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Unguaranteed Money in the NFL: A Useful Tool for Risky Players

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Abstract

This study is investigating whether or not the percentage of non-guaranteed money or length in NFL contracts reflects how risky players are as judged by past statistics. While sports economists have completed numerous studies on the motivational power of incentives, a study trying to identify the riskiness of players to lead to the strategic use of non-guaranteed money and length of contract is a new idea.

Contract details were gathered for running backs and wide receivers on NFL rosters for the 2012 season from rotoworld.com. Players who were still on rookie contracts and who were primarily special teams players were excluded. Career statistics were also compiled, including yards per attempt, touches per game, touchdowns per game, games missed, and age. These variables will be used to capture the inconsistency, susceptibility to injury, and other types of uncertainty that will identify how risky they are.

Regressions were run testing both percent of money not guaranteed and contract length as dependent variables. Independent variables that were tested include the coefficient of variation of key statistics based on position, career average of the mentioned key statistics, games missed per year, age, and a dummy variable for signing with a new team.

Table of Contents

Chapter I: Introduction

Contracts in the NFL have evolved to become more and more complicated. When signing a player, many details need to be reached, including a base salary, contract length, and incentives like unguaranteed money. Unguaranteed money is the amount of money that a team can avoid paying by cutting a player. This paper is investigating whether or not the percentage of unguaranteed money or length in NFL contracts reflects how risky players are as judged by past statistics. The idea of pinpointing the type of players through statistical analysis that should be offered less guaranteed money or shorter contracts is a new idea. Adaptations to NFL rules and regulations on free agency and salary caps have lead to more emphasis on managing the risk of NFL teams. Besides providing motivation to players, we will see how unguaranteed money and shorter contracts are ways to protect NFL teams from risk and transfer it to the players.

It is important to understand what risk is involved when signing players in the NFL. Like any sports organizations, win maximization is the ultimate goal, as success leads to more revenue through television deals, ticket sales, and other memorabilia sales. In order to be successful, teams must attract the most talented players to their team by offering them better contracts then other competitors. However, these players are being offered wages that reflect past performance, and it is impossible to determine if future performance will be the same. If future performance after the contract signing is high, then the team's risk will have paid off as the team would be successful and their revenue will more then make up for the

player's wage. However, there is also a chance that the player's future performance will be below average and the team will suffer in terms of wins. Revenue will be significantly lower in this case, but the team is still obligated to pay the new star player's high wage regardless. These two situations on opposite ends of the spectrum demonstrate the risk that team's take when signing a player.

Contract details and career statistics were gathered for players on NFL rosters for the 2012 season. Players who were still on rookie contracts and who were primarily special teams players were excluded. Players on rookie contracts do not have any past statistics in the NFL, so contract negotiations were based on college performance or other factors instead. Additionally, there are more NFL regulations governing rookie contracts that make them very different then contracts for veteran players. Specialty team players were excluded because they are judged by statistics that are not included in this study's regressions. Career statistics that were compiled include yards per attempt, touches per game, touchdowns per game, games missed, and age. These variables will be used to capture the inconsistency, susceptibility to injury, and other types of uncertainty that will identify how risky they are.

Regressions are run testing both percent of money not guaranteed and contract length as dependent variables. Percent of money not guaranteed is a suitable measure of risk, because it shows what percentage of the maximum value of the contract a team will be forced to pay no matter what the circumstances. Contract length is also a suitable measure of risk because a longer contract means that a team will have to pay the player a high wage for a longer period of time.

Future contract negotiations, where wages and other details can be adjusted, are delayed by long contracts. Independent variables that are tested include the coefficient of variation of key statistics based on position, career average of the mentioned key statistics, games missed per year, age, and a dummy variable for signing with a new team. The data gathered for running backs and wide receivers show that the length of a contract can be explained by the riskiness of a player while percent of money not guaranteed cannot.

In conclusion, percent of money not guaranteed did not correlate with the riskiness of a player as defined by the independent variables for any position. On the other hand, length of contract was able to be defined by the variables. At both the running back and wide receiver position, the coefficient of variation of yards per attempt, the best measure of statistical inconsistency, was statistically significant in the contract length regression. The negative coefficient supports the hypothesis that as the coefficient of variation of yards per attempt increase, or statistical inconsistency increased, then a player would receive less years in their contract. A measure of risk due to health issues was also significant at both positions. For running backs, the games missed per year variable was statistically significant while for wide receivers the age variable was significant. With negative coefficients on these two variables, the hypothesis that an increase in health or injury risk will lead to fewer years in a contract was supported. In addition, the variables for career averages of key statistics remained significant in both regressions. In conclusion, a player with higher career averages will be granted more years in their contract even with their risk. The dummy variable for players signing with a new team proved to

be inconclusive or position specific. This variable was not significant in the running back regression, but was significant in the wide receiver regression. As a result, there is no indication that a running back coming from a new team involves additionally uncertainty that will be reflected in the length of a contract. On the other hand, the hypothesis that players signing with a new team would receive shorter contracts was supported for wide receivers.

The findings in this paper are bound to have future implications on contract negotiations. The amount of unguaranteed money in a contract seems to be random. Also, teams don't seem to trade off between unguaranteed money and contract length when negotiating contracts. NFL teams should use unguaranteed money as a risk management tool, and offer more unguaranteed money to players who are riskier. On the other side, NFL teams do offer shorter contracts to players that have been proven to be riskier based on past statistics. The findings of this paper can be used as guidelines in future contract negotiations. Player salaries are on the rise, which brings additional importance to managing team risk. Unguaranteed money and contract length can be used in unison to attack the problem of risk in signing players.

Chapter II: Background Information

2.1 Principal-Agent Theory

When a principal hires an agent to perform a task with uncertain outcomes, the terms of their contract will determine who bears the risk of uncertainty. The agreement between these two actors has been coined as the principal-agent relationship. In this model, there are two parties involved that are both self-interested utility maximizing actors, a principal and an agent. When a principal hires an agent, the principal is dependent on the performance of the agent. Problems arise because the interests of the principal and the agent don't completely align. The agent will act in his best interest and not that of the principal, who is facing all the risk. Professional sports have become a common way to study the principal-agent relationship, as data on performance of athletes and the contracts they receive is easily accessible.

The principal-agent relationship in sports is created when an organization, the principal, signs a free agent player, the agent, to a contract. Assuming that the player's contracts detail a set wage, the player is not financially affected if the team wins or loses. However, the owner is significantly affected by wins and losses; one could expect the revenue of a losing team to significantly increase if that same team

had a winning record. In order to solve the problem of risk bearing, the owner should be interested in providing unguaranteed money to the players that they offer contracts to.

In the NFL, unguaranteed money is already commonly used in player contracts. While the motivating power of incentives is easy to understand, this paper suggests the use of unguaranteed money for an additional reason. Unguaranteed money can be used to protect teams when they take a chance and sign a risky player. Imagine if a team signed a risky player to a large contract, and this risky player turned out to have another year of bad performance. The team would not perform up to expectations because of the underperformance of the player, and the owner would see less profit as a result. On top of that, the risky player still gets paid the maximum value of his contract. If the risky player had unguaranteed money in his contract, his underperformance would mean that the team is not obligated to pay the full value of the contract. In this scenario, even though revenue would still be lower than expected, so would the cost of paying the players, so the team would not be harmed financially. Therefore, unguaranteed money attacks the principal-agent relationship problem in sports in two ways, by motivating the players to increase their effort which will most likely increase their output, and by providing a safety net if the player's effort and/or output turns out to be lower then what was hoped for.

