The Worth of NFL Free Agent Quarterbacks

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Abstract

Success in the National Football League is largely dependent on the quarterback play. Finding the right quarterback to lead a team to success is difficult, and I wondered whether signing a quarterback in free agency or trading for one is worth the money. Through studies using my Quarterback Productivity Rating, I discovered that not only is signing expensive free agent quarterbacks not necessarily worth the money, but re-signing franchise quarterbacks that play at a less than elite level may also be a mistake.

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Introduction

The National Football League (NFL) is one of the largest entertainment companies in the United States, being worth more than all the country's other major sports organizations. According to the *Business Insider*, in 2016, the average NFL team was worth $2.3 billion, with a total value of $74.8 billion for the NFL as a whole. To put that into perspective, the combined value of the second- and third-most valuable sports organizations, Major League Baseball (MLB) and National Basketball Association (NBA), respectively, is $76 billion (Gaines). The NFL dominates the sports world for nearly the entirety of the year, with the NFL training camps beginning in July, preseason games in August, regular season games from September through December, postseason games in January, and finally, television's annual most-watched event, the Super Bowl, in February. These events are followed in February and March by what is called "Draft Season," during which scouts and fans endlessly watch game tape and discuss on platforms, mainly Twitter, college players that are about to be drafted in late April.

As of March 9, 2018, the NFL's Twitter account had approximately 24.5 million followers. Twitter is a platform for fans and analysts alike to discuss and debate the moves made by NFL teams. One move that is most often critiqued is the decision of who will be the team's starting quarterback. In 2017, NFL teams paid their quarterbacks an average of $16.5 million cash, per *Spotrac.com* ("NFL Quarterback Spending – Cap"). The quarterback is the leader of the team's offense, often seen as the face of the franchise, and the most important player on the team. It is crucial for teams to make the right choice at quarterback, not only to win games but to also keep the faith of the fans and to avoid major scrutiny. With that said, there are three main avenues for a team to take when choosing its franchise quarterback: either signing a free agent quarterback from another team, trading for another team's quarterback, or drafting and grooming its own quarterback. Most teams will either sign a free agent or draft one of its own, as trades typically do not happen that often in the NFL.

Many of the NFL's major storylines belong to the quarterbacks. In 2016, they included Aaron Rodgers lighting up the league as one of the most athletically gifted quarterbacks in NFL history, the Houston Texans' signing of Peyton Manning's backup, Brock Osweiler, and everything in between. Osweiler had started just seven games in the first four years of his career before inking the $72 million deal with $37 million guaranteed with the Texans, only to play terribly in 2016 during his only season in Houston. He would then be traded to the Cleveland Browns in an early 2017 transaction that saw Houston send Osweiler and a second-round pick in the NFL Draft in order to get Osweiler off of their books. How much did this save them? $16 million in cash and $10 million on their cap (Knowlton). On the other hand, the Green Bay Packers have been praised for drafting Rodgers and letting him sit behind Hall of Famer Brett Favre before eventually letting him take the reins in 2008. Meanwhile, the Texans signed Osweiler for a large sum of money, only for the move to fail, and the Broncos have failed to find any success at the quarterback position since letting him walk (nevertheless, he did return in 2017 as a backup and much less productive version of his pre-Houston self).

Head-scratching moves like that made me wonder if it was worthwhile for NFL teams to attempt to sign their franchise quarterbacks in free agency or if they are better off just drafting a rookie and grooming him instead. One major issue that I had encountered before wanting to investigate this was that I did not have a good way to evaluate quarterbacks. Watching film is very time-consuming, and the two major NFL quarterback metrics are flawed, which I explain my "Methodology" section; therefore, I created my own statistical metric: the NFL Quarterback Productivity Rating, a metric that uses only box score statistics to grade how productive a quarterback is.

I used my NFL Quarterback Productivity Rating (or QPR for short, not to be confused with ESPN's "QBR") to determine if there is a market inefficiency in the NFL with quarterbacks. Are NFL teams spending too much money on free agent quarterbacks? Could they be spending that money more wisely on players to fill the other 52 positions on their 53-man active roster? Would teams be better served always drafting a quarterback and attempting to groom him when it is time to make a change at quarterback? Should teams risk getting Osweiler-type production in hopes of signing someone that will go to the Hall of Fame, like Drew Brees, who signed with the New Orleans Saints in 2006 after spending the first five seasons of his career in San Diego? These are the types of questions that I answered using the QPR and statistical analysis.

Hypothesis Statement

There is a chance that teams are paying their quarterbacks more based on the passer rating than other statistics that better represent a quarterback's ability, which would, therefore, be an inefficiency in the market. I analyzed statistics to determine if that deficiency is present, but based on a non-in-depth statistical glance at many of the quarterbacks that have been signed in free agency over the past decade, I believe that it is not worth signing a quarterback in free agency for NFL teams, and that they are better served drafting a player and building a team around him rather than spending too much money on a player and attempting to force him into a team that is different than the environment into which he entered the league.

Methodology

The methodology for determining whether it is worthwhile for an NFL team to sign a quarterback is multi-stepped. Obviously, I had to determine if homegrown quarterbacks are better, on average, than those signed in free agency. Then I had to determine whether the difference in their qualities is worth the money used signing said quarterbacks or the money saved by not signing quarterbacks.

How to determine the quality of the quarterbacks is where discernment is necessary. There are many ways to judge an NFL quarterback. The most effective way to judge them is to watch game film, but that requires two things that most people, including myself, do not have: the time to watch nearly 1,280 one-hour-long football games to grade five years' worth of performances (because there are 256 regular season games per year), and the ability to scout the actual physical qualities of what a quarterback does that makes him good, to properly assign a grade. A more practical method, however, is to determine the quarterback's quality based on his statistics. A quarterback's statistics are not tell-all by any means, as their statistics are affected by others on the football field, such as the receivers' ability to catch the ball or the offensive line's ability to block.

Nevertheless, statistics are based on objective reality and are not subject to bias, which makes them an effective tool to judge the quarterbacks.

The next issue is to determine which statistical measures should be used to judge the quarterbacks. Sports writers use two major statistical metrics today to judge quarterbacks: the NFL passer rating and ESPN's "quarterback rating." I have major issues with both metrics.

The passer rating is formulated by using only the number of the quarterback's passing attempts, completed passes, and thrown passing yards, touchdown passes, and interceptions. This is a great rating to determine how effective a quarterback is as a passer, especially when comparing how he does when targeting a certain player or a certain side of the field; however, the rating only accounts for passing statistics. In today's NFL, the quarterback is expected to do much more than just throw the football. During the 2016 NFL Regular Season, the Packers lost multiple running backs due to injury, and were forced to convert wide receiver Ty Montgomery into a running back. He rushed the ball 77 times for 457 yards to lead the team. Up until the last few weeks of the season, however, the Packers' leading rusher surprisingly was quarterback Aaron Rodgers, who is also seen as one of the best passers in the league. Teams are expecting their quarterbacks to be able to run with the ball, and they are drafting quarterbacks like Marcus Mariota, Russell Wilson, and Cam Newton, who can do it all.

Another issue with the passer rating is that it does not account for how many times the quarterback fumbles the football. A fumble can kill momentum, even if it does not result in a turnover, and football is a game of momentum, meaning that fumbles hurt NFL teams. Fumbles that result in turnovers affect the teams just as negatively as interceptions, but some analysts forget about that when judging quarterbacks, only looking at interceptions. How frequently a quarterback is sacked, also, is not accounted for by the passer rating, and while sacks are often a result of poor blocking or poor route running by the receivers, certain quarterbacks are more prone to being sacked than others. In 2015, the Super Bowl Champion Broncos saw two quarterbacks start and play in a significant number of games. Future Hall of Famer Peyton Manning saw significant time in ten games and was sacked 16 times, averaging 1.6 sacks taken per game. Their other quarterback, Osweiler, only saw significant time in eight games, but he was sacked 23 times, averaging nearly three sacks per game. Manning was known for his ability to avoid being sacked, making him a more effective quarterback than Osweiler in that area, but the NFL passer rating does not account for that. While the passer rating is arguably outdated, it is undoubtedly insufficient in determining if a quarterback is worth signing in free agency. One possible reason that an outdated and insufficient rating, such as the passer rating, is used so widely is that its formula is extremely complex and rather confusing. According to Don Weiss, who served on the committee that developed the passer rating, the metric is not questioned because the mathematics are "so complicated" that people just "accepted it" (Berri 138-139). We need a metric that is easily comprehensible and transparent.

