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The Effect of NBA Free Agency on Player Utility

Austin Erikson
South Dakota State University, austin.erikson@jacks.sdstate.edu

THE EFFECT OF NBA FREE AGENCY ON PLAYER UTILITY

BY

AUSTIN ERIKSON

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THE EFFECT OF NBA FREE AGENCY ON PLAYER UTILITY

This thesis is approved as a creditable and independent investigation by a candidate for the Master of Science in Economics degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

George Langelett, Ph.D. Date
Thesis Advisor

Eluned Jones, Ph.D. Date
Head, Department of Economics

Dean, Graduate School Date

To my father, the person who first discovered this research problem. Your unimaginable work ethic has always motivated me to be more than what I think possible. You love for your family is obvious to all, second only to your love for God. Your selflessness in all things is uplifting, and the fact that you put everyone else first is inspiring. I've always known you are my hero, and I'm reminded of why every day. Thank you for my life, your love, and the example that you set. I hope to honor you in the life that I live. This research is for you.

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ABBREVIATIONS

NBA National Basketball Association

CBA Collective Bargaining Agreement

BRI Basketball Related Income

PPG Points per Game

NBPA National Basketball Player's Association

UFA Unrestricted Free Agent

RFA Restricted Free Agent

NFL National Football League

MLB Major League Baseball

PER Player Efficiency Rating

S Starter

E Experience

FAS Free Agent Stayed

G Guard

F Forward

SF Small Forward

PF Power Forward

C Center

PER_t PER Decision Year

$Contract_t$ Contract Decision Year

PER_{t-1} PER Pre

$Contract_{t-1}$ Contract Pre

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ABSTRACT

THE EFFECT OF NBA FREE AGENCY ON PLAYER UTILITY

AUSTIN ERIKSON

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Observably, free agents in the National Basketball Association often make misguided decisions during the free agency period. These decisions may have a direct effect on a player's performance and salary, affecting their overall utility. Research exists confirming that moving through free agency leads to an effect on player performance, but no study has explored the effect of changing teams through free agency on a player's salary. As a significant number of players enter this market every year, research on this area is crucially important. The null hypothesis for performance is: H_0: moving to a different team through free agency leads to a decrease in player performance. The hypothesis for a player's salary is that moving to a different team through free agency will lead to an increase in the magnitude on a player's contract. Ordinary Least Squares regressions were used to test these hypotheses for two datasets. The main findings of this study are that players who re-sign with the team they played for in the previous year (in free agency) will earn an estimated $494,723.60 more on average over the next two years of their contract while performing slightly worse (an average decrease in performance of 4.36%). With an awareness of the potential drop in performance, players who choose in free agency to re-sign could increase their utility by earning a larger salary.

CHAPTER 1: INTRODUCTION

Sports economics is a respectable, recognized field in academia, and is so for good reason. A 2013 study estimates that the sports industry as a whole in the United States brings roughly $14.3 billion in earnings a year, along with 456,000 jobs at an average salary of $39,000 (Burrow, 2013). In the 2014-2015 season, the 30 teams in the National Basketball Association (NBA) generated $5.2 billion in revenue, with $900 million in operating profit. On a franchise level scale, the average franchise at the beginning of 2016 was worth $1.25 billion, with the highest valued team in the NBA worth $3 billion (New York Knicks). At that value they rank as the fourth most valuable U.S. sports franchise, behind only the Dallas Cowboys ($4 billion), New England Patriots ($3.2 billion), and New York Yankees ($3.2 billion) (Badenhausen, 2016). More specifically, teams can impact their local economies on a per game basis. City officials in Oklahoma City (along with consultations with the Greater Oklahoma City Chamber, the Oklahoma City Convention and Visitors Bureau, and Destination Marketing Association International) estimated that the economic impact of the Oklahoma City Thunder was $1.5 million per game during the 2012-2013 season. For the team's 2011-2012 season, it was estimated that the total economic impact for the season, including their time in the playoffs, was $54.3 million (the 2011-2012 season was shortened from 82 to 66 games due to a strike) (Lackmeyer, 2013). On a smaller scale, individual players can impact their economy as well. A 2014 study by a professor from the Boler School of Business at John Carroll University estimated that the signing of LeBron James to the Cleveland Cavaliers could add nearly $500 million dollars to the local economy (Gregory, 2014).

As media has become more widely available, the sports industry has flourished. The NBA in particular has grown exceptionally fast. As mentioned above, the average NBA franchise is worth $1.25 billion, but that number has grown 13 percent from 2015, and 74 percent from the preceding year. In the final year of the last Collective Bargaining Agreement (2010-2011), the average NBA franchise was valued at $369 million, a mere third of what they are now. The 2017-2018 deal with Nike to outfit NBA teams is an eight-year contract worth more than $1 billion annually, up from the $400 million deal that Adidas was paying. In July of 2015 the NBA started a deal with Chinese internet company Tencent to provide live games and other programming. The new deal is worth $500 million guaranteed over five years, with a revenue sharing component of up to $200 million. This deal is unsurprising as, according to the NBA, China has more than 300 million participants in basketball (Badenhausen, 2016). In short, the professional basketball industry in the United States is a thriving industry that offers a significant economic impact. This study believes that the NBA has not reached its full potential, and that the above figures could grow substantially if the league operated more efficiently.

Research covering the NBA is relatively limited. Studies have been completed that explore player performance in terms of pressure, the effect of all-star players on ticket sales, salary discrimination for foreign players, entering the draft early, among other scattered topics. While research on this area is not something new, little has been done to help players operate more optimally in their decision-making. With that, the research does not seem to focus on finding ways for players to improve, or finding ways that the league can improve as a whole to increase its entertainment value. In an environment where teams are becoming more profitable and the players want more of the

revenues, forward-looking research is pertinent to ensure that lockouts are avoided and that the NBA thrives for the years to come.

As a sports fan, it is heard repeatedly from players that winning is the number one goal. In the National Basketball Association, this can be heard more clearly as player emotions are frequently reported. Of the highest grossing sporting leagues in the world, basketball plays the fewest number of players at one time. As a result, individual players are seen to have a more significant impact in this sport than others. This fact makes free agency in the NBA different from other sports leagues. As an unrestricted free agent in the NBA, players have the ability to sign with any team that offers them a contract (Lin & Chang, 2011). Now, it would seem reasonable that the player, if presented with multiple opportunities, would choose the situation that affords them the best opportunity to be happy or maximize one's utility. This can mean a number of things depending on the player's goals. Some players may feel that they will be the happiest on the team that offers them the largest contract. For others, their happiness may be maximized on the team where they have the best opportunity to win, or in the city where the player can achieve the most individual success.

It seems that often players leave their current team because they feel that they have a better chance to win a championship elsewhere. These decisions seem to be at times irrational and based on questionable logic. As a result, it seems that a misconception exists in the NBA that a different team always means a better chance of winning. This, of course, is not true. It would be very unlikely that every player could benefit from leaving their current team, especially if that meant moving from a championship-contending team to a team at the bottom the standings. This trend of

players using free agency to start fresh somewhere new presents an interesting question that has not been addressed in the research. Players may be better off, the majority of the time, moving to a new team, but no empirical evidence supports this claim. This area of free agency in the NBA is an unexplored facet that is used every season by a significant number of players, yet almost no research has been done to determine if players are acting optimally. Does a consistent relationship exist between moving through free agency a player's success? Concurrently, could players find more happiness by better understanding their free agency decision? These questions create a gap in the research that this study hopes to answer.

For the purpose of answering the aforementioned questions, a model will be formulated with the intention of exploring the effects of free agency on a player's happiness in the NBA. Happiness will be represented in terms of utility (a topic defined in the Conceptual Framework), and the utility equation will be comprised of two simple factors: performance and salary. A number of reasons dictate that the average NBA player likely gains that greatest amount of utility (happiness) from their performance and the size of the contract that they sign (contract size means the magnitude of the salary). As a result, the overarching goal of this research is to determine if a consistent relationship exists between free agency and player utility, with hypotheses focusing on the effects of free agency in terms of both player performance and salary.

Considering the objective and subsequent goals, the following research will be organized very specifically. First, Chapter 1 will give a background on two different topics. The first topic addressed will be a technical explanation of free agency, with details on the salary cap and collective bargaining agreement, taken directly from the

NBA's salary cap FAQ website. Following this is a discussion on free agency from the player's perspective, with some of the reasons why a player might choose to re-sign as opposed to sign somewhere new. This section will lead directly into Chapter 2, the literature review, where a brief history of free agency will be given, along with a summary of the existing research related to this topic. Furthermore, Chapter 3 will follow, with an explanation of the concept of utility maximization. Moreover, this leads directly into the research design, which discusses the objectives, hypotheses, and methodology. With this information in mind, the research results will be presented in Chapter 4, with a discussion of the results immediately to follow in Chapter 5. In Chapter 6, the implications of the results will be induced, along with the study's shortcomings and potential extensions.

BACKGROUND

NBA SALARY CAP AND FREE AGENCY TECHNICAL INFORMATION

Free agency in the NBA is both extremely simple and quite complicated. In one regard, free agency is as simple as this: free agents have the ability to accept any contract offered to them. Contrary to this, free agency is as complicated as: "If a second round pick or undrafted player met the starter criteria following his second or third season in the league, his qualifying offer equals the amount of the qualifying offer applicable to the 21st pick in the first round of the draft class whose rookie scale contract is now finishing, if this amount is higher than the qualifying offer he otherwise would have received" (Coon, 2016). As can be seen, free agency in the NBA is very intricate, with a number of clauses, restrictions, provisions, and more. For the purposes of this study, a more simplistic overview of the rules of free agency will be offered here.

In this study, free agency will be mentioned consistently, with the rules of such being alluded to frequently. As a result, a basic understanding of said rules is completely necessary. Before the rules, taken directly from the 2011 Collective Bargaining Agreement, are discussed, a couple characterizations are necessary. Every free agency class (the group of players who qualify as free agents in between two seasons) has two general types of players; players who are desired and receive multiple contract offers, and those who are undesired, who are either unsigned or who sign short-term contracts year after year. These players will be referred to as 'desired' and 'undesired', respectfully. These characterizations are necessary as each group has drastically different free agency experiences. Desired players receive multiple contract offers, often with an offer from their current team. These players, when qualifying as an unrestricted free agents, have the

ability to choose the team with which they play, directly affecting their personal utility. Along with this, desired players who qualify as restricted free agents are also likely to receive multiple offers, which significantly effects their free agency outcome. Undesired players, on the other hand, are likely to exit the free agency period unsigned, or sign temporary contracts. This group of players is not the focus of this study. This study hopes to uncover consistent relationships between free agency and player performance and contracts, with the intention of applying these results to utility decisions. The question, are players making utility-maximizing decisions in the free agency period, is at the heart of this study, and undesired players are not helpful as they have less control of their NBA future. To be absolutely clear, all of the information in this sections was taken from the NBA Salary Cap FAQ website, with all items in quotations being taken directly.

Before the rules of free agency can be discussed, an understanding of collective bargaining agreements must first be reached. As noted above, the majority of the information in this chapter will be taken directly from the NBA Salary Cap FAQ website, which details the 2011 NBA Collective Bargaining Agreement. In an attempt to not misrepresent any of the upcoming technical information, most of this information will be quoted directly from the website. First of all, the collective bargaining agreement is a "legal contract between the league and the players association that sets up the rules by which the league operates." This agreement is commonly abbreviated as the "CBA", and it will be often referred to as CBA in the remainder of this document. "The CBA defines the salary cap, the procedures for determining how it is set, the minimum and maximum salaries, the rules for trades, the procedures for the NBA draft, and hundreds of other

things that need to be defined in order for a league like the NBA to function." (Coon, 2016)

As stated, the CBA defines the salary cap, a factor this is very important in the rules of free agency. "A salary cap is a limit on the amount teams can spend on player contracts, which helps to maintain competitive balance in the league." The website elaborates that without a cap in place, teams that have more money would possess the ability to outspend the remaining teams for the better free agents. This is done so that every team in the NBA is on a level playing field. "While this is true in theory, NBA teams in big markets nevertheless have been able to significantly outspend teams in small markets. For example, for the 2010-11 season (the final season under the previous CBA) the lowest team payroll was approximately $45 million and the highest was over $90 million (plus an additional $20 million in luxury tax)." This disparity also effects the team's success. "For the 2010-11 NBA season the correlation coefficient between team payroll and regular season wins was 0.53 -- high enough to conclude that deep-pocket teams have been able, to a certain extent, to buy their way to success." "The NBA has a soft cap. A hard cap cannot be exceeded for any reason. A soft cap like the NBA's contains exceptions which allow teams to sign players or make trades that exceed the cap under certain conditions. In practice, very few NBA teams are ever under the cap during a season." According the CBA FAQ, the soft cap is in place because it gives teams exceptions that allow them to keep players that they want to retain but cannot due to a lack of cap space (Coon, 2016).

The most recent CBA was ratified on December 8, 2011. The current CBA will expire at the end of the 2020-2021 season, although either side (the league or the Players

Association (the NBA player's union)) can opt out after the 2016-2017 season. Aforementioned, the CBA defines the salary cap. "Starting in 2012-13 the salary cap is calculated based on projected amounts for Basketball Related Income (BRI) and benefits for the upcoming season. The projected BRI is a matter of negotiation between the league and players association. Each year the sides meet to try to agree on an amount." "The salary cap calculation beginning in 2012-13 takes 44.74% of projected BRI, subtracts projected benefits, and divides by the number of teams in the league." "Basketball Related Income essentially includes any income related to basketball operations received by the NBA, NBA Properties, NBA Media Ventures, or any other subsidiaries. It also includes income from businesses in which the league, a league entity or a team has an ownership stake of at least 50%." To get an idea of how this calculation changes the salary cap from year to year, 2013-2014 salary cap was $58.679 million, and the 2016-2017 cap is $94.143 (Coon, 2016).

At this point the CBA has been defined and the salary cap has been discussed. Next, it is important to know how the salary cap is impacted. "A team's cap room (referred to simply as "room" in the CBA) refers to its ability to sign players to free agent contracts. If a team is above the cap, then its room is limited to the exceptions it possesses. If the team is below the cap, then its room is how far it is below the cap when all salaries and cap holds are included. Cap holds are "placeholders" for players the team is expected to sign in the future. For example, a team is expected to sign its unsigned first round draft pick, so an amount is reserved for this signing in the form of a cap hold. A team $10 million below the cap with $4 million in cap holds therefore has $6 million in room. A team $5 million under the cap with $6 million in cap holds is not considered to

be under the cap at all, and must use exceptions to sign players." Team salary consists of a number of things including but not limited to salaries of all active and inactive players, the full season salary of any player that the team acquires in midseason trades, salaries paid or payable to waived players (with exceptions), any salary still being paid to a retired player, and a number of different scenarios related to cap holds. Teams must also spend a certain amount of the salary cap which varies based on the year (2016-2017: 90 percent of the cap). (Coon, 2016).

Teams are limited in the amount that they can pay players on top of the limit of the salary cap (as in the team cannot pay one player 80 percent of the cap). "Players have both minimum and maximum salaries, and both are based on how long the player has been in the league. The minimum salaries scale upward each season starting in 2013-14." Maximum salaries have exceptions, but the general rules to maximum salaries are as follows: players who have been the league for 0-6 years can earn up to 25 percent of the cap. Players 7-9 can receive 30 percent of the cap, and players that have been in the league for 10 or more seasons can earn 35 percent of the teams salary cap. An example of an exception to the league maximums can be seen with free agents. "A free agent's maximum salary in the first year of a new contract is never less than 105% of his salary in the last year of his previous contract. For example, a ten-year veteran free agent who most recently earned $20 million has a maximum salary of at least $21 million, even if that is above the league-wide maximum. A free agent does not need to remain with the same team in order to receive 105% of his previous salary, although the team that signs him is subject to the same salary cap restrictions as with any other free agent." Other player salary rules include: "A first round draft pick who completed all four years of his

rookie scale contract, or a second round draft pick or an undrafted player who has four years of service, is eligible to receive a higher maximum salary if he meets certain criteria, -called the "5th Year 30% Max" criteria: named to the All-NBA First, Second or Third team at least twice, voted as a starter in the All-Star game at least twice, and named the NBA Most Valuable Player at least once." A number of rules exist on top of this, but for the purposes of this study, these examples are sufficient in explaining player salary structure (Coon, 2016).

The last two aspects of the CBA that need to be discussed before the specifics of free agency are the luxury tax and salary cap exceptions. "The luxury tax is a mechanism that helps control team spending. While it is commonly referred to as a "luxury tax," the CBA simply calls it a "tax" or a "team payment." It is paid by high spending teams -- those with a team salary exceeding a predetermined tax level. These teams pay a penalty for each dollar their team salary exceeds the tax level. The tax level is determined prior to the season…" The specifics for the computation of the tax are detailed and unimportant in the scheme of this study. Along with this, multiple exceptions exist allowing teams to exceed the salary cap (Coon, 2016).

