Evaluating Talent Acquisition Via the NFL Draft

by

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Executive Summary

In this work we apply data analytics to the National Football League Draft enabling us to pose and seek answers to a number of interesting questions regarding the success of drafting players over the period 2000 through the most recent 2012 draft and league season. The analysis is based on measuring the cost of acquiring players through the draft and the success of these players once acquired. We employ two primary metrics for measuring the cost of drafted players. The first simply uses the round in which a player is taken while the second uses a table of draft pick values initially developed within the NFL in the early 1990s. We also employ two metrics for measuring the success of drafted players where the first assigns a value to each player's performance for a season. The second was developed as part of this work and is based on a weighted score for games played, games started and recognition as a top player.

Using these metrics, we examine many questions of interest. We first examine which teams have drafted the best using combinations of cost and success metrics for all 32 NFL teams. If we ignore costs then Green Bay is the team that has drafted the best players since 2000 with New England and San Francisco close behind. In contrast, Washington has acquired the least amount of talent via the draft. However, if we consider the costs to acquire players then Pittsburgh is the most cost-effective team at drafting with the best ratio of player success to cost. Indianapolis and Green Bay are the next best teams for efficiency with St. Louis being the least efficient team.

When we focus on talent acquisition based on football positions, we find safeties provide the highest average success, but on average teams spend the most to acquire quarterbacks, defensive ends and offensive tackles. In terms of cost effectiveness, centers, guards, and kickers are undervalued on average while cornerbacks are overvalued.

We find interesting results in looking at the value of draft picks. Through examination of recent draft-pick-only trades within the same draft year, we find that teams continue to make use of the draft pick value table for determining the trade value of each pick. However our results show that this table does not accurately reflect the success of a player drafted in a given round. Rather the table overvalues first-round picks relative to all other rounds with the average success of second- and third-round players much higher than predicted by the table. The average success for picks in subsequent rounds drops off more gradually and continues to be much higher than predicted by the draft pick value table. The recently introduced rookie pay scale has resulted in average salaries for each round that better match the historical average success of draftees in the round, but discrepancies still point to excellent value in the second round where draftees provide 70% of the production of first-round draftees at just over 40% of the salary. Our results also show the importance of undrafted free agents to teams in the NFL as the total success of these undrafted players exceeds the total for all draft rounds except the first.

Finally when we examine player success by age, not surprisingly we find that the youngest 25% of players have the lowest average success as many spend the early years of their career with limited playing time. The average success for players in the next quartile (ages 25 and 26) begins to increase, a trend that continues to roughly age 30. The 30-35 age range then shows a plateau of average player success, but only 18% of the players are in this range with another 2% more than age 35. These results show that while teams will retain younger players for development, they only tend to retain older players who are productive.

1 Introduction

Each year the National Football League Draft occurs with teams investing large amounts of money and time to select the best players for their team. Pundits analyze the set of available players before the draft and then often grade the success of each team's draft picks after it is done. With this focus on the NFL Draft, it is not surprising that the growing field of data analytics is being applied to better understand it.

In recent years analytics have been applied in various ways to the draft. Some have tried to analyze the success of teams' draft strategy by seeing how well these drafted players have performed and as a consequence which teams have done the best [2,3]. Others have examined the value of individual draft picks [4,11]—specifically examining the accuracy of a draft pick value chart originally developed in the early 1990s and apparently still in use [8]. Many of these analyses have made use of a metric developed by Doug Drinen at Pro Football Reference called Approximate Value, which assigns a seasonal value to each player in the NFL [5].

This project follows up on this recent analytics work making use of some of the same metrics and asking some of the same questions regarding team drafting success and the value of specific draft picks. However, we extend previous work both in terms of the metrics that we use and the questions that we seek to answer. We not only want to examine the success of a team's drafted players, but also examine the cost to acquire these players. In particular, our work makes a number of contributions:

1. We employ multiple draft pick cost and player success metrics including a new measure of a player's value, which we call Appearance Score, based on a

weighted score for games played, games started and being recognized as a top player.

2. We perform a comprehensive evaluation of team draft success over a 13-year period from 2000 through the most recent 2012 season for all NFL teams using each of these metrics.
3. We use these same metrics to evaluate draft success over this time period on a per-position basis to better understand which positions provide the best and worst value.
4. We investigate whether the draft pick value table developed is still in use and examine its accuracy as well as that of the new NFL rookie wage scale using multiple metrics. We also consider the success of undrafted free agents.
5. We evaluate player success by age and years in the league as a measure of how long it takes to develop and retain talent.

In the remainder of this report we first pose the set of research questions to investigate followed by defining the cost and success metrics used to evaluate them. We then describe the results we obtained for each question and conclude with a summary of our results. This report is a summary of a larger report [1].

2 Research Questions

Evaluation of talent acquisition requires understanding the cost of acquiring this talent and the success that this talent has once it is acquired. NFL teams acquire talent through the draft, trades and free agency. In this work we focus on the success of teams acquiring talent through the draft. This focus leads to four categories of research questions that we seek to investigate. We define these questions in the remainder of this section and answer them in Section 4 once we have defined how we evaluate cost and success metrics in Section 3.

1. We seek to understand which teams have drafted better and worse over recent history. While pundits like to give their immediate opinion of which teams did well in a particular draft, a true assessment is not possible until these players have had a chance to produce on the field over a period of time. The time it takes for a player to develop into a productive player, the level of productivity and the longevity of the production are all factors in the success of a player.
2. Along with knowledge of which team drafted a player, we also know the playing position of each draftee. These data afford us the opportunity to examine which positions provide the best and worst value for NFL teams.
3. The value of individual draft picks is important for teams to understand as they contemplate using these picks as part of trades to acquire players or other draft picks. We seek to use the success of players obtained in different draft positions and rounds to understand if this success corresponds to accepted values of draft picks. As part of this analysis, we also examine the relative success of undrafted free agents, which can be considered to have zero acquisition costs. We examine how well salaries paid to draftees under the new NFL rookie wage scale correspond with historical player success.

4. Finally we examine how much a player's age or time spent in the league affects their performance on the playing field. Examination of these data can lead to better knowledge on time to develop drafted players and how long these players stay at the top of their game.

3 Methodology

We considered multiple approaches to evaluate the cost of acquiring players and their success once acquired. In this section we describe cost and success metrics that we considered and then detail the two metrics of cost and of success that we ultimately choose to use in our work. We choose to use more than one metric for each of cost and success so that results we obtain are not dependent on a single set of chosen metrics.

