



Rush vs. Pass: Modeling the NFL



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Objective

We seek to analyze rushing yards and passing yards as measures of team strength in the NFL.

Models

Keener's Model defines the strength of a team to be proportional to its rating.

$$s_i = \frac{1}{n_i} \sum_{j=1}^N a_{ij} r_j \quad \mathbf{s} = \mathbf{A} \mathbf{r} = \lambda \mathbf{r}$$

The Generalized Markov Model finds the limiting probability vector of a convex combination of stochastic matrices.

$$\mathbf{G} = \alpha_1 \mathbf{S}_1 + \dots + \alpha_k \mathbf{S}_k$$

The Offense Defense Model uses matrix balancing to find offense and defense rating vectors.

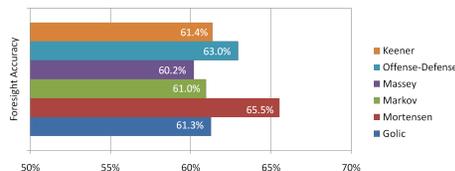
$$o_j = m_{1j} \frac{1}{d_1} + \dots + m_{nj} \frac{1}{d_n}$$

$$d_i = m_{i1} \frac{1}{o_1} + \dots + m_{im} \frac{1}{o_m}$$

Massey's Least Squares Model assumes that the difference in ratings between two teams is equal to the difference in points scored.

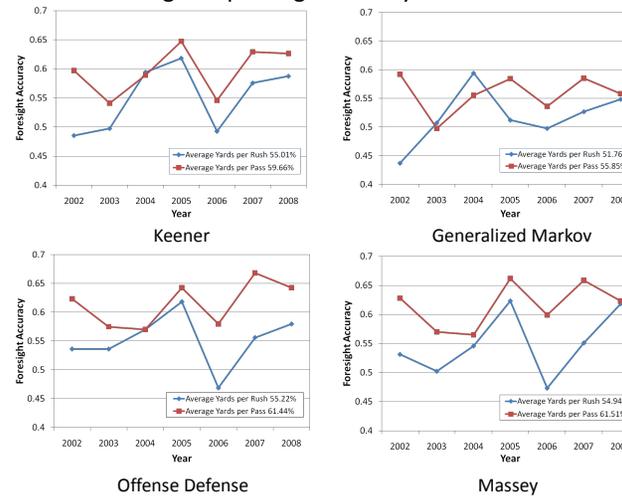
$$r_i - r_j = y_k \quad \mathbf{X} \mathbf{r} = \mathbf{y}$$

The accuracy of these models in game prediction is competitive with ESPN analysts (2008 season).



Rushing and Passing in the Models

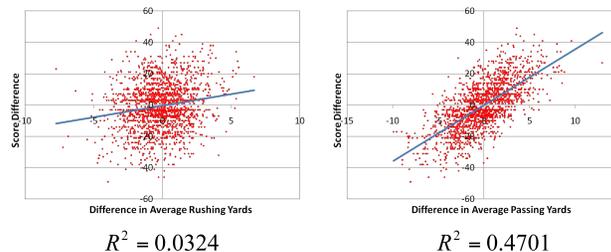
To determine whether rushing yards or passing yards is a better game predictor, we load measures of rushing and passing efficiency into the models.



In each model, passing efficiency outperforms rushing efficiency as a game predictor.

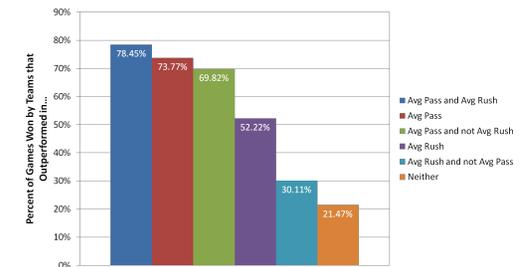
Correlation with Score Differences

If either rushing yards or passing yards is important in determining game outcomes, we would expect their measures of efficiency to be correlated with scores.



Conditional Analysis

We now examine the proportion of games won by teams that outgained their opponents in average rush, average pass, or combinations of the two. In the graph below, statistics were compiled over the 2002 to 2008 seasons.



It is apparent that teams that outperformed in average passing won 21.55% more games than teams that outperformed in average rushing. Moreover, teams that outperformed in average passing but not average rushing won 39.71% more than teams that did the opposite.

Conclusion

In each of the ways we compared rushing and passing efficiency, passing efficiency is clearly a superior indicator of team strength. Thus, if one wishes to predict the outcome of an NFL game, more weight should be given to the relative strengths of the teams' passing games than to the relative strengths of their rushing games.

Acknowledgements

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