Finally, "There are two types of free agency: unrestricted and restricted. An unrestricted free agent is free to sign with any other team, and there is nothing the player's original team can do to prevent it. Restricted free agency gives the player's original team the right to keep the player by matching a contract the player signs with another team. This is called the "right of first refusal."" "Restricted free agency exists only on a limited basis. It is allowed following the fourth year of rookie "scale" contracts for first round draft picks. It is also allowed for all veteran free agents who have been in

the league three or fewer seasons. However, a first round draft pick becomes an *unrestricted* free agent following his second or third season if his team does not exercise its option to extend his rookie scale contract for the next season. All other free agency is limited to unrestricted free agency." "In order to make their free agent a restricted free agent, a team must submit a **qualifying offer** to the player between the day following the last game of the NBA Finals and June 30. The qualifying offer is a standing offer for a one-year guaranteed contract, which becomes a regular contact if the player decides to sign it. This ensures that the team does not gain the right of first refusal without offering a contract themselves. The amount of the qualifying offer for players on rookie "scale" contracts is based on the player's draft position. The qualifying offer for all other players must be for 125% of the player's previous salary, or the player's minimum salary plus $200,000, whichever is greater. However, a player may qualify for a higher or lower qualifying offer based on whether or not he met the "starter criteria" in the previous season, or in the average of the previous two seasons. The starter criteria are based on starting 41 games or playing at least 2,000 minutes in the regular season (Coon, 2016).

- If the player was drafted with picks 10-30 and met the starter criteria, his qualifying offer equals the amount of the qualifying offer applicable to the ninth pick in the same draft class.
- If a second round pick or undrafted player met the starter criteria following his second or third season in the league, his qualifying offer equals the amount of the qualifying offer applicable to the 21st pick in the first round of the draft class whose rookie scale contract is now finishing, if this amount is higher than the qualifying offer he otherwise would have received.

- If the player was drafted with picks 1-14 and did not meet the starter criteria, his qualifying offer can be no higher than the amount of the qualifying offer applicable to the 15th pick in the same draft class." (Coon, 2016)

"A qualifying offer automatically expires on October 1, unless it is extended by the team (which is rarely done). A qualifying offer cannot be extended past March 1. If the deadline passes and the qualifying offer is neither withdrawn nor accepted, the player continues to be a restricted free agent. The team and player are free to negotiate a new contract after the qualifying offer expires -- the deadline only affects the player's ability to accept his qualifying offer." "If the player is coming off the fourth year of his rookie scale contract, then in addition to a qualifying offer, his team can also submit a **maximum qualifying offer**. A maximum qualifying offer is for five seasons at the maximum salary with 7.5% annual raises. It can contain no options, ETOs or bonuses of any kind, and must be fully guaranteed. When a team submits a maximum qualifying offer (in essence "stepping up" with a maximum contract offer before the player hits the free agent market), it places a more stringent requirement on other teams' offer sheets." "A player can elect to accept his qualifying offer and play the following season under its terms. This is sometimes done in order to become an unrestricted free agent the following summer." "When a restricted free agent wants to sign with another team, the player and team sign an **offer sheet**, the principal terms of which the original team is given three days to match. The offer sheet must be for at least two seasons (not including option years). If the player's prior team also submitted a maximum qualifying offer, then the offer sheet must be for at least three seasons (not including option years). If the player's original team exercises its right of first refusal within three days, the player is then under

contract to his original team, at the principal terms of the offer sheet (but not the non-principal terms). If the player's original team does not exercise its right of first refusal within three days (or provides written notice that it is declining its right of first refusal), the offer sheet becomes an official contract with the new team" (Coon, 2016).

"As with any contract offer, a team must have enough room -- either cap room or room provided by an exception -- for the offer sheet. It must maintain the necessary room from the time the offer sheet is signed until the time the new contract is in place or the player's prior team exercises its right of first refusal." "A team may relinquish its right of first refusal, making the player an *unrestricted* free agent. If a qualifying offer is outstanding, the team can withdraw it unilaterally through July 23. It can be withdrawn after July 23 if the player consents, in which case the player is also renounced as a free agent. If a qualifying offer is *not* outstanding, then a team can relinquish its right of first refusal at any time by providing written notice." (Coon, 2016)

To sort through the information, a summary of restricted free agency is provided here.

"A restricted free agent essentially has five options:

- He can accept his prior team's qualifying offer, play for one season, and become a free agent again the following summer.
- He can accept his prior team's maximum qualifying offer (if applicable, and if one has been submitted) and play under a long-term contract at the maximum salary.
- He can negotiate a new contract with his prior team that is independent of the qualifying offer or maximum qualifying offer.

- He can sign an offer sheet with another team through March 1, which his prior team is given the opportunity to match.
- If he does not sign a qualifying offer, a contract, or an offer sheet for one year, his prior team can submit a new qualifying offer (or maximum qualifying offer), and the player becomes a restricted free agent again the following offseason."

"If a team matches an offer sheet and retains its free agent, then for one year they cannot trade him without his consent, and during that year cannot trade him at all to the team that signed him to the offer sheet. They also cannot trade the player in a sign-and-trade transaction. A restricted free agent's resulting contract (whether with the new team or the contract is matched by the player's prior team) cannot be amended in any manner for one year" (Coon, 2016). For the purposes of this study, it is important to note that players can use restricted free agency to lead to unrestricted free agency. "If the player really wants to leave, he can sign his original team's qualifying offer, which constitutes a one-year contract at a scale salary. He must then play with his original team for one season, and following that season he will become a free agent again. If he meets the tenure requirement he will be an *unrestricted* free agent, and then can sign with any other team." (Coon, 2016)

FACTORS OF A FREE AGENCY DECISION

Unrestricted free agents in the NBA possess the ability to accept any offer presented to them. For a majority of free agents this freedom is irrelevant as they are not offered a contract from any team, and are forced to remain as free agents (based on data in this study, 38.54% of all free agents signed with an NBA team during free agency period). For the desired players that receive multiple contract offers, including an offer

from their current team, choosing whether to stay with their team (re-sign with their previous team) or leave is a complex decision. A number of reasons exist for both staying and leaving; and often do not yield a clear decision. These details are discussed below.

A principle factor in this decision is the magnitude and specifications of each contract offer. This factor is present in both the decision to stay and leave, and therefore it will not be discussed as a reason for either choice. The NBA operates under collective bargaining agreements that are subject to change, with the most recently changed agreement lasting six years. These agreements contain a number of provisions and exceptions, giving teams the ability to offer unique contracts. Very generally, the contract offers are likely to be quite similar in length and structure (assumedly, as every team has the same ability to value the player's worth), making it so that no team's offer is above and beyond that of another. This can vary based on the perceived worth of the player. The top free agent, for example, will be offered maximum contracts from each interested party, meaning that salary cap restrictions regulate the largest contract that a team is able to offer (Coon, 2016). If salary offers are similar, the magnitude of the contract will not play as large of a role in the player's decision. With lesser rated players, however, the contract offers could range significantly based on the extent that the player is desired by each team. For example, teams with lower winning percentages in the previous season could feel the need to sign free agents, offering them larger contracts than what they are worth. This could be the result of desperation, or the fact that the higher rated prospects desire a higher performing team, causing lower performing teams to either surrender desired prospects or overpay to compensate for their lower standing. This latter explanation follows the hypothesis of this study: unrestricted free agents follow the allure

of larger contracts, and underweight the possibility of lowered performance as a result of playing on a lower caliber team.

A number of factors outside of basketball may be considered when choosing to sign with a different team (as opposed to signing a new contract with the player's previous team). Often times a change of team requires the player to acquire a new home, although it is possible for the player to retain their current residence while also renting or buying closer to the new team. In either circumstance, the player has to consider the logistics of their living situation. With that decision comes the fact that the player will be spending an extended period of time in a new city. The NBA is comprised of teams all throughout the United States (with one team located in Canada) meaning that the new team could be located in a different city with a host of differences, such as; the climate, size of the city, proximity to the player's family, the market (i.e. New York City vs. Milwaukee), and also the tax rate. Also, Kopkin (2012) outlines the structure of income tax in the NBA. The income tax that the player pays is based on the state where each game is played. With an 82 game season, 41 games will be played in the team's home state, meaning that the magnitude of the player's contract will be effected by the location of the team's home arena. A good example of this is LeBron James' free agency decision in 2010. James final decision was to sign with the Miami Heat, a team located in a state with no income tax. The New York Knicks were one of the teams that James was considering, a team located in New York City, New York. Had James decided to sign with New York, he would have paid $25 million in state taxes over the life of his contract (based on his contract and $40 million a year in endorsements) (Erb, 2012). This illustrates the financial significance that the state income tax can have on a salary.

TEAM CHEMISTRY CONSIDERATIONS

As basketball is a sport that plays a small number of players at one time, each player needs to possess a certain degree of skill along with an understanding of the team's mission and tendencies of the player's on the team. Each player operates both autonomously and as a member of a team. While the individual acts on their own to produce a result, that circumstance is the result in some way or another of the team's efforts. That is to say that the game is played by a team and that no player is entirely responsible for the outcome of their results. This fact is fundamentally important for players to remember when acting in the free agent market. The player may be elite and their performance could be largely a result of their own skill, but often times even the best players benefit from the actions of their teammates. These actions could easily be unseen, but the players need to question the impact of their teammates on their own performance. For example, perhaps a scoring guard (one whose offense primarily results from one-on-one scenarios and points scored close to the basketball hoop) plays on a team with a very offensively-talented center. In this example the guard is one of the top free agents in PPG (Points per Game). For the sake of the example, it is assumed that the guard chose to use free agency to move to a different team. This new team resembles that of the player's previous team, but at the end of the new season the player's PPG is down six points. This decrease in performance could be strictly a result of the player, but it could also be the fact that the center on the previous team drew a great deal of attention from opposing post players, creating lanes for the guard to drive in with less opposition under the basket. The guard could have played at the same level in both seasons, but the number of contested shots could have increased greatly on the new team as a result of

different personnel. This team composition factor cannot easily be seen in statistics, but it is the reality of the game. As a result, a significant reason for a player to remain on their current team is the predictability of the upcoming season. Now, basketball like all sports is dynamic, in that each player on the team could perform drastically different from one season to the next, but the likelihood of this happening would appear to be low, giving the free agent a convincing reason to stay where they are already having success.

Similarly, team chemistry is critically important to the success of a team. One could argue that the synergy of the team is more important than the talent of the individual players. To support this argument, in the 2011 NBA Finals, the Dallas Mavericks beat the Miami Heat. Miami famously had three top rated players, whereas Dallas had an older group of players who were not performing at their younger level. During the regular season, the average PER of the top five players for Miami (only including players who played the majority of the season) was 19.24 to Dallas's 17.9. Miami had 2 players with PER values over 20 with another at 19.4. For Dallas, their top rated player had a PER of 23.4, but then their next best season ending PER by a starter was 18.4. Based on their regular season performance, the Dallas Mavericks were at a large disadvantage going into the NBA Finals as they lacked the individual talent; however, for the playoffs as a whole the Mavericks average PER for their top five players was 18.64, to Miami's 18.48 (Basketball-Reference.com, n.d.). Basketball analysts agreed that Miami had the individual talent but they lacked chemistry as they were in the process of determining how three all-stars could function on the same team. For Dallas the team chemistry was very high, and when it mattered most the Mavericks, as a team, outplayed the Heat. The talent level of the Heat was unquestionable, but their chemistry

was too low to beat the best team in the Western Conference. In the next season (which was abbreviated due to a strike), the Heat won the NBA Championship and the Mavericks lost in the first round of the playoffs (Basketball-Reference.com, n.d.). This example shows that chemistry alone can wins games, but that continued success also requires a certain level of ability.

For free agents who had success in the prior season, the level of team chemistry should be considered in their free agency decision. As mentioned repeatedly, each player relies on their teammates. A large percentage of points scored are the result of an assist, a statistic that inherently requires more than one player. For example, even if the free agent's athleticism is the reason that they are open, the fact remains that they required a teammate to pass the ball, or else they would not have had the opportunity to score. A team with great chemistry often finds the open player and plays team defense. A team such as this could produce a number of players with impressive individual statistics. These players could then take their unrestricted free agency and accept the offer from the highest bidder, disregarding the fact that they were part of a team that gave them the opportunity to perform well. The history of the NBA is filled with examples of players who possessed a great deal of talent but who were never surrounded by an adequate supporting staff. These players produced at high levels and are regarded as top players, but they never won championships. It is impossible to predict what would have happened had these players been surrounded by a group with chemistry, but experts agree that better support would have translated into more wins. For those players, they had the talent but they were not in situations that allowed them to win. For free agents who find

themselves on successful teams, they should consider very seriously how the team continuity affected their performance.

Related to a player's familiarity with their team and the team's chemistry is the prospect of winning a championship. One of the goals of professional sports teams is to win. This obviously means winning individual games, but also winning enough games to reach the playoffs, win the championship and be considered the best team in the league. For a team to achieve this goal, the aforementioned factors are almost entirely necessary. As team chemistry and continuity are developed over time, it is logical to think that a player has a better chance at winning a championship on their current team. This varies as a player on a poor team could have good chemistry with his teammates while still losing due to the team's lack of talent. Player's in this situation have two very basic options; they can re-sign and attempt to build on the chemistry, or they can leave in hopes of finding success on a team higher in the standings. An argument can be made that star players on poor teams should choose to stay with their current team with the intention of building a championship-caliber team. The flipside of this coin would be for the player to sign with a team that already has a championship-caliber roster. This idea has gained popularity after the Boston Celtics traded for both Kevin Garnett and Ray Allen (separate transactions) to form "The Boston Three Party" with their current player Paul Pierce (Thomsen, 2015). This combination of three highly rated players went on to win the NBA championship in their first season (Harper, 2013). This formation of players could have inspired LeBron James and Chris Bosh to choose to sign in Miami to join fellow all-star Dwyane Wade to form the "Big 3," a combination of players that went on to win two championships (Gutierrez, n.d.). These two examples are quite different, as the Boston

Celtics team was formed through trades, while the Miami "Big 3" was formed through free agency. Both examples send mixed signals to upcoming free agents. For players who feel that they are better off starting somewhere new, these examples could act as a catalyst, inspiring players to use free agency as an avenue to a championship team. With the Big 3 in Miami, LeBron James and Chris Bosh both won championships by using free agency to leave their team in hopes of something better. For players who want to win a championship with their current team, Dwyane Wade showed that it is possible to bring a championship to your team by encouraging other top players to join you (with the Celtics Pierce won a championship with his current team by encouraging the signing of top players). Both sides of this require players to move through free agency (or trades, which can be influenced per the player's request), demonstrating that it can be beneficial for players who sign with a different team and players who choose to re-sign with their previous team.

FAN BASE CONSIDERATION

A significant factor for each free agent decision should be how one's move will affect the feelings of their fan base. While a player's fans may be much less important than their future performance and salary, the free agency decision should not be made without taking this group into account. For a lesser known player, their fan base could dissipate by moving to a different team. For the more popular players, their decision could drastically change their fans' opinions. For example, LeBron James' decision in 2010, after he publicly announced that he would be leaving Cleveland, caused minor riots to break out with fans posting videos of themselves burning his jersey (Keneally, 2014). Financially, a larger fan base can mean increased jersey sales and the potential for

endorsements. In terms of performance, a fan base could mean vocal support in the player's home arena. With the presence of social media, a fan base could mean a great deal of cyber encouragement, but also cyber discouragement. The increased significance of social media (tweets are read and discussed on popular sports television shows) along with its perceived importance could inspire a psychological state. This state could be positive with feelings of encouragement, but it could also be negative with an increased feeling of pressure which could then cause a decrease in performance (the converse is also possible). A player's fans may not directly impact their well-being, but indirectly the fan base affects the player in a number of ways.

MOVING THROUGH FREE AGENCY

Player roles in professional basketball are studied and analyzed very significantly. A number of different roles exist, including starter, the clutch player, the sixth man, a three-point specialist, a rebounding specialist, and a defensive-minded player among others. These roles often stay with a player unless their performance starts to decrease or they develop their game further. While a player may feel that their role has changed, or that they deserve a chance to show that their role has changed, their coach may not feel the same way. When this occurs tension is built, and the player is left with almost no option other than to keep performing well with the hopes that their coach changes their opinion; however, if this tension develops in a year where the player is going to become an unrestricted free agent, the player has the option to finish out the season to the best of their ability, with the intention of signing with another team after the season ends. In this circumstance, unrestricted free agency presents a wonderful opportunity for the player to move to a different team with the hopes of moving into a new role. An example of a

player finding success on a new team after feeling underappreciated is James Harden. Harden was a very successful bench player for the Oklahoma City Thunder, and in the 2011-2012 season, Harden won the NBA Sixth Man Award (Release, 2012). Harden held the sixth man role on the Thunder as he was playing behind already successful player Russell Westbrook. The Thunder attempted to sign Harden to a large contract extension, which would have made Harden the highest paid sixth man in NBA history, but for Harden that was not enough. According to Harden, "I felt like I already made a sacrifice coming off the bench and doing whatever it takes to help the team, and they weren't willing to help me." Essentially, Harden was willing to take a lessened role and come off the bench as he wanted to stay with the Thunder, but with that he was not willing to accept the contract of a sixth man. As a result, Harden wanted out and the Thunder traded James Harden to the Houston Rockets where he was given a large contract and a starting role. In his first two years in Houston, Harden was given nearly 10 more minutes of playing time per game, which has translated to 25.7 points per game (up from 14.2) and a PER of 23.2 (up from 18.6) (these statistics are based off of the average of his final two years in Oklahoma City and his first two years in Houston) (Favale, 2014). These statistics show that Harden was ready to move from a sixth man to a starter and an all-star, but his coach and team were not willing. This example is not perfect as Harden was not eligible for free agency and therefore he found his new role through a trade, but the trade was orchestrated based on his request, and had he been an unrestricted free agent his new success would have been assumedly the result of moving through free agency. In summation, players may find themselves on teams where they are unable to advance

based on the current roster and the coaching staff, and in situations such as this, signing with a different team during free agency is likely the best option.

