metta World Peace	13.31875428	

2004-2005 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Tim Duncan	22.59859827	4
Amare Stoudemire	22.27173911	9
Dirk Nowitzki	22.12147523	3
Shawn Marion	21.89794743	16
Steve Nash	20.09944441	1
Manu Ginobili	19.0735369	
Shaquille O'Neal	18.1243189	2
Kevin Garnett	15.49962501	11
Dwyane Wade	14.90860708	8
Joe Johnson	14.79968518	
Tony Parker	13.71137848	

2005-2006 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Dirk Nowitzki	21.0734968	3
Chauncey Billups	19.57414929	5
Dwyane Wade	19.54041845	6
Shawn Marion	19.05108295	11
Steve Nash	17.74628708	1
Tim Duncan	17.5619615	8
Ben Wallace	17.40914005	
Kobe Bryant	16.70900543	4
LeBron James	16.70044694	2
Rasheed Wallace	16.43622058	
Tony Parker	15.01402004	9

2006-2007 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Tim Duncan	23.89485784	4
Dirk Nowitzki	22.9694866	1
Steve Nash	20.60437602	2
Shawn Marion	20.07692382	
Amare Stoudemire	16.89544965	13
Manu Ginobili	16.86562254	
LeBron James	16.46882794	5
Jason Terry	15.88555232	
Tony Parker	15.37371744	17
Josh Howard	14.57485511	
Luol Deng	14.38514319	

2007-2008 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
Kevin Garnett	23.75113722	3
Paul Pierce	21.77149468	16
Kobe Bryant	21.37598733	1
Chris Paul	21.0675285	2
Amare Stoudemire	19.67480625	6
Dwight Howard	19.10583016	5
Dirk Nowitzki	18.53695589	11
Steve Nash	18.00555747	9
Chauncey Billups	17.53685025	
Tim Duncan	16.71491624	7
Carlos Boozer	16.37988004	14

2008-2009 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
LeBron James	30.74380619	1
Kobe Bryant	21.55607956	2
Dwight Howard	21.13332257	4
Pau Gasol	20.50504761	
Chris Paul	19.61410679	5
Brandon Roy	17.90876538	9
Lamar Odom	17.53571633	
Ray Allen	17.28159903	
Yao Ming	16.42750884	12
Rashard Lewis	16.06902172	
Dwyane Wade	15.70090647	3

2009-2010 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
LeBron James	26.58199742	1
Dwight Howard	21.65422044	4
Kevin Durant	19.40260649	2
Dwyane Wade	16.32072202	5
Tim Duncan	16.01414091	
Kobe Bryant	15.83318981	3
Al Horford	15.6907059	
Deron Williams	15.42435722	9
Dirk Nowitzki	15.39400023	7
Pau Gasol	14.94628908	
Amare Stoudemire	14.2551549	10

2010-2011 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
LeBron James	23.21646131	3
Dwight Howard	20.78206979	2
Dwyane Wade	20.07877271	7
Pau Gasol	19.93435272	
Dirk Nowitzki	18.46767354	6
Chris Bosh	17.98489261	14
Paul Pierce	17.87254758	
Derrick Rose	17.70580176	1
Kevin Garnett	17.24119812	
Manu Ginobili	16.39584222	8
Kobe Bryant	15.27016889	4

2011-2012 NBA Season

Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
LeBron James	21.20179273	1
Kevin Durant	16.78268655	2
Chris Paul	15.62477141	3
Blake Griffin	14.11070705	
Dwyane Wade	13.60082743	10
Tony Parker	13.29357957	5
Russell Westbrook	12.89098444	13
James Harden	12.66627638	
Chris Bosh	12.33525113	
Dwight Howard	12.04829977	7
Tim Duncan	11.65140064	14

Interestingly, in the 2000-2001 season Allen Iverson (who was voted MVP of the season) did not even finish in the top ten in Combined Player Rater Value (CPRV). Also, in every season there was at least one player in the top ten in CPRV who did not receive a single MVP vote. It is encouraging to see that all of highest ranked players according to the CPRV, highlighted in green for each season, received MVP votes and that all finished at least in the top 7 of the MVP race. However, the fact that there is disparity between the actual MVP vote totals and the CPRV rankings provides support to the claim that there are outside factors that affect how player efficiency in the NBA is viewed.