3.1 Cost Metrics

We considered a number of approaches for evaluating the cost of acquiring a drafted player. Salary and time to develop are two such metrics. While salary is a true measure of cost, it is not readily available for all players and the salary structure for draftees has changed with the introduction of a rookie wage scale. The time to develop a player is not so clear how to evaluate and is dependent on a team's willingness to wait for such development.

Rather than focus on salary or development time, we adopted two more straightforward cost metrics. The first metric is the round in which a player is chosen. In today's NFL draft, each of the 32 teams begins with one draft pick in each of seven rounds with some additional compensatory picks due to lost free agents and lost picks due to team violations. In our evaluation we define the Round Points (RP) cost metric as 7 points for a first-round draft choice, 6 points for a second-round choice down to one point for a seventh round pick. We assign a cost of zero to all undrafted free agents signed by a team.

While straightforward, this cost metric is not necessarily fair as it assigns the same cost for the first pick of the first round (first overall) as it does for the last pick of the round (32nd overall). As an alternative, a table of draft pick values was initially developed in the early 1990s by Jimmy Johnson of the Dallas Cowboys as means to better correlate a draft pick with its true value [8]. In this table the value of the first overall pick is 3000 while the value of the last pick in the first round is 590. The value for the first pick in each subsequent round is 580, 265, 112, 43, 28 and 15.2. The value for last pick in the seventh round , known as "Mr. Irrelevant" (position 224 if no changes occur in the set of picks), is 3.

In order to understand if these draft values are still being used in the league we analyzed recent draft-pick-only trades made within the same draft year. We used data obtained from Pro Sports Transactions [10]. These trades are often made on draft day when one team "trades up" in the draft to acquire a higher draft pick for a combination of lower draft picks. Analyzing such trades for the 2009, 2010 and 2011 drafts, we compute the difference in draft pick values for each team in the trade. In the 2009 draft trades this difference is 10% excluding one outlier in 16 trades (12% difference for all). In 2010 the difference is 6% and in 2011 it is 8% again excluding one outlier in each case. These results are a strong indication that the table of draft pick values is still in use, particularly given that teams can only trade pick positions that they have, and may not be able to exactly match up to the true trade values in the table.

As a consequence of its existence and apparent continued use, the second cost metric we use in our study is the draft pick value in the draft pick value table [8]. We term this metric as

Draft Points (DP) in our study and again assign a cost of zero for undrafted free agents. A summary comparison of the average cost value for all picks in each round (scaled to a common maximum value of 7) is shown in the graph of Figure 1. The "8th round" is designated for undrafted free agents at a cost of zero. As expected, the graph shows a linear relationship between rounds for the Round Points metric while a more exponential relationship between rounds for the Draft Points metric.

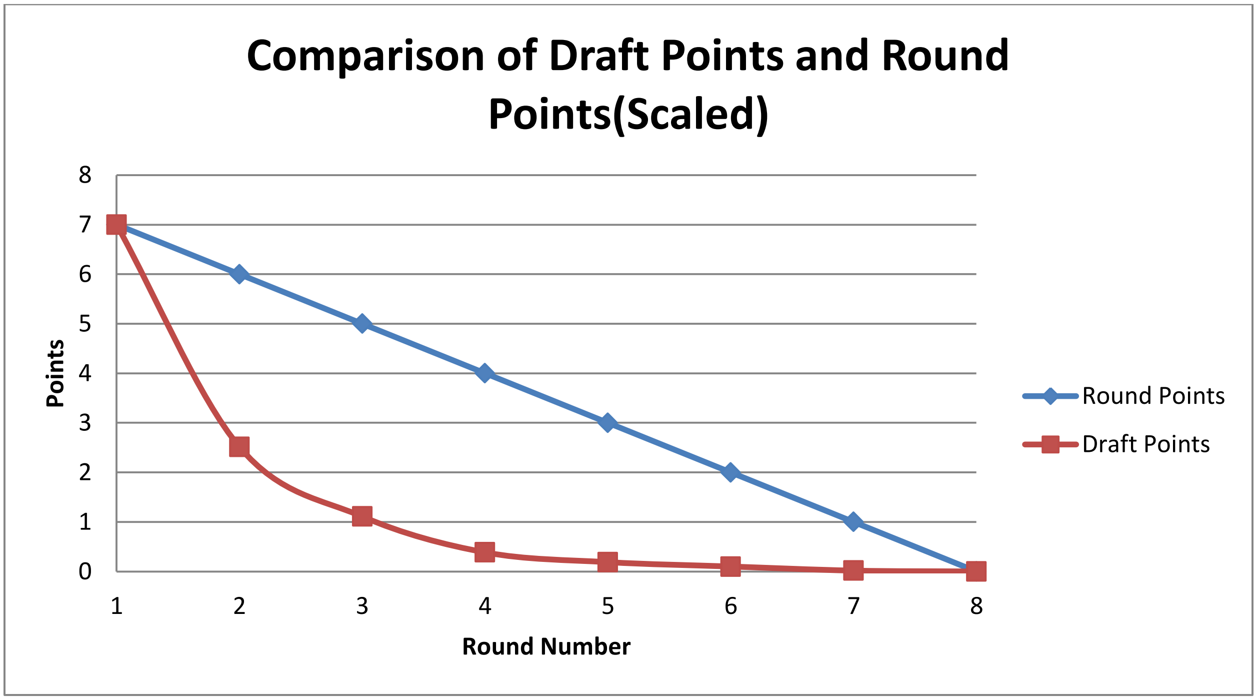

Figure 1: Comparison of Draft Points with Round Points

3.2 Success Metrics

Similar to cost, many approaches can be used to determine the success of a drafted player. One approach is to examine the success of a drafted player's team. Team success can be viewed through team stats, team revenue, team record, championships or power rankings. While team success is the ultimate goal in team sports, determining a player's individual contribution to that success is difficult and we did not pursue that approach. Rather we adopted two metrics for player success.

The first metric, known as Approximate Value (AV), was developed by Doug Drinen, the founder of pro-football-reference.com, in an attempt to put a single number on the seasonal value of a player from any position for any year [5]. As its name implies, it does not necessarily mean that a player at a higher AV level is better than a player at a lower AV level, but the collection of players at a higher AV level is expected to be better than a collection of lower AV level players. There are many details on how AV is determined, which are discussed in more depth in [1]. We adopted it as a success metric for our study because it provides a per player value for all player positions.