PARITY ISSUE

Parity among teams in the NBA varies. The Eastern conference, historically, has been comprised of significantly less-talented teams than the West. That is not to say that the Western conference is strictly better than the East. The teams that finished with the worst record in the West are not necessarily any worse than the worst-performing teams in the East. Along with that, the best teams in the West are not necessarily better than the best teams in the East. For example, the Cleveland Cavaliers (East) beat the Golden State Warriors to win the NBA Championship in the 2016 season (Petski, 2016). This information is worth noting as some teams in the NBA are much better than others. Therefore, an unrestricted free agent might find themselves on one of the worst teams in the league, with no realistic prospect of improving in the upcoming season. The National Basketball Association has both free agency and a draft (consists of two rounds with each team having one pick per round. After the lottery determines the order of the first three picks, the draft order goes in reverse order of the regular season records) to acquire college players, two ways that teams can improve by changing their personnel (DraftSite, 2016). Lower-ranked teams are less likely to sign top prospects, and because of the NBA lottery, the players drafted might not develop into competent players (the draft lottery is weighted, or in other words, the team with the worst record is not guaranteed the first pick, but their chance of receiving it is the highest) (Patt, 2015). As a result, teams that finish lower in the standings are more likely to finish poorly in the upcoming season. For example, as of 2014, four teams in the NBA had missed the playoffs at least five years in

a row, with the Minnesota Timberwolves having missed nine seasons in a row (Figueroa, 2014). For the players on teams such as these, free agency can be a great opportunity to sign with a new team, and hopefully have increased personal and team success in the future.

Teams can find themselves offering contracts to players that are larger than what they would have liked to pay. Free agency for successful players can mean an opportunity to earn a premium on their contract by letting multiple teams bid for their services. As not every player in free agency is not being offered a maximum contract, teams have the ability to persuade players by offering them larger contracts. When choosing a team in free agency, it is possible for the players' current team to offer the largest contract, and in that case the player can earn a premium without signing with a different team through free agency; however, unrestricted free agency allows for multiple teams to bid for a player, something that creates the possibility for the salary premium. In the case that a new team offers a player the largest contract offer, moving gives the player the ability to earn more money.

PROSPECT OF A NEW BEGINNING

"The grass is always greener on the other side," or in other words, people are never satisfied with their own situation (dictionary.com, n.d.). This expression, while common, holds a great deal of truth. The unknown is full of possibilities, and under a positive disposition, the human mind can easily foresee those possibilities as certainties. The implications of this idiom have been experienced by most, but that does not prevent individuals from seeing hope in the future. This philosophical dilemma appears to presents itself in free agency, as out of all of the unrestricted free agents who signed with

a team from 2003 – 2012, 64 percent signed with a new team. Out of that group of players, 62.5 percent had their average PER over the following two seasons decrease. That decrease in performance could be minimal, and it needs to be noted that every player is older in the following two seasons (which could contribute to the decreased performance), but an ocular analysis of this dataset illustrates that a majority of free agents choose to sign with a new team, and that the majority of these players have decreased performance on average in the following two seasons. Based on those percentages and that naïve analysis, it appears that the meaning of the "grass is always greener" idiom holds true in NBA free agency, and that moving to a different team does not necessarily lead to more success (at least in terms of performance); however, this does not mean that the appeal of something new does not affect free agent decisions.

As unrestricted free agents, players in the NBA possess a great deal of freedom and the ability to make a choice that could lead to greater success. While it is impossible to predict the future, well-educated decisions should, on average, lead to better circumstances. Based on the dataset used in this study, these free agency decisions generally lead to a decrease in performance, something that one would think would decrease an individual's utility. As rational individuals theoretically attempt to maximize their utility, it appears that players in the NBA are not acting rationally. The above discussion attempts to outline the main reasons that a player should choose to stay with their team or leave. The reasons for both choices are subjective and require the analysis of the individual and their circumstances, but it is the belief of this study that a careful analysis of these factors will lead to better decisions, better outcomes, and increased utility for the unrestricted free agents in the National Basketball Association.

To summarize, the main considerations in a free agents decision may be team chemistry, a player's fan base, redefining one's team role, a better chance to win a championship, and a chance to earn a larger salary. The chemistry and continuity that a player has with their current team is crucially important, as that connection might not be found on a different team. On a new team, the player's future performance could suffer, giving the player an incentive to re-sign with their previous team. For those on a team where they feel that they deserve a better opportunity to change their role, moving through free agency might be their best option. When changing teams, players should consider how this change will affect their fan base. Choosing to sign with a new team could give fans the impression that the player is disloyal, or if a player moves from a small market to a large market, the new team could mean a larger fan base. The effects that fans can have a player's mental state is worth considering when making a free agency decision. Incidentally, a portion of teams in the NBA are going to perform poorly each year, with select teams performing poorly for a number of years in a row. If a player is on a team such as this, free agency presents an opportunity to move to a team with a better chance of winning an NBA championship. For players interested in signing the largest contract possible, free agency could offer an opportunity for multiple teams to bid for their services, leading to a salary that is larger than what it would have been if only one team offered a contract. Lastly, the allure of something new is difficult to measure, but it is almost always present. Players might find themselves unhappy with their current team, captivated by the idea of starting some place new. For players with this feeling, changing teams might be their only chance to feel satisfied and happy with their decision.

CHAPTER 2: LITERATURE REVIEW

In the literature review below, background information is provided about:

- the history of unrestricted free agency in the NBA,
- how the freedom of choice affects player performance,
- different factors that influence contract specifications, and
- the impact of star players on consumer demand.

Free agency is a fundamental instrument in professional sports, yet the existing research on this field is fairly limited. While studies can be found addressing player salaries and player performance, little has been done exploring free agency effects on a player's well-being. This study hopes to gain from the surrounding knowledge in hopes of applying it to the research objectives. That is to say, the goal of this literature review is to extract the available information and to use it as a basis for the continuing research on how player mobility through free agency effects player utility. The history of unrestricted free agency in the NBA is discussed in the first section, research on player performance is discussed in the second, and research on player contracts is discussed in the third. The second section will be divided further into subsections relating to the different aspects of free agency.

A BRIEF HISTORY ON FREE AGENCY IN THE NBA

In the National Basketball Association (NBA) in 2015, free agents have the ability to choose any team that offers them a contract barring that they qualify for unrestricted free agency. Before 1988, however, players were not afforded this freedom. In the years leading to 1976, all NBA player contracts contained a reserve clause that required the player to play for whichever team owned their contract. Players only

changed teams if their contracts were transferred to another team (Lin & Chang, 2011). In other words, when a player joined the NBA, that player no longer had control over the team that they played for. Discontent with this reserve clause was present in 1970, but efforts to amend this clause were not successful until 1976 when the NBA singed the Robertson Agreement. This agreement allowed players to own their playing rights when their contracts expired, but a compensation system restricted the newfound freedom that the players were granted. In order for a player to leave a team, the team that was losing the player had to be compensated with cash, players, or draft choices determined by the commissioner of the NBA (Lin & Chang, 2011).

This system was replaced by a new rule in 1980, the right of first refusal. Very simply, if a player wanted to leave a team, the team that previously owned their contract had the right to match the offer of the new team (this resembles present-day restricted free agency). If the original team abstained from matching the new team's offer for 15 days, the player could transfer to the new team. If the original team matched the offer, however, the player was required to stay with that team (Lin & Chang, 2011).

The right to first refusal rule persisted until 1988. In that year, as part of the Collective Bargaining Agreement between the National Basketball Player's Association (NBPA) and the NBA, unrestricted free agency (UFA) emerged. As an unrestricted free agent, a player had the freedom to accept an offer from any team once their second contract expired (Lin & Chang, 2011). In 1996, the NBPA and the NBA reached a new agreement that eliminated all restrictions on free agency (players were free to accept offers from any team after their contract expired). As a result of a lockout that continued into the 1999 season, a new CBA was signed that included restrictions to free agency.

Teams partially regained their right to first refusal, depending on the characteristics of the player. For all players that joined the NBA after the 1998-1999 season, they would become restricted free agents (RFA) if their contracts expired following the fourth year of the rookie 'scale' for first round draft picks, and if their contracts expired after being in the league for three or fewer years. In order for the team to exercise its right of first refusal, it had to propose a qualifying offer to the player. If the player did not match any of these conditions, they became UFAs when their contracts expired (Lin & Chang, 2011).

1. PLAYER PERFORMANCE

A. THE IMPACT OF CHANGING TEAMS ON PERFORMANCE

The objective of this thesis is to assess how player mobility (a player choosing to sign with a team different from their previous contract) effects player utility. It hypothesized that individual statistics are the best measure of a player's value to a team. As a result, individual statistics are helpful in tracing the progression of a player's career. If a player hopes to sign a larger contract with a new team once they become a UFA, it is reasonable that their statistics need to improve. In an article by Christian Deutscher, the impact of the audience on player performance is measured. Incidentally, the effect of changing teams is also measured by player performance, more specifically free throw performance in home games. Part of the study questions if social pressure affects player performance. The social pressure hypothesis asserts that individual performance declines as a result of spectator expectations (Deutscher, 2011).

The data set in the study contains every free throw outcome from regular season games for the 1997-1998 season to the 2006-2007 season. Free throw performance is

evaluated as the player's success is independent of opponents' or teammates' actions. In sports, measuring the effect of a player's nerves is difficult as a player's performance is almost always effected by other players. For example, in football the kicker is the player who has the most control over the result of a field goal attempt. While a successful or unsuccessful attempt is majorly attributed to the kicker, other players on the field can influence the result of the kick. In order for the kicker to have a fair attempt at kicking the ball through the field goal posts, the player who throws the ball is required to throw it accurately to the holder, who is then responsible for placing the ball in a position that the kicker expects. If this is executed perfectly, and the offensive lineman keep the other team away from the ball, the kicker then has close to complete control over the result of the kick. This example is included as a field goal kicker is a player who is often associated with performing under constant social pressure, yet their performance depends on multiple factors that they cannot control. Free throw shooting, however, takes place in a controlled environment, with no opponent contention. The author classifies free throw shooting as skill-based performance, as the result becomes increasingly automatic and less conscious through repetition during practice. This is an important distinction as the author included that Baumeister (1984) found that skill-based performance is more likely to be effected by pressure than effort-based performance (Deutscher, 2011).

Three different types of players were evaluated in this study: players who remained with their current team from one season to the next, players who were traded during the off-season to a new team, and players who signed with a new team as free agents. The reason for the different types of players is based on the freedom of choice. The author is evaluating if social pressure in home games affects the performance of new

players. If the player remained on the same team, they are not performing in front of a new home audience, and it is hypothesized that their performance should not vary greatly from the previous seasons. If the player is on a new team due to a trade, they typically have little to no control over their new team. As a result, the player's performance should be consistent with the previous season as the social pressure from the new home audience should not be an increased factor. Conversely, if a player comes to a new team through free agency, they are signing with a team of their choosing, increasing the social pressure (Deutscher, 2011). Essentially, it is hypothesized that freedom of choice influences the effect of social pressure, and as a result, worsens the performance of these players. The data reveals that free agents who sign with a new team perform significantly worse during home games (in free throw percentage), but players who were traded to a new team maintain their free throw performance. An important note is that the quantile regression shows that especially bad free throw shooters suffer from the additional pressure, whereas the performance of good free throw shooters does not decline. The author concludes that by having the ability to select the team that they play for, the player is negatively impacted by the increased pressure to perform well (Deutscher, 2011).

The objective of this study is to explore the effect that moving through free agency has on player utility. A crucial facet of player utility is a player's individual statistics, a measure that results from player performance. According to the results of Deutscher's study, players that move to new teams through free agency will have negatively impacted performance in home games due to increased social pressures. This result is extremely significant moving forward with this study as it could be fundamental in explaining a player's performance after changing teams through free agency.

2. PLAYER CONTRACTS

A. FREE AGENTS IN THE NATIONAL FOOTBALL LEAGUE

Signaling can be found everywhere that we look. Whether it is the sale price on a t-shirt or the sticker price on a new car, explanatory signals are available to assist in the decision-making process. This can be useful in personal decision as it can also be useful in business transactions. In the world of professional sports, signaling can be an important tool in valuing a player's worth. Understanding this process is crucial in the free agent market.

Simmons, and Berri (2009) demonstrate sound economic thought in their study that addressed position specialization in the National Football League (NFL). The authors questioned which paid more: multi-skilling or specialization. In other words, is it in the player's best interest to develop multiple skillsets or to focus on one trait? The study measured this using data on running backs who had at least 100 rushing attempts in a season from 1994 to 2006, and it compared players who produced in both the running game and the passing game, and players who produced mostly in the running game. The authors concluded that the returns to specialization were greater than the returns to diversification (running backs earn more when they gain the majority of their yards either rushing or receiving) (Simmons & Berri, 2009).

Simmons and Berri (2009) also addressed in the study the effects of free agency on salary. They found that free agency alone does not raise salary, but that free agency along with requisite ability leads to higher salaries. This is only the case if the free agent stays with the original team. If the player changes teams, they experience a salary reduction. The authors contend that this is a result of signaling. If a player becomes a free

agent and the team does not offer a new contract, this is a signal that the previous team does not believe that the player is worth their present contract value. As a result, the player signs with a new team for less money (Simmons & Berri, 2009).

The economic concepts addressed in this study are not difficult to understand. If a player's previous team chooses not to offer them a new contract, the player is clearly overvalued at their current salary, and any interested team should offer the player a lesser contract. While the study confirms this logic to hold true in the NFL, its implications may not be significant when applied to the NBA. The collective bargaining agreement differs between the two leagues, creating a different landscape for player mobility. Where you have NFL players signing larger contracts with their previous team, it can be seen in the NBA players signing increased contracts with new teams. Not all UFA's find themselves with contract offers from their previous team, and many are forced to go to any team that is willing to offer them a contract. When this is the case, the findings from the Simmons and Berri study are directly applicable to the objective of this thesis.

B. CONTRACTS BASED ON PAST PERFORMANCE IN THE MLB

As players age in professional sports, a diminishing marginal return to labor presents itself. This is not surprising if a person has a basic understanding of economics, sports, and the human body. While this is common knowledge for every sports team, the implications of the concept are difficult to apply, simply because it is difficult to predict the age where marginal returns begin to decrease. One would assume that teams would account for this ambiguity by offering older players shorter contracts for smaller amounts. Interestingly, this does not seem to be the case. Most devout baseball fans can attest to the phenomena of teams in Major League Baseball (MLB) signing older players

for large contracts of great length. What motivates this seemingly irrational behavior inspired the following research.

Healy (2008) addressed this question directly by questioning if firms have short memories. He did this by analyzing the performance data of all major league baseball hitters who signed free agent contracts from 1985 – 2004. According to the data, a player's performance can be best predicted by looking at their performance from 2 and 3 seasons prior. In other words, if a person is predicting a player's statistics for the upcoming year, they would achieve the most accurate results by looking at the statistics from 2 and 3 seasons beforehand. This method is 20 percent more accurate than predicting a player's performance based on their performance from the previous year. Interestingly, player salary in the current year depends only half as much on his performance from 2 and 3 years prior. This result is alarming as it indicates that professional baseball organizations determine player contracts ineffectively. Despite the fact that player performance is best predicted by performance 2 and 3 years prior, player salaries are determined based on performance in the previous year. As a result, MLB teams are overpaying certain players by incorrectly interpreting player statistics (Healy, 2008).

Healy (2008) also classifies teams as successful and unsuccessful by evaluating the team's ability to accurately base player salary on past performance. If the team achieved more wins than their payroll would predict, Healy refers to that team as successful. Using this classification, the author found that only the unsuccessful teams show significant memory-based biases in their salary offers. That is to say, unsuccessful

teams seem to base a player's future performance far too much on the previous season, disregarding seasons 2 and 3 years prior.

Examples exist of older players signing very large contracts despite the realities of the aging process. Healy explored this phenomena only to find that MLB teams base older player contracts more on the previous year's performance than they do the previous 2 and 3 years. This pattern persists more for older players than it does for younger players. The author found that performance in the previous year for younger players predicted salary 1.5 times more strongly than performance 2 years ago. For older players, performance in the previous year predicted salary more than 4 times more strongly than 2 years before. This significant difference seems to indicate that teams in the MLB have short term memories when it comes to older players (Healy, 2008).

In an effort to explain this decision-making process, the psychology of memory was studied. It was found that people access the most salient memories when making decisions, which he contends could explain why teams focus so heavily on performance in the previous year (Healy, 2008). As Major League Baseball organizations differ from professional basketball organizations, it is difficult to apply these findings directly to the NBA; however, as the two professional sporting leagues are very comparable, it is not unreasonable to suspect that NBA teams also have short memories. Taking into account Healy's findings on the psychology of memory could be very useful in understanding how certain NBA player contracts are determined. For example, Dwyane Wade, at age 33, was a 12-year-veteran who had missed a number of games in the past seasons due to injuries. Despite declining statistics in the 2 and 3 years prior, Wade performed well during the 2014-2015 season (ESPN, n.d.). Before the 2015-2016 season, Wade re-signed

with the Miami Heat for one-year and $20 million (Boylan-Pett, 2015). While rational thinking would predict that Wade's upcoming performance would be worth less than $20 million, Wade still signed the large contract even at his elevated age. This could be an indication that NBA teams also have short memories, but this study does help to predict an athlete's future performance.

C. SALARY DISCRIMINATION BY NATIONALITY IN THE NBA

The National Basketball Association is a global league with an increasing presence of international players. In the 2014-2015 season, twenty percent of the minutes played in the league were attributed to international players. In the same season, 58 international players held roster spots on playoff teams (Schonbrun, 2015). This is an impressive figure when you take into account that the entire league only held 35 international players in the 1999-2000 season (Yang & Lin, 2012). With the ever increasing international presence in the NBA, the question of salary discrimination is inevitable. The upcoming study explores this issue with diligence.

