What is the Most Effective 4th Quarter Play in the NFL?

By Rahil Pasha and Sumanth Pallamreddy

Introduction/Abstract

In the National Football League, games are decided in the fourth quarter, when offenses must choose the correct strategy in order to score before time runs out. Deciding what plays to call is critical, and it is crucial to understand which areas of the field are better to target with the game on the line.

Our goal is to determine which plays are the most effective at gaining yards at the end of the 4th quarter. Our analysis of the NFLsavant 2021 play-by-play data determined that quarterback scrambles were consistently the most effective play at gaining yards, averaging 8.5 yards per play with a standard deviation of 6.6 yards. When taking into account different types of passes, passes in the deep middle sections of the field yield, on average, 12.3 yards. Removing interceptions and sacks from the dataset reveals that passes in the deep left side of the field yield, on average, 28.8 yards; however, the standard deviation in this set is a staggering 13.3 yards. Passing in the deep middle is more consistent, with a standard deviation of 6.2 yards, while also retaining an average gain of 22.5 yards.

Methodology

We used GoogleColab[1] to run our python script. We used the pandas, NumPy, and matplotlib libraries to analyze the data from NFLsavant's 2021 play-by-play dataset[2].

Three Major Plays: Running, Passing, and QB Scramble

We first filtered out all the plays that took place in the first three quarters and the first 6 minutes of the fourth quarter. Then we narrowed down our optimal play search from the 15 given to 3 play types: passes, runs, and quarterback scrambles.

[1]Pasha, R. (2022), 4th Qrt NFL Code - MSJ Datathon.ipynb, Google Colaboratory. https://colab.research.google.com/drive/1OB1woJWfDZynLKfRH0wVdJkpqz9EUCp-

[2]NFLsavant.com: Advanced NFL Statistics (2021), Nflsavant.com. http://nflsavant.com/about.php?year=2021

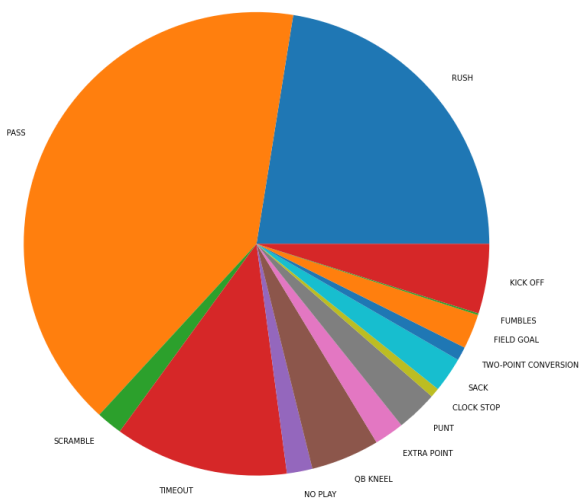

Figure 1: Breakdown of play types

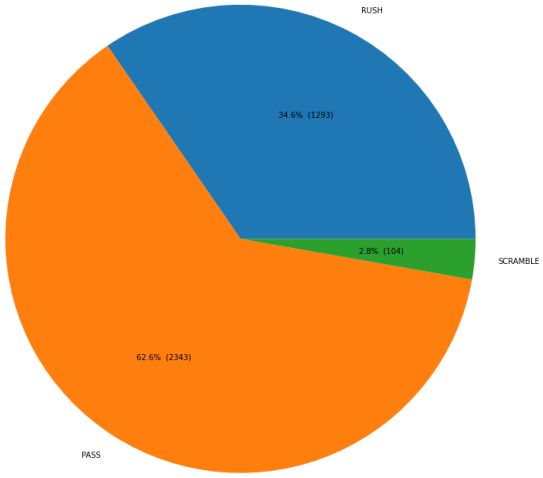

Figure 2: Frequency of passes, runs, and scrambles in the last 6 minutes

Afterward, we tracked the usage of each of these play types across the final 6 minutes and plotted it in figure 3 below.

