

## Week 3 Risky Business

### The Complex and Unremarkable Two-point Conversion

PAT decisions are often the most talked about and controversial moment that occur in an NFL game. It is a choice between taking the (almost) guaranteed points against rolling the dice for double the stakes. Interestingly, based on recent statistical averages, the standard 'equity' of the PAT options is nearly identical for typical NFL teams.

1 PAT ~94% success rate for 0.94 expected points

2 PAT ~47.5% success rate for 0.95 expected points

Early in the game expected points correlate fairly well with GWC, but at later stages and at certain score differences, the decision can shift substantially. Based upon the above assumptions, the theoretical maximum cost of a PAT decision is approximately 46.5% GWC. This would occur when a team is tied at the end of regulation. Kicking would provide about 94% GWC while going for two would result in a win approximately 47.5% of the time. Obviously, every coach would know what to do in this situation but there are many PAT choices far below this theoretical maximum that can become quite complex. Fortunately, the non-obvious and more complicated PAT decisions generally don't carry nearly as much weight as many of the 4<sup>th</sup> downs we regularly discuss here in Risky Business. Still, they are a fascinating class of problems to examine.

When analyzing most 4<sup>th</sup> down decisions with the EdjFootball model, the simulation must account for a wide range of outcomes and properly weight each of them to determine the effect on GWC. PAT problems instead focus on predominantly three distinct game states.

- Kick the PAT
- Attempt the 2 PAT and succeed
- Attempt the 2 PAT and fail

Because the kick has a well-known success rate with a high degree of parity among NFL kickers, it serves as a very reliable benchmark to assess the risk and reward associated with a two-point conversion. By looking at the comparative gain and cost of succeeding or failing on the 2 PAT, we can accurately determine the required success rate for any unique game state and opponent. In fact, this is the very thing we provide our NFL clients at EdjSports each week in the form of a customized look-up table.

Here are a couple of recent examples of interesting PAT decisions:

Trailing 28-3 to the Bills on Sunday at 4:47 of the 3<sup>rd</sup> quarter, the Rams scored a Touchdown to start their unlikely comeback. They chose to kick rather than going for two and this decision was questioned by some in the press. Here are the relevant GWCs.

Rams Kick PAT:	GWC = 1.8%
Rams Succeed 2 PAT:	GWC = 2.4%
Rams Fail 2 PAT:	GWC = 1.4%

While the effect is very small and very unlikely to change the outcome of the game, the Rams needed approximately a 40% chance of success to justify the 2 PAT and couldn't really be faulted one way or the other. Interesting? Yes. Impactful? not so much.

$$(1.8 - 1.4)/(2.4 - 1.4) = 0.4$$

Perhaps the most controversial PAT of the season so far occurred last week when the Cowboys were trailing 39-24 to the Falcons and chose to go for two after scoring a touchdown with 4:57 remaining in the game to pull within 9 points. In these types of situations when trailing by 8 or 9 points after the score, teams will often postpone going for 2 until they score the 2<sup>nd</sup> TD. However, the Cowboys made a reasonable choice to go for two immediately and this is consistent with the findings of many analysts including this one. What is unremarkable is that it just doesn't make that big of a difference compared to so many other decisions that coaches often mishandle. To further illustrate the point, we again ran the respective game states through the EdjFootball model:

Cowboys Kick PAT:	GWC = 9.8%
Cowboys Succeed 2 PAT:	GWC = 14.8%
Cowboys Fail 2 PAT:	GWC = 5.2%

The Cowboys risk 4.6% to gain 5% for a required success rate of  $(9.8 - 5.2)/(14.8 - 5.2) = 47.9\%$

Some may contend these decisions are like splitting hairs when considering statistical uncertainty, and they would be correct. Both the Rams and the Cowboys employed very sound tactics that could be further supported if their offenses were expected to outperform NFL average conversion rates. It does however drive home a more important point that most of the controversial PAT decisions while interesting, pale in comparison to critical 4<sup>th</sup> down decisions where coaches often squander GWC in double digits!