Born to Run (or Pass)

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Data

- Using PFF base data, we created columns such as Offensive Success, Score Differential, Season Type (Reg, Post), and other play related dummy variables

- We also created a win probability model to our base play by play data to include Win Probability Added

Data - Success Rate

- Based on Warren Sharp's definition, a play is successful if:
  - 40% of yards to go were gained on 1st Down
  - 60% of yards to go were gained on 2nd Down
  - 100% of yards to go were gained on 3rd Down
  - 100% of yards to go were gained on 4th Down

- If any of these criteria were met for a play:
  - Offensive Success = 1

Game Plan

- We decided not to create a concrete Run/Pass ratio that should be strictly followed by each team
- The reason for this is because we believe that a team's play call should not be to meet a certain ratio, but should be based on the game situation
  - Therefore, we predicted the likelihood of success for each play if it were to be a run or a pass
  - Using this we can evaluate which teams "correctly" called the play type based on the game situation

Methodology

- We split the data into 10 different subsets, 2 per field section (Run/Pass)

- For each subset, we built a Random Forest Model:
  - Pass Model (Built using pass subset of the field section)
  - Run Model (Built using run subset of the field section)
    - Dependent variable was always Offensive Success (1 or 0)
    - Independent variables remained the same for each model

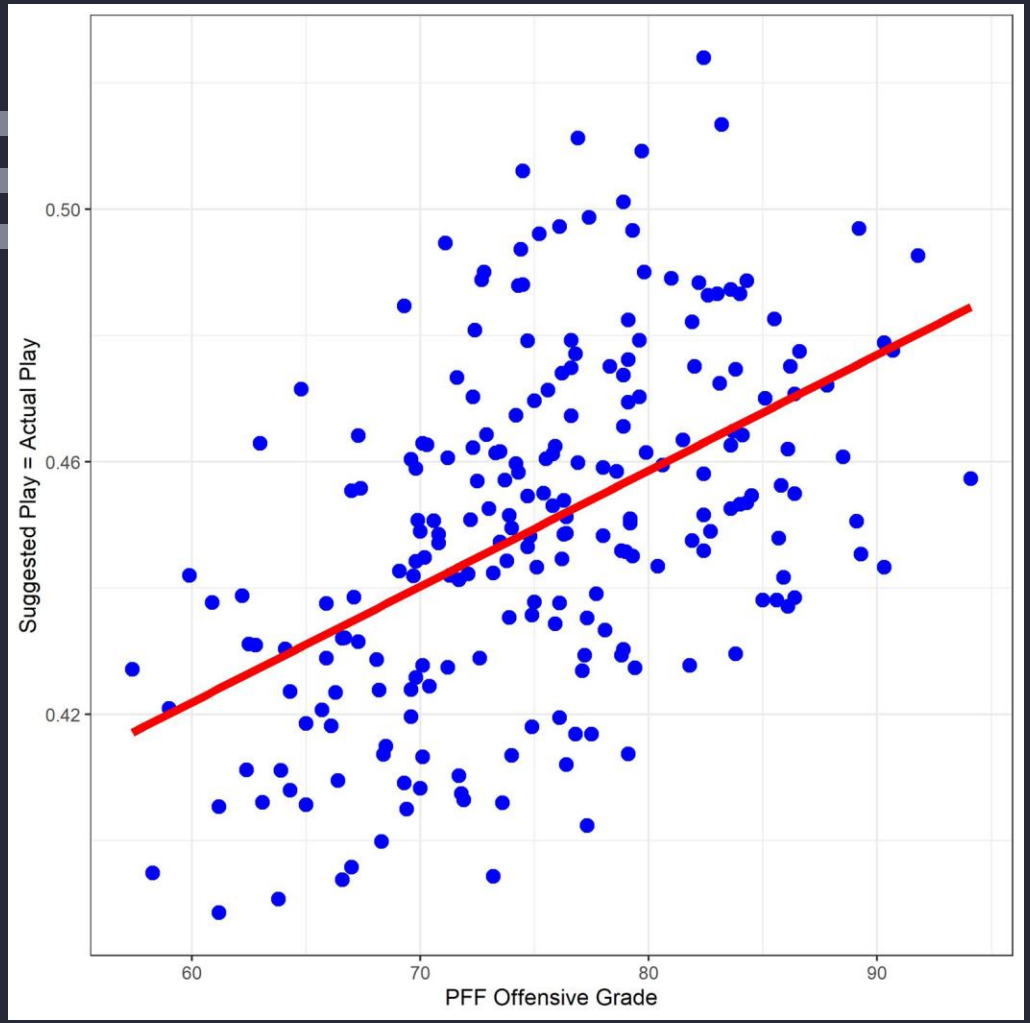
Independent Variable	Description
Down	Down of Play
Distance	Distance to First Down
Previous Play Dummy	If the Previous Play was a Rush or Pass
Time Left	Time Left in the Quarter
Run Percent	Percentage of Plays that were Previously Run Plays in the Game
Quarter	Quarter being played in (1st, 2nd, 3rd, 4th, OT)
2 Minute Dummies	Dummy Variable for if it was within the 2 Minute Warning
Offensive PFF Grades	Recv, Rblk, Pblk,
Defensive PFF Grades	Rdef, Prsh, Cov, Tack