One question we did investigate in our study relative to the Approximate Value metric is how it compares to a more widely known metric of individual performance—Fantasy Points. We found (see [1] for details) a strong correlation between AV and Fantasy Points for skilled player positions such as running back, wide receiver and quarterback, but unlike Fantasy Points the AV metric also provides values for non-skilled positions. We did use the strong correlation between AV and Fantasy Points to determine an AV value for kickers in the league as we could find Fantasy Point data for this position, but no AV values.

3.3 Appearance Score

The other metric we choose to use for evaluating a player's success was developed by us based on a player's playing time and recognition. We call this metric Appearance Score (AS) where its motivation is that the more a player appears in the NFL and gains recognition, the higher his value. In contrast to Approximate Value, this metric does not directly use in-game performance statistics. Using data that gives a player's games played, games started, and Pro-Bowl and All-Pro team selections, a seasonal score is given to a player. This score is a yearly summation that awards points in a weighted manner based on the likelihood of a player attaining different recognition levels.

We start with the assumption that a player earns one point for each game that he plays in. Given that the game day roster for a regular season game is 45 players and there are 32 teams that is a total of 1440 players with an opportunity to play each week. On each team, 22 of those players will start so the likelihood of starting a game is approximately 50% of playing and we assign two points for each game started by a player.

The Pro-Bowl and All-Pro rosters are the other areas of examination for this metric. The NFL Pro-Bowl teams are two teams which consist of the best players from AFC and NFC in their respective conference. Players are selected based on fan votes and coach's and player's polls. The number of people on the roster changes on a yearly basis but it is roughly 100 total for both teams. This brings the Pro-Bowl ratio to 100/1440 = 7% and we assign 14 points for a player being named to the Pro Bowl. Finally, the NFL All-Pro team is selected by the Associated Press to be what they consider the best NFL players for the year. The number of players selected to be All-Pro also changes on a yearly basis, but there are approximately 65 players selected per year. The All-Pro Ratio becomes 65/1440 = 4.5% and we assign 22 points for a player being named an All-Pro.

As an example for calculating the Appearance Score of a sample player, "Joe," where for the first three games of the season, he sees no playing time. During game four, Joe replaces the starter during the game and gets a game played. During game five, the same situation occurs and he gets a second game played. From game six on, Joe is named the starter and starts in every game for the rest of the season. After the season is over, Joe also gets a selection to the Pro Bowl; however, he does not receive an All-Pro selection. In this scenario, Joe has played in 13 games, started 11 games, and was selected to be in the Pro Bowl. With these numbers, Joe would have an Appearance Score of 49 (13*1 + 11*2 + 14) where the maximum Appearance Score a player can get is 84 and the lowest is 0.

3.4 Data Collection

We computed Round Points and Draft Points cost metrics as well as the Approximate Value and Appearance Score success metrics for all NFL drafts and seasons from the 2000 draft and season through the most recent 2012 league season. We used many sources. Approximate Value data was obtained from the Pro Football Reference Web site [5]. The same site was used to obtain players on each team's roster [6] and those chosen to be on the All Pro team or selected to go to the Pro-Bowl [7]. We used Fantasy Football Today for obtaining fantasy points data [12]. Detailed draft pick history was found at the Draft History Web site [9].

As a summary of these data using our two success metrics, Figure 2 shows a plot of each player's cumulative Approximate Value against his Appearance Score for all players in our data set. The graph shows that the two scores have a linear relationship with many outliers. Since Appearance Score can be calculated for any position while Approximate Value can only be determined for specific positions, there are also cases when a player has a zero AV and a non-zero AS. We believe each of these metrics has merit and are valuable to consider for our analysis.

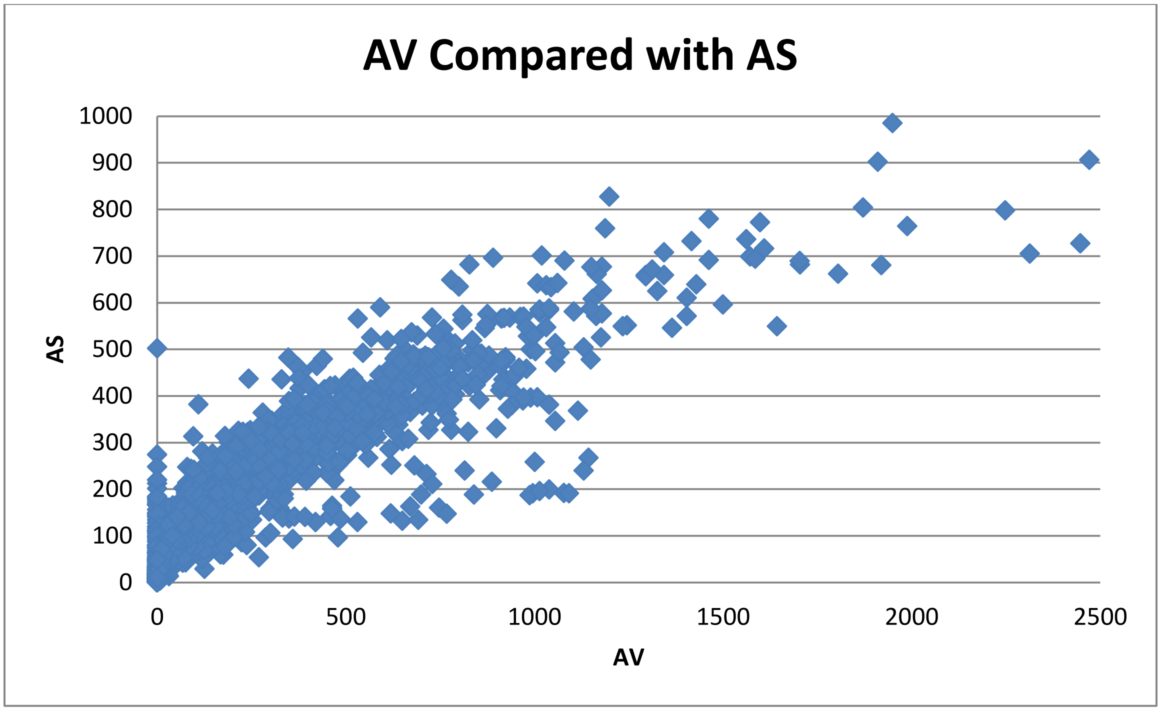

Figure 2: Approximate Value Compared with Appearance Score for All Players

4 Results

In light of our metrics for evaluating cost of drafting a player for the NFL and our metrics for evaluating the success of each player, we now examine the questions posed in Section 2.