Next, we have ESPN's "quarterback rating," known as the "QBR." The QBR accounts everything that the passer rating does not: rushing yards, rushing touchdowns, fumbles, and sacks taken; however, it is not entirely based on statistics. The QBR is subject to bias because it accounts for situations in football; for example, those who score QBRs will weigh a touchdown in the fourth quarter more heavily than one in third quarter if it is to take a lead late in the game. While I agree that those touchdowns are worth more, it is subject to opinion. Another issue with the QBR is that ESPN has never released how the QBR is calculated, meaning that it is entirely subject to bias without transparency.

With both the NFL's main metrics being flawed, in January 2016, I created my own metric with hopes of being transparent, yet effective, in grading how productive a quarterback is. I named it the "NFL Quarterback Productivity Rating," which was later coined by a former colleague of mine, Ryan Tracy, as the "QPR." The Productivity Rating accounts for the quarterback's completed passes, incomplete passes, passing yards, passing and rushing touchdowns, interceptions, sacks taken, sack yards lost, rushing yards, and fumbles recovered and lost. It is calculated similarly to the passer rating and is as transparent as such, but it encompasses all the statistics that ESPN's metric does.

The Quarterback Productivity Rating is calculated by weighing the quarterback's statistics and then adding them together. That sum of the weighted statistics is the Productivity Rating. How the statistics are weighed can be seen in Table 1. I developed this rating and weight with the hopes of what I considered a "perfect game" to be scored at a 100.0; that score would be four touchdowns (60 points) and 500 passing yards (40 points. I wanted the complete and incomplete passes to be worth the same to cancel each other out. Overall completion percentage, however, does not weigh heavily because even if the quarterback even doesn't complete 50% of his passes, but he is tossing touchdowns with every other pass, he is still productive. Touchdowns are weighed more heavily than turnovers because I do not believe that a quarterback turning the ball over once outweighs the six points he scored on a touchdown, but two turnovers (-20 points) does outweigh that of one touchdown.

Table 1 – QPR Calculations

Statistics	Worth
Complete, non-TD passes	0.25
Incomplete, non-INT passes	-0.25
Passing Yard	0.08
Passing Touchdown	15
Interception	-10
Sack	-2
Sack Yards	-0.05
Rushing Yards	0.05
Rushing Touchdown	15
QB Fumble (Recovered)	-2.5
QB Fumble (Lost)	-10

My goal was to record the Productivity Rating for every quarterback that started at least four games, which is my definition of a starting quarterback, from the 2013 regular season through the 2017 season, and compare the quarterbacks that were homegrown with those that were playing on a team that did not groom them from the beginning of their careers. Quarterbacks like Osweiler and Matt Flynn, who returned to the teams that groomed them after only a year or two away, are considered to be homegrown for their previous teams.

In order to calculate the QPRs, I had to go through some difficult stages of data collection. For the first year and a half, I manually created a page for each quarterback along with a table for each season that was specifically formatted for the team that they played for. Then, I had to manually enter the game statistics for each game to calculate the QPR, which was then averaged to find the seasonal QPR. Table 2 shows the original Excel sheet for Detroit Lions quarterback Matthew Stafford's 2015-2016 season.

Table 2 – Original QPR Table Example

Detroit Lions, 2015-2016, 7th Season																		
Games Counted: 16																		
Opponent	Week 1 @SD	Week 2 @MIN	Week 3 DEN	Week 4 @SEA	Week 5 ARI	Week 6 CHI	Week 7 MIN	Week 8 @KC	Week 9	Week 10 @GB	Week 11 OAK	Week 12 PHI	Week 13 GB	Week 14 @STL	Week 15 @NO	Week 16 SF	Week 17 @CHI	Starting Record
Win/Loss	L	L	L	L	L	W	L	L		W	W	W	L	L	W	W	W	
Play/Start	S	S	S	S	S	S	S	S		S	S	S	S	S	S	S	S	Averages
Complete (Non-TD)	17	30	30	24	19	23	16	21		22	22	22	21	28	19	27	25	22.88
Incomplete (Non-INT)	9	20	12	11	9	14	8	12		13	13	11	12	15	3	8	11	11.31
Pass Yards	246	286	282	203	188	405	256	217		242	282	337	220	245	254	301	298	266.38
Pass TD	2	2	1	0	1	4	2	1		2	0	5	2	2	3	2	3	2.00
INT	2	1	2	0	3	1	0	2		1	0	0	0	1	0	0	0	0.81
Sacked	1	1	4	0	1	2	7	6		0	4	2	3	4	3	2	4	2.75
Sack Yards	13	1	20	0	0	14	59	32		0	16	15	15	25	8	17	16	15.69
Rush Yards	-1	20	-1	0	2	37	5	5		1	31	22	22	5	-1	11	10	10.50
Rush TD	0	0	0	0	0	0	0	0		0	1	0	0	0	0	0	0	0.06
Fumbles (Recovered)	0	0	0	0	0	0	0	0		1	0	0	0	1	0	0	0	0.13
Fumbles (Lost)	0	0	1	0	0	0	0	0		0	0	0	1	0	0	0	0	
Productivity	28.98	44.33	3.01	19.49	0.64	81.80	35.78	1.26		39.16	32.56	101.06	34.20	31.35	62.87	54.53	64.04	
Mean	39.69																	
Variance	746.72																	
Standard Deviation	27.33																	

This worked well at first, but it was near impossible to compare quarterbacks from year-to-year and even more difficult to compare two different quarterbacks. So, I had to create a new table that had all of the quarterbacks' productivity ratings so that I could make comparisons. The only issue with this, however, was that it would be too difficult to have a table that held all of the statistics in Table 2 to calculate the QPRs. I realized that I needed calculate the QPRs separately and only include the mean QPR in the table. Through trial, error, and multiple versions, I created a sheet with Excel macros (automated functions that combine a lot of functions into one, activated by the click of a button) that would allow me to copy and paste the game logs for a season and then get the QPRs on the game level for my table that had each game rating but also returned the mean QPR for the table that only showed the mean QPRs for the season. Below is Table 3, which is the final "CopyPasteCalculator," which ultimately sped up the process of calculating QPRs tremendously. A table with all of the starting quarterbacks' QPRs can be seen in Appendix 1.

Table 3 – Final Calculator

A	C	D	E	F	H	N	Q	W	Y	Z	AA	AB	AC
WK	Opp	Result	G	GS	Att	Sck	Att	QPR	Mean	STDV			
									#DIV/0!	#DIV/0!			
									Fix				
									Clear				

Now, to determine the financial worth of the players, I had to determine how much the quarterbacks are costing their teams. Money is no issue for NFL teams, but teams do have to worry about a salary cap. We can compare the percentage of the salary cap that free agent/traded-for quarterbacks (or as I may refer to them later: "acquireds") are taking up compared to those home-grown. To acquire those numbers, I consulted *Spotrac.com*, which is a website that specializes in and contains the contract and salary cap information for the professional sports teams. I wanted focus on cap percentage, which is the percentage for how much of a team's salary cap taken up by one player. The cap limits how much a team can spend on player contracts, so I feel it is imperative to examine how much the players exhaust that allotment.