Notable performances based on CPRV are Tim Duncan in 2001-2002, Kevin Garnett in 2003-2004, LeBron James in 2008-2009, LeBron James in 2009-2010, and LeBron James in 2011-2012. All of these players finished as the MVP of their corresponding season and also were the most efficient players of the season based on CPRV. This study does not cover data for seasons prior to 2000, but Michael Jordan most likely had multiple seasons with this accomplishment. If LeBron James had been voted the MVP in the 2010-2011 NBA season, which he should have been according to CPRV, he would have accomplished this feat for the

past four seasons. This supports why LeBron James should be compared to Michael Jordan as the greatest NBA player of all time, both from a perceived value standpoint (actual MVP votes) and from a quantitative view (CPRV results).

CPRV Applied to 2012-2013 NBA Season

After applying the CPRV formula on March 20, 2013 to NBA player data for the 2012-2013 season, here are the top 30 players:

This data represents the top 30 players based on the combination of player raters, thus based solely on quantifiable data. So far, 83% of the season's games have been played, so these rankings are an accurate reflection of how the efficiency rankings will look at the end of the regular season. The current MVP Ladder Rankings, the top 10 favorite players to win the MVP award based on the media, is shown below:

CPRV: March 20, 2013 (Season 83% Complete)

NAME	2012-2013 CPRV
LeBron James	24.67498531
Kevin Durant	23.21892779
Dwyane Wade	17.78474154
Russell Westbrook	17.57681812
Chris Paul	15.55697182
Tony Parker	15.45854346
Tim Duncan	15.21437456
Blake Griffin	14.48992968
Chris Bosh	14.04478201
David West	12.73604581
Marc Gasol	12.56609339
Tiago Splitter	12.39686763
James Harden	12.27985529
Serge Ibaka	12.1452634
Mike Conley	11.64279911
George Hill	11.47073366
Paul George	11.44257967
Tyson Chandler	10.61508241
Al Horford	10.51091616
Danilo Gallinari	10.46523142
Mario Chalmers	10.45675148
Zach Randolph	10.37563682
Thabo Sefolosha	10.201131
Kobe Bryant	10.03652192
Kawhi Leonard	9.742296187
Kevin Martin	9.53050085
David Lee	9.46781543
Ty Lawson	9.260677744

As you can see, LeBron James and Kevin Durant finished first and second respectively in terms of efficiency and in the MVP race. However, players like Kobe Bryant, Carmelo Anthony, and Ty Lawson are examples of players currently on the MVP Ladder who have not been playing as efficiently as their MVP rankings suggests. Perception factors, such as past performance and the accrual of overrated statistics like points, are the main reason for this.

MVP Ladder: March 20, 2012 (Season 83% Complete)	
MVP Ladder Rank	Name
1	LeBron James
2	Kevin Durant
3	Kobe Bryant
4	Dwyane Wade
5	Chris Paul
6	Carmelo Anthony
7	Russell Westbrook
8	Ty Lawson
9	James Harden
10	Marc Gasol

CONCLUSION

Based on the tests run throughout this study it is clear that there are factors that affect how NBA player efficiency is viewed. These perception factors affect multiple audiences, whether it is just a casual fan or an NBA head coach. In this study MVP voting results were used to measure how player effectiveness (among the top players in the league) is perceived and this was compared with results from multiple Player Raters designed by NBA statisticians. Of course, each of the six Player Raters had its own strengths and weaknesses on how it represented player value with a single number. However, by using the correlation values between each combination of raters to properly weight them a Combined Player Rater was

developed. This rater paints a larger picture of player efficiency than any single rater did because each of the six raters brought different aspects of the game to the table.