Methodology

- Our Random Forests predict the likelihood of the play being successful based on:
  - Pre-Snap Game Context
  - Level of Offensive Talent
  - Level of Defensive Talent
- For each play, we created 2 predictions:
  - The likelihood of the play being successful if it was a run
  - The likelihood of the play being successful if it was a pass
  - Our suggested play would be the play with a higher likelihood of being successful

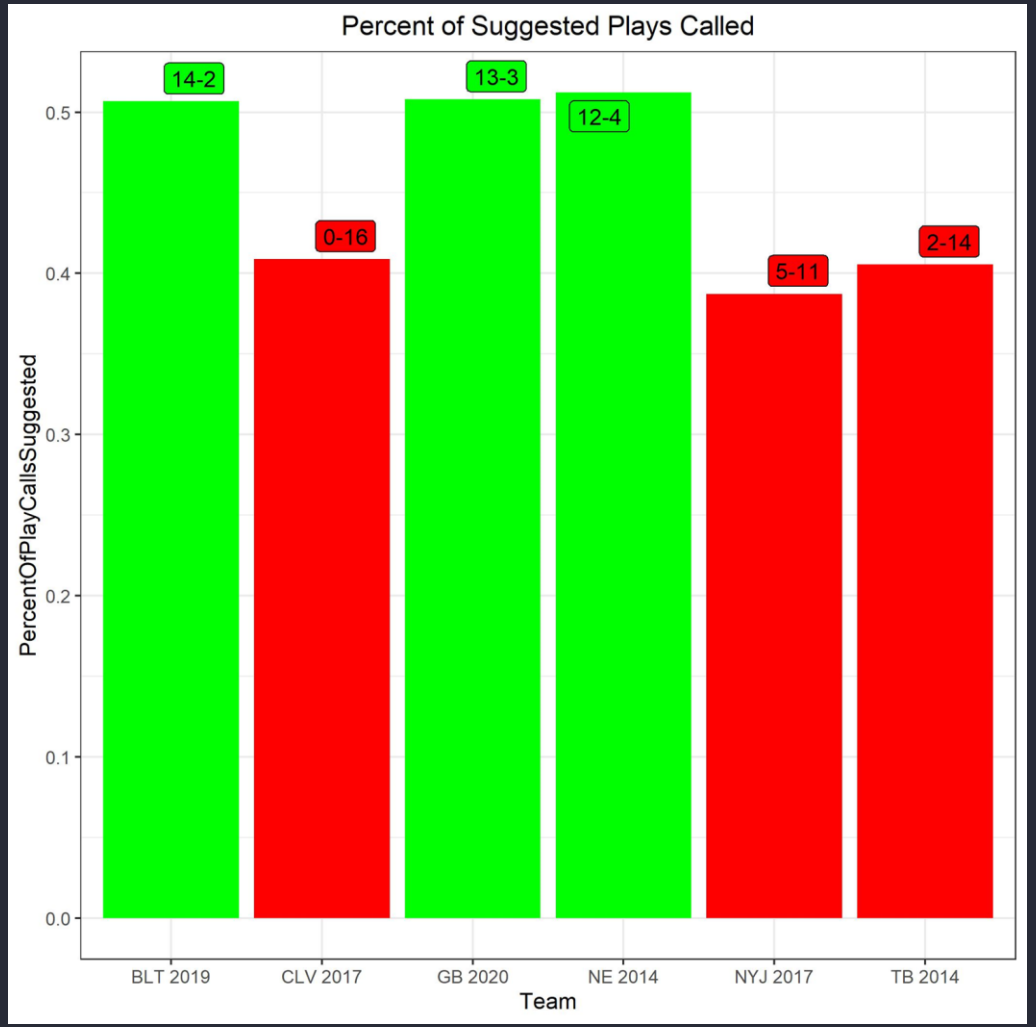
Methodology Example

- Play Description:
  - 2014 Week 13 Cardinals vs Falcons Game (Falcons Ball)
  - 1st and 10 from the 40 yard line
  - Falcons up 7 with 2:01 left in the 2nd Quarter
- Our Prediction:
  - Pass Play Being Successful: 0.849
  - Run Play Being Successful: 0.45
- Outcome:
  - Pass Play for 8 Yards



