What Makes NFL Franchises Successful?

A Value-Based Analysis of the NFL Draft

The Honors Program
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ABSTRACT

The National Football League (NFL) is characterized as a dynamic sports league. The game has continued to evolve over time as rules and skill levels have developed and changed. Consequently, the strategies employed by the league's teams have evolved and the variety of strategies has increased in number. This paper aims to analyze the NFL draft. It will seek to find an optimal drafting strategy and develop a forecasting formula as a way to predict a college player's future success in the NFL. It will look at the varying level of value certain positions provide to teams and which positions are most valuable. In addition, it will seek to determine the amount of value a team can expect a player to provide based on the round he was drafted in and the position he plays.

INTRODUCTION

NFL franchises spend millions of dollars on players and coaches in an effort to put the best possible team on the field. Since player salaries have escalated in recent years, identifying the best players is extremely important because mistakes can be costly.

There are two main ways teams in any major professional sports league acquires talent: free agency and the draft. Many professional sports do not have a salary cap, so rich franchises can outspend poorer franchises in free agency to get the best players. This is often cited in a sport like baseball, where teams like the New York Yankees, Boston Red Sox, Los Angeles Dodgers, and New York Mets routinely outspend other Major League Baseball teams to acquire the best players in free agency. In baseball, even teams that draft well, often have a difficult time keeping their young talented players once these players become eligible for free agency.

However, the NFL has a salary cap and teams are limited in how much money they can spend. Since the disparity in payrolls among teams is much smaller, richer teams aren't able to outspend their opponents. The best players who are eligible for free agency have less of a reason to leave their current team because other teams cannot offer significantly more money. As a result, free agency plays a much smaller role in the acquisition of talent and the draft becomes far more vital.

In the draft process, teams are essentially trying to identify players who will provide the most value for their team. If teams had a better method of predicting which players would provide the most value, and were able to identify a drafting strategy that would optimize the value they obtain through the draft, their franchises would have a significant advantage over their opponents.

We have statistical measures to quantify the on-field play of quarterbacks, running backs, wide receivers, and defensive players. Therefore we can compare players of similar positions. However, since these players accumulate different types of statistics based on position, it is not easy to compare the contributions by a player from one position to the contributions of a player of another position. My analysis will be important because I will formulate an optimal draft strategy to maximize the value an NFL team can garner from a draft. It will examine players' statistics with an index to compare players of various positions. It will convert this figure into another index to take into account career length, so we can compare players who have playing careers of different lengths. Using this index, we can see what positions provide the most value. It will then show where these positions should be taken in the draft, given the past performances of players of similar position (comparing the total value added from taking a quarterback in the first round and a running back in the fourth round to the value of taking a running back in the first round and a quarterback in the fourth round). This would help teams devise an optimal drafting strategy.

Additionally, my analysis will be important to the public. Individual teams undergo their own assessments of rating players, but these analyses are not made public. Fans do not have access to the type of information teams do and therefore may not understand why a team would draft a player at a certain position. Fans spend millions of dollars on magazines, books, cable television, and online publications with inside information. However, there is no information like this currently available. As a result, many fans focus on high-profile positions, such as quarterback and running back, but know little about the relative value of much lower-profile positions, such as nose tackle or safety. This analysis will validate whether or not these high profile positions are more valuable than lesser-profile positions.

RESEARCH

Among all professional sports leagues, The National Football League is by far the most lucrative sports league. In 2007, the NFL's annual revenues exceeded $7 billion (Biner 2009). In contrast, Major League Baseball generated revenues of just over $6 billion, the National Basketball Association was around 3.3billions and the National Hockey League lagged far behind (Biner 2009).

To ensure equalization, there must be a constant supply of new playing skill (Biner 2009). Barriger et al. (2004) theorized that a salary cap should narrow the talent gap between teams because an "overzealous owner" would not be able to engage in "monopolizing playing talent". This should result in competitive balance among teams. A salary cap results in equal playing strengths and would be adopted if the cap is sufficiently low (Biner 2009). However, they found, that since the institution of the "hard salary cap" in 1994, the level of competitive balance has regressed (Barriger et al. 2004).

Hendricks et al. (2008) discussed the concept of player value. NFL teams must estimate a collegiate player's value based on statistical information, personal information, combine results and other factors.

Treme and Allen (2009) elucidated on the difficulty and consequence of evaluating players in the draft. Organizations acquire tremendous amounts of information on players. This includes on and off the field evaluations, scouting tapes, personal information, personal interviews, and the scouting combine results. Based on this information, teams must "make an estimate of that player's value" (Treme and Allen 2009). The players expected to provide the most value will be drafted early, compensated well, and will most likely be among the best and most valuable players on the team.

Hendricks et al. (2008) took particular interest in the value of players selected in the later rounds of the draft because so few players meet the "minimum acceptable standards" of an NFL player, compared to the number of players who meet those standards in the early rounds. If a team can routinely select players in the later rounds who have significant value, they will have a certain advantage over their competition. In addition, these players carry much less risk because their salaries are lower and the lengths of the contracts are shorter.

Being able to properly evaluate players taken in the first few rounds is of the utmost importance for two reasons. First, these are the players that will receive the highest salaries, in long-term contracts, with the most guaranteed dollars (Treme and Allen 2009). Secondly, there will be players taken in the later rounds of the draft or not drafted at all, which can provide an impact, but Treme and Allen (2009) cautioned that the number of these players remains "very few".

The importance of quarterback play is getting more and more credence in regards to their respective team's success. Stair et al. (2008), in their article entitled "The Factors affecting team performance in the NFL: does off-field conduct matter?" found that little research had been done examining the determinants of winning percentages of NFL teams. Many have often looked at offensive and defensive yardage as measureables that translate into success. Several different researchers have tried to isolate other variables, such as yards per pass, "Give-N-Take" differential, and salary cap allocation. The article broke down variables into four categories: offensive performance variables, defensive performance variables, special teams variables, and others. The results indicated that QB rating, an offensive performance variable, had the largest impact on team wins (Stair et al. 2008).

Sports media is now highlighting the importance of quarterback play, as well. Miklasz (2010) stated simply "This is a passing league now". In the past two NFL seasons (2009 and 2008), the league's second and fourth highest yards passing per game have been recorded. The teams with the most success passing the ball have had the most success. Over the past three seasons, twenty-one of the thirty six teams to make the postseason were ranked in the top third in passing. Most recently, in 2009, ten of the twelve teams were in this top third (Miklasz 2010).

Most of the top quarterbacks today were drafted early. In fact, over half of the teams that have made the playoffs in the last decade had quarterbacks who were first round draft picks. However, teams are often fearful of drafting quarterbacks in the draft because of the immense risk. Miklasz (2010) recaps a number of players who have failed, and the devastating impact it had on the teams that drafted these players.

Based on this information, as well as the questions still left unanswered, this paper will seek to expand on their information and answer four essential questions.

QUESTIONS

At the beginning of this paper, four hypotheses were made, posing the following questions.

A. Can we identify a drafting strategy to optimize the amount of value a team can garner in the NFL draft?

B. Are NFL team payrolls highly correlated with their winning percentages?

C. Are there certain metrics we can use from college quarterbacks' statistics that will allow us to predict whether or not they will be successful NFL quarterbacks?

