Corporate Sport Sponsorship and Stock Returns: Evidence from the NFL

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ABSTRACT

Most of the home stadiums/arenas of major-sport teams in the U.S. are sponsored by large publicly traded companies. Using NFL data we find that stock returns to the sponsoring firms are affected by the outcomes of games played in their stadiums. For example, the mean difference between next-day abnormal returns after a win and after a loss of the home team is 50 basis points for Monday night games and 82 basis points for post-season elimination games. Evidence suggests that this effect is partially driven by investor sentiment. The next-day abnormal return is further carried to subsequent days, providing profitable trading strategies.

Keywords: Stock returns; Sport sponsorship

JEL Classifications: A12, G12, G14

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1. Introduction

Consider a major sport team that is hosting an important and highly rated televised match, at which it is expected to win. The match is played at the team's home stadium, which is named after the team's sponsor, a large and well-known publically traded corporation. The name of the sponsor is therefore repeatedly mentioned and seen during the match. Now suppose that the team is unexpectedly losing the match. Will this loss be reflected in the return on the sponsor's stock in the next trading day? If so, is it because the sponsor has been associated with the prevailing disappointment in the team? Or is the market reacting to the financial implications of the loss – a shorter season, fewer opportunities to promote the sponsor? Would the market have had a similar reverse reaction after a win? In this study, we document that stock prices of companies that sponsor National Football League (NFL) stadiums *are* affected by the outcomes of important individual games played in the stadiums. Our evidence suggests that this effect is partially driven by investor sentiment.

Several recent studies have explored the association between the outcomes of sport matches and stock market returns. Boyle and Walter (2002) find no relation between the success of the New Zealand national rugby team and the stock market reaction in the country. Ashton, Gerrard, and Hudson (2003) find a strong relationship between the performance of the English national soccer team and the change in the price of shares traded on the London stock exchange, where good (bad) performances by the national team are followed by positive (negative) market returns. Edmans, Garc'ia, and Norli (2007) conduct a cross-country analysis and find that losses in soccer (and other sports) matches have an economically and statistically significant negative effect on the losing country's stock market; yet they find no evidence of a corresponding effect after wins. Scholtens

and Peenstra (2009) analyze matches of eight publically traded European soccer teams. They find that the stock market response is significant and positive for victories and negative for defeats.

Our study is the first to examine the effect of professional sport match outcomes on stock returns of the teams' sponsors.[1] Although corporate sponsorship of professional sports stadia can be traced back to the early 1900s, the number of major league teams playing in corporate-named stadiums and arenas has sharply increased in the last two decades. As of the end of 2013, 62 percent of the home stadiums/arenas of the four major league sports (football, baseball, basketball, and hockey) were sponsored by publically traded companies.

Sponsoring a sport team is a major decision for a corporation. It is typically a long-term commitment that requires a significant investment. The average price for acquiring naming rights of a team's stadium in the U.S. National Football League in recent years is 120 million dollars for an average period of 17 years (see details in Table A1 in the appendix). In turn, the sponsoring company is provided an opportunity to tie the company's brands with a successful and popular sport organization, an opportunity to establish a strong relation with a large fan base and the local community, and a range of effective marketing tools – the sponsor typically gets branding and signage inside and outside the stadium, product placement rights within the stadium, exclusivity for use of its products by the team (official sponsor status), and has access to the team's coaches and players for promotions.[2]

[1] Extant stadium naming literature focuses on market reaction to the initiation of stadium sponsorship (see, for example, Clark, Cornwell, and Pruitt (2002), Becker-Olsen (2003), and Leeds, Leeds, and Pistolet (2007)).

[2] For example, the NFL team the Dallas Cowboys has recently signed a 25-year, 500 million dollar stadium naming rights deal with AT&T. As part of the deal, AT&T will continue to invest in improvements to wireless technology at the stadium, the city of Dallas will get 5 percent of revenue from the deal to help pay off the city's debt, and even the Legends Drive near the stadium will become AT&T Blvd. (DallasNews.com, July 25, 2013).

