

Analyzing the Conventional Wisdom of the Two-Runningback-Draft-Strategy in Fantasy Football using Wins Above Replacement (WAR)

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Abstract— Fantasy football has led to a spike in fan engagement and viewership over the last decade for the NFL. An industry of experts has grown out of the desire to get the highest value players in a fantasy draft. The most prevalent strategy is to select two running backs early because those are the most valuable players. This paper looks to answer whether this theory is valid by assigning a WAR rating to all positional fantasy players. It was found the RB position does provide the most value in a standard fantasy league, but the ability of managers and experts to rank the top RBs is the least consistent among the positions.

Keywords— *Fantasy Football, NFL, Sports Analytics, Wins Above Replacement, Average Draft Position*

I. INTRODUCTION

Each year over forty million team managers sign up to draft fantasy football teams to compete for league championships against up to 12 of their friends, family members, coworkers, or sometimes enemies. At the heart of their task is prediction and risk optimization: which player is going to have the best season and how high of a draft pick do you need to get them? How can one maximize value against cost? Managers want to select higher scoring players before other managers, but not too early. However, if they skip a player in the hopes of getting them for a lower pick, they run the risk of losing that player to another manager. Alternatively, a highly sought-after player expected to have an amazing season can woefully underperform and ruin a manager's fantasy team. Draft picks are the capital that managers spend each year to build the best team possible.

To aid managers an entire industry has formed to forecast player performance and rank them by predicted value for each upcoming season. Analysts consider many factors when ranking players such as a player's stats from previous seasons, a player's skill/tendencies, their team's upcoming schedule, the player's backup, how injury prone a player is, and much more. Simulations have been developed to predict the expected output of each player to aid these rankings. Managers tend to cling to these ratings as the ultimate guide to drafting, so much so that the order of players drafted in many leagues will go straight down the ESPN consensus rankings list. However, even with all the predictive power at their disposal, there are surprise players each year whose Average Draft Position (ADP) makes them a bargain or a bust.

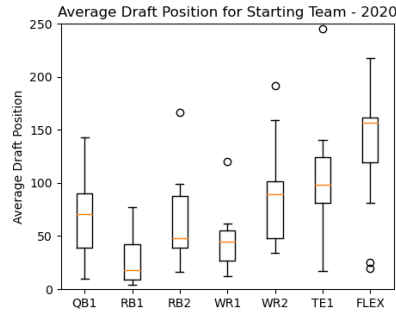


Figure 1. Average Draft Position by Player Position - Early rounds are dominated by running back selections.

The goal of this paper is not to predict the future performance of players, but to determine whether the players are appropriately valued by the fantasy community. The specific analysis will be to evaluate the soundness of the strategy to draft running backs in each of the first two rounds of a fantasy football draft, as is reflected on many fantasy football “Big Boards.” The early round draft picks are dominated by running back selections.

In order to analyze a player’s value, we will formulate a Wins Above Replacement (WAR) for fantasy football to ascertain how many wins a manager could have expected to gain from drafting a given player for the season. Comparing player WAR ratings to their ADPs will give an indication of how well the predicted performance matched their output for the season.

II. FANTASY FOOTBALL – LEAGUE RULES

Fantasy football is a simple enough game to play with a variety of different rulesets. Leagues in the early days of the fan-sport would record stats from the newspaper after all games are played and tabulate the results. Now leagues are hosted online via ESPN/Yahoo/NFL.com/Other with easy user interfaces which pull game data and display results in real time. This section will establish the rules for the league in which the analysis will apply. A 12-team snake redraft league with ESPN standard scoring was chosen because it is one of the most common formats.

The first league format that must be clarified is for the starting positions. Standard leagues starters feature: 1 Quarterback (QB), 2 Running Backs (RB), 2 Wide Receivers (WR), 1 Tight End (TE), 1 Flex player from the RB/WR/TE positions (FLEX), 1 Kicker (K), and 1 Defense/Special Teams (DST). Other variations include 2-QB, 2-FLEX, 3-WR, and Individual Defensive Player (IDP). However, only the QB/RB/WR/TE positions (skill positions) will be analyzed in this study.

