Are NFL Athletes Receiving Over-Valued Contracts?

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ABSTRACT

Many sport research studies have been conducted that examine the performance of professional athletes and their corresponding effect on franchise winning percentages, team revenues, economic repercussions, performance-based compensation, and much more. Research in the National Football League, however, has been found to be somewhat limited due to the numerous possible positions and resulting vastness of position-specific variables. The NFL lockout in 2011 caused many to question the specific relationship between professional athlete performance and salary distribution. This study's purpose was to find a collection of variables with which all NFL athletes could be compared, and to identify relationships existing between a player's performance and his value/salary. Data was collected from USAToday.com, Pro-football-reference.com, and AdvancedNFLStats.com. This data was then organized and manipulated into a format that allowed all players in the league during the 2009 season to be compared. Of the nine variables considered for this study, four were found to have a significant relationship with a player's value/salary. These results were utilized to create a Player Valuation model and then analyze the overall salary distribution throughout the NFL. From this, it was observed while there are many athletes in the NFL that receive extravagant salaries well over their projected value, there is a much larger portion of the league that is undervalued and receive less than their projected value. It was then concluded that a super-star variable would be necessary to create a more accurate Player Valuation model, and the reason there is a larger proportionof NFL players receiving a lower salary than they deserve is due to franchise cap limits. These cap limits place pressure on franchises to push down the salaries of non-superstar athletes in order to compensate for the salaries required for the super-star athletes on their rosters.

INTRODUCTION

During the 2011 NFL offseason, there was an increasing amount of concern regarding the possibility of the season being cancelled due to the NFL athletes' lockout not being resolved in time for the start of the 2011 NFL regular season. The underlying cause of this lockout was a dispute over salary amounts between the owners of the NFL franchises and the NFL Players' Association. The two parties eventually came to an agreement, settling the issue mostly in favor of the NFL franchise owners,including a substantial change in NFL policy being the treatment of NFL draftee salaries. Regardless of the outcome of thedisagreement, much attention was brought to the potential solutions for this highly debated topic. One popularly discussed resolutionwas the reduction of player salaries. Among many others, the NFL Players' Association wasstrongly against any kind of salary cut.However, after looking at some of the most recent salary contracts of NFL stars, one begins to wonder, are these salaries reasonable? As stated by USATODAYin 2009, the top three paid NFL athleteseachhad a salary of over 20 million dollars. The top twenty five paid athletes each hada salary over 10 million dollars. Additionally, the median salary of all NFL teams was above $500,000. In comparison, since 2001 the President of the United States' salary has been limited to $400,000. The median American household income was $49,777 in 2009 according to the U.S. Census Bureau.The extravagant salaries given to NFL athletes suggest that there should be no complaints about a salary cut considering these statistics, and it becomes very appropriate to ask, are NFL athletes being over-compensated?

One hypothetical comparison of an average NFL career to an average American's career gives an idea of how relevant NFL salaries are to these players. For this example, it will be assumed that a player partakes in five NFL seasons and earns the average median salary of all NFL teams from the USATODAY 2009 database: $837,671 per year. According to Hendricks et al. (2003), the average career length of an NFL athlete is 4.5 – 4.75 years. The player would accumulate approximately $4,188,355 in his career. On the other hand, if it was assumed that an average career in the United States had a length of 43 years, from the age of 22 to 65, and also consistently earned the median household income of $49,777, then an average American citizen would accumulate $2,140,411 over the course of their life; half the accumulation of an NFL athlete. This comparison of a 43-year career to a 5-year career is flawed because it does

notincorporate inflation, salary increases, or rises in the cost of living. These variables would be significant especially to the average citizen's salary because of the considerably longer non-NFL career length. Nonetheless, this example gives a general idea of the extreme salary gap between the average American worker and an NFL athlete.From the viewpoint of NFL athletes, there have been many instances where NFL athletes did not have a realistic perception of a post-career life and inadequately plannedfor retirement. As stated by Miller et al. (2000), several professional sport organizations have post-career planning services, however, these are not well used by the athletes and there is "very little written about the effects, utility, or practicality of such programs". This now raises an additional question of whether or not NFL athletes have a severepost-career disadvantage after putting themselves through a highly intensive and physically demanding lifestyle, and additionally if this salary gap between the average American citizen and NFL athletes is therefore necessary.

The following research will go into an analysis of the relationship between NFL player salary and the actual value the player contributed to a NFL franchise. This project did not go into an economical investigation of the financial disparity between average citizens and NFL athletes. Instead, the purpose of this project was to analyze the effect ofindividual player value on an athlete's salary in order to determine whether or not NFL athletes are receiving over-valued NFL contracts. The accomplishment of this goal ideally would address the validity of the outlying salaries of "super-star" NFL athletes.

This statistical analysis provides an alternative consideration of NFL athletes and their salaries. In previous research, player valuation has typically been given a very individualistic approach. Hence, valuation and salary determination is solely interested with individual achievements. With sports such as baseball and basketball, this approach is appropriate. However, with football, the combination of drastic differences between positions and the extreme necessity for all around team success, rather than individual success,raises the following question. At what level should player salaries be determined by individual statistics? This study provides a new approach to player valuation through a model that heavily incorporates team success. Additionally, this study will be available for the public to determine the validity of NFL player salaries through statistical measures rather than from

television analysts. If successful, this empirical model could be used as a starting point for another highly debated football topic; whether or not college athletes should receive payment for their performance. Derivations from this project could potentially initiate a model that would determine the appropriate amount of payment to college athletes, should the NCAA ever decide to award the performance of college athletes financially.

LITERATURE REVIEW

When analyzing professional sport statistics, including salary data, American football proves to be the most difficultto find accurate results because of the limited number of games played in every season. As pointed out by Schumaker, Solieman and Chen (2010)in *Sports Data Mining,*American football has not yet acquired the same level of statistical techniques used in both baseball and basketball. The main reason for this is that football lacks a comparable depth of data. The NFL only plays 16 regular season games. Compared to Major League Baseball's 162 regular game seasons or the National Basketball Association's 82 regular season games, the NFL's compilation of data appears insufficient. However, due to American football's non-conventional recorded variables, such as fourth down strategies and variation in position statistics, interesting relationships between variables can be made. Extensive databases provided for the public are mentioned in *Sports Data Mining*. These include: NFL.com, AdvancedNFLStats.com, and Pro-football-reference.com. These three data bases will be referenced forcurrent statistics of the NFL.

Although, the extreme disparity between NFL athletes' salaries and the average American's salary suggests that there is no question that professional NFL athletes receive over-valued contracts, two observationscontradict this assumption. First, U.S. consumers promote "superstars" in the general media. Simmons (2007) explains this issue as a "diamonds-water paradox". Professional athletes have rare abilities and there is a large market willing to pay to view their performances. Similar to diamonds, the abilities of the best professional athletes are so rare that prices charged to see their skills at stadiums, or on the television, can be driven extremely high, resulting in an exceptionally high salary base for these talents. Simmons (2007) explains the water portion of the paradox as plentiful professionals with less

specialized abilities who do not have their performances viewed by a large paying public. Secondly, only a relatively small portion of NFL athletes receive the extremely high salaries that are widely publicized. As stated by USATODAY, the median salary of NFL teams for 2009 ranges from approximately $540,000 - $1,175,000. With this information, the question of whether or not NFL athletes are actually over-paid becomes much more complicated. Is it possible that there are only a few highly over-paid NFL athletes? According to Simmons' article (2007), "the NFL [salary] average is lowest of the four main sports leagues, and is much less than baseball and basketball". To emphasize this statement, Table 1,asdisplayed on AdvancedNFLStats.com, clearly demonstrates how NFL players receive the lowest income on average compared to all major professional sports in the United States.Additionally, as stated by Plunkett Research (2011), the NFL creates $1.8 billion more in revenue than Major League Baseball, which receives the second highest revenue compared to other professional sporting leagues. The total sum of revenues from the third and fourth highest professional sporting leagues, the NBA and NHL, accumulates to $1.9 less than the NFL's total revenue.

Table 1

Salary	NFL	NBA	MLB	NHL
League Total	$3.4 B	$2.2 B	$2.7 B	$1.6 B
Team Average	$105 M	$72 M	$89 M	$52M
Player Average	$2.0 M	$4.8 M	$3.5 M	$2.1 M

In their study of the NFL draft equalizing teams, Lock and Gratz (1983) suggest the reason the NFL has comparably lower salaries is due to the inability of players to freely negotiate between teams. The NFL assigns teams their order of pick in the NFL draft, resulting inthe most valued collegiate football athletes being acquired by the worst teams in an attempt to keep the league competitive. Therefore, the best teams are unable to offer extremely high salaries to purchase the most anticipated athletes. Lock and Gratz (1983) discuss the free agency differences seen in the NFL. They state that leagues such as the MLB and the NBA "have adopted free agency rules that are much more liberal than the NFL rule. A professional basketball or baseball player usually has, at some point in his career, the opportunity to negotiate with more than one team". By eliminating a competitive bidding system for the

NFL's top athletes, it can be expected that NFL players do not receive salaries that are equivalent to their market value.

If the average salary of NFL athletes is actually lower than that of other professional athletes, it therefore "is likely that many players in the NFL are underpaid rather than overpaid" (Simmons 2007). The idea of team function must now be brought into play. In order to determine if, and how much, a NFL athlete is over-paid, some kind of value that incorporates a player's abilities must be attributed to each specific athlete. The difficult part of this task, however, is the reliance of athletes on their entire team as a whole. The NFL is a unique league where an individual cannot produce wins single-handedly. A single team's roster accumulates approximately 60 players, and up to 33 different starter players per game. A team may have elite defensive athletes, however, these defensive athletes have no capability to influence the production of the team's offense. An example given by Simmons (2007), is that "a star on the offense needs a strong defensive capability to stop an opponent's offense and so give opportunity and time to play offence". Another example is a superstar quarterbackwho cannot use his exceptional passing abilities without an adequate offensive line that can protect him. Given reliance of teammates on one another,it would be expected that the vast dissimilarities of salaries on a team would cause poor performance for the team as a whole. On the contrary though, research conducted by Frick and Prinz (2003),concluded this was not true. Their results showed there was no solid relationship between degree of salary differences and team success. In fact, as stated in their article, "a higher degree of wage inequality can have a positive as well a negative influence on team performance". The one consistent pattern shown however was that "the higher the turnover rate between two adjacent seasons, the poorer is the performance in the subsequent season". This conclusion sparks a new question. It can be assumed that teams with a lower turnover rate generally would have longer contracts. Therefore, it would seem reasonable that teams with long term contracts would have more success. This desire of longevity can however become a difficult task for NFL franchises due to the NFL's strict salary caps. If a player is able to continue their career past the average career length of four to five years, typically, this athlete is exceptional at his position and therefore requires a higher salary. This creates a conundrum for NFL teams. The

ultimate goal is to collect the best athletes in the NFL in order to win, however, this is severely limited because of the best athletes' demand for the highest salaries and franchise salary caps. NFL teams must therefore strategically pick out which athletes to retain with large salaries, while at the same time strategizing to win. This restriction caused by salary caps may actually be the pressure that keeps NFL athletes' salaries lower than they deserve.

Following this logic, the additional question is now raised of whether or not it is more important for franchises to collect superstars or strategize players to create the best possible chance of winning games? Scully (1974) addressed this question in his research regarding Major League Baseball salaries and team revenues asking do "fans attend or watch games to see the team win, not to see player skills per se"? It would appear reasonable that the success of a NFL player is a key variable when determining how valuable that player is. Additionally, it would be assumed that success in the NFL would be measured by games won, but most importantly, championships won. This relationship cannot be assumed, however. A prime example of this can be shown by comparing the two quarterbacks Tom Brady and Phillip Rivers. Starting at the 2008 football season, Brady and Rivers had salaries of $8,001,320 and $9,380,040 respectively, as stated by USAToday.com. Both players were considered elite at their position as both lead their teams with exceptional position statistics throughout their careers. Accumulating up to the end of the 2008 season however, Brady had a post-season record of 14-3, including three Superbowl victories, while Rivers' playoff record only consisted of 2-2, without any Superbowl victories. While individual statistical data is not given here for the two quarterbacks, it seems unreasonable that a player with such a successful career would have a salary less than another, less successful player.A logistical view of this circumstance is that an outstanding quarterback that has an excellent passer rating, but loses more than 50% of the games he plays will have a lower value than a more successful quarterback. Therefore, an athlete with more important victories accomplished, or simply a more successful winning percentage, should receive a higher salary. After examining the Brady/Rivers example, it would be interesting to analyze how adequately Rivers' franchise distributes its salary funds, and also, whether or not teams that have more appropriately allocated salaries are more successful.

For the purpose of this research project, it is interesting to examine the relationship between salary and contract length. Krautmann and Oppenheimer (2002) evaluated this relationship in the MLB and proposed that players' salary and contract lengths are more of an insurance negotiation between individual players and team managers. As proposed in their article, "players 'purchase' insurance by agreeing to a lower return on their performances in exchange for long-term employment security", while team managers attempt to reduce the risk of inflated salaries in the future by "locking a star player into a long-term contract". They also suggest, in their empirical model, that star players receive long-term contracts while mediocre players tend to receive short-term contracts. Interestingly, Krautmann and Oppenheimer (2002) point out that "a similar phenomenon occurs in other labor markets such as the market for upper management, where the superstar CEOs receive high salaries together with large stock options". The results of their study indicatethat contract length is a significant factor in the negotiation of MLB player wages. With this information in hand, it can be assumed that undervalued players will show a trend of combination of both short-term contracts and lower salaries.

In order to compare salary to player value for all players in the NFL, one must first recognize the uniqueness of the different positions in the NFL. Leeds (2001) goes into detail about the importance of this issue and emphasizes that "in football one cannot compare the performance of two players at different positions. In all other sports, performance measures exist that one can compare across most positions". The key term used by Leeds is "performance measures". The creation of an empirical valuation model will allow the variables,player valueand salary, to be compared to all players in the NFL at once rather than at specific positions. The difficult task presented here is the acquiring of a quantitative value for each athlete's player value. Leeds' approach to this is that "if player *i* plays position *k* for team *j*, he generates the value V_{ijk}". The importance of this variable is that it provides a unique value for each individual player. Leeds continues to explain that "because no two players are exactly alike and no two teams' needs and opportunities are alike, $V_{ijk}$is a unique value for each player-team-position combination". Leeds' study, which researched the effects of the new collective bargaining

agreement in 1993, concluded that improving player performance was much more effective at increasing salaries for athletes that were underpaid, compared to athletes that were overpaid. This suggests that large increases in salary are more likely to come from athletes who are undervalued. An analysis of salary change rates per player would be beneficial for determining the impact of under-valued players.

DATA / VARIABLES

Salary

The most essential data required for this study is the salary of NFL players. USAToday.com offers a comprehensive list of salaries for all NFL athletes.The site is a public provider of NFL player salaries. The website contains salary caps for each team as well as individual salaries for every year from 2000 to 2009. The site also includes brief mathematical analysis of all franchise salaries including means, standard deviations, and medians. The site provides the calculation of combining players' base salaries and signing bonuses for the year and in result providing a year-end total salary for that season. Additionally, the site provides the contribution of cap value each individual salary has on a team's total salary cap. The most updated record of this data is for the 2009 season. Therefore, all data used in this study will be from the 2009 NFL season.

In order to construct a value model for all NFL players, a set of variables that can be measured between all positions and teams must be identified. In his research of the NFL draft, Niles (2010) assessed the validity of the "Added Value" statisticgenerated by the extensive database, Pro-football reference.com. The Added Valuestatistic is a version of the V_{ijk}variable. It gives all NFL athletes a quantitative value that can be compared between all positions and teams. Niles concluded that a team's total Added Value statistic was a strong indicator of success. Considering the goal of football teams is to accumulate as many wins as possible, this should be expected to act as a precursor for an athlete's salary. The higher one's Added Value, the better the salarywill be.

The NFL is quite literally a firm with a multitude of different employees ranging from team owners to star quarterbacks. Therefore, like any other firm, it needs to find data that will

predict the performance of prospective employees. Even though the NFL uses data such as speed, height, and weight, Hendricks, DeBrock and Koenker (2003) explain the similarities of firms using "interviews, prejob test scores, and letters of recommendation to provide both objective and subjective information". Firms, just like the NFL, look for "signals that have proven effective in the prediction of worker performance". These predictive variables are good indicators of player value. In their analysis of the NFL's methods of researching college athletes, Hendricks et al. (2003) explain that NFL teams use these signals to create a ranking of the talent of prospective employees. As Scully's (2011) research adds, "making reasonable assumptions about how a player's performance alters team performance permits approximations of the player's marginal revenue", and hence, validates the process of valuing or ranking current NFL athletes with less uncertainty than when players are valued for the NFL draft.

In a similar manner to Pro-football-reference.com, this study will create a unique valuing approach to all NFL athletes using the following key variables:

Age

A very simple and easily comparable statistic is player age. This statistic can be found from either NFL.com or Pro-football-reference.com. It is anticipated that as age increases, a player's value would decrease.

Career Length

As in any other job, an NFL athlete employee must earn his salary with the exception of the top draft picks of the annual NFL draft. Once athletes arrive in the NFL, only these top few draft picks receive extraordinarily high salaries. The rest must then earn their positions which determine their salaries. Opposite to this are the aging professionals. NFL career lengths are extremely short compared to the average job. While new draft picks are brought into the league, the more experienced, veteran players must defend their positions and compete with others much younger than themselves. The task in this situation is to determine how to value relatively young NFL athletes compared to veteran players who could possibly be reaching the end of their career length. The difficult aspect of this variable will be distinguishing the risk of very young players compared to very old players.To start, Hendricks et al. (2003)

claim that the range for players' career length is from 1 to 14 years, and that average NFL career lengths range between 4.5 and 4.75 years.Based off of this career range, it can be assumed that the more volatile athletes will be those with three years or less experience in the NFL. Players in their first years in the NFL with high contracts will be prone to be overvalued compared to the rest of the league. On the other hand, as players become veterans, their age becomes a prominent factor in determining whether or not to resign the player because injuries and performance are now questionable. Therefore, it would seem reasonable that teams would attempt to strive for lower and less risky salaries for their aging veterans. This suggests that age and/or career length are more likely to be factors causing players to become undervalued. In both cases, any rookie star athlete or veteran star athlete should be able to nullify this decrease in value with higher than average performance. To compensate for the riskiness of rookie players, NFL teams have applied the assumption that the round the player was drafted in will determine his level of riskiness. Hendrick et al. (2003) concluded in their study that their variable "DRAFTN", which designated round drafted, gave a high expectation for players to have longer careers. Additionally, a study on NBA career lengths, done by Croates and Oguntimein (2010), concluded similar results. They found that a player drafted early has an increased expected career length. The study did not find strong relationships between college productivity and career lengths, thus suggesting that a player's draft position "captures all the relevant information about a player's likely longevity as a professional". Before the 2011 NFL lockout, a first round NFL draftee, from whom franchises could anticipate a long career, would constitute a higher value as a rookie. However, with recent restructurings of the NFL due to the resolution of the 2011 lockout, the multi-million dollar contracts that first round draft picks previously would receive are no longer possible. First round draft picks will now be compensated for their highly drafted position at the start of their fifth season in the NFL. The NFLPA explains these constraints as "5th year club options", which are designed for first round draft picks and can be exercised by the team for the player, after the player's third season. Additionally, these 5th year club options are limited to salary restrictions once the option is executed. The restrictions continue for the later picks in first round of the draft and continue for all of the following draft rounds.