Free agent players in the NFL can be labeled as risky for any number of reasons. It could be the case that a player has had seasons where he proved himself to be an all-star at his position. However, the same player may have had forgotten

years where his performance was below average. Due to this type of volatile performance, this player would be considered a risky player with a tremendous upside. Also, players who have proved to be susceptible to injuries over their career will be labeled as risky. Teams will expect that these players are more likely to get injured in the future, and they can't help the team if they are not on the field. Additionally, players may be considered risky simply because they are getting too old. Data on statistical performance, games missed due to injury, and age is available to a team who is considering signing a player. Therefore, it is possible to try to capture the riskiness of a player, an important component when negotiating the terms of a contract. Unguaranteed money should most likely be included in contracts of players deemed to be high-risk.

2.2 Incentives

The stage is set for organizations to provide unguaranteed money for players so they act in the best interest of the team. Previous studies have focused on unguaranteed money for the incentive that it provides, but not its relationship with risk. Teams now need to find incentives that are efficient at accomplishing the goal of aligning interests. Sports economists have different theories on what types of incentives should be used. According to Huebeck and Scheuer (2002), the ideal incentive would be based on individual effort as opposed to individual performance or statistics. However, effort is subjective and requires the organization to closely

monitor the effort of players in practices and games. In the NFL, there are many coaches in the staff of a given team, so one could assume that monitoring is more or less possible. Players who prove to put in the most effort compared to other players at their position will be rewarded with additional playing time. With the additional playing time, players will be able to achieve higher statistics and earn incentive bonuses if they are included in their contract. The authors refer to this situation where players are rewarded for their effort as a tournament-style incentive, because players are competing against each other to win the approval of the coaching staff. In general, the authors believe that performance is not well correlated with effort. However, as mentioned above, the close monitoring of NFL organizations create the situation where increased effort will lead to increased statistical performance. Therefore, for an analysis of the NFL, individual statistical output will be a suitable measure as it is closely correlated to effort.

Heubeck and Scheuer (2002) also analyze incentives that are tied to the performance of the team as a whole, not individual statistics. In some incentive clauses, a player can receive more pay if the team achieves a certain win total or reaches the playoffs. The authors do not support this type of incentive, because a single player's effort actually has a minimal effect on the outcome of a game in team sports. A team can win the game even if the player in question slacks off and has a bad performance, but he will be rewarded none-the-less. Despite this opinion, team performance based incentives are used in NFL contracts as a risk transfer strategy. If teams experience success then they will be willing to pay their players more due

to high revenues, even if it is impossible to determine that certain players had significant effects on the team's success.

2.3 Collective Bargaining Agreements

Conclusions on the effect of incentives give teams an idea of what types of contracts they would be willing to offer. Teams can piece together the terms of a contract to ensure they are offering attractive deals while managing risk. However, there are many rules and regulations set forth that restrict the way these contracts can be structured. Some rules and regulations will have implications on what players are included in the data set later on. These rules and regulations are negotiated in Collective Bargaining Agreements (CBA's) between the team owners and the NFL Player's Association. The NFL player's association, or the NFLPA, was created in 1956 to ensure proper representation of the player's rights.[1] Collective Bargaining Agreements have different lengths, and as the expiration approaches, both parties need to come to agreements on new issues for a new deal to be made. In the event that an agreement cannot be made before the expiration of the previous CBA, the league will enter in a lockout where the operations of organizations and their players are completely shut down. This occurred most recently in 2011, although a new CBA was eventually agreed upon before any games were actually cancelled. The presence of these two parties, the NFL owners and the NFLPA, and

[1] https://www.nflplayers.com/about-us/

the threat that is created by not reaching a CBA deal are the driving forces of the adaptation of NFL rules and regulations over the course of the league history.

2.4 Free Agency

The component of day-to-day operations in the NFL that is most relevant to this paper is free agency. Free agency is the ability of players to shop around organizations in the NFL in order to seek the best possible deal for themselves. When a team decides to negotiate the terms of a contract, they must adhere to NFL rules regarding free agency. The evolution of the NFL free agency system has forced teams to consider the use of unguaranteed money as a precaution when signing players, something that they have not always had to do. Free agency began in the NFL in 1989 under a system known as Plan B free agency.[2] Under these guidelines, a team was permitted to preserve limited rights of no more then 37 players on their roster from the previous year. Under these limited rights, players would have to allow their previous team to sign them first before negotiating with other teams. The Plan B free agency system benefited the owners, as teams could keep their best players around with out having their wages driven up by bidding wars with other teams. It was for this reason that eight players sued the NFL in 1992 in US federal court claiming that Plan B free agency violated antitrust laws. The court ruled in favor of the players forcing the league to search for a new free agency system.

[2] http://en.wikipedia.org/wiki/Free_agent

A new system, simply Plan A free agency, became effective for the 1993 NFL season. Under this system, free agents are classified as either restricted or unrestricted free agents.[3] A player who has been in the league for less then three seasons is labeled as a restricted free agent and sees restrictions similar to those of players in the Plan B system. But after four seasons in the NFL, a player becomes an unrestricted free agent and can negotiate with any team as he pleases. Plan A free agency leads to bidding wars between teams competing for the best players that drive the wages of free agents up. Therefore, a team may have to offer more money then they are comfortable with to attract the best talent. Therefore, teams are facing serious risk under Plan A free agency when they commit millions of dollars to a player in a long-term deal and need tools to protect themselves from overpaying risky athletes.

To compensate for increased rights of players, the NFL owners implemented a tool to delay a player from becoming an unrestricted free agent. Under current NFL rules, players can be "slapped" with a franchise tag as their contract expires. This franchise tagged player would be guaranteed a salary that equals the average of the five highest players in the league at his position or 120% of his previous salary if higher.[4] In return, this player will remain on the team for one additional year without negotiation privileges. Franchise tags were seen as necessary to inhibit the movement of top players, especially from small-market to large-market teams. While a team only has one franchise tag a year, they can designate it to the same player multiple years in a row. Since the franchise tag sets clear guidelines for a

[3] http://en.wikipedia.org/wiki/National_Football_League
[4] http://en.wikipedia.org/wiki/Franchise_tag

guaranteed salary for the player, players who received tags did not negotiate the terms of the contract and will be excluded from this analysis.

