Long Field Goal Decision Making:

Analyzing when punting in football becomes a better team decision than a difficult, but makeable, field goal attempt

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Introduction

a. Question description

The goal of this research project is to determine at what point a field goal, even if the kicker can make it and/or has made it from that distance before, becomes not worth the risk and a punt is instead the better option. This analysis will be performed using an expected points function created in R using Pro Football Focus NCAA Football play-by-play data from the 2019 college football season. Rather than focusing on the field goal kicker himself, our question aims to broaden the question and base it on quantifiable data. While the kicker's probability of making field goals from a given range is still an important factor in our research question, it is not the only one that we want to account for. A team's decision to punt and pin the opponent in their own end has the potential to give that team a better chance of still scoring next as opposed to if they just settled and had their kicker attempt a long field goal. Of course, this is a hypothetical and is dependent on kicker accuracy, so our question seeks to find what the decision making is when it becomes reality during a football game. To be clear, this is taking actual game situations out of it and assuming that these decisions are made in games where time and score are not a direct factor in that moment.

b. Why the question is interesting

We believe this is an interesting question to research because the first thing most football viewers consider when determining if a team should attempt a field goal (in normal conditions), is how long their longest field goal made is. We want to dive into what impacts the coaching staff's decision making with the increased reliance on analytics in football today. If the field goal attempt is within that maximum distance, the consensus tends to be to attempt it. However, what if they only make it 10% of the time? Is it worth the attempt then? What about a higher success rate of about 25%? How about even 50%? We want to find the cutoff point at which punting becomes the smarter, although less obvious, play call even if the kicker has made it from that distance before. This is a question that constantly comes to mind when watching football games and our expected points model will give us a strong indication of what the best decision is given these different situations.

Methods

a. Model changes for testing

There were a few changes made to this model to find a more relevant answer to our research question. To describe our model, we used linear regression to simulate kicking accuracy from the existing dataset. We first had to change the field goal success percentages based on our question, so we manually inputted the various success rates into the expected points function. For the model itself, tears are set to always attempt the field goal when it is 4th down and they have more than two yards to go from the opposing team's 36 yard line. As a result, the expected points

for those various success rates were calculated with that normal decision making. On the other hand, for the expected points after punting, I changed the decision making to punt from the opponent's 36, which would cause the field goal make percentage we are assessing to have to be applied to the opponent's 35 yard line to keep as much consistency as possible between the estimations.

b. Accuracy of these modifications

The modifications were correct because they allowed us to accurately test the expected points from a given situation using different field goal success rates. When I was doing the punting tests and had to make the given success rate apply to a field goal one yard shorter, we believed that was the best way to approach the testing while trying to keep the rest of the model as consistent as possible. One flaw we most likely encountered was that with lower success rates at the 53 yard field goal distance we are testing, we would expect it to lead to lower success rates on shorter field goals as well, but instead, we used our previously made linear regression model to simulate the make probability for every field goal but that exact distance. Regardless, we strongly believe that our results can be trusted even with this small difference.

Results and Analysis

a. Findings

To test this question, we varied the field goal make percentages while starting from 4th and 10 on the opponent's 36 yard line. We chose 4th and 10 to take out the idea of going for a first down and the 36 yard line was the longest field goal in which we had a large enough sample size from the 2019 college field goals. To find the expected points shown in the results, we took the mean of 10000 iterations of the expected points function given the described situation. The following table displays the results of our expected points model testing:

FG Make Probability (%)	Expected Points - FG	Expected Points - Punt
47.5 (actual)	0.200	-0.434
40	0.035	-0.335
38	-0.333	-0.346
35	-0.459	-0.319
33	-0.529	-0.287
30	-0.717	-0.310

b. Analysis of findings

From the table above, it is clear that somewhere between 35 and 40% is where the crossover occurs between the best decision being attempting the field goal vs. punting the ball. For all make percentages 40% and above, the expected points value of a field goal is higher than that of punting, and vice versa for make percentages less than 35%. We also ran tests for field goal make percentages that are less than 30%, but as can be expected, the expected points gap just got larger in the trending direction. The table also shows that the expected points when punting is typically the same as we would expect, because the only difference is the 53 yard field goal success rate. The reason the field goal attempt expected points decreases with the decreasing field goal accuracy is because of the higher likelihood of a miss, which would then set the opponent up with much better field position than if they punted. All of this decision making can obviously change from kicker to kicker depending on their personal accuracies and of course it would depend on the actual game situation as well. If a kicker has any chance of making the field goal and time is running out, then we would definitely say to attempt the kick because the concept of expected points has a much smaller role in that situation.

Discussion

a. Recap question

Every week in football we all see it, the inexplicable coach who chooses to punt rather than go for a field goal when everyone thinks that the kicker can make it. Obviously many of today's decisions are decided by analytics, so at what point is it not worth it anymore to kick the field goal and to punt instead? At what point is a team's expected points going to be greater for a punt rather than trying to kick a field goal? A team has a lot to think about in this scenario, most of the issue coming from the possibility that the field goal is missed. If it is a deep field goal, then it puts the other team in great field position and more likely to score next. Unfortunately, it is impossible for us to calculate every in-game scenario and assess the accuracy and leg strength of each individual kicker. We are seeking to find when the probability of a kick being made outweighs the potential expected points of the other team scoring next through a simulated environment. This question is extremely important as games constantly come down to the line with a made or missed field goal being the difference between a huge win or a crushing loss.

b. Discuss findings, why they are interesting

Although the findings may be close to what one would expect, they are still very interesting to see just how our expected points will work out. Any field goal with at least a 40% chance of being made should be taken. The expected points on that field goal is more than if one is to punt and give the ball up to the other team. These types of kicks would typically be thought of in college as 40-50 yard kicks. We can also see that after the 40% chance, the expected points are not positive for either a field goal or a punt. But, below the 35% success threshold, a team is better off punting it as they are more likely to give up less points. This is very interesting because

of the field position. If a team takes that long field goal, which they are more likely to miss, and do in fact miss, then the other team gets the ball much closer to the end zone, therefore making it easier for them to score. At that point though, it is no longer worth it for them to attempt it as punting will put the other team farther away and therefore less likely to score. In a game where field position and little amounts of points can make or break the game, these results could be very helpful in whether or not a field goal is taken. Of course as we do not have the data for every kicker we cannot know fully for an individual team, but all of this data is a baseline for when field goals should be attempted. With wins being extra valuable in college football, this type of information could potentially make or break a school's season, either helping them scrape out a tough win, or leaving the fans disappointed.

c. Limitations

The limitations of this model are the limits of the information regarding the game state that can currently be implemented in the model. While we are able to process the physical state of the game, i.e. yards to go, field position, and down, the model does not currently account for the time left on the clock, score differential, and various play data such as turnovers and more breakdown for yards gained based on down and distance. Obviously the model is not going to be perfect, we cannot account for the human aspect of football nor can we possibly fit every single scenario into this model. Small changes such as blocked punts, returning kickoffs or punts for touchdowns, and turnover probability, will not lead to big changes in expected points but will make our model much more complete. More time would also have allowed us to be able to run more iterations of the model. This would allow us for a better viewing of what is actually going on and allow us to be more complete with our analysis. We could be running more field goal distances, probabilities, and other factors for more variables to perform our analysis. Overall though, this model does a very good job of answering our question of interest, but more time would have allowed for more model tuning and exploration.