4.1 Team Related

We first analyzed the success of each team in drafting the best talent at the least cost. While all teams start with the same number of draft picks, some teams gain or lose draft picks as part of trades so not all teams have the same available number to invest in each draft year. We did our analysis using all combinations of cost and success for each team over the 13 seasons of data that we collected. Rather than present all results in this report, we focus on summary results over the span of our study data. See [1] for season-by-season performance for each team organized based on each division.

Figure 3 shows results where the cumulative Round Points are plotted against the cumulative Approximate Value for drafted players of each team since 2000. Note: these team-oriented results show the total Approximate Value for each team's draftees only. These data do not include undrafted free agents or any acquisitions made outside of the draft.

The graph shows that New England has the highest cumulative Approximate Value and Washington Redskins has the lowest cumulative Approximate Value for all draft picks during this time. A trend line is shown in the graph where teams lying above the line have performed better in terms of success per cost while teams below the line have performed worse for this combination of cost and success. Teams such as New England, Green Bay and Pittsburgh have drafted the best by this success/cost ratio while St. Louis has drafted the worst.

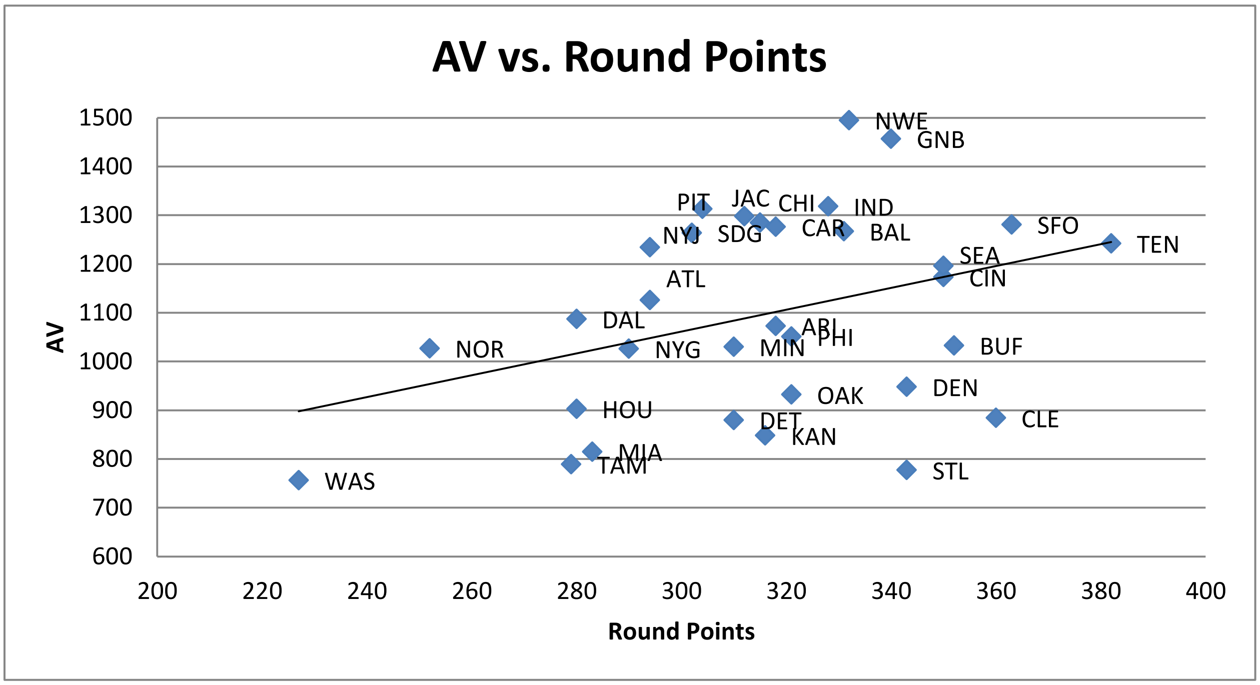

Figure 3: Total Round Points Versus Total Approximate Value for All Teams Since 2000

Rather than show all results in terms of scatter plots as done in Figure 3, we generated two tables showing the result for all teams across all combinations of metrics. In the first, shown in Table 1, we focus only on the two success metrics, Approximate Value and Appearance Score, to see which team actually gets the most production out of their picks and which team gets the least production. Results in this table ignore the cost to obtain the drafted players. The results in Table 1 show scaled Approximate Value and Appearance Score values where the best team for each metric is assigned a value of 100 and the worst team for each is assigned a value of 0. Thus New England is assigned 100 and Washington is assigned zero for the Scaled AV.

Table 1: Overall Drafting Success of Teams

Rank	Draft Team	Scaled AV	Scaled AS	Average
1	GNB	95	77	86
2	NWE	100	72	86
3	SFO	71	100	86
4	TEN	66	84	75
5	IND	76	72	74
6	CAR	70	75	73
7	BAL	69	76	72
8	CHI	72	70	71
9	JAC	73	68	70
10	PIT	75	62	68
11	SDG	69	59	64
12	NYJ	65	59	62
13	SEA	60	64	62
14	CIN	56	55	56
15	ARI	43	54	49
16	DAL	45	49	47
17	ATL	50	40	45
18	HOU	42	47	44
19	BUF	37	49	43
20	MIN	37	42	40
21	NYG	37	41	39
22	PHI	40	35	37
23	OAK	24	48	36
24	NOR	37	32	35
25	CLE	17	34	26
26	DEN	26	22	24
27	DET	17	27	22
28	KAN	12	24	18
29	MIA	8	17	13
30	TAM	4	19	12
31	STL	3	17	10
32	WAS	0	0	0

Similarly we calculated a scaled Appearance Score for each team since 2000 and while New England has the highest Approximate Value the team does not have the highest Appearance Score or the highest average cost metric score. This distinction belongs to Green Bay who edge New England and San Francisco when we average the two scaled scores. Washington has the worst success of any NFL team with the worst values for each metric.

Our next analysis takes into account the cost to obtain a given level of success. Table 2 shows the scaled ratios of draft success versus draft cost for the four combinations of these metrics. This table demonstrates how efficiently a team drafts instead of simply measuring the productivity of a team's picks. The values in this table are scaled from 0 to 100 so each combination can be compared. The higher the scaled value the more efficiently a team has drafted.