Once I had all my data compiled, I had to compare the averages of the two groups of quarterbacks using the "difference of means" statistical test. This allows us to see if there is a significant difference in their productivities and if there is a significant difference in their salary numbers. I also compared the win percentages by the two groups of quarterbacks to see if teams win more games with one set of quarterbacks. This is important because winning games is what matters most to NFL teams because winning teams make the most money due to fan bases being more energized and willing to spend money on the teams. I was also be able to look at a few different correlations. I correlated the average productivity rating to win percentage on the season, and I did the same with the passer rating. Then I also looked at how the two different ratings correlate with the quarterbacks' salaries to see if there is a market inefficiency. Are teams basing their contracts too much on the passer rating when they could be looking at a different rating, such as my productivity rating? This can also help us see if teams are investing too much in quarterbacks when they could spread that money to bolster the other positions on the team to have the highest win percentage. Is there an optimal productivity rating to have that does not warrant too large of a salary but manages to win the necessary amount of games to go to the playoffs? Those were all questions I wanted to answer through statistical tests.

Results

To begin analysis, we must look at correlations to determine the importance of our statistics. The population consists of 201 starting quarterbacks. I want to see how the QPR correlates to win percentage and cap percentage, but I also need to see how that compares to the passer rating's correlations. Comparing the correlation coefficients (r-values) between the QPR and the cap percentage and the r-value between the passer rating and the cap percentage, we see that the QPR/Cap correlation appears higher, but through statistical testing, we cannot confirm this, given the two-tail p-value of 0.3077 (which we would need to see below 0.05 to claim statistical significance). Next, we can see the r-values between QPR and win percentage and the passer rating and win percentage of 0.609 and 0.591 are not significantly different without even using a test (that said, a test does prove this to be true). Finally, we see there is a correlation coefficient of 0.268 between win percentage and cap percentage, which tells us that if we were to try to predict win percentage based on cap percentage, only about 7.2% of the variation in the model would be explained by the cap percentage (we get the 0.072 R-squared value by squaring the correlation coefficient of 0.268). On the other hand, the passer rating and QPR have an r-value of 0.873, which tells us that if a quarterback has a good passer rating, he probably has a good productivity rating, as well.

Figure 1: Correlations between the main statistics of this study

Since 2013, there were 131 homegrown starting quarterbacks and 70 acquired starters (keep in mind, many of these quarterbacks have been counted at most five times: the 2013, 2014, 2015, 2016 and 2017 versions of themselves, per se). Comparing the statistics, the average homegrown starter had a mean QPR of 29.67 for the season, and the average acquired starter had a mean QPR of 26.60. Using the one-tail difference of means test, we get a p-value of 0.0484, which allows us to say that the homegrown quarterbacks were more productive than the acquired starters, on average. The two-tailed test gives us a p-value of 0.0968, which does not allow us to reject the null hypothesis that they are equal sets of quarterbacks, but I am confident enough from my knowledge of the league to use the one-tailed test to reject the hypothesis. The two-tailed result is significant at the 10% level, which is something. The average seasonal passer rating for the homegrown starters was 88.10 compared to the acquired starters' 86.35; however, the one-tailed p-value of 0.1563 and two-tailed p-value of 0.3126 do not allow us to reject the null hypothesis. The average win percentage for the homegrown starters was 0.480, whereas the acquired win percentage was 0.465, with a p-value of 0.6392, not allowing us to reject. Finally, the mean cap percentage for homegrown was 6.42%, and the mean for the acquired quarterbacks was 5.38%, yielding a p-value of 0.1709, once again not allowing us to reject the null hypothesis.

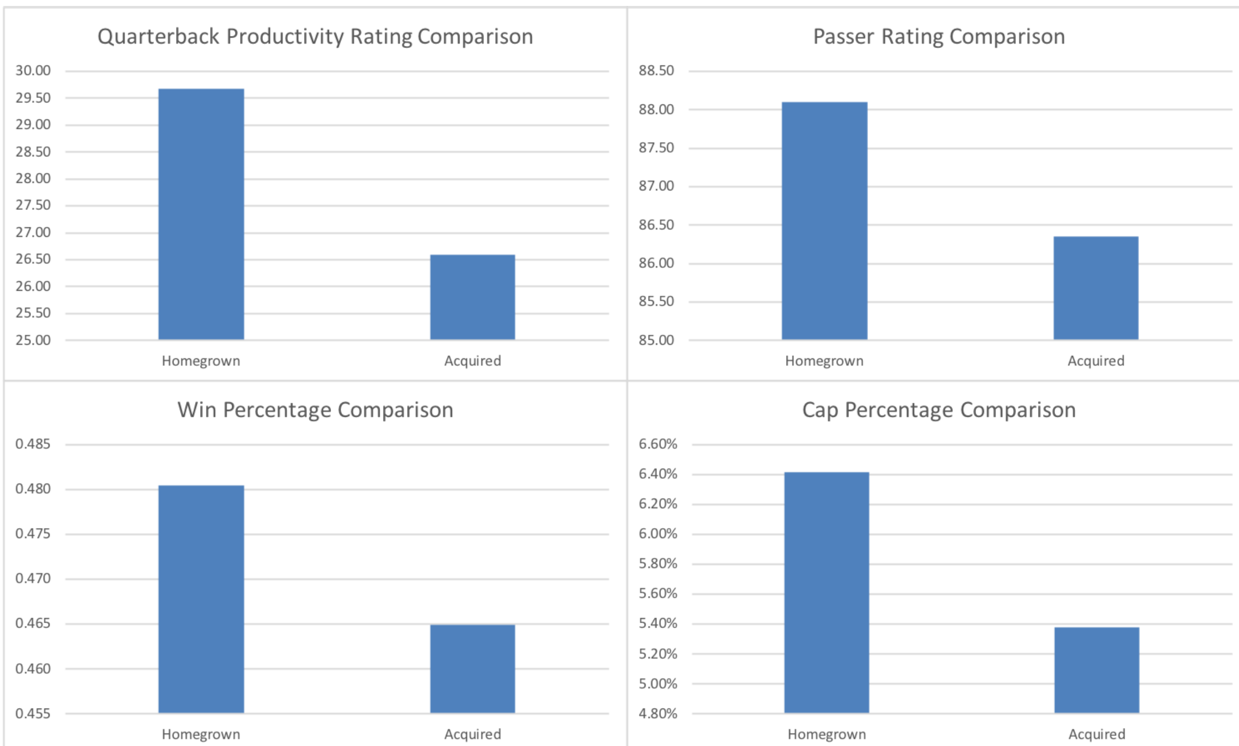

Figure 2: Comparisons between all homegrown and acquired starters

With this in mind, it appears that the homegrown quarterbacks were better than the acquired quarterbacks, but we cannot say for certain that they are more likely to win games. The better route is to now look at subgroups of quarterbacks. I have made separations based on experience because most rookie contracts end after the fourth season. Players drafted in the first round of the NFL Draft have a fifth-year option built into their contracts that allows them to stay on contract for their fifth season before hitting free agency; however, the fifth year of the contract has a value that differs depending on when the players were drafted. Top ten picks get paid the average of the top ten salaries for their respective positions, and the players picked between slots 11 and 32 will get the average of third through 25th highest salaries at their respective positions (SI Wire). The subgroups that I have compared are homegrown quarterbacks with four or more years of experience versus their acquired counterparts, homegrown quarterbacks with three or less years of experience versus homegrown quarterbacks with four or more years of experience, and homegrown quarterbacks with three or less years of experience versus acquired quarterbacks with four or more years of experience.

This simulates three decisions that teams might have to make:

1. Is it better to re-sign a quarterback or trade for or sign a guy in free agency?
2. Is it better to re-sign a quarterback or pick a rookie in the NFL Draft?
3. Is it better to draft a rookie or trade for or sign a quarterback in free agency?

Comparing the NFL veterans with four or more years of experience, the homegrown passers had an average productivity rating of 34.91 compared to the acquireds' mean seasonal QPR of 27.32. Out of QPR, passer rating, average win percentage, and average cap percentage, average QPR is the only statistic that the homegrown quarterbacks with four or more years of experience were significantly better than the acquired quarterbacks, with a one-tailed test p-value of 0.0484. The rest all had p-values greater than 0.05 for both the one- and two-tailed tests.