Standard Fantasy Scoring		
Skill Positions		
Passing	Yards	0.04
	TD	4.00
Rushing/ Receiving	Yards	0.10
	TD	6.00
Turnover	Int	-2.00
	Fumble	-2.00

Figure 2. Fantasy Skill Standard Player Scoring

The final league parameter is which scoring scheme to utilize. The main types of leagues are Points-Per-Reception (PPR), half-PPR, and standard (or non-PPR). Full and half-PPR leagues grant 1.0 or 0.5 points for each reception players record which attempts to reduce some of the gap between RB and WR/TE value. The skill position point breakdown is

in Figure 2 above. Points for each passing TD and yard are reduced when compared to the rushing and receiving so that QBs are more even with the other skill positions.

In redraft leagues, teams start from scratch each year and all players are initially available in the draft pool. This differs from various versions of keeper leagues where teams are allowed to keep some or all their players from the previous year.

A snake draft is preferred in fantasy football leagues because it is intended to reduce the advantage of managers with higher draft picks by reversing the order each round. A manager with the 12th pick would get the last pick in each odd numbered round, but the first pick in each even number to compensate. This contrasts with linear drafts such as how the major sports teams draft players each year, where each team drafts in the same position each round. Figure 3 provides the draft order for each format for reference.

Snake Draft Format												
	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9	Team 10	Team 11	Team 12
Round 1	1	2	3	4	5	6	7	8	9	10	11	12
Round 2	24	23	22	21	20	19	18	17	16	15	14	13
Round 3	25	26	27	28	29	30	31	32	33	34	35	36
Round 4	48	47	46	45	44	43	42	41	40	39	38	37

Linear Draft Format												
	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9	Team 10	Team 11	Team 12
Round 1	1	2	3	4	5	6	7	8	9	10	11	12
Round 2	13	14	15	16	17	18	19	20	21	22	23	24
Round 3	25	26	27	28	29	30	31	32	33	34	35	36
Round 4	37	38	39	40	41	42	43	44	45	46	47	48

Figure 3. Draft Format Comparison - Snake draft format provides more equitable opportunity for all teams.

Now that the rules of play have been established, players can effectively be compared with a shared understanding of value.

III. METHODS

The following two sections detail how the data was gathered and analyzed to form the results of this study. The effort was performed using Python 3.6 and some of its supporting libraries: Pandas for tabulating data; Requests for web scraping; NumPy and SciPy for math; and Matplotlib for plotting.

A. Collecting and Organizing Statistical Data Set

No free, easily accessible spreadsheets exist online which can be downloaded directly containing NFL player stats and/or average draft position. Instead, the required data was scraped and compiled manually from two different websites: myfantasyleague.com lists all fantasy players with their ADP for each season dating back to 2013 and NFL.com provides the historic weekly game logs for all NFL players. Using the fantasy player list allows for a targeted data scraping effort of player stats so that only data from players of interest need to be compiled. After the data was scraped from the websites, it was appended and formatted into weekly and annual spreadsheets for each player, the fields of which can be seen in the figure below. Further reducing the search, the two non-skill positions were ignored for this analysis, Kickers and Defense/Special Teams. Not only is data more complicated to compile for these players, but they generally do not perform consistently at a high level. Therefore, the two positions are usually selected with each manager's final few picks.

Fantasy Football Table Data Fields				
Player Info	Passing	Rushing	Receiving	Fantasy
Name	Attempts	Attempts	Receptions	Fantasy Total
Position	Yards	Yards	Yards	Fantasy Avg
Week #	Avg Yards	Avg Yards	Avg Yards	WAR
Year	Touchdowns	TD	TD	
ADP	Interceptions	Fumbles		
Unique ID	Completions			

Figure 4. Fantasy Football Player Data Fields - custom fields for data scraped from the web.

B. Developing a Useful WAR Metric for Fantasy Football

The usefulness of the Wins Above Replacement statistic has been demonstrated in baseball for evaluating the relative value of different players. Compared to the other major sports, evaluating player contributions to the chance to win the game is relatively straightforward. A baseball play has a well-defined start and stop and are mostly concerned with the actions of two players: the pitcher on defense, and the batter on offense. However, when translated to a game like basketball that flows seamlessly between plays and requires the coordinated efforts of all players on the court, it becomes harder to answer the question “how much value is this player adding on this play?” Football faces an equally challenging task. While there is a defined beginning and end to each play, the events during the play are much more chaotic and feature dramatically different assignments by each player.

Fantasy football does not struggle to adapt in the same manner as its real-life counterpart. In fact, it lends itself extremely well to be quantified using WAR. The values of each player are well defined by their counting statistics based on their positions, and the predicted value of a player is their most important aspect when considering when a manager should draft them to their team.