Offensive Grades of Teams Based on How Often They Ran the Plays We Would Have Suggested

- The upward trend in the graph suggests that as teams run more of our suggested plays, their seasonal PFF Grade will increase



Best vs Worst Performing Teams based on our Suggested Plays

- The teams that follow our model perform significantly better
  - BLT 2019
  - GB 2020
  - NE 2014
- Teams that do not follow our model do not perform well
  - CLV 2017
  - NYJ 2017
  - TB 2014

Offensive Success Predictions

- Among all Offensive Plays:
  - We suggested the actual play 45.3% of the time
- Among all Successful Offensive Plays:
  - We suggested the actual play **89.2%** of the time

Team Selection

- We wanted to select 2 teams with similar PFF Grades but different levels of offensive success

- Our goal is to identify if a team changes their play calling to our suggestions, will they perform better?

Team 1: Las Vegas Raiders (8-8)

2020 grade rankings:

Overall Offense Grade - 73.3 (13th best)

Overall Run Grade - 77.8 (18th)

Run Block Grade - 59.3 (26th)

Overall Pass Grade - 84.9 (9th)

Pass Block Grade - 67.2 (17th)

Overall Defense Grade - 47.8 (30th)

Team 2: Denver Broncos (5-11)

2020 grade rankings:

Overall Offense Grade - 66.7 (31st best)

Overall Run Grade - 83 (tied 10th)

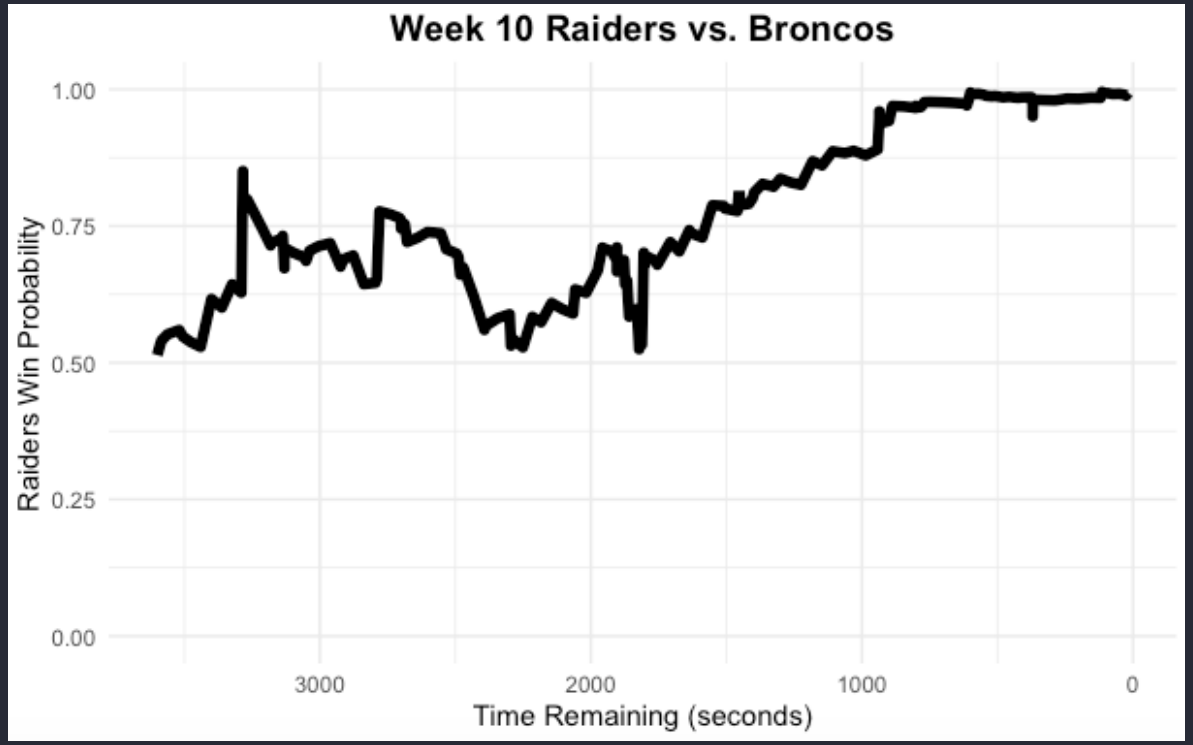
Run Block Grade - 58 (28th)