2.5 Salary Cap

The NFL salary cap is also crucial for this analysis because it forces teams to make decisions when considering free agents. The use of unguaranteed money was again increased in order to cope with this rule regarding the payroll of a team. The salary cap was implemented in the NFL in 1994 due to the fear that small-market teams would not be able to keep their best players because of free agency and remain competitive in the league.[5] With competitive balance in mind, the salary cap was put into place. The NFL uses a "hard" salary cap, meaning a team's payroll, or the sum of the money it is due to pay to its players in a year, cannot exceed a predetermined value. Teams could no longer attract top talent simply by offering the highest base salary, as they would need to have enough cap room to sign an entire roster. With the salary cap in place, once a team offers to pay a risky player a high salary for multiple years, they cannot then sign someone else to replace them no matter how much money the owner is willing to pay. The use of unguaranteed money was adapted to ensure that every dollar spent would be worth it and also as a tool to strategically alter the "cap hit" involved when signing a player over the course of the contract. The cap hit is how much the signing of a player adds to the total value of the team's payroll, and the league has set forth clear rules on how they

[5] http://en.wikipedia.org/wiki/Salary_cap

are calculated. Unguaranteed money in a contract will allow teams to avoid significant cap hits in the future if the player is deemed not worth his wage.

The salary cap changed the way contracts would be structured forever. Teams were forced to consider trade-off strategies to strategically manage the cap hits of players over the life of the contract. Teams started negotiated a value of unguaranteed money as one trade-off strategy. Unguaranteed money ensured that a team will end up paying based on the performance they get from the player in the future. A player on a long-term contract who underperforms can get cut before the expiration of the contract and they would forfeit the negotiated percentage of unguaranteed money. Additionally, contracts started to include various types of "likely to be met" and "unlikely to be met" incentives, the latter of which was not included in cap hit calculation. If players wanted to avoid incentives and unguaranteed money in their contracts, teams could offer them shorter contracts to protect themselves from the risk. The measures to manage risk of unguaranteed money and contract length will both be considered in this analysis.

2.6 Revenue Sharing

The revenue sharing guidelines in the NFL also have significant implications on this study. One of the basic assumptions of sports economics including this study is that if a team performs better then they will increase their revenue. The correlation between team performance and revenue is limited in the NFL due to revenue sharing. While revenue sharing is good for the league as a whole, it harms

some teams. In the NFL, the league negotiates a television deal instead of teams negotiating individually, and the television revenue is equally distributed among the teams in the league. In other sports, the league negotiates a deal for only part of the schedule, and teams can individually negotiate their own deals for the remaining portion of the games. As a result, large market NFL teams that would make enormous sums of money if they negotiated their own deal are forced to accept significantly less. About 2/3 of the NFL's revenue comes from their negotiated television deal.[6] Additionally, the revenue generated from ticket sales is split 60/40 with the home team only getting 60%. Weak-drawing teams typically have low ticket-sales revenues, but benefit greatly when a large-market team comes to play in their city.

The consequences of revenue sharing schemes like the ones mentioned above are that owners cannot freely act to maximize revenue. Generally, there is less incentive for NFL teams to win compared to leagues without revenue sharing because the marginal revenue of an additional win is decreased. The financial difference between having a winning season compared to a losing season is significantly less then is would be in the absence of revenue sharing. None-the-less, NFL teams are still focused on win maximization, and their success relies on the performance of the players they sign.

2.7 Examples of NFL Player Incentives

[6] http://football.calsci.com/SalaryCap.html

Unguaranteed money is very common in NFL player contracts today. In a study comparing the use of incentives in contracts across all major sports, Heubeck and Scheuer (2002) found that roughly 65-75% of NFL players receive payments that are based on individual performance. Other forms of unguaranteed money may include payments based on team performance. Pay tied to team performance is a bad incentive but a great way to transfer risk to players. NFL organizations have branched out to use more and more types of incentives. The CBA also details exactly what types of incentives can be used in NFL contracts. Incentives that are common include work out bonuses, for completing a work out regimen in the offseason, and roster bonuses, for making the team in a certain year. Additionally, incentives can be based on individual accomplishments or awards. Incentives under this category can involve rushing for a certain amount of yards in a season or being selected to the Pro Bowl, the NFL version of an all-star game. For example, a quarterback could receive a bonus at the end of the year if his team earns a playoff spot.

Looking at the details of an actual NFL contract can help understand the use of unguaranteed money, contract length, other incentives, and cap hits in the NFL. Marshawn Lynch, a running back for the Seattle Seahawks, signed a new contract with his team after the 2011 season. The contract is worth $31 million dollars over four years, but only $17 million is guaranteed.[7] The guaranteed portion consists of a $6 million dollar signing bonus and the $11 million dollars that is his first and second year salaries ($4 million and $7 million respectively). This means, Lynch's third and fourth year base salaries ($5 and $5.5 million respectively) are

[7] http://www.rotoworld.com/player/nfl/4186/marshawn-lynch

unguaranteed, and if he were to get cut, he would miss out on significant potential pay. Other incentives within the contract include $1 million bonuses for 1,500 rushing-yard seasons in two of the years of the contract and $2.5 million worth of per-game roster bonuses in the final two years.

Considering the implications on Lynch's cap hits through the course of his deal will help understand the reasoned for including the mentioned unguaranteed money and incentives in the contract. Per NFL rules, the signing bonus, even though it is paid directly upon signing of the contract, is prorated over the life of the contract. In this case, the $6 million dollar signing bonus will add $1.5 million to the cap hit calculation in each year.[8] In the first year of the contract, the 2012 season, Lynch's contract comes with a $5.5 million cap hit, including the $4 million base plus $1.5 prorated signing bonus. Exhibit 1 shows how the cap hit of Lynch's contract changes over the four years.

Exhibit 1: Marhsawn Lynch's Contract Cap Hit Calculation (in $millions)

Year	Base Salary	Signing Bonus	Incentive Bonus	Cap Hit
2012	4	1.5	0	5.5
2013	7	1.5	0	8.5
2014	5	1.5	.5	7
2015	5.5	1.5	2	9

Source: www.spotrac.com

[8] http://www.spotrac.com/nfl/seattle-seahawks/marshawn-lynch/

There are a few things worth noting from Exhibit 1. First, the sum of the four cap hits is $30 million even though the contract can potentially be worth $31 million. Even though a $1 million difference seems modest considering the total value, the Seahawks organization used incentives, specifically ones classified as not likely to be met, to dampen the impact of signing Lynch on their salary cap. In addition, the cap hits in the final two years of the contract are significantly higher then the first year cap hit. If the team decided that Lynch was not worth the contract after his second year, the Seahawks could cut Lynch and avoid the significant $7 and $9 million dollar hits on their salary cap. From Lynch's perspective, there is $13 million dollars up for grabs in the final years of his contract, and he obviously would want to work hard to earn a spot on the team and receive that pay. The structure of Lynch's contract, which more-or-less escalates in terms of cap hit, is not at all rare across the NFL. The Seahawks organization used unguaranteed money strategically in certain years to help navigate the salary cap. Perhaps they knew they had a lot of cap space in the final three years but not so much in 2012, and crafted a deal that would attract and motivate Lynch while also allowing the team to stay below the salary cap.

