Route Combination Realization

An analysis of route combination usage and performance against various coverages

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Data Preparation

In order to properly identify play-by-play route combinations, the “Skill Position Players” dataset had to be adjusted to a wide format and the route information compiled. I wrangled the data so that each row corresponds to a play and created a variable with all the relevant play information.

In short, the “play” variable I created included: on-field position, alignment, and route for all pass-catchers into a single character string (eg. WR-L-1 Slant TE-L-2 Block SWR-R-2 Curl   WR-R-1 Post) once per play. This allowed for easier play-design identification

Route Combination Classification

Utilizing common route combinations described by former NFL defensive back Matt Bowen[1] and the X's and O's football website[2], I hard-coded 48 concepts and their most utilized variants into bins to classify the play by play data.

Out of the 18,818 plays categorized as "pass" by Sports Info Solutions ("challenge pass" situations were excluded to ensure the sample was representative), 11,006 plays were classified into the aforementioned bins as a "common" route combination concept.

[1] Bowen 2014
[2] X's O's Staff 2016

Most Popular Route Combinations

The two concepts that rose above the rest by a wide margin were “Hi-Lo” and “Pin” route combinations (refer to combination classification glossary in the appendix) with 1,139 and 1,082 runs, respectively.

These were then followed by “Slot Cross,” “Flood,” and “Play Action Boot” all above 400 runs (excluding screen plays as they interact differently with coverage schemes)[1].

We will consider these five when evaluating the best performers against each coverage type

[1] Among Screens “Quick” designation was most popular with 596 runs. Includes Quick and Shovel passes

Success Against Coverages

Out of the route combo-coverage scheme pairs, I established a 25 play minimum cutoff for the analysis. This rendered 29 unique combinations to evaluate

The evaluation method consisted of 5 criteria for each pair:

- Mean expected points added (EPA) and median EPA (via SIS)
- Success % (percentage of plays with EPA>0)
- Completion % over expected (CPOE via nflfastR*)
- Defended % (Pass breakups + interceptions + sacks per total plays)

The best route combination was selected for each evaluation criterion and coverage scheme. The route combo with most metrics in their favor was deemed most effective

*nflfastR data was joined on the following variables: offensive team, defensive team, week, quarter, and quarter seconds remaining

Methodology

Those 5 metrics were chosen because they offer different viewpoints on route combination performance.

- mEPA and Success% speak about the consistency of good outcomes and most common result.
- Completion % over expected presents a comparison point against the “average” play design in the same game-situation. It also balances deep and short route-concepts as it accounts for throw depth
- Defended % offers insight on how often those combinations may see negative outcomes
- Average EPA provides a snapshot of performance while giving more weight to both “boom” plays and costly negative outcomes in their own respect.

Best Results by Coverage

Color represents top route combo in metric/coverage

Coverage	Success%	EPA	mEPA	CPOE	Def%	Best Combo
Cover 0						Hi-Lo
Cover 1						Hi-Lo
Cover 2						Slot Cross
Man Cover 2						Hi-Lo
Tampa 2						Pin
Cover 3						PA Boot
Cover 4						PA Boot
Cover 6						Hi-Lo

Legend

- Hi-Lo
- Pin
- Flood
- Slot Cross
- PA Boot

Takeaways

Maybe somewhat unsurprising that the most used route combination in 2020 (Hi-Lo) also led in most success against coverages with four (0, 1, Man-2, 6)

What's more surprising, however, is the fact that "Play Action Boot" seemingly took over Defended %. What I infer from this is that PA Boot can be a very "hit-or-miss" combination against coverages in general, but the misses won't have an overly detrimental effect for the offense as the ball is kept away from the defense.

It's also important to note that "Flood" had very little presence across the board despite being quite popular. Perhaps it isn't as effective as traditional knowledge may suggest or it excels at something not yet measured in this analysis.

Conclusion and Limitations

Although for most coverages there isn't a unanimous “beater” combination, we can observe clear trends that unequivocally reveal the most effective route design.

The biggest limitation to this approach comes from the specificity of classification. If the bins are designed with utmost rigor (as well as coverage/personnel variations), we could analyze the effectiveness at a more precise level but sacrifice a large sample size. On the flipside, plays could be grouped into fewer bins (only highlighting key concepts) to archive more matches but without a pin-point dissection for variations.

With more resources, I would conduct a study to determine the right level of preciseness as well as consult with experts to construct a robust classifier at that level.

Sources

1. Bowen, Matt. “NFL 101: Introducing the Basic Route Combinations”, *Bleacher Report* (2014). Consulted July 13th 2021, https://bleacherreport.com/articles/2024638-nfl-101-introducing-the-basic-route-combinations
2. X’s O’s Football “Common Pass Routes and Route Combos” (2016). Consulted July 13th 2021, https://www.xsosfootball.com/common-pass-routes-route-combos/