On the other hand, the lockout resolution introduced strict limitations on all NFL teams' full-padded, contact practices, as well as shorter off-seasons. This suggests that now veteran players are at less risk for injury and will have a prolonged career value. Furthermore, a player's value and, in return, adequate salary would be expected to increase as they increase their career length in the NFL. Therefore, every player's length of career in the NFL wascollected. Hendrick et al. (2003) explain this deterioration of risk by stating that "as the player's tenure in the league lengthens, his true productivity becomes more evident, and the impact of his draft position becomes less important". This decline in risk for NFL franchises as a player's tenure lengthens is strengthened by the adjustments made in response to the NFL lockout. Once a player has had more than a four-year career, it can be assumed that there is no longer a question regarding his competitive performance abilities in the NFL. This assumption goes hand in hand with the NFLPA's 5th year club option.

Pro-football-reference.com publically offers the rosters of all NFL teams for the 2009 season and includes the career length of every player. This database was used for the career length variable. All rookies are listed as "Rook" under their Career Length, but this will be assumed to zero.

Team Success

The overall goal of any professional team is to win as many games as possible. Not only does this allow them to advance into playoff and championship games, but it increases revenue from fans and media. If given the option, an NFL team will acquire a group of athletes who improve each others' performance and result in a higher winning percentage, rather than a few athletes who create high individual statistics. This is an important part of strategically constructing a franchise that promotes a high winning percentage but does not incorporate enough "super-stars" so the franchise is able to keep under the salary cap. Therefore, this study incorporated each player's win/loss history. When considering player value and salary, a player's most recent performance is the most important information to be considered. Therefore, the player valuation model will focus on a player's more current record by weighting players' win/loss historically. This study is looking at values with data from the 2009 season. Therefore, a player's most recent season record (2009) will be given a weight of

1.0. The previous season (2008) record will receive a weight of 0.95. The 2007 record will receive a weight of 0.9. This 5% discount per season will continue throughout the entirety of a player's career.

Pro-football-reference.com provides a listing of all NFL Teams' regular season win/loss ratio for every year needed. Only regular season records were used for this variable, as post season records are utilized in a variable discussed later. This separation of regular season and post season is done to avoid eliminating high value players on teams without high enough records for post-season contention.

Pro-bowl Appearance

In their study, Hendricks et al. (2003) incorporate the proportion of years an athlete is chosen for the Pro-Bowl. In order to be selected for the Pro-Bowl, a player must be voted in by fans and his peers in the NFL, including other players and coaches from other teams. This is an extremely valuable statistic to track and will help increase the value of good players on relatively weak teams. Opposite from Hendricks et al. (2003), this statistic will be measured discretely. Rather than taking the percentage of times a player is chosen for the Pro-bowl over his career length, the actual number ofPro-bowl selections will be counted. This will be done with a discrete method because of the exceptional difficulty that goes along with achieving making the Pro-bowl roster. Less than seven percent of NFL players are chosen for the Pro-bowl, and therefore, this statistic is expected toidentify the NFL "super-stars" who are deserving of massive contracts.

Pro-football-reference.com lists every player selected for the Pro-bowl for every season required. This study will use information back to 1988. This portion of the data will take a longer required amount of time to determine due to the fact that cumulative totals are not available and the annual numbers will need to be tabulated and summed.

Championships

Similar to the team success variable, the ultimate goal of any NFL team is to win as many championships as possible. This, again, results in an increased revenue flow from fans and

media. It also promotes higher salaries for players. The General Managers of NFL teams are most concerned with acquiring athletes who perform best during playoff and championship games. A player who has won a championship is considered a higher valued player than one who has not, regardless of statistics. This study will incorporate a player's history of Superbowl victories, NFC/AFC championships, and playoff wins. This will be done through the same process as team success is calculated. The post-season success for every team a player has played with throughout his career, (including not participating in the post-season all together) will be attributed to the respective players on that team. This variable will also be calculated using the same discounting method as described in the Team Success variable. The reasoning behind including all teams' post-season records, regardless of if they are able participate, is that teams who do not make the post-season will be simply valued on their team success variable (regular season winning records), and therefore, teams who enter the playoffs, but lose during the first round will have the same post-season value for that year as teams who do not even make the playoffs. This will be done with the desire to identify the exceptional teams of that particular year and to eliminate teams who enter the playoffs due to an easier division from which post-season teams are selected.

Pro-football-reference.com provides a list of all playoff results for every NFL season. This portion of data collection will prove to be the mostmanualportion of the data collectiondue to the fact that a table of all player's team history will first have to be created. Then, a collection of each franchise's success in the post-season will need to be prepared. This will prove to be more difficult than collecting the team success variable because post-season records are not listed in table format for the entire league. Hence, each team's playoff history will have to be entered manually year by year. Pro-football-reference.com provides a collection of the historicalpost-season records of every franchise which will be used to create all franchise's post-season winning percentages.

Games Played

When comparing NFL athletes' values, one simple statistic is to count the number of games played. As a player's number of games adds up, it can be assumed that his experience, abilities, and knowledge of the game have increased. Therefore, an athlete who has been in

the league for 3 years who has played 40 games will be more valuable than an athlete that's been in the league for 5 years and played only 20. This variable is also intended to adjust for the risk that accumulates as a player's age increases. If a player has been able to play every game throughout his 8 years in the NFL, it is assumed that his value should not be significantly affected by the risk of a lengthy NFL career. Additionally, it was of interest to see if this particular statistichas similar effects on player value as Career Length. This variable will be measured discretely and simply summed over the length of a player's career.

This data can be found at Pro-football-reference.com. Each player's profile from every team can be accessed where a record of total number of games played per season can be found.

Games Started

This variable appears to be the most obvious significant variable related to a player's value. Players that consistently start for a franchise are expected to be the most exceptional and consistent players on the team. This statistic was extremely valuable when attempting to differentiate the value between positions with few measurable statistics such as Offensive Lineman. One negative aspect of this variable, however, is that NFL kickers and punters are never marked as starting a game. Therefore, a "starting" NFL kicker/punter will typically have 16 games played for a season, but 0 games started for the season. Due to the fact that the players at these two positions very rarely receive exceptionally high salaries, this should not cause a large error with the final data regression.

This variable can be easily found along with Games Played on Pro-football-reference.com.

Individual Position Performance

Due to the vast differences between positions in the NFL and the statistics valued for each position, it is very difficult to compare all athletes who play different positions. Unlike sports such as basketball or baseball, where nearly every player can be measured with a universal variable, it is impossible to statistically compare simply an offensive player to a defensive player. Additionally, it is nearly impossible to compare any two different offensive positions

due to the extreme differences in the responsibilities as part of the team. Defensive players, on the other hand, have a more common and comparable set of statistics that can be compared, however, the standard for each of these statistics is different for every position. For example, a Defensive Back would be expected to accumulate interceptions throughout his career, while it would be rare for a Defensive Tackle to accumulate interceptions. To compensate for the different expectations of each position, this study used an average based ratio. To illustrate, all quarterbacks were compared by calculating statistics that are specific to the position, such as yards thrown, and then an average was created. Players were evaluated based on the percentage above or below the average in which they fall. A set of the most important, discrete statistics for each position were averaged, and then every player was compared to this positional average. Finally, each player's percentages were averaged and his individual position performance variable will be created.

The Offensive Lineman position was the most difficult for this study, and was handled by viewing offensive lines as a whole per team. Statistics such as sacks allowed and positive rushing attempts were considered.

The statistics used to create a league average are listed by position in the following Table.

Table 2

POSITION	STATISTICS USED
Quarterback	Completions, Attempts, Pass Yards, QBR, Pass TD, Interceptions
Running Back	Carries, Rush Yards, Total Yards (rushing and receiving), Total TDs, Fumbles
Wide Receiver	Receptions, Yards, TDs, Fumbles
Tight End	Receptions, Yards, TDs, Fumbles
Full Back	Sacks Allowed, Tackles for Loss, Run-EPA, Pass-EPA, Games Started, Games Played
Offensive Line	Sacks Allowed, Tackles for Loss, Run-EPA, Pass-EPA, Games Started, Games Played

Defensive End	Sacks, Tackles, Tackle Assists, Forced Fumbles, Interceptions, Pass Deflections, Tackle Factor
Defensive Tackle	Sacks, Tackles, Tackle Assists, Forced Fumbles, Interceptions, Pass Deflections, Tackle Factor
Linebacker	Sacks, Tackles, Tackle Assists, Forced Fumbles, Interceptions, Pass Deflections, Tackle Factor
Defensive Back (includes Cornerbacks and Safeties)	Sacks, Tackles, Tackle Assists, Forced Fumbles, Interceptions, Pass Deflections, Tackle Factor
Kicker	Field Goals Attempted, Field Goals Made, Extra Points Attempted, Extra Points Made
Punter	Punts, Punt Yards

This portion of data utilized the data available from Pro-football-reference.com, which provides extensive lists of all basic statistics for all players, and AdvancedNFLStats.com, which provides a more selective list of more complicated statistics. One example of AdvancedNFLStats.com's complex variables is the "Tackle Factor" which, as explained in the Glossary of AdvancedNFLStats.com, gives "the ratio of a player's proportion of his team's tackles compared to what is expected at his position". This site also provides a collection of statistics for offensive linemen per team such as EPA's (expected points added) for running and passing, as well as WPA's (win percentage added). This allowsfor analysis of all positions at an even depth.

For this study, only the position statistics acquired from the most recent season, the 2009-2010, are used. It was determined that this was more adequate than utilizing a discounting method of entire career individual statistics because the length of salary contracts are not being considered.

Injury Analysis

A variable that will not be incorporated in this study is injury history. This could range from scaling the degree of injury along with the time unable to perform, however, this information is unavailable in a data base format. Therefore, the logic behind the current player value formula is that the variables that have been determined to be used will integrate any injury that a player experiences during his career. When a player incurs a significant enough injury that he cannot perform for a period of time, this will be reflected by almost all of the variables to be used. Additionally, as an athlete becomes older, it can be assumed that he is more injury prone. This will already be accounted for by the Age and Career Length variables. Even if an athlete is injured and aged, his IPP will be the factor that balances his value at the time. Additionally, if a player would unfortunately become injured and unable to play for a period of time, a NFL franchise would make the decision of their investment with the injured player without consideration of a formula such as the one being used in this study. The franchise's decision would be made on an event-by-eventbasis while the player recovers and cannot perform for the team.

Player Valuation Formula

The initial Player Valuation equation created for this study was based on research done on other studies trying to determine similar results, player value or significance. It was also created based on personal interpretations of NFL statistics that would value all positions on an even basis, rather than only a few positions receiving extraordinarily high salaries. Therefore, the formula was intended calculate a player's value towards an entire franchise. Some of the equations and variables that aided in the formation of this study's Player Value model are shown below:

- $WP = \alpha_0 + \alpha_1 GINI + \alpha_2 LNPAY + \alpha_3 NOP + \alpha \sum TD + \alpha \sum JD + \square$
- $SAL_{ij} = f[E(PERF_{ij}), TEAM_j, PLAYER_i, X_{ij}]$
- V_{ijk}

The WP equation (Weighted Performance) taken from Frick and Prinz's (2003) research was useful due to its use of weighing the variables taken into consideration. It is very similar to the Linear Weights equation used by Schumaker, Solieman, and Chen (2010) in their sports data mining study. The example they use is as follows:

Linear Weights = 0.47(1B) + 0.78(2B) + 1.09(3B) + 1.40(HR) + 0.33(BB + HBP) + 0.30(SB) – 0.60(CS) – 0.25(AB – H) – 0.5($\Sigma Outs_{Base}$)

Even though this equation was utilized to measure baseball performance, it uses the same principle of weighting determined coefficients in order to create a value. Through utilizing linear regressions, the goal of this study was to create an empirical model that is anticipated to result similar to the following equation:

$$\Omega = \alpha_0 + \alpha_1 AGE + \alpha_2 CL + \alpha_3 TS + \alpha_4 CH + \alpha_5 PB + \alpha_6 FS + \alpha_7 GP + \alpha_8 GS + \alpha_9 IPP$$

Thedependant variable, Ω, which was inspired by the dependent variable, V_{ijk} (Leeds and Kowalewski, 2001) discussed previously in the Literature Review. If player values will be compared over multiple positions, it is crucial that variables are constructed into a format that can be compared on a league basis. Finally, the SAL_{ij}equation (Krautmann and Oppenheimer, 2002) demonstrates a relationship between salary and expected performance. The structure of theanticipated final Player Value formula is based on the reasoning that an athlete's salary,SAL_{ij}, is a dependent variable contingent on the individual independent variables that a player can contribute to a team. It therefore suggests that a player's value is equivalent to their salary.Krautmann and Oppenheimer's model proves to be similar to the functionality of the proposed Ω model for this project, and in theory the same aspects will be incorporated to determine player value. First, expected performance, $E(PERF_{ij})$, is the same concept of the Individual Position Performance variable utilized in this research. The second part of Krautmann and Oppenheimer's equation, $TEAM_{j,}$ is another important aspect of player valuation that was considered in calculating the Ω model of this study. The variable, $TEAM_j$,in this equation refers to the concept that a player's performance at for all teams in their career must be taken into consideration to create an adequate salary determination. This was incorporated through the Team Success and Championship variables. A complete history of every athlete in the NFL was created that lists the team the athlete plays for each season of their career, allowing for determination of each athlete's winning percentage throughout their career for all teams they were a part of. Finally, the $PLAYER_i$ is identical to evaluating all

players of the 2009 season, and the X_{ij} variable is similar to the multiple other variables also being considered for this project

The following is a table of the abbreviations used for the Player Value formula displayed earlier:

Table 3

Variable	**Abbreviation**
Player Value	Ω
Age	AGE
Career Length	CL
Team Success	TS
Championships	CH
Pro-Bowl Selections	PB
1st Team Selections	FS
Championships	CH
Games Played	GP
Games Started	GS
Individual Position Performance	IPP

The final Player Value formula was constructed using only the variables found to be significant through the data analysis of this study.

METHODOLOGY

In order for this research project to be successful, the three following goals were completed.

1. Adequate data collection and organization of player salaries and other performance characteristic variables.
2. Utilization of linear regression testing to determine significant variables for calculating each individual player's value.
    - Specification of key variables and linear weights to take into consideration

- Application of empirical model to consistently compare multiple athletes at various positions.

3. Identification of athletes who are determined to be overvalued and listing of most valuable players using significant variables in the empirical model created.

Timeline

Task	Start Date	Completion Date
Data Collection: Salaries, Age, Games Played, Pro-Bowl Selections	10/05/11	10/31/11
Data Collection: Team Success, Championships, Individual Position Performance	11/01/11	12/01/12
Submission of Manuscript Progress Report		12/02/12
Review of Data Collection	12/03/11	12/15/11
Utilization of data to create linear weights	12/16/11	12/31/11
Determination of valuable statistical tests	01/01/12	01/15/12
Retrieving results: Actual running of tests	01/16/12	02/28/12
Conclusions	03/01/12	03/31/12
Preparation for Final Submission and Presentation	04/01/12	04/16/12
Colloquium Presentation	04/17/12	04/19/12
Final Submission preparation	04/20/12	04/25/12
Final Submission and Certification		04/26/12

The following will discuss the process taken to achieve each of these goals:

1. Data Collection

Collecting data appears to be the simplest aspect of this study, however, it easily was the most time consuming and difficult process of this study as a whole. All variables desired were found online in website format from public databases. It was explained previously where each variable was collectedin the Data/Variables section. The public data base websites used include USAToday.com, Pro-football-reference.com, and AdvancedNFLStats.com. The initial, main concern of the process was extracting all of the data from these websites and merging it into a more manageable format in Microsoft Excel.Fortunately, through the help of Professor Brian Blais, a quick and efficient procedure using Notepad++ was used to take this information from online databases and convert it into an organized Microsoft Excel format.

The first step taken was collecting all NFL franchises' salary listings from the 2009-2010 football season listed by USAToday.com. Appendix 1 shows a sample of the table created after combing all franchise's salary records. The appendix displays the top 50 highest paid players from the Excel spreadsheet created. It also includes every player's position and listed team from that season. Some errors found with the data from USAToday.com were incorrect position listings and some inconsistent spelling and/or identification of players' names when compared to Pro-football-reference.com. The error found with position listings only concerned offensive lineman. All players that have an offensive line position are listed as "Outside Linebackers". Fortunately, this error does not cause any significant problems due to the fact that the main purpose of this spreadsheet is to display the relationship between a player's name and salary. The additional error of unpredictable spelling and/or abbreviation of player names causes a much more significant concern. For the most part, these errors take place with athletes who have the same first and last name, or typically refer to themselves with some sort of nickname or shortened version of their name. For athletes with identical first and last names, the website puts in parenthesis either the player's position or university they played for in college, however, there is not a consistentsystem used. For athletes with regularly used nicknames, the data base has the nickname listed after the first name in single quotation marks. Both of these methods create errors when attempting to reference athletes with a VLOOKUP function from Pro-football-reference.com which only list players' names with first and last names. This error was addressed by using the "find" tool in Excel and identifying players that included a parenthesis or single quote in their listed name.

The next variables acquired were Age and Career Length which could be collected at the same time. This was done using Pro-football-reference.com's 2009 listing of team rosters. Every team's roster for the 2009 season was put into Excel format and then all were organized into a league roster for that season. Part of organizing this data included reformatting the names of all listed athletes due to fact that Pro-football-reference.com lists the names of the athletes in a "First Last" format, while the other utilized sites for this study list players in a "Last, First" format. Additionally, Pro-football-reference.com identifies the accomplished

NFL players of that season by marking all Pro-bowl selections with an asterix and/or marking all 1st-Team selections with a plus sign after their last name. Through the CONCATINATE function found in excel, as well as the find/replace tool, these adjustments were able to be made efficiently.Appendix-2 displays the first 25 athletes of this completed and reformatted spreadsheet. As can be seen, Pro-football-reference.com's rosters not only provide players' respective teams, Age, and Career Length, but also include Games Played for the 2009 season, Games Started for the 2009 season, and other variables that were not considered for this particular study. This 2009 league roster was the first of many rosters that would be required to successfully create many of the additional variables needed for this study.