D. Is the value added index variable a viable tool for assessing a player's value?

HYPOTHESES

Different positions provide different levels of value to NFL teams and some positions are deeper in talent (meaning there are more available players that will provide this value). Due to differing values of these positions and player availability, NFL teams will select the players with the most value and least availability earliest in the draft.

A. Optimal Drafting Strategy-. NFL teams can devise a drafting strategy that will allow them to identify the best way to optimize total draft value.

Paying more for players will allow teams to acquire better players through free agency because players generally chose to play for teams who are willing to provide them the best compensation.

B. Payroll- Teams with the higher payrolls will acquire better players and, consequently, will have more success, dictated by higher winning percentages.

It is a commonly held belief that the quarterback position provides more value than any other position. This paper will attempt to prove this theory and show the importance of drafting quality quarterbacks on a team's success and the metrics used to identify these players.

C. A college quarterback's college statistics can be used to predict his level of success in the NFL.

This paper's analysis will use a "value added index" variable to quantify a players value to a team, taking into account position and career length.

D. The value added index variable is a valuable tool to use in quantifying a player's value.

METHODOLOGY

The first part of this study's analysis is looking into how professional teams can identify the best college players to draft. There is data published by pro-football reference.com, which includes a career value statistic. The Career Added Value is computed by summing 100% of the player's best-season Added Value, 95% of his second-best-season Added Value, 90% of his third best, and so on. From this statistic this study constructed a variable called "value added" for all players drafted from 2000-2009. Based on the number of seasons a player has been in the NFL, this study computed what the average Career Added Value would be for each player. Overall this variable will be used an indicator of how successful a career a player has had. The transformation of this variable allows us to compare players' value controlling for position and length of career. Thus, it can be used across positions for comparison purposes (even for defensive players, offensive lineman, and other players who do not routinely score points). Secondly, it can be used to compare players who have been in the NFL longer (having more opportunity to provide "value") to players who have had less time to produce value. For example, you would not want to compare the total value of a player who has been in the NFL for ten years to a player who has been in the NFL for two years. This variable will allow for this study to determine how much relative value each team has acquired through the draft.

A. For one set of regressions this study will use the value added index, calculated as previously described, as the dependent variable. I then acquired college players collegiate statistics (along with other metrics the study has found important through a literature review, such as height) to be used as independent variables. By doing this, we can see which college statistics are important to having success in the NFL. This would be important for NFL teams because they can focus in on the statistics measures that do indicate a higher likelihood of success in the NFL.

B. Using the same data set, this study will find the value added by all players by position and round. We will be able to see how much value each position adds on average, to determine what positions provide the most value. We will pay particular attention to the quarterback position, as this is thought to be the most valuable position in the sport and the hardest to predict future success. This paper will look at college statistics of quarterbacks drafted over the last decade. We will try to identify what college statistics would be most important for NFL scouts to look at (what statistics are most correlated with NFL success). This will be done by using college quarterbacks' college statistics as independent variables and their NFL statistics for quarterback rating and their NFL value added index as dependent variables. This paper will then break down the draft by round to determine an optimal drafting strategy. We would like to know if there an optimal round to draft a certain position based on depth and average value added in that round.

C. This study will also look into whether drafting more talented players has a direct effect on winning, in order to show the importance of drafting well for an NFL franchise to be successful. We will use the sum total of the value added variable for all of the players on a given team as the independent variable and the number of wins for that team over the same period of time as the dependent variable. This will show if there is a correlation between the value acquired in the draft and winning.

DATA AND VARIABLES

This study used pro-footballreference.com as its database for the draft analysis regressions. This website has created a metric that quantifies the amount of value (points) a player has provided his team since being drafted, the round he was drafted in and the position he plays. Although not all players physically score points, this value quantifies all players contributions to his team point total, regardless of whether the player scored himself, or his play on the field helped score points for his team. This allowed for analysis as to how much predicted value players provide based on draft round and position.

Definition of Variables

Variable	Definitions
QB	The position of quarterback
RB	the position of running back
WR	the position of wide receiver
TE	the position of tight end
C	the position of center
G	the position of guard
T	the position of offensive tackle
DE	the position of defensive end
DT	the position of defensive tackle
DB	the position of defensive back
LB	the position of linebacker
NT	the position of Nose tackle
pick #	The overall draft pick number (in ascending order) for a given year
Comp %	Completion Percentage
Rating	College quarterback rating
Height	A quarterback's height (in inches)
Round	The overall draft round number (in ascending order) for a given year
BCS	Dummy Variable 1= Player played in a BCS Conference, 0 if not
Attempts	Number of Passes attempted in a player's college career
Yards	Number of Yards thrown for in a player's college career
Touchdowns	Number of Touchdowns thrown for in a player's college career
Yrds/Att	Number of yards gained per pass attempt
Rush att	Number of rush attempts
Yds/Rush	Number of yards per rushing attempt
QB Rating	NFL quarterback rating
Index/ AV	A figure quantifying the value a player has added to his team (in points) per year
Wins	the number of wins a team had in a given year (regular season)
Payroll	The total payroll (in millions of dollars) for a given team
AVGSAL	the average salary (in millions of dollars) for players of a given position
AVGSTRT	the average salary (in millions of dollars) for a starter of a given position
PCT	Completion Percentage in the NFL
YDS/A	Yards per attempt in the NFL

REGRESSION ANALYSIS

A. Optimizing Draft Value

While it is important to know how much value each position averages in each round, it is equally important to understand how much the value players of a certain position lose each round in order to optimize the round you take players of a certain position. For instance, if position A were to average 100 in the first round and position B averages 80 in value, it still may be smart to take the player from position B. For example, if the position A declined by 10 index points in value and position B declined by 30 points in value each round, you would get more overall value drafting position B in the 1st round and A in the second round (170 value points) than drafting position A in the first round and B in the second round (150 value points). Players' values typically decline because the best players (who will provide the most value) are drafted first.

Consequently, teams should benefit from selecting players early in the draft, which play positions that lose the most value as the draft moves into the later rounds. Thus, the following regression was run for the overall value decline by round and pick and for each individual position. To find these values, this study calculated the average value each position provided for the first round. This was done by taking all the value added for all players drafted from that position for the entire data sample and finding the average of this variable. As the draft progresses, the number associated with each round in the draft increases. As the round number increases, the average value decreases, because the best players are selected first. Thus we can expect the highest average added value in the first round and then for value to decrease for each subsequent round after.

(See Appendix A for complete regression results)

	Average 1st round value	Value Lost Per Round	P-value	Significance
Overall	245	33.9	0.000	***
QB	252	37.1	0.000	***
RB	315	47.1	0.000	***
WR	228	33	0.000	***
TE	235	31.3	0.000	***
C	242	31.4	0.000	***
G	207	25.9	0.000	***
T	300	43.6	0.000	***
DE	243	30.6	0.000	***
DT	232	31.8	0.000	***
DB	220	29.1	0.000	***
LB	258	35.1	0.000	***

Figure 1: Value Added Index

What this table means is that, on average, a quarterback would provide 245 points in the first round and then lose 37.1 points in value added for each subsequent round if the rate of lost value were linear. The three stars of significance indicate that each variable was significant at the 1% level of significance.