Overall Pass Grade - 55.9 (tied 31st)

Pass Block Grade - 62.2 (tied 22nd)

Overall Defense Grade - 73.6 (tied 7th)

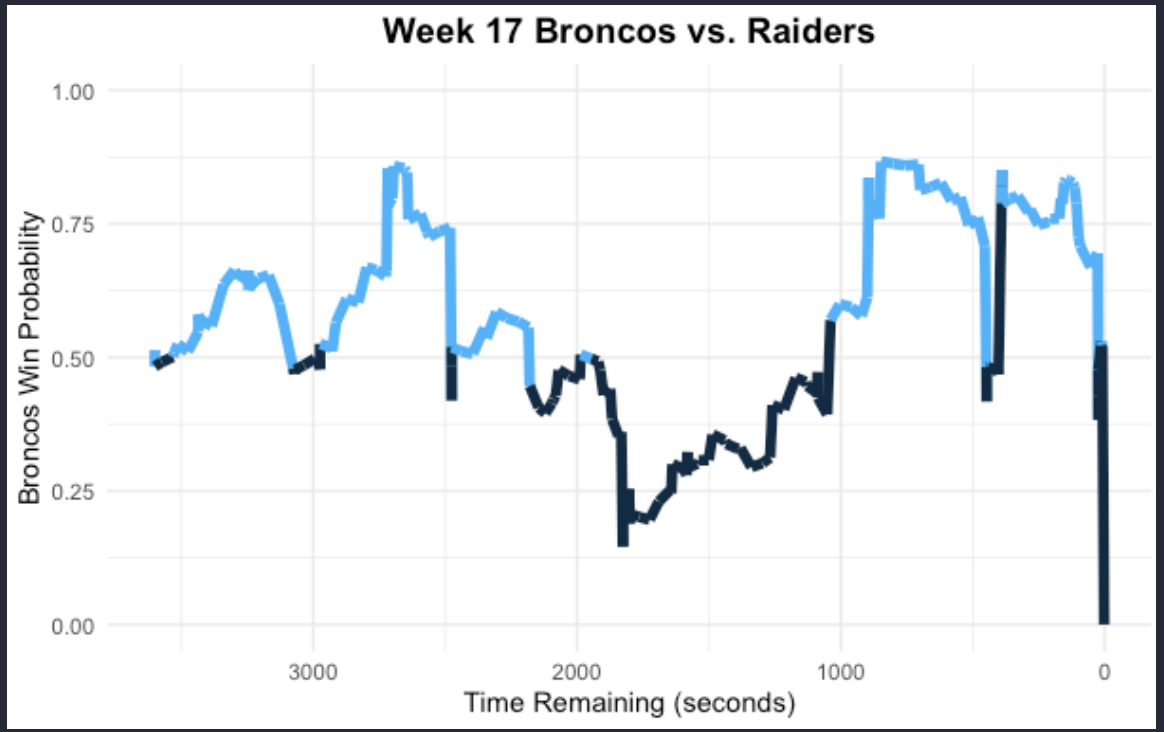
Win Probability Graph: Week 10



Raiders 37

Broncos 12

Win Probability Graph: Week 17



Raiders 32

Broncos 31

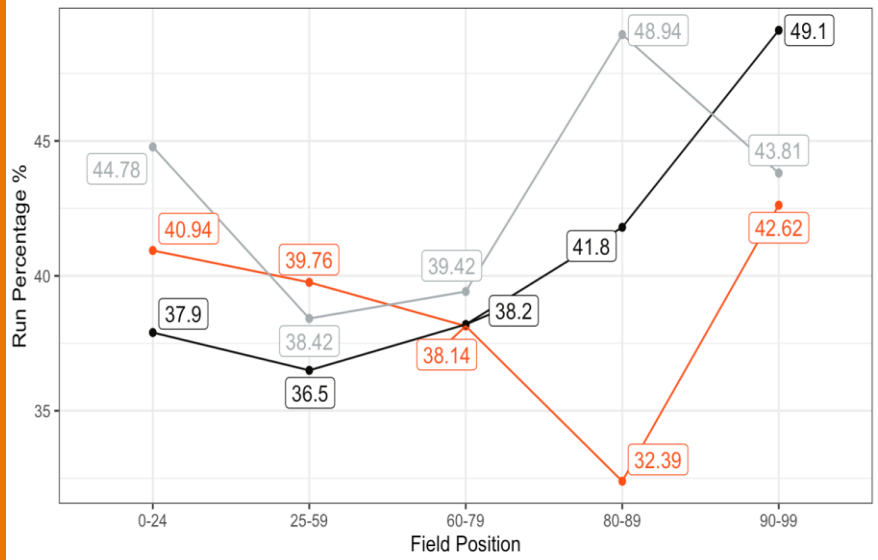
Red Zone Breakdowns LV vs DEN 2020

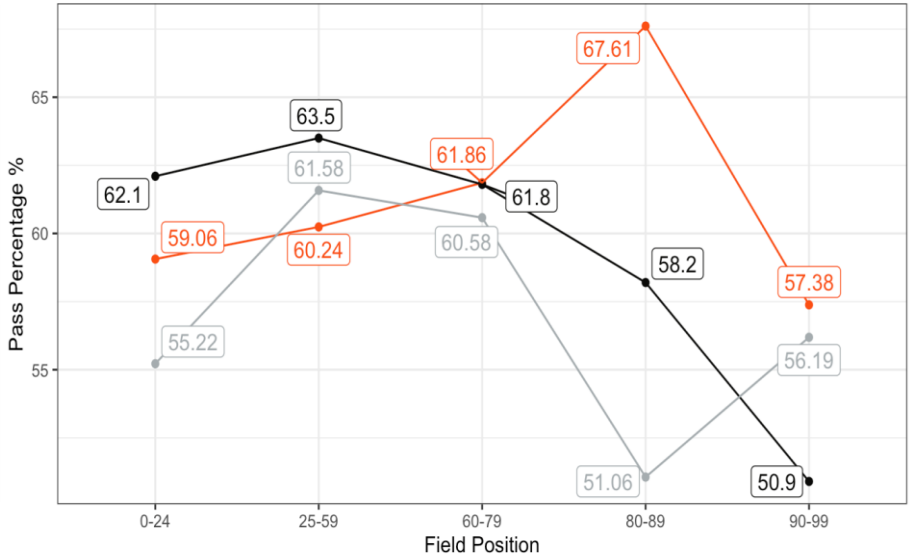
Red Zone (1-10)	Week 10		Week 17	
	LV	DEN	LV	DEN
% Of Play Calls Suggested	25.00%	14.29%	20.00%	62.50%

NOTE: Both teams ran 8-10 plays in the Red Zone each game

DEN WPA in Week 10 was -1.3% vs +19.9% in Week 17 in the Red Zone

LV and DEN Run/Pass Breakdowns (Regular Season)





DEN LAVG LV

Play Action Breakdown

	Play Action % (Plays)		
Field Position	LV	LAVG	DEN
1-24	9.0% (6)	15.6%	15.2% (26)
25-59	16.1% (98)	16.6%	11.5% (66)
60-79	14.4% (30)	15.3%	15.5% (30)
80-89	7.4% (7)	11.5%	15.5% (11)
90-99	14.3% (15)	15.9%	18.0% (11)
Overall	14.4% (156)	15.8%	13.4% (144)

Indicates at least 2% below LAVG

Indicates at least 2% above LAVG

Play Action Plays

	Las Vegas Raiders		League Average		Denver Broncos	
Field Position	EPA	Success %	EPA	Success %	EPA	Success %
1-24	0.804	50.00%	0.341	54.98%	0.406	53.85%
25-59	-0.044	50.00%	0.081	53.59%	-0.168	43.94%
60-79	-0.202	60.00%	0.013	52.78%	-0.046	43.33%
80-89	0.250	57.14%	0.282	44.26%	0.086	54.55%
90-99	0.271	6.67%	0.250	11.92%	0.221	0.00%
Overall	0.002	48.08%	0.127	49.79%	0.010	43.1%

Indicates at least 5% or 0.15 below LAVG

Indicates at least 5% or 0.15 above LAVG

Conclusions

- There is no overarching correct run/pass ratio
  - It is different for every team and constantly changing because of game situation
- DEN's offense has potential to become more successful
- In 2 matchups with LV, DEN proved more successful in the red zone when they followed our suggestions

QUESTIONS?