In light of these potential advantages of sport sponsorship, attaching the company's name to a sport team can also be risky. If the team does not perform well, it will likely suffer less exposure in the media, lower demand for the team's games and merchandises, and damaged reputation, all of which can affect the team's sponsoring company. The nature of competitive sports suggests that a single event or game can largely determine the success versus failure of the team, and thereby the value of its sponsoring company.[3]

In an efficient market therefore post-game stock returns to the sponsoring firms should reflect rational market reaction to the financial implications of the game outcomes. Yet there may also be a behavioral effect, which is driven by the unique ability of sport events to generate strong sentiment at the moment of time among large populations.[4] Edmans et al. (2007) argue that national sport events (especially soccer matches) can produce substantial and correlated mood swings in a large proportion of a country's population, which is translated into the stock market movement in the country. Analyzing publically traded European soccer clubs, Bernile and Lyandres (2011) conclude that investors are overly optimistic about their teams' prospects ex ante and, on average, end up disappointed ex post, leading to negative post-game abnormal returns. This conclusion is consistent with the study of Brown and Hartzell (2001) on the impact of basketball game results on the stock price of the NYSE listed Boston Celtics Limited Partnership. Palomino, Renneboog, and Zhang (2009) find evidence that the abnormal returns for the winning British soccer teams do not reflect rational expectations but are high due to overreactions induced

[3] For example, an article in BusinessWeek observes: "BMW Oracle (ORCL) team sailboat, eliminated in May from the America's Cup qualifying competition in Valencia, Spain, before the main event even started. German press reports put the cost of the failed Cup bid at nearly $200 million." (Jack Ewing, June 7, 2007).

[4] Other effects on investor sentiment include sunshine (Saunders (1993) and Hirshleifer and Shumway (2003)), changes to and from daylight saving hours (Kamstra, Kramer, and Levi (2000)), amount of daylight across seasons (Kamstra, Kramer, and Levi (2003)), nonsecular holidays (Frieder and Subrahmanyam (2004)), temperature (Cao and Wei (2005)), lunar cycles (Yuan, Zheng, and Zhu (2006)), and aviation disasters (Kaplanski, and Levy (2010)). See Hirshleifer (2001) on psychological biases in asset pricing.

by investor sentiment. We ask therefore whether sudden change in investor mood as a result of game outcomes is translated into the market value of the teams' stadium sponsors.

We concentrate on the NFL for several reasons. First, football is the most popular sport in the U.S. and has been for many years by a wide margin. Football games attract the largest crowds and achieve the highest television ratings among all major sports.[5] Second, a fairly large proportion of NFL stadiums are sponsored by publically traded companies, 21 out of total of 32 NFL teams (see details in Table A1). Third, the importance of a single game in the NFL is very high, relative to the other major sports in the U.S. (baseball, basketball, and hockey). This is because the NFL season is very short (16 games, compared to at least 82 games in the other sports). Furthermore, the NFL post-season (playoff) system is based on one game at each progression towards the championship, compared to a series of games (typically best-of-seven) in the other sports.

The NFL therefore provides a unique setting to assess the impact of outcomes of important and popular sport matches on the stock price of the sponsoring companies. We manually collected detailed data on all NFL games for teams with stadiums that are sponsored by publically traded companies. The sample contains 3,399 games (1,710 home games) during the pre-seasons, regular seasons, and post-seasons of 21 teams with 26 sponsoring companies, over the period 1997-2013.

We begin our analysis by looking at home games of the NFL teams and comparing the next-day abnormal stock returns of their sponsors after wins and losses. We measure abnormal returns using six different models. When all home games are included in the sample, the results do not

[5] A 2009 ESPN Sports poll asked respondents to name their favorite spectator sport (defined as one in which the responder attends games or matches, watches them on TV, listens to them on the radio, or reads about them). The poll results showed that professional football is the most popular sport with 24.4%, where professional baseball is the second with 11.0%. The Harris Poll has recently released the results of its annual survey of the favorite sports of Americans; professional football was the most popular with 35%, followed by professional baseball with 14% (BusinessInsider.com, January 27, 2014). According to the NFL, during the fall of 2013, NFL games accounted for 34 of the 35 most-watched TV shows among all programming (Bloomberg.com, February 5, 2014).

indicate any abnormal return after wins or losses. This is not very surprising given that most games are played simultaneously with other games, are not played in prime time hours, are not nationally televised, and for the most part their outcome (i.e., the game winner) is expected. We therefore focus our examination on subgroups of games that attract the highest interest: games with unexpected outcome, games that are played on Monday nights, and post-season games. An unexpected outcome of a game naturally attracts more media attention and also carries more "news" to the fans/investors, thus is likely to generate a stronger post-game stock market reaction. We classify a game outcome of a team as unexpected using two criteria: if the game outcome is contrary to the pre-game betting spread prediction or if it comes after a sequence of games with the opposite outcome (i.e., a loss after a series of wins). Monday night games and post-season games attract high attention because they are stand-alone (no other games played at the same time), nationally broadcasted by a major television network, played at prime time hours (the Monday night games), and are critical for the team success (the post-season elimination games).