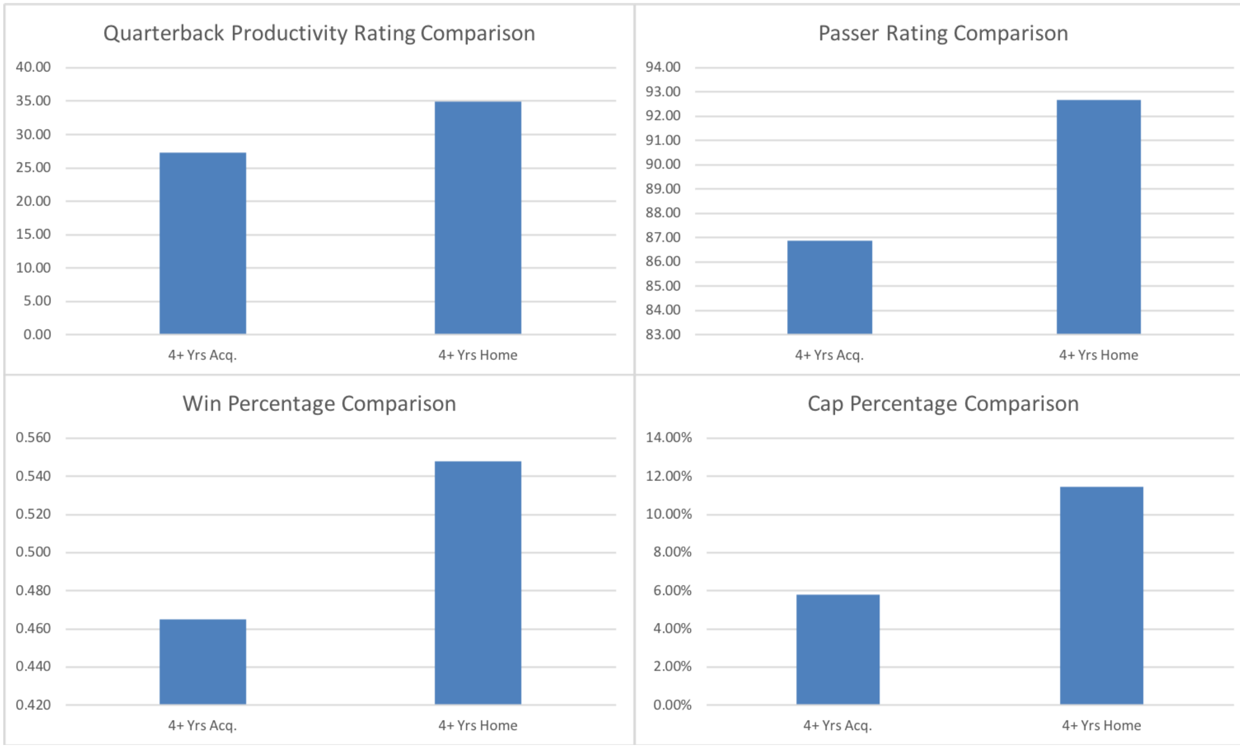

Figure 3: Comparisons between homegrown veterans and acquired veterans

Using these results, we can see that the homegrown quarterbacks are significantly more productive than the acquired ones, but it is not enough to see a significant difference in win percentage. This could be due to the fact that a quarterback is just one player and cannot affect a game *that* much, but there are other subgroups where the productivity difference suggests a difference in win percentage, as well. It could also be a matter of the fact that as quarterbacks improve, the marginal gain in win percentage decreases. That said, I am not sure this is the case, either. Looking at the single game productivity ratings in the table below with whether they won or not, we see for the most part, as quarterbacks' productivity ratings jump from one bracket to the next, the probability of winning increased. As win percentage increased from negative teens to through 40s, we see a leveling off, but when productivity jumps to the 50s, we see a massive jump in win probability, with even more jumps through the 80s group, until the sample size is too small to really tell in the 90s and 100+ groups.

Table 4 – Productivity and Win Probabilities

QPR	Games	Game %	Wins	Losses	Win %
Negative 30s and Below	14	0.55%	0	14	0.00%
Negative 20s	31	1.21%	0	31	0.00%
Negative Teens	106	4.14%	9	97	8.49%
Negative Singles	178	6.95%	35	143	19.66%
Singles	277	10.82%	80	197	28.88%
Teens	328	12.81%	133	192	40.55%
20s	400	15.63%	198	200	49.50%
30s	377	14.73%	214	163	56.76%
40s	294	11.48%	177	116	60.20%
50s	205	8.01%	151	53	73.66%
60s	145	5.66%	107	37	73.79%
70s	103	4.02%	82	21	79.61%
80s	62	2.42%	54	8	87.10%
90s	23	0.90%	20	3	86.96%
100 and above	17	0.66%	16	1	94.12%

Looking at the next subset of veteran homegrown quarterbacks compared to young homegrown quarterbacks, we see some major differences in quality. The average seasonal QPR for the veterans was 34.91 compared to their younger counterparts' mean of 25.37, showing significant difference with one- and two-tail p-values less than 0.00001. The average win percentage for the veterans was 0.548, while the average for the young guys was 0.425. These translate to 8.77 and 6.80 wins on average per season, respectively; however, if you go two standard deviations above the mean for both, they max out at approximately 15 and 14 wins, respectively, and three and zero wins if you go two standard deviations below the mean. Because of the higher standard deviations of the younger quarterbacks, we can see that the good, young quarterbacks are nearly just as capable of winning games as the good, experienced players. What this tells me is that if a team drafts a talented rookie quarterback and pairs him with a strong quarterback coaching staff, he can be almost as effective in winning games as a veteran. These younger players will cost a lot less money, on average taking up only 2.3% of their teams cap compared to the average 11.44% of cap taken up by the veterans. This means that the teams can build strong teams around these young players more easily to help them succeed and be productive, as the quarterback is only one guy on the field.

Looking even further, we see that the young quarterbacks have a 0.664 correlation coefficient between mean QPR and win percentage, whereas the vets have a correlation coefficient of 0.524. With a one-tailed p-value of 0.1131, we can't say for sure that win percentage and mean QPR are more correlated for the young quarterbacks than the veterans, but a value that low does give us some evidence that it might. This makes us wonder that maybe the franchise quarterback is an overrated idea and that drafting a talented rookie every few years and building a team for him to succeed with may be a reasonable route to the playoffs. The feasibility of this theory is evidenced by the correlation coefficient between mean QPR and cap percentage for the young guys, which is only 0.132. Since the players drafted the highest in the NFL Draft have the highest cap numbers, this implies that QPR is not necessarily correlating with draft position. Midand late-round picks are capable of being very productive, as well. This is something I'm really not sure about, but I want to investigate it more outside of this study.