2.8 Shirking Theory

Although this paper does not consider whether unguaranteed money affects player performance after the contract is signed, much of the literature analyzing incentive contracts in professional sports centers around the theory of shirking. Shirking is when a player decreases his effort after signing a big long-term contract

because he knows he is getting paid regardless of performance and that the next round of contract negotiations are far off in the future. The media commonly speculates that athletes, particularly high profile stars, are guilty of shirking behavior. Frustrated fans and media members alike figure that the athletes worked hard in recent years with the hopes of a long-term guaranteed contract. If such speculation is correct, incentives seem to be a logical solution to the problem of shirking in sports. Sports economists use many different models to try to search for evidence of shirking, as we will se later on. Such economists would compare measures of performance of athletes from before and after the signing of a big, long-term contract. Economists studying shirking believe that there is a moral hazard problem to explain declines in performance.

This paper centers around a different, but not completely opposite, theory regarding performance and contracts. In essence, these players that some may label as shirkers do not intentionally decrease their effort after signing big, long-term contracts. Instead, these players were actually riskier assets in the first place, and teams failed to find evidence of such risk when working out the terms of the contract. Bad performance that could come after the signing of a contract is this risk coming to the surface. Chances are, the player in question had just completed one or two years where they proved to be an all-star caliber player. However, it is important for organizations to avoid being nearsighted, as there may have also been years where this same player was just average or even worse. From a team's perspective, they should be uncertain of what quality of performance they are going to get in the future. Since an organization's well being depends on the performance

of their top players, they are at risk. This theory does not deny that a moral hazard problem could exist, although the widespread use of incentives and unguaranteed money specifically in the NFL should eliminate shirking. Therefore, the NFL proves to be a sufficient setting to explore this theory of player riskiness.

Indeed, unguaranteed money can be used to motivate players, but this unguaranteed money should be focused more on athletes who are deemed to be riskier. Perhaps these players are inconsistent, prone to injury, or simply too old. None the less, it is important to see if organizations in the NFL are finding risk in the data of the player they are considering signing and appropriately providing themselves a safety net in response. Incentives, unguaranteed money, and shorter contracts are tools that need to be properly used to transfer risk to the players.

The speculation that sports organizations are too near sighted has been studied before in different major sports. Sports economists are interested to see if teams offer too much money or too long of contracts to players coming off years of high performance. Healy (2008) attempted to uncover if organizations in Major League Baseball have "short-term memories". Healy exerts that players could have had great years before signing a contract either because of "luck" or intentionally increasing effort with contract negotiations in mind. Using suitable measures of statistical performance, which is very easy in the sport of baseball, Healy looked at the variations of performance of players leading up to contract years. Using wage as a dependent variable, Healy used a regression to estimate the effect of recent performance on wage versus the effect of past performance on wage. The results indicated that MLB teams infer too much from performance in the most recent

season relative to performance from earlier seasons. As a result, teams make the mistake of spending resources on players who may have had only one great season, thereby being too near-sighted. Although Healy's study involves the MLB, it is very much related to this paper on the NFL. Even though Healy does not use the word "risk" very often, he is very much using a similar hypothesis. Risky players may have had a "lucky" season and earned long-term guaranteed contracts in the MLB, and the performance after the fact did not live up to expectations. In economic terms, this underperformance is known as winner's curse. Basically, the asset proved to be less valuable then the bidder anticipated. As Healy mentions, MLB teams were harmed by being too near-sighted, or not identifying risk, and organizations in the NFL are vulnerable to make the same mistakes.

It is important to mention that evidence of shirking has been inconclusive across other major sports. Because of the inconsistency in the results of such studies, an opportunity to explore a different theory should be taken. However, the models and assumptions used in shirking studies are very much related to this study on player riskiness and incentive contracts. Kahn (2000) tried to pinpoint moral hazard problems that result from players signing long-term contracts. Similar to effects seen in the NFL, Kahn found that the addition of free agency brought about increased incidence of long-term contracts. Again, we see that the competition between teams that comes from free agency leads teams to push the limits regarding offering long-term guaranteed contracts. In bidding against one another, teams may unwillingly sign a risky player to a long-term deal. Kahn uses data from past studies to compare MLB players on contracts of two years or less to

those on contracts of three years or more. Data shows that before the signing of the new contract, players that ended up with contracts of three years or more were on average 2 years younger and had 2.2 less days per season of disability then those that ended up with contracts of two or less years. In essence, the numbers show that the group of players who would receive long-deals were actually less injury prone to this point in their career. However, after signing, long-term contract players averaged 12.6 disable days per season compared to 5.2 for those on one or two year contracts. As a result, Kahn concludes that a moral hazard problem that falls under the definition of shirking did exist in the MLB, at least in the given data set. Relating back to this study on the NFL, if football players are given long-term guaranteed contracts then it is very possible that shirking would exist. However, the nature of current NFL contracts is such that if you don't play, you don't get paid. Therefore, shirking should not explain declines in performance in the NFL.

A quick look into two studies that involve the National Basketball Association can help show the inconsistency in results of shirking theory. Stiroh (2007) uses a unique database of individual measures of performance, contract status, and compensation to analyze incentive effects of contracts in the NBA. Stiroh states that the presence of long-term contracts is both a good and bad incentive. Players will work hard to try to earn a long-term contract, but once they have earned it, a reverse incentive is then created. Stiroh ran regressions using NBA contracts from the 1980's and 1990's, using past statistics in relation to the year in which long-term contracts were signed. In conclusion, Stiroh found statistically significant evidence of above average performance before contract years followed by a below average

performance after signing the contract. As a result, Stiroh states that focusing on a single year of performance can be misleading and that shirking behavior did exist in the NBA.

Berri and Krautmann (2006) used a different model to search for evidence of shirking in the NBA. In particular, the authors were testing the incentive effects of guaranteed money in the NBA. Two commonly used measures of performance in the NBA were considered, and they were controlled for team strength and age. The authors included dummy variables for players with contracts of three years or more in length, players with less than two years in the league, and players with over twelve years' experience in the league. Using a general economist's view of individual performance based on marginal product, the paper could not conclude evidence of shirking in the NBA. On the other hand, Berri and Krautmann's own "NBA model" of player productivity did show statistically significant evidence of shirking. In conclusion, Berri and Krautmann admit that the economic realities of professional sports make shirking unlikely and that the media frequently blows things out of proportion. As can be seen, although shirking seems to be a very possible behavior in principle in the NBA as well as all sports, actual statistical studies have led to mixed results. Results all depend on the many variations that economists have used in models, measures of performance, and other independent variables. Because of the nature of offering unguaranteed money in contracts, the NFL offers a sufficient opportunity to explore a different theory of player riskiness.

Chapter III: Data, Model and Equation

In order to see if the percentage of unguaranteed money or length of contracts reflect how risky players are, players under contract for the start of the 2012 NFL season will be observed. A few conditions must be met in order to ensure a proper analysis is completed. First, only running backs and wide receivers will be included. Performance at these positions can adequately be measured by readily available statistics. Additionally, there are enough roster players per team to put together enough observations for regressions to be run. Players who are on the roster at these positions but are used primarily as special teams players will be excluded, as one can assume their salary is significantly affected by their special teams abilities that won't be reflected as independent variables. In the NFL each position is paid to perform different tasks so statistics that capture the performance of players differs based on position. For example, running backs are paid to run the ball and wide receivers are paid to catch the ball. In light of the differences in statistical measures, different regressions will be run for running backs and wide receivers. Secondly, players must not still be on their rookie contracts. This paper is considering if teams use past NFL data on players when drafting the details of contracts, but this past data does not exist for players out of college signing their first contract. Only college football performance is available, but there is no indication of how this performance will translate to the higher skill level in the NFL. Thirdly, the statistics will only be gathered from seasons completed prior to the signing of a contract. If a player signed a contract in 2009 then they have completed

three seasons after the fact, but these statistics did not exist when contract negotiations were ongoing. Unlike in shirking studies, this paper does not consider performance after the signing of a contract.