The fourth variable collected was Team Success. In order to acquire this variable, however, a historical look at every player's team history would need to be available. Thisrequired the creation of a spreadsheet that listed the team that every played with throughout their entire NFL career. The first step in completing this table was to compile league rosters for every season until every player's career in the league would be completely covered. Therefore, league rosters for every season dating back to the 1988 season, were created. Once all seasons were compiled and formatted accordingly, the process of tracking all players' paths throughout the NFL during their career was possible using the VLOOKUP function. This process required referencing multiple rosters because as players' ended, the function would output errors. Therefore, multiple references were required to check whether the previous season was the particular athlete's rookie season, or if the athlete was simply not listed for that season. One potential drawback discovered during this process was that Pro-football-reference.com does not list an NFL player if they do not create any individual statistics for the season. An example of this would be that if any athlete happened to be injured in the early portion of the season, and this resulted in them being injured for the entire season, they would not be listed on their respective team's roster. A potential benefit from this error would be that any player that is injured seriously enough to miss an entire season would be quickly brought to the attention of the franchise's coaching staff who would not require a player value analysis to determine that player's future with the franchise. Appendix-C displays the first 50

athletes listed with the completed spreadsheet. It can be seen how the table displays a career timeline for every athlete that played in the 2009 season.

Once the career history of all players was acquired, this table was used to as a reference for associating a player's career success for all the teams on which he had played for. After collecting the regular-season winning percentage of every NFL franchise from the 1988 season to the 2009 season and creating a spreadsheet shown on Appendix-D, a table that merged these two data sets and displayed every player's historical winning percentage was created. This allowed a discounted winning percentage spreadsheet to be created that decreased the value of a player's winning percentage by 5% for every year the player's career extended. Meaning that a player's winning percentage for the 2009 season was not discounted, but the winning percentage of the 2008 season was multiplied by 0.95, the 2007 season was multiplied by 0.90, and so forth. After all years were decreased by their respective discount, every player's history of winning percentages was summed,rather than averaging a player's career length winning percentages.This was done to emphasize that a player's more recent performance was more important to his current value and salary than his previous history in the NFL. Appendix-E displays a small portion of the final table created that includes a player's accumulated career success.

The next variable collected and organized, Championships, was also heavily based on having a listing of every player's career path with different franchises. By having a table of every player's previous teams, all that needed to be done was a collection of every team's historical post-season winning percentages. Unfortunately, neither of the three databases referenced have a listing of winning percentages per season. Pro-football-reference.com does, however, have a list of every franchise that made the play-offs per season and their record in the post-season. Using this list, all relevant teams' winning percentages were calculated manually. Once this was completed, essentially the same process as was done for the Team Success variable was applied, including the discounting factor and summation of every player's post-season success history. Appendix-F demonstrates a small sample of the final table.

The next spreadsheet created was used to collect every player's history of Pro-Bowl and 1st Team Selections. This process required the total league rosters for every season as used previously, but only the names listed were required due to Pro-football-reference.com's system of distinguishing of all Pro-bowl and 1st team selections with asterix or plus symbols. IF statement functions were used identify all players selected for either distinction and if they were selected, they received a value of one per selection for that year. This was repeated for every season since the 1988 season.Every player's selections were then totaled, but kept separate as either Pro-bowl or 1st team selections. A discount method was not applied to these two variables because of the high degree of difficulty for achieving either of these selections. Appendix-G displays a small portion of the final table created.

The variables Games Played and Games Started were collected next. Due to the multiple times the collection of league rosters from '88-'09 were used previously, these variables were easily acquired at the same time via aVLOOKUP reference from these rosters in the same format as the previous variables. Both variables were summed for all players.

The final variable desired for this study, Individual Position Performance (IPP), required the most effort compared to all of the other variables collected. The initial step was collecting all available individual statistics available from Pro-football-reference.com and AdvancedNFLstats.com. Pro-football-reference.com separates its listing of individual statistics into passing, receiving, rushing, kicking/punting, kick & punt returning, and defensive categories. AdvancedNFLStat.com organizes its listing of variables according to position, including offensive lines as a whole, but limits these statistics to players who perform at a high level. This selective distribution of statistics to only high performing athletes in the NFL was not foreseen and had to be addressed later when calculating an IPP value for all players. Once all statistics available were put into Excel format, players' names were used as a reference with the VLOOKUP function to collect the desired individual statistics that were listed earlier in the Data/Variables section. After all statistics were distributed throughout the league, a table organized by position was created that allows players of similar position to be compared. A portion of this table that displays some of the

individual quarterback statistics can be found under Appendix-F under Table A-1. The next step required to compare every player's individual statistics across the league was to find the average statistics for each position in the 2009 season. Finding positional averages was extremely important.As can be seen on the positional average table, Table A-2 found under Appendix-F, Wide Receivers and Tight Ends were measured based on the same statistics. However, Wide Receivers averaged nearly twice the amount of reception yards as Tight Ends. This was also important for Defensive Positions that were all compared with the same individual statistics. Finally, the IPP value was able to be created based on a player's performance in comparison to the rest of the league at his particular position for each statistic desired. For statistics that are desirably higher, such as Touchdowns, each player's individual statistic was divided by the positional, however, if the statistic is desirably lower, such as fumbles, the positional statistic was divided by the individual. This process resulted with a percentage of how much better or worse each player did compared to the average performance of every other athlete in the league playing the same position. In other words, this method identified how exceptional or unexceptional each player was at the desired statistics. All percentages calculated for each player were then averaged to generate IPP values throughout the league. Table A-3 in Appendix-F displays a small sample that includes Running Backs, Offensive Linemen, and Linebackers from this final IPP spreadsheet.On a side note, some of the variables that were desired to be used from AdvancedNFLstats.com were determined to be incompatible with the large portion of data taken from Pro-football-reference.com. These variables included, EPA-Run, EPA-Pass, and Tackle Factor. The EPA statistics provided by AdvancedNFLStats.com gave a wide range of positive or negative values that identified the expected points added for a team per game based on an offensive line's success throughout the season. However, because these EPA values were the only statistics that included negative values and had large ranges, the IPP values being calculated for offensive lineman were extremely skewed. It was attempted to square and then square root all EPA values, however, this still delivered skewed values and the variables were eliminated from evaluating offensive linemen. On the other hand, the Tackle Factor statistic was found to work extremely well with the data from Pro-football-reference.com. Unfortunately, the website only displayed a small portion of players for this statistic, and it was decided to not

include the Tackle Factor statistic in order to avoid over-valuing the better athletes in the league who already had relatively high IPP values.

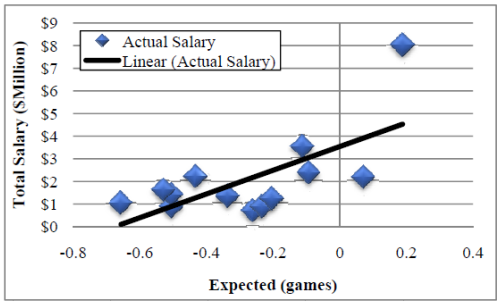
2. Significance Testing

The next step of this study wasdiscovering the significance of the variables collected through the utilization of linear regressions and other tests administered through Minitab Statistical Software. First, a final compilation spreadsheet of all variables collected was created, which allowed the necessary data to be transferred between Excel and Minitab as needed. A portion of this final table is displayed in Appendix-I.By using both linear regression testing and step-wise regression testing, significant variables were identified and analyzed, as well as insignificant. A revised version of the empirical model for player valuation was created with these results. Additionally, residual analysis was analyzed heavily to interpret the significance of the final data spread sheet in the following step.

3. Application and Analysis

With a revised Player Value formula, a listing of all NFL athletes according to their calculated value was created. This proved to be insightful when interpreting the accuracy of the final Player Value formula, however, the most significant output available for analysis was the residual graphs and listings. An example of what was anticipated to be created can be seen in Young's (2010) dissertation of a mathematic model, called HEART, intended to maximize the combination of athletes on a single NFL team. Young presented the following graph to demonstrate the relationship between salary and the expected value (expected increase in team wins). Expected value is a similar version of the Player Value model that this study attempted to recreate.

Figure 2



As seen in Figure 2, Young's data appears to have a strong correlation except for the outlier in the upper right corner of the graph. According to Young's linear regression, this individual's salary was $3million dollars more than his expected value. It is outliers such as this that this study attempts to identify.

With the final residual listings available, the initial question of this research study,"Are NFL athletes over-valued", could be addressed. The residuals were listed and sorted. This provided a method to pin point exactly which athletes were over-valued based on this study's findings. The results were also compared to Pro-football-reference.com's variable, Approximate Value, which is a quantitative value that has been constructed by the site for every NFL player to ever play. This was donein order toexamine any possible similarities from this study's findings and the determined values created by an overwhelming large data base. Interpretation of the final results and accuracy of the player value formula were then analyzed.

DATA ANALYSIS

The initial test ran was a linear regression that included all data collected. The resulting p-values of the test suggested significant variables, but did not suggest correlation throughout the data with an R-Squared value of 24.5%.

Regression results of all collected data

```
The regression equation is
SALARY = 1655298 - 49451 AGE + 55540 Career Length + 296503 reg win d=5
         - 24629 Career Post Season Winning % (d + 337171 Probowl
- 200790 1st-Team Selection - 7638 Games Played + 20072 Games Started
         + 499878 IPP


1666 cases used, 161 cases contain missing values


Predictor                          Coef  SECoef      T      P
Constant                        1655298  1131165   1.46  0.144
AGE                              -49451    48648  -1.02  0.310
Career Length                     55540    58659   0.95  0.344
reg win d=5                      296503   122424   2.42  0.016
Career Post Season Winning % (d  -24629   126701  -0.19  0.846
Probowl                          337171    86404   3.90  0.000
1st-Team Selection              -200790   163862  -1.23  0.221
Games Played                      -7638     3207  -2.38  0.017
Games Started                     20072     2169   9.25  0.000
IPP                              499878    71894   6.95  0.000
```

```
S = 2319318   R-Sq = 24.9%   R-Sq(adj) = 24.5%


Analysis of Variance

Source            DF           SS           MS      F      P
Regression         9  2.95013E+15  3.27792E+14  60.94  0.000
Residual Error  1656  8.90802E+15  5.37924E+12
Total           1665  1.18581E+16


Source                           DF       Seq SS
AGE                               1  5.52907E+14
Career Length                     1  1.88409E+14
reg win d=5                       1  6.08674E+14
Career Post Season Winning % (d   1  2.48405E+13
Probowl1  6.21670E+14
1st-Team Selection                1  2.40141E+13
Games Played                      1  6.03379E+12
Games Started                     1  6.63528E+14
IPP                               1  2.60055E+14
```

Continuing off of the initial test ran on all of the data collected, a step-wise regression was utilized to determine significant variables that could be further investigated. The test identified Games Started, IPP, ProBowl, Regular Season Winning Percentage, and Games Played all as significant variables as can be seen below. The test was done two separate times with the Regular Season Winning Percentage with a discount of 5%, d=5%, and a discount of 2%, d=2%. This was done to identify if adjusting the discount value affected the strength of the correlation. The 2% discount resulted with a slightly lower R-Squared value and returned as an insignificant variable, and therefore the test results from that trial are not listed below.

Stepwise Regression: SALARY versus AGE, Career Length, ...

```
  Alpha-to-Enter: 0.15  Alpha-to-Remove: 0.15


Response is SALARY on 9 predictors, with N = 1666
N(cases with missing observations) = 161 N(all cases) = 1827


Step                1        2        3        4        5
Constant       971749   586688   656638   525417   515031

Games Started   28209    24282    20131    18382    20464
T-Value         20.94    17.00    11.87     9.13     9.54
P-Value         0.000    0.000    0.000    0.000    0.000

IPP                     529942   497466   503144   499812
T-Value                   7.41     6.96     7.03     7.00
P-Value                  0.000    0.000    0.000    0.000
```

Probowl			255389	244997	253300
T-Value			4.47	4.26	4.41
P-Value			0.000	0.000	0.000
reg win d=5				92814	282625
T-Value				1.61	3.17
P-Value				0.107	0.002
Games Played					-7133
T-Value					-2.78
P-Value					0.006
S	2374930	2337399	2324179	2323063	2318381
R-Sq	20.85	23.38	24.29	24.41	24.76
R-Sq(adj)	20.80	23.29	24.15	24.23	24.53
Mallows Cp	82.8	29.0	11.0	10.4	4.7

To better interpret the distribution of the original data, residual plots, histograms and graphs were created. These can be found under Appendix-J.

Because of the lack of correlation from the previous testing, the data set was adjusted in order to investigate if stronger correlation results were possible. The dependent variable, Salary, was logged due to its extreme values and the positively skewed residual results of the previous test. The results from the linear regression with logSalary had a remarkably stronger correlation than the previous test. As can be seen below, the R-Squared value of the adjusted data set raised to 40.3% which was approximately a 15% increase in correlation from the previous test.

Results of Regression with logSalary instead of Salary. All other variables kept consistent.

```
The regression equation is
log Salary = 5.93 - 0.0113 AGE + 0.0155 Career Length + 0.0869 reg win d=5%
             - 0.0306 Career Post Season Winning % (d + 0.0077 Probowl
             - 0.0103 1st-Team Selection - 0.000323 Games Played
             + 0.00362 Games Started + 0.0885 IPP


1666 cases used, 161 cases contain missing values


Predictor                            Coef    SE Coef      T      P
Constant                           5.9344     0.1626  36.49  0.000
AGE                              -0.011343   0.006995  -1.62  0.105
Career Length                     0.015548   0.008434   1.84  0.065
reg win d=5%                       0.08694    0.01760   4.94  0.000
Career Post Season Winning % (d   -0.03065    0.01822  -1.68  0.093
Probowl                            0.00770    0.01242   0.62  0.536
1st-Team Selection                -0.01027    0.02356  -0.44  0.663
```

```
Games Played                    -0.0003235  0.0004611  -0.70  0.483
Games Started                    0.0036216  0.0003119  11.61  0.000
IPP                                0.08853    0.01034   8.56  0.000


S = 0.333473   R-Sq = 40.3%   R-Sq(adj) = 40.0%


Analysis of Variance

Source            DF       SS      MS       F      P
Regression         9  124.406  13.823  124.30  0.000
Residual Error  1656  184.154   0.111
Total           1665  308.560


Source                           DF  Seq SS
AGE                               1  46.507
Career Length                     1  11.721
reg win d=5%                      1  24.208
Career Post Season Winning % (d   1   2.341
Probowl                           1   8.245
1st-Team Selection                1   0.225
Games Played                      1   1.516
Games Started                     1  21.486
IPP                               1   8.157
```

This adjustment to the dependent variable also affected the significant variables identified. As can be seen in the stepwise regression below, the variables identified, in order of significance are Games Started, Regular Season Winning Percentage, IPP, and Post Season Winning Percentage (listed as Championships previously in manuscript). Interestingly, the linear regression test identified Career Length as more significant than Post Season Winning Percentage, however, the stepwise regression did not recognize Career Length as significant.

Stepwise Regression: log Salary versus AGE, Career Length, ...

```
  Alpha-to-Enter: 0.15  Alpha-to-Remove: 0.15


Response is log Salary on 9 predictors, with N = 1666
N(cases with missing observations) = 161 N(all cases) = 1827


Step                                 1        2        3        4
Constant                         5.840    5.746    5.679    5.671

Games Started                  0.00588  0.00446  0.00375  0.00366
T-Value                          29.81    17.29    14.15    13.53
P-Value                          0.000    0.000    0.000    0.000

reg win d=5%                            0.0700   0.0727   0.0856
T-Value                                   8.35     8.85     7.74
P-Value                                  0.000    0.000    0.000
```

IPP			0.087	0.088
T-Value			8.56	8.62
P-Value			0.000	0.000
Career Post Season Winning % (d=5%)				-0.030
T-Value				-1.74
P-Value				0.082
S	0.348	0.341	0.334	0.333
R-Sq	34.81	37.43	40.07	40.18
R-Sq(adj)	34.77	37.35	39.96	40.04
Mallows Cp	146.9	76.1	4.9	3.8

The residual plots of the logSalary regression test demonstrated patterns much more similar to a normal distribution than the previous test. These plots can be found under Appendix-K, and when compared to the previous residual graphs, it is clear that the data is much better distributed. The histogram of the residual plots from the logSalary data, in particular, displays a very useful interpretation of the data. The residuals form a very slightly, positively skewed normal distribution. Also, from this distribution, it is clear that the largest portion of residual plots is below the zero mark, which can be interpreted as being below the best-fit line. This suggests that most athletes are actually undervalued and not receiving salaries appropriate to their contribution to their team. This point will be discussed further later in the Discussion section.

After the noticeable increase from logging the dependent variable Salary, two predictor variables, Games Played and Games Started, were also logged to observe any additional increase in regression correlation. The logging of Games Played and Games Started resulted in a 1.5% increase in the R-Squared value, raising it to 41.8%. This increase did not appear significant enough to adjust more predictor variables, and therefore, all predictor variables were left as their original values.

Based on the results from the logSalary regression tests, a listing of all residual plots was created and matched to its corresponding NFL athlete. With this, a table listing the NFL athletes from the most over-valued to the most under-valued was created. The fifty largest outliers, both positive and negative, can be seen in table format under Appendix-L. A notable detail about this range of residual listings and its relationship to salary is that the average of all points with residuals less than 0.1 and greater than -0.1 was $1,524,853. This range

included 296 different athletes. A further analysis of average salary per over/under-value ranking was conducted as well. This chart and graph can also be found under Appendix-L. One of the observations that stands out most from the graph just mentioned is the extraordinarily high increase in the average salary amount from the 101-200 tier of athletes to the 1-100 tier of over-valued athletes. Without this extremely high salary for the highest 100 residuals, the graph of average salaries would be rather timid. However, this remarkable spike suggests a superstar variable that was not taken into consideration in the original data collection. This topic will be discussed further in the following section of this manuscript.

With the significant variables identified from the original regression test, an additional linear regression was run using only these variables. This was done in order to output what would be the linear coefficients for the variables now being considered. The resulting regression test delivered the following equation:

```
logSal = 5.67 + 0.0857 RSWP d=5% - 0.0299 PSWP d=5% + 0.00365 Games Started
         + 0.0889 IPP
```

Therefore, the Player Valuation model could be finalized as seen below:

$$\Omega = 5.67 + 0.0857(TS) – 0.0299(CH) + 0.00365(GS) + 0.0889(IPP)$$

The player values for all the athletes taken into consideration in this study were then calculated and listed in an Excel table from the most valuable to the least. This table can be found under Appendix-M.

