# Does ESPN's Total Quarterback Rating Help Explain an NFL Team's Probability of Winning?

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## I. Research Objective

The purpose of this study is to examine the relationship between an NFL quarterback's Total Quarterback Rating (TQR) and his team's prospect of winning games. We use a binary-logit model to estimate the marginal effects of TQR on the probability of winning, controlling for teams' power rankings and home-field advantage. We find that a 5-point improvement in the TQR score would lead to a 2% increase in the probability of winning the game. Our results suggest that NFL coaches could see an increase in the probability of winning through the improvement of their quarterbacks' performance. This model can also be used to predict the outcome of NFL games in the coming seasons.

## II. Model and Variables

$$\Pr(W_{gjt} = 1 \mid X) = \beta_0 + \beta_1 TQR_g + \beta_2 RATIO_{gjt} + \beta_3 HOME_{gjt} + \epsilon_{gjt}$$

- $TQR_g$: Rolling Average of Total Quarterback Rating before the $g^{th}$ game.

- $RATIO_{gjt}$: a variable equal to $\frac{OPPRank}{Rank}$, where Rank is the $j^{th}$ team's latest weekly Power Ranking before the $g^{th}$ game and OPPRank represents the opponent team's latest weekly Power Ranking before the game. Rank is ordered 1 to 32 (Strongest to weakest).

- $HOME_{gjt}$: a dummy variable used to account for a team's home-field advantage. It is equal to 1 for home games and 0 otherwise.

## III. Hypotheses

- $TQR_g$: The higher the TQR score, the higher the probability that a team would win a game. Therefore, we expect TQR variable to be positively correlated with the probability of winning.

- $RATIO_{gjt}$: The rank of a team subjectively measures its relative strength compared to other teams. Since a stronger team has a lower rank; it has a higher probability of winning a game. We therefore expect RATIO to be positively correlated to the winning probability.

- $HOME_{gjt}$: The dummy variable Home is used to account for a team's home-field advantage. We hypothesize that a team playing on their home field would have a positive impact on their probably of winning that game.

## IV. Data

- Binary-Logit Regression
  - 32 teams
  - 16 games a season
  - 455 valid observations

- Primary Source of Data
  - 2013 weekly game statistics from ESPN's website
  - National Football League website

- Challenges and Limitations
  - Bye weeks
  - Teams switched quarterbacks from week to week
  - ESPN's reporting is not flawless

## V. Empirical Results

| Independent variable | Estimated coefficient |
|---|---|
| TQR | 0.01799 |
| | (3.153774)* |
| RATIO | 0.230671 |
| | (3.934446)* |
| HOME | 1.093687 |
| | (5.307591)* |
| Number of observations | 455 |
| $R_P^2$ | 63.96% |
| % Correct $W=1$ | 70.89% |
| % Correct $W=0$ | 56.42% |

*Note*: Standard errors are in parentheses. *Statistically significant at 5%.

## VI. Conclusion and Implications

- Our model correctly predicts 70.89 percent of the winning games, 63.96 percent of the total games and 56.42 percent of the losing games.

- A one point increase in TQR increases teams' probability of winning by 0.45 percent.

- When teams play at home, their probability of winning increase by 27.34 percent.

- Our results suggest that NFL coaches could see an increase in their teams' winning probability through consistent improvements of quarterbacks' performance in the games. Moreover, our model can also be used to predict NFL games in the coming seasons.