One dependent variable that will be used in regressions is percent of money not guaranteed (PMNG). This percentage will be calculated using the most detailed description of the terms in a player's contract. The formula for calculating PMNG is the amount of unguaranteed money in a contract divided by the maximum possible value. For example, the PMNG calculation for Marshawn Lynch's contract would be $14 million unguaranteed divided by $31 million maximum value for a PMNG value of about 0.45. This seems to be the best possible measure of the unguaranteed money in a contract. However it must be noted that capturing the unguaranteed money into an objective measure is complicated. It is not just the value of unguaranteed money that matters, as the years that the salary is unguaranteed also matters. For the purpose of this paper, PMNG will be tested anyway given the absence of any alternatives. Also, years in contract length (CONTYRS), which is more objectively measured, will be compiled for all players. Contract data was compiled from rotoworld.com.

A few different possible statistical measures provided by NFL data can be used to measure performance at different positions. For this study, statistics were compiled for touches per game, yards per attempt, and touchdowns per game. Touches consist of primarily rushes for running backs and receptions by receivers. On one hand, touches are an adequate measure because those who are performing well will see more playing time and get more rushes or catches. However, for

players who were backups to superstars and saw rare playing time before signing as a starter for a new team, touches are not a good measure. Touchdowns per game were included, as many players are paid for performance specifically in the end zone. Running backs can prove to be "goal line" backs just as wide receivers can be the go-to man in the red zone. They are paid to finish off a drive but wont necessarily put up huge numbers in touches or yards. Yards per attempt, more specifically yards per rush for a running back and yards per catch for a wide receiver, shows how effective a player was when they did get the ball. Clearly, there are problems that arise with trying to define a player's performance with a few statistical measures. All in all, yards per attempt seems to be the single best statistical measure of performance for running backs and wide receivers. In the event that touches per game and touchdowns per game prove to be statistically significant in the model, they will be considered as well. Obviously, NFL player statistics are available all over the web, but in this case were collected from rotoworld.com. To adapt these statistics into a risk measure of performance inconsistency, the coefficient of variation for career statistics in all three categories will be calculated. The variables for the coefficients of variation for touches per game, yards per attempt, and touchdowns per game will be listed as VARTOUCH, VARYDSATT, and VARTD respectively.

Alongside the data for player productivity, other variables will be collected as well. For each player, age (AGE) and number of completed seasons (SEASONS) will be collected as a possible measure of riskiness due to getting too old, or being too "seasoned" as some experts would say. Multicollinearity exists between these

mentioned variables, so one or the other may exist in the final equation, but not both. Also note that a player's age and seasons completed would be at the time that their most recent contract was signed. Average games missed per year prior to signing the contract (MISSED) will be collected as well to capture the injury risk of the players. Additionally, players who missed full years due to injury (YEARMISSED) or temporary retirement prior to signing their contract will be recorded and considered as a dummy variable in the regression. Players under this category may come with a higher level of uncertainty or risk.

Other independent variables that cannot be classified as measures of risk but may affect the unguaranteed money or length of contract that a player receives will be compiled as well. The career average of the three statistical categories mentioned above will be calculated, AVGTOUCH, AVGYDSATT, and AVGTD for touches per game, yards per attempt, and touchdowns per game respectively. These variables will control for the possibility that players who prove to put up the highest career averages may receive more guaranteed money or years of contract then their riskiness measures indicate. Lastly, a dummy variable will be considered for players signing with a new team (NEWTEAM). A free agent may come with more uncertainty from a team that has not become familiar with them or had the opportunity to monitor them closely.

The tables in Exhibits 2a and 2b show the means and standard deviations of the data used in this paper for running backs and wide receivers.

Exhibit 2a: Means and Standard Deviations of Data Set for Running Backs

Running Backs (33 Observations)

Variable	Mean	Standard Deviation
PMNG	54.99	24.10
CONTYRS	3.67	1.86
VARTOUCH	0.41	0.21
VARYDSATT	0.17	0.13
VARTD	0.67	0.34
AVGTOUCH	13.3	5.49
AVGYDSATT	4.48	0.53
AVGTD	0.43	0.22
AGE	26.52	1.94
SEASONS	4.45	1.23
MISSED	1.99	1.44

Exhibit 2b: Means and Standard Deviations of Data Set for Wide Receivers

Wide Receivers (43 Observations)

Variable	Mean	Standard Deviation
PMNG	59.49	13.54
CONTYRS	4.19	1.76
VARTOUCH	0.36	0.19
VARYDSATT	0.14	0.07
VARTD	0.58	0.31
AVGTOUCH	3.56	1.24
AVGYDSATT	13.9	2.40
AVGTD	0.31	0.16
AGE	27.67	2.93
SEASONS	5.60	2.61
MISSED	1.83	1.42

Additionally, of the 33 running backs and 43 wide receivers there are 12 and 17 players respectively who signed with a new team. Only one wide receiver and zero running backs had missed entire years before the signing of a contract. Due to

a lack of observations, the YEARMISSED variable will not be included at all in the regressions.

Continuing with the example of Marshawn Lynch will help put perspective on how the independent variables should affect PMNG or CONTYRS. Exhibit 3 shows the variables that were gathered for Marshawn Lynch and if they are greater than or less than the averages of running backs in the data.

Exhibit 3: Marshawn Lynch Comparison to Running Back Data

Variable	Running Back Data Average	Marshawn Lynch	Greater or Less Than Average
PMNG	54.99	45.16	Less
CONTYRS	3.67	4	Greater
VARTOUCH	0.41	0.26	Less
VARYDSATT	0.17	0.06	Less
VARTD	0.67	0.52	Less
AVGTOUCH	13.3	18.04	Greater
AVGYDSATT	4.48	3.94	Less
AVGTD	0.43	0.51	Greater
AGE	26.52	25	Less
SEASONS	4.45	5	Greater
MISSED	1.99	1.6	Less

Simply by looking at Exhibit 3, one can presume that Marshawn Lynch is relatively less risky in terms of performance inconsistency and injury risk. All of his coefficient of variation variables are less than the average of the running back data set. Additionally, he is younger and has missed less games over the course of his career compared to running back averages. With regards to career averages, there is mixed results. Lynch actually averages less career yards per attempt than the average running back but more touches per game and touchdowns per game. Lastly, notice that Lynch received less unguaranteed money in terms of percentage

of total value and a longer contract then the average running back. Overall, Lynch appears to be a relatively low risk in terms of statistical performance inconsistency and susceptibility to injury. His career averages of the three statistical averages vary, but all in all it is safe to say he has performed close to average in relation to the other running backs. This paper would assume that the result for Lynch would be relatively more guaranteed money and a relatively longer contract. Given that Lynch's PMNG variable is lower than the running back average and his CONTYRS is greater than the running back average, the assumption holds in this specific observation.