The final step of this study was to compare the results of the most valuable set of players as determined from this dataset to the most valuable players as determined by Pro-football-reference.com. To do this, all players used in this study were listed highest value to lowest based on the Player Value model. Then, Pro-football-referenceFootball-Reference.com's table of the 51 top players, determined by their Approximate Value variable, was downloaded. The two were compared revealing that 26 of Pro-football-reference.com's top 51 players were also in the top 51 players listed by the Player Value model created in this study.

DISCUSSION

Successfully collecting an extensive amount of raw data and discovering a correlation of slightly over 40% was the biggest accomplishment of this study. Even though there is a remaining 60% of unanswered variability in NFL athletes' valuation, this is to be expected. Real life negotiations and contract agreements are not easily predictable and will always stray any predetermined value model. By effectively identifying four basic variables that are significant in the estimating of a NFL athlete's true value, this research could easily be taken into further study and a stronger correlation created.

The main purpose of this study, however, was to attempt to make a conclusion on whether or not the players in the NFL are over-valued or under-valued, based on their performance and influence on NFL franchises. It was concluded that there is a larger portion of NFL players that are actually under-valued rather than over-valued. The basis of this argument comes from the residual graphs created from the linear regression tests conducted. The histogram residual graph, in particular, displayed a positively skewed, normal distribution appearing visual, where a large portion of players were marked slightly to the left of the 0.0 hash. This type of distribution indicates that a significant percentage of the NFL athletes were not fully recognized for their input to their respective franchise. However, this conclusion does not mean that the NFL does not consist of over-valued athletes. The outlier data makes it clear that there are a number of NFL players that are significantly over-valued. There appears to be two striking factors that cause this excessive overvaluation. The first is the use of signing bonuses. This feature of a player's contract can significantly skew an athlete's income for a particular year. It is assumed that any signing bonus would stem from a player's previous exceptional play, however, signing bonuses are also used to manipulate franchise salary caps which could cause inaccurate valuation. The second factor identified, is that some NFL athletes posses a superstar quality. This characteristic was not recognized for this study, however, it is obvious that some athletes are so vitally crucial to particular franchises that they require overcompensation to continue their play for the team. Hence, the blatantly skewed distribution of salaries throughout the NFL. This requirement for NFL franchises to acquire superstars and keep them as long as possible results in franchises reducing the salaries of non-

superstar athletes. Therefore, because this superstar quality is rare, this results in an overall slight undervaluation of NFL athletes.

Areas for improvement

If this study were to be redone or continued further there are several aspects that could be enhanced for a better quality result. The first and most obvious would be player accuracy. This includes a consistent and unique naming/identification process. This study had multiple errors due to different data sources using different names for the same player, i.e. "Mike" instead of "Michael", regularly used nicknames instead of first names, athletes with the exact same first and last name but without a distinction between the two. To address this limitation, a better identification system needs to be created that recognizes every athlete as a unique individual. The study would also need to be able to reference a center data base so that when adjusted, it would consistently adjust any particular variable in all other utilized tables. Finally, there would need to be a system created for when athletes do not produce any statistics for a particular season, due to injury or lack of play, and are therefore not listed on Pro-football-reference.com's team rosters. Because of this, or inaccurate postings by USAToday.com, there were 155 players that were not able to be included in the data analysis. These players accounted for a listed sum of $131,082,864 in salary.

Another adjustment needed for continuing this research would be to adjust the Championship variable. The variable was identified as significant, however, it has an inverse impact on a player's value. As a player increases his Championship variable, his player value decreases, which appears counterintuitive. It would be assumed that the more successful an athlete is in the post-season, the higher his value. Therefore, a potentially beneficial adjustment would be to give all players who simply make the playoffs some kind of starting value instead of only giving value to teams that win in the playoffs. This study gave a value of zero to all players who did not make the playoffs for that season or who lost in the first round of the playoffs. The adjustment would be to give some sort of value to a player that made the playoffs regardless of whether they won in the first round or not. This would be beneficial due to the difficulty and sparse number of teams that actually make the playoffs every season, let alone win the in the first round.

Unfortunately, due to time constraints, this study was not able to determine an effective way to collect and include kick and punt return statistics in the IPP variable. Even though the IPP variable was identified as significant, some players were not accurately valued because their main function in the NFL is performing returns. Additionally, returners do not receive Games Started acknowledgements when playing and therefore, because Games Start is another part of the Player Value model, some athletes' values are 50% inaccurate.

An additional statistic that was unable to be included for this particular study was AdvancedNFLStats.com'sEPA-run and EPA-pass for offensive lineman. This was a significant drawback due to the lack of available statistics for offensive lineman. The EPA-run and EPA-pass statistics, which were mentioned in the Data/Variables portion of the manuscript, gave the calculated benefit that a particular offensive line provided for a franchise for utilizing either running or passing plays. The problem encountered with this statistic was that its range included negative values. In other words, the statistic included the possibility that the offensive line could negatively affect a franchise's run or pass game. In order to disregard the negative EPA values given, it was attempted to square all values and then take the square root of the values.However, the resulting IPP values for offensive linemen were extremely skewed and it was determined that it would be more beneficial to disregard the EPA statistics at this stage of this research. If this study were continued, utilizing a ranking system may prove to be useful for measuring the distance from the lowest determined EPA value of that particular season.

One of the main objectives of this study and creating the Player Value model was to identify an empirical model that calculated a player's current value in the NFL, rather than determine that player's overall success in the NFL throughout his career. After the significant variables had been identified and the Player Values for all available athletes were calculated, a list of the 2009 NFL league was created. The top 51 players can be seen in Appendix-N. With some previous knowledge of the NFL during the 2009 season, it is almost immediately apparent that a majority of the top players on this list are seasoned veterans. While some of the listed top 51 players were without question deserving of being recognized as some of the best in the

NFL at that time, this list did not include some athletes from the 2009 season who were truly extraordinary, such as Adrian Peterson and Chris Johnson. These two players were both selected to the Associated Press' 1st-Team list which is compiled of only 25 players per season. Therefore, it is apparent that a stronger discount factor needs to be used when calculating players' regular-season winning percentage and post-season winning percentage. The discount factor incorporated in this study was only 5%, resulting in up to twenty years of weighted winning percentages. Given the average career length in the NFL is only approximately 4.5 years, a more reasonable discount factor would include regular season winning percentages only up to ten years previously. The table shown under Appendix-N also includes the Pro-football-reference.com (PFR) ranking of players' Approximated Value who played up until 2011. The PFR variable weights a player's seasonal performance based on "Best season played, 2nd best season played, etc…", and therefore it is a measure of players' career long performance rather than their current value. As expected, over 50% of the top 51 players listed according to Approximate Value by PFR are the same players listed by this study; not including the few players that retired between the end of the 2009 season and the beginning of the 2011 season.

Finally, due to the selectiveness of the Pro-Bowl and 1st-Team selection statistics, it would seem reasonable that these two variables would play a significant role on the value of an NFL athlete. This study interpreted these selection statistics as discrete and did not find them significant when tested in a regression. This suggests that this statistic should be calculated similar to the method Hendrick's et al. (2003) utilized, which calculates the proportion a player was selected for the Pro-Bowl in comparison with his career length in the NFL. A significant relationship between Pro-Bowl/1st-Team selections and player value could also aid in the creation of a super-star variable as mentioned previously.

Continuing this research

If this study were to be extended, there are numerous topics and details that could be explored, first being the inquiry of additional, unexplored variables. Due to the drastic differences between NFL positions and the plethora of comparable and/or conditional statistics, there are numerous variables that are available to be tested and determined if

significant enough to be added to the Player Value model. One of the first variables to be included, because of its use in many other professional sports, would be a strength of schedule variable. This is a common statistic in both professional and college athletics. Additionally, the statistic would be valuable due to the structure of NFL seasons where teams are not guaranteed to play every other team in the league and must play teams in their division twice per season. A strength of schedule variable, possibly applied to the current Team Success variable, would provide a more accurate identification of exceptional players.

In order to determine the practicality of this study and the Player Value model created, it would be useful to analyze the season following study, the 2010 season, and identify if salary adjustments were consistent with the results of this study. In other words, it would be beneficial to examine whether or not players identified as over-valued had their salaries lowered or if players that were identified as under-valued had their salaries raised. Following this, it would be practical to observe the average calculated Player Value of all NFL athletes who did not continue their careers the following season.

Another method to determining the usefulness of this study's resulting Player Value model would be to examine the averageresidual values for each individual franchise and whether or not there was a relationship between a franchise's average residuals and success in a season. Due to the structure of NFL cap limits, it would seem logical that a team with a lower average residual per player would be more successful because this would mean that this team has acquired a larger group of valuable players at a lower price. Similar to monitoring stock prices, this would suggest that the franchise is getting a deal on its players and is able to identify good athletes that are undervalued. This could be done for analyzing success in regular-season or post-season.

Lastly, the final agreement beginning in 2011, between the NFL and the NFLPA, resulted with a new Collective Bargaining Agreement (CBA) which included tight regulations on NFL draftee salaries. With the results and methodology used in this study, continued research could be done for the 2010 and 2011 seasons. After completing the same process for the most recent two seasons, it would be possible to analyze any trends or noticeable changes in the player

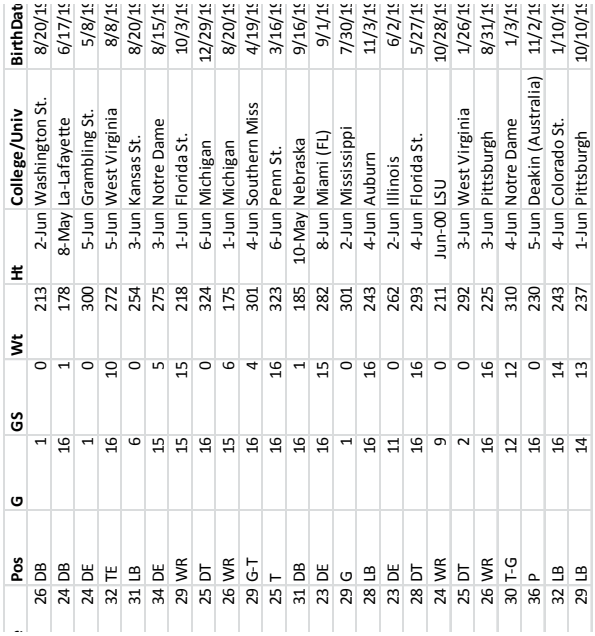
valuation process and salary distribution between the 2009 season, the 2010 season that did not have cap limits, and the 2011 season which now incorporates a regulated draftee salary system. The most significant issue that could be addressed from this continued research would be whether or not the new CBA reduced the number of over-valued athletes.

APPENDIX:

Appendix A:Player Salary Table

PLAYER	BASE SALARY	SIGN BONUS	ALL BONUSES	CAP VALUE	SALARY	POSITION	TEAM
Rivers, Philip	$6,000,000	$19,550,000		$11,541,630	$25,556,630	Quarterback	SDC
Cutler, Jay	$14,944,090	$7,000,000		$11,534,999	$22,044,090	Quarterback	CHI
Manning, Eli	$7,500,000	$13,000,000		$13,066,668	$20,500,000	Quarterback	NYG
Warner, Kurt	$4,000,000	$15,000,000		$11,504,680	$19,004,680	Quarterback	ARZ
Hayden, Kelvin	$1,730,000	$13,500,000		$6,680,000	$17,480,000	Cornerback	IND
Schaub, Matt	$6,950,000			$10,250,000	$17,000,000	Quarterback	HOU
Peppers, Julius	$16,683,000			$19,183,000	$16,683,000	Defensive End	CAR
Long, Chris	$385,000			$6,294,780	$16,592,280	Defensive End	SLR
Jennings, Greg	$5,000,000	$11,250,000		$8,148,800	$16,251,300	Wide Receiver	GBP
Smith, Antonio D.	$3,000,000	$12,500,000		$5,507,280	$15,507,280	Defensive End	HOU
Suggs, Terrell	$1,000,000	$10,100,000		$7,020,000	$15,100,000	Defensive End	BAL
Brown, Jason	$4,000,000	$11,000,000		$6,207,150	$15,007,150	Outside Linebacker	SLR
Cassel, Matt	$5,000,000			$15,205,200	$15,005,200	Quarterback	KCC
Carey, Vernon	$800,000	$12,000,000		$5,400,000	$15,000,000	Outside Linebacker	MIA
Grove, Jake	$2,000,000	$12,000,000		$4,600,000	$14,200,000	Outside Linebacker	MIA
Manning, Peyton	$14,000,000			$21,205,718	$14,005,720	Quarterback	IND
Gamble, Chris	$4,000,000	$10,000,000		$7,005,460	$14,005,460	Cornerback	CAR
Williams, Roy E.	$3,655,900			$5,660,320	$13,660,320	Wide Receiver	DAL
Harrison, James	$800,000	$10,000,000		$5,701,030	$13,357,280	Linebacker	PIT
Jones-Drew, Maurice	$4,100,000	$9,000,000		$6,140,000	$13,100,000	Running Back	JAC
Dorsey, Glenn	$2,385,000			$4,722,000	$13,070,000	Defensive Tackle	KCC
Brees, Drew	$4,487,500	$5,001,000		$10,660,400	$12,989,500	Quarterback	NOS
Staley, Joe	$460,000			$13,527,280	$12,677,280	Outside Linebacker	SF4
McNabb, Donovan	$9,200,000			$16,773,950	$12,507,280	Quarterback	PHI
Harvey, Derrick	$802,500			$7,527,500	$12,367,500	Defensive End	JAC
Canty, Chris	$3,750,000	$8,500,000		$5,450,000	$12,250,000	Defensive End	NYG
White, Roddy	$6,000,000	$6,000,000		$8,113,530	$12,007,280	Wide Receiver	ATL
Asomugha, Nnamdi	$4,500,000	$7,500,000		$6,001,560	$12,001,560	Cornerback	OAK
Favre, Brett	$12,000,000			$12,000,000	$12,000,000	Quarterback	MIN
Jacobs, Brandon	$3,500,000	$8,000,000		$5,506,110	$11,506,110	Running Back	NYG
Scott, Bart	$7,500,000	$4,000,000		$9,000,000	$11,500,000	Linebacker	NYJ
Starks, Max	$1,400,000	$8,000,000		$5,406,240	$11,406,240	Outside Linebacker	PIT
Russell, JaMarcus	$7,805,880	$3,442,800		$13,618,215	$11,255,440	Quarterback	OAK
Haynesworth, Albert	$6,000,000	$5,000,000		$7,007,280	$11,007,280	Defensive Tackle	WAS
Peters, Jason	$10,500,000			$12,704,680	$10,504,680	Outside Linebacker	PHI
Lewis, Ray	$1,000,000	$6,250,000		$5,006,240	$10,006,240	Linebacker	BAL
Gross, Jordan	$5,000,000	$5,000,000		$6,005,980	$10,005,980	Outside Linebacker	CAR
Pace, Calvin	$750,000	$5,900,000		$7,113,333	$10,000,000	Linebacker	NYJ
Robinson, Dunta	$9,957,000			$9,957,000	$9,957,000	Cornerback	HOU
Rhodes, Kerry	$700,000	$6,080,000		$5,752,666	$9,950,000	Safety	NYJ
Bryant, Antonio	$9,884,000			$9,890,760	$9,890,760	Wide Receiver	TBB
Coles, Laveranues	$1,900,000	$3,000,000		$7,500,000	$9,750,000	Wide Receiver	CIN
Dansby, Karlos	$9,678,000			$9,680,340	$9,680,340	Linebacker	ARZ
Boley, Michael	$2,500,000	$7,000,000		$3,900,000	$9,500,000	Linebacker	NYG
Palmer, Carson	$9,500,000			$14,300,000	$9,500,000	Quarterback	CIN
Colombo, Marc	$1,342,059			$2,699,339	$9,449,339	Outside Linebacker	DAL
Ellis, Sedrick	$3,366,000			$4,866,000	$9,366,000	Defensive Tackle	NOS
Vilma, Jonathan	$3,300,000	$6,000,000		$4,500,000	$9,300,000	Linebacker	NOS
Gholston, Vernon	$2,900,000			$4,476,240	$9,186,240	Defensive End	NYJ

Appendix B:Roster Listing Example



	Pos	G	GS	Wt	Ht	College/Univ	BirthDat
26	DB		1	0	213	2-Jun Washington St.	8/20/1
24	DB		16	1	178	8-May La-Lafayette	6/17/1
24	DE		1	0	300	5-Jun Grambling St.	5/8/1
32	TE		16	10	272	5-Jun West Virginia	8/8/1
31	LB		6	0	254	3-Jun Kansas St.	8/20/1
34	DE		15	5	275	3-Jun Notre Dame	8/15/1
29	WR		15	15	218	1-Jun Florida St.	10/3/1
25	DT		16	0	324	6-Jun Michigan	12/29/1
26	WR		15	6	175	1-Jun Michigan	8/20/1
29	G-T		16	4	301	4-Jun Southern Miss	4/19/1
25	T		16	16	323	6-Jun Penn St.	3/16/1
31	DB		16	1	185	10-May Nebraska	9/16/1
23	DE		16	15	282	8-Jun Miami (FL)	9/1/1
29	G		1	0	301	2-Jun Mississippi	7/30/1
28	LB		16	16	243	4-Jun Auburn	11/3/1
23	DE		11	0	262	2-Jun Illinois	6/2/1
28	DT		16	16	293	4-Jun Florida St.	5/27/1
24	WR		9	0	211	Jun-00 LSU	10/28/1
25	DT		2	0	292	3-Jun West Virginia	1/26/1
26	WR		16	16	225	3-Jun Pittsburgh	8/31/1
30	T-G		12	12	310	4-Jun Notre Dame	1/3/1
36	P		16	0	230	5-Jun Deakin (Australia)	11/2/1
32	LB		16	14	243	4-Jun Colorado St.	1/10/1
29	LB		14	13	237	1-Jun Pittsburgh	10/10/1

Appendix C: Players' Team History Table

	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1
	ARI	CLE	DEN	DEN	DEN	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	SLR	TBB	TBB	TBB	NYJ	NYJ	NYJ	NYJ	NYJ	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	NEP	KCC	KCC	KCC	KCC	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	DEN	DEN	DEN	--	IND	IND	IND	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	CAR	CAR	CAR	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	CLE	MIN	MIN	NYG	NYG	NYG	NYG	-	-	-	-	-	-	-
	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	--	-	-	ATL	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-
	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	BUF	BUF	CHI	CHI	CHI	-	-	-	-	-	-	-	-	-
	ARI	ARI	NYJ	NYJ	NYJ	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	PIT	PIT	PIT	PIT	PIT	PIT	PIT	PIT	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	--	ARI	ARI	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	SLR	PIT	PIT	PIT	PIT	PIT	PIT	PIT	PIT	-	-	-	-	-	-	-
	ARI	DEN	DEN	DEN	DEN	DEN	DEN	DEN	TEN	TEN	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	PIT	PIT	PIT	PIT	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	PIT	PIT	PIT	PHI	--	-	-	NEP	-	-	-	-	-	-
	ARI	NYJ	NYJ	NYJ	NYJ	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	--	ARI	ARI	SEA	SEA	SF4	SF4	SF4	SF4	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	ARI	ARI	CIN	CIN	CIN	-	-	-	-	-	-	-
	ARI	ARI	CIN	CIN	CIN	MIA	CHI	CHI	CHI	CHI	CHI	CHI	SLR	-	-	-	-
Dominique	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	NEP	--	PHI	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	--	-	-	-	PIT	-	-	-	-	-	-	-	-	-	-	-
aRod	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	PHI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ARI	ARI	ARI	--	SEA	SEA	-	-	-	-	-	-	-	-	-	-	-