To calculate the WAR for each player, we must first find the mean and standard deviation in production of both the average and replacement players. Players are sorted by their average weekly fantasy production to group them into ranked tiers, indicated by the gray lines in Figure 5. As a reminder, the starting skill positions in this league are: QB, RB1, RB2, WR1, WR2, TE, FLEX.

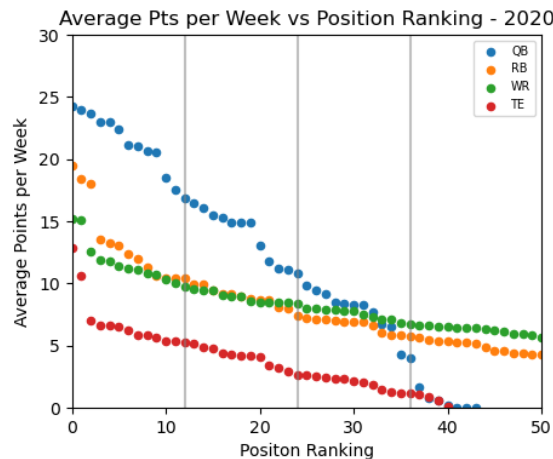


Figure 5. Average Points per Week vs Positional Ranking - 2020

The average points for each of the positional starters is then simply the average from the different tiers. For example, the average RB1 weekly average would be the mean and standard deviation from the 1-12 ranked players, the RB2 average would be from the 13-24 players, and so on. Since there is only a single QB and TE, these are simply the average

of the top 12 players. The FLEX position is handled a little differently since it can be from RB, WR, or TE. Given the lack of depth at the TE position we will take the FLEX player as the average of the 25-32 ranked players of the RB and WR. The final two positions that have not been addressed are the K and DST. Because data was not readily available for these positions to calculate them independently, we will use the consistent values for all seasons and teams.

The average team is then assembled from the average of players at each position for the given year. This is a team that would be expected to have a win rate of approximately 50% in its league for the given year. In general, fantasy teams in this format score around 100 points per game, with a standard deviation of 8.5 points per game. From the graph below we can see that RB do tend to account for few more points than the other skill positions do each game, QBs are the highest scoring single position, and TE have the lowest average single scoring position.

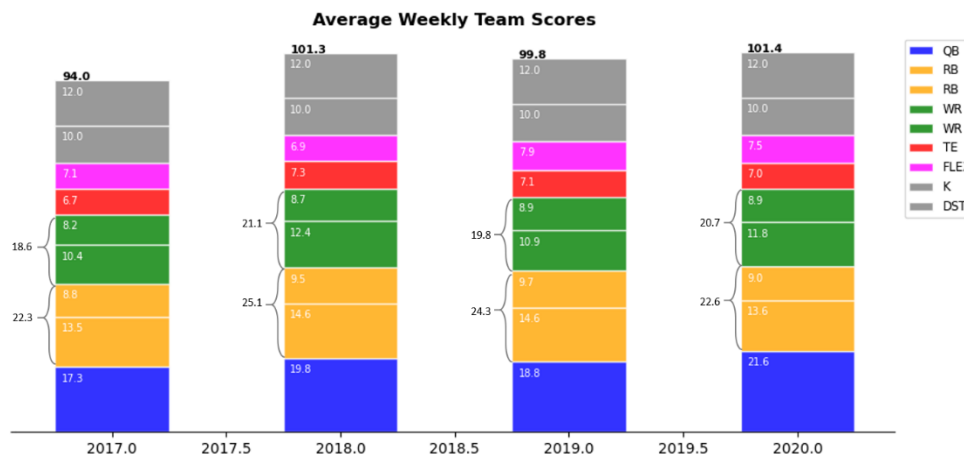


Figure 6. Average Player Scores per Position by Year

Next, we need the value of our lowly replacement players. These are the players that would step into the starting lineup if one of our starters is injured. The replacement pools are taken from the players immediately after the starters. The top ranked player available after the starter was not selected as the replacement because most fantasy teams roster backup players. Instead, the average from the rankings following the starters is used, for example the average from the QB 13-18 players for the replacement QB. For the RB and WR players, the FLEX players are used as the replacements. A summary of the average and replacement player scores and ranked pools are in the table below.