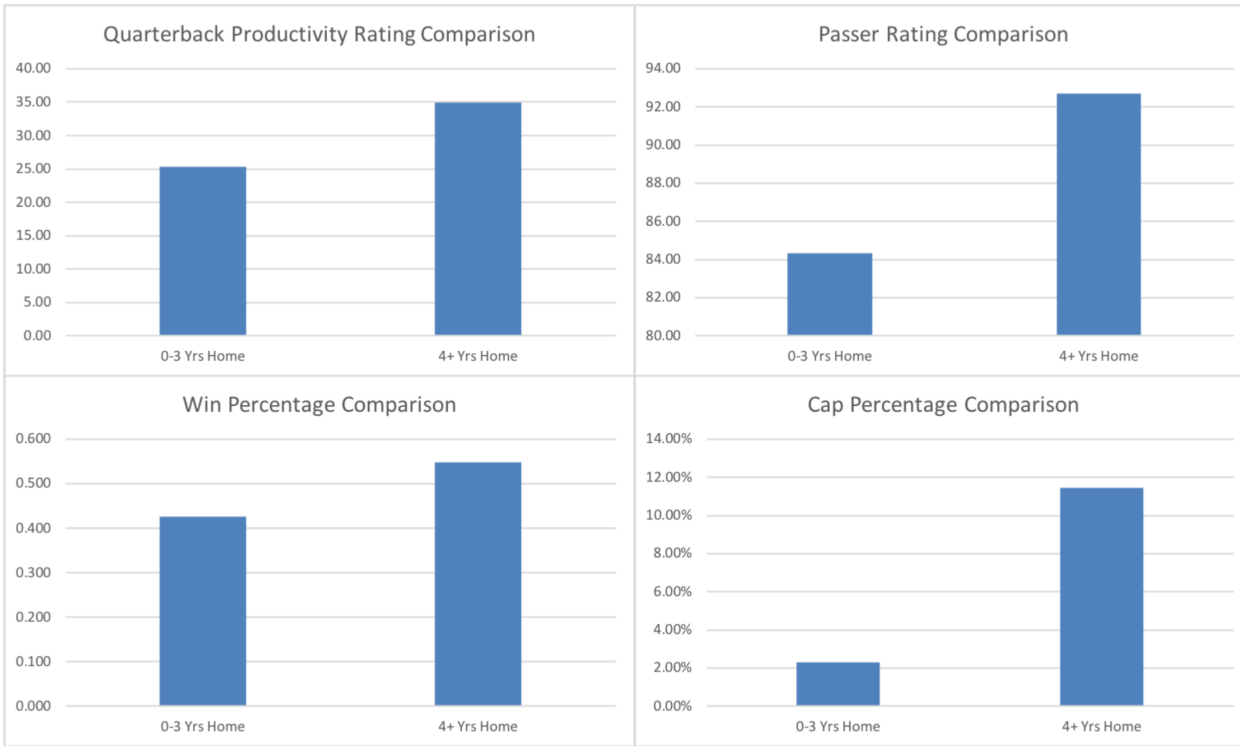

Figure 4: Comparisons between homegrown young and veteran quarterbacks

The final subgroup comparison is the young homegrown quarterbacks compared to the veteran acquireds. The mean QPR for the young ones was 25.37, and the veterans' was 27.32. Those are really close, so I want to look at the two-tailed test p-value, which is a 0.3649, telling me that we cannot reject the null hypothesis, and there might not be a significant difference between the two groups' productivities. When you consider the average cap percentage of 5.81% for the acquired quarterbacks, which is significantly higher than the young homegrown quarterbacks' 2.3% average, the cost does not outweigh the reward.

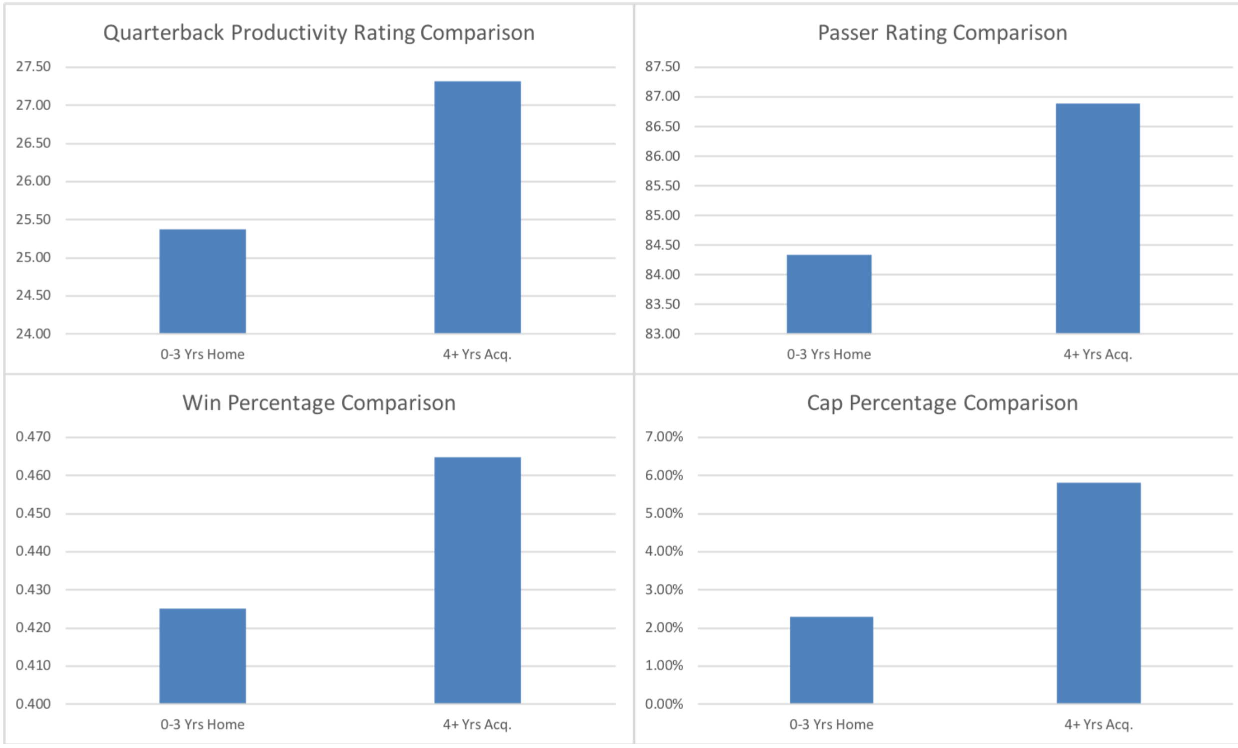

Figure 5: Comparisons between homegrown young quarterbacks and acquired veterans

Conclusion

Looking at the subgroup comparisons is the key to making a conclusion in this case. The homegrown veterans are significantly better than the acquired veterans, but they are also on average twice as much. Is that worth the extra cost? The veteran homegrown quarterbacks are significantly better than the young homegrown quarterbacks, but they cost almost five times as much, on average, with a win percentage only 0.123 higher, on average. That average win percentage of 0.548 translates to just under nine wins per season, which is typically not enough to get a team to the playoffs. Above average homegrown veteran quarterbacks (often known as “the franchise quarterback”) will get a team to the playoffs, but they also will cost the team significantly more money and decrease the funds available to build a team. From the last five Super Bowls, three of the ten quarterbacks were not "franchise quarterbacks," as Seattle Seahawks quarterback Russell Wilson won the game in Super Bowl 48 and narrowly lost in Super Bowl 49, both times on a rookie contract. The Philadelphia Eagles went to the 2017-2018 Playoffs due to the extraordinary play of a quarterback on his rookie contract, Carson Wentz, who tore his ACL near the end of the season. The Eagles would be led to win Super Bowl 52 by veteran backup quarterback Nick Foles, who was costing his team just 0.93% of their cap. The Super Bowl can be won by a team without an expensive franchise quarterback. From what I've researched, I don't believe signing a big-money free agent quarterback is worth the money, but I also don't know that growing a franchise quarterback and keeping him for years is worth it either, unless the quarterback is truly elite. Maybe, just maybe, the franchise quarterback is overrated, and the route to success is through young, but talented, quarterbacks with inexpensive backups. That is not a narrative that everyone wants to hear, given how popular those players are with the fans, who want to see someone lead their team for many years and represent their communities.

Works Cited

Berri, David J., and Brian Burke. "Measuring Productivity of NFL Players." Economics of the National Football League: The State of the Art. Ed. Kevin G. Quinn. New York: Springer, 2012. 138-39. Print.

Gaines, Cork. "The 32 NFL Teams Are worth as Much as Every MLB and NBA Team Combined." *Business Insider*. Business Insider, 15 Sept. 2016. Web. 29 Jan. 2017.

Knowlton, Emmett. “The Browns' Trade for Brock Osweiler Was the One of the 'Most Creative' Trades in NFL History and It Looks like a Genius Move.” *Business Insider*, Business Insider, 9 Mar. 2018.

"NFL Quarterback Spending - Cap." *Spotrac.com*. Web. 9 March 2018.

SI Wire. “2017 NFL Fifth-Year Option Tracker.” *SI.com*. Web. 2 May 2017.