Appendix D: Franchise success

Team (abr.)	Team (full name)	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
ARI	Arizona Cardinals	0.625	0.563	0.5	0.313	0.313	0.375	0.25	0.313	0.438	0.188
ARI	Phoenix Cardinals	-	-	-	-	-	-	-	-	-	-
ATL	Atlanta Falcons	0.563	0.688	0.25	0.438	0.5	0.688	0.313	0.594	0.438	0.25
BAL	Baltimore Ravens	0.563	0.688	0.313	0.813	0.375	0.563	0.625	0.438	0.625	0.75
BUF	Buffalo Bills	0.375	0.438	0.438	0.438	0.313	0.563	0.375	0.5	0.188	0.5
CAR	Carolina Panthers	0.5	0.75	0.438	0.5	0.688	0.438	0.688	0.438	0.063	0.438
CHI	Chicago Bears	0.438	0.563	0.438	0.813	0.688	0.313	0.438	0.25	0.813	0.313
CIN	Cincinnati Bengals	0.625	0.281	0.438	0.5	0.688	0.5	0.5	0.125	0.375	0.25
CLE	Cleveland Browns	0.313	0.25	0.625	0.25	0.375	0.25	0.313	0.563	0.438	0.188
DAL	Dallas Cowboys	0.688	0.563	0.813	0.563	0.563	0.375	0.625	0.313	0.313	0.313
DEN	Denver Broncos	0.5	0.5	0.438	0.563	0.813	0.625	0.625	0.563	0.5	0.688
DET	Detroit Lions	0.125	0	0.438	0.188	0.313	0.375	0.313	0.188	0.125	0.563
GBP	Green Bay Packers	0.688	0.375	0.813	0.5	0.25	0.625	0.625	0.75	0.75	0.563
HOU	Houston Texans	0.563	0.5	0.5	0.375	0.125	0.438	0.313	0.25	-	-
IND	Indianapolis Colts	0.875	0.75	0.813	0.75	0.875	0.75	0.75	0.625	0.375	0.625
JAC	Jacksonville Jaguars	0.438	0.313	0.688	0.5	0.75	0.563	0.313	0.375	0.375	0.438
KCC	Kansas City Chiefs	0.25	0.125	0.25	0.563	0.625	0.438	0.813	0.5	0.375	0.438
MIA	Miami Dolphins	0.438	0.688	0.063	0.375	0.563	0.25	0.625	0.563	0.688	0.688
MIN	Minnesota Vikings	0.75	0.625	0.5	0.375	0.563	0.5	0.563	0.375	0.313	0.688
NEP	New England Patriots	0.625	0.688	1	0.75	0.625	0.875	0.875	0.563	0.688	0.313
NOS	New Orleans Saints	0.813	0.5	0.438	0.625	0.188	0.5	0.5	0.563	0.438	0.625
NYG	New York Giants	0.5	0.75	0.625	0.5	0.688	0.375	0.25	0.625	0.438	0.75
NYJ	New York Jets	0.563	0.563	0.25	0.625	0.25	0.625	0.375	0.563	0.625	0.563
OAK	Oakland Raiders	0.313	0.313	0.25	0.125	0.25	0.313	0.25	0.688	0.625	0.75
OAK	Los Angeles Raiders	-	-	-	-	-	-	-	-	-	-
PHI	Philadelphia Eagles	0.688	0.594	0.5	0.625	0.375	0.813	0.75	0.75	0.688	0.688
PIT	Pittsburgh Steelers	0.563	0.75	0.625	0.5	0.688	0.938	0.375	0.656	0.813	0.563
SDC	San Diego Chargers	0.813	0.5	0.688	0.875	0.563	0.75	0.25	0.5	0.313	0.063
SF4	San Francisco 49ers	0.5	0.438	0.313	0.438	0.25	0.125	0.438	0.625	0.75	0.375
SEA	Seattle Seahawks	0.313	0.25	0.625	0.563	0.813	0.563	0.625	0.438	0.563	0.375
SLR	St. Louis Rams	0.063	0.125	0.188	0.5	0.375	0.5	0.75	0.438	0.875	0.625
SLR	Los Angeles Rams	-	-	-	-	-	-	-	-	-	-
TBB	Tampa Bay Buccaneers	0.188	0.563	0.563	0.25	0.688	0.313	0.438	0.75	0.563	0.625
TEN	Tennessee Titans	0.5	0.813	0.625	0.5	0.25	0.313	0.75	0.688	0.438	0.813
TEN	Tennessee Oilers	-	-	-	-	-	-	-	-	-	-
TEN(HOU)	Houston Oilers	-	-	-	-	-	-	-	-	-	-
WAS	Washington Redskins	0.25	0.5	0.563	0.313	0.625	0.375	0.313	0.438	0.5	0.5

Appendix E: Players' Team Success

Names	Sum	Average	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Abdullah, Hamza	2.689	0.5378	0.625	0.25	0.438	0.563	0.813					
Adams, Michael	1.688	0.562666667	0.625	0.563	0.5							
Banks, Jason	0.625	0.625	0.625									
Becht, Anthony	5.002	0.5002	0.625	0.125	0.563	0.25	0.688	0.625	0.375	0.563	0.625	0.563
Beisel, Monty	4.752	0.528	0.625	0.563	0.5	0.313	0.625	0.438	0.813	0.5	0.375	
Berry, Bertrand	5.566	0.463833333	0.625	0.563	0.5	0.313	0.313	0.375	0.625	0.563	0.5	
Boldin, Anquan	2.939	0.419857143	0.625	0.563	0.5	0.313	0.313	0.375	0.25			
Branch, Alan	1.688	0.562666667	0.625	0.563	0.5							
Breaston, Steve	1.688	0.562666667	0.625	0.563	0.5							
Bridges, Jeremy	3.001	0.500166667	0.625	0.75	0.438	0.5	0.313	0.375				
Brown, Levi	1.688	0.562666667	0.625	0.563	0.5							
Brown, Ralph	5.064	0.5064	0.625	0.563	0.5	0.25	0.563	0.5	0.25	0.625	0.438	0.75
Campbell, Calais	1.188	0.594	0.625	0.563								
Claxton, Ben	1.125	0.5625	0.625				0.5					
Dansby, Karlos	2.689	0.448166667	0.625	0.563	0.5	0.313	0.313	0.375				
Davis, Will	0.625	0.625	0.625									
Dockett, Darnell	2.689	0.448166667	0.625	0.563	0.5	0.313	0.313	0.375				
Doucet, Early	1.188	0.594	0.625	0.563								
Dykes, Keilen	0.625	0.625	0.625									
Fitzgerald, Larry	2.689	0.448166667	0.625	0.563	0.5	0.313	0.313	0.375				
Gandy, Mike	3.44	0.43	0.625	0.563	0.5	0.438	0.313	0.313	0.438	0.25		
Graham, Ben	2.313	0.4626	0.625	0.563	0.25	0.625	0.25					
Haggans, Clark	6.346	0.6346	0.625	0.563	0.625	0.5	0.688	0.938	0.375	0.656	0.813	0.563
Hayes, Gerald	2.626	0.437666667	0.625	0.563	0.5	0.313		0.375	0.25			
Highsmith, Ali	1.188	0.594	0.625	0.563								
Hightower, Tim	1.188	0.594	0.625	0.563								
Iwebema, Kenny	1.188	0.594	0.625	0.563								
Johnson, Rashad	0.625	0.625	0.625									
Keith, Brandon	0.625	0.625	0.625									
Kreider, Dan	5.908	0.5908	0.625	0.125	0.625	0.5	0.688	0.938	0.375	0.656	0.813	0.563
Leach, Mike	6.003	0.6003	0.625	0.5	0.438	0.563	0.813	0.625	0.625	0.563	0.438	0.813
Leinart, Matt	2.001	0.50025	0.625	0.563	0.5	0.313						
Lutui, Deuce	2.001	0.50025	0.625	0.563	0.5	0.313						
McFadden, Bryant	3.188	0.6376	0.625	0.75	0.625	0.5	0.688					
Morey, Sean	5.064	0.633	0.625	0.563	0.5	0.5	0.688	0.938	0.75			
Nugent, Mike	2.313	0.4626	0.625	0.563	0.25	0.625	0.25					
Okeafor, Chike	5.002	0.5002	0.625	0.563		0.313	0.313	0.563	0.625	0.625	0.75	0.375
Patrick, Ben	1.688	0.562666667	0.625	0.563	0.5							
Rackers, Neil	3.689	0.3689	0.625	0.563	0.5	0.313	0.313	0.375	0.25	0.125	0.375	0.25

Appendix F: Players' Post-Season Success

	discount facto	5%	1	95%	90%	85%	80%	75%	70%	65%
Player	**Sum**	**Average**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Abdullah, Hamza	0.9	0.040909091	0.5	0	0	0	0.4	0	0	0
Adams, Michael	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Banks, Jason	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Becht, Anthony	1.2	0.054545455	0.5	0	0	0	0	0.375	0	0.325
Beisel, Monty	1.6125	0.073295455	0.5	0.7125	0	0	0.4	0	0	0
Berry, Bertrand	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Boldin, Anquan	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Branch, Alan	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Breaston, Steve	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Bridges, Jeremy	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Brown, Levi	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Brown, Ralph	1.954166667	0.088825758	0.5	0.7125	0	0	0	0.375	0	0
Campbell, Calais	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Claxton, Ben	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Dansby, Karlos	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Davis, Will	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Dockett, Darnell	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Doucet, Early	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Dykes, Keilen	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Fitzgerald, Larry	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Gandy, Mike	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Graham, Ben	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Haggans, Clark	3.0125	0.136931818	0.5	0.7125	0	0	0.8	0.375	0	0.325
Hayes, Gerald	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Highsmith, Ali	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Hightower, Tim	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Iwebema, Kenny	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Johnson, Rashad	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Keith, Brandon	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Kreider, Dan	2.3	0.104545455	0.5	0	0	0	0.8	0.375	0	0.325
Leach, Mike	0.9	0.040909091	0.5	0	0	0	0.4	0	0	0
Leinart, Matt	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
Lutui, Deuce	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0
McFadden, Bryant	2.25	0.102272727	0.5	0.95	0	0	0.8	0	0	0
Morey, Sean	2.7375	0.124431818	0.5	0.7125	0	0	0.8	0.375	0.35	0
Nugent, Mike	0.5	0.022727273	0.5	0	0	0	0	0	0	0
Okeafor, Chike	1.5375	0.069886364	0.5	0.7125	0	0	0	0	0	0.325
Patrick, Ben	1.2125	0.055113636	0.5	0.7125	0	0	0	0	0	0

Appendix G: Probowl/1st Team Selections

Names	sum (probowl)	sum (1st-Team)	2009		2008		2007		2006		2005	
			Probowl	1st-Team	Probowl	1st-Team	Probowl	1st-Team	Probowl	1st-Team	Probowl	1st-Team
Abdullah, Hamza	0	0										
Adams, Michael	0	0										
Banks, Jason	0	0										
Becht, Anthony	0	0										
Beisel, Monty	0	0										
Berry, Bertrand	1	0										
Boldin, Anquan	3	0			1				1			
Branch, Alan	0	0										
Breaston, Steve	0	0										
Bridges, Jeremy	0	0										
Brown, Levi	0	0										
Brown, Ralph	0	0										
Campbell, Calais	0	0										
Claxton, Ben	0	0										
Dansby, Karlos	0	0										
Davis, Will	0	0										
Dockett, Darnell	2	0	1				1					
Doucet, Early	0	0										
Dykes, Keilen	0	0										
Fitzgerald, Larry	4	1	1		1	1	1				1	
Gandy, Mike	0	0										
Graham, Ben	0	0										
Haggans, Clark	0	0										
Hayes, Gerald	0	0										
Highsmith, Ali	0	0										
Hightower, Tim	0	0										
Iwebema, Kenny	0	0										
Johnson, Rashad	0	0										
Keith, Brandon	0	0										
Kreider, Dan	0	0										
Leach, Mike	0	0										
Leinart, Matt	0	0										
Lutui, Deuce	0	0										
McFadden, Bryant	0	0										
Morey, Sean	1	0			1							
Nugent, Mike	0	0										
Okeafor, Chike	0	0										
Patrick, Ben	0	0										
Rackers, Neil	1	1									1	1
Robinson, Bryan	0	0										
Rodgers-Cromartie, Dominique	1	0	1									
Rolle, Antrel	1	0	1									
Sendlein, Lyle	0	0										
Spach, Stephen	0	0										
St. Pierre, Brian	0	0										
Stephens-Howling, LaRod	0	0										
Togafau, Pago	0	0										
Toler, Gregory	0	0										

AppendixH: Individual Position Performance

Table A-1: Example of Individual Statistics Table, 2009 Quarterbacks

First Last w/distinc	Pos	Tea	Completions	Atempts	~Cmp% qb	Pass Yards	QBR	~Pass Yds/Game	Pass TD	Int	~TD/Int
Matt Leinart	QB	ARI	51	77	66.2	435	64.6	54.4	0	3	0
Brian St. Pierre	QB	ARI	2	4	50	12	56.2	12	1	1	1
Kurt Warner	QB	ARI	339	513	66.1	3753	93.2	250.2	26	14	1.857142857
Chris Redman	QB	ATL	69	119	58	781	78.4	130.2	4	3	1.333333333
Matt Ryan	QB	ATL	263	451	58.3	2916	80.9	208.3	22	14	1.571428571
Joe Flacco	QB	BAL	315	499	63.1	3613	88.9	225.8	21	12	1.75
Troy Smith	QB	BAL	5	9	55.6	24	21.3	6	0	1	0
Brian Brohm	QB	BUF	17	29	58.6	146	43.2	73	0	2	0
Trent Edwards	QB	BUF	110	183	60.1	1169	73.8	146.1	6	7	0.857142857
Ryan Fitzpatrick	QB	BUF	127	227	55.9	1422	69.7	142.2	9	10	0.9
Jake Delhomme	QB	CAR	178	321	55.5	2015	59.4	183.2	8	18	0.444444444
Josh McCown	QB	CAR	1	6	16.7	2	39.6	2	0	0	0
Matt Moore	QB	CAR	85	138	61.6	1053	98.5	150.4	8	2	4
Jay Cutler	QB	CHI	336	555	60.5	3666	76.8	229.1	27	26	1.038461538
Caleb Hanie	QB	CHI	3	7	42.9	11	10.7	3.7	0	1	0
J.T. O'Sullivan	QB	CIN	4	11	36.4	40	47.5	13.3	0	0	0
Carson Palmer	QB	CIN	282	466	60.5	3094	83.6	193.4	21	13	1.615384615
Derek Anderson	QB	CLE	81	182	44.5	888	42.1	111	3	10	0.3
Brady Quinn	QB	CLE	136	256	53.1	1339	67.2	133.9	8	7	1.142857143
Tony Romo*	QB	DAL	347	550	63.1	4483	97.6	280.2	26	9	2.888888889
Kyle Orton	QB	DEN	336	541	62.1	3802	86.8	237.6	21	12	1.75
Chris Simms	QB	DEN	5	17	29.4	23	15.1	7.7	0	1	0
Daunte Culpepper	QB	DET	89	157	56.7	945	64.8	118.1	3	6	0.5
Matthew Stafford	QB	DET	201	377	53.3	2267	61	226.7	13	20	0.65
Drew Stanton	QB	DET	26	51	51	259	26.1	64.8	0	6	0
Matt Flynn	QB	GBP	7	12	58.3	58	36.1	3.9	0	1	0
Aaron Rodgers*	QB	GBP	350	541	64.7	4434	103.2	277.1	30	7	4.285714286
Rex Grossman	QB	HOU	3	9	33.3	33	5.6	33	0	1	0
Matt Schaub*	QB	HOU	396	583	67.9	4770	98.6	298.1	29	15	1.933333333
Peyton Manning*+	QB	IND	393	571	68.8	4500	99.9	281.3	33	16	2.0625
Curtis Painter	QB	IND	8	28	28.6	83	9.8	41.5	0	2	0
Jim Sorgi	QB	IND									
David Garrard*	QB	JAC	314	516	60.9	3597	83.5	224.8	15	10	1.5
Luke McCown	QB	JAC	1	3	33.3	2	42.4	0.7	0	0	0
Matt Cassel	QB	KCC	271	493	55	2924	69.9	194.9	16	16	1
Brodie Croyle	QB	KCC	23	40	57.5	230	90.6	76.7	2	0	0
Matt Gutierrez	QB	KCC	1	1	100	3	79.2	3	0	0	0
Tyler Thigpen	QB	KCC	4	8	50	83	87	41.5	1	2	0.5
Chad Henne	QB	MIA	274	451	60.8	2878	75.2	205.6	12	14	0.857142857
Chad Pennington	QB	MIA	51	74	68.9	413	76	137.7	1	2	0.5
Tyler Thigpen	QB	MIA	4	8	50	83	87	41.5	1	2	0.5
Brett Favre*	QB	MIN	363	531	68.4	4202	107.2	262.6	33	7	4.714285714
Tarvaris Jackson	QB	MIN	14	21	66.7	201	113.4	25.1	1	0	0
Tom Brady*	QB	NEP	371	565	65.7	4398	96.2	274.9	28	13	2.153846154
Julian Edelman	QB	NEP									
Brian Hoyer	QB	NEP	19	27	70.4	142	82.6	28.4	0	0	0
Drew Brees*	QB	NOS	363	514	70.6	4388	109.6	292.5	34	11	3.090909091
Mark Brunell	QB	NOS	15	30	50	102	44	6.4	0	1	0
David Carr	QB	NYG	21	33	63.6	225	93.6	37.5	1	0	0
Eli Manning	QB	NYG	317	509	62.3	4021	93.1	251.3	27	14	1.928571429
Kellen Clemens	QB	NYJ	13	26	50	125	63.8	12.5	0	0	0
Mark Sanchez	QB	NYJ	196	364	53.8	2444	63	162.9	12	20	0.6
Brad Smith	QB	NYJ	1	1	100	27	118.7	2.1	0	0	0
Charlie Frye	QB	OAK	53	87	60.9	581	65.3	193.7	1	4	0.25
Bruce Gradkowski	QB	OAK	82	150	54.7	1007	80.6	143.9	6	3	2
J.P. Losman	QB	OAK	0	1	0	0	39.6	0	0	0	0
JaMarcus Russell	QB	OAK	120	246	48.8	1287	50	107.3	3	11	0.272727273
Jeff Garcia	QB	PHI									
Kevin Kolb	QB	PHI	62	96	64.6	741	88.9	148.2	4	3	1.333333333
Donovan McNabb*	QB	PHI	267	443	60.3	3553	92.9	253.8	22	10	2.2
Michael Vick	QB	PHI	6	13	46.2	86	93.7	7.2	1	0	0
Charlie Batch	QB	PIT	1	2	50	17	79.2	17	0	0	0
Dennis Dixon	QB	PIT	12	26	46.2	145	60.6	145	1	1	1
Ben Roethlisberger	QB	PIT	337	506	66.6	4328	100.5	288.5	26	12	2.166666667