The regression shows that the positions of tackle, running back and quarterback, not only provide a higher starting value on average, but the amount of value they produce also declines the most per round. This would suggest drafting these three positions as early as possible would benefit NFL franchises. If a team were to wait until later rounds to draft these positions, significantly more value would be lost in comparison to other positions.

On the other hand, drafting a position such as guard, would, on average, not be a wise decision. Guard not only has the lowest starting value, but the amount of value lost by forgoing selecting a guard early and then drafting one later is not as great a loss in value as doing the same for other positions.

The following table shows how much value each position has provided, broken down by round. The average value for each position for each round was calculated. The table accounts for the non-linear decline in value we have seen in actuality (for the years 1999-2008). By "non-linear decline" we are referring to the aspect that although value is lost each round. The drop from one value to the next is not always constant, based on historical averages. The table was produced to see if there are any positions that routinely are able to produce great value later in the draft. Such information would be valuable, because a team could wait to take a player of that position later in the draft and spend an earlier pick on another position that had a greater disparity in value between the early and late rounds.

See Appendix B for complete Summary Statistics

	Round	1	2	3	4	5	6	7
Position	All	261.36	171.82	105.92	87.57	58.2	39.01	35.99
QB	100.081061	286.7	85.1	60.7	90.9	10.09	64	25.2
RB	125.4	322.7	183.8	153.8	96	59.2	31.9	15.6
WR	86.81	238.8	172.4	95.7	62.1	36.42	18.26	31.17
TE	94.5	255.4	169.6	117.3	81.2	61.4	50	34.47
C	91.7	223.9	195.9	157.5	78.9	96.7	41.3	35.6
G	87.62	258.1	164.4	85.3	91.2	65.6	56.3	39
T	116.11	277.7	254.4	123.8	73.7	55.5	25.34	45.8
DE	120.4	246.2	149.8	114.6	138.1	99.6	31.37	53.4
DT	92.18	222.7	175.1	106.5	63.6	75.8	43.17	21.95
DB	101	232.7	168.1	92.6	88.8	58.63	42.97	48.06
LB	111.97	298.5	172.8	113.8	120.1	62.9	54.2	37.02

Figure 2: Draft Value Chart

Optimizing Value for a Single Draft Pick

One can compare how much value a player from one position should provide versus the average player (or any specific other position) selected in the same round. This would help determine if it is worth selecting a player from this position in this round. A simple highlighting procedure quickly produces a table that could show NFL general managers making draft selections, what positions produce above average value for that round.

	Round	1	2	3	4	5	6	7
Position	All	**261.36**	**171.82**	**105.92**	**87.57**	**58.2**	**39.01**	**35.99**
QB	100.081061	286.7	85.1	60.7	90.9	10.09	64	25.2
RB	125.4	322.7	183.8	153.8	96	59.2	31.9	15.6
WR	86.81	238.8	172.4	95.7	62.1	36.42	18.26	31.17
TE	94.5	255.4	169.6	117.3	81.2	61.4	50	34.47
C	91.7	223.9	195.9	157.5	78.9	96.7	41.3	35.6
G	87.62	258.1	164.4	85.3	91.2	65.6	56.3	39
T	116.11	277.7	254.4	123.8	73.7	55.5	25.34	45.8
DE	120.4	246.2	149.8	114.6	138.1	99.6	31.37	53.4
DT	92.18	222.7	175.1	106.5	63.6	75.8	43.17	21.95
DB	101	232.7	168.1	92.6	88.8	58.63	42.97	48.06
LB	111.97	298.5	172.8	113.8	120.1	62.9	54.2	37.02

Figure 3: Draft Value Chart: Single Draft Selection Optimization

By doing this, several drafting strategies can be ascertained for each position.

Quarterback- Quarterback provides significant value in the first round, but then experiences by far the sharpest decline in value after the first round. In fact, all rounds provide less than average value for the quarterback position (100) except round 1. If one is to draft a quarterback, you should probably do so in the first round. This follows Miklasz theory on the importance of drafting quarterbacks in round one.

Running back- Provides above average value in the first five rounds and below average in the last two rounds. Running back also experiences sharp declines, but significant value can still be acquired through round three. Running backs selected after round 3 are below average running backs (value less than 125.4).

Wide Receiver- Provides below average value for all rounds except round two. It appears this would be the optimal round to select a wide receiver.

Tight End- Only provides above average value in round three and five; this position's optimal draft rounds.

Center- The center position experiences no large drops in value and does not greatly differ from the average value for all positions in any round. Thus, selecting a player from one round to the next probably will not yield too great a difference. Since other positions do provide greater benefit in the earlier rounds, the position of center should be selected later in the draft.

Guard- Should be selected in the later rounds, as it provides lesser value on average in the first three rounds and above average value in the last four rounds. Guard is one of three positions that you can draft that provides above average value for its position (87.62) after the third round.

Tackle- Should be selected in the early rounds, as it provides greater value on average in the first three rounds. A team should probably focus on the first two rounds, as there is a sharp decline in value between round two and three. It seems as the best tackles are identified and drafted early because of this sharp decline, and selecting tackles later in the draft is probably not worth it.

Defensive End- Provides above average value in the middle three rounds, as well as the last round. There is a sharp decline after round five, so drafting in rounds 3-5 would be optimal. You can still draft an above average defensive end in the fourth round.

Defensive Tackle- Is similar to center in that it does not differ too greatly from the average in any one round and there are no drastic declines in value from round to round. Thus, there is no optimal drafting round.

Defensive back- Does not provide above average value until the third round and therefore, teams would benefit from selecting these players later in the draft.

Linebacker- Rates as above average in value for all rounds and does not experience large fluctuations in value from round to round. The decline from round one to round two is the greatest, but teams can still acquire above average value in later rounds, so no round should be deemed optimal.

By adhering to the chart and the above recommendations, a team assures that they can select players of above average value in that round (based on historical figures). Still, teams need to exercise their own judgment. If their scouting has identified a player as potentially having significant value, they cannot assume that his value isn't such. We must remember that the figures used for this analysis represent the average value of a large sample of players. There are always players who exceed the average. Conversely, teams should not select a player of a certain position assuming his value is higher than what they have observed through scouting, just because historical average dictate it would be unlikely. There are always players who will fall below the historical average and thus, they should not be drafted as highly, if scouting dictates that their value is below average.

Optimizing Value over the course of an Entire Draft

A simple color-coded chart, as constructed below, would be a useful tool for general managers during the draft when time to make picks is limited. Based on the analysis above, this chart highlights in green when a position should be drafted, when it would be acceptable (yellow), and when it should be avoided (red).

If a team knows they have a need at a certain position, they could plan on what round they need to try and select a player. For instance, if a team knows they need a running back, they should plan on using one of their picks in the first three rounds to acquire one.

If a team is in the middle of the draft with no particular positional need, they could refer to the chart and see what players available play positions that should provide the most value for that round. For example, if a team needs to make a selection in the fourth round, they should primarily focus on defensive end, defensive back and linebacker, while avoiding tackle and defensive tackle. This would be vital in acquiring the most possible value over the entire draft.