Appendix 1 – All Starting Quarterbacks

Starting Quarterback Productivity Table										
QB	Season	Years Pro	Team	# of Starts	Win %	Mean QPR	Standard Deviation	Passer Rating	Acquired/ Homegrown	Cap %
Peyton Manning	2013	15	DEN	16	0.8125	69.44	30.30	115.10	A	13.15%
Tom Brady	2016	16	NE	12	0.9167	56.64	24.01	112.20	H	9.32%
Deshaun Watson	2017	0	HOU	6	0.5000	56.61	26.24	103.00	H	1.54%
Josh McCown	2013	10	CHI	5	0.6000	55.36	25.83	109.00	A	0.46%
Aaron Rodgers	2016	11	GB	16	0.6250	54.31	24.71	104.20	H	12.50%
Drew Brees	2013	12	NO	16	0.6875	53.94	31.74	104.70	A	14.02%
Nick Foles	2013	1	PHI	10	0.8000	52.69	34.68	119.20	H	0.52%
Aaron Rodgers	2014	9	GB	16	0.7500	52.55	28.36	112.20	H	13.10%
Matt Ryan	2016	8	ATL	16	0.6875	52.26	20.27	117.10	H	15.44%
Tom Brady	2015	15	NE	16	0.7500	51.23	21.41	102.20	H	9.91%
Drew Brees	2016	15	NO	16	0.4375	51.02	30.00	101.70	A	11.79%
Cam Newton	2015	4	CAR	16	0.9375	50.41	28.42	99.40	H	8.95%
Andrew Luck	2014	2	IND	16	0.6875	49.22	27.08	96.50	H	4.87%
Peyton Manning	2014	16	DEN	16	0.7500	49.18	27.83	101.50	A	12.96%
Drew Brees	2015	14	NO	15	0.4667	48.37	31.59	101.00	A	16.65%
Carson Wentz	2017	1	PHI	13	0.8462	46.96	19.48	101.90	H	3.52%
Carson Palmer	2015	12	ARI	16	0.8125	46.76	17.07	104.60	A	5.09%
Eli Manning	2015	11	NYG	16	0.3750	43.90	31.80	93.60	H	11.26%
Andy Dalton	2015	4	CIN	13	0.7692	43.86	25.16	106.20	H	6.67%
Ben Roethlisberger	2014	10	PIT	16	0.6875	43.73	33.70	103.30	H	14.32%
Drew Brees	2014	13	NO	16	0.4375	43.22	24.10	97.00	A	13.97%
Tony Romo	2014	11	DAL	15	0.8000	43.18	24.82	113.20	H	9.09%
Philip Rivers	2013	9	SD	16	0.5625	43.10	20.24	105.50	H	11.44%
Tom Brady	2017	17	NE	16	0.8125	43.05	23.60	102.80	H	8.55%
Russell Wilson	2015	3	SEA	16	0.6250	43.00	30.87	110.10	H	4.79%
Alex Smith	2017	12	KC	15	0.6000	42.82	26.49	104.70	A	10.09%

Derek Carr	2016	2	OAK	15	0.8000	42.53	25.60	96.70	H	0.89%
Kirk Cousins	2015	3	WAS	16	0.5625	42.42	30.89	101.60	H	0.56%
Tom Brady	2014	14	NE	16	0.7500	42.32	30.57	97.40	H	11.02%
Ben Roethlisberger	2016	12	PIT	14	0.6250	41.64	32.35	95.40	H	15.82%
Kirk Cousins	2016	4	WAS	16	0.5313	41.48	21.89	97.20	H	13.64%
Russell Wilson	2017	5	SEA	16	0.5625	41.18	25.18	95.40	H	8.74%
Aaron Rodgers	2013	8	GB	9	0.6667	40.81	28.34	104.90	H	9.65%
Philip Rivers	2015	11	SD	16	0.2500	40.66	25.18	93.80	H	15.03%
Carson Palmer	2014	11	ARI	6	1.0000	40.48	17.20	95.60	A	9.76%
Andrew Luck	2016	4	IND	15	0.5333	40.37	25.13	96.40	H	12.07%
Tony Romo	2013	10	DAL	15	0.5333	40.27	20.86	96.70	H	10.10%
Philip Rivers	2017	13	LAC	16	0.5625	40.21	23.51	96.00	H	11.42%
Drew Brees	2017	16	NO	16	0.6875	39.86	11.55	103.90	A	11.75%
Matthew Stafford	2015	6	DET	16	0.4375	39.69	27.33	97.00	H	12.37%
Ben Roethlisberger	2017	13	PIT	15	0.8000	39.65	24.69	93.40	H	11.14%
Jared Goff	2017	1	LAR	15	0.7333	39.62	24.88	100.50	H	4.05%
Dak Prescott	2016	0	DAL	16	0.8125	39.30	21.29	104.90	H	0.36%
Aaron Rodgers	2017	12	GB	7	0.5714	38.99	21.06	97.20	H	12.14%
Ryan Fitzpatrick	2015	10	NYJ	16	0.6250	38.92	20.62	88.00	A	2.12%
Sam Bradford	2013	3	STL	7	0.4286	38.63	22.77	90.90	H	10.13%
Brian Hoyer	2016	7	CHI	5	0.2000	38.27	22.85	98.00	A	1.35%
Matt Ryan	2014	6	ATL	16	0.3750	38.13	25.11	93.90	H	13.16%
Andy Dalton	2013	2	CIN	16	0.6875	38.11	33.05	88.80	H	1.12%
Eli Manning	2014	10	NYG	16	0.3750	37.58	29.78	92.10	H	15.46%
Joe Flacco	2014	6	BAL	16	0.6250	37.01	25.87	91.00	H	11.85%
Aaron Rodgers	2015	10	GB	16	0.6250	36.84	28.98	92.70	H	12.87%
Case Keenum	2017	4	MIN	14	0.7857	36.73	22.45	98.30	A	1.26%
Derek Carr	2015	1	OAK	16	0.4375	36.35	27.10	91.10	H	0.89%

Matthew Stafford	2016	7	DET	16	0.5625	36.33	23.39	93.30	H	15.03%
Blake Bortles	2015	1	JAX	16	0.4545	36.00	28.40	88.20	H	3.45%
Ben Roethlisberger	2015	11	PIT	11	0.6364	35.83	30.42	94.50	H	12.41%
Tyrod Taylor	2015	4	BUF	14	0.5714	35.68	18.37	99.40	A	0.64%
Marcus Mariota	2016	1	TEN	15	0.5333	35.12	28.65	95.60	H	3.66%
Andrew Luck	2013	1	IND	16	0.6875	35.11	24.75	87.00	H	3.89%
Matthew Stafford	2013	4	DET	16	0.4375	35.03	23.36	84.20	H	14.86%
Philip Rivers	2014	10	SD	16	0.5625	34.52	30.03	93.80	H	12.42%
Jimmy Garoppolo	2017	3	SF	5	1.0000	34.42	14.88	96.20	A	0.30%
Matthew Stafford	2017	8	DET	16	0.5625	34.17	20.38	99.30	H	10.24%
Russell Wilson	2014	2	SEA	16	0.7500	33.79	23.77	95.00	H	0.63%
Ryan Tannehill	2014	2	MIA	16	0.5000	33.60	23.04	92.80	H	2.43%
Kirk Cousins	2017	5	WAS	16	0.4375	33.58	27.34	93.90	H	13.70%
Jameis Winston	2015	0	TB	16	0.3750	33.19	19.01	84.20	H	3.45%
Cam Newton	2013	2	CAR	16	0.7500	33.08	26.77	88.80	H	5.46%
Philip Rivers	2016	12	SD	16	0.3125	32.72	19.40	87.90	H	10.61%
Joe Flacco	2015	7	BAL	10	0.3000	32.30	24.40	83.10	H	10.30%
Ben Roethlisberger	2013	9	PIT	16	0.5000	32.08	23.27	92.00	H	10.84%
Andrew Luck	2015	3	IND	7	0.2857	31.84	21.55	74.90	H	4.91%
Tom Brady	2013	13	NE	16	0.7500	31.58	24.31	87.30	H	11.15%
Andy Dalton	2016	5	CIN	16	0.4063	31.55	15.77	91.80	H	8.38%
Sam Bradford	2016	6	MIN	15	0.4667	31.22	20.69	99.30	A	4.45%
Jay Cutler	2014	8	CHI	15	0.3333	31.17	22.53	88.60	A	14.08%
Dak Prescott	2017	1	DAL	16	0.5625	31.08	33.72	86.60	H	0.40%
Carson Palmer	2016	13	ARI	15	0.4333	30.91	24.10	87.20	A	11.79%