Regressions will be run to see if similar results are evident throughout the entire data set. The regression will estimate coefficients for the following equations at both positions. These estimated equations come from the economic model of contract negotiations. While all of the listed independent variables may not exist in the final equation, they will be used initially in regressions.

$$PMNG = ß_0 + ß_1NEWTEAM + ß_2VARTOUCH + ß_3VARYDSATT + ß_4VARTD + ß_5AVGTOUCH + ß_6AVGYDSATT + ß_7AVGTD + ß_8MISSED + ß_9AGE$$

$$CONTYRS = ß_0 + ß_1NEWTEAM + ß_2VARTOUCH + ß_3VARYDSATT + ß_4VARTD + ß_5AVGTOUCH + ß_6AVGYDSATT + ß_7AVGTD + ß_8MISSED + ß_9AGE$$

Chapter IV: Empirical Results:

The empirical results should demonstrate that riskier players get shorter contracts and a higher percentage of unguaranteed money. If this hypothesis is correct, the coefficients of the coefficient of variation variables should be negative, as a higher variation means more inconsistency risk and therefore less contract years or more unguaranteed money. Furthermore, the coefficients of the risk variables of MISSED, AGE, and/or SEASONS should be negative, demonstrating that more injury risk will lead to shorter contracts and more unguaranteed money. The coefficients of the career average statistic variables should be positive, because a higher average performance should lead to more contract years and guaranteed money. Lastly, the coefficient for the NEWTEAM dummy variable should be negative, showing that players receive less contract years and more unguaranteed money when coming from a new team due to the increased uncertainty. Regressions can be run in attempt to see if these hypotheses are rejected or if they fail to be rejected.

While running regressions, I used a f-test to see if the null-hypothesis, that all the beta values equal zero, could be rejected. If the null-hypothesis was rejected initially, I used a process of elimination and eliminated the independent variable with the lowest t-statistic. I repeated this process until the t-statistics no longer increased by the further eliminating of variables. In general, an absolute value

greater then 2 is an acceptable value for the t-statistics of the final regression. As mentioned, both PMNG and CONTYRS were used as dependent variables in regressions for both positions. Exhibit 4 shows the initial regression for running backs with PMNG as the dependent variable.

Exhibit 4: Running Back Initial Regression Analysis - PMNG

Dependent Variable: PMNG
Method: Least Squares
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.015510	1.038585	0.977782	0.3384
AGE	0.014932	0.027070	0.551601	0.5865
AVGTD	-0.270880	0.419967	-0.645002	0.5253
AVGTOUCH	-0.006405	0.017452	-0.367017	0.7170
AVGYDSATT	-0.096249	0.109982	-0.875134	0.3905
MISSED	-0.012358	0.038449	-0.321421	0.7508
NEWTEAM	-0.172556	0.126102	-1.368387	0.1844
VARTD	-0.234363	0.227777	-1.028911	0.3142
VARTOUCH	-0.042321	0.337182	-0.125515	0.9012
VARYDSATT	0.200562	0.493920	0.406062	0.6885

R-squared	0.174985	Mean dependent var	0.549934
Adjusted R-squared	-0.147847	S.D. dependent var	0.240961
F-statistic	0.542032	Prob(F-statistic)	0.828767

The regression analysis in Exhibit 4 shows an f-statistic of about 0.54. The critical value of an f-test with 33 observations and 9 degrees of freedom is 2.18. Because 0.54 is less than the critical value, the null-hypothesis cannot be rejected. These results were not anticipated for the PMNG regression, as it seems that PMNG cannot be explained by the independent variables. Next, a regression was run with CONTYRS as the dependent variable for the running back position. Since PMNG was not explained by the independent variables, I assumed that PMNG is an exogenous variable. Therefore, PMNG was included as an independent variable in the initial

regression to see if it is a determinant factor of CONTYRS. Exhibit 5 contains the regression analysis.

Exhibit 5: Running Back Initial Regression Analysis - CONTYRS

Dependent Variable: CONTYRS
Method: Least Squares
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.600991	4.444291	0.585243	0.5643
AGE	-0.165022	0.114249	-1.444399	0.1627
AVGTD	2.331541	1.776743	1.312256	0.2030
AVGTOUCH	-0.000433	0.073389	-0.005904	0.9953
AVGYDSATT	1.183519	0.468759	2.524792	0.0193
MISSED	-0.497433	0.161573	-3.078682	0.0055
NEWTEAM	-0.357925	0.549837	-0.650965	0.5218
VARTD	1.876337	0.976785	1.920931	0.0678
VARTOUCH	-1.260224	1.414260	-0.891084	0.3825
VARYDSATT	-4.003130	2.078379	-1.926083	0.0671
PMNG	0.376185	0.874285	0.430278	0.6712

R-squared	0.768469	Mean dependent var	3.666667
Adjusted R-squared	0.663228	S.D. dependent var	1.865252
F-statistic	7.301988	Prob(F-statistic)	0.000054

Exhibit 5 shows an F-statistic for the initial running back CONTYRS regression of 7.30. Given that the critical value for an f-test with 33 observations and 10 degrees of freedom is 2.13, the null-hypothesis can be rejected. Therefore, CONTYRS can be explained by some combination of the independent variables. A process of elimination was conducted by eliminating the variable with the lowest t-statistic. Exhibit 6 shows the final regression analysis for the running back regression.

Exhibit 6: Running Back Final Regression Analysis – CONTYRS

Dependent Variable: CONTYRS
Method: Least Squares
Date: 02/19/13 Time: 12:39
Sample: 1 33
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.584129	2.183601	-1.641385	0.1123
AVGTD	3.486937	1.218775	2.861017	0.0081
AVGYDSATT	1.382126	0.421952	3.275551	0.0029
MISSED	-0.547405	0.159857	-3.424335	0.0020
VARYDSATT	-3.897475	1.947053	-2.001730	0.0555
VARTD	1.948148	0.849226	2.294027	0.0298

R-squared	0.709083	Mean dependent var	3.666667
Adjusted R-squared	0.655209	S.D. dependent var	1.865252
F-statistic	13.16198	Prob(F-statistic)	0.000002

As can be seen by Exhibit 6, the process of elimination resulted in all independent variables showing a t-statistic with an absolute value greater then 2. All variables are also significant at the 10% significance level. Additionally, the f-statistic of 13.16 is greater than the critical value at the 0.05 error level with five degrees of freedom of 2.50, so the null-hypothesis can be rejected. The regression shows that the length of contract that a player receives can be explained by the variables that were compiled for this analysis. The only coefficients of variation variables for performance inconsistency that remain in the equation are VARYDSATT and VARTD. The coefficient for VARYDSATT is negative, which was expected. If a running back's coefficient of variation of career yards per rush were to increase by one, or if their inconsistency increased, then they would receive on average 3.90 less years in their contract, holding everything else constant. While a change of 1 in the coefficient of variation is unlikely, the effect demonstrated is the result that was expected. To put into a different perspective, a running back whose

coefficient of variation in career yards per attempt is about 0.72 higher than another player's can expect to receive one less year in contract length, holding everything else constant. On the other hand, VARTD's coefficient is positive which is not what was expected. However, it remains significant in the regression none-the-less. Overall, given that the coefficient of the key statistic variable VARYDSATT is negative, the hypothesis that an increase in inconsistency leads to shorter contracts is not rejected.

