

College Football's Home-Field Advantage

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Abstract

American college football is the most popular and highest revenue generating collegiate sport. The National Collegiate Athletic Association (NCAA) organizes several competitive levels of football including its highest level, the Football Bowl Subdivision (FBS), which is comprised of 120 teams. The Bowl Championship Series (BCS) determines an FBS national champion by a single head-to-head game between the two top-ranked FBS teams. The BCS ranking and selection for the championship game has been a persistent source of criticism and complaint. The BCS uses six computer models to estimate the relative competitiveness of each FBS team. As such, the BCS ranking implicitly create a prediction for the outcomes of college football games. No one doubts that a statistically significant component of any such prediction should account for the home-field advantage.

The home-field advantage is a conglomeration of influences (such as familiarity with the stadium and fan support) that results in an advantageous scoring imbalance that favors the home team. This research confirms the existence of a home-field advantage in FBS games of about $3\frac{1}{2}$ points. Fair and Oster (2007) reported that the home-field advantage has a "fairly precise estimate" of about 4.3 points. Harville (2003) reported that a general assessment is three to four points. Furthermore, Harville (2004) claims that failing to account for a home-field advantage biases rankings.

One of the issues related to determining rankings and the home-field advantage has been large margins-of-victory against non-competitive opponents. Stern (1992) suggested that large margins-of-victory might be affecting team ranking estimates and suggested "downweighting" margins-of-victory beyond 20 points. Harville (2003) addressed the "running up the score" problem using a modified least squares with a hazard function and a cutoff value of 21 points. Bassett (1997), in an application to professional football, proposed that instead of using the most common least-squares criteria to instead use an L_1 estimate to reduce the effect of large margins-of-victory. And, Harville and Smith (1994) suggested modeling the home-field advantage as categorically team dependent, with a principal emphasis on categorizing home teams with differential home-field advantages. As shown below at the average team level, there is no team dependent home-field advantage.

This research does provide a general consideration and positive results for a game-dependent home-field advantage. Smith (2005) discussed some elements of the home-field advantage. While the previous research focused on games with large margins-of-victory, this research focuses instead on the relative rankings of teams. All ranges of relative rankings are considered for differential home-field

advantage effects. For example, it could be the case that extra scoring (a home-field advantage) occurs only in games featuring a large mismatch for the home team, as is commonly observed in the first part of the season. Or, it could be the case that extra scoring (a home-field advantage) occurs only in games featuring a competitive match for the home team. This research finds that maximum explanatory power is achieved when allocating a home-field advantage of approximately seven points only in games in which the home team is expected to win. If the home team is not expected to win, then this research estimates the scoring effect of the home team is zero additional points. These results are significant since all common models presume that the home-field advantage is constant for each individual team, a condition which is demonstrated.

The data for this study is the 771 games from the 2011 FBS football season. For each game i , the home team's score is denoted H_i and the visiting team's score is denoted V_i . A paired t -test is conducted for the mean of the home team's score and the mean of the visiting team's score. The results are statistically significant in that home teams score more points than visiting teams.

$$\bar{H} = 31.54 \quad \bar{V} = 23.40 \quad t\text{-statistic}_{771} = 10.07 \text{ (1\% critical value 2.58)}$$

Furthermore, the scoring averages for home teams and for away teams are relatively consistent week-to-week throughout the season as shown in Figure 1 below. The only week in which the visiting team averaged out-scoring the home team was in Week 7.

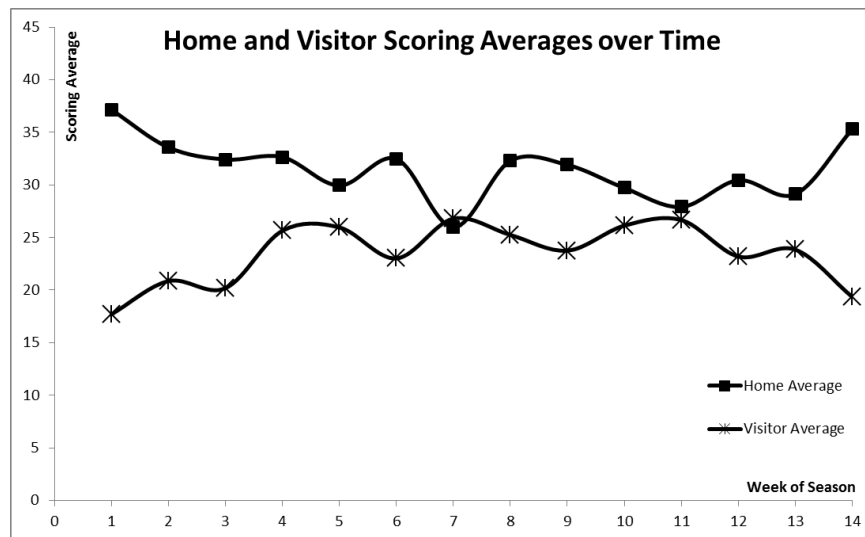


Figure 1 – Scoring Averages over Time

The focus of this research is to look at structural features of this scoring difference between home teams and visiting teams. The home scoring differential is defined as $D_i = H_i - V_i, i=1..771$. The easiest structural feature to parse out is the differential between scoring in games between two FBS teams and games between one FBS team and one non-FBS team.