* Statistics marked with "~" were not used

Table A-2: Positional Averages						
QB						
Completions	**Attempts**	**Pass Yards**	**QBR**	**Pass TD**	**Int**	
134.5584416	220.7272727	1541.688312	71.48311688	9.142857143	6.74025974	
RB						
Carries	**Rush Yds**	**Total yards (rush/rec)**	**TD (rush+rec)**	**Fumbles**		
91.40740741	391.8518519	525.6518519	3.251851852	1.340740741		
WR						
Receptions	**Yards**	**TD**	**Fumbles**			
32.80571429	433.9542857	2.514285714	0.868571429			
TE						
Receptions	**Yards**	**TD**	**Fumbles**			
22.45544554	247.1188119	1.881188119	0.297029703			
OL (FB, C, G, T)						
Sacks Allowed	**Tackles for Loss**	**Run-EPA**	**Pass-EPA**	**Games Started**	**Games Played**	
32.94230769	60.70192308	-0.448076923	0.420192308	8.418269231	12.62019231	
DE						
Sacks	**Forced Fumbles**	**Interceptions**	**Pass Deflections**	**Tackles**	**Tkl Assists**	**Tackle Factor***
3.438650307	0.889570552	0.110429448	1.392638037	22.23312883	8.17791411	0.560487805
DT/NT						
Sacks	**Forced Fumbles**	**Interceptions**	**Pass Deflections**	**Tackles**	**Tkl Assists**	**Tackle Factor***
1.023178808	0.205298013	0.039735099	0.907284768	17.30463576	6.490066225	0.798484848
LB						
Sacks	**Forced Fumbles**	**Interceptions**	**Pass Deflections**	**Tackles**	**Tkl Assists**	**Tackle Factor***
1.189873418	0.654008439	0.337552743	1.729957806	30.85232068	11.36708861	0.91936
DB/S						
Sacks	**Forced Fumbles**	**Interceptions**	**Pass Deflections**	**Tackles**	**Tkl Assists**	**Tackle Factor***
0.280172414	0.439655172	1.212643678	4.885057471	28.62356322	7.034482759	0.748933333
Return Statistics						
total return yds	**total return TD**					
445.7272727	1.4					
K						
FGA	**FGM**	**XPA**	**XPM**			
21.84444444	17.64444444	28.02222222	27.57777778			
P						
Punts	**Total Punt Yds**					
64.92307692	2856.461538					

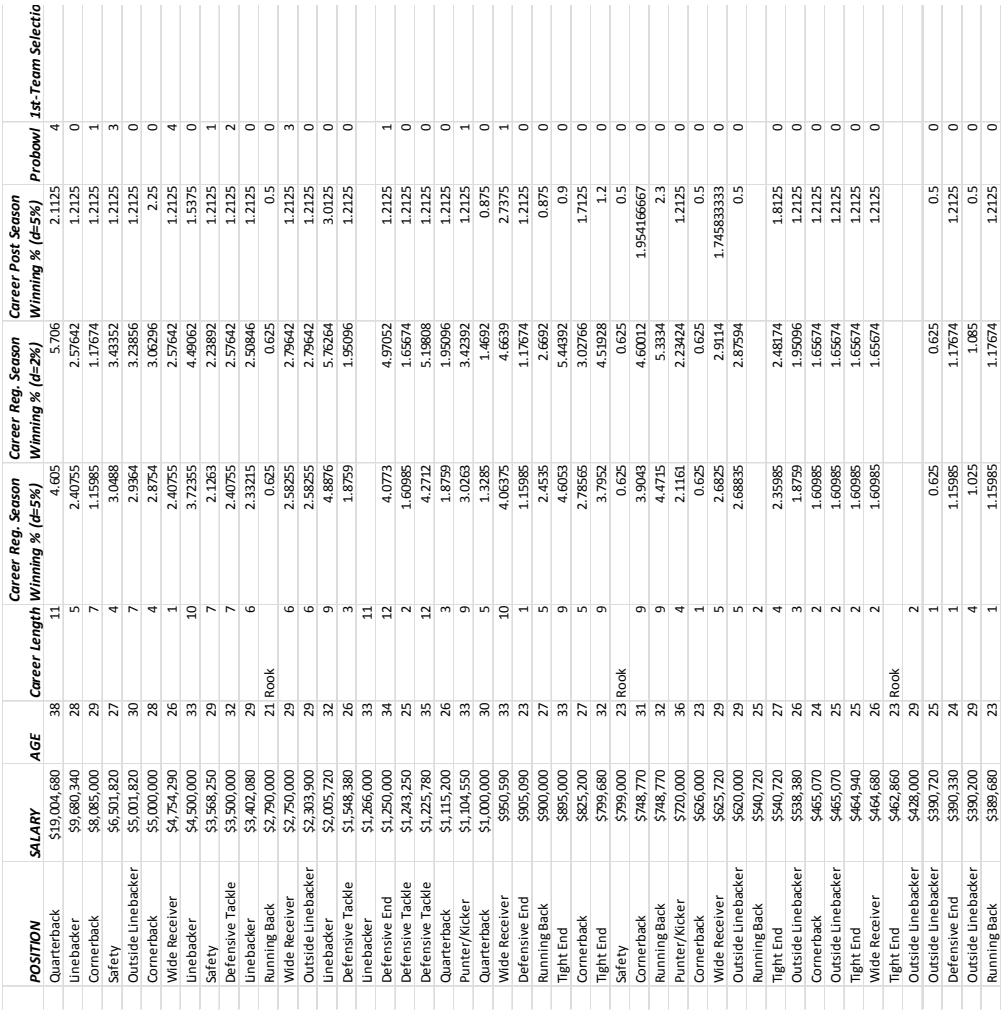
Table A-3: IPP final value examples for Linebackers, Offensive Tackles and Running Backs

LB			IPP Value (w/o TF)	IPP value	Sacks	Forced Fumbles	Interceptions	Pass Deflecti	Tackles	Tkl Assists	Tackle Factor
Monty Beisel	LB	ARI	0.032412473	0.027782119	0	0	0	0	0.194474836	0	0
Karlos Dansby	LB	ARI	2.048054743	1.943494488	0.840425532	1.529032258	2.9625	2.312195122	2.884710066	1.759465479	1.316132962
Clark Haggans	LB	ARI	1.852745435	1.706162091	4.20212766	3.058064516	0	0.57804878	1.782685996	1.495545657	0.826662026
Gerald Hayes	LB	ARI	0.45531062	0.545653845	0	0	0	0	1.58821116	1.143652561	1.087713192
Ali Highsmith	LB	ARI	0.091061322	0.078052562	0	0	0	0	0.194474836	0.351893096	0
Pago Togafau	LB	ARI	0.016206236	0.01389106	0	0	0	0	0.097237418	0	0
Reggie Walker	LB	ARI	0.021608315	0.018521413	0	0	0	0	0.129649891	0	0
Spencer Adkins	LB	ATL	0	0	0	0	0	0	0	0	0
Kroy Biermann	LB	ATL	1.27313794	1.091261091	4.20212766	1.529032258	0	0	0.939961707	0.967706013	0
Tony Gilbert	LB	ATL	0.284163134	0.243568401	0	1.529032258	0	0	0	0.175946548	0
Robert James	LB	ATL	0	0.191126747	0	0	0	0	0	0	1.337887226
Curtis Lofton	LB	ATL	1.669316405	1.634400387	0	3.058064516	0	1.156097561	3.338484683	2.46325167	1.424904281
Stephen Nicholas	LB	ATL	1.466461171	1.362630285	2.521276596	1.529032258	0	1.734146341	1.782685996	1.231625835	0.73964497
Mike Peterson	LB	ATL	2.642076565	2.434009539	0.840425532	3.058064516	2.9625	4.046341463	2.657822757	2.287305122	1.185607379

RB			IPP value	Carries	Rush Yds	Total yards (rush/	TD (rush+rec)	Fumbles
Tim Hightower	RB	ARI	1.55413173	1.564424635	1.526086957	1.951862238	2.460136674	0.268148148
LaRod Stephens-Howling	RB	ARI	0.387722595	0.065640194	0.038279773	0.186435185	0.307517084	1.340740741
Chris Wells	RB	ARI	1.643524148	1.925445705	2.023724008	1.780646252	2.15261959	0.335185185
Jason Wright	RB	ARI	0.1648812	0.032820097	0.043383743	0.133167989	0.615034169	0
Verron Haynes	RB	ATL	0	0	0	0	0	0
Jerious Norwood	RB	ATL	0.791210322	0.831442464	0.643100189	0.833251131	0.307517084	1.340740741
Jason Snelling	RB	ATL	1.396939957	1.553484603	1.56436673	1.658892662	1.537585421	0.67037037
Aaron Stecker	RB	ATL	0.037239505	0.054700162	0.038279773	0.093217592	0	0
Michael Turner	RB	ATL	1.860806977	1.94732577	2.222778828	1.723574257	3.075170843	0.335185185
Matt Lawrence	RB	BAL	0.010273946	0.04376013	0	0.007609599	0	0
Le'Ron McClain*	RB	BAL	0.437660657	0.503241491	0.459357278	0.610670349	0.615034169	0
Willis McGahee	RB	BAL	1.884666546	1.192463533	1.388279773	1.196609501	4.30523918	1.340740741
Jalen Parmele	RB	BAL	0.02608494	0.054700162	0.043383743	0.032340797	0	0
Ray Rice*	RB	BAL	2.597144863	2.778768233	3.41710775	3.882798078	2.460136674	0.44691358

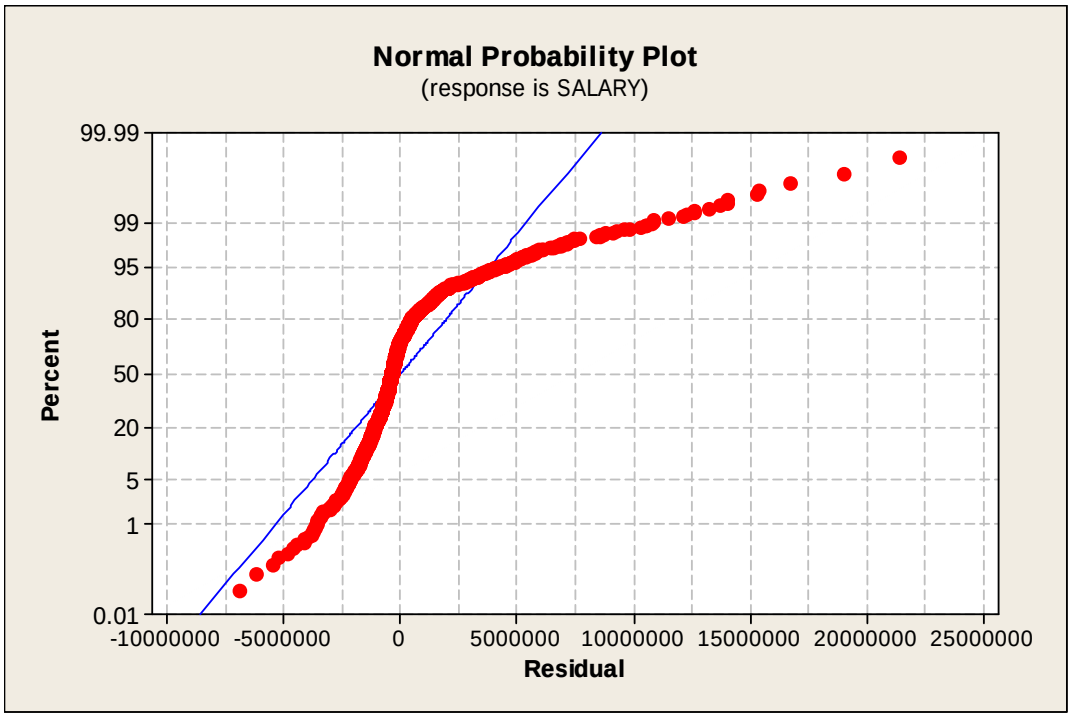
T			IPP value (w/o EPAs)	IPP value	Sacks Allowed*	Tackles for Loss*	Run-EPA	Run-EPA~	Pass-EPA	Pass-EPA~	Games Started	Games Played
Levi Brown	T	ARI	1.372567007	-1.384955329	1.176510989	1.145319303	10.1	22.54077253	-23.9	56.87871854	1.900628212	1.267809524
Brandon Keith	T	ARI	0.659695668	-1.860202888	1.176510989	1.145319303	10.1	22.54077253	-23.9	56.87871854	0	0.316952381
Sam Baker	T	ATL	1.3682508	6.645500533	1.22008547	1.480534709	15.5	34.59227468	18.9	44.97940503	1.663049686	1.109333333
Tyson Clabo	T	ATL	1.467264479		1.22008547	1.480534709	15.5	34.59227468	18.9	44.97940503	1.900628212	1.267809524
Harvey Dahl	T	ATL	1.219730281		1.22008547	1.480534709	15.5	34.59227468	18.9	44.97940503	1.306681896	0.871619048
Garrett Reynolds	T	ATL	0.774202664		1.22008547	1.480534709	15.5	34.59227468	18.9	44.97940503	0	0.396190476
Will Svitek	T	ATL	0.992073486		1.22008547	1.480534709	15.5	34.59227468	18.9	44.97940503	0.237578527	1.030095238
Oniel Cousins	T	BAL	0.630131953		0.941208791	0.905998852	1.5	3.347639485	5.4	12.85125858	0.35636779	0.316952381
Jared Gaither	T	BAL	1.006377147		0.941208791	0.905998852	1.5	3.347639485	5.4	12.85125858	1.306681896	0.871619048
Tony Moll	T	BAL	0.56084953		0.941208791	0.905998852	1.5	3.347639485	5.4	12.85125858	0	0.396190476
Michael Oher	T	BAL	1.253911345		0.941208791	0.905998852	1.5	3.347639485	5.4	12.85125858	1.900628212	1.267809524
Marshall Yanda	T	BAL	1.046030134		0.941208791	0.905998852	1.5	3.347639485	5.4	12.85125858	1.06910337	1.267809524