Fantasy Football Team Scoring - 2020					
Position	Player Rank	Weekly Avg	Weekly Std	Replace Rank	Replace Avg
QB	1-12	21.6	2.1	13-18	15.9
RB1	1-12	13.6	3.3	25-32	7.1
RB2	13-24	9.0	0.6		
WR1	1-12	11.8	1.7	25-32	7.9
WR2	13-24	8.9	0.4		
TE	1-12	7.0	2.3	13-18	4.7
FLEX	25-32	7.5	0.4	NA	7.5
K	NA	10.0	3.5		10.0
DST		12.0	6.0		12.0
Total		101.4	8.5		65.1

Figure 7. Fantasy Positional Averages and Replacement Player Values for 2020

Before generalizing to a WAR for any player, we must first find the wins expected by inserting a replacement player into the starting lineup for each position. When inserting a player into the starting lineup, we will always assume they are replacing the top ranked starter (RB1/WR1). The point difference is divided by the average team scoring standard deviation, providing the Z-Score of the player. This can be transformed into a win probability by relating the value to the normal distribution. Remembering the nominal win probability before replacement is 0.50, we observe the biggest drop in win probability is given when replacing a starting RB and the smallest decrease is from the TE.

Replacement Player Single Game Win Probabilities					
	Average	2017	2018	2019	2020
QB	0.30	0.32	0.30	0.33	0.25
RB	0.21	0.21	0.18	0.21	0.22
WR	0.32	0.33	0.26	0.36	0.32
TE	0.38	0.40	0.34	0.37	0.39

Figure 8. Single Game Win Probabilities from Replacement Players

Finally, we have reached the moment of calculating the WAR for any player in fantasy football! Just as with the replacement players, the player is inserted into the lineup in the place of the positional starter for the week and a win probability is calculated from the Z-Score. To get WAR the win probability of the position's replacement player is subtracted from the probability of the current player. The total WAR for a player is accumulated over all games in the season. This method will reward consistency and penalize players who sit out games. A player with a WAR of 0.0 for the season would be as valuable as the replacement level players.

It should be unsurprising to find that a team composed entirely of replacement players would perform dreadfully in an average league. After all, that team would not feature a single starter in any of the skill positions. The total number of expected wins for a season for this team is between 0.1 and 0.45, depending on the year. Fortunately, all managers have an equal opportunity at the higher draft picks to select a more productive player. This does highlight how devastating an injury to a top player can be to a manager's fantasy season if they are trying to replace them from their bench.

IV. RESULTS

Examining the WAR rankings for each position over the last four seasons reveals that there is a distinct advantage to drafting a top RB in fantasy football. The mean and peak production of the RB1 players in each year's draft from 2017-2019 are the highest among all positions, with the worst RB still competing with the replacement players. Only in 2020 was the RB1 position dethroned atop the WAR rankings by the QB position. Compared to the previous years, there was a much steeper drop in points by the lower ranked QBs. The WRs are more comparable to a RB2 player, but the higher value WR targets are more on par with the average RB1s. Furthermore, the WR1 and WR2 players show remarkably similar production, with WR2 players generally outperforming WR1s other than in 2018.