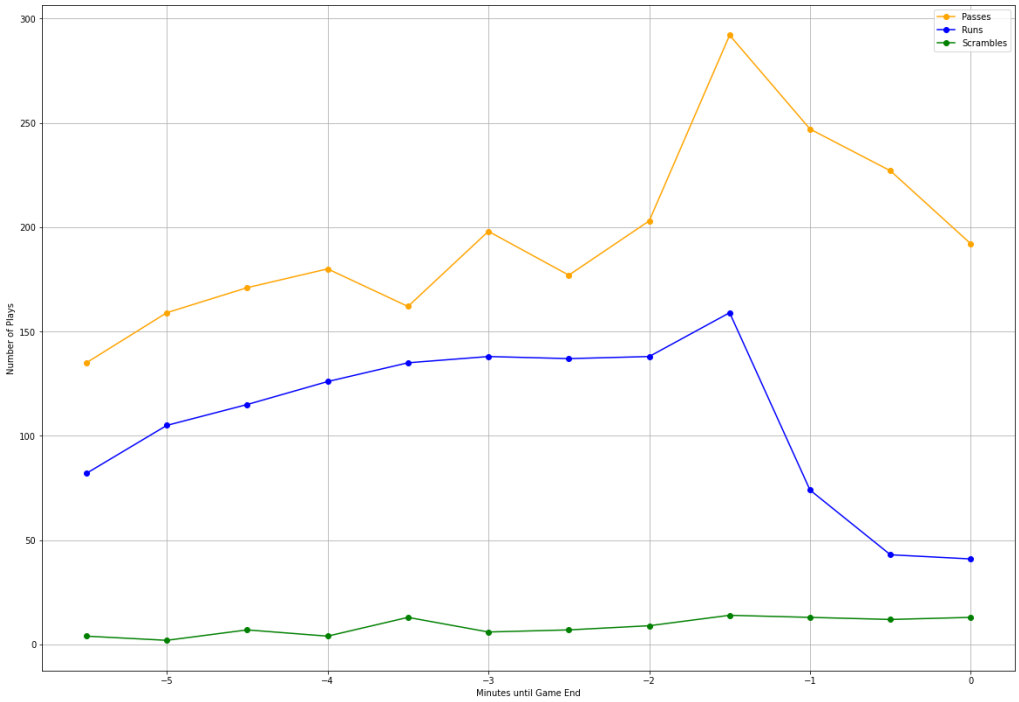

Figure 3: Frequency of play types during the last 6 minutes of play

Then to determine the most effective play we used the yards gained and plotted them for each play type in a histogram (see figure 5 in results).

We used the yardage data to determine the mean and standard deviation of all three types of plays.

Passing Plays

We further examined how the area where the pass was thrown affects the effectiveness of the play. Using the same methods as mentioned above we split the types of passes into 6 areas of the field: short left, short right, short middle, deep left, deep right, and deep middle.

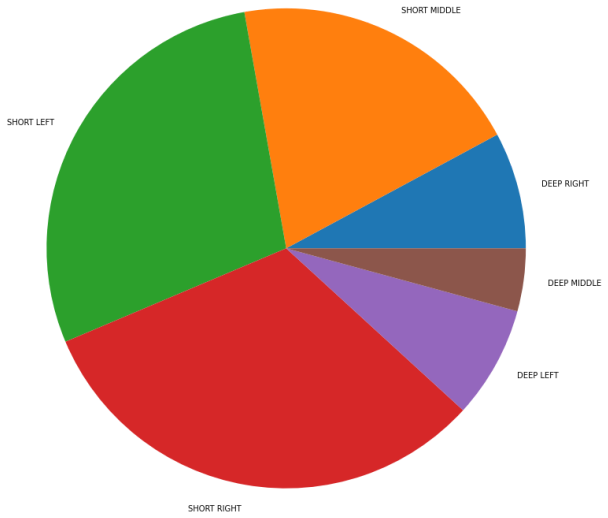

Figure 4: Breakdown of pass types

We then used the yardage data to plot a histogram (see figure 6 in results) and determine the mean and standard deviation of all six types of passes.

After examining the standard deviations and the skewed distribution across the histogram we decided to remove the plays that resulted in interceptions and sacks. This way we could see which passing play is most effective when the pass is successful (see figure 7 in results).

Results and Conclusions

These histograms show the distribution of yards gained based on the type of play being used.