	Round	1	2	3	4	5	6	7
Position	All	**261.36**	**171.82**	**105.92**	**87.57**	**58.2**	**39.01**	**35.99**
QB	**100.081061**	286.7	85.1	60.7	90.9	10.09	64	25.2
RB	**125.4**	322.7	183.8	153.8	96	59.2	31.9	15.6
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C	**91.7**	223.9	195.9	157.5	78.9	96.7	41.3	35.6
G	**87.62**	258.1	164.4	85.3	91.2	65.6	56.3	39
T	**116.11**	277.7	254.4	123.8	73.7	55.5	25.34	45.8
DE	**120.4**	246.2	149.8	114.6	138.1	99.6	31.37	53.4
DT	**92.18**	222.7	175.1	106.5	63.6	75.8	43.17	21.95
DB	**101**	232.7	168.1	92.6	88.8	58.63	42.97	48.06
LB	**111.97**	298.5	172.8	113.8	120.1	62.9	54.2	37.02

Figure 4: Draft Value Chart: Value Optimization for an entire Draft

B. Payroll

As previously discussed, NFL franchises are limited in the amount of money they can spend on players however, not all teams spend the same amount of players. Is it really beneficial to be a “high payroll team”? To assess the impact of dollars spent, a simple linear regression was run using team payroll as the predictor and wins as the response variable. The results, which are significant at the alpha=.02 level, indicate that for every additional million dollars spent, a team can expect to win .09 additional games (see appendix C for complete regression).

Although this may seem like a lot of money needed to generate an additional win, it is important to realize that in the 2009 season payrolls ranged from over 137 million dollars down to slightly over 62 million dollars (see appendix D for complete descriptive statistics). Teams that spent the least, generally finished worst. Of the nine teams with five wins or less, six had a payroll that ranked between 24th and 32nd (out of 32). No teams in the top 11 in team payroll had less than 7 wins.

Since certain positions provide more value than others and there is a correlation between money spent and winning, it would make sense that teams would reward positions that provided the most average value with the highest salaries. Nonetheless, this does necessarily bear itself out in reality. A simple linear regression was run with the variable of added value for each position as the dependent variable and the average salary for that respective position as the explanatory variable. Although the correlation was positive it was far from statistically significant based on a p-value of 0.883 (See appendix E for complete regression).

A regression was then run using the average salaries of NFL starters (players who play the most). This was to control for variability in salaries among second string players. However, similar results were found and there appears to be no significant correlation (a p-value of 0.976) between the average value a position offers and the average salary of that position (See appendix F for complete regression). This indicates that just because one position may provide more value to a team than another, players of the higher value position may not necessarily receive higher compensation.

One of the confounding factors that may distort this is position availability. There are far more players that can be acquired for certain positions than others, so they have less demand. The average quarterback may not provide as much value as other positions but there are far few players capable of playing the position and the best quarterbacks provide significantly more value than almost any other position. Consequently, their low supply and high demand raises their average wage above that of other positions. This would be in line with principle economic theory that states as supply rises, demand decreases, and price decreases.

The results of previous regressions show that certain positions provide more value than other positions and the more value a team can acquire through the draft, the more successful that team is. Consequently, the question should be posed; does drafting certain positions more frequently translate into a higher success rate for NFL teams?

Even though a team can't play an unlimited amount of players of a certain position at one time, perhaps drafting certain positions more frequently, results in a higher probability of drafting an above average player of a certain position. If that position provides significant value, then taking more chances of trying to draft a player of that position, would result in a higher likelihood of successfully drafting an above average player.

All of this assumes that teams have identical drafting abilities. In "drafting ability", we are referring to the ability to recognize talent. It would be safe to assume that this is probably not the case; however, we can't pre-determine what teams in the future are going to be above or below average in being able to assess the ability of college players.

Nonetheless, to assess the possibility of drafting players of certain positions with higher frequency resulting in a higher winning percentage, a regression was run using wins as the response variable and the frequency of each position a team could draft as the respective explanatory variables.

The coefficient for each explanatory variable signifies the relative rate of success (wins) garnered from drafting the respective position (see appendix G for complete regression).

Position	Coefficient	P-value
C	3.726	0.279
DB	1.763	0.157
DE	2.235	0.221
DT	0.639	0.733
FB	-1.237	0.722
G	4.092	0.021
LB	-0.321	0.824
NT	21.900	0.06
QB	1.513	0.596
RB	0.523	0.799
T	2.803	0.117
TE	-1.334	0.588
WR	0.190	0.871

Figure 5: NFL Success based on Positional Drafting Frequencies

This regression shows us that drafting certain positions (FB, LB and TE) will detract (negative coefficients) from a team's win total, while the others should increase the number of wins they achieve. Using this regression, it is concluded that drafting nose tackles benefited teams by far more than any other position. This is indicated by the relatively high positive coefficient in comparison with any other position.

It is also worthy of note that the frequency with which any positions were drafted, other than nose tackle, showed no statistical significance in correlation with winning. This is most likely due to the rarity of nose tackles in the NFL. Since there are so few players capable of playing the position, teams that have acquired nose tackles with a higher level of frequency, have proven to have increased their success. Conversely, many teams view FB's and TEs as interchangeable and of lesser value than other skill positions. Linebackers are seen as more interchangeable because of their large availability.

C. Impact of Quarterbacks

Is it possible to predict a drafted quarterbacks NFL quarterback rating? To determine this, the following independent variables (college statistics) were tested: draft round, draft pick number, whether the player was from a BCS conference, pass attempts, pass completions, passing yards, passing touchdowns, yards per attempt, rushing attempts, yards per rushing attempt, and quarterback rating. The dependent variable used was the quarterbacks' NFL quarterback rating.

This study chose the draft variables based on the assumption that players chosen earlier in the draft are more coveted because they are perceived to have the skills needed to provide value to NFL teams (they are expected to be better players). We would expect the coefficient of the draft round variable to be negative.

We included the BCS variable because players coming from the best conferences and the best teams in college football. They face the best competition and generally play a higher caliber of college football, more similar to the NFL than non-BCS conferences. We would expect players from BCS conferences to be better players and provide more value. Players were classified as coming from a BCS conference or not, using a dummy variable. BCS players were given the value of 1 and all others were given the value of zero. We would expect the coefficient of this variable to be positive.

The rest of the variables are all statistics of the players' collegiate careers. We would expect players who have the best passing statistics to be better players in the NFL. We would expect the coefficients of these variables to be positive. Cmp is the variable for the number of completions a quarterback had, Att is the variable for number attempts, Yds is the variable for number of yards, TD is the variable for number touchdowns thrown, Y/A is the number of yards per attempt, and Rate is the variable for his college quarterback rating (a figure designed to capture a quarterback's overall passing acumen).

The study also included the rushing statistics because it is a common perception that quarterbacks relying on their legs and running the ball, rather than mostly throwing the ball, struggle in the NFL. This is because most NFL offenses are designed for "pure passers" and the defenses are too fast for quarterbacks to run on. We would expect the coefficients of these variables to be negative. ATT_1 refers to the amount of rushing attempts a player had in his career. Y/A_1 is the variable for yards per rushing attempt. The following table shows the coefficients of the regression, along with their p-values and significance level. The dependent variable was the players' added value (See appendix H for complete regression). One star of significance indicated the variable was significant at the 10% level, two stars indicate the variable was significant at the 5% level and three stars indicate the variable was significant at the 1% level.