Alex Smith	2013	8	KC	15	0.7333	30.91	27.10	89.10	A	6.27%
Matt Ryan	2013	5	ATL	16	0.2500	30.82	20.07	89.60	H	7.86%
Tyrod Taylor	2016	5	BUF	15	0.4667	30.72	19.28	89.70	A	4.54%
Eli Manning	2016	12	NYG	16	0.6875	30.25	19.51	86.00	H	15.62%
Russell Wilson	2016	4	SEA	16	0.6563	30.08	27.25	92.60	H	12.34%
Ryan Fitzpatrick	2014	9	HOU	12	0.5000	30.06	29.00	95.30	A	2.56%
Ryan Tannehill	2015	3	MIA	16	0.3750	30.04	20.51	88.70	H	3.36%
Mike Glennon	2014	1	TB	5	0.2000	29.61	10.28	83.30	H	0.51%
EJ Manuel	2014	1	BUF	4	0.5000	29.42	4.64	80.30	H	1.37%
Cam Newton	2017	6	CAR	16	0.6875	29.42	32.12	80.70	H	11.46%
Jay Cutler	2013	7	CHI	11	0.4545	29.32	18.61	89.20	A	8.19%
Russell Wilson	2013	1	SEA	16	0.8125	29.31	20.98	101.20	H	0.51%
Matthew Stafford	2014	5	DET	16	0.6875	29.28	25.87	85.70	H	11.95%
Kyle Orton	2014	9	BUF	12	0.5833	29.25	19.58	87.80	A	2.71%
Joe Flacco	2016	8	BAL	16	0.5000	29.13	19.85	83.50	H	14.94%
Josh McCown	2017	14	NYJ	13	0.3846	29.12	27.33	94.50	A	4.49%
Alex Smith	2016	11	KC	15	0.7333	29.09	20.39	91.20	A	11.67%
Jameis Winston	2016	1	TB	16	0.5625	29.03	24.63	86.10	H	3.70%
Nick Foles	2014	2	PHI	8	0.7500	28.97	22.81	81.40	H	0.57%
Matt Ryan	2017	9	ATL	16	0.6250	28.95	13.37	91.40	H	14.28%
Colin Kaepernick	2016	5	SF	11	0.0909	28.85	22.02	90.70	H	12.51%
Jay Cutler	2015	9	CHI	15	0.4000	28.82	16.49	92.30	A	11.66%
Colin Kaepernick	2013	2	SF	16	0.7500	28.54	28.69	91.60	H	1.14%
Brian Hoyer	2015	6	HOU	9	0.5556	28.54	26.21	91.40	A	3.66%
Derek Carr	2017	3	OAK	15	0.4000	28.40	22.53	86.40	H	9.57%
Brock Osweiler	2015	3	DEN	7	0.7143	28.39	18.83	86.40	H	0.77%
Josh McCown	2015	12	CLE	8	0.1250	28.25	25.17	93.30	A	2.80%
Blake Bortles	2017	3	JAX	16	0.6250	28.23	25.82	84.70	H	3.84%

Alex Smith	2015	10	KC	16	0.6875	28.06	17.35	95.40	A	11.03%
Cam Newton	2016	5	CAR	14	0.4286	27.87	21.56	75.80	H	14.01%
Blake Bortles	2016	2	JAX	16	0.1875	27.72	17.93	78.80	H	3.74%
Alex Smith	2014	9	KC	15	0.5333	27.50	17.76	93.40	A	3.47%
Matt Ryan	2015	7	ATL	16	0.5000	27.49	18.22	89.00	H	14.31%
Matt Cassel	2013	8	MIN	6	0.5000	27.45	29.48	81.60	A	2.87%
Mark Sanchez	2014	5	PHI	8	0.5000	27.06	18.46	88.40	A	1.67%
Ryan Tannehill	2016	4	MIA	13	0.6154	26.58	21.44	93.50	H	7.69%
Sam Bradford	2015	5	PHI	14	0.5000	26.44	16.92	86.40	A	8.64%
Trevor Siemian	2016	1	DEN	14	0.5714	26.40	22.81	84.60	H	0.37%
Marcus Mariota	2015	0	TEN	12	0.2500	26.20	33.75	91.50	H	3.42%
Andy Dalton	2014	3	CIN	16	0.6563	26.12	23.28	83.50	H	6.88%
Jameis Winston	2017	2	TB	13	0.2308	26.09	24.61	92.20	H	4.48%
Carson Palmer	2017	14	ARI	7	0.4286	26.01	18.52	84.40	A	14.28%
Andy Dalton	2017	6	CIN	16	0.4375	26.00	29.08	86.60	H	9.71%
Blaine Gabbert	2015	4	SF	8	0.3750	25.79	12.72	86.20	A	1.28%
Jason Campbell	2013	8	CLE	8	0.1250	25.28	32.78	76.90	A	1.21%
Cam Newton	2014	3	CAR	14	0.4643	25.16	22.38	82.10	H	5.25%
Jake Locker	2013	2	TEN	7	0.5714	24.96	25.46	86.70	H	2.69%
Carson Palmer	2013	10	ARI	16	0.6250	24.10	21.53	83.90	A	3.33%
Tyrod Taylor	2017	6	BUF	14	0.5714	24.01	19.25	89.20	A	6.26%
Kirk Cousins	2014	2	WAS	5	0.2000	23.23	34.05	86.40	H	0.52%
Marcus Mariota	2017	2	TEN	15	0.6000	23.12	16.79	79.30	H	4.10%
Jay Cutler	2017	10	MIA	14	0.4286	22.98	25.84	80.80	A	5.82%
Joe Flacco	2017	9	BAL	16	0.5625	22.95	20.81	80.40	H	15.51%
Eli Manning	2017	13	NYG	15	0.2000	22.94	25.59	80.40	H	11.77%
Ryan Tannehill	2013	1	MIA	16	0.5000	22.67	19.83	81.70	H	2.56%
Derek Carr	2014	0	OAK	16	0.1875	22.64	21.84	76.60	H	0.78%

Teddy Bridgewater	2014	0	MIN	12	0.5000	22.48	20.93	85.20	H	0.96%
Ryan Fitzpatrick	2013	8	TEN	9	0.3333	22.39	23.76	82.00	A	1.86%
Matt McGloin	2013	0	OAK	6	0.1667	22.08	18.12	76.10	H	0.33%
Blaine Gabbert	2016	5	SF	5	0.2000	21.81	13.77	68.40	A	1.72%
Matt Hasselbeck	2015	16	IND	8	0.6250	21.80	19.36	84.00	A	2.09%
Mike Vick	2013	12	PHI	6	0.3333	21.73	30.89	86.50	A	9.60%
Carson Wentz	2016	0	PHI	16	0.4375	21.60	16.80	79.30	H	3.19%
Mike Glennon	2013	0	TB	13	0.3077	21.46	20.12	83.90	H	0.44%
Robert Griffin III	2013	1	WAS	13	0.2308	21.38	24.56	82.20	H	4.38%
Colin Kaepernick	2014	3	SF	16	0.5000	21.22	23.26	86.40	H	2.86%
Austin Davis	2014	2	STL	8	0.3750	20.17	22.23	85.90	H	0.44%
Case Keenum	2013	1	HOU	8	0.0000	20.11	25.83	78.20	H	0.33%
Teddy Bridgewater	2015	1	MIN	16	0.6875	20.01	23.80	88.70	H	1.06%
Jacoby Brissett	2017	1	IND	15	0.2667	19.93	19.60	81.70	A	0.37%
Charlie Whitehurst	2014	8	TEN	5	0.2000	19.38	10.92	87.40	A	1.18%
Brian Hoyer	2014	5	CLE	13	0.5385	19.27	21.07	76.50	A	0.92%
Drew Stanton	2014	7	ARI	8	0.6250	18.85	17.30	78.70	A	2.00%
Johnny Manziel	2015	1	CLE	6	0.3333	18.78	9.46	79.40	H	1.34%
Zach Mettenberger	2014	0	TEN	6	0.0000	18.69	21.52	83.40	H	0.35%
EJ Manuel	2013	0	BUF	10	0.4000	18.36	26.03	77.70	H	1.40%
Shaun Hill	2014	12	STL	8	0.3750	18.28	23.86	83.90	A	1.34%
Case Keenum	2015	3	STL	5	0.6000	18.12	17.33	87.70	A	0.42%
Case Keenum	2016	4	LAR	9	0.4444	17.87	26.64	76.40	A	2.43%
Drew Stanton	2017	9	ARI	4	0.7500	17.57	17.21	66.40	A	2.40%
Joe Flacco	2013	5	BAL	16	0.5000	17.54	13.59	73.10	H	5.32%