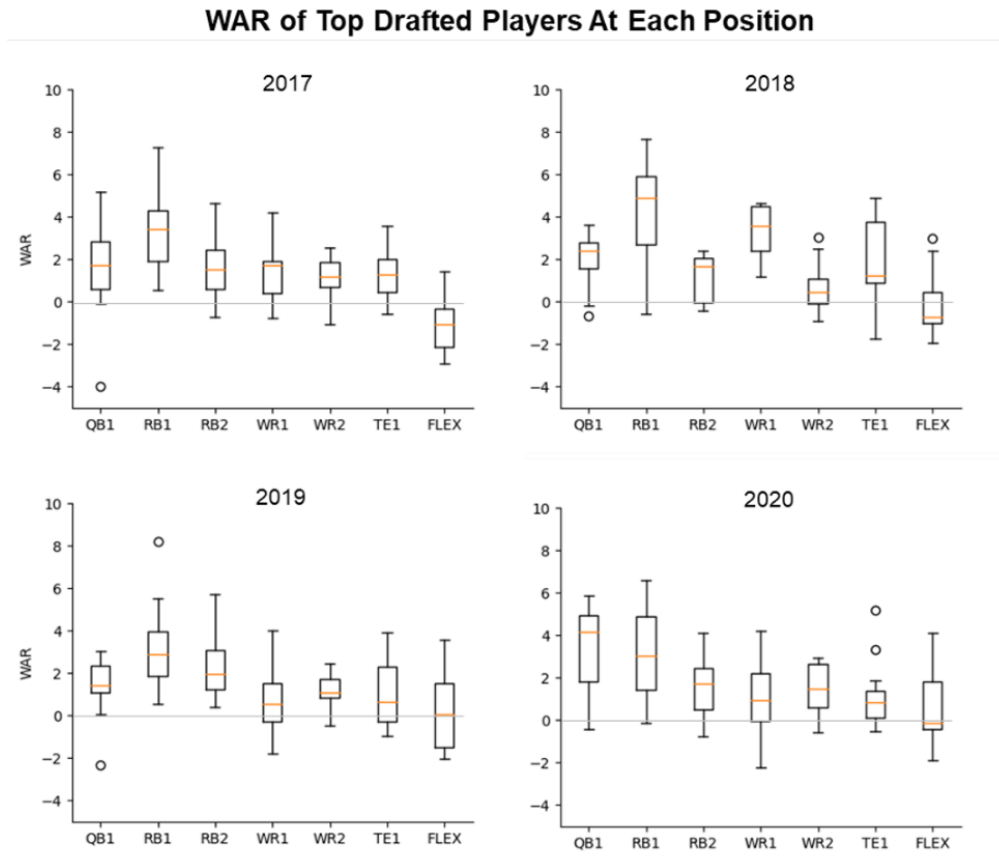


Figure 9. WAR of Top Drafted Players at each Position - RBs tend to provide highest added wins.

There are one or two TEs each season which dramatically outperform the other members of their position. Apart from these high-end talents, the next couple TEs drafted tend to at least be a net positive addition to the team. After the first 4-5 though, the position features a lot of uncertainty. If a manager is unable to draft one of the more reliable TE, they should opt for the safer choice because there is not enough upside at the position to justify risks.

The upside of drafting a high ranking QB does not appear to be justified. Other than in 2020, if a manager can acquire a QB from the top 12-15 their team should not be impacted much when compared to the average starting QB. There is a much steeper drop after the replacement level QBs are drafted though and the lowest ranked QBs are the most detrimental to a team's success. Having the best QB helps about as much as having one of the worst QB hurts, so it would benefit managers to draft a competitive backup to protect from injuries.