Variable	Coefficient	P-value	Significance
round	-33.930	0.031	**
pick #	0.785	0.068	*
BCS	13.676	0.181	
Comp %	0.557	0.004	***
Attempts	-0.218	0.042	**
Yards	-0.033	0.053	*
Touchdowns	1.957	0.005	***
Yrds/Att	34.570	0.029	**
Rush Att	0.237	0.024	**
Yds/Rush	-14.541	0.011	**
Rating	-1.967	0.006	***

Figure 6: Regression Results for Quarterbacks' Added Value Index

Coefficients show how a one unit increase in the independent variable would change the value added index of a quarterback. For example, an increase in 1 % of completion percentage would increase a quarterback's value added index by .557.

Although the overall regression was highly significant, not all the individual variables are. To make a more parsimonious model, we systematically eliminated variables that had less theoretical backing and were deemed insignificant given their p-values (see appendix I for details). These variables were BCS and attempts. BCS was a dummy variable used to show whether or not a quarterback came from one of the six Bowl Championship Series conferences, widely accepted as containing the elite football teams in division one college football. The attempts variable was the total number of passes attempted. This was dropped because a quarterback's value should not increase just because he threw a lot of passes in his college career. Other metrics, the one's staying in the model, would be better indicators of skill.

After a few runs of eliminating variables, we arrived at the following final model, in which all the variables are significant at 10% level and the overall model is significant at the 10% level. The independent variables that are most significant are draft round and pick, completions, yards, touchdowns, yards per attempt, rushing attempts, rushing yards per attempt and college quarterback rating. The variable for round is highly significant and negative. This indicates that there is a steep decline in the NFL quarterback rating in the later rounds (higher round number) of the draft. This would make sense because the best players would be taken first. The pick number is positive but this is probably just offsetting some of the effect of the highly negative round coefficient. As the number of completions, yards per attempt and touchdowns increase we also see a large rise in predicted quarterback rating. Meanwhile, total yardage accumulated is slightly negative (just under 0). This means that sheer accumulation of yards is not as important in NFL success as being an efficient passer. It is more important to be accurate (completions) and lead scoring drives (touchdowns) than it is to rack up yardage. Yardage is important, however, as indicated by the significance of yardage per attempt. What this means is successful quarterbacks get their yardage using the fewest amount of passes. Remember yardage is not significant, but yards per attempt are. An example of this would be two quarterbacks who average 200 yards in a game. If one quarterback can get his 200 yards in 20 attempt and a second quarterback needs 40 attempts, the first quarterback is much more valuable and productive because he can get the same production in less plays and failed attempts. The following table shows the coefficients, p-values and level of significance of the final model, using the added value index as the dependent variable. One star of significance indicated the variable was significant at the 10% level, two stars indicate the variable was significant at the 5% level and three stars indicate the variable was significant at the 1% level.

Variable	Coefficient	P-value	Significance
round	-37.130	0.023	**
pick #	0.802	0.073	*
Comp %	0.329	0.038	**
Yards	-0.040	0.02	**
Touchdowns	1.711	0.014	**
Yrds/Att	36.350	0.027	**
Rush Att	0.165	0.1	***
Yds/Rush	-11.180	0.038	**
Rating	-1.636	0.02	**

Figure 7: Final Regression for Quarterbacks' Added Value Index

Coefficients show how a one unit increase in the independent variable would change the value added index of a quarterback. For example, an increase in 1 % of completion percentage would increase a quarterback's value added index by .329 in this model.

The following table shows the average (mean) quarterback rating and added value quarterbacks can be expected to generate based on where they are selected in the NFL draft.

Variable	Round	Mean
QB Rating	1	79.16
	2	60.96
	3	51.7
	4	37.9
	5	21.6
	6	28.2
	7	25
Added Value	1	247.5
	2	46.1
	3	87.3
	4	47.5
	5	14.71
	6	37.3
	7	46.2

Figure 8: Mean Quarterback ratings and Added Value Indices by Round

You will note the precipitous decline from the 1st round to the 2nd, in comparison to the less steep declines from there on after (from round to round). In fact, over this four year period (2004-2008), quarterbacks drafted in the last round generated as much value as those drafted in the second. This means that hypothetically a team could get as much value out of drafting a quarterback 5 rounds later in the draft at the quarterback position, enabling them to draft a player from another position earlier and getting additional value at that position.

It appears evident that in order to obtain a quarterback that can start for your team regularly, you most likely need to allocate a first round draft choice to the position. This study states this because in the 2009 season, the average quarterback rating of all quarterbacks was 83.4. None of the rounds generate a quarterback of this caliber on average, but the 3rd quartile of the first round is above this (89.73). Only two quarterbacks drafted outside the first round have a career quarterback rating above 83.4. One player is Luke Mccown, who was drafted in the 3rd round. The other is Jim Sorgi who was drafted in the 6th round. Despite their above average quarterback ratings, these two players have provided little value (added value index numbers of 54 and 45 respectively) because they rarely play. This demonstrates how important it is to select a quarterback in the first round if a team is looking to select a player that will be a successful starting quarterback in the NFL. (See appendix J for complete Descriptive Statistics)

Furthermore, it supports the previous findings in which the optimal draft rounds were determined for each position. Recall Figure 4.

	Round	1	2	3	4	5	6	7
Position	All	**261.36**	**171.82**	**105.92**	**87.57**	**58.2**	**39.01**	**35.99**
QB	**100.081061**	286.7	85.1	60.7	90.9	10.09	64	25.2
RB	**125.4**	322.7	183.8	153.8	96	59.2	31.9	15.6
WR	**86.81**	238.8	172.4	95.7	62.1	36.42	18.26	31.17
TE	**94.5**	255.4	169.6	117.3	81.2	61.4	50	34.47
C	**91.7**	223.9	195.9	157.5	78.9	96.7	41.3	35.6
G	**87.62**	258.1	164.4	85.3	91.2	65.6	56.3	39
T	**116.11**	277.7	254.4	123.8	73.7	55.5	25.34	45.8
DE	**120.4**	246.2	149.8	114.6	138.1	99.6	31.37	53.4
DT	**92.18**	222.7	175.1	106.5	63.6	75.8	43.17	21.95
DB	**101**	232.7	168.1	92.6	88.8	58.63	42.97	48.06
LB	**111.97**	298.5	172.8	113.8	120.1	62.9	54.2	37.02

Figure 4: Draft Value Chart: Value Optimization for an entire Draft

We can see recent examples of this by looking at the starting quarterbacks in the most recent NFL seasons. All five of the quarterbacks taken in the first round of the draft in 2008 and

2009 are already starting quarterbacks in 2010 (Mark Sanchez, Matthew Stafford, Josh Freeman, Joe Flacco, and Matt Ryan). Meanwhile, only 1 of 19 of the quarterbacks taken in all the other rounds (Chad Henne) was a starting quarterback in 2010.