The results show that New England, Carolina and Indianapolis (twice) are the best performers for the four respective combinations while St. Louis is the worst in three and Detroit worst in the other. Despite not being the best for any combination, the best overall performer when averaging the four scaled combinations is Pittsburgh. Surprisingly, Washington is not the least efficient team despite obtaining the least success from its picks. This result is because Washington has spent less on its picks than other teams (see Figure 3), possibly because it has traded many away in transactions. Instead the team with the lowest ratio, the least efficient drafting team in the National Football League, is St. Louis.

We also analyzed the cumulative success of individual players for each team using both success metrics and compared each team's results with the number of wins by the team since

2000. Not surprisingly there is a correlation between team wins and player success for each metric. See [1] for more details.

Table 2: Team Ratios of Success of Drafted Players Versus the Cost of Drafting Those Players

Rank	Draft Team	Scaled AV/RP	Scaled AV/DP	Scaled AS/RP	Scaled AS/DP	Average
1	PIT	92	99	92	89	93
2	IND	78	100	87	100	91
3	GNB	90	94	85	82	88
4	NWE	100	93	83	72	87
5	BAL	70	86	90	94	85
6	CHI	81	81	94	81	84
7	JAC	85	63	94	58	75
8	CAR	78	57	100	59	73
9	DAL	72	61	94	65	73
10	NYJ	86	56	98	51	73
11	SDG	86	58	90	51	71
12	NOR	81	51	96	48	69
13	TEN	44	72	63	88	67
14	SFO	56	47	96	63	66
15	NYG	57	62	73	68	65
16	ATL	70	56	68	48	61
17	SEA	51	58	58	60	57
18	PHI	45	52	39	49	46
19	MIN	47	38	57	40	46
20	ARI	50	26	69	29	44
21	CIN	49	33	47	28	39
22	OAK	29	23	57	36	36
23	HOU	43	24	49	22	34
24	TAM	25	26	47	38	34
25	BUF	30	28	38	33	32
26	WAS	48	12	60	10	32
27	MIA	27	24	40	30	30
28	KAN	19	22	27	29	24
29	DEN	22	26	7	22	19
30	DET	26	0	36	0	15
31	CLE	9	5	13	8	9
32	STL	0	0	0	3	1

4.2 Position Related

The next question we examined was the cost and success of drafted players based on their position independent of their team. For this analysis we focus on the average number of Round Points for each drafted player compared with the average AS and average AV attained by these players. Use of average values allows us to compare success of different positions to each other even though there are many more players at some positions than others. The results of this analysis are shown in the graphs of Figures 4 and 5. Each point on the graphs represents a single football position. Some positions were removed because they did not have a large enough sample size of players. Also punters were removed from the Approximate Value graph because there is no Approximate Value calculated for this position.

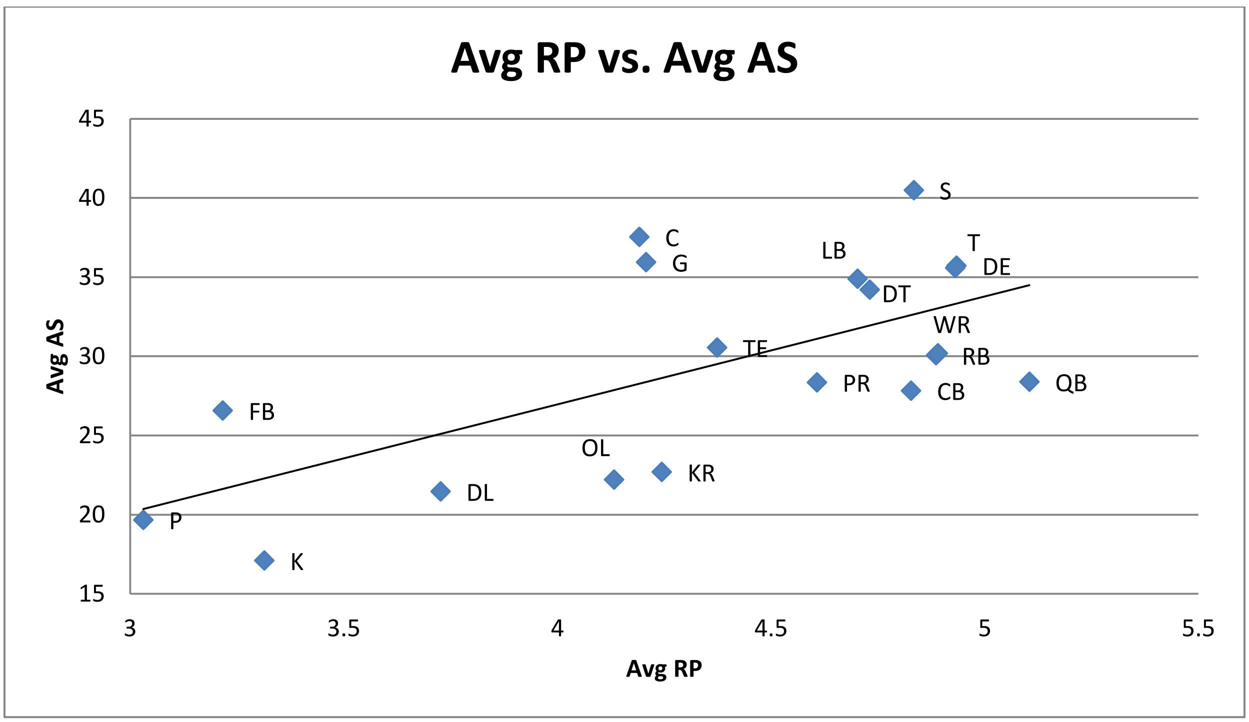

Figure 4: Average Round Points Versus Average Appearance Score for Each Position.