By comparing actual MVP voting results with a simple average of the Player Rater values I was able to identify players who were overrated for a given season. Upon further research on each individual player I was able to support the fact they were overrated by using perception factors. The Combined Player Rater Values (CPRV) were also calculated for all NBA players for the past 12 seasons and the top ten players for each season based on this rater were determined. Although several players on these lists were MVP candidates for their respective NBA seasons, there were several players who should have received MVP votes than they did as well as many players who received too many MVP votes, based on their CPRV. The fact that there are many inconsistencies between actual player efficiency (for the top players in the NBA) and MVP votes means this must exist for *all* players. Clearly it is impossible to place a numerical value on *perceived* player efficiency without the use of MVP votes to quantify the value, but the results of this study support the claim that there are several factors affecting how NBA player value is being judged.

As explained previously, it would greatly benefit all NBA audiences to become aware of the multiple perception factors affecting their take on how efficient each player in the NBA actually is. The perception factors covered in this study included many quantifiable factors driving media hype like jersey sales, fan support, team heritage, city population, and Fan Cost Index. Other factors include past season performances, playoff performances, breaking records, and also receiving awards and recognitions (such as All-Star appearances). Perhaps after viewing the Combined Player Rater fans and announcers will become aware of the unintentional bias affecting how they view certain players. CPRV would be even more useful

to NBA team coaches, owners, and any member of the staff responsible for player operations. Having an accurate method to value players that properly combines several types of Player Raters can help them with crucial decisions such as adjusting salaries, playing time, and also for making trades.

NBA data mining is slowly becoming a necessity for NBA organizations that are seeking for an edge on their opponents by using statistics. Today, NBA data is being collected and analyzed more than ever. As explained in this study Adjusted Plus-Minus is probably the most complex, yet most accurate method of determining player efficiency. However, it has only existed since 2006 and only is available in formats that make it unreasonable to analyze. However, the CPRV formula which was developed in this study by using several other types of Player Raters is a very accurate method of measuring player efficiency. As technology improves and new types of NBA data analysis are created more accurate Player Raters will surface. By measuring performance using quantifiable NBA data they will help us avoid unwanted bias when debating who the most effective players in the NBA actually are. As mentioned, because NBA statisticians are being hired by teams they are forced to keep their new findings from the public. However, the application of more and more advanced analytics to NBA data will surely be conducted by enthusiasts like me who will allow the public to improve how they view NBA player efficiency.

APPENDICES

Appendix A – Top 10 CPRV Each Season

Year	Name	COMBINED PLAYER RATER VALUE	Actual MVP Rank
2000	Tim Duncan	22.37186644	2
2000	Shaquille O'Neal	21.32959987	3
2000	Dirk Nowitzki	19.24151806	
2000	David Robinson*	18.04284684	10
2000	Derek Anderson	17.09674788	
2000	John Stockton*	16.86497175	16
2000	Chris Webber	16.41756073	4
2000	Karl Malone*	16.23533885	7
2000	Kobe Bryant	15.18556762	9
2000	Ray Allen	14.86069121	11
2001	Tim Duncan	23.12696533	1
2001	Shaquille O'Neal	22.32945768	3
2001	Dirk Nowitzki	17.64139924	8
2001	Kevin Garnett	16.76494438	12
2001	Chris Webber	16.71905116	7
2001	Kobe Bryant	16.46369999	5
2001	Tracy McGrady	14.65171953	4
2001	Paul Pierce	14.28759642	11
2001	David Robinson*	13.9767903	
2001	Peja Stojakovic	13.40669505	18
2001	Vlade Divac	13.3215167	
2002	Dirk Nowitzki	25.84378015	7
2002	Tim Duncan	22.21576578	1
2002	Kevin Garnett	20.38259182	2
2002	Shaquille O'Neal	18.53405782	5
2002	Jason Kidd	17.10364261	9
2002	Steve Nash	16.87649836	12
2002	Michael Finley	16.52217191	
2002	Tracy McGrady	15.67102179	4
2002	Kobe Bryant	15.39641561	3
2002	Chris Webber	14.32687092	10
2002	Peja Stojakovic	14.02700117	
2003	Kevin Garnett	25.25896734	1
2003	Tim Duncan	20.39952598	2
2003	Sam Cassell	16.97367889	10