For the most part, quarterbacks with higher college quarterback ratings provide more value to their future teams. A regression illustrating the correlation between quarterback rating and the added value index was run using quarterback rating as the explanatory variable for added value. The regression (see appendix K for complete regression) had a p-value of 0.000, indicating significance at the 1% level. The coefficient was 2.32, indicating that for each additional point in quarterback rating a quarterback has, we can expect them to provide and added value index 2.32 points higher.

Is quarterback rating, once a player is in the NFL, just as important as his college quarterback rating? To assess this a regression was run using wins a team had in a particular season as the dependent variable and their respective quarterback's quarterback rating for that indicated season as the independent variable. The results show significance at the 5% level that a quarterback's QB rating has a direct impact on their team's ability to win games (see appendix L for complete regression). The coefficient (.16542) denotes that for every 6 points higher a quarterback's rating is, we can expect his team to win an additional game. In the sample used by this study, quarterback ratings ranged from over 105 to just above 66, showing just how many more wins a team can expect to have based on the play of their quarterback. The lowest rated quarterback team would be expected to win 6.5 less games than the highest rated quarterback. That is often the difference between being the best and worst team in a division.

At the time of publication, the 2010 season was about two thirds completed and all eight first place teams (the Jets, Ravens, Colts, Eagles, Chiefs, Rams, Falcons, and Bears) showcased 1st round quarterbacks. The eight teams in last place of their division (Bills, Bengals, Cowboys, Lions, Panthers, Cardinals, Titans, and Broncos) showcased only 1 first round quarterback. Four of the teams' quarterbacks had suffered injury, one was selected in the fourth round, and one was selected in the sixth round and was selected in the seventh round.

What other statistical measures can be looked at to see how a quarterback's play impacts winning? To find this a regression was run with wins as the response variable to the many common variables used to measure quarterback play. They were attempts, completions, completion percentage, yards per attempt, touchdowns, interceptions, touchdown to interception ratio, times sacked, and yards per game. The overall model was significant but not all variables were. Variables were gradually eliminated until a more parsimonious model was found. The most significant variables were variables concerning measures of efficiency, rather than overall totals. Thus, the variables having to do with totals (attempts, completions, touchdowns, interceptions, times sacked, and yards per game) were dropped from the final regression.

The final, most significant model used completion percentage and yards per attempt as the independent variables (see Appendix M for complete regression). These statistical measures can be viewed as efficiency metrics. Completion percentage shows what percent of a quarterback's passes are completions (as opposed to incompletions) and yards per attempt measures how many yards a team gains each time the quarterback attempts to throw a pass. Neither measure is influenced by the frequency of pass attempts or total yardage gained. More efficient passers, who can complete more passes and get more yards per throw, have an advantage over those who just accumulate yardage because they throw the ball more frequently. This reflects the value of being efficient in the NFL, similar to the value we observed in efficient with regards to college quarterbacks.

D. Assessing the Validity of the Added Value Index

Throughout this study we have used the added value index as a means of assessing player value. The question becomes whether or not this is a viable measure to use. Is the Added value index a good predictor of success? The answer is an emphatic yes. To come to this answer, we can regress the total added value index of each team with the number of wins they have garnered over the same ten year time period. The following regression shows a statistically significant positive relationship at the 1% level, meaning as a team the value a team can draft increases, their win total will increase at a positive linear rate.

Dependent Variable- Wins

Predictor	Coefficient	SE Coef	T	P
Constant	20.73	15.17	1.37	0.182
Added Value	0.007210	0.001885	3.83	0.001

Figure 9: Assessing the Validity of the Added Value Index

LIMITATIONS

A. Statistical Means

We must remember that the figures used for this analysis represent the average value of a large sample of players. NFL franchises perform scouting on all players they are considering selecting. There are many subjective and objective measures. Their analysis will be more applicable to specific players. The analysis of this study provides more broad and general information to guide them.

There are always players who exceed the average, and therefore a team should not avoid drafting a specific player on the basis that the charts created in this study dictates otherwise. Conversely, teams should not select players of a certain position assuming their value is higher than what they have observed through scouting; just because historical average dictate it would be unlikely. There are always players who will fall below the historical average and thus, they should not be drafted as highly, if scouting dictates that their value is below average.

B. Changes in the Game of Football

Secondly, this analysis was conducted on players over a ten year period, drafted from 1999-2008. Since the game of football is always evolving, what helps teams win and what type of skills provide value is constantly changing. Positions that provided significant value ten years ago may not provide the same value today.

From an observational perspective, this paper has already identified that the NFL is becoming more dominated by the passing game (as opposed to the running game). This probably means that positions associated more with the passing game, such as quarterback, wide receiver and tight end will provide more value in the future. Defensively, the positions of cornerback, defensive end and safety are defensive positions associated with defending the passing game, and therefore would also gain value. As all of these positions rise in value, the relative value of the remaining positions would decrease.

Another observation is the change to what is called the "Running back by Committee" approach to the running game. Many NFL franchises now use multiple players throughout the game at the running back position. Historically, many teams would have one and some teams use two running backs, who would receive the vast majority of the rushing attempts. Nowadays, most teams have at least two running backs and sometimes three or four running backs that receive rushing attempts. This means there are fewer players with very high values and very low values and more players with values in between. Thus, we can say the standard deviation of the value for that position has probably been reduced, as well.

C. Sample Size

It should be remembered that this is a sample. There may have been an influx of talent for certain positions that will skew results. For example, if there happened to be a large number of very good defensive ends over the past decade, the position of defensive end would be seen as providing more value than it probably does in reality moving forward. On the other hand, if there had been very few talented defensive ends, their value will be deflated in this study's results.

D. Drafting Ability

As previously stated, this research assumes each NFL team has identical ability to indentify talent in college players that they will be drafting. Part D of our analysis (Assessing the

Validity of the Added Value Index) showed that teams that have historically acquired more value through the draft have won more games. We can't assume which teams will be above, below or at the average in drafting value moving forward and how that will have an effect on future drafts. Thus, we assume the same pattern in player value holds true moving forward.

E. Pending Labor Agreement

After the 2010 season, there will be no Collective Bargaining Agreement (CBA) in place in the NFL because the terms of the deal are expiring. The CBA is a set of financial agreements between the owners and the NFL Player's Union by which the league operates. Not only does this mean there could be a lockout or no 2011 football season, it also means that if and when an agreement is reached, there may be changes in the salary cap structure and rules. Part of my analysis was conducted on the effect of how much money a team spends on payroll on their winning percentage. If rules change, this could alter the results observed in this paper's analysis.

QUESTIONS

At the beginning of this paper, four hypotheses were made, posing the following questions.

A. Can we identify a drafting strategy to optimize the amount of value a team can garner in the NFL draft?

B. Are NFL team payrolls highly correlated with their winning percentages?

C. Are there certain metrics we can use from college quarterbacks' statistics that will allow us to predict whether or not they will be successful NFL quarterbacks?