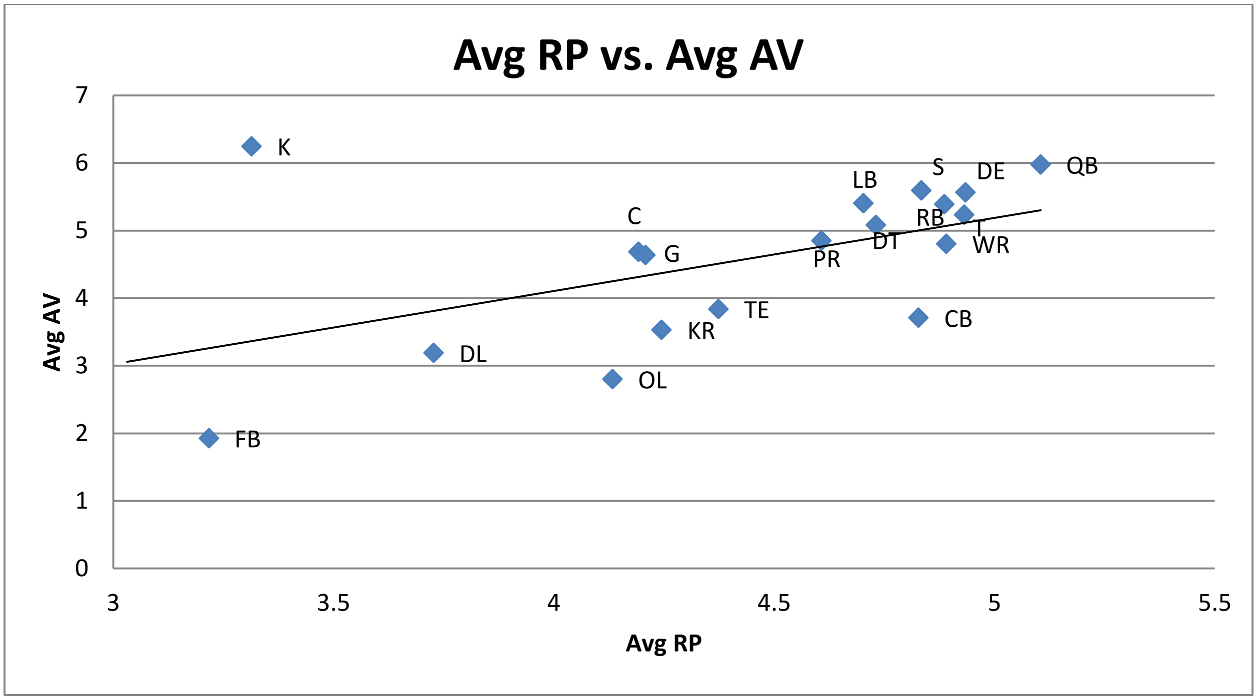

Figure 5: Average Round Points Versus Average Approximate Value for Each Position

These results allow us to answer questions about cost, success and overall value. In terms of average cost for each position, points furthest to the right on the graphs indicate the positions that are most costly on average. These positions are quarterbacks, defensive ends, and tackles. This trend can be seen in the NFL draft over the last thirteen years where quarterbacks have been drafted first overall in ten out of the thirteen drafts. In the three drafts that quarterbacks were not drafted first, either a defensive end or tackle was picked.

The position with the highest average success depends on which metric is being considered where the best is at the top of each graph. When Appearance Score is used to determine the most successful position, then according to Figure 4 safeties, centers, and guards are the most successful positions. According to the Approximate Values in Figure 5, the most successful positions are kickers, quarterbacks, and safeties. Safeties are among the most successful according to each metric therefore safeties can be considered the most successful position overall.

Finally the graphs can be used to determine which positions provide the best success/cost ratio. To aid in this analysis a trend line was added to each graph. If a point appears far above the trend line, then that particular position is undervalued. As can be seen in both figures, centers and guards are undervalued. In Figure 5, kickers are also undervalued. In contrast, cornerbacks are overvalued according to each success/cost combination as this point is much below each graph's trend line.

4.3 Value of Draft Picks

The availability of success metrics for draft picks also allows us to assess the relative value of these picks on a round-by-round basis. In extending our comparison of Round Points and Draft Points of Figure 1, Figure 6 shows adding the average Approximate Value and Appearance Score for all players drafted in each of the seven rounds as well as an "8^{th} round" for undrafted free agents. As comparison we also include data on the average annual rookie salary paid for draftees in each of the seven rounds of the 2012 draft [13], which is the first since introduction of the rookie wage scale. Each line in the figure is scaled relative to assigning 100% to the average value of a first round pick.

As found in previous work [4,11], the Draft Points cost metric does not reflect the expected success of players. Its drop-off between rounds 1 and 2 is much more significant than the drop-off using either the AV or AS success metric, indicating that first-round picks are overvalued. It also shows that this cost metric undervalues later-round draft picks. Using either the AV or AS metric shows a sharper drop-off between the first three rounds then a more gradual decline in success for remaining rounds.

In contrast, the average per-round salaries paid under the rookie wage scale better correlate with the historical average success metrics for each round. Salaries in the second and third rounds are lower than player production for these rounds, but salaries for the remaining rounds are a good match for player success, particularly when using the Approximate Value metric. These results indicate that second-round draftees represent the best value with 70% of the production of first-round draftees at just over 40% of the salary.

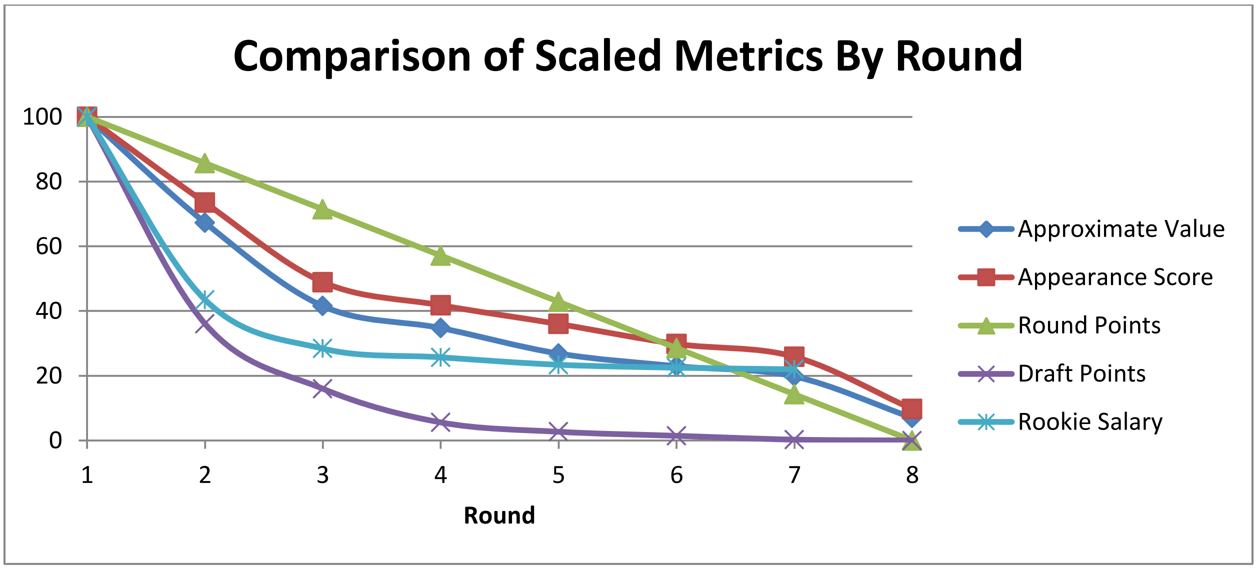

Figure 6: Comparison of Average Metric Values by Round of the Draft Using Round 1 as 100% of Value

Figure 6 also shows that the average success of an undrafted free agent is significantly less. However, there are approximately ten times as many of such players in comparison to the number of players drafted in a particular round. In fact, as shown in Figure 7, the *total* AV and AS for all undrafted free agents from 2000-2012 exceeds the total for all rounds except the first indicating the importance of these players to teams in the NFL.

