Syracuse University's

Football Analytics Blitz

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Optimizing the Pass/Run Ratio in Different Sections of the Field

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Introduction

An offensive play can be simplified into the binary categories of **pass and run**. While these are binary options, their frequencies change based on the situation of the game. One could assume that you are more likely to see a run play than a pass play when closer to either endzone, or that you would be more likely to see pass plays in the middle of the field. Your goal will be to explore what the likelihood of the two play types are given the state of the game and find the optimal pass/run ratio for each of the different zones described below.

A developing trend within the National Football League and all levels of football is the emergence of mobile quarterbacks. While Steve Young, John Elway, and Michael Vick were threats in the rushing game, there is a much higher percentage of mobile quarterbacks in today's game. The majority of these mobile quarterbacks are a part of the younger generation (Jackson, Murray, Allen) and have added an extra wrinkle for defenses. As more and more of today's quarterbacks include a rushing component to their game, the ratio of passing plays to running plays is directly impacted.

The optimal pass/run ratio should be determined by utilizing the data provided entitled "*Play by Play*." A more in-depth breakdown of what is contained within this dataset is provided later in this prompt. Your analysis should include a mix of approaches from both the aggregate and the individual team perspective. The requirements of this are detailed below as well.

The pass/run ratio should be evaluated and broken down into the following categories:

- **1 - 24 Yard Line (Deep in own territory)**
- **25 – opposite 41 Yard Line (Touchback - Common Field Goal range)**
- **40 - 21 Yard Line (Common Field Goal Range, Start of Red Zone)**
- **20 - 11 Yard Line (Start of Red Zone - Middle of Red Zone)**
- **10 - 1 Yard Line (Middle of Red Zone - Goal Line)**

These categories were chosen based on the situation the offensive team is likely looking at in different areas of the field.

In determining what the optimal pass/run ratio is within the different zones, you are encouraged to look at this from a team perspective as well. For example, a team with a better running back will likely have a higher percentage of rushes than a sub-par running back and vice versa. This part of your analysis should utilize the data in the spreadsheet titled "*Facet Grades*".

Data

The data provided includes a portion of PFF's Play by Play data and the PFF Team Facet Grades. These data contain all of the necessary pieces in order to complete your analysis. However, you are welcome to obtain additional data from any public source to supplement your analysis. These data are **NOT TO BE SHARED** on any public platform and is provided solely for the sake of this competition. The data must be deleted after the completion of the competition.

The first dataset entitled "*Play by Play*" contains the play-by-play data from the 2014-2020 seasons. Within the column "down," if there is a play with a down of 0, it means it was a special teams play. The column "rps" can be broken down into: "R" (run), "P" (pass), "blank" (special teams play), or "X" (penalty before the play). Quarterback scrambles are labeled as pass plays. The different variables that are included within the dataset are:

- "**down**" (The down the play occurred)
- "**distance**" (The distance to the first down when the play occurred)
- "**yards_to_go**" (The distance from the end-zone when the play occurred)
- "**rps**" (The type of play that occurred)
- "**play_action**" (Whether the play was part of a play action sequence)
- "**EPA**" (Expected Points Added)

The second dataset entitled "Facet Grades" contains the different grades for each of the different offensive categories. These grades are given on a scale of 0-100 and reflect the aggregate performance for each team within the individual season. The different variables and grades included within this dataset are as follows:

- "**PF**" (Points Scored)
- "**PA**" (Pointed Allowed)
- "**over**" (Overall Team Grade)
- "**off**" (Offensive Grade)
- "**pass**" (Passing Grade)
- "**pblk**" (Pass Blocking Grade)
- "**recv**" (Receiving Grade)
- "**run**" (Running Grade)
- "**rblk**" (Run Blocking Grade)
- "**def**" (Defensive Grade)
- "**rdef**" (Rushing Defense Grade)
- "**tack**" (Tackling Grade)
- "**prsh**" (Pass Rushing Grade)
- "**cov**" (Coverage Grade)
- "**spec**" (Special Teams Grade)

As mentioned above, you are not required to only use the data provided, you are highly encouraged to get data from other sources (which would enhance the quality of your analysis). Other potential sources for teams to consider using include overthecap.com, which includes contract data for all NFL teams, pro-football-reference.com, which includes a variety of different player and team stats, and any other publicly accessible data.

Case Requirements

This case is designed to elicit creative approaches to the prompt. Listed here are the main topic points your presentation should address, but you are encouraged to add additional layers of analysis.

- **Determining the optimal pass/run ratios in the following zones based on down, distance, and game situation:**

    - 1 - 24 yard line (Deep in own territory)
    - 25 – opposite 41 yard line (Touchback - Common Field Goal range)
    - 40 - 21 yard line (Common Field Goal Range, Start of Red Zone)
    - 20 - 11 yard line (Start of Red Zone - Middle of Red Zone)
    - 10 - 1 Yard Line (Middle of Red Zone - Goal Line)

- **Select two teams of your choice from the 2020 season and provide a detailed description of their pass/run ratios in the different zones described above. Identify why their optimal ratios may differ from the league average and if they behaved optimally.**

- **For the teams of your choice, evaluate which zone of the field has the highest percentage of play-action passes and compare your teams to the league average percentage. Discuss the strategical elements explaining these differences.**

In terms of your analysis, the points above are the main subjects that must be addressed within your presentation. Judges will be focused on your approaches to these points but will also be judging you on the following criteria:

- **Overall Process:** Background information including but not limited to:
    - The problem being addressed
    - Summary of data used
    - Statistical tools utilized to obtain results
    - Potential pitfalls within your methodology
    - Conclusions and recommendations
- **Creativity**: Elements of personal insight beyond the requirements stated in the case. This is a crucial element of your overall presentation performance.
- **Presentation Quality**: Visualizations and slides should be well formatted with the purpose of effectively communicating results to the audience.
- **Clarity**: The organization and succinctness of your presentation. Being convincing with your results is important in impacting decision-making.

This competition is intended for undergraduate students to compete against other undergraduate students. We do not permit teams to acquire assistance from any faculty, family, friends, or any other individual. In addition, teams should not contact anyone associated with an NFL team or the league office. Teams that disregard this rule will be disqualified and will not be invited to participate in the future.

Teams are allowed to use the internet to help answer the case questions and develop their analyses but will be judged based on your unique insights. While there is analysis that could be related to this topic online, an over-reliance on previous analysis or papers will be detrimental to your performance.

Each team must submit their final presentation (in both PowerPoint and PDF format) to Football Analytics Blitz President Zak Koeppel at zkoeppel@syr.edu by 9:00 PM EST on Thursday February 25th.

If you have questions about the case, contact Football Analytics Blitz Vice President Ben Ayers at sbayers@syr.edu.