Racial salary discrimination in the NBA is a widely explored issue in sports economics, and with the influx of international players an interesting question emerged; does the NBA labor market differentiate between U.S.-born players and international players? Yang and Lin (2012) explored this issue by looking at 618 players from the 1999-2000 to 2007-2008 season. What they found is that on-court records, such as rebounds, assists, steals, and blocked shots contribute strongly to determining a player's salary, especially for points per game (Yang & Lin, 2012).

More specifically to their objective, the author's found that during the 1996-1997 and 1997-1998 seasons, foreign-born players were paid a large premium above other

players; however, after those seasons, the premium disappeared. The author's credit this drastic change to NBA teams having a found an established system to evaluate potential international players, something that was not present in the previous years. As a result, the authors contend that the temporary premium could be attributed to a "winner's curse"; that is to say that the teams may have overestimated the marginal revenue that international players could have brought in the free agent market. Along with this, NBA teams gained bargaining power to negotiate contracts due to the increased supply of potential international players, diminishing any salary premium that may have remained (Yang & Lin, 2012).

In all, Yang and Lin (2012) found that on average international players receive a 13-18% lower salary after controlling for personal characteristics and on-court performance. Additionally, the authors found that U.S.-born White players are paid less than their non-White U.S.-born counterparts, ceteris paribus; however, white players tend to be bench players and are paid less as a result (the study offers that racial discrimination could be possible). Finally, the study found that international players from larger economies are more likely to receive a wage premium as a result of the foreign market effect. The authors did include an interesting note about between-season player movement. According to the study, player movement during this time represents a "lemon market" that signals a player's struggles and therefore contributes to a decreased salary (Yang & Lin, 2012).

The evaluation of international players is no easy task as seen in the recent years. While an established system to evaluate international players is in place, questionable decisions continue to be made regarding foreign players. The previous study associated

the one-time international salary premium to the "winner's curse", the trend to overestimate the marginal revenue that players could bring in the free agent market. It could be argued that the "winner's curse" is still present for foreign-born players in 2015. Despite the fact that international players are no longer receiving a salary premium, it would seem that these players are still earning a premium in their draft value. Since the beginning of the 21st century, foreign-born players are consistently being selected early in the NBA draft. In the 2015 draft, for example, the three top international prospects were selected in the first seven picks (Schonbrun, 2015). This may not seem alarming at first glance, but after further review, one might question this behavior. Since 2002, 19 international players have been drafted in the lottery, and of those 19 players, not one has been selected as an All-Star (Feldman, 2015). It would seem that with this consistent pattern, teams would begin to evaluate foreign-born players differently, yet no sign indicates that this has happened yet. One would think that this could be attributed to the uncertainty that comes with acquiring a new player. No matter what the previous statistics and indications may communicate, a chance always exists that a player could change and be something more. This idea could be present in the current free agent market in the NBA. With older players receiving large contracts and fading players earing increased salaries, one could argue that the "winner's curse" is still present and a controlling factor in the free agent market.

D. TAX INFLUENCES ON NBA FREE AGENCY

Professional basketball players in the NBA make a great deal of money when compared to the median household salary in the United States (Gaines, 2014) (CNNMoney, 2014). Sports fans are accustomed to player contracts that exceed 100

million dollars. When dealing with such large sums of money, one could assume that the tax rate is not a crucial factor in a free agent's team selection. What is 10 percent in taxes when the annual salary is in the tens of millions of dollars? At the same time, athletes are individuals, and they are assumed to be rational. As a rational individual, it is impossible to ignore the tax rate, and when dealing with unrestricted free agency and state-by-state income tax rates, it is foreseeable that this is a variable that players consider when choosing a team.

Kopkin (2012) conducted a study to measure the effects of state income tax rates on labor migration in the NBA. Each team plays a total of 82 games in the regular season, with 41 home games and 41 away games. The income tax that the player pays is based on the state where the game is held. For the 41 away games, the tax rate that is paid is the highest rate between the state where the game is played and the team's home state (for home games the tax rate is the rate in the home state). As can be seen, the location of a team can have a large impact on a player's contract. Now, a salary cap does exist in the NBA. For individual players, there is a maximum salary that cannot be exceeded, and for a team, there is a salary cap that restricts the size of a team's payroll. Exceptions exist that change how much an individual player can make, and how much a team can spend. In the NBA, there is a luxury tax that allows a team to have a payroll that exceeds the salary cap; however, for every dollar over the salary cap, the team must pay a dollar to the league. That money is then dispersed evenly to every team in the league that is not over the salary cap (Kopkin, 2012).

The author questioned if player contracts account for income tax rates and how the rates effect player mobility. What was found is that a relative increase in the income

tax rate on a given team leads to a decrease in the average skill of the free agents that the team is able to sign. Also, as teams are constrained financially, it does not appear that teams incorporate the tax rate into player contracts. As a result, players may be best suited to play for teams with lower tax rates (Kopkin, 2012).

In the summer of 2010, free agent LeBron James chose to sign with the Miami Heat, one of the six teams that he was considering. Conveniently, of those six teams, signing a contract with the Heat would require Mr. James to pay the smallest amount in taxes (Kopkin, 2012). Now, one could argue that LeBron James going to the Miami was the biggest free agent transaction in NBA history, and it is no surprise that his decision benefitted him financially. This example and the findings in this study could be very explanatory in understanding NBA free agent decisions. A significant amount of player utility is derived from a player's salary, and better understanding how a player arrives at that salary is crucial in the objective of this study.

3. STARS IN THE NBA

More and more it can be heard that the NBA is a league driven by standout players, players who are considered superstars. These stars are valuable on and off the basketball court. It would appear that superstar players increase ticket sales regardless of team wins. If team wins increase with the emergence of a superstar, ticket sales would assumedly increase even more significantly. The question that is difficult to quantify is how valuable is a star player regardless of team wins?

Berri, Schmidt, and Brook (2004) addressed the impact that the competitive imbalance has on consumer demand for the NBA product. They did this in part by measuring how star power, a measure of players considered to be stars, influenced

consumer demand. In this study, the authors used All-Star Game votes as the measure of star power. They incorporated franchise characteristics such as stadium capacity, expansion team, roster stability, and they included market characteristics. The authors found that star power was indeed statistically significant, but that it was a team's ability to generate wins that appears to be what drives consumer demand (Berri, Schmidt , & Brook, 2004).

While this study is economically sound in how it derived its results, it is also outdated. Despite being published in 2004, the data that was employed in the study is from the years 1992-1996. If this study were to be redone with updated data, the results could be quite different. While the way the game is played has not changed significantly, the way that the game is received has. With social media and the increased access to player's personal lives, star power has fundamentally changed. It would not be surprising if individual stars are far more responsible for consumer demand now than they were in the mid 1990's.

While the impact that a player's star power has on team revenue may not be a factor in player utility directly, one cannot overlook this issue. The 2015 Collective Bargaining Agreement limits the maximum salary that a player can receive, but this CBA will expire and the NBA Players Association will push to eliminate the maximum salary (Adande, 2015). If the NBAPA were to succeed, the way that NBA player's contracts were determined would change dramatically. Now, things such as the effects of a player's star power on team revenues becomes intrinsically important. The organization would have to quantify the value that the player could bring to the team, and if that value is greater due to star power, player utility could be significantly increased.

4. THE EFFECT OF EXTRINSIC INCENTIVES

A 1997 study by David Kreps explored the interaction between norms and economic incentives. Kreps (1997) begins with two simple questions: *"Why do people adhere to norms,"* and *"Do people adhere to the norm because it is a norm per se, or is there something desirable in the specific norm?"* Four answers are offered for the first question, but only the third and fourth answer are discussed throughout the study. Answer three states "adherence, while immediately costly, leads to better treatment by others than will violation," with answer four reading "adherence is desirable per se." Distinguishing between answer three and four can be important when norms and economic incentives interact. The second question is left unanswered as it depends very much on the answer to the first question.

The author goes on to assert that extrinsic incentives for workers can be counterproductive as they could destroy the workers' intrinsic motivation; however, well-documented cases exist where extrinsic incentives led to significant increases in worker effort and employer profit. Kreps (1997) argues that these outcomes persist only when the employees possess high initial levels of intrinsic motivation (pride in one's work is high and the work is interesting). Strong empirical evidence to support this last fact is hard to find, and the studies with these results can be interpreted in other ways. Taking this into account along with the anecdotal evidence in support of Krep's (1997) assertion contributed to the continuation of this theoretical study.

In the model for Agency Theory, extrinsic incentives cannot lower effort levels, and without incentives effort is at its lowest possible level. Extrinsic incentives can be many things including the desire for continued employment. If the worker fears losing

their job, which could result from a lack of effort, extrinsic incentives are present. The efficiency-wage theory can also be applied. This theory says that if an employer pays above-market wages, the threat of dismissal provides motivation. Similarly, when a promotion is possible based on a worker's performance quality, motivation is provided. Intrinsic motivation may be a result of extrinsic motivators, and because these motivators are fuzzy, observers may not see them and misattribute their consequences to intrinsic motivation.

Jobs that have high levels of intrinsic motivation often involve task ambiguity and creativity. These tasks are often multifaceted with the important facets being hard to measure. As a result, the imposed extrinsic incentives, which almost necessarily will be relatively objective and formulaic, may not be optimal. It can be difficult to forecast what should have been done when tasks are ambiguous and creative in nature, leading to better incentives.

Ambiguous evaluation criteria creates risk aversion leading a worker toward higher levels of effort in order to ensure that they stay safely employed. As a result, workers subject to ambiguous evaluation criteria are worse off ex ante, and retaining them requires higher overall compensation. The employer benefits from higher effort levels but their bottom line remains unchanged.

Signaling effects could be at work as well. For employers who want their current employees to believe that a long-term employment relationship is in prospect, they have to "oversignal" with incentive systems based on long-term monitoring and vague promotion criteria.

Adherence to a norm could be put into a utility function if done so in an interesting fashion. To discipline the theory, one must dig deeper to determine how a utility function is formed. If an employee undertakes some effort without the presence of some extrinsic incentive, they will rationalize their efforts as reflecting their enjoyment of the task. Due to their enjoyment, the employee will work harder at that task, but if extrinsic incentives are put in place, they will attribute their efforts to those incentives, developing a distaste for the required effort. A normative lesson for economic incentives is this: economic incentives, to complement intrinsic incentives, should emphasize the voluntary nature of the desired behavior.

Relationships within an organization need not fit any particular archetype; however, it is natural for individuals to attempt to fit them into a standard pattern. If an employer does not monitor closely the performance of their employees, and if they complement this by symbolic acts of gift-giving, they may inspire kinship relations. Now, if the employer imposes extrinsic incentives, the nature of their relationship with the employees may become confused. The employee is sent signals that the relationship is market exchange and reacts accordingly, taking full advantage of the new opportunities. If anything, the employee spends more time and effort attempting to figure out what is appropriate in specific contingencies that arise.

Kreps (1997) presents an intriguing perspective on incentive-based compensation, with implications that can be used in further economic research, management strategies, and this NBA study. As players in the NBA are compensated with fixed contracts (generally, incentive-based compensation exists but is typically non-substantial), direct extrinsic contract incentives are not present (the majority of NBA contracts are fully

guaranteed). Indirect (as in not included in their existing fixed contract) incentives such as increased playing time, better statistics, more wins, team honors, individual honors, increased future contracts, and endorsements exist. As stated in the article, intrinsic motivation may be the result of extrinsic motivators, which is the situation in the NBA.

The study also discusses that jobs with higher levels of intrinsic motivation often involve multifaceted tasks and creativity. While professional sports may not have been included in the jobs that Kreps (1997) was referencing, the tasks of a professional basketball player are multifaceted and they require creativity. The author also outlined that these jobs contain a level ambiguity, a characteristic that is present in the occupation of a professional athlete. According to the study, jobs with these characteristics are not well-suited for extrinsic incentives. As a result, it can be difficult to forecast what should be done, leading to better incentives. In other words, these findings could be extended to say that extrinsic incentives for professional athletes lead to larger incentives than what are appropriate. This is a pleasing finding as it can be seen anecdotally throughout the history of modern professional sports, and it aligns with the findings of Healy (2008) in the MLB.

Similarly, the author of this study also mentions “oversignaling” in relation to incentivizing employees to stay for long-term. Now, this is slightly different from what can be seen in professional sports, but sports teams do offer large, long-term contracts to convey their belief in the athlete with the goal of a cordial employment relationship. Once again, this finding aligns with the results of the study by Healy (2008), in that MLB teams sometimes overpay for players with contracts that are too long.

CONCLUSION

The emergence of unrestricted free agency in 1988 changed the landscape of player mobility in the NBA. Players have the ability to choose who they sign with after the fourth year of their career (Lin & Chang, 2011). As a result, player decisions relating to free agency and the effects of these decisions are brought into question. Christian Deutscher (2011) shed light on how having the ability to choose a team effects a player's performance. It was determined that players who had the ability to choose their team performed worse due to the increased pressure to perform well (Deutscher, 2011). This study could be helpful in understanding player performance after a player changes teams through free agency.

Related to this, player contracts have a significant impact on the decisions that free agents make. In a study conducted by Simmons and Berri (2009), conclusions were drawn from research on position specialization in the NFL. It was found that running backs were rewarded better for specialization than they were for multi-skilling. The authors also found that players who change teams through free agency earn lower salaries due to signaling from the player's previous team (Simmons & Berri, 2009). This study suggests that players leave through free agency because their previous team determines that the player is not worth their contract value. From this, one could infer that player mobility is directly related to decreases in performance, and not player preference to change teams.

Similarly, a study that focused on contract pricing as it relates to past player performance in the MLB was conducted by Andrew Healy (2008). This study addressed the trend in professional baseball for teams to offer players large contracts based on only

one year of performance, and to offer large, long-term contracts to older players. Incidentally, it was found that a player's performance is more accurately predicted by performance from 2 and 3 years prior, and not from the previous year. It was also found that successful teams consistently offer players accurate contracts based on their past performance (Healy, 2008). In exploring the psychology of memory, Healy (2008) found that people access their most salient memories when making decisions, a concept that could explain why teams focus on performance in the previous year (Healy, 2008). Despite the differences between the MLB and the NBA, understanding the psychology of memory could help to understand how teams make decisions in the free agent market.

Concerning salary discrimination in the NBA, a study by Yang and Lin (2012) found that on average international players receive a 13-18% lower salary after controlling for personal characteristics and on-court performance. The authors also found that foreign-born players from larger economies are more likely to receive a wage premium. Interestingly, the study mentioned that players who change teams between seasons represent a "lemon market". That is to say that this market signals that players have not been performing as well and it often results in smaller salaries; however, the authors also address the concept of the "winner's curse". The idea of this "curse" is that teams may overestimate the marginal revenues that a player could bring in as a free agent, and as result, the player receives a larger salary (Yang & Lin, 2012). This idea could be present in the NBA, and its implications could help in understanding why players choose to move through the free agent market.

When the media reports on large player contracts it is unlikely that they will discuss the player's take-home salary after taxes. While this may not seem surprising, it

actually is when the income tax structure in the NBA is considered. A study by Nolan Kopkin (2012) looked at this tax structure and tested to see if the variability in the tax rate was compensated for in player contracts. It was found that due to salary restrictions and the salary cap, teams were unable to adjust player contracts for the income tax rate. It was also found that a negative relationship between the tax rate and player quality exists. In other words, teams with higher income tax rates consistently sign lower quality free agents. These results could be very helpful in explaining player decisions in the free agent market.

In an effort to address the current trend where teams seek out multiple top-rated free agents, a study on star power in the NBA was reviewed. The study by Berri, Schmidt, and Brook (2004) evaluated how star power in the NBA affected gate revenue. It was found that star power was not a good measure of gate revenue, and that team success was the better indicator (Berri, Schmidt , & Brook, 2004). While this study was economically sound, its data was outdated. As a result, it is difficult to apply these findings to the current landscape of the NBA; however, understand the effects of star power on team revenue could be crucial in the future as the CBA could someday include no salary cap. If this is ever the case, quantifying a player's worth will be unavoidable.

Lastly, a theoretical discussion of extrinsic incentives was included to address player motivations. A study conducted by David Kreps (1997) attempted to build some pre-empirical intuition on the interaction between norms and economic incentives. The author discussed how intrinsic motivation can be based on extrinsic incentives, the distaste for effort if extrinsic incentives are in place, and that these incentives can be suboptimal if the job contains multifaceted tasks and creativity. The author's discussion

offered an explanation for the incorrectly specified contracts in professional sports along with a reason for the lengthy contracts that teams offer their players.

Therefore based on the literature review, in regards to free agency in the NBA, there is a need to better understand the effect of free agency on player utility. As demonstrated in the article by Deutscher (2011), free agency decisions have an effect on player performance. Outside of this article, no other studies were found testing the effects of free agency. As a result, a need for further research on this topic exists. Incidentally, this study assumes that new contracts are based off of the previous two years of performance, as the study by Healy (2008) found that future performance is best predicted by past performance two to three years prior. This finding supports the assumption of this study.