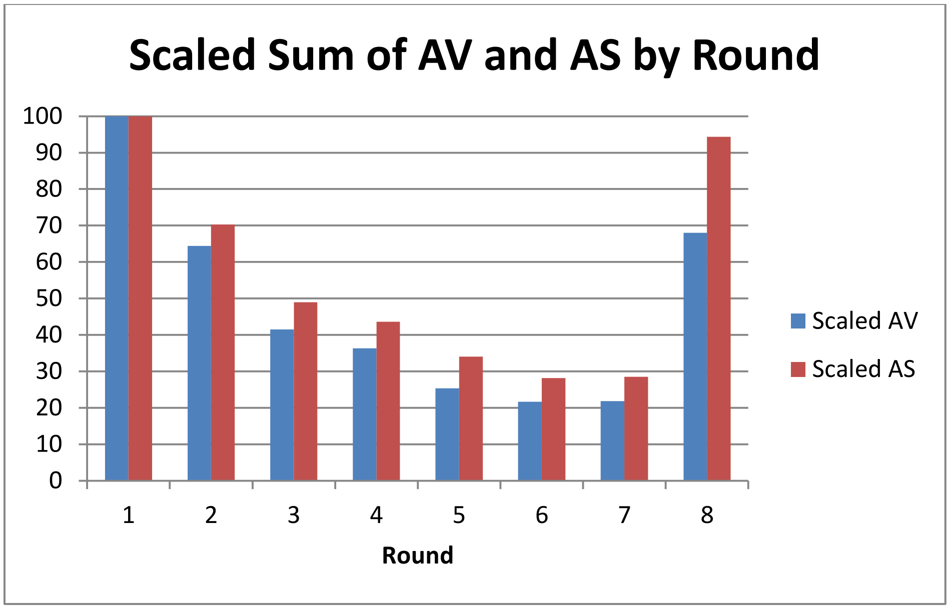

Figure 7: Scaled Sum of Approximate and Appearance Score by Round

Rather than average the value of all picks in each round, Figure 8 shows the draft values for each individual pick in the draft compared with a scaled version of the Draft Points metric.

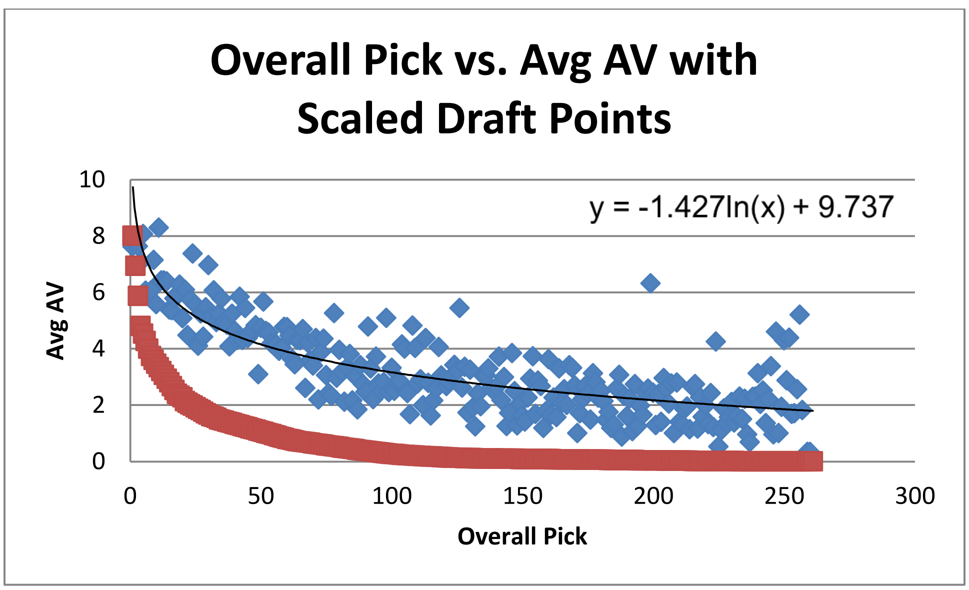

Figure 8: Average AV for Each Pick in the Draft Compared to the Values of Draft Points

The Draft Points boxes in 8 are much below the corresponding Approximate Value points. The data also show that the logarithmic trend line for the AV is flatter than expected from the Draft

Points cost metric. There are outliers in the data as fewer players are being averaged for each point so a player like Tom Brady who was drafted as the 199th pick overall, but has an average AV of just under 14, skews the data for that draft pick.

4.4 Age Related

The last question we looked at is how a player's age or years played in the league affect his success. The NFL eligibility rule states that a player cannot join the league until it has been three years since he has completed high school. Between the 2000 and 2012 season, the average age of a rookie player was approximately 23.3 years of age. It is expected that a player's skill level would increase as a player gets older until he eventually reaches the peak of his career where his productivity would begin to see some decline. Using the Approximate Value success metric, we investigate this question.

Figure 9 shows the average Approximate Value sorted by age during the season for the NFL player base from 2000 to present. Outliers, those players aged 21 and younger as well as 39 and older, were omitted from the graph as these groups represented approximately the lowest and highest 0.05% of the player base, respectively.