The results show a strong effect of the games' outcomes on the sponsors' stock returns. After games with unexpected outcome, the sponsor of the home team typically earns a positive abnormal return if the team won and negative abnormal return if the team lost, yielding a significant win-loss return difference of 99 basis points. For Monday night games, the abnormal stock return to the sponsor is lower by 50 basis points after a loss than after a win. For post-season games, the losing teams' sponsors earn average abnormal return lower by 82 basis points than that of the winning teams' sponsors, although the returns are negative both after wins and losses (-0.19 and -1.01 percent, respectively). This can be explained by the crucial effect a payoff game loss has on the team, as it eliminates the team from the playoff contention. This may also indicate a surprise effect, i.e., the home team is expected to win a post-season game (a playoff game is typically

played at the stadium of the team with the better record); thus a win does not have much effect while a loss leads to a significant negative return of the home team's sponsor.

We confirm these results using a pooled regression; we estimate abnormal returns for all sponsor-days in the sample (game and no-game days), and regress them against dummy variables indicating a first trading day after a win/loss of the sponsored teams. The coefficients of the win and loss indicators are typically positive and negative, respectively, where the differences between the coefficients are fairly similar to the cross-sectional differences in abnormal returns after wins and losses. The impact of the game outcome remains significant when controlling for sponsorship characteristics, including sponsor and team market values, size of media market, and the total value and tenure of the sponsorship deal.

We next explore the drivers for the effect of match outcomes on sponsors' stock returns. As discussed above, we distinguish between two mechanisms. On the one hand post-game returns to the sponsoring companies should reflect changes in expected cash flows due to the financial implications of the game outcomes. On the other hand outcomes of sport events are associated with investor sentiment, which is often reflected in stock price movements.

We assess the presence of investor sentiment using several tests. First, we look at returns on the sponsors' stock after away games (games played at the opponent's stadium). Rational expectations suggest a similar effect of wins/losses in away games and home games, as both should have similar implications for the team's success (i.e., wins/losses count the same in home and away games) and thereby the exposure of its sponsor for the remaining of the season. Behavioral bias suggests a stronger effect for home games; this is because the stadium sponsoring company is only visible during home games, for which investors may associate the game outcome with the sponsor.

The results generally show substantial reductions in sponsor abnormal returns after away games, which is consistent with investor sentiment.

We further test investor sentiment by analyzing intraday trading characteristics. Changes in mood as a result of game outcomes should have a more pronounced influence on investors' trading behavior at the start of the trading day. This is because investors experiencing psychological changes tend to translate their sentiment quickly into the stock market, and the impact of these changes on returns is vanishing as more information arrives in the market during the trading day (see, e.g., Lo and Repin (2002)). Utilizing intraday trades and quotes data we find that the effect of game outcome on sponsor stocks is particularly strong during the opening trading hours, and more importantly, these intraday returns are accompanied by patterns of non-institutional trading and stock liquidity that typically characterize behavioral investments.

The effect of investor sentiment on the post-game day stock return can be also associated with subsequent returns; i.e., an initial overreaction to the game outcome is more likely to reverse in the subsequent days. Our results however are mixed; while in certain cases the next-day abnormal return tends to reverse in the following days, other cases exhibit return continuation. Considering all sets of tests we conclude that investor sentiment plays a role in shaping the market value of the sponsoring firms after important games.

In the final part of the study we investigate whether the sponsors' post-game stock return patterns provide profit opportunities. We first form a weekly zero-investment portfolio of buying the stocks of all sponsoring companies whose teams won that week and selling the stocks of all sponsoring companies whose teams lost that week. We hold this portfolio from the second trading day to the fifth trading day after the game (as the first-day profit cannot be earned). The portfolio generates abnormal profits, particularly for home games whose outcomes are hard to predict and

by nature attract more attention and provide a higher element of news: mean excess return and factor-model alphas of 28 to 30 percent per NFL season.

We further take our analysis from the instant, post-game investor reaction to a season-wide view. We examine whether the performance of a team during the entire season is carried to the sponsoring company's value after the season. We form an off-season portfolio of buying the stocks of all sponsoring companies whose teams had a "successful" season (measured by winning record, improvement from the previous season, or playoff participation) and selling the stocks of all sponsoring companies whose teams had a "non-successful" season. These portfolios exhibit surprisingly strong results: mean excess return and factor-model alphas of approximately 1.5 percent a month. We do not have a convincing explanation for these abnormal profits, but rather acknowledge a possible presence of mispricing, as the implications of a team's performance for its sponsor are gradually revealed and thus reflected in off-season price movement.