CHAPTER 3: CONCEPTUAL FRAMEWORK

Athletes in professional sports likely have three primary goals: to win games and championships, to perform exceedingly well as an individual, and to earn a substantial amount of money and recognition. Athletes in the National Basketball Association likely have the same primary goals with an increased focus on individual performance and earnings. Teams in the NBA are often comprised of a few different types of players, an all-star candidate, a consistent starter, a rotation player, a sixth man, a few primary bench players, and reserves. Of course team structures vary and different teams possess different combinations of these player types. Championship contenders could have multiple all-star candidates and a reduced number of rotational players, while teams lower in the standings might consist primarily of rotational players. The point is that NBA teams can be significantly affected by a few player. As a result, players in the NBA might have a stronger focus on personal performance, as their performance could mean the difference of winning a championship. In professional football, baseball, and hockey, it is less likely that one player can completely change a team's chances of a championship. With this information, it would seem that NBA players care the most about their performance and contract size, or said differently, their happiness is most affected by their performance and contract size. This statement leads into the topic of utility.

In economics, utility is a measure of pleasure or happiness, and how it relates to the decisions that people make. Additionally, utility measures the benefits and costs from consuming a good or service, or from working (Moffatt, n.d.). Utility is not directly measurable, and like pleasure or happiness, the magnitude of utility is determined by the

individual. For example, if an individual enjoys playing the trumpet, the utility that they gain from consuming that good is assumedly quite high. For another individual who dislikes music, their utility gained from the same scenario would likely be quite low, if not negative. In terms of utility gained from working, not all aspects of working are likely to increase an individual's utility. As an example, a person could gain the most utility from the income that they receive. That same person could gain a great deal of utility from the portion of their job where they interact with customers, while gaining the least amount of utility from filing paperwork. Utility is a very useful economic concept that can be helpful in decision making. Similar to the economic concept of opportunity cost (the cost of something is both explicit and implicit, i.e. the cost of a lamp is the monetary cost along with the cost of the time used to buy the lamp, and the foregone things that could have been done with the money used on the lamp), utility offers a way to make decisions on a more personal level (Beggs, Opportunity Cost as True Economic Cost, n.d.).

To better understand the concept of economic utility, the following example is used. A person could go through ads for one hour every week picking out the coupons that are directly beneficial to what they consistently buy. These coupons could lead to savings of $20 per week. Now, thinking simply, this individual saved $20 dollars. Thinking in terms of opportunity cost, this person used one hour that they could have used working or consuming a leisure activity (doing an enjoyable activity). For the sake of the example, in that hour this individual could have worked at their job where they earn $15 an hour, or they could have used that time to read (a leisure activity that they very much enjoy). With this information a decision can be made as to what to do for that

one hour each week. If they choose to work instead of search for coupons they lose $5 in coupon savings. If they choose the leisure activity, monetarily they lose $20. This is where utility has value. If individuals think purely in monetary terms, financially they will be better off finding coupons, but this does not necessarily mean that they are as happy as they could be. Going back to the example, it can be assumed that the individual has a stressful job, and when they are not at work they are very busy with other tasks. This person, for the sake of the example, is also quite stressed from their job, feeling the need for a break. For this individual, that one hour of reading could mean a reduction of stress, which could lead to an increase of happiness. In this case, the question becomes what does the person values more, $20 or less stress and more happiness.

This long-winded example demonstrates the value of making decisions in terms of utility. Every individual is different and therefore every aspect of life is perceived differently. This study believes that everyone can live a happier life if they determine the things that offer them the most utility. These items can then be weighted and incorporated into a utility function. This function, when maximized, produces the largest degree of happiness for the individual. In economics, it is assumed that individuals are rational, and that rational individuals maximize their utility (Beggs, Introduction to Utility Maximization, n.d.). Understanding this, players in the NBA are rational individuals, and therefore maximize their utility.

Once again, in order to maximize one's utility it is first required to know one's utility function. For professional basketball players, their utility function likely includes performing well, earning a large income, winning games, winning championships, living in a preferred city, enjoying their teammates, liking the coach, among a long list of

personal desires. This study believes that the two most important items in a player's utility function are performing well and earning a large income. For a player to maximize their utility, they have to perform as well as they believe possible, and earn a salary that they believe equals their worth. Free agency is the focus of this study, and therefore free agency's effect on player performance and salary is the objective that this study will explore. Thus, it is the goal of this study to determine how a player can maximize their utility (comprised primarily of performance and salary) when they qualify as free agents.

CONCEPTUAL METHOD

In order to explore the objectives, time series data was collected. That dataset consists of performance and contract statistics for free agents in the NBA from 2001 – 2014. While data for unrestricted free agents exists starting in 1988 (Lin & Chang, 2011), this study will focus on free agency in the 21st century. The years of free agency that will be tested are 2003 – 2012, with backward-looking data through 2001, and forward-looking data through 2014. As part of measuring player performance after a player changes teams through free agency, a two-year average of the player's performance before the free agency year will be used as a control for their future performance. The dependent variables in this study are two-year averages of the PER statistic and the player contracts (salary). These averages are used as indicators of the player's success in terms of their statistics and salary for the two years after their free agency decision (i.e. the free agency year is 2003 and the dependent variables are averages for the years 2004 and 2005).

Two datasets will be used in this study. The first dataset will be referred to as the 'population' dataset. This dataset will include all of the free agents who sign with a team

during the free agency period, excluding those who end the period without signing a new contract. The second set of data that will be used will be referred to as the 'sub-population'. This dataset derives from the population, including only the players who were unrestricted free agents. This is done in an attempt to isolate the player's freedom of choice, as restricted free agents are not fully in control of their free agency decision.

RESEARCH DESIGN

The research design focuses on two primary objectives:

- Determine if a consistent relationship exists between unrestricted free agency and player performance,
- Measure the effect of player mobility on a player's contract.

DATA SOURCES

This research study uses secondary data that has been recorded from outside sources. The two objectives of this study explore player performance and player salaries over the years 2003 through 2012. In order to evaluate these items, NBA free agency data is taken from multiple websites. The majority of data on free agents was taken from NBA.com, with the data for 2008 and 2009 coming from other sources. Player performance is comprised of a number of factors, so to simplify this the Player Efficiency Rating (PER) will be used as a single statistic to measure player performance. The player PER data and contract data was taken from the Basketball-Reference.com. The data was compiled into Excel sheet by manually entering in the data from the aforementioned websites. To become more familiar with the data, descriptive tables are provided below.

Table 1: Original Data

Original Unadjusted Dataset			
	*Free Agents (**Population**)*	*Restricted*	*Unrestricted (**Sub-population**)*
Total	1514	380	1134
Re-signed	1130	219	911
% Stayed	74.64%	57.63%	80.34%

Table 2: Used Data

Dataset Used			
	*Free Agents (**Population**)*	*Restricted*	*Unrestricted (**Sub-population**)*
Total	584	214	370
Re-signed	273	143	130
% Stayed	46.75%	66.82%	35.14%

HYPOTHESES:

HYPOTHESIS 1

Hypothesis H_0: moving through free agency leads to a decrease in performance

Free agency in the National Basketball Association allows players, as discussed previously, to move from one team to another at certain points in their contracts. Observably, players tend to use these opportunities to sign somewhere different, as opposed to staying with the same team for the entirety of the career. This tendency seems to lead to three things; team turnover, larger contracts, and a decrease in player performance. This observation is purely anecdotal. This study is not asserting that empirical evidence supports this claim, but merely that a trend appears to exist. Now, trends exist everywhere, but if this trend is a reality players should be notified. As

rational individuals, it is assumed that these players maximize their utility, and if research could uncover a pattern to free agency, players could use this information to make better decisions. Consequently, this study questions if free agency affects player utility in a consistent way.

To explore this topic, a number of factors need to be considered. For one, players do not qualify for unrestricted free agency until they have been in the league for 5 years (for first round draft picks). If a player chose to sign with a new team in their first opportunity as a free agent, they typically will not qualify for Unrestricted free agency for another 4 to 5 years (varies based on signed contract). For a player to move through free agency multiple times they either need to be an undesired player (as described in the Background section) or to have played for a relatively large number of years. In the latter scenario, the player has aged considerably in the context of a professional basketball career (average length is 4.8 years), and at that point it will be very difficult to attribute the decrease in performance to anything other than years of experience (Nelson, 2013). Additionally, the majority of free agents in each free agent class are undesired players who perpetually move from team to team, signing short-term contracts. When testing a dataset, players such as this could greatly influence the results, making it difficult for a desired player to learn anything from the output results. Incidentally, the hypothesis of this study is changing teams through free agency leads to decreased player performance.

HYPOTHESIS 2

Hypothesis H_0: Movements through free agency lead to a monetary increase in a contract's magnitude

Concurrent with the first objective, this study suggests that as players repeatedly move through free agency, their performance worsens. A consistent, predictable effect of decreased performance is a decrease in compensation. In other words, as a player's performance decreases, so too does the size of their contract; however, in order for this to take place, the player is required to change teams through free agency multiple times, with decreasing performance after each move. As multiple movements through free agency by desired players will take a number of years, the decrease in compensation could very likely be the result of years in the league. To mitigate this, years of experience is a variable in the model, with an additional squared experience variable to test for non-linearity with experience. Hypothesis 2 was formulated based, once again, on an observable trend. It can be seen that free agents appear to move through free agency, rejecting their current team's offer, when other teams offer the player a larger contract (in terms of dollars, not years). This behavior seems rational as more compensation should increase utility, but as discussed in the Background section, leaving one's current team may not be the best decision long-term. While more money over the next four to five years is positive, if the team that the player signs with is not suited for the player's skillset, their performance with that team could decrease leading to a smaller contract after the next free agency period. In this scenario, the player could have benefitted from a accepting a smaller contract from their current team, continue to have success, and then sign another large contract in the next free agent period. This idea is purely conjecture, but it is the belief of this study that this scenario occurs consistently, and that players tend to base their free agency decision on short-term financial compensation, and not long-term success; therefore, Hypothesis 2 proposes that as players move through free agency

their contracts increase while their performance decreases. As Hypothesis 1 focuses on player performance, Hypothesis 2 will focus only on the player contracts.

METHODOLOGY:

HYPOTHESIS 1

Player performance will be measured as a function of efficiency, using the statistic titled Player Efficiency Rating. This statistic is a function of a number of individual statistics, and it is intended to show a player's per-minute productivity (Hollinger, 2011). This singular statistic will be used to measure player performance as it includes the individual statistics that this study deemed significant in measuring a player's performance, and it is considered to be one of the best single metrics available. The statistics included in this function are: minutes played, three-point field goals made, field goals made, field goals attempted, free throws made, free throws attempted, value of possession, rebounds (offensive, defensive, total, and percentage of offensive or defensive), assists, steals, blocks, turnovers, personal fouls, and select statistics to represent the league as a whole (Includes variations of the statistics) (Lawhorn, 2014).

Statistician John Hollinger developed this statistic, and he has done research in an attempt to determine the exact relative importance of each statistic. This is crucially important as each statistic is assigned a value used to weight the contribution of that statistic to the PER formula. These weights are very important as not all of the statistical categories are assigned the same weight. For example, 'field goals made' are weighted more heavily than 'assists', as the goal of every possession to score points (make a field goal). The calculation is very specific, using per-minute statistics as opposed to raw totals, as per-minute statistics are more meaningful in representing a player's

productivity. To illustrate how technical this statistic is, the ‘pace’ of each team is also considered in the calculation. This is done so that the player’s effectiveness is not skewed, as teams who have a higher ‘shots per minute’ will have more opportunities to gain statistics.

The PER statistic is a single number that would appear to arbitrary if one was unaware of what the magnitudes correspond to; therefore, here is the chart of PER categories and what they represent in terms of the player’s success:

- All-time great season: 35+
- Hands-down MVP: 30-35
- Strong MVP candidate: 27.5-30
- Long-shot MVP candidate: 25-27.5
- Definite All-Star: 22.5-25
- Borderline All-Star: 20-22.5
- Second offensive option: 18-20
- Third offensive option: 16.5-18
- Slightly above-average player: 15-16.5
- Rotation player: 13-15
- Non-rotation player: 11-13
- Fringe roster player: 9-11
- Player who won't stick in the league: 5-9

To offer a reference point, the all-time leader in career NBA PER is Michael Jordan with 27.91. This career number is quite high, with other all-time top players being Shaquille

O'Neal (26.43), David Robinson (26.18), Wilt Chamberlain (26.13), and Bob Pettit (25.37). An important note to be aware of, when calculating PER, the final step involves using a multiplication factor so that the league average PER is always 15, regardless of the players or season.

PER is a very beneficial statistic as it is an improvement upon using box scores (a list of important statistics such as points, rebounds, assists) to analyze a player's game performance. PER is considered to be much more detailed and accurate than anything that a person could do with raw statistical totals or per-game numbers. Along with its benefits, PER does have its negatives. The biggest weakness of the PER statistic is its lack of consideration for defense. While defensive statistics are included in the calculation, such as blocked shots and steals, the formula does not account for players who play great individual or team defense.

As the statistics in this function change over the course of a season, the player's season-ending average PER is recorded, as that value incorporates the performance from the entire season. The PER function is not perfect, but it is a comprehensive single metric statistic that will be sufficient in analyzing player performance in movements through free agency (Hollinger, 2011).

In order to measure the effects of moving through free agency, the following formula will be used. A simple linear regression will be used with PER Average Post as the dependent variable, a two-year average of the player's PER statistic after the free agency decision year,

$$PER\_Avg\_Post_t = \beta_0 + (\beta_1)\, UFA + (\beta_2)\, S + (\beta_3)\, E + (\beta_4)\, E^2 + (\beta_5)\, FAS + (\beta_6)\, G + (\beta_7) F + (\beta_8)\, PER_t + (\beta_9)\, Contract_t + (\beta_{10})\, PER_{t-1} + (\beta_{11})\, Contract_{t-1}$$

with the following as independent variables:

- *UFA*, **Free Agency Status:** a dummy variable indicating if the player was an Unrestricted Free Agent (1 = Unrestricted, 0 = Restricted)
- *S,* **Starter:** a dummy variable that indicates if the player was a starter (Starter – if the player started in 50% of the games played in season t)
- *E,* **Experience:** the number of years that a player has been active at time t
- E^2, **Experience Squared:** the Experience variable squared
- *FAS,* **Stayed:** a dummy variable that represents if the free agent stayed or moved at time t (1 = Stayed)
- *G,* **Guard:** a dummy variable indicating if the player was either a point guard or shooting guard
- *F,* **Forward:** a dummy variable indicating if the player was either a small forward (SF) or power forward (PF). The base dummy for *G* and *F* is *C* (**Center**, a dummy indicating if the player was a center)
- PER_t, **PER_Decision_Yr:** the player's season average PER in the year of the free agency decision
- $Contract_t$, **Contract_Decision_Yr:** the player's contracted salary in the year of the free agency decision

- *PER $_{t-1}$* ,**PER_Pre:** a control for the player's performance before the decision year. This variable is an average of the player's PER for the prior two seasons
- *Contract $_{t-1}$* ,**Contract_Pre:** a control for the player's contract before the decision year. This variable is an average of the player's contract for the prior two seasons.

This model will be applied to two datasets, population and sub-population. The model will be nearly identical in both cases, but with the sub-population the variable Unrestricted will be removed from the model. The sub-population dataset only includes unrestricted free agents, so that dummy variable becomes redundant. Outside of that change the models stay the same, but Hypothesis 1 will be tested twice, using first the population followed by the sub-population.

HYPOTHESIS 2

The purpose of exploring this hypothesis is not to predict the size of a player's contract or to explore what variables have a positive effect on player contracts. This objective is very simply looking to see if a consistent relationship exists between changing teams through free agency and the size of a player's contract. The dependent variable will be a two-year average of the player's new contract after the free agency decision year,

$$Contract\_Avg\_Post_t = \beta_0 + (\beta_1)\, UFA + (\beta_2)\, S + (\beta_3)\, E + (\beta_4)\, E^2 + (\beta_5)\, FAS + (\beta_6)\, G + (\beta_7) F + (\beta_8)\, PER_t + (\beta_9)\, Contract_t + (\beta_{10})\, PER_{t-1} + (\beta_{11})\, Contract_{t-1}$$

with the following independent variables,

- *UFA*, **Free Agency Status:** a dummy variable indicating if the player was an Unrestricted Free Agent (1 = Unrestricted, 0 = Restricted)
- *S,* **Starter:** a dummy variable that indicates if the player was a starter (Starter – if the player started in 50% of the games played in season t)
- *E,* **Experience:** the number of years that a player has been active at time t
- E^2, **Experience Squared:** the Experience variable squared
- *FAS,* **Stayed:** a dummy variable that represents if the free agent stayed or moved at time t (1 = Stayed)
- *G,* **Guard:** a dummy variable indicating if the player was either a point guard or shooting guard
- *F,* **Forward:** a dummy variable indicating if the player was either a small forward (SF) or power forward (PF). The base dummy for *G* and *F* is *C* (**Center**, a dummy indicating if the player was a center)
- PER_t, **PER_Decision_Yr:** the player's season average PER in the year of the free agency decision
- $Contract_t$, **Contract_Decision_Yr:** the player's contracted salary in the year of the free agency decision
- PER_{t-1}, **PER_Pre:** a control for the player's performance before the decision year. This variable is an average of the player's PER for the prior two seasons
- $Contract_{t-1}$, **Contract_Pre:** a control for the player's contract before the decision year. This variable is an average of the player's contract for the prior two seasons.

This model will be applied to two datasets, population and sub-population. As was true with Hypothesis 1, the model will be nearly identical in both cases, but with the sub-population the variable Unrestricted will be removed from the model. Concurrent with Hypothesis 1, this hypothesis will be tested twice with each test using a different dataset. The sub-population dataset only includes unrestricted free agents, so that dummy variable becomes redundant. Outside of that change the models stay the same, but Hypothesis 1 will be tested twice, using first the population followed by the sub-population.

