

## Unit 1: The Politics Exam (#3) “McCarthy’s Crunch-time Conundrum”

### A) GAME SCENARIO

The Green Bay Packers and Chicago Bears are in the fourth quarter of their last football game of the regular season, with the Bears leading 20-17, and 15 seconds remaining.

- The game has significant implications not only because of the rivalry between the teams, but also because the result of this game will determine the winner of the NFC North division; the losing team will miss the playoffs.
- If the game ends in a tie, the Bears will win the NFC North division and the Packers will win the Wildcard.
- The Bears are 7-0 on the road this season coming into this game, so while they would prefer to beat the Packers, they are OK with the game resulting in a tie. (A tie would result in the Bears winning the division, but not receiving home-field advantage in the playoffs.)
- The Packers are 1-7 on the road this season, so their chances of reaching the Super Bowl are almost zero if they do not win the division.
- Assume, for the purposes of this game, that if the game heads to overtime tied at 20, it will end that way.

The Packers have the ball on the Bears 35 yardline and are facing 3<sup>rd</sup> down and 25, following a penalty and a sack. They have enough time to run two plays, but must score on one of them or they will lose the game. Head coach Mike McCarthy has three plays to choose from and two strategies to consider (Bears head coach Lovie Smith must also choose one of three plays to run).

1. McCarthy can play to win the game by scoring a touchdown – this entails running a long-distance, low-percentage “Hail Mary” pass play. However, if the Bears run either their “LB Blitz” or “Safety Eyes” defensive plays, the pass will be incomplete and the Packers will have to kick a 52-yard field goal. Green Bay’s kicker Mason Crosby has missed all eight of his attempts from that distance this season, so they will almost certainly lose the game in this scenario.
2. McCarthy can run a short-distance, high-percentage “Quick Slants” pass play and attempt to gain 10 yards to get into position for a game-tying field goal; Crosby is 17-for-17 on the season from 42 yards away or closer. However, if the Bears run “Tight Press”, the pass will be intercepted and run back for a Bears’ touchdown, also resulting in a Packers’ loss.
3. McCarthy can run a halfback rush play called “Liberty Sweep” and attempt to gain 10 yards that way. However, the Bears’ defense is very fast, and if they run the “LB Blitz play”, the Packers will be stopped for no gain.

## B) MATRIX:

		Bears Call		
		Tight Press	LB Blitz	Safety Eyes
Packers Call	Hail Mary	35	0	0
	Quick Slant	-65	10	10
	Liberty Sweep	10	0	15

The left side of the above matrix shows the offensive plays Green Bay Packers head coach Mike McCarthy can call; the top of the matrix shows the defensive plays Chicago Bears head coach Lovie Smith can call. The entries in the matrix for each play show the number of yards the Packers will gain for each combination of offensive/defensive plays run by the teams. Zeroes in the matrix represent plays that result in no gain. The -65 entry for Quick Slant/Tight Press means that this combination of plays will result in the Bears intercepting a pass and returning it 65 yards for a touchdown.

## C) TERMS RELATED TO GAME

### Zero-sum:

“McCarthy’s Crunch-time Conundrum” is a zero-sum game, because yardage gains for the Packers mean equivalent yardage losses for the Bears. In other words, for each yard closer the Packers get to the Bears’ goalline, they benefit exactly as much as the Bears are hurt.

### Utility:

Utility plays an important role in “McCarthy’s Crunch-time Conundrum” because the Packers’ head coach knows that his team needs home-field advantage in the playoffs (and thus needs to win the division) in order to have any chance of reaching the Super Bowl. Similarly, the rivalry aspect of this game means that the Packers would be much happier winning than tying the Bears. The yardage gains in the matrix above can also be quantified with utilities as shown below:

		Bears Call		
		Tight Press	LB Blitz	Safety Eyes
Packers Call	Hail Mary	7	-5	-5
	Quick Slant	-7	1	1
	Liberty Sweep	1	-5	1

A successful Hail Mary has a utility of 7 for the Packers because that will not only give them a division win and home-field advantage, but also a gain in momentum that comes

from beating their main rival. Each of the plays that results in no gain has a utility of -5 to the Packers because they will lose the game and miss the playoffs in those instances. Each play that results in a gain of 10-20 yards has a utility of 1 to the Packers, because they will tie the game and reach the playoffs as a Wildcard, but will have virtually no chance of winning the Super Bowl, and will not gain any momentum from beating their rival. A Quick Slant play that results in an interception and touchdown for the Bears has a utility of -7 to the Packers because not only will they lose the game and miss the playoffs in that situation, but the Bears will gain momentum heading into the playoffs and will be more likely to reach the Super Bowl, which the Packers would really hate to see. (Utilities for the Bears are -1 times the utilities for the Packers shown in the matrix.)

### **Dominated Strategy:**

The “Safety Eyes” strategy for the Bears is strictly dominated by the “LB Blitz” strategy, because no matter what play the Packers call, Green Bay will gain at least as much – in some cases, more – yardage if the Bears call “Safety Eyes” as they would if the Bears called “LB Blitz”.

### **Expected Value:**

The Expected Value of a strategy is the average result achieved using that strategy assuming that your opponent randomly, but rationally, chooses his/her strategy. In this case, assuming that Bears coach Lovie Smith is rational means excluding the dominated “Safety Eyes” strategy from the Bears’ consideration. The calculations below show the Expected Values of each play Coach McCarthy can run for the Packers.

$$\text{Hail Mary: Expected Value} = \left(\frac{1}{2} \times 35\right) + \left(\frac{1}{2} \times 0\right) = 17.5 \text{ yards}$$

$$\text{Quick Slant: Expected Value} = \left(\frac{1}{2} \times -65\right) + \left(\frac{1}{2} \times 10\right) = -27.5 \text{ yards}$$

$$\text{Liberty Sweep: Expected Value} = \left(\frac{1}{2} \times 10\right) + \left(\frac{1}{2} \times 0\right) = 5 \text{ yards}$$

Based on these calculations, if Coach McCarthy were choosing a play and assuming the Bears were choosing theirs randomly, he would call “Hail Mary” because that one has the highest Expected Value.

These calculations show the Expected Values of each play Coach Smith can run for the Bears. (In this case, lower yardages represent better expected values.)

$$\text{Tight Press: Expected Value} = \left(\frac{1}{3} \times 35\right) + \left(\frac{1}{3} \times -65\right) + \left(\frac{1}{3} \times 10\right) \approx -6.67 \text{ yards}$$

$$\text{LB Blitz: Expected Value} = \left(\frac{1}{3} \times 0\right) + \left(\frac{1}{3} \times 10\right) + \left(\frac{1}{3} \times 0\right) \approx 3.33 \text{ yards}$$

**Safety Eyes:** Expected Value =  $\left(\frac{1}{3} \times 0\right) + \left(\frac{1}{3} \times 10\right) + \left(\frac{1}{3} \times 15\right) = 8.33$  yards

Based on these calculations, if Coach Smith were choosing a play and assuming the Packers were choosing theirs randomly, he would call “Tight Press” because that one has the highest Expected Value.