The paper contributes to the literature in several aspects. To the best of our knowledge, this is the first study to highlight the sensitivity of sponsoring corporations' value to the outcome of individual sporting events. Although NFL stadium sponsors are typically among the largest and most well-known firms listed on the U.S. stock exchanges, the outcome of a single match played by their sponsored teams can lead to significant swings in sponsor firm stock prices. Second, our evidence indicates that stock market reaction to game outcomes is driven, at least to a certain extent, by investor sentiment. This finding is consistent with prior studies attributing countrywide market price movement after sport matches to changes in investor mood (e.g., Edmans et al. (2007)), and also with the documented emotional reactions that NFL matches can illicit (see White (1989) and Chang et al. (2012)). Lastly, in a broader asset pricing view, we show that the effect of game outcome on sponsoring firm value embeds various profitable stock trading opportunities.

The paper proceeds as follows. Section 2 describes the data and game samples, Section 3 examines the effect of home-game outcome on sponsoring firm return, Section 4 tests for the presence of investor sentiment, Section 5 offers team performance-based stock trading opportunities, and Section 6 concludes.

2. Data and game samples

We manually collected data on all NFL games over the years for teams that are sponsored by publically traded companies. Using official NFL team websites and stadium websites, we identified teams who are or have engaged in stadium naming rights agreements with publicly traded firms and obtained key characteristics of the agreements. We then use team websites as well as secondary sports websites to gather data on game schedules across the sample period, including game date, location, score, television coverage, and more.[6] Based on the game date, we identified the first subsequent day of stock market activity for the sponsoring firms. Sunshine Forecasts' database was used to identify historic betting spreads for each game. Our sample contains 3,399 games (1,710 home games) during the pre-season, regular season, and post-season, representing 21 NFL teams and 26 sponsoring companies over the period 1997-2013. Table A1 lists the sample teams, stadiums, and sponsoring companies. Table A2 shows the game distribution over the sample period.

We combine the NFL data with CRSP and Compustat to draw accounting variables and stock return data on the sponsoring companies. Table 1 presents descriptive statistics for the sponsoring companies and for all CRSP/Compustat firms over the same sample period. Not surprisingly, firms

[6] In addition to NFL.com, secondary websites included Sports Illustrated (sportsillustrated.cnn.com), ESPN (espn.go.com), and ProFootball Weekly (profootballweekly.com).

that sponsor home stadiums of NFL teams are typically much larger than the average firm, have less growth opportunities (indicated by higher book-to-market ratios), and higher leverage ratios. Sponsoring firm are also highly traded and highly liquid (trading volume, Amihud's illiquidity measure, and bid-ask spread, all are significantly different than those of the average firm). Mean daily stock returns of sponsoring firms are not substantially different than those of the full sample, but are less volatile (measured by the standard deviation of daily stock returns over a month), whereas market beta is somewhat higher for sponsoring firms.

Considering the full sample of home games, which includes all pre-season, regular season, and post-season games, we do not expect a strong effect. Most NFL games are played simultaneously with other games, are not played in prime time hours, are not nationally televised, and do not attract particular post-game media attention unless their outcome is really unexpected. Hence, the stadium sponsoring companies are not visible to a large, national audience for a typical game. We therefore focus on several samples of home games that provide very high visibility and are highly important for the sponsoring companies.

The first sample consists of all games whose outcome is unexpected. These games are likely to get more media attention after the game, making the stadium sponsoring companies more visible. In addition, if a game win/loss is unexpected, it creates news of larger magnitude for the team and thereby for its sponsor. An unexpected win or loss can be viewed as any other corporate news that carries value for the company, and thus can have stronger stock market reaction. To capture the extent to which a game outcome is unexpected we use information obtained from betting spreads and prior team performance. We classify a game outcome as unexpected if it falls in one of two categories. First, a game is classified as having an unexpected outcome if the identity of the game winner is against the sign of the pre-game betting spread. To eliminate trivial game

predictions we consider only spreads of at least 5 points. Second, a game is considered to have an unexpected outcome if the game win (loss) comes after at least three consecutive losses (wins). The sample of games with unexpected outcome contains 316 home games.

Our