2003	Shaquille O'Neal	16.92096434	6
2003	Peja Stojakovic	16.72687278	4
2003	Brad Miller	16.61087897	
2003	Dirk Nowitzki	15.81947957	12
2003	Ben Wallace	14.38835494	7
2003	Jermaine O'Neal	14.36453137	3
2003	Kobe Bryant	13.41351083	5
2003	Metta World Peace	13.31875428	
2004	Tim Duncan	22.59859827	4
2004	Amare Stoudemire	22.27173911	9
2004	Dirk Nowitzki	22.12147523	3
2004	Shawn Marion	21.89794743	16
2004	Steve Nash	20.09944441	1
2004	Manu Ginobili	19.0735369	
2004	Shaquille O'Neal	18.1243189	2
2004	Kevin Garnett	15.49962501	11
2004	Dwyane Wade	14.90860708	8
2004	Joe Johnson	14.79968518	
2004	Tony Parker	13.71137848	
2005	Dirk Nowitzki	21.0734968	3
2005	Chauncey Billups	19.57414929	5
2005	Dwyane Wade	19.54041845	6
2005	Shawn Marion	19.05108295	11
2005	Steve Nash	17.74628708	1
2005	Tim Duncan	17.5619615	8
2005	Ben Wallace	17.40914005	
2005	Kobe Bryant	16.70900543	4
2005	LeBron James	16.70044694	2
2005	Rasheed Wallace	16.43622058	
2005	Tony Parker	15.01402004	9
2006	Tim Duncan	23.89485784	4
2006	Dirk Nowitzki	22.9694866	1
2006	Steve Nash	20.60437602	2
2006	Shawn Marion	20.07692382	
2006	Amare Stoudemire	16.89544965	13
2006	Manu Ginobili	16.86562254	
2006	LeBron James	16.46882794	5
2006	Jason Terry	15.88555232	
2006	Tony Parker	15.37371744	17

2006	Josh Howard	14.57485511	
2006	Luol Deng	14.38514319	
2007	Kevin Garnett	23.75113722	3
2007	Paul Pierce	21.77149468	16
2007	Kobe Bryant	21.37598733	1
2007	Chris Paul	21.0675285	2
2007	Amare Stoudemire	19.67480625	6
2007	Dwight Howard	19.10583016	5
2007	Dirk Nowitzki	18.53695589	11
2007	Steve Nash	18.00555747	9
2007	Chauncey Billups	17.53685025	
2007	Tim Duncan	16.71491624	7
2007	Carlos Boozer	16.37988004	14
2008	LeBron James	30.74380619	1
2008	Kobe Bryant	21.55607956	2
2008	Dwight Howard	21.13332257	4
2008	Pau Gasol	20.50504761	
2008	Chris Paul	19.61410679	5
2008	Brandon Roy	17.90876538	9
2008	Lamar Odom	17.53571633	
2008	Ray Allen	17.28159903	
2008	Yao Ming	16.42750884	12
2008	Rashard Lewis	16.06902172	
2008	Dwyane Wade	15.70090647	3
2009	LeBron James	26.58199742	1
2009	Dwight Howard	21.65422044	4
2009	Kevin Durant	19.40260649	2
2009	Dwyane Wade	16.32072202	5
2009	Tim Duncan	16.01414091	
2009	Kobe Bryant	15.83318981	3
2009	Al Horford	15.6907059	
2009	Deron Williams	15.42435722	9
2009	Dirk Nowitzki	15.39400023	7
2009	Pau Gasol	14.94628908	
2009	Amare Stoudemire	14.2551549	10
2010	LeBron James	23.21646131	3
2010	Dwight Howard	20.78206979	2
2010	Dwyane Wade	20.07877271	7
2010	Pau Gasol	19.93435272	
2010	Dirk Nowitzki	18.46767354	6

2010	Chris Bosh	17.98489261	14
2010	Paul Pierce	17.87254758	
2010	Derrick Rose	17.70580176	1
2010	Kevin Garnett	17.24119812	
2010	Manu Ginobili	16.39584222	8
2010	Kobe Bryant	15.27016889	4
2011	LeBron James	21.20179273	1
2011	Kevin Durant	16.78268655	2
2011	Chris Paul	15.62477141	3
2011	Blake Griffin	14.11070705	
2011	Dwyane Wade	13.60082743	10
2011	Tony Parker	13.29357957	5
2011	Russell Westbrook	12.89098444	13
2011	James Harden	12.66627638	
2011	Chris Bosh	12.33525113	
2011	Dwight Howard	12.04829977	7
2011	Tim Duncan	11.65140064	14