SUMMARY

The overall objective of the research is to determine if a consistent relationship exists between movements through free agency and player performance and player contracts. Player performance will be measured as a function of player efficiency. The Player Efficiency Rating is the result of a number of individual statistics that show a player's per-minute productivity. The two-year average of this statistic after the free agency decision year will act as the dependent variable in a regression that seeks to explain the effect of a movement through free agency on player performance. Hypothesis 1 proposes that moving through free agency leads to a decrease in performance.

A second regression will be modeled with the intent of determining if a relationship exists between a movement through free agency and a player contract. The dependent variable in this model will be a two-year average of the player's contract after the free agency decision year. Hypothesis 2 proposes that as players move through free agency their contracts increase. Both hypotheses will be tested using the population dataset and the sub-population dataset.

CHAPTER 4: RESULTS

Four regressions produce the core results for this study. Two regressions have the dependent variable PER Average Post and two have the dependent variable Contract Average Post. Each dependent variable will be tested twice, once with one dataset and once with another. The first dataset that will be tested is the data population as a whole, with the second set making up the sub-population (unrestricted free agents only). The population consists of all of the NBA free agents from 2003 – 2012 that signed with a team in the NBA while also having all of the necessary statistics. The necessary statistics are PER and contract for the two years before and after the year of the free agency decision. An insignificant number of players that signed with a team had missing data and were therefore eliminated from the dataset (This could be the result of a number of reasons, some of which could be the data reference website missing data). The remaining players make up all of the restricted and unrestricted free agents in the prescribed time period. The sub-population derives from the population, including only the unrestricted free agents. This group of players is perhaps the most important as these players had the ability to choose the team with which they signed. This is important as this study is attempting to discover if players are making optimal decisions in the free agent market. Restricted free agents are not fully in control of the team that they sign with, and as a result they are not making the decision that controls their upcoming team. While this study is attempting to determine whether or not it is beneficial to stay or move in free agency, its broad objective is to assess the effects of moving through free agency. This objective requires all of the free agents who are desired by NBA franchises (as the players who do not sign a contract were eliminated from the dataset).

Before running any regressions, an "eye ball" analysis of the data is completed. As stated, the population dataset contains restricted free agents, players who do not fully control their free agency decision. The sub-population contains only unrestricted free agents, players who do control (assuming that they receive multiple offers) their free agency decision. Looking at the sub-population dataset, of all of the unrestricted free agents who signed with a team from 2003 – 2012, 64 percent signed with a new team. Out of that group of players, 62.5 percent had their average PER over the following two seasons decrease. Out of that same group of players who left, 62.9 percent of the players had their contract average over the following two seasons increase. This simplistic analysis is merely stating that (based on this sample) players tend to sign with new teams during the free agency period, and that the majority of the unrestricted free agents signed new contracts that were larger than their previous contract.

The first two regressions will be testing the population dataset. As discussed in the methodology section, the models for PER Average Post and Contract Average Post are,

$$PER\ Avg\ Post_t = \beta_0 + (\beta_1)\ UFA + (\beta_2)\ S\ + (\beta_3)\ E + (\beta_4)\ E^2 + (\beta_5)\ FAS\ + (\beta_6)\ G + (\beta_7)F + (\beta_8)\ PER_t\ + (\beta_9)\ Contract_t + (\beta_{10})\ PER_{t-1} + (\beta_{11})\ Contract_{t-1}$$

$$Contract\ Avg\ Post_t = \beta_0 + (\beta_1)\ UFA + (\beta_2)\ S\ + (\beta_3)\ E + (\beta_4)\ E^2 + (\beta_5)\ FAS\ + (\beta_6)\ G + (\beta_7)F + (\beta_8)\ PER_t\ + (\beta_9)\ Contract_t + (\beta_{10})\ PER_{t-1} + (\beta_{11})\ Contract_{t-1}$$

with the first regression testing PER and the second regression testing Contracts. From this point on the regression testing PER Average Post using the population will be Regression 1. The regression testing Contract Average Post using the population will be Regression 2. Regression 2 differs from Regression 1 in only the dependent variable. The regression testing PER Average Post using the sub-population will be Regression 3, and the regression testing Contract Average Post using the sub-population will be Regression 4.

The independent variables in this model are Unrestricted Free Agent, Starter, Experience, Free Agent Stayed, Guard, Forward, PER statistics in the decision year, contract value in the decision year, past PER average, and past contract average. The first independent variable, UFA, is a dummy variable that is activated if the player is an unrestricted free agent. S, or Starter, is a dummy that is activated if the player is a starter. The NBA season has 82 games and it is common for players to sit out games with minor afflictions such as back pain or a minor injury. The NBA season is also condensed with games being played as quickly as the very next day. As a result, injuries are very common. Most injuries require a few weeks of rest if not months. The NBA season spans from October to April meaning that teams often play three games per week, which means that a relatively serious injury could keep a player out for upwards of a quarter of a season (Bonner, 2011). Taking this into account, a player in this dataset is considered a starter if they started in fifty percent or more of the games that they played in.

E, Experience, is a numeric variable stating the number of years that the player has been in the league. Intermittently there were years in the data where a player would have an entire year with no statistics. There were a number of reasons listed for this, such

as an injury, the player played in a different league, or a retirement. In every case, except that of a retirement, the year was still counted as one year of experience. Even though the player did not play, they still had the ability to sit in on practices and learn in the professional basketball league. For those who played in a different league, the player's body still experienced wear and tear, and for that reason the year still counted as a year of experience. While a retired player still aged during their time out of the league, it was assumed that their body was not as affected by the time (as it would if they were competing professionally). Along with this, the player was not actively in the league gaining theoretical knowledge or experience. Experience, in this study, will likely affect the players through its wear on their bodies, but experience can also benefit players, which is why being injured is counted as experience as the player can still gain from practice without physically participating.

Experience Squared is a variable used to test the concavity of the variable Experience. The effects of experience are likely to be negative, as when a player ages, their performance is more likely to decrease. Experience, however, is very important for a player, as it takes time for players to adapt to the NBA and develop. While very young players have the ability to play well in the league, it is unlikely that a player is at their best with zero years of experience. While their bodies will eventually weaken, sometimes players need time to develop muscle, which means that experience leads to a more physically capable player. Along with this, some players can be in the league for a number of years before they begin to perform at their best. Experience Squared eliminates the linearity of the Experience variable, accounting for the fact that experience is both positive and negative.

FAS, or Free Agent Stayed, is a dummy that is activated if the player chooses to stay with their current team. The independent variables G, Guard, and F, Forward, are dummy variables indicating the player's position. If the player was either a Point Guard or Shooting Guard they are considered a guard (the dummy variable G is activated), and if the player was a Small Forward or Power Forward they are considered a Forward. Another position exists in basketball, the position Center, and this dummy variable does exist in the dataset. The dummy variable Center is not included in the model as this would add a third dummy which would lead to multicollinearity. As a result, the base dummy variable for the position variables is Center. PER_t, PER in time t, is the value of the PER statistic in the decision year. $Contract_t$, Contract in time t, is the numeric contract value in the decision year. The final two independent variables act as a control for the players' past. PER_{t-1}, PER Average Pre, is a two-year average of the player's PER before the decision year. $Contract_{t-1}$, Contract Average Pre, is a two-year average of the player's contract before the decision year. As mentioned in the literature review in the section titled "Contracts Based on Past Performance in the MLB," "a player's performance can be best predicted by looking at their performance from 2 and 3 seasons prior." As a result of this finding, the pre and post averages are two years in an effort to capture an accurate sample of the player's performance in time t. If the pre statistic included a larger number of years, that value might misrepresent the player's current performance in the time of the decision.

In 2010 the NBA made a proposal for a new collective bargaining agreement. The league claimed that the majority of its teams were losing money, and as a result it proposed that players receive a reduction in pay, a rollback of existing salaries, a hard

salary cap, and shorter contracts. This proposal was not beneficial to the players, and the National Basketball Players Association chose not to accept the deal. This led to 50 negotiation sessions that lasted over two years. In the end, the NBPA relinquished nearly $300 million per year in salary, which almost matched the amount that the owners claimed to lose in the recent years. Other items were negotiated but the impact of this lockout on this study is that 16 games of the regular season were lost (Staudohar, 2012). This means that the 2011-2012 season had 66 games instead of the standard 82. This is worth noting as it could have an effect on the data. This potential effect was tested for by eliminating the 2010-2011 free agents from the dataset. The results of this dataset were compared to the results for the population and sub-population, and the differences were very small. As a result, it is reasonable to include the lockout year in the dataset, while noting that the shortened season could have an effect on the dataset.

While a player's performance should not be affected greatly by the number of games in the season, the lack of games could have an effect on the player's statistics, which could affect this dataset for the 2010-2011 free agents. For one, the lockout inspired a small number of players to sign with other leagues as a way to earn a salary if the lockout lasted the entire season. For example, the 16 games that were not played caused the owners and players to forfeit close to $400 million each (Staudohar, 2012). The risk of forfeiting an entire year's salary was too great for some players which caused them to sign overseas. For these players, they now had no PER information for the 2011 season, and depending on how long they stayed out of the NBA, they might not have any PER data for the rest of this dataset. Potentially, a very small number of players could have exited the dataset as a result (player's with holes in their data were eliminated from

the final dataset). The largest impact of this lockout could be the structure of the contracts that players' signed. Some free agents were considering a one-year contract so that they could sign a new contract with the new CBA. If players signed a one-year contract, this could also affect their performance in the 2011-2012 season. Taking this into account, players could have signed one-year contracts (affecting their contract data for the year), and then performed at different level in the next season due to the incentive of a new contract. The number of cases where these possibilities became a reality are likely small, but the possibility is there, and it should be noted; however, as the effects of this lockout are insignificant, no new variable will be created to account for it, and the 2010 free agents will not be eliminated from the dataset.

PER RESULTS: POPULATION

Table 3. Regression 1

PER Average Post: Population (Regression 1)		
	R-Squared	0.406
	F-Statistic	41.89
	P-value: F-stat	0.0000
Variables	**Coefficient**	**P-value**
Constant	4.4399240	**0.000**
Unrestricted	-0.1336187	0.689
Experience	-0.6758602	**0.000**
Experience^2	0.0239292	**0.044**
Starter	-0.3726230	0.257
Stayed	0.0068953	0.983
Guard	0.8444413	**0.064**
Forward	0.3989963	0.304
PER Decision Year	0.5465484	**0.000**
Contract Decision Year	7.72×10^{-8}	0.136
Contract Average Pre	1.76×10^{-7}	**0.001**
PER Average Pre	0.1692089	**0.000**

This simple Ordinary Least Squares (OLS) regression yielded a coefficient of determination value of .4060. This means that that the model explains 40.60 percent of the variation of the dependent variable PER Average Post. The F-statistic is 41.89 and it is statistically significant, meaning that the null hypothesis can be rejected. In other words, this model is significant and the statistically significant independent variables have explanatory power. The intercept is 4.4399, which means that the player's PER statistic will be 4.4399 if the player is unaffected by the other independent variables. Every player in the population is impacted by the variables in this model, so the intercept is merely a starting point. A number of the variables in this model were statistically

insignificant (P-value > .10). These variables include Unrestricted (P-value of .689), Starter (.257), Stayed (.983), Forward (.304), and Contract Decision Year (.136). The remaining variables in this model are significant (P-value < .10), and they are Experience, Experience Squared, Guard, PER Decision Year, Contract Average Pre, and PER Average Pre.

The most important variable in all of the regressions is Stayed, as that is the variable that explains the effects of moving through free agency. For Regression 1, Stayed was statistically insignificant with a p-value of .983. The coefficient for this variable is .0069. To show how this variable is important for the objectives of this study, the coefficient would be interpreted as, if the variable was statistically significant: players from the population who stayed (re-signed with their current team) had a PER Average Post statistic that was .0069 higher. In other words, if the player chose to stay during the free agency period, their average PER over the next two season was .0069 higher than players who chose to leave their current team. Once again, for Regression 1, Stayed was not statistically significant, so no information can be drawn from this variable.

For the statistically significant variables, Experience has a coefficient of -.6758, meaning that for every additional year of experience, the player's PER Average Post decreases by .6758. Experience Squared was also significant, with a coefficient of .0239. The variable Guard had a coefficient of .8444, meaning that players who were either a Point Guard or Shooting Guard had a PER Average Post statistic that was .8444 higher than the players who played any of the other positions. PER Decision Year had a coefficient value of .5465, meaning that the player's PER Average Post increased by .5465 for every one unit of the player's PER statistic in the year of free agency. Said

differently, the variable PER Decision Year represents the player's season ending PER for the season before the free agency decision. For example, if the player became a free agent in 2003, their PER Decision Year would be their season ending PER for the season 2002-2003. If the player had a PER statistic for that season that was 10, their two-year average PER Average Post would be roughly 5.465. The final two statistically significant variables for Regression 1 are Contract Average Pre and PER Average Pre. Both of these variables have a positive coefficient, but the magnitudes are too small to draw conclusions. The statistical significance indicates that it is necessary to control for the player's past performance and contract.

The population dataset is cross-sectional which means that heteroscedasticity is likely present. Looking at the scatter plot of the predicted values and the squared residuals, it can be seen that the output takes a relatively consistent form. This result is indicative of homoscedastic error terms. Ocular analysis in this case is not sufficient, so the Breusch-Pagan test is applied (for the PER model, but Experience Squared is not included). The squared residuals are regressed on the independent variables in Regression 1 (the squared residuals are the dependent variable), and the p-value for the F-statistic is insignificant. This value is very statistically insignificant, meaning that we fail to reject the null hypothesis of homoscedasticity. As a result, it can be concluded that heteroscedasticity is not present in Regression 1. In other words, the error term is correctly specified. In an effort to be certain about the presence of heteroscedasticity, an abridged White's Test is run. The p-value for the F-statistic is very significant, indicating that heteroscedasticity is present. At this point the scatter plot indicated a homoscedastic error term, the Breusch-Pagan test indicated a homoscedastic error term, and the abridged

White's Test indicated a heteroscedastic error term. As a result, the Breusch-Pagan is conducted in Stata. The results are a chi value-squared value of 232.11 with a p-value of zero to the fourth decimal point. This results allows us to reject the null hypothesis of homoscedastic error terms and conclude that the alternative hypothesis holds, that the error terms are heteroscedastic.

In order to correct for heteroscedasticity, robust standard errors are applied in Stata. This action improved the F-statistic from 35.60 to 41.89. The p-values for the independent variables changed slightly as well; however, the five statistically insignificant variables remained insignificant and the six significant variables remained significant. The main variable of interest, Stayed, became slightly more significant.

Another error that presents itself in data sets is autocorrelation. In order to test the population data for autocorrelation (also known as serial correlation), the Durbin-Watson test is conducted in Stata. The result for Regression 1 is a Durbin-Watson d-statistic of 2.006944. With this statistic, a value of 2 indicates no autocorrelation. 2.006944 is very close to 2, and as a result it is determined that the population dataset has no autocorrelation.

Regression 1 explains roughly 40 percent of the variation in the dependent variable PER Average Post, with an F-Statistic that indicates that the model is statistically significant. Half of the independent variables are statistically significant. Heteroscedasticity was found using the Breusch-Pagan test and corrected for using robust standard errors in Stata. Using the Durbin-Watson test, autocorrelation was tested for only to yield a d-statistic of 2, indicating no autocorrelation. Regression 1 is a sufficient model for Objective 1 as this study is exploring the effect that moving through free

agency has on a player's performance and salary. The goal is not to better predict PER Average Post, so the lower coefficient of determination is acceptable and no new variables will be added to this model. Hypothesis 1 explores the effects of free agency on performance, and from Regression 1 it can be seen that no statistically significant relationship exists between staying and leaving.

CONTRACT RESULTS: POPULATION

Table 4. Regression 2

Contract Average Post: Population (Regression 2)		
	R-Squared	0.6999
	F-Statistic	91.77
	P-value: F-stat	0.0000
Variables	**Coefficient**	**P-value**
Constant	-2714136.00	**0.000**
Unrestricted	-434913.70	**0.080**
Experience	246728.30	**0.022**
Experience^2	-34153.22	**0.000**
Starter	829292.80	**0.002**
Stayed	494723.60	**0.007**
Guard	-253039.30	0.236
Forward	-179484.20	0.397
PER Decision Year	230196.40	**0.000**
Contract Decision Year	0.2484818	0.135
Contract Average Pre	0.2313521	**0.002**
PER Average Pre	132670.40	**0.008**

As stated above, Regression 2 differs from Regression 1 only in the dependent variable. Regression 2 uses the dependent variable Contract Average Post, a two-year average of the player's contract after the decision year. As contracts in the NBA are often relatively consistent throughout the life of a contract, the average value should not differ

greatly from any individual year of the contract. As with Regression 1, an OLS regression was run in Excel. The coefficient of determination is .6999, meaning that the model explains 69.99 percent of the variation in the dependent variable. The F-statistic is 91.77 with a statistical significance of close to zero, meaning that this model is statistically significant. The coefficient for the intercept is -2714136, which is not greatly relevant as every player's contract is positive. Three of the independent variables are statistically insignificant at the 90 percent confidence interval, Guard, Forward, and Contract Decision Year. Guard is insignificant with a p-value of .236, with Forward and Contract Decision Year having p-values of .397 and .135 respectively. Of the eight statistically significant independent variables, only Unrestricted is insignificant at the alpha level of .05. To be clear, Unrestricted, Experience, Experience Squared, Starter, Stayed, PER Decision Year, Contract Average Pre, and PER Average Pre are all statistically significant at the alpha level of .10.

