

Risky Business Week 18

A Prisoner's Dilemma in Las Vegas

There is a classic problem in game theory where two prisoners can guarantee lessening their maximum sentences if they don't testify and don't attempt to blame the other guy. If they both try to exploit each other, they each do worse. However, if either prisoner knows the other one is going to cooperate, he can get the very best outcome by betraying him. This sticky problem is complicated by the fact they are unable to communicate or collude. Knowing how your opponent is likely to behave and how they may perceive your behavior, can alter strategy. It is represented in the following table:

	Prisoner A stays silent	Prisoner A betrays prisoner B
Prisoner B stays silent	Each receives a one-year sentence	Prisoner A gets no sentence Prisoner B gets a three-year sentence
Prisoner B betrays prisoner A	Prisoner B gets no sentence Prisoner A gets a three-year sentence	Each receives a two-year sentence

If you are wondering what any of this has to do with football, look no further than the drama that unfolded between the Raiders and Chargers in Las Vegas last night.

After the Indianapolis Colts suffered a surprising upset in Jacksonville, the Raiders and Chargers found themselves in a peculiar situation. A tie would guarantee that BOTH teams make the playoffs. Speculating on this scenario earlier in the week, Brandon Staley squashed any possibility that either team would consider colluding in any manner. But what if the game went to overtime? What if it was tied in the final minutes? Such a fascinating conclusion to the regular season was fun to consider but seemed very unlikely to occur. All of that changed when Justin Herbert heroically rallied the Chargers from a 15-point deficit to send the game into overtime.

As soon as the Raiders received the opening possession, the game theory strategies became relevant. The Raiders would undoubtedly prefer to win the game outright but not without fair consideration to the utility of a tie. A win would place them in Cincinnati for the first round of the playoffs while a tie would offer a less desirable trip to Kansas City. Under normal (early

season) circumstances, the Chargers would typically be very motivated to win the game on a subsequent possession. The utility of a tie is generally worth about $\frac{1}{2}$ of a game early in the season, but here it is very nearly as valuable as a win. "Game Winning Chance" or GWC is normally the metric that drives our model recommendations but in this unusual circumstance it must be revised to "Playoff Berth Chance" or PBC. Consider the fourth-and-3 the Raiders faced on the Chargers 22-yard line on the opening drive of the overtime. Under normal scenarios where a tie is worth approximately $\frac{1}{2}$ of a win, both teams will be trying to win the game. Kicking a field goal would cost the Raiders 16% in GWC (with a tie counting as 50% GWC). This is due to the enormous leverage of a first possession touchdown that eliminates a response from the Chargers. However, if your goal is to make the playoffs and the key metric changes to PBC, the choice gets far more interesting. With so much at stake, would the Chargers ever intentionally try to score a touchdown rather than settle for a field goal. We know Staley loves to go for it on fourth down, especially in field goal range. But in this game he will likely get very conservative on the subsequent possession if the Chargers find themselves in field goal range. If Rich Bisaccia has an accurate read on Brandon Staley's motives it can greatly alter the optimum choice. Because of the unique behavioral circumstances, it is very difficult to simulate this overtime. Normally, about 4% of overtime games would be expected to end in a tie. Here, it is highly plausible the frequency of ties is much greater. It is hard to imagine the Raiders missing the playoffs with a successful field goal, yet it is a choice that would be a sizeable blunder without the game theoretical considerations. Staley's behavior will also be dictated by how he perceives the Raiders to respond if the game is tied for a second time. As it turns out, the Raiders may have been more assertive in their pursuit of a win than he expected.

Staley was one of the most innovative play-callers of the 2021 season and according to our analysis one of the very best at fourth down decisions. He was also one of the most widely criticized coaches due to his uncommon aggression, especially for a rookie head coach. There were three particularly scrutinized decisions in this game.

1. Chargers go for it on 4th and 1 from their own 18-yard-line

Trailing 17-14 with 8:57 remaining in the third quarter this was a very bold move. It looks horrible when it fails, which it did, but it has the right amount of leverage to be justified. Simply put, the GWC gained from a successful conversion is approximately 9% while the cost of a failure is 8%. The Chargers are getting slightly better than even money odds on a proposition that succeeds (NFL average) about 70% of the time. This choice boosts their overall GWC by 4%. If someone offered you a deal where you collect \$7 if a fair coin flips heads and you pay \$3 if it lands tails, you should take it all day long. You will lose the bet half of the time, but the expected payout is excellent. Same here.

2. Chargers kick extra point to send the game into overtime.

Normally this might be an intriguing choice if you believe your chances of converting a 2 PAT exceed your chances of winning in overtime. But as noted above, this is not a typical overtime. The rate of ties is likely to be well above the 4% average because of the utility

considerations. Kicking was a clear decision for Staley to improve his chances of getting in the playoffs.

3. Chargers call a timeout with 38 seconds remaining in overtime.

This seemed odd to me at the time like it did to many fans. On further examination, the Raiders were clearly going to snap the ball in time, and it only affected the play clock by 1-2 seconds at most. It is very unlikely this decision cost the Chargers with respect to the number of ties. Staley wanted to keep the Raiders out of reasonable field goal range and wasn't comfortable with the defensive set. Some are arguing the play stoppage may have improved the Raiders' prospects on the next play, but that is very speculative at best.