Appendix B – Player Rater Ranks: MVP Candidates

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2000_Allen Iverson	1	17	13	5	103	13	10
2000_Tim Duncan	2	8	12	11	7	1	4
2000_Shaquille O'Neal	3	1	2	1	2	6	1
2000_Chris Webber	4	3	5	2	11	12	15
2000_Kevin Garnett	5	4	8	7	5	51	11
2000_Tracy McGrady	6	7	6	3	21	36	7
2000_Karl Malone*	7	6	7	9	13	10	5
2000_Jason Kidd	8	14	35	21	23	77	24
2000_Kobe Bryant	9	5	9	4	38	15	14
2000_David Robinson*	10	44	11	36	14	3	9
2000_Ray Allen	11	16	14	13	20	19	3
2000_Vince Carter	12	11	4	6	30	22	6
2000_Paul Pierce	13	21	20	14	39	334	19
2000_Jerry Stackhouse	14	26	24	8	154	319	25
2000_Anthony Mason	15	25	86	40	15	93	13
2000_John Stockton*	16	42	19	43	48	4	17
2000_Michael Finley	17	31	56	26	67	7	31

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2001_Tim Duncan	1	1	3	2	2	2	1

2001_Jason Kidd	2	15	33	22	15	19	23
2001_Shaquille O'Neal	3	4	2	1	5	1	4
2001_Tracy McGrady	4	6	5	3	10	27	11
2001_Kobe Bryant	5	9	9	10	42	5	7
2001_Gary Payton	6	7	11	9	28	51	8
2001_Chris Webber	7	3	4	4	7	8	27
2001_Dirk Nowitzki	8	5	6	7	6	7	3
2001_Allen Iverson	9	13	19	5	141	33	48
2001_Ben Wallace	10	33	42	44	1	65	10
2001_Paul Pierce	11	10	10	8	21	22	5
2001_Kevin Garnett	12	2	7	6	3	17	6
2001_Michael Jordan*	13	32	31	27	131	146	145
2001_Steve Nash	14	27	20	25	55	23	17
2001_Jerry Stackhouse	15	44	43	34	155	84	71
2001_Mike Bibby	16	87	111	71	135	11	61
2001_Elton Brand	17	8	8	11	4	167	2
2001_Peja Stojakovic	18	26	23	18	32	12	16

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2002_Tim Duncan	1	5	6	5	3	3	5
2002_Kevin Garnett	2	1	4	4	2	9	1
2002_Kobe Bryant	3	4	5	3	11	30	4

2002_Tracy McGrady	4	2	1	1	8	43	2
2002_Shaquille O'Neal	5	3	2	2	4	15	3
2002_Allen Iverson	6	17	22	7	111	51	17
2002_Dirk Nowitzki	7	6	7	6	5	1	6
2002_Ben Wallace	8	22	84	46	1	37	22
2002_Jason Kidd	9	9	9	11	16	6	9
2002_Chris Webber	10	7	14	10	12	12	7
2002_Jamal Mashburn	11	23	69	24	68	64	23
2002_Steve Nash	12	25	8	23	54	4	25
2002_Paul Pierce	13	10	10	8	28	74	10

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2003_Kevin Garnett	1	1	1	1	1	1	1
2003_Tim Duncan	2	2	2	3	2	2	3
2003_Jermaine O'Neal	3	21	22	19	23	9	24
2003_Peja Stojakovic	4	5	9	5	14	12	2
2003_Kobe Bryant	5	8	5	4	29	27	10
2003_Shaquille O'Neal	6	7	3	6	4	11	15
2003_Ben Wallace	7	42	71	48	3	10	12
2003_Jason Kidd	8	15	34	21	24	21	48
2003_LeBron James	9	33	53	18	86	387	90
2003_Sam Cassell	10	14	11	15	62	3	4