As expected, the coefficients of AVGYDSATT and AVGTD in the equation are positive and statistically significant. This confirms the hypothesis that a player with higher average career statistics will receive more years in their contract then can be explained just by the performance inconsistency. In other words, teams are willing to put up more with inconsistency if the overall average of performance is higher. If a running back's career yards per attempt is increased by 1, then they would receive on average 1.38 more years in their contract holding all else constant. Similarly, if a running back scores five more touchdowns per season, or increases their career touchdown average per game by 0.31, they would receive on average 1.09 more years on their contract, holding all else constant. The last variable, MISSED, also demonstrates the expected correlation with CONTYRS. If a running back's career games missed per year increase by 1, or if their susceptibility to injury is higher, then they would receive on average 0.55 less years on their contract, holding all other variables constant. In other words, an increase in games missed per year of 2, which is highly plausible in a sport such as football, would result in a contract that is a year shorter in length, holding all else constant. Again, the hypothesis that an

increase in injury risk as represented by games missed per year will lead to a shorter contract is not rejected because of the negative coefficient on MISSED.

It is worth discussing variables that were hypothesized to effect the dependent variables but proved to be insignificant. For example, AGE or SEASONS were not significant in the running back regression on CONTYRS. While this was predicted to be a measure of running back riskiness, it dropped out. It is possible that this risk is captured by the MISSED variable, which does have an effect on the length of contract that a running back receives. Also, the variables of VARTOUCH and AVGTOUCH dropped out, but this was considered highly possible from the beginning. The PMNG independent variable also dropped out which is surprising. Basically, the CONTYRS variable does not depend on PMNG. Therefore, the length of a contract offered is not affected by unguaranteed money, failing to show evidence of any trade-off scenario between the considered dependent variables. It seems logical to assume that a player would have to accept a shorter contract if they wanted more guaranteed money, but the regression results find no evidence of any correlation between these two variables. Lastly, the NEWTEAM variable that was predicted to add uncertainty to a player and result in less years of contract did not turn out to be a determining factor in CONTYRS.

In conclusion, the regression for running backs using CONTYRS as a dependent variable produced results that support the hypothesis of my paper. The equation demonstrates that if a player is less consistent in terms of performance or more likely to get injured then they will receive a shorter contract. Players with these conditions would be considered riskier and would receive shorter contracts as

a result. From a team's perspective, contract length proved to be a tool that reflects the riskiness of a player. They will offer longer contracts to less risky players who they are more certain about and shorter contracts for riskier players. In essence, teams protect themselves from risk by offering shorter contracts to riskier running backs, which confirms the hypothesis of this paper. On the other hand, the percent of money not guaranteed in a contract does not seem to reflect the riskiness of player.

Wide receivers were then tested to look for similar results that were obtained from running back regressions. The same process that was used for running backs will be used for wide receivers, again testing PMNG as a dependent variable first. Exhibit 7 shows the regression analysis.

Exhibit 7: Wide Receiver Initial Regression Analysis – PMNG

Dependent Variable: PMNG
Method: Least Squares
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.758474	0.288422	2.629733	0.0129
AGE	0.004385	0.008053	0.544540	0.5897
AVGTD	0.154045	0.231239	0.666170	0.5099
AVGTOUCH	-0.047906	0.029618	-1.617455	0.1153
AVGYDSATT	-0.010544	0.010936	-0.964124	0.3420
MISSED	-0.007421	0.019309	-0.384316	0.7032
NEWTEAM	0.017805	0.045296	0.393073	0.6968
VARTD	0.235553	0.114983	2.048595	0.0485
VARTOUCH	-0.254495	0.201073	-1.265686	0.2145
VARYDSATT	-0.379788	0.396956	-0.956750	0.3457

R-squared	0.178146	Mean dependent var	0.594901
Adjusted R-squared	-0.045996	S.D. dependent var	0.135417
F-statistic	0.794793	Prob(F-statistic)	0.62324

Exhibit 7 shows an f-statistic of about 0.79 for the wide receiver PMNG initial regression. The critical value for an f-test with 43 observations and 9 degrees of

freedom is 2.11. Again, the null-hypothesis for the PMNG regression cannot be rejected because its f-statistic is less than the critical value. Contrary to expectations, PMNG cannot be explained by the independent variables. In light of this discovery of the PMNG variable, I included it as a exogenous independent variable and tested CONTYRS as a dependent variable for the running back position. Exhibit 8 shows the initial regression analysis.

Exhibit 8: Wide Receiver Initial Regression Analysis – CONTYRS

Dependent Variable: CONTYRS
Method: Least Squares
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.88281	3.065047	3.876878	0.0005
AGE	-0.397641	0.078161	-5.087489	0.0000
AVGTD	2.794916	2.249349	1.242544	0.2231
AVGTOUCH	0.443163	0.297319	1.490530	0.1459
AVGYDSATT	0.131996	0.107148	1.231900	0.2270
MISSED	-0.016348	0.186993	-0.087428	0.9309
NEWTEAM	-0.967999	0.438700	-2.206515	0.0346
VARTD	-0.364543	1.179568	-0.309048	0.7593
VARTOUCH	4.705084	1.989486	2.364975	0.0243
VARYDSATT	-6.235164	3.888463	-1.603504	0.1186
PMNG	-1.965609	1.682044	-1.168584	0.2512

R-squared	0.560899	Mean dependent var	4.186047
Adjusted R-squared	0.423680	S.D. dependent var	1.762787
F-statistic	4.087621	Prob(F-statistic)	0.001109

Exhibit 8 shows an f-statistic of about 4.09. This is greater than the critical value with 43 observations and 10 degrees of freedom of 2.06. Therefore, the null-hypothesis can be rejected and CONTYRS can be explained by a combination of the independent variables. The process of elimination will be repeated to get a reduced form of the CONTYRS wide receiver regression. Exhibit 9 shows the regression analysis once the lowest t-statistic variables were eliminated.

Exhibit 9: Wide Receiver Final Regression Analysis - CONTYRS

Dependent Variable: CONTYRS
Method: Least Squares
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.50996	2.148010	6.289526	0.0000
AGE	-0.398055	0.077993	-5.103732	0.0000
AVGTD	5.664758	1.601476	3.537212	0.0011
NEWTEAM	-1.091026	0.438223	-2.489661	0.0174
VARYDSATT	-7.198578	3.493380	-2.060634	0.0464
VARTOUCH	3.816389	1.458838	2.616048	0.0128

R-squared	0.481043	Mean dependent var	4.186047
Adjusted R-squared	0.410913	S.D. dependent var	1.762787
F-statistic	6.859363	Prob(F-statistic)	0.000128

The process of elimination resulted in five remaining independent variables, all with t-statistic absolute values greater than two and significant at the 5% confidence level. Given that the f-statistic of 6.86, as seen in Exhibit 9, is greater then the critical value of 2.43, the null-hypothesis can be rejected. Although the wide receiver regression in Exhibit 6 contains different variables then the running back regression, CONTYRS seems to be explained by a combination of the considered variables. Again, VARYDSATT, which was predicted to be the best measure of performance inconsistency, remains in the wide receiver equation. The coefficient of -7.20 is significantly greater but is negative as expected. If a wide receiver's VARYDSATT, or the coefficient of variation in career yards per catch increases by 1, then they would receive 7.20 less years on average in their contract, holding everything else constant. This increase is a little too dramatic, but an increase in VARYDSATT of 0.14, which is the average value in the data set, would result in an average decrease of 1 year in a wide receiver's contract. Again, the

numbers prove that an increase in performance inconsistency would result in a shorter contract because the wide receiver would be riskier. However, the other coefficient of variation variable, VARTOUCH, comes with a bit of surprise. First and foremost, the coefficient is positive which is not what would be expected, much like the VARTD variable in the running back regression. However, the variable remains statistically significant and remains in the regression. Yards per attempt seems to be the best statistic that can be used for measuring performance inconsistency. Therefore, the hypothesis that performance inconsistency leads to shorter contracts is not rejected.

AVGTD, which was in the running back regression, also remains in the wide receiver regression and with a similar effect. An increase in 1 in touchdowns per game would lead to 5.66 more years in contract length. The significance of the AVGTD variable at both positions shows that players are rewarded with more years in their contract for being a touchdown threat then can be explained by their riskiness. For example, a player who has averaged 0.18 more touchdowns per game will receive an additional year in their contract compared to a player with equal riskiness in terms of performance inconsistency and age or injury risk.

The most alarming difference in the wide receiver equation is that AGE remains statistically significant while MISSED does not. The age coefficient of -0.40 is negative but is lower then expected. To put into perspective, an increase in AGE of a wide receiver by 3 years will result in on average 1.20 less years in their contract holding everything else constant. Therefore, the shorter contracts in this case do seem to reflect the risk of the wide receiver in terms of age. However,

shorter contracts do not seem to reflect MISSED for some reason. It is possible that for wide receivers, injury risk is assumed due to increased age but not because of the average of games missed over the course of their career. Since wide receivers seem to last longer in the NFL, as shown by a higher average age at the position compared to running backs, AGE ends up being a more important variable. It is also worth noting that the average running back misses more games due to injury than a wide receiver does. Therefore, the running back position is in general more susceptible to injury. All in all, it seems that running backs do not last long enough in the league due to injuries for age to become a factor when negotiating contracts. On the flip side, wide receivers do not show as much injury history and last in the league longer, but become riskier as they become too aged.

One final observation from the wide receiver equation is that NEWTEAM is a significant variable, which it was not for running backs. A wide receiver that is signing with a new team would receive on average 1.09 less years in their contract, holding all else constant. At least at the wide receiver position, the results show evidence of the hypothesis that a wide receiver coming to a new team who is unfamiliar with him would come with more uncertainty. Teams would view this as risk and respond by offering a shorter contract to the wide receiver. It is difficult to determine why this NEWTEAM dummy variable does not affect the running back position, but seems to capture the behavior of NFL teams during contract negotiations none-the-less.

Overall, the length of contract that a player receives, but not the percentage of unguaranteed money, is reflected by the risk of a player. The two dependent

variables also showed no correlation with each other, eliminating the trade-off scenario hypothesis between unguaranteed money and contract years. NFL teams seem to protect themselves from the risk that comes with signing a player by offering shorter contracts. The amount of money that is unguaranteed in these contracts seems to be more or less random. One possibility is that it is difficult to capture the amount of unguaranteed money in a contract and put it into an objective measure. Percent of money not guaranteed might not accurately reflect how much risk the team is transferring to the player. None-the-less, the regressions with CONTYRS as a dependent variable were surprisingly significant considering the low number of observations.

Chapter V: Conclusion

While the results were not exactly expected, the regression analysis did lead to interesting findings. NFL teams do not seem to use unguaranteed money strategically to protect themselves from risky players. In essence, the amount of unguaranteed money offered does not correlate with the independent variable measures of risk. The unguaranteed money in the contracts of the data set seems to be more or less random. Unguaranteed money also did not prove to be traded off with contract length, as the unguaranteed money variable was not significant in the contract length regression. On the other hand, NFL teams do use length of contract as a tool to protect themselves from risky players. The length of contract reflects how risky a player is in terms of performance inconsistency and injury or age risk. Additionally, players who have higher career averages in key statistics will receive longer contracts then players with the same risk. NFL teams will accept more inconsistency if the overall average of performance is higher. Lastly, although signing with a new team seems to result in shorter contracts for wide receivers, it does not affect the contract length of running backs. The hypothesis about uncertainty of signing unfamiliar players resulting in more risk protection is inconclusive.

Further research can be done to clarify the conclusions of this paper. First off, more observations can be included to achieve more accurate regression results. The amount of roster players in a single year provides limitations, so past and future

contracts can be added for clarification. Additionally, a more in depth study of player contracts to find an objective measure of unguaranteed money can be performed. Lastly, more NFL positions can be included to see if the results remain across the entire league.

The results of this paper will provide perspective in future contract negotiations in the NFL. The equations summarize the behavior of past NFL teams during contract negotiations at different positions. In a league where problems such as contract hold-outs and bidding wars result in teams offering too much in the way of contract years, this clear analysis will help eliminate confusion and ensure teams are not taking on too much risk. Additionally, since teams seem to offer random amounts of unguaranteed money in contracts, perhaps they need to adapt the way they use unguaranteed money in their contracts. Ideally, there should be a trade off between unguaranteed money and contract years that explain the riskiness of players in the NFL.

Bibliography

Berri, D. & Krautmann, A. "Shirking on the Court: Testing For the Incentive Effects of Guaranteed Pay." *Economic Inquiry,* 44, 2006, 536-546.

Healy, A. "Do Firms Have Short Term Memories? Evidence From Major League Baseball." *Journal of Sports Economics,* 9, 2008, 407-424.

Heubeck, T. & Scheuer, J. "Incentive Contracts in Team Sports: Theory and Practice." *German Working Papers in Law and Economics,* 2002, Paper 17.

http://en.wikipedia.org/wiki/Franchise_tag

http://en.wikipedia.org/wiki/Free_agent

http://en.wikipedia.org/wiki/National_Football_League

http://en.wikipedia.org/wiki/Salary_cap

http://football.calsci.com/SalaryCap.html

https://www.nflplayers.com/about-us/

Kahn, L. "The Sports Business as a Labor Market Laboratory." *Journal of Economic Perspectives,* 14, 2000, 75-94.

Stiroh, K. "Playing For Keeps: Pay and Performance in the NBA." *Economic Inquiry,* 45, 2007, 145-161.

www.rotoworld.com

www.spotrac.com