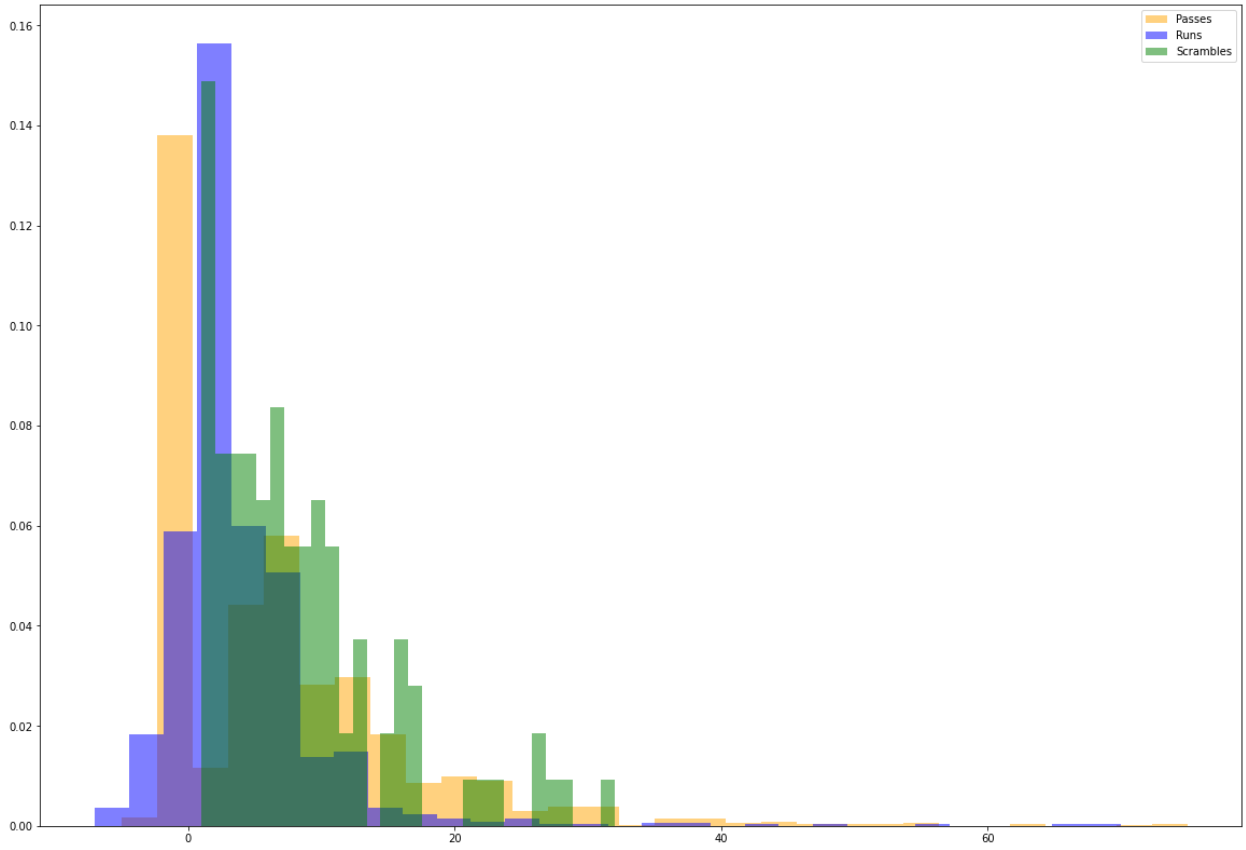

Figure 5: Distribution of yards gained by passing, running, and QB scramble plays

In Figure 2, we can see the distribution of play calls, with most being pass plays and fewer run plays. This is logical because NFL teams pass more when running out of time in order to stop the clock from running if there are incompletions. This claim is further supported by Figure 3, which shows how the number of running plays diminishes when there are around 1.5 minutes until the end of the game. Figure 5 shows that pass plays are better suited for marching downfield in chunks, as the big play opportunity is higher when the quarterback can sling it downfield.

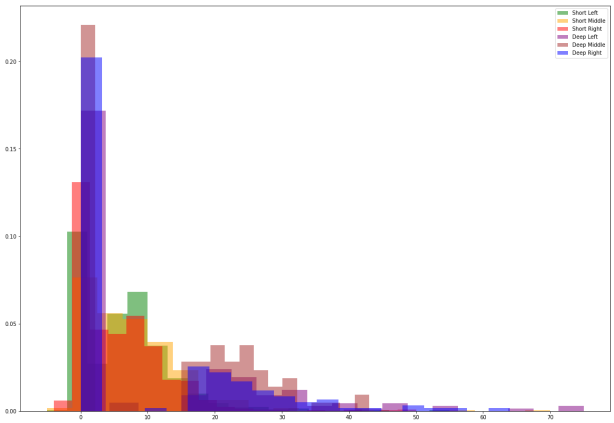

Figure 6: Distribution of yards gained in different passing areas

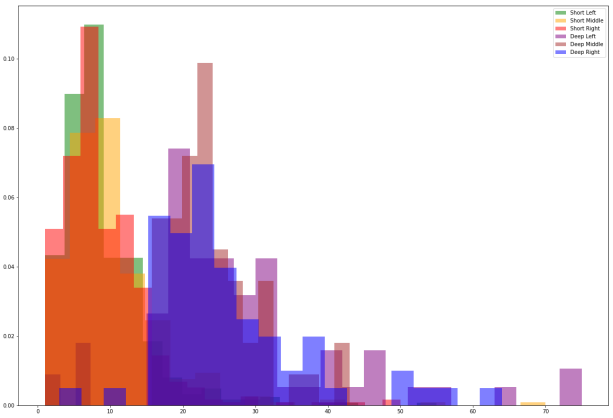

Figure 7: Distribution of yards without interceptions or dacks

Short passes are preferred by NFL teams, as seen in Figure 6, while deep middle passes on average allow for more first downs. A large portion of deep passes ended up being incomplete resulting in 0 yards gained. This is shown in the skewed distribution of the histogram. Figure 7, was created without incomplete pass/sack data, which is used to represent the connection between a great quarterback and a wide receiver duo. From this data, it is clear that going deep left has a higher chance of payoff than a pass to the right or the middle, gaining 28.8 yards on average.

In conclusion, our analysis of the NFLsavant 2021 play-by-play data determined that quarterback scrambles were consistently the most effective play at gaining yards, averaging 8.5 yards per play with a standard deviation of 6.6 yards. When taking into account different types of passes, passes in the deep middle sections of the field yield, on average, 12.3 yards. Removing interceptions and sacks from the dataset reveals that passes in the deep left side of the field yield, on average, 28.8 yards; however, the standard deviation in this set is a staggering 13.3 yards. Passing in the deep middle is more consistent, with a standard deviation of 6.2 yards, while also retaining an average gain of 22.5 yards.