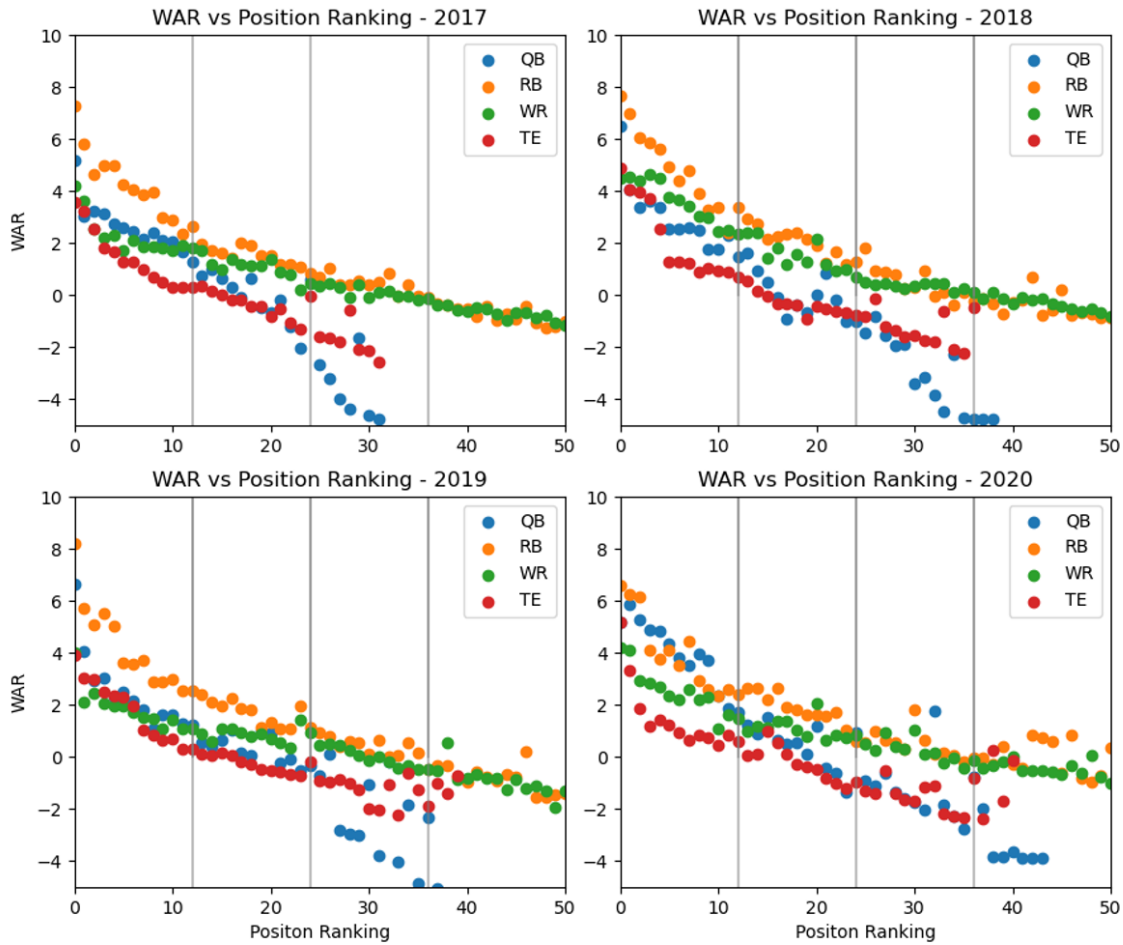


Figure 10. WAR for Players by Position Ranking - RB has highest peak, WR have the most consistent value throughout its position, QB shows sharpest decline after the starters, and TE has little value after the first set of starters.

Based solely on total scoring output, there were an equal number of sleepers and busts shared between the RB and WR positions. A sleeper is a player who outperforms their drafted value, and a bust is a player who underperforms. Rule-of-thumb says that players drafted in the first five rounds (pick 60) should rank in the top 20 of their position. From 2017-2020, the RB and WR positions each produced 24 sleepers and the RB had 22 bust players compared to 20 by the WR. The draft order is generally correct, with some shuffling in the expected ranges and a few busts due to injury. However, examining the WAR tells a much different story about positional value.

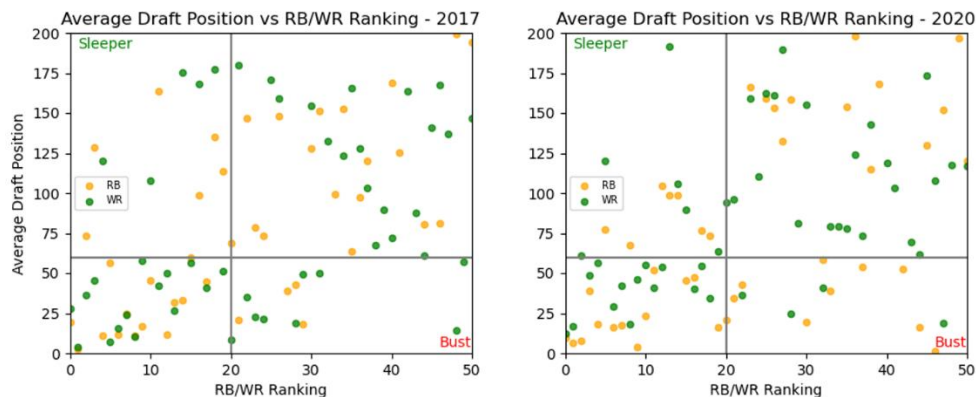


Figure 11. ADP vs Position Rank for RB/WR - Sleepers and busts shown in the top left and bottom right quadrants, respectively.

While RBs provide the biggest upside, draft trends reveal that people are not great at ranking RBs. There is a much clearer downward trend in WAR for the QB and TE as the draft progresses, and to some extent WRs. However, the 3rd group of RBs drafted are seen to be nearly as valuable as the second group. This appears to justify the strategy of selecting RBs in bulk in the hopes of finding a diamond in the rough, a high value player at a low cost. The highest ranked RBs are the most immune to bust, but also tend to have the highest injury rate.