2003_Baron Davis	11	19	26	11	81	48	47
2003_Dirk Nowitzki	12	4	8	8	9	15	6
2003_Andrei Kirilenko	13	22	14	14	13	79	5
2003_Carmelo Anthony	14	46	59	34	114	96	69
2003_Yao Ming	15	24	19	32	17	41	7
2003_Michael Redd	16	34	29	17	63	302	16

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2004_Steve Nash	1	14	11	19	28	3	15
2004_Shaquille O'Neal	2	13	5	10	8	11	13
2004_Dirk Nowitzki	3	3	7	4	3	6	2
2004_Tim Duncan	4	10	6	13	4	1	10
2004_Allen Iverson	5	5	10	2	81	157	22
2004_LeBron James	6	2	8	1	9	55	4
2004_Tracy McGrady	7	9	18	7	31	29	7
2004_Dwyane Wade	8	12	13	9	56	20	14
2004_Amare Stoudemire	9	4	3	5	7	5	3
2004_Ray Allen	10	29	35	20	80	31	16
2004_Kevin Garnett	11	1	4	3	1	60	1
2004_Gilbert Arenas	12	16	27	11	54	86	9
2004_Vince Carter	13	20	15	15	61	122	20
2004_P.J. Brown	14	62	142	82	26	460	50

2004_Marcus Camby	15	56	41	69	10	82	67
2004_Shawn Marion	16	7	16	14	2	4	5

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2005_Steve Nash	1	10	12	12	17	12	10
2005_LeBron James	2	2	3	1	10	24	2
2005_Dirk Nowitzki	3	5	5	7	6	8	1
2005_Kobe Bryant	4	3	1	2	33	20	4
2005_Chauncey Billups	5	18	18	18	34	4	3
2005_Dwyane Wade	6	6	2	4	19	10	8
2005_Elton Brand	7	8	4	5	3	47	6
2005_Tim Duncan	8	17	20	22	8	6	14
2005_Tony Parker	9	41	34	37	84	7	21
2005_Allen Iverson	10	7	8	3	60	208	16
2005_Shawn Marion	11	4	9	9	2	13	7

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2006_Dirk Nowitzki	1	3	3	5	8	2	1
2006_Steve Nash	2	7	6	10	20	3	5
2006_Kobe Bryant	3	2	2	1	23	67	4
2006_Tim Duncan	4	12	5	17	6	1	3
2006_LeBron James	5	6	12	3	22	18	2
2006_Tracy McGrady	6	26	16	18	64	17	28

2006_Chris Bosh	7	8	17	11	10	44	21
2006_Gilbert Arenas	8	9	10	4	48	42	12
2006_Carlos Boozer	9	5	7	19	4	50	18
2006_Kevin Garnett	10	1	11	6	1	155	13
2006_Chauncey Billups	11	36	31	28	45	19	8
2006_Shaquille O'Neal	12	71	25	60	60	115	177
2006_Amare Stoudemire	13	18	8	25	16	14	10
2006_Dwyane Wade	14	4	1	2	26	71	25
2006_Carmelo Anthony	15	13	13	7	68	79	40
2006_Baron Davis	16	24	18	21	55	34	60
2006_Tony Parker	17	46	27	38	86	9	20

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2007_Kobe Bryant	1	4	6	3	24	5	4
2007_Chris Paul	2	2	5	2	14	12	1
2007_Kevin Garnett	3	8	7	13	6	2	6
2007_LeBron James	4	1	4	1	8	85	2
2007_Dwight Howard	5	5	15	9	1	13	8
2007_Amare Stoudemire	6	3	3	4	4	23	3
2007_Tim Duncan	7	13	11	17	9	20	13
2007_Tracy McGrady	8	51	56	38	109	46	77

2007_Steve Nash	9	15	19	21	31	6	14
2007_Manu Ginobili	10	32	13	27	41	18	12
2007_Dirk Nowitzki	11	7	8	6	16	10	7
2007_Deron Williams	12	17	23	14	55	19	11
2007_Carmelo Anthony	13	12	14	8	37	80	36
2007_Carlos Boozer	14	6	17	16	12	21	15
2007_Antawn Jamison	15	21	41	24	20	67	23
2007_Paul Pierce	16	33	38	35	47	1	9
2007_Rasheed Wallace	17	87	104	86	56	15	45