D. Is the value added index variable a viable tool for assessing a player's value?

CONCLUSION

A. Determining a draft strategy to optimize value

This study determined the average values of each football position over the last decade. Additionally, it found in what round players with these values have been historically taken in the NFL Draft. By comparing these two calculations, this study determined in what round players of certain positions should be selected. This analysis would be useful in trying to optimize value for a certain round. Secondly, the color-coded draft chart created would be useful as a guide for teams to optimize the total value they could garner throughout the entire draft.

B. An assessment of the impact of team payrolls and allocation of payroll dollars

A positive correlation was found between the amount of money spent on team payroll and the amount of wins that team had in a given season. It would be concluded that teams spending more money are able to acquire better players and have more team success. However, positions that provide the most value to a team are not always rewarded with the higher salaries. This may be due to the difference in player availability of certain positions. When supply is high, demand is low, and thus wages, are reduced. Lastly, drafting players who play positions with smaller supply (ex. Nose tackle), does appear to benefit teams' expected win total.

C. Predicting quarterbacks' future NFL success

Using college statistics and other nominal variables, this study developed a formula to predict a college quarterback's future NFL quarterback rating and value. The variables used created a linear regression to form this prediction. In doing so, this study isolated which statistics and variables are most important when assessing a college quarterback. Statistical measures of efficiency appear to be most important. Lastly, if a team wants to find a franchise quarterback in the draft, they should plan on using a first round draft pick to do so. Although there have been successful quarterbacks selected in later rounds, the chances of quarterbacks selected after round 1 being successful is highly unlikely.

D. The Value Added Index

The value added index had a high positive correlation with NFL teams' winning percentage, showing it is a viable tool for assessing a player's value.

E. Final Implications:

In all, this information would be valuable to fans of football as well as professional franchises. The results of this study would improve fans knowledge of the game. At the franchise level, NFL teams would be better equipped in developing their draft strategy and predicting player success.

APPENDICES

Appendix A – (Added Value Index)

All Players

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	244.77	4.77	51.27	0.000
Round	-33.871	1.016	-33.35	0.000

QB

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	252.45	25.85	9.77	0.000
Round	-37.058	5.54	-6.69	0.000

RB

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	314.66	19.88	15.83	0.000
Round	-47.071	4.386	-10.73	0.000

WR

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	228.02	12.93	17.64	0.000
Round	-33.026	2.722	-12.13	0.000

TE

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	234.62	16.12	14.56	0.000
Round	-31.303	3.289	-9.52	0.000

C

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	242.34	25.51	9.5	0.000
Round	-31.417	4.942	-6.36	0.000

G

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	206.88	17.11	12.09	0.000
Round	-25.859	3.422	-7.56	0.000

T

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	299.63	18.19	16.47	0.000
Round	-43.603	3.962	-11.11	0.000

DE

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	234.42	15.29	15.92	0.000
Round	-30.557	3.386	-9.03	0.000

DT

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	232.48	14.93	15.57	0.000
Round	-31.847	3.126	-10.19	0.000

DB

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	219.819	9.783	22.47	0.000
Round	-29.108	2.162	-13.46	0.000

LB

Dependent Variable- Value Added Index

Predictor	Coefficient	SE Coef	T	P
Constant	258.37	14.65	17.64	0.000
Round	-35.067	3.191	-10.99	0.000

Appendix B – Descriptive Statistics: Difference in value by round

Variable- Value Added Index

round	N	Mean	StDev
1	316	261.36	150.63
2	316	171.82	120.06
3	339	105.95	108.56
4	365	87.57	95.66
5	355	58.2	82.23
6	386	39.01	70.42
7	471	35.99	67.62

Difference in value by position

Results for round = 1

position	N	Mean	StDev
C	4	223.9	44.4
DB	56	232.7	128.1
DE	38	246.2	130.7
DE	2	271	112
DT	30	222.7	145.8
G	8	258.1	101
K	1	0	*
LB	30	298.5	168.9
NT	2	341	19.2
QB	21	286.7	212.2
QB	7	280.1	120
RB	31	322.7	174.2
T	31	277.7	156.2
T	1	666.67	*
TE	14	255.4	79.7
WR	40	238.8	144.4

Results for round = 2

position	N	Mean	StDev
C	7	195.9	91.6
DB	73	168.1	99.5
DE	34	149.8	116
DT	17	175.1	115.9
FB	1	98.462	*
G	21	164.4	84.1
K	1	0	*
LB	43	172.8	118.4
QB	11	85.1	144.9
RB	25	183.8	160.7
T	22	254.4	119
TE	16	169.6	108.1
WR	45	172.4	134.1

Results for round = 3

position	N	Mean	StDev
C	5	157.7	81.6
DB	67	92.6	86.9
DE	25	114.6	92.9
DT	26	106.5	95.9
FB	5	92.5	64.5
G	19	85.3	75.4
K	2	0	0
LB	56	113.9	122.3
P	2	0	0
QB	14	60.7	92.1
RB	25	153.8	172.3
T	27	123.8	105.3
TE	22	117.3	95.8
WR	44	95.7	117.1

Results for round = 4

position	N	Mean	StDev
C	10	78.9	67.4
DB	79	88.8	95.3
DE-DT	1	0	*
DE	28	138.3	127.5
DT	27	63.6	74.6
FB	10	56.5	42.7
G	22	91.2	81.2
K	3	0	0
LB	48	120.1	89.9
P	6	0	0
QB	13	90.9	122.7
RB	32	96	101.6
T	29	73.7	104.6
TE	16	81.2	92
WR	41	62.1	82.1

Results for round = 5

position	N	Mean	StDev
C	9	96.7	103.2
DB	69	58.63	73.11
DE	27	99.6	118.4
DT	26	75.8	92.7
FB	10	32.7	34.8
G	25	65.6	89.7
K	3	0	0
LB	49	62.9	86.4
NT	1	168.61	*
P	3	0	0
QB	20	10.09	17.21
RB	19	59.2	78
T	26	55.5	99.4
TE	25	61.4	59.9
WR	43	36.42	65.29

Results for round = 6

position	N	Mean	StDev
C-G	1	0	
C	12	41.3	65.3
DB	71	42.97	55.39
DE	34	31.37	53.97
DT	36	43.17	49.26
FB	6	49.44	21.44
G	18	56.3	77.5
K	8	0	0
LB	43	54.2	89.1
NT	1	295.38	*
P	7	0	0
QB	22	64	154.7
RB	24	31.9	69.3
T	33	25.34	50.26
TE	21	50	72.3
WR	49	18.26	39.71

Results for round = 7

position	N	Mean	StDev
C	16	35.6	65.3
DB	70	48.06	80.59
DE	38	53.4	83.7
DT	39	21.95	36.85
FB	10	70.9	67.9
G	39	39.01	61.83
K	7	0	0
LB	51	37.02	55.58
P	5	0	0
QB	24	25.2	61.1
RB-TE	1	0	*
RB	35	15.6	35.34
T	35	45.8	92.8
TE	33	34.47	45.75
WR	68	31.17	78.77

Appendix C – Regression Analysis: NFL Success vs. Payroll

Dependent Variable- Wins

Predictor	Coefficient	SE Coef	T	P
Constant	-1.746	3.802	-0.46	0.649
Round	0.09199	0.0356	2.58	0.015