Chad Henne	2013	5	JAX	13	0.3077	17.45	16.57	76.50	A	3.86%
Jake Locker	2014	3	TEN	5	0.2000	17.29	20.90	70.90	H	3.14%
C.J. Beathard	2017	0	SF	5	0.2000	16.76	23.40	69.20	H	0.44%
Brock Osweiler	2016	4	HOU	14	0.5714	16.69	18.02	72.20	A	7.89%
Cody Kessler	2016	0	CLE	8	0.0000	16.56	15.36	92.30	H	0.47%
Matt Barkley	2016	3	CHI	6	0.1667	16.36	21.25	68.30	A	0.40%
Tony Romo	2015	12	DAL	4	0.7500	16.09	30.66	79.40	H	10.86%
Brett Hundley	2017	2	GB	9	0.3333	15.84	31.89	70.60	H	0.40%
Ryan Fitzpatrick	2016	11	NYJ	11	0.2727	15.81	26.62	69.60	A	4.43%
Matt Schaub	2013	9	HOU	8	0.2500	15.65	26.42	73.00	A	8.68%
Brandon Weeden	2013	1	CLE	5	0.0000	15.44	15.23	70.30	H	1.48%
Geno Smith	2014	1	NYJ	13	0.1538	15.33	22.47	77.50	H	0.96%
Colt McCoy	2014	4	WAS	4	0.2500	15.13	24.41	96.40	A	0.48%
Brian Hoyer	2017	8	SF	6	0.0000	15.10	27.00	74.10	A	3.63%
Colin Kaepernick	2015	4	SF	8	0.2500	14.96	25.58	78.50	H	11.16%
Matt Flynn	2013	5	GB	4	0.5000	14.00	37.25	86.30	H	0.24%
Christian Ponder	2013	2	MIN	9	0.2778	13.74	15.86	77.90	H	2.15%
Ryan Mallett	2015	4	HOU	4	0.2500	13.68	17.20	63.60	A	2.06%
Peyton Manning	2015	17	DEN	9	0.7778	13.19	27.98	67.90	A	12.06%
Kellen Clemens	2013	7	STL	9	0.4444	12.94	19.39	78.80	A	0.45%
Eli Manning	2013	9	NYG	16	0.4375	12.84	23.09	69.40	H	16.13%
Mitch Trubisky	2017	0	CHI	12	0.3333	12.42	16.39	77.50	H	3.15%
Thad Lewis	2013	3	BUF	5	0.4000	12.39	19.08	81.00	A	0.34%
Nick Foles	2015	3	STL	11	0.3636	12.39	21.29	69.00	A	2.87%
Terrelle Pryor	2013	2	OAK	9	0.3333	12.34	18.38	69.10	H	0.61%
Trevor Siemian	2017	2	DEN	10	0.5000	11.61	24.55	73.30	H	0.40%
Geno Smith	2013	0	NYJ	16	0.5000	11.58	30.77	66.50	H	0.75%
Josh McCown	2014	11	TB	11	0.0909	11.37	18.57	70.50	A	3.46%
Robert Griffin III	2016	4	CLE	5	0.2000	9.30	10.53	72.50	A	4.02%
Brock Osweiler	2017	5	DEN	4	0.0000	8.91	13.77	72.50	H	0.50%
DeShone Kizer	2017	0	CLE	15	0.0000	8.59	23.93	60.50	H	0.57%
Mike Glennon	2017	4	CHI	4	0.2500	8.42	10.77	76.90	A	8.35%
Matt Cassel	2015	10	DAL	7	0.1429	7.97	18.06	70.60	A	1.28%
Blaine Gabbert	2017	6	ARI	5	0.4000	7.96	22.94	71.90	A	0.53%
Blake Bortles	2014	0	JAX	13	0.2308	7.59	14.86	69.50	H	2.99%
Jay Cutler	2016	10	CHI	5	0.2000	6.64	17.44	78.10	A	11.46%
Robert Griffin III	2014	2	WAS	7	0.2857	6.06	10.73	86.90	H	4.35%
Jared Goff	2016	0	LAR	7	0.0000	3.22	14.57	63.60	H	3.39%
Tom Savage	2017	3	HOU	7	0.1429	2.14	20.40	71.40	H	0.48%
Zach Mettenberger	2015	1	TEN	4	0.0000	1.40	12.10	66.70	H	0.42%
Bryce Petty	2016	1	NYJ	4	0.2500	0.19	11.44	60.00	H	0.42%

Appendix 2 – Total Group Comparisons

Group	Sample	QPR, Cap	Passer, Cap	QPR, Win%	Passer, Win%	Win%, Cap	Passer, QPR	Mean QPR	Mean PR	Mean Win%	Average Wins	Mean Cap%
Total	201	0.443	0.357	0.609	0.591	0.268	0.873	28.60	87.49	0.475	7.60	6.06%
Homegrown	131	0.442	0.358	0.649	0.642	0.280	0.875	29.67	88.10	0.480	7.69	6.42%
Acquired	70	0.428	0.344	0.536	0.491	0.237	0.869	26.60	86.35	0.465	7.44	5.38%
4+ Years	123	0.450	0.334	0.559	0.519	0.274	0.883	30.96	89.67	0.505	8.08	8.51%
4+ Yrs Acq.	64	0.409	0.337	0.540	0.464	0.274	0.873	27.32	86.89	0.465	7.44	5.81%
4+ Yrs Home	59	0.237	0.054	0.524	0.535	0.065	0.876	34.91	92.69	0.548	8.77	11.44%
0-3 Yrs Home	72	0.237	0.156	0.664	0.649	0.132	0.843	25.37	84.33	0.425	6.80	2.30%
H vs A	one-tail	0.4562	0.4562	0.123	0.0681	0.3783	0.4325	0.048412	0.156298	0.319621		0.085457
p-values	two-tail	0.9124	0.9124	0.246	0.1362	0.7566	0.865	0.096823	0.312595	0.639242		0.170913
4+ Yr. Comp.	one-tail	0.1492	0.0548	0.4522	0.305	0.121	0.4721	0.000264	0.002068	0.011819		0.00001
p-values	two-tail	0.2983	0.1096	0.9045	0.6101	0.242	0.9442	0.000528	0.004135	0.023639		0.00001
3- vs. 4+ H	one-tail	0.5	0.2843	0.1131	0.1635	0.352	0.2389	0.00001	0.000011	0.000863		0.00001
p-values	two-tail	1	0.5687	0.2263	0.3271	0.7039	0.4777	0.00001	0.000023	0.001725		0.00001
3- vs. 4+ A	one-tail	0.1357	0.1357	0.1335	0.0618	0.2005	0.2578	0.182457	0.100421	0.153491		0.0001
p-values	two-tail	0.2713	0.2713	0.267	0.1236	0.4009	0.5157	0.364914	0.200843	0.306982		0.0001