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2008_LeBron James	1	2	3	1	2	1	1
2008_Kobe Bryant	2	8	7	4	40	3	7
2008_Dwyane Wade	3	3	4	2	14	47	3
2008_Dwight Howard	4	5	8	6	1	9	5
2008_Chris Paul	5	1	5	3	4	24	2
2008_Chauncey Billups	6	42	39	29	71	33	12
2008_Paul Pierce	7	37	69	31	66	11	11
2008_Tony Parker	8	22	16	16	89	27	24
2008_Brandon Roy	9	17	15	8	37	14	6
2008_Tim Duncan	10	11	9	15	9	36	13
2008_Dirk Nowitzki	11	4	11	5	15	38	9

2008_Yao Ming	12	14	18	20	12	18	10

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2009_LeBron James	1	1	3	1	2	1	1
2009_Kevin Durant	2	2	6	2	13	8	2
2009_Kobe Bryant	3	14	21	8	65	5	21
2009_Dwight Howard	4	12	11	13	1	2	3
2009_Dwyane Wade	5	9	5	3	38	20	4
2009_Carmelo Anthony	6	11	15	6	59	36	31
2009_Dirk Nowitzki	7	7	13	7	20	23	5
2009_Steve Nash	8	18	19	20	44	15	14
2009_Deron Williams	9	13	24	11	45	9	12
2009_Amare Stoudemire	10	15	12	12	21	27	11
2009_Manu Ginobili	11	52	18	34	67	13	16
2009_Chauncey Billups	12	38	29	23	76	57	20
2009_Chris Bosh	13	4	8	4	6	159	19
2009_Stephen Jackson	14	58	122	44	142	81	93
2009_Joe Johnson	15	29	48	22	72	22	26

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2010_Derrick Rose	1	13	11	5	60	10	5
2010_Dwight Howard	2	3	3	2	2	11	3

2010_LeBron James	3	2	2	1	6	1	1
2010_Kobe Bryant	4	18	7	12	69	17	14
2010_Kevin Durant	5	6	8	3	24	35	7
2010_Dirk Nowitzki	6	10	6	14	20	8	10
2010_Dwyane Wade	7	8	5	4	28	4	6
2010_Manu Ginobili	8	46	19	31	63	6	18
2010_Amare Stoudemire	9	12	10	7	33	124	30
2010_Blake Griffin	10	4	15	8	5	382	20
2010_Rajon Rondo	11	31	85	42	48	15	50
2010_Tony Parker	12	37	27	30	85	24	27
2010_Chris Paul	13	9	13	15	23	41	4
2010_Chris Bosh	14	24	47	25	27	2	13
2010_Stephen Jackson	15	78	164	69	174	429	223
2010_Joe Johnson	16	59	101	53	138	111	117

	MVP Rank	NBA Efficiency Rating	Hollinger's PER	Hollinger's Game Score	Wins Produced	Plus-Minus	Win-Shares
2011_LeBron James	1	1	1	1	3	1	1
2011_Kevin Durant	2	3	4	2	8	7	3
2011_Chris Paul	3	4	3	4	15	12	2
2011_Kobe Bryant	4	12	20	6	93	74	37
2011_Tony Parker	5	28	17	20	90	2	22
2011_Kevin Love	6	2	6	3	2	162	4
2011_Dwight Howard	7	5	8	5	1	54	16

2011_Rajon Rondo	8	20	85	34	45	49	61
2011_Steve Nash	9	27	38	35	46	56	47
2011_Dwyane Wade	10	13	5	7	40	10	15
2011_Derrick Rose	11	18	14	8	82	17	41
2011_Dirk Nowitzki	12	17	25	19	35	27	18
2011_Russell Westbrook	13	15	15	10	85	6	13
2011_Tim Duncan	14	35	11	41	20	14	45
2011_Joe Johnson	15	50	67	33	86	32	32

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