Appendix I: Final Spreadsheet

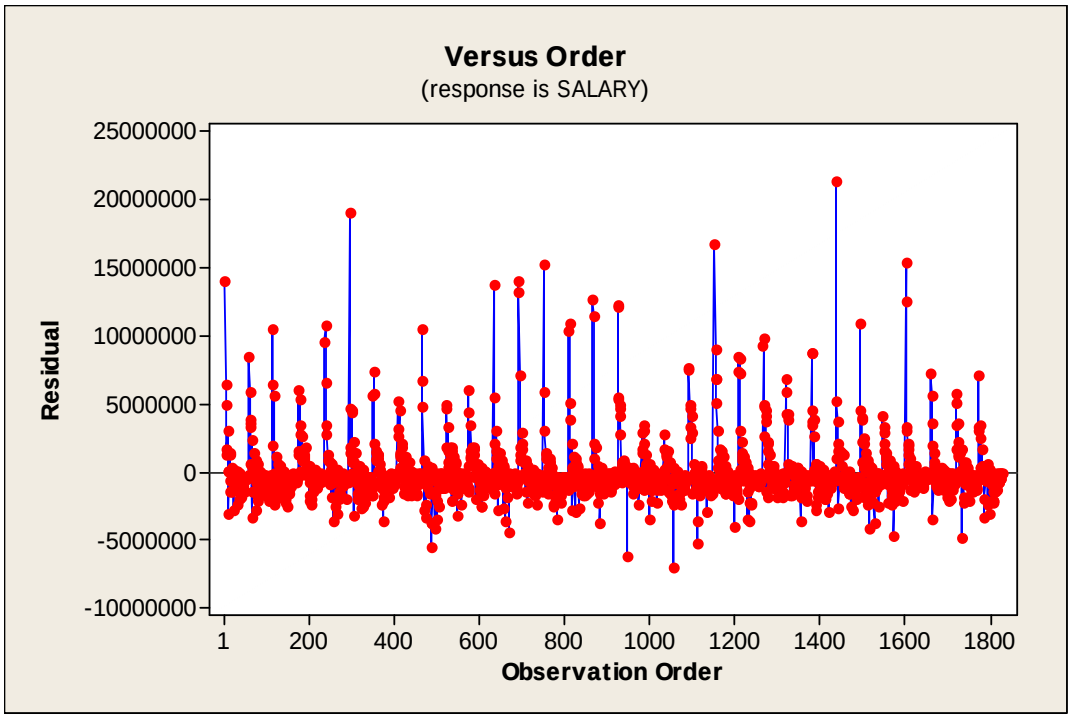


POSITION	SALARY	AGE	Career Length	Career Reg. Season Winning % (d=5%)	Career Reg. Season Winning % (d=2%)	Career Post Season Winning % (d=5%)	Probowl	1st-Team Selectio
Quarterback	$19,004,680	38	11	4.605	5.706	2.1125	4	
Linebacker	$9,680,340	28	5	2.40755	2.57642	1.2125	0	
Cornerback	$8,085,000	29	7	1.15985	1.17674	1.2125	1	
Safety	$6,501,820	27	4	3.0488	3.43352	1.2125	3	
Outside Linebacker	$5,001,820	30	7	2.9364	3.23856	1.2125	0	
Cornerback	$5,000,000	28	4	2.8754	3.06296	2.25	0	
Wide Receiver	$4,754,290	26	1	2.40755	2.57642	1.2125	4	
Linebacker	$4,500,000	33	10	3.72355	4.49062	1.5375	0	
Safety	$3,568,250	29	7	2.1263	2.23892	1.2125	1	
Defensive Tackle	$3,500,000	32	7	2.40755	2.57642	1.2125	2	
Linebacker	$3,402,080	29	6	2.33215	2.50846	1.2125	0	
Running Back	$2,790,000	21	Rook	0.625	0.625	0.5	0	
Wide Receiver	$2,750,000	29	6	2.58255	2.79642	1.2125	3	
Outside Linebacker	$2,303,900	29	6	2.58255	2.79642	1.2125	0	
Linebacker	$2,005,720	32	9	4.8876	5.76264	3.0125	0	
Defensive Tackle	$1,548,380	26	3	1.8759	1.95096	1.2125	0	
Linebacker	$1,266,000	33	11					
Defensive End	$1,250,000	34	12	4.0773	4.97052	1.2125	1	
Defensive Tackle	$1,243,250	25	2	1.60985	1.65674	1.2125	0	
Defensive Tackle	$1,225,780	35	12	4.2712	5.19808	1.2125	0	
Quarterback	$1,115,200	26	3	1.8759	1.95096	1.2125	0	
Punter/Kicker	$1,104,550	33	9	3.0263	3.42392	1.2125	1	
Quarterback	$1,000,000	30	5	1.3285	1.4692	0.875	0	
Wide Receiver	$950,590	33	10	4.06375	4.6639	2.7375	1	
Defensive End	$905,090	23	1	1.15985	1.17674	1.2125	0	
Running Back	$900,000	27	5	2.4535	2.6692	0.875	0	
Tight End	$895,000	33	9	4.6053	5.44392	0.9	0	
Cornerback	$825,200	27	5	2.78565	3.02766	1.7125	0	
Tight End	$799,680	32	9	3.7952	4.51928	1.2	0	
Safety	$799,000	23	Rook	0.625	0.625	0.5	0	
Cornerback	$748,770	31	9	3.9043	4.60012	1.954166667	0	
Running Back	$748,770	32	9	4.4715	5.3334	2.3	0	
Punter/Kicker	$720,000	36	4	2.1161	2.23424	1.2125	0	
Cornerback	$626,000	23	1	0.625	0.625	0.5	0	
Wide Receiver	$625,720	29	5	2.6825	2.9114	1.745833333	0	
Outside Linebacker	$620,000	29	5	2.68835	2.87594	0.5	0	
Running Back	$540,720	25	2					
Tight End	$540,720	27	4	2.35985	2.48174	1.8125	0	
Outside Linebacker	$538,380	26	3	1.8759	1.95096	1.2125	0	
Cornerback	$465,070	24	2	1.60985	1.65674	1.2125	0	
Outside Linebacker	$465,070	25	2	1.60985	1.65674	1.2125	0	
Tight End	$464,940	25	2	1.60985	1.65674	1.2125	0	
Wide Receiver	$464,680	26	2	1.60985	1.65674	1.2125	0	
Tight End	$462,860	23	Rook					
Outside Linebacker	$428,000	29	2					
Outside Linebacker	$390,720	25	1	0.625	0.625	0.5	0	
Defensive End	$390,330	24	1	1.15985	1.17674	1.2125	0	
Outside Linebacker	$390,200	29	4	1.025	1.085	0.5	0	
Running Back	$389,680	23	1	1.15985	1.17674	1.2125	0	

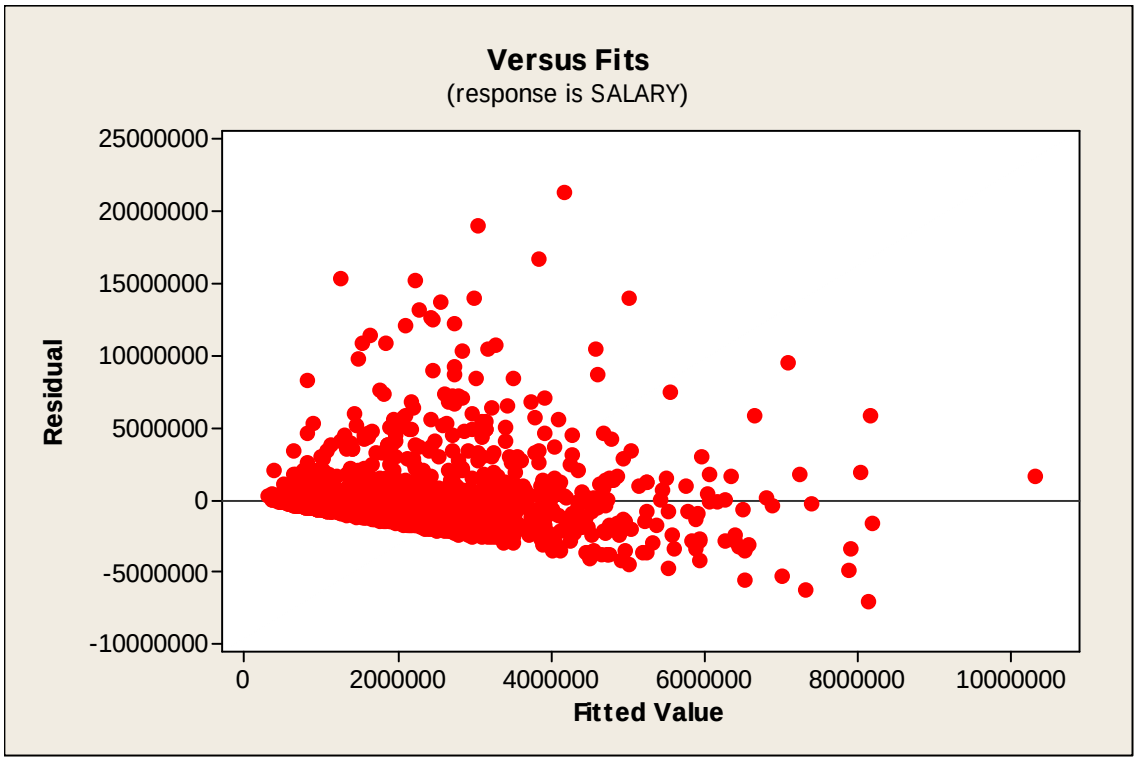
Appendix J: Residual Graphs from Unadjusted Data



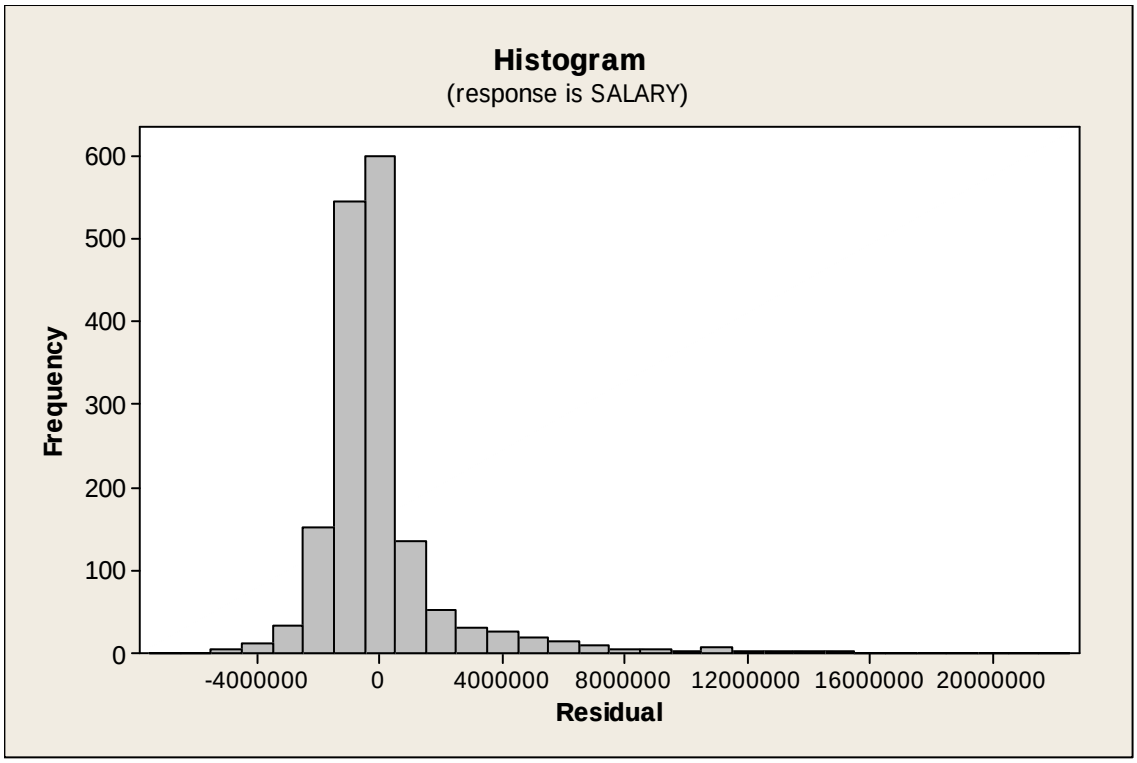
Depicts how similar the data points tested were to a normal distribution based on the original linear regression equation utilized.



Demonstrates the distance between each data point's actual value and its predicted value created from the Player Value Model.

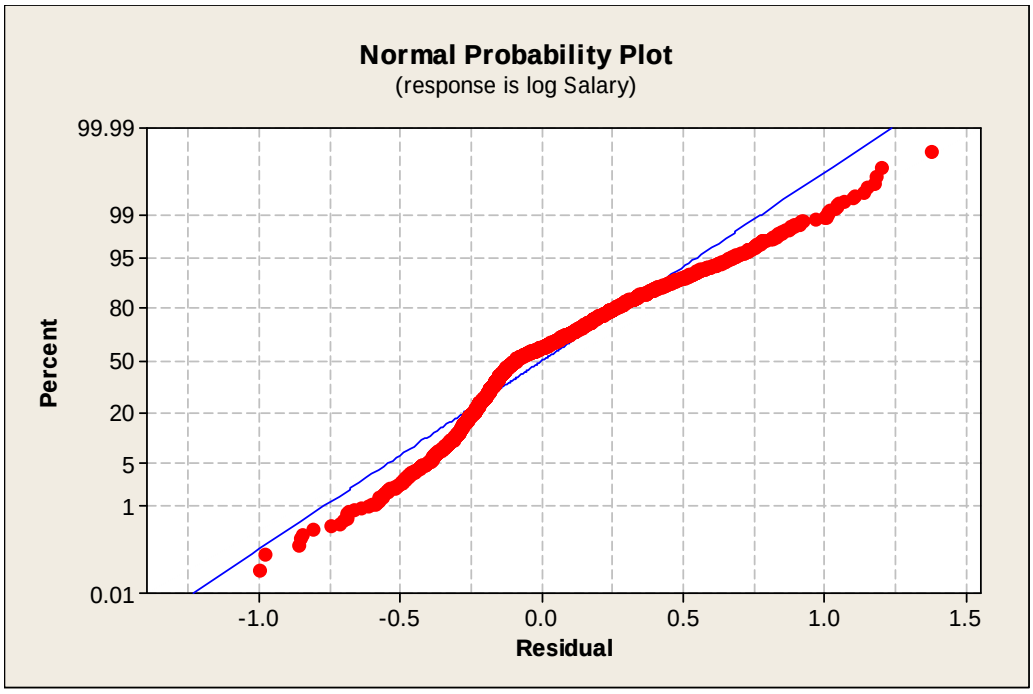


Exhibits each data point's actual position in relation to the regression model utilized.

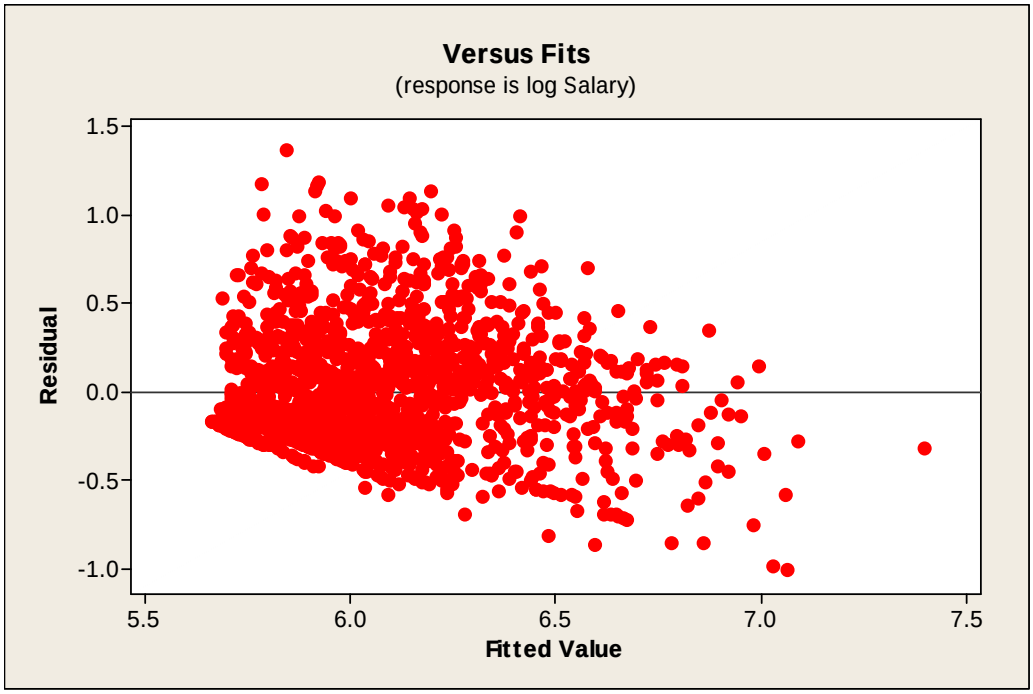


Illustrates the frequency of residual values from the data points when compared to the determined regression equation.

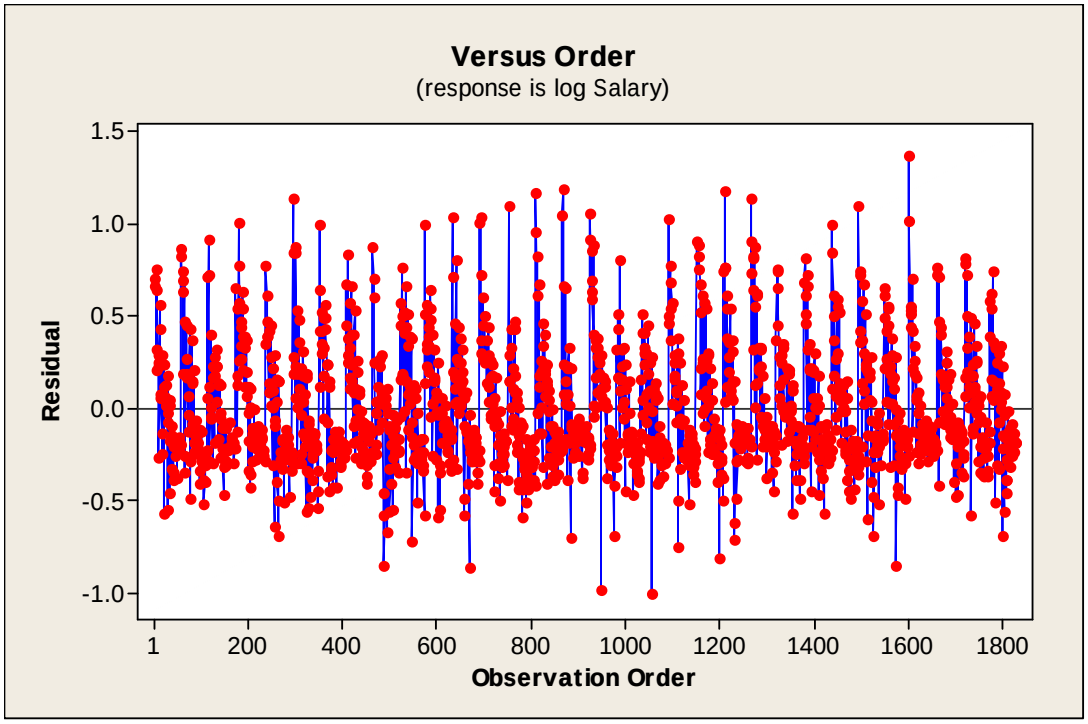
Appendix K: logSalary Residual Plots



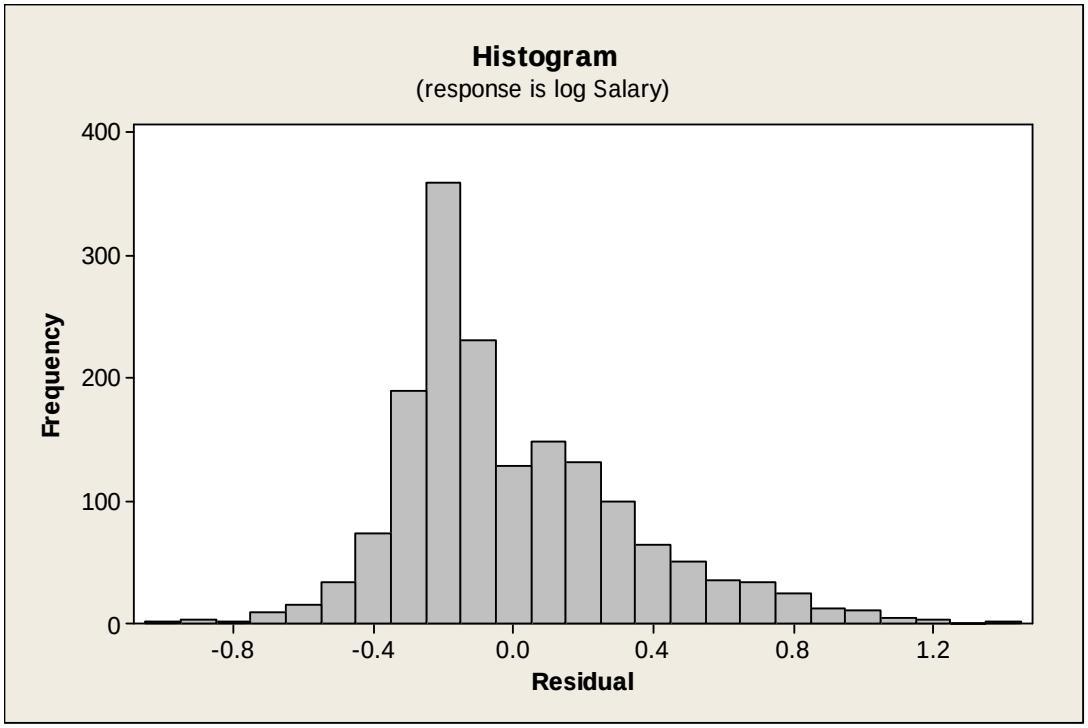
Depicts how similar the data points tested were to a normal distribution based on the original linear regression equation utilized.



Exhibits each data point's actual position in relation to the regression model utilized.



Demonstrates the distance between each data point's actual value and its predicted value created from the Player Value Model.



Illustrates the frequency of residual values from the data points when compared to the determined regression equation.