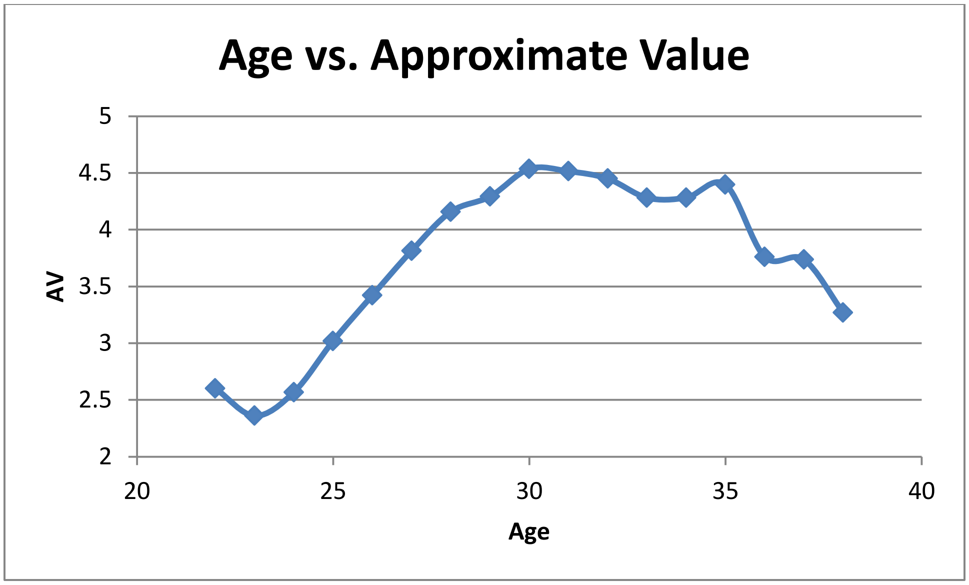

Figure 9: Player Age and the Corresponding Average AV

From this plot, a clear trend can be seen which matches our expectation: player skill increases to a maximum point and then begins to decline. Ages 22-24 are clearly the lowest point in terms of the average skill level of the players in the NFL. This result is reasonable as many new players in the league spend the early years of their career with limited or no playing time thus resulting in the lower Approximate Value. This range group represents about 25% of the player base with another 25% in the 25-26 age range, which is when the success of players begins to increase as they age until roughly age 30. The 30-35 age range shows a plateau of the average AV, but only 18% of the players are in this range with only 2% more than age 35.

Figure 10 shows the average Approximate Value according to the number of years a player has been in the league with the rookie season being equal to zero. These results again show that there is a development cost for drafted players before they reach their peak success level.

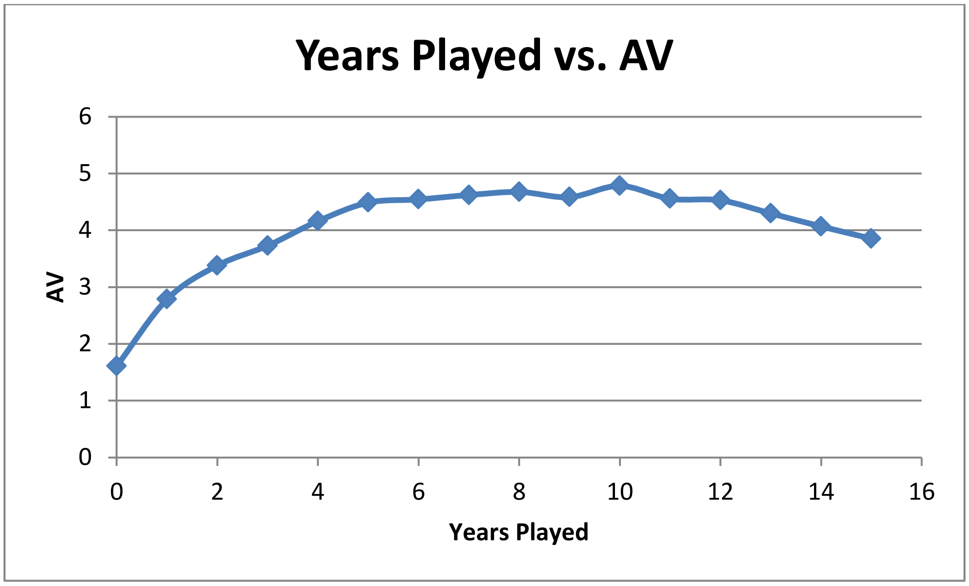

Figure 10: Years Played and the Corresponding Average AV

5 Conclusion

In this work we have applied data analytics to the NFL draft enabling us to pose and seek answers to a number of interesting questions regarding strategies for drafting players over the period 2000 through the most recent 2012 draft and league season. The analysis is based on measuring the cost of acquiring players through the draft and the success of these players once acquired. We employ two primary metrics for measuring the cost of drafted players. The first simply uses the round in which a player is taken while the second uses a table of draft pick values initially developed within the NFL in the early 1990s. We also employ two metrics for measuring the success of drafted players where the first assigns a value to each player's performance for a season. The second was developed as part of this work and is based on a weighted score for games played, games started and recognition as a top player.

Using these metrics, we examined many questions of interest. We first examined which teams have drafted the best using combinations of cost and success metrics for all 32 NFL teams.

If we ignore costs then Green Bay is the team that has drafted the best players since 2000 with New England and San Francisco close behind. Washington has acquired the least amount of talent via the draft. However, if we consider the costs to acquire players then Pittsburgh is the most cost-effective team at drafting with the best ratio of player success to cost. Indianapolis and Green Bay are the next best teams for efficiency with St. Louis being the least efficient team.

When we focus on talent acquisition based on football positions, we found safeties provide the highest average value, but teams on average teams spend the most to acquire quarterbacks, defensive ends, and offensive tackles. In terms of cost effectiveness, centers, guards, and kickers are undervalued on average while cornerbacks are overvalued.

We found interesting results in looking at the value of draft picks. Through examination of recent draft-pick-only trades within the same draft year, we show that teams continue to make use of the draft pick value table for determining the trade value of each pick. However our results show that this table does not accurately reflect the success of a player drafted in a given round. Rather the table overvalues first-round picks relative to all other rounds with the average success of second- and third-round players much higher than predicted by the table. The average success for picks in subsequent rounds more gradually declines and continues to be much higher than predicted by the draft pick value table. The recently introduced rookie pay scale has resulted in average salaries for each round that better match the historical average success of draftees in the round, but discrepancies still point to excellent value in the second round where draftees provide 70% of the production of first-round draftees at just over 40% of the salary. Our results show the importance of undrafted free agents to teams in the NFL as the total success of these undrafted players exceeds the total for all draft rounds except the first.

Finally when we examine player success by age, we find that the youngest 25% of players have the lowest average success as many spend the early years of their career with limited playing time. The average success for players in the next quartile (ages 25 and 26) begins to increase, a trend that continues to roughly age 30. The 30-35 age range then shows a plateau of average player success, but only 18% of the players are in this range with another 2% more than age 35. These results confirm that while younger players are retained hoping they will develop, only the productive older players are retained.

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