Appendix D – Descriptive Statistics: NFL Payrolls

N	Mean	StDev	Min	Q1	Median	Q3	Maximum
32	105.6	15.05	62.38	95.61	106.4	116.34	137.64

Appendix E – Correlation between Added Value Index and Player Salaries

Dependent Variable- Added Value Index

Predictor	Coefficient	SE Coef	T	P
Constant	102.23	11.86	8.62	0.000
Round	0.861	5.643	0.15	0.883

Appendix F – Regression Analysis: Added Value Index for NFL Starters

Dependent Variable- Added Value Index

Predictor	Coefficient	SE Coef	T	P
Constant	103.626	9.710	10.67	0.000
Round	0.069	2.180	0.03	0.976

Appendix G – Regression Analysis: NFL Success based on Drafting Frequencies

Dependent Variable- Wins

Predictor	Coefficient	SE Coef	T	P
Constant	-15.67	34.97	-.45	.660
C	3.726	3.335	1.12	0.279
DB	1.763	1.193	1.48	0.157
DE	2.235	1.761	1.27	0.221
DT	0.639	1.845	0.35	0.733
FB	-1.237	3.422	-0.36	0.722
G	4.092	1.620	2.53	0.021
LB	-0.321	1.424	-0.23	0.854
NT	21.90	10.93	2.00	0.060
QB	1.513	2.802	0.54	0.596
RB	0.523	2.020	0.26	0.799
T	2.803	1.701	1.65	0.117
TE	-1.334	2.419	-0.55	0.588
WR	0.190	1.152	0.17	0.871

Appendix H – Regression Analysis of Quarterbacks' Added Value Index

Dependent Variable- Added Value Index

Predictor	Coefficient	SE Coef	T	P
Constant	23.2	198.4	0.12	0.908
Pick	-0.824	0.237	-3.46	0.001
Comp%	11.748	5.822	2.02	0.052
Rating	-4.577	1.950	-2.35	0.025
Height	25.75	12.87	2.00	0.054

Appendix I – Regression Analysis of Quarterback rating

Dependent Variable QB Rating
First Regression

Predictor	Coefficient	SE Coef	T	P
Constant	74.52	50.93	1.46	0.155
Round	-33.93	14.90	-2.28	0.031
Pick	0.7854	0.4136	1.90	0.068
BCS	13.676	9.979	1.37	0.181
Comp%	0.5572	0.1787	3.12	0.004
Attempts	-0.2175	0.1022	-2.13	0.042
Yards	-0.0327	0.0617	-2.02	0.053
TD	1.9566	0.6392	3.06	0.005
Yrds/At	34.57	14.98	2.31	0.029
Rush Att	0.23740	0.09943	2.39	0.024
Yds/rush	-14.541	5.316	-2.74	0.011
Rating	-1.9674	0.6552	-3.00	0.006

After Elimination of variables

Predictor	Coefficient	SE Coef	T	P
Constant	67.95	51.46	1.32	0.197
Round	-33.90	15.12	-2.24	0.033
Pick	0.7636	0.4195	1.82	0.079
Comp%	0.4824	0.1727	2.79	0.009
Attempts	-0.16098	0.09494	-1.70	0.101
Yards	-0.03308	0.01641	-2.02	0.053
TD	1.8055	0.6391	2.83	0.008
Yrds/Att	34.08	15.20	2.24	0.033
Rush/att	0.2233	0.1004	2.22	0.034
Yds/rush	-14.655	5.395	-2.72	0.011
Rating	-1.7875	0.6515	-2.74	0.010

Final Regression Equation

Predictor	Coefficient	SE Coef	T	P
Constant	37.52	49.72	0.75	0.456
Round	-37.13	15.46	-2.40	0.023
Pick	0.8016	0.4318	1.86	0.073
Comp%	0.3292	0.1517	2.17	0.038
Yards	-0.04021	0.01635	-2.46	0.020
TD	1.7106	0.6563	2.61	0.014
Yrds/Att	36.35	15.61	2.33	0.027
Rush att	0.16496	0.09720	1.70	0.100
Yds/rush	-11.180	5.144	-2.17	0.038
Rating	-1.6358	0.6652	-2.46	0.020

Appendix J – Descriptive Statistics: QB Rating and Added Value Index by Round

QB Rating

round	N	Mean	StDev
1	12	79.16	11.15
2	5	60.96	15.5
3	7	51.7	37.2
4	4	37.9	43.8
5	7	21.6	36.9
6	8	28.2	39.5
7	11	25	35.2
	Added Value Index		
1	12	247.5	138
2	5	46.1	58.4
3	7	87.3	122.6
4	4	47.5	63.9
5	7	14.71	22.29
6	8	37.3	74
7	11	46.2	84

Appendix K – Correlation between Added Value Index and Quarterback Rating

Dependent Variable- Added Value Index

Predictor	Coefficient	SE Coef	T	P
Constant	-13.12	19.53	-0.67	0.505
Rating	2.322	0.3359	6.91	0.000

Appendix L – Regression Analysis: Wins versus Quarterback Rating

Dependent Variable- Wins

Predictor	Coefficient	SE Coef	T	P
Constant	-6.061	5.173	-1.17	0.251
Rating	0.16542	0.06066	2.73	0.011

Appendix M – Metrics Predicting NFL Success

Dependent Variable- Wins

Predictor	Coefficient	SE Coef	T	P
Constant	-14.397	7.769	-1.85	0.074
PCT	0.1777	0.1673	1.06	0.297
YDS/A	1.6414	0.9502	1.73	0.095

REFERENCES

Barriger, Andrew K., John W. Sharpe, Brendan P. Sullivan, Paul M. Sommers. “Has a Salary Cap Improved Competitive Balance?” Department of Economics: Middlebury College. Paper No. 04-02. 2004.

Biner, Burhan. "Equal Strength or Dominant Teams: Policy Analysis of NFL." 17920 (2009): 1-33. *Munich Personal RePEc Archives*. Web. <http://mpra.ub.uni-muenchen.de/17920/>

Hendricks, Wallace, Lawrence DeBrock, and Roger Koenker. "Uncertainty, Hiring, and Subsequent Performance: The NFL Draft." *Journal of Labor Economics* 2003rd ser. 21.4 (2008): 857-86. *JSTOR*.

Miklasz, Bernie. "Rams Need to Show Some Fortitude and Draft Bradford." *St. Louis Post-Dispatch*. 11 Mar. 2010. Web. 12 Mar. 2010. <http://www.stltoday.com/stltoday/sports/columnists.nsf/berniemiklasz/story/B125FF77F 1B9353D862576E300161E04?OpenDocument>.

Pro-Football-Reference.com. “NFL Draft History and AFL Drafts.” 2000-2009 Sports LLC. <http://www.pro-football-reference.com/draft/>.

Stair, Anthony, April Day, Daniel Mizak, and John Neral, (2008) "The factors affecting team performance in the NFL: does off-field conduct matter?" *Economics Bulletin*, Vol. 26, No. 2 pp. 1-9

Treme, Julianne and Samuel K. Allen, (2009) "Widely Received: Payoffs to Player Attributes in the NFL", *Economics Bulletin*, Vol. 29 no.3 pp. 1631-1643.