The majority of the independent variables in this model are statistically significant, meaning that the variable coefficients will have explanatory power. Experience has a coefficient of 246728.3, with Experience Squared having a coefficient of -34153.22. For Starter, the coefficient is 829292.8, meaning that if the player was a starter in the free agency decision year, their Contract Average Post is $829,292.80 larger. The player's PER Decision Year has a coefficient of 230196.4, indicating that every unit of the player's PER in the decision year corresponds to $230,196.40 in the Contract Average Post. PER Average Pre has a coefficient of 132670.4, meaning that every unit of the two-year average PER statistic before the decision year corresponds to $132,670.40. The last statistically significant variable is Stayed, which is also the key

explanatory variable for the objectives of this study. Stayed was significant with a p-value of .007, and a coefficient of 494723.6. This value is both positive and significantly large. Interpreting this value, players who chose to re-sign in the year of the decision gained $494,723.60 in their Contract Average Post. This finding is very substantial as it indicates that a clear relationship exists between re-signing and signing a larger contract.

Once again, cross-sectional datasets are frequently heteroscedastic, so the Breusch-Pagan test is conducted in Stata. In Stata, the test yielded a chi-squared value of 3016.52 at a significance level of zero to the fourth decimal place. The Breusch-Pagan indicated heteroscedastic error terms. To correct this problem robust standard errors are applied in Stata, yielding slightly different results. The F-statistic decreased from 121.46 to 91.77, while maintaining its significance level (zero to the fourth decimal place). In terms of statistical significance, correcting for heteroscedasticity produced one additional statistically insignificant variable. Autocorrelation could be present in Regression 2, so the Durbin-Watson test is conducted in Stata. The result is a d-statistic of 1.9966. Once again, a d-statistic of 2 indicates no autocorrelation, so this d-statistic indicates no autocorrelation.

Regression 2 improved upon Regression 1 with a coefficient of determination of .6999 and an F-statistic of 91.77. This model yielded eight statistically significant variables with only three insignificant variables. Heteroscedasticity was present and corrected for, and no autocorrelation was found. The model, both with and without heteroscedastic error terms produced a substantial amount of explanatory power, with the independent variable Stayed being significant below the alpha level of .05. The variable

explains that players who re-signed in the decision year had an increased Contract Average Post of $494,723.60.

PER RESULTS: SUB-POPULATION

Table 5. Regression 3

PER Average Post: Sub-population (Regression 3)		
	R-Squared	0.5454
	F-Statistic	38.87
	P-value: F-stat	0.0000
Variables	**Coefficient**	**P-value**
Constant	3.7400760	**0.000**
Experience	-0.4561814	**0.023**
Experience^2	0.0122869	0.345
Starter	-0.2013570	0.601
Stayed	-0.6536972	**0.075**
Guard	0.3255941	0.547
Forward	0.1588687	0.763
PER Decision Year	0.5820886	**0.000**
Contract Decision Year	1.69×10^{-7}	**0.025**
Contract Average Pre	1.16×10^{-7}	**0.048**
PER Average Pre	0.1421442	**0.025**

Regression 3 differs from Regressions 1 and 2 in that Regression 3, like Regression 4, uses the sub-population instead of the population. This dataset differs from the population in that it only includes the unrestricted free agents and not both the restricted and unrestricted. Along with this, as only one type of free agent is in this dataset, the independent variable Unrestricted has been removed. For a reference point, the population dataset contains 584 observations, while the sup-population contains 370. The magnitude of the sup-population is still relatively large which should lead to reliable results.

To refresh, Regression 3 has the dependent variable Per Average Post, which is a two-year average of the player's PER statistic after the decision year. The coefficient of

determination for Regression 3 is .5454, which means that this model explains 54.54 percent of the variation in the dependent variable. The F-statistic is 38.87 with a significance level close to zero. Once again, this indicates that the model is statistically significant and that the significant independent variables have explanatory power. The intercept is 3.7400, which is only relevant if the player does not qualify as any of the independent variables. As every player is affected by at least one of the independent variables, the intercept is a mere starting point that can be ignored. Six of the ten variables are statistically significant at the alpha level of .10, including Experience (.023), Stayed (.075), Per Decision Year (.000), Contract Decision Year (.025), Contract Average Pre (.048), and Per Average Pre (.025). The statistically insignificant variables include Experience Squared (.345), Starter (.601), Guard (.547), and Forward (.763).

Experience has a coefficient of -.4562, indicating that for every year of experience, the player's PER Average Post decreases by .4562. Experience Squared has a very small positive coefficient, with a p-value of .345. PER Decision Year's coefficient is .5821, meaning that for every one unit of PER in the decision year, the player's PER Average Post increases by .5821. Both Contract Decision Year and Contract Average Pre have coefficients that are very close to zero, indicating that their impact is too small to interpret. The coefficient for PER Average Pre is .1421, which means that for every one unit of PER for the two-year pre average, the PER Average Post is multiplied .1421. As mentioned above, the variable Stayed has a p-value of .075, making the variable statistically significant at the alpha level of .10. The coefficient is -.6537, which means that if the player stayed (re-signed) in the decision year, their PER Average Post will be

.6537 less than if they would have moved through free agency. This is an interesting finding that will be analyzed further in Chapter 5.

The sub-population dataset set contains cross-sectional data which raises a concern for heteroscedastic error terms. To test for this the Breusch-Pagan test will be conducted in both Excel and Stata. Running the Breusch-Pagan test in Excel (for a model not including Experience Squared) yielded an F-statistic of 1.8148 with a significance level of .0643. This gives reason to believe that the error terms in Regression 3 are heteroscedastic. Before running the Breusch-Pagan test in Stata, and abridged White's Test was conducted (again without Experience Squared). The results are an F-statistic of 2.6265 at a significance level of .0737. Once again, this significance level is slightly higher than preferred but it is still a strong indication of heteroscedastic error terms. In order to be completely sure, the Breusch-Pagan test is ran in Stata. This test yields a chi-squared value of 114.20 at significance level of zero to the fourth decimal point. This indicates that the error terms are indeed heteroscedastic. To correct for this, robust standard errors are applied in Stata. The result is a changed F-statistic (43.19 to 38.87) that maintains its level of statistical significance. The robust errors effected the p-values for the independent variables slightly, with no significant changes. The key explanatory variable Stayed had its p-value change from .054 to .075. Another concern with a dataset such as this is autocorrelation. In order to test for this a Durbin-Watson test is conducted in Stata. The result of the test is a d-statistic of 1.9843, indicating that autocorrelation is not present in this model.

Regression 3 is a statistically significant model that explains 54.54 percent of the variation in the dependent variable PER Average Post. Heteroscedastic error terms were

present and corrected for, and autocorrelation was not present in this model. Six of the independent variables are statistically significant at the alpha level of .10. The key explanatory variable Stayed is statistically significant at a 90 percent confidence interval with a p-value of .075. The coefficient on this variable is -.6537, which indicates that players who stayed had a PER Average Post that is .6537 less than those who move through free agency.

CONTRACT RESULTS: SUB-POPULATION

Table 6. Regression 4

Contract Average Post: Sub-population (Regression 4)		
	R-Squared	0.7714
	F-Statistic	98.07
	P-value: F-stat	0.0000
Variables	**Coefficient**	**P-value**
Constant	-2316266.00	**0.000**
Experience	134676.30	0.306
$Experience^2$	-23841.25	**0.025**
Starter	322893.70	**0.082**
Stayed	311293.70	0.130
Guard	-132066.60	0.625
Forward	37475.53	0.879
PER Decision Year	154895.30	**0.000**
Contract Decision Year	0.5788701	**0.000**
Contract Average Pre	0.0627831	**0.045**
PER Average Pre	128722.90	**0.003**

Regression 4 differs from Regression 3 only in its dependent variable. The dependent variable for Regression 4 is Contract Average Post, a two-year average of the player's contract after the decision year. A simple OLS regression produced the

following output. The R-Squared value, the coefficient of determination, is .7714, which means that the model explains 77.14 percent of the variation in the dependent variable Contract Average Post. The F-statistic for this model is 98.07 with a significance level very close to zero. This communicates that this model is statistically significant meaning that the statistically significant independent variables have explanatory power. Four of the variables in this model are statistically insignificant at the 90 percent confidence interval. Variables Experience, Stayed, Guard, Forward, have p-values of .306, .130, .625, and .879 respectively. Experience Squared (.025), Starter (.082), PER Decision Year (.000), Contract Decision Year (.000), Contract Average Pre (.045), and PER Average Pre (.003) are statistically significant at the 90 percent confidence interval.

The intercept for Regression 4 is -2316266. This value is the size of a player Contract Average Post before any of the independent variables are applied. Every player will qualify as at least one of the independent variables, which will give every player a Contract Average Post that is positive. The coefficient for the intercept in this model is not relevant. Starter has a coefficient of 322893.70, indicating that if the player was a starter in the decision year their Contract Average Post is $322,893.70 larger. For Contract Average Pre, the coefficient is a number close to zero indicating that the explanatory power is insignificant. Experience has a coefficient of 134676.30, which means that for every additional year of experience that a player has, their Contract Average Post decreases by $134,676.30. Experience Squared has a coefficient of -23841.25, with a p-value of .025. PER Decision Year has a coefficient of 154895.30, meaning that for every one unit of PER that the player has in the decision year, their Contract Average Post is $154,895.30 larger. Contract Decision Year has a coefficient

that is less than 1, indicating that its implications are insignificant. Lastly, PER Average Pre has a coefficient of 128722.90, which means that for every unit of PER in the players PER Average Pre, the players Contract Average Post increases by $128,722.90.

As was true with Regression 3, the presence of heteroscedastic error terms needs to be tested. To do this, the Breusch-Pagan test will be conducted in both Excel and Stata. Along with this an abridged White's Test will also be conducted. The Breusch-Pagan test in Excel produces an F-statistic of 21.8397 with a significance level close to zero (for a model not including Experience Squared). This indicates the presence of heteroscedastic error terms. The abridged White's Test produces an F-statistic of 46.3129 with a significance level of close to zero (also not including the variable Experience Squared). The Breusch-Pagan Test is ran in Stata yielding a chi-squared value of 566.64 with a significance level of zero to the fourth decimal point. This confirms that heteroscedasticity is present in this model. Finally, it is pertinent to test for autocorrelation, so the Durbin-Watson test is conducted in Stata. The results of this test are a d-statistic of 2.0114, which indicates that autocorrelation is not present in this model.

To correct for the heteroscedastic error terms, robust standard errors are applied in Stata. The result is an F-statistic that changed from 121.47 to 98.07 while staying statistically significant. The p-values on the independent variables changed slightly, with the key explanatory variable Stayed changing from .105 to .130. The p-value for Starter improved from .118 to .082, and the p-value for Contract Average Pre improved from .061 to .045.

Regression 4 is a statistically significant model that explains 77.14 percent of the variation in the dependent variable Contract Average Post. Heteroscedastic error terms were found and corrected for, with no sign of autocorrelation. The model, after correcting for heteroscedasticity, has six independent variables that are significant at the 90 percent confidence interval. The key explanatory variable Stayed was statistically insignificant with a p-value of .130, meaning that the coefficient has no explanatory power.

CHAPTER 5: DISCUSSION

To test the data, four models were created. With those models, four regressions were run on two different datasets, the population and sub-population. Each regression is unique, with two of the regressions having the dependent variable PER Average Post, and two of the regressions having the dependent variable Contract Average Post. The four regressions include the same independent variables, Unrestricted, Starter, Experience, Experience Squared, Stayed, Guard, Forward, PER Decision Year, Contract Decision Year, PER Average Pre, and Contract Average Pre; however, Regressions 3 and 4 do not include the variable Unrestricted, as it does not exist in the sub-population (the variable is redundant). These regressions were tested for heteroscedasticity and autocorrelation, with each model having heteroscedastic error terms, and none of the models having autocorrelation. Each model had its error terms corrected using robust standard errors.

The key explanatory variable in each of the regression is Stayed. This variable is a dummy indicating whether or not the free agent re-signed with his current team or signed elsewhere. This is the key independent variable as its coefficient is interpreted as follows (if the variable is statistically significant): the coefficient of Stayed is x, which means that if the player chose to re-sign in free agency, their PER Average Post (two-year average of the players PER after the decision year)/ Contract Average Post (two-year average of the player's contract after the decision year) increased/decreased by x (PER statistic)/$x (contract value). As the core objective of this study is to explore if a relationship exists between free agency and player utility (comprised of performance (using the PER statistic) and salary), this variable is the most revealing.

PER RESULTS: POPULATION

Regression 1 had an F-statistic that indicated that the regression formula was statistically significant. This is crucial as the independent variables lose their explanatory power if the regression is insignificant. The model explains 40.60 percent of the variation in the dependent variable PER Average Post. After correcting for heteroscedasticity, the model yielded six statistically significant independent variables at the alpha level .10.

The first two statistically significant variables are Experience and Experience Squared. The coefficient for Experience is -.6759, meaning that each additional year of experience decreases the players PER Average Post by .6759. This finding aligns with what was expected, because as players age, their physical ability begins to decrease. At the beginning of a players career, an additional year of experience most likely leads to an increase in their PER for the following season, as All-Star players are rarely rookies. Time to develop is required for players to reach the maximum potential. As a result, the sign and magnitude for this are pleasing. Assuming that the first few years of experience increase the players PER average post, and taking into account that there are players in the dataset with 10 or more years of experience (16 years being the highest), the magnitude of the coefficient had to be relatively small, and negative.

In an attempt to determine if experience has positive effects on a player's performance, the additional variable Experience Squared is included. This variable, when interpreted with the variable Experience, shows the more true relationship between years of experience and PER Average Post. The coefficient for Experience Squared is .0239, which is both small and positive in magnitude. Experience has a negative coefficient, indicating that experience for the players in this dataset has a convex relationship to

performance. This means that for the majority of the players experience has a negative effect on PER Average Post, but for a very small group of players more years of experience can lead to an increase in PER. This is less likely, but Experience Squared shows that experience is not simply a negative linear relationship.

The independent variable Guard is statistically significant in the 90 percent confidence interval (p-value of .064). The coefficient is .8444, which explains that if the player is either a Point Guard or Shooting Guard their PER Average Post is .8444 higher. The sign and magnitude of this variable were predicted as Guards tend to have higher PER statistics than other positions (observable trend). For Small Forwards and Power Forwards, they are less likely to have a larger PER statistic. The statistic PER is comprehensive and its formula is complex; however, this statistic is formulated form other statistics. The forward position is at a disadvantage as their performance is not as well reflected by statistics. Small Forwards bridge the gap between Shooting Guards and Power Forwards. They are often taller than SG's but shorter than PF's. They are likely slower than a SG but faster than a PF. As a result of the particularity of the skillset, Small Forwards are less likely to be dominant scorers, produce a number of assists, rebounds, steals, or blocks. While the PER statistics includes a great deal more, the base concept is that the Small Forward position often produces less in terms of statistics. The same concept is true for Power Forwards. They need to rebound and play defense like a Center but possess offensive skills more similar to that of a SF. The result of this paradox is performance that is not as visible in the statistics. Centers, like guards, are more likely to have their performance reflected in the statistics. Their size and skillset often leads to a larger number of points, rebounds, and blocks (in comparison to PF's). In this regression

(and the other three) the variable Center acts as the base dummy variable. Every player is different and not every player plays the position the same way. What has been outlined are the generalities of the five positions. To reiterate, the positive coefficient for Guard was predicted, and its sign and magnitude are logical.

PER Decision Year is another statistically significant variable. Its coefficient is .5465, which means that for every unit of the player's PER statistic in the decision year, their PER Average Post is going to be .5465 higher. Players in the NBA who are offered contracts in free agency are quality players who perform at a relatively consistent level. While performance from one year to the next can change drastically, it is less likely. As was found in the article by Healy (2008), a player's future performance is best predicted by their performance from two to three years prior. Baseball players, on average, have a longer career than NBA players (5.6 for MLB as opposed to 4.8 for the NBA) (Nelson, 2013). As a result, the Pre and Post variables in this study are two-year averages. Due to the consistency of the players in the NBA, one can expect that a player's PER statistic in year one is likely to be very similar to their PER statistic in year two; therefore, it is unsurprising that the variable PER Decision Year is statistically significant. The magnitude of the coefficient is more surprising. At .5465, this is saying that the player's average PER over the next two seasons is going to be 50 percent of their PER in the year of their free agency decision. In other words, the individuals in this dataset tend to perform just over half as well in the two years after their free agency decision.

Contract Average Pre is statistically significant, but the coefficient is close to zero meaning that its size and magnitude are insignificant. PER Average Pre is also statistically significant, but once again the coefficient is quite small. For this variable

however, the coefficient is .1692, which is large enough to discuss briefly. PER Average Pre is the two-year average of the player's PER before the decision year. Like with PER Decision Year, it is reasonable that the player's PER Average Post will be similar to the player's PER Average Pre. The coefficient in this case means that for every one unit of the player's PER Average Pre, their PER Average Post will be close to 17 percent. For example, if the player's PER Average Pre is 10, their PER Average Post will be 1.7. This example demonstrates why no conclusions will be drawn from the coefficient on PER Average Pre.

Regression 1 had results that were expected which is satisfying. The variable of interest, Stayed, was statistically insignificant, which is unfortunate as this model is not as helpful in explaining the objectives of this study; however, the independent variable PER Decision Year is helpful. The coefficient for this variable communicates that players tend to have a lower PER after their free agency decision. This finding is illuminating as it is saying that players perform worse on average in the two years after their free agency decision.