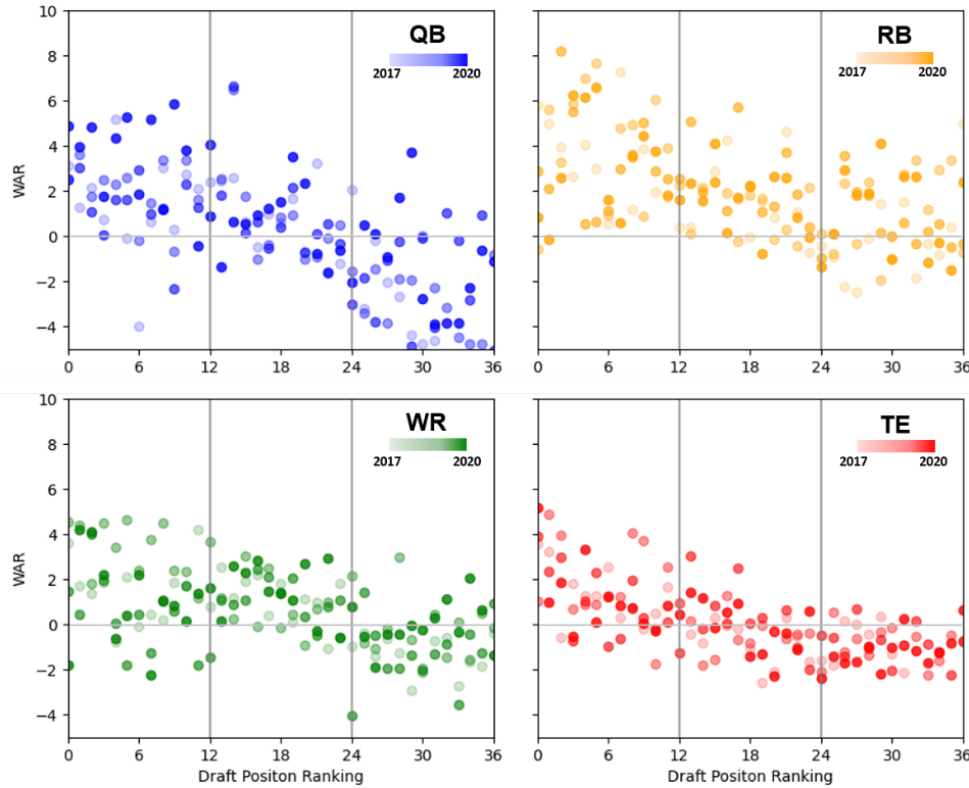


Figure 12. WAR for each Position Based on Draft Position

V. STUDY DEFICIENCIES AND OUTSIDE APPLICATIONS

A. Deficiencies – What could have been done better

There are a few potential improvements that can be made to the methods of this study to give it wider use and more clarity. The WAR for each player is calculated based on the annual averages. This could be updated to calculate the WAR based on the weekly averages, taking the weekly scoring variation into account. The distribution of weekly scoring is also assumed to be gaussian. The true distribution could be generated to produce more accurate win probabilities each week. However, if consistent values are used to baseline all players in a season, the relative difference is the most important factor.

This study does not seek to predict but to retroactively evaluate player performance. Again, using the weekly variations of certain players and their predicted scoring totals for the following year, a WAR could be predicted going into the next season to aid in an upcoming draft.

B. Applications Beyond Fantasy Football

Being able to assign appropriately value to an asset is transferable to most any field. The WAR calculation is a great tool to show ranking biases and to reveal trends. One more direct application would be in evaluating current or potential employee performance. Past hiring trends and output can be compared to try to predict which candidate will make fit best in the team and be the most productive. Another potential use of the WAR evaluation is in examining stock or other traded assets for value. Different types of market traders value different characteristics: a day trader may look for highly volatile holdings while someone with a 401k might be more interested in steady growth. Being able to evenly compare potential assets can give insight to the level of risk associated with each, allowing for a more informed decision maker.

VI. CONCLUSION

Analyzing the production of all fantasy skill-position players show that the strategy to draft two RBs early is justified. The top running backs have the highest potential for adding wins to a fantasy team and have the best opportunity cost among all positions. There is not enough scarcity at the QB and TE to defend selecting them with an early round draft pick when RBs can provide more value to the team. The idea that wide receivers have the most depth is not totally warranted though. A more accurate statement is that there simply is not as much of a difference between WR drafted early and those drafted in the mid-later rounds. If none of the top five WR1 players are available and top RB2 players are still on the board, it is best practice to select a running back. The WAR in the RB2 position is generally as high as the WR1 position outside of the top few receivers, and the WR1 and WR2 players are nearly identical in performance. However, there is a drop off into WR3.

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