AppendixL: Residual Listings

Figure A-1: 50 Largest Residuals, Most Over-Valued NFL Athletes in 2009

PLAYER	2009 Tean	RESIDUAL	POSITION	SALARY
Long, Chris	SLR	1.375708361	Defensive End	$16,592,280
Dorsey, Glenn	KCC	1.196398986	Defensive Tackle	$13,070,000
Gholston, Vernon	NYJ	1.181904108	Defensive End	$9,186,240
Harvey, Derrick	JAC	1.17665533	Defensive End	$12,367,500
Cutler, Jay	CHI	1.147116117	Quarterback	$22,044,090
Russell, JaMarcus	OAK	1.138818266	Quarterback	$11,255,440
Staley, Joe	SF4	1.10304247	Outside Linebacker	$12,677,280
Hayden, Kelvin	IND	1.098316282	Cornerback	$17,480,000
Grove, Jake	MIA	1.06419993	Outside Linebacker	$14,200,000
Cassel, Matt	KCC	1.046998146	Quarterback	$15,005,200
Jennings, Greg	GBP	1.040095264	Wide Receiver	$16,251,300
Smith, Antonio	HOU	1.040064166	Defensive End	$15,507,280
Ellis, Sedrick	NOS	1.03490777	Defensive Tackle	$9,366,000
Brown, Jason	SLR	1.016987696	Outside Linebacker	$15,007,150
McKelvin, Leodis	BUF	1.009019002	Cornerback	$6,243,330
Schaub, Matt	HOU	1.008577321	Quarterback	$17,000,000
Rivers, Keith	CIN	1.002051157	Linebacker	$9,185,000
Cherilus, Gosder	DET	1.001419813	Outside Linebacker	$7,496,370
Rivers, Philip	SDC	0.996683491	Quarterback	$25,556,630
Jones-Drew, Maurice	JAC	0.963003509	Running Back	$13,100,000
Carey, Vernon	MIA	0.92353166	Outside Linebacker	$15,000,000
Flacco, Joe	BAL	0.917269499	Quarterback	$8,601,760
Asomugha, Nnamdi	OAK	0.91202137	Cornerback	$12,001,560
Manning, Eli	NYG	0.910062478	Quarterback	$20,500,000
Allen, Jason	MIA	0.890758785	Cornerback	$5,506,240
Jacobs, Brandon	NYG	0.88770683	Running Back	$11,506,110
E. Williams, Roy	DAL	0.880285005	Wide Receiver	$13,660,320
McFadden, Darren	OAK	0.876125673	Running Back	$5,391,760
Hester, Devin	CHI	0.875420485	Wide Receiver	$5,750,000
Ryan, Matt	ATL	0.869374786	Quarterback	$7,907,280
Long, Jake	MIA	0.860539586	Outside Linebacker	$8,006,240
Sproles, Darren	SDC	0.85262319	Running Back	$6,627,630
Omiyale, Frank	CHI	0.848638037	Outside Linebacker	$6,300,000
Williams, Chris	CHI	0.84704256	Outside Linebacker	$5,955,200
Anderson, Derek	CLE	0.836938284	Quarterback	$6,450,000
Lechler, Shane	OAK	0.832526363	Punter/Kicker	$6,401,560
McCown, Luke	JAC	0.830493252	Quarterback	$5,006,760
Webster, Corey	NYG	0.82987583	Cornerback	$9,000,000
White, Roddy	ATL	0.826351487	Wide Receiver	$12,007,280
Johnson, Chris	OAK	0.819109268	Cornerback	$6,006,760
Starks, Max	PIT	0.813965932	Outside Linebacker	$11,406,240
Washington, Nate	TEN	0.813848428	Wide Receiver	$7,806,240
Farwell, Heath	MIN	0.809230023	Linebacker	$4,505,330
Raji, B.J.	GBP	0.805828134	Defensive Tackle	$3,970,000
Haye, Jovan	TEN	0.789596581	Defensive Tackle	$7,007,280
Maybin, Aaron	BUF	0.778985948	Defensive End	$3,450,000
Bush, Reggie	NOS	0.778017296	Running Back	$7,089,940
Gamble, Chris	CAR	0.776268444	Cornerback	$14,005,460
Rhodes, Kerry	NYJ	0.772330921	Safety	$9,950,000
Clayton, Michael	TBB	0.768959783	Wide Receiver	$7,506,760

*All players listed as "Outside Linebacker" are actually Offensive Linemen. This is an error in USAToday.com's salary data base.

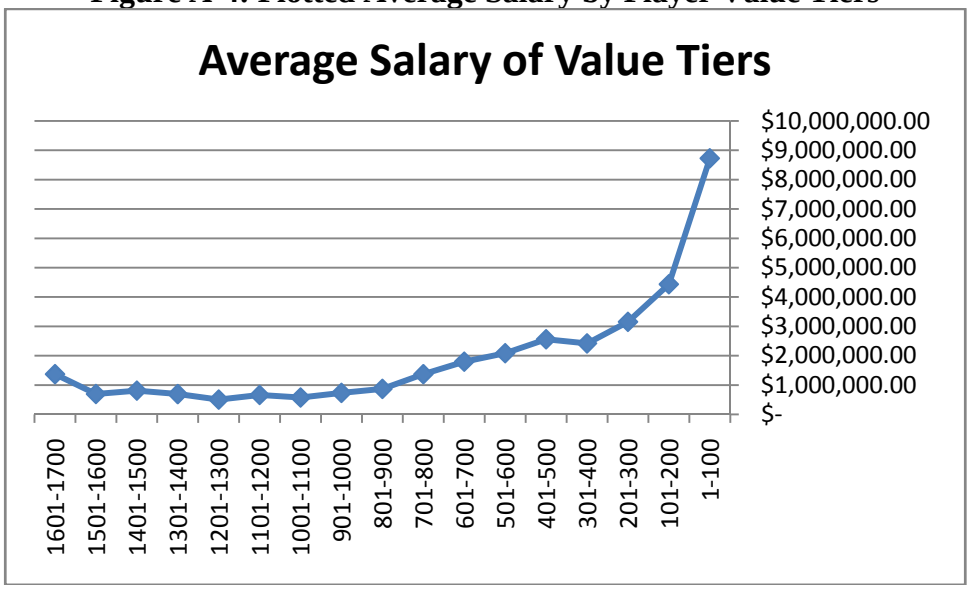
Figure A-2: 50 Lowest Residuals, Most Under-Valued NFL Athletes in 2009

PLAYER	2009 Team	RESIDUAL	POSITION	SALARY
Seau, Junior	NEP	-1.003972249	Linebacker	$1,145,000
Taylor, Jason	MIA	-0.983338255	Defensive End	$1,102,860
Jolly, Johnny	GBP	-0.863279769	Defensive Tackle	$535,910
Adams, Flozell	DAL	-0.85528156	Outside Linebacker	$1,005,720
Milloy, Lawyer	SEA	-0.851555842	Safety	$845,000
Smith, Steve	NYG	-0.811731709	Wide Receiver	$466,110
Sharper, Darren	NOS	-0.747353521	Safety	$1,704,550
Holliday, Vonnie	DEN	-0.720253594	Defensive End	$895,000
Richardson, Tony	NYJ	-0.707625065	Running Back	$902,280
Brown, Mike	KCC	-0.696397812	Safety	$900,000
Bly, Dre'	SF4	-0.695709599	Cornerback	$866,560
Starks, Randy	MIA	-0.691968126	Defensive End	$385,000
Daniels, Phillip	WAS	-0.691714138	Defensive End	$900,720
Thomas, Hollis	CAR	-0.686948151	Defensive Tackle	$845,000
Davis, Leonard	DAL	-0.669966184	Outside Linebacker	$755,720
Muhammad, Muhsin	CAR	-0.643848829	Wide Receiver	$1,502,990
Jones, Thomas	NYJ	-0.616522839	Running Back	$1,000,000
Bruce, Isaac	SF4	-0.60386376	Wide Receiver	$1,750,000
Salaam, Ephraim	DET	-0.593538824	Outside Linebacker	$896,040
Bethea, Antoine	IND	-0.586839882	Safety	$540,720
Green, Ahman	GBP	-0.582326869	Running Back	$845,001
Newman, Terence	DAL	-0.581402624	Cornerback	$902,280
Mawae, Kevin	TEN	-0.579865195	Outside Linebacker	$3,005,070
Baker, Chris	DEN	-0.579629884	Defensive Tackle	$325,000
Trotter, Jeremiah	PHI	-0.56860119	Linebacker	$845,000
Robinson, Bryan	ARZ	-0.568404233	Defensive Tackle	$1,225,780
Woodley, LaMarr	PIT	-0.564856021	Linebacker	$466,240
Romo, Tony	DAL	-0.563869654	Quarterback	$625,980
Wynn, Renaldo	WAS	-0.557852089	Defensive End	$845,000
Garza, Roberto	CHI	-0.555366423	Outside Linebacker	$820,000
Jansen, Jon	DET	-0.55012474	Outside Linebacker	$796,690
Becht, Anthony	ARZ	-0.548409554	Tight End	$799,680
Spencer, Anthony	DAL	-0.546190344	Defensive End	$485,680
Brown, Alex	CHI	-0.541562953	Defensive End	$750,070
Bowman, Zackary	CHI	-0.534882236	Cornerback	$315,200
DeCoud, Thomas	ATL	-0.521996655	Safety	$392,280
Goldson, Dashon	SF4	-0.520618479	Safety	$467,280
Harper, Roman	NOS	-0.513872973	Safety	$540,200
Fletcher, London	WAS	-0.511925554	Linebacker	$2,250,000
Session, Clint	IND	-0.511492008	Linebacker	$466,760
Dumervil, Elvis	DEN	-0.510174041	Defensive End	$540,980
Johnson, Charles	CAR	-0.505058559	Defensive End	$465,720
Thomas, Terrell	NYG	-0.500858339	Cornerback	$391,110
Brunell, Mark	NOS	-0.500124776	Quarterback	$1,555,000
Vincent, Keydrick	CAR	-0.498514415	Outside Linebacker	$870,000
Pollard, Bernard	HOU	-0.493684684	Safety	$535,000
McNeill, Marcus	SDC	-0.490435855	Outside Linebacker	$541,630
McClure, Todd	ATL	-0.489938033	Outside Linebacker	$1,407,280
Celek, Brent	PHI	-0.486922144	Tight End	$467,280

Figure A-3: Average Salary Tiered by Player Value Rank

Over-Value Rank	Average Salary
1-100	$ 8,727,658.69
101-200	$ 4,435,758.00
201-300	$ 3,154,780.38
301-400	$ 2,419,325.87
401-500	$ 2,558,694.94
501-600	$ 2,084,677.46
601-700	$ 1,796,897.05
701-800	$ 1,368,842.31
801-900	$ 867,930.07
901-1000	$ 734,000.54
1001-1100	$ 575,326.94
1101-1200	$ 659,877.00
1201-1300	$ 503,042.65
1301-1400	$ 692,240.85
1401-1500	$ 810,941.23
1501-1600	$ 693,595.90
1601-1700	$ 816,586.97

Figure A-4: Plotted Average Salary by Player Value Tiers



Appendix M: Player Value Table

PLAYER	*2009 Team*	*Player Value*	*Salary*	*Position*
Favre, Brett	MIN	7.413468923	$ 12,000,000	Quarterback
Mawae, Kevin	TEN	7.114009259	$ 3,005,070	Outside Linebacker
Woodson, Charles	GBP	7.071673191	$ 6,507,280	Cornerback
Manning, Peyton	IND	7.037787812	$ 14,005,720	Quarterback
Taylor, Jason	MIA	7.023449595	$ 1,102,860	Defensive End
Seau, Junior	NEP	7.013540495	$ 1,145,000	Linebacker
Sharper, Darren	NOS	7.009184716	$ 1,704,550	Safety
Lewis, Ray	BAL	6.990436191	$ 10,006,240	Linebacker
Gonzalez, Tony	ATL	6.96966954	$ 4,507,280	Tight End
Dawkins, Brian	DEN	6.951823019	$ 7,182,210	Safety
Barber, Ronde	TBB	6.940167814	$ 3,006,760	Cornerback
Moss, Randy	NEP	6.932185449	$ 6,507,280	Wide Receiver
Owens, Terrell	BUF	6.931104432	$ 6,250,000	Wide Receiver
Farrior, James	PIT	6.912032336	$ 2,979,680	Linebacker
Fletcher, London	WAS	6.899606891	$ 2,250,000	Linebacker
Peppers, Julius	CAR	6.874581966	$ 16,683,000	Defensive End
Pryce, Trevor	BAL	6.86136277	$ 4,000,000	Defensive End
Saturday, Jeff	IND	6.853993011	$ 8,954,160	Outside Linebacker
Williams, Pat	MIN	6.849788286	$ 4,600,000	Defensive Tackle
Ward, Hines	PIT	6.842230642	$ 5,804,680	Wide Receiver
Faneca, Alan	NYJ	6.837837641	$ 7,000,000	Outside Linebacker
Adams, Flozell	DAL	6.828477684	$ 1,005,720	Outside Linebacker
Jenkins, Cullen	GBP	6.825314226	$ 3,100,000	Defensive End
Muhammad, Muhsin	CAR	6.823200749	$ 1,502,990	Wide Receiver
Dockett, Darnell	ARZ	6.822417804	$ 3,500,000	Defensive Tackle
Bruce, Isaac	SF4	6.811121891	$ 1,750,000	Wide Receiver
Peterson, Mike	ATL	6.801373787	$ 3,507,280	Linebacker
Bailey, Champ	DEN	6.800559892	$ 9,001,525	Cornerback
Mason, Derrick	BAL	6.776024584	$ 3,004,160	Wide Receiver
Milloy, Lawyer	SEA	6.77121091	$ 845,000	Safety
Brooking, Keith	DAL	6.760878864	$ 3,500,000	Linebacker
Wiegmann, Casey	DEN	6.758614875	$ 2,505,070	Outside Linebacker
Bulluck, Keith	TEN	6.75783493	$ 6,503,120	Linebacker
Ellis, Greg	OAK	6.75592425	$ 3,000,000	Linebacker
Wayne, Reggie	IND	6.748239979	$ 4,940,000	Wide Receiver
Kreutz, Olin	CHI	6.744906873	$ 3,133,333	Outside Linebacker
Collins, Kerry	TEN	6.739708513	$ 8,507,280	Quarterback
Porter, Joey	MIA	6.721813265	$ 5,000,000	Linebacker
Schobel, Aaron	BUF	6.720652717	$ 6,997,761	Defensive End
Tomlinson, LaDainian	SDC	6.709375747	$ 6,731,630	Running Back
McNabb, Donovan	PHI	6.6968901	$ 12,507,280	Quarterback
Brady, Tom	NEP	6.693869795	$ 8,007,280	Quarterback
Pace, Orlando	CHI	6.685581893	$ 6,000,000	Outside Linebacker
Thomas, Tra	JAC	6.67912064	$ 2,350,000	Outside Linebacker
Williams, Kevin	MIN	6.676496682	$ 1,500,000	Defensive Tackle
Clark, Dallas	IND	6.676002209	$ 3,350,000	Tight End
Holliday, Vonnie	DEN	6.675188184	$ 895,000	Defensive End
Spikes, Takeo	SF4	6.673395487	$ 3,006,760	Linebacker
Springs, Shawn	NEP	6.672784367	$ 4,557,280	Cornerback

Appendix N: Player Values Compared to Outside Data

Player Value Rank	*PLAYER*	*Player Value*	*PFR Rank*	*PFR Listing*
1	Favre, Brett	7.413468923	1	Peyton Manning
2	Mawae, Kevin	7.114009259	2	Ray Lewis
3	Woodson, Charles	7.071673191	3	LaDainian Tomlinson
4	Manning, Peyton	7.037787812	4	Jason Taylor
5	Taylor, Jason	7.023449595	5	Ronde Barber
6	Seau, Junior	7.013540495	6	Tom Brady
7	Sharper, Darren	7.009184716	6	Brian Urlacher
8	Lewis, Ray	6.990436191	7	Donovan McNabb
9	Gonzalez, Tony	6.96966954	8	Reggie Wayne
10	Dawkins, Brian	6.951823019	8	Champ Bailey
11	Barber, Ronde	6.940167814	9	Tony Gonzalez
12	Moss, Randy	6.932185449	10	Drew Brees
13	Owens, Terrell	6.931104432	10	Brian Dawkins
14	Farrior, James	6.912032336	11	Mark Brunell
15	Fletcher, London	6.899606891	12	Julius Peppers
16	Peppers, Julius	6.874581966	13	Charles Woodson
17	Pryce, Trevor	6.86136277	14	Ed Reed
18	Saturday, Jeff	6.853993011	14	James Farrior
19	Williams, Pat	6.849788286	15	Jeff Garcia
20	Ward, Hines	6.842230642	15	Jeff Saturday
21	Faneca, Alan	6.837837641	16	Antonio Gates
22	Adams, Flozell	6.828477684	16	Joey Porter
23	Jenkins, Cullen	6.825314226	17	Chad Ochocinco
24	Muhammad, Muhsin	6.823200749	18	Hines Ward
25	Dockett, Darnell	6.822417804	18	Derrick Mason
26	Bruce, Isaac	6.811121891	18	Kevin Williams
27	Peterson, Mike	6.801373787	19	Kerry Collins
28	Bailey, Champ	6.800559892	20	Richard Seymour
29	Mason, Derrick	6.776024584	20	Lance Briggs
30	Milloy, Lawyer	6.77121091	21	Matt Light
31	Brooking, Keith	6.760878864	22	John Abraham
32	Wiegmann, Casey	6.758614875	23	Matt Hasselbeck
33	Bulluck, Keith	6.75783493	23	Keith Brooking
34	Ellis, Greg	6.75592425	23	Takeo Spikes
35	Wayne, Reggie	6.748239979	24	London Fletcher
36	Kreutz, Olin	6.744906873	24	Jon Kitna
37	Collins, Kerry	6.739708513	25	Philip Rivers
38	Porter, Joey	6.721813265	25	Steve Hutchinson
39	Schobel, Aaron	6.720652717	25	Ricky Williams
40	Tomlinson, LaDainian	6.709375747	26	Michael Vick
41	McNabb, Donovan	6.6968901	26	Andre Johnson
42	Brady, Tom	6.693869795	27	Steve Smith
43	Pace, Orlando	6.685581893	27	Jared Allen
44	Thomas, Tra	6.67912064	28	Donald Driver
45	Williams, Kevin	6.676496682	29	Mike Peterson
46	Clark, Dallas	6.676002209	29	Troy Polamalu
47	Holliday, Vonnie	6.675188184	29	Ryan Diem
48	Spikes, Takeo	6.673395487	30	Shaun Ellis
49	Springs, Shawn	6.672784367	30	Aaron Smith
50	Brunell, Mark	6.670724557	30	Ben Roethlisberger
51	Driver, Donald	6.665894059	30	Carson Palmer

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