CONTRACT RESULTS: POPULATION

Regression 2 was statistically significant with heteroscedastic error terms. After correcting for this, eight of the independent variables were statistically significant, including Stayed. These variables are significant at the alpha level .10. Experience is statistically significant with a positive coefficient. Experience Squared is also statistically significant, but this variable has a negative coefficient. This means that experience for players in this dataset has a negative effect the majority of the time. When players have a very small amount of experience, additional years of experience can have positive effects,

however, the results indicate that the majority of players are negatively affected by experience. For the players where experience is only negative, its effects the first three years in the league are less than its effects in the next three years, indicating that the more experience the player has, the more they are penalized in terms of their Contract Average Post.

Starter was statistically significant at the 99 percent confidence interval. Its coefficient is 829292.80, which means that if the player was a starter, their Contract Average Post is $829,292.80 larger. This finding was expected as starters tend to earn larger contracts than bench players. The magnitude of this coefficient is underwhelming, as it is saying that starters earn a premium of close to $830,000 (on the two-year average).

The key explanatory variable Stayed is statistically significant at the 95 percent confidence interval. The coefficient is 494723.60. Interpreting this value, players who chose to re-sign as opposed to change teams through free agency had a Contract Average Post that was $494,723.60 larger. This is a very substantial finding in terms of the objectives of this study. Objective 2 looks to explore the effect of free agency on a player's contract. According the variable Stayed in Regression 2, players who stay with their current team (re-sign) earn a premium in comparison to those who sign with a new team. Now, the sign of this coefficient could be the result of a large number of factors, but very simplistically, choosing to re-sign as a free agent leads to earning a larger salary. This finding needs to be interpreted carefully, as this regression is using the dataset population. This dataset includes all of the free agents over the prescribed time period who signed with team. In other words, restricted free agents are in this dataset. These

players are not fully in control of their free agency decision. As a result, the finding from this regression is not entirely reflecting the decision to stay as opposed to the decision to leave. While it cannot be said that NBA free agents who choose to stay are rewarded with a larger contract, it can be said, very generally, that players who re-sign in free agency sign contracts with salaries that increase from their previous contract. This could be the result of teams matching qualifying offers for restricted free agents, but it could also mean that teams reward the players who choose to stay.

PER Decision Year is statistically significant with a coefficient of 230196.40. This means that for every unit of the PER statistic in the free agency year, the player's Contract Average Post increases by $230,196.40. As contracts vary greatly, this finding is less telling. The league average PER is set at 15, so based on the PER Decision Year coefficient, the league average for the two-year average post salary over the prescribed time period is $3,452,946. The coefficient for the significant variable Contract Average Pre is less than one, indicating that its explanatory power is insignificant.

PER Average Pre is statistically significant with a coefficient of 132670.40. Interpreting this, for every unit of PER in the two-year pre average, Contract Average Post is multiplied by $132,670.40. Once again, contracts vary so this magnitude is arbitrary. The takeaway from this variable is simply that player performance before the decision year is relevant to the magnitude of the Contract signed in the year of the free agency decision.

PER RESULTS: SUB-POPULATION

Regression 3, testing the sup-population dataset, is statistically significant. The results of this dataset reflect the decisions of the unrestricted free agents. The dependent

variable in this model is PER Average Post. Six of the independent variables are statistically significant at the alpha level of .10, including the key explanatory variable Stayed. The results for Experience and Experience Squared are very comparable to that of the results from Regression 1. The coefficient of -.4562 indicates that for every additional year of experience that the player has, their PER Average Post will decrease by .4562. To refresh, the results from experience in Regression 1 were that the effects of experience are largely negative, but for some players a large enough amount of experience can yield positive effects on performance. It can be noted that the magnitude of this coefficient is smaller than the magnitude of the coefficient for Experience in Regression 1 (-.4562 as opposed to -.6759). Analyzing this, years of experience has a smaller effect on performance for unrestricted free agents than it does on both unrestricted and restricted free agents.

PER Decision Year is once again statistically significant which was expected. The player's performance in the year of their free agency decision significantly reflects their performance in the two years after the decision. The coefficient is .5821, which is larger than the coefficient for PER Decision Year in Regression 1 by .0356 (.5821-.5465). In other words, every unit of PER in the decision year corresponds to .5821 PER Average Post. Said differently, the player's PER Average Post is 58.21 percent of their PER Decision Year. Comparing datasets, unrestricted free agents alone perform 3.56 percent better in their two-year average PER than do both unrestricted and restricted free agents. The reason for this difference is not immediately apparent, but it could again be related to the accompanying pressure of choosing the team that you sign with. The variables Contract Decision Year, Contract Average Pre, and PER Average Pre are statistically

significant with coefficients that have magnitudes that indicate that no clear relationship exists.

Stayed, the key explanatory variable is statistically significant at the 90 percent confidence interval. The 95 percent confidence interval is more reputable, but with the importance of this variable, its lower statistical significance will be accepted. The coefficient is -.6537, which means that if a player chose to stay with their current team, their PER Average Post decreased by .6537. This finding was not expected, as it was predicted that players who re-signed would benefit from team chemistry and a familiarity with the team. The magnitude of this coefficient is relatively small if it is considered that the NBA league average PER is 15. One explanation for the decreased PER Average Post could be related the quality of the player. Every player in this dataset signed with a team, but it is possible that players only received offers from their current team, and that they re-signed out of necessity and not free will. In that circumstance it could be deduced that the player showed signs of decreased performance in the free agency year, which gave outside teams a reason to doubt the player's performance. To explore this idea further, the Stayed variable in Regression 4 will be very informative (if statistically significant).

CONTRACT RESULTS: SUB-POPULATION

Regression 4 was statistically significant with heteroscedastic error terms. This was corrected by applying robust standard errors. Six of the independent variables are statistically significant at the alpha level of .10. The results for Experience and Experience Squared can be interpreted to mean that for players with little experience, the first few years of experience can have a positive effect on their salary. For the majority of players, however, additional years of experience leads to a decrease in salary.

The variable Starter is statistically significant at the 90 percent confidence interval. The coefficient is 322893.70, meaning that players who were starters had a Contract Average Post that was $322,893.70 larger than bench players. In comparison to the population dataset, starters in the sub-population earned a premium that is just over 2.5 times less ($829,292.80 vs. $322,893.70). The reason for the difference in size of the premium could be related to the restricted free agents. Perhaps teams pay a premium to restricted free agents as a means to discourage their current team from matching the offer. This would either lead to the restricted free agent signing with a different team for a premium, or their current team matching the inflated contract offer, which still gives the player a premium. Teams are more likely to offer a premium to top-tier players, and these players are likely to be starters.

PER Decision Year is significant with a coefficient of 154895.30, which is significantly smaller than PER Decision Year in Regression 2. The difference is 75301.10 (230196.40 vs. 154895.30). Interpreting this, the player's PER in the year of the free agency decision corresponds to a smaller contract for the sub-population dataset. Said differently, unrestricted free agents alone are rewarded less for a higher PER in the decision year. Once again, this could be attributed to the premium that could exist when attempting to sign restricted free agents. Contract Decision Year and Contract Average Pre are both significant at the alpha level of .05, but they have coefficients that are too small to draw conclusions.

PER Average Pre is statistically significant with a coefficient of 128722.90. This means that every unit of PER Average Pre corresponds to $128,722.90 of Contract Average Post. In comparison to Regression 2, PER Average Pre is smaller by

(132670.40-128722.90) 3,947.50. In the scheme of million-dollar contracts, this number is relatively insignificant, but it follows the trend of Regression 4 of having smaller coefficients than Regression 2. Based on these two models, the variables for the sub-population consistently have a smaller magnitude, meaning that the variables in this model affect Contract Average Post less than the exact same variables in Regression 2's model. These smaller effects could be interpreted as unrestricted free agents earning less than restricted free agents. In order to explore this idea further, additional research is needed.

The key explanatory variable stayed is not statistically significant at the 90 percent confidence interval. Unfortunately, this means that the conclusions drawn from the variable's coefficient are not reliable. The coefficient for Stayed is 311293.70, meaning that players who chose to stay earned a premium of $311,293.70. This is worth discussing to follow up on the findings from Regression 3. The Stayed variable in that regression communicated that players who stayed with their current team performed worse in the following two seasons. The findings from this regression would be informative if they were statistically significant, as staying earned the players a premium, despite the fact that their performance decreased; however, Stayed is not statistically significant (p-value of .130), and less weight should be given to this result.

Stayed is the independent variable with the most to contribute to the objectives of this study. Unfortunately, of the four regressions, Stayed was only statistically significant at the 95 percent confidence interval once. It was significant at the 90 percent confidence interval as well. These two regressions are very telling. For the variable that was significant at the 95 percent confidence interval, the finding was that players who stayed

earned a premium of $494,723.60 as compared to the players who moved through free agency. This finding was for the population dataset which includes both unrestricted and restricted free agents. The variable Stayed was significant at the alpha level of .10 in Regression 3. The finding was that the players who chose to stay during the free agency period had a PER Average Post that was .6537 less than players who signed with a different team. This finding applies to the sub-population which includes only unrestricted free agents.

In terms of the two objectives of this study, Objective 1 explores the effects of free agency on a player's performance, and Objective 2 explores the effects of free agency on a player's contract. Fortunately, two of the regressions produced results that directly apply to these objectives. For Objective 1, Regression 3 found that players who stayed in free agency performed over the next 2 years at a lower level than players who left. The change in PER was small at .6537, but the statistics are sound. Also, this finding is from the sub-population dataset, meaning that this effect is in part the result of the player's decision. Hypothesis 1 proposes that after movements through free agency players performance decreases. This supposition, based on the results from Regression 3 is incorrect. Players who moved through free agency actually performed better than those who stayed. This happening could be the result of a number of things. Players who stayed could have done so due to the lack of offers from other teams. In this scenario, it is reasonable that the player's performance would decrease as the lack of interest in the player would indicate the player's lack of potential, decreasing skill, or waning performance. Another explanation for the decrease in performance could be the result of added pressure. If the player signed a new contract that was larger than what they had

previously, they could feel added pressure to not only perform the same as the previous year, but to perform better. Along with this, the team personnel could have changed as well. If the player who re-signed earned a larger contract, the team could be giving this player a larger role, expecting more out of their performance. With that role change and increased in salary, the team might have had to create cap space for the player by letting other free agents go, or with the role change they felt that they no longer needed certain players. The change of the personnel could lead to a change in chemistry, which could then lead a decrease in performance.

Regarding Objective 2, Regression 2 found that players who stayed in free agency earned a premium of $494,723.60 compared to the players signed with a different team. This finding is taken from the population dataset meaning that this applies to unrestricted and restricted free agents. This means that this finding is not necessarily the result the player's decision, as restricted free agents are not fully in control of their free agency decision. Hypothesis 2 proposes that as players move through free agency their contracts increase. According to the results of Regression 2, this prediction was incorrect. Players who re-sign earn over $400,000 more than players who sign with a different team. It is important to note that this model was run using the population dataset, which includes both unrestricted and restricted free agents. Taking this into account, it is reasonable to assume that the results are partially the result of the presence of restricted free agents. As discussed in the section Background, teams with desired free agents receive offer sheets with offers to sign their restricted free agents. The team that receives these offers has the right of first refusal, and they have the ability to match the offer sheet and re-sign their player. In this case, the offer sheet for the player could be a salary that is larger than what

the player is worth with the intention of discouraging their current team from matching the offer. This happening would inflate the player's contract, which would explain the premium that that Regression 2 suggests.

In the sub-population dataset, 64 percent of the players signed with a new team. Out of that group of players, 62.5 percent had their average PER over the following two seasons decrease, while their average contract over the same time period increased. In other words, for the majority of the players in the sub-population, as they changed teams during free agency, their contracts increased while their performance decreased. This pattern of decreased performance and increased contract was predicted by this study, and now it is clear as to why. The hypotheses in this study were based on observable trends that the author recognized from years of interest in the NBA. While these predictions were not caused by the decision to stay or move through free agency, the trend does exist. Regressions 2 and 3 uncovered that the reasons for this trend are not the decision to stay or move. In fact, the decision to re-sign results in the exact opposite of the trend, offering the players a larger salary and decreased performance.

The implications from these results are that players financially benefit from re-signing with the same team. While the players also tend to perform worse in the next two seasons, the size of the change in performance is quite small. The average PER in the NBA is 15 as controlled by the PER statistic's calculation, so a decrease of .6537 is a mere decrease of roughly 4 percent. Similarly, the change in contract value is also relatively small at $494,723.60; however, that amount of money is tangible and directly beneficial to a player's utility. While a very small decrease in performance would

decrease a player's utility, a 4 percent decrease in the PER statistic is likely to present itself as a very small change in the player's per game performance.

For NBA players, the implications of this study are that re-signing leads to an increase in salary over the next two season with a slight decrease in performance. Competitive individuals, it would seem, thrive on challenges, and they believe to an extent that they can control their performance. When presented with these results the player should see an opportunity to earn a larger contract, and a challenge to prove this study wrong. It is the belief of this author that winning is the top priority in professional sports, and that a player's performance should be weighted higher than the size of their contract; however, the predicted performance decrease is something that the player can control, and should therefore be weighted less than the predicted increase in contract. Not only is the player primarily in control of their performance, but the predicted performance decrease is quite small, meaning that the player will not have to do much to avoid this result. It is the belief of this author, purely based on the results of this study, that players should consider re-signing more heavily than moving elsewhere. The free agency decision, as discussed in the Background section, has more factors than performance and contracts, but all else equal, re-signing has more to offer a player's utility than does signing elsewhere.

CHAPTER 6: CONCLUSION

According to the results of this study, players in the National Basketball Association who re-sign with their team when they are free agents will earn an estimated $494,723.60 more (as opposed to those who sign with a new team) on average over the next two years of their contract. Along with this, these players will perform slightly worse, with their PER decreasing an average of .6537 over the next two years (for the average player a decrease in PER of 4.36%). For individuals playing in the NBA, this means that there should be a more careful consideration of the free agency process. Based on years of watching and following professional basketball, players focus too heavily on the wrong aspects when making their free agency decision. Players tend to sign with the team in the bigger market or with the team that offers the largest salary, but these factors are not necessarily the most important consideration for each player. Exceptions are present in most everything, but trends also exist and in some cases they should be considered. For professional basketball players in the NBA, the results of this study could mean a larger contract. This increase in the player's salary could then lead to more utility for that player. Making a decision based on this study could also mean choosing to stay with a team despite the chance of a decrease in performance, knowing that the performance change is likely and playing differently as a result. The improved decision-making by these players could lead to longer careers, and less player turnover. This could then lead to a longer average player career. While performance is estimated to decrease, if players make their free agency decision taking this into account, they could perform better as a result of the increased awareness. This could then lead to teams in smaller markets retaining their top players, which could then lead to winning more games.

Disparity in the NBA is very high, and an increase in parity could lead to an increase in profitability for small market teams.

Both NBA teams and individual players affect their local economies. If the above effects become a reality, both players and cities could benefit. Not only could teams in smaller markets feel these effects, but larger markets could as well. Due to the large differences in quality, when top teams play the lower-ranked teams, attendance and viewership likely decrease. A more competitive NBA could lead to a larger fan base, larger television contracts, more profitable organizations, and economic stimulation in terms of ticket sales, merchandise sales, and television subscriptions. The likelihood of this study leading to these changes is very low, but better understanding free agency could lead to these effects, and this study is beginning the exploratory process.

This graduate thesis suffers from a number of shortcomings. First, a possibility exists that there are errors in the datasets. The data was collected manually, transferring the PER and contract information from the website and typing it into Excel. With this, the website where the information was found had missing data in places where it appeared data should be available. Due to time restrictions, detailed searches for the thousands of players collected could not be performed, and as a result some of these players had to be eliminated from the dataset. Similarly, free agent records varied for the years addressed in this study. Multiple sources had slight variations in the listing of free agents for each year. In these cases, the most detailed source was used in this study.

Secondly, this study is also limited by the complexity of its model. While it is believed that all of the necessary variables are included in the model, certain things could have been improved upon. For one, the classification for the variable Starter is simplistic

(Starter: started in 50 percent of games played). In terms of performance and contracts, simple averages were used. While the averages were sufficient for the purposes of this study, a more detailed calculation could have increased the accuracy of the results.

Third, one of the two main results from the regressions came from the population dataset which includes both unrestricted and restricted free agents. Consequently, the results of that regression are more difficult to interpret, as it is challenging to determine the degree that restricted free agents skew the results.

Improvements could be made to this research study. Two datasets were used with these regressions, one containing unrestricted and restricted free agents, and one containing only unrestricted free agents. The reason for this distinction is to see the effects of free agency on both types of free agents, while focusing on effects that result from unrestricted free agents only, as they are fully in control of their free agency decision (the underlying hypothesis is that free agents make poor decisions, and that can only be tested with unrestricted free agents). This study proposes that the same two models are tested using a third dataset that includes only restricted free agents, with the purpose of determining the effects that restricted free agents have on the population dataset regression results. Potentially, the results of these new regressions could offer insights into the results from Regression 2, helping to better understand the effects of moving through free agency as an unrestricted free agent.

Further research on this topic is recommended. Some of the implication of this study effect team performance. A possible extension of this study would be to include the player's team's success, which would most likely be a function in terms of wins (controlling for the previous team's record). This addition could uncover information on

the impact that free agents have when they re-sign or sign with a new team. Better understanding the effects of signing current versus new free agents could significantly help teams to better control their personnel decisions leading to more team success.

The effect of free agency on the players and teams in the NBA is an unexplored area of sports economics. Further understanding this area could lead to improvements for both individuals and teams, and ultimately the league as a whole. In a time when television contracts are growing increasingly large, any increase in viewers would be helpful, and the best way to achieve that is through better competition. This study believes that a more competitive NBA could exist if players and teams better understood free agency, and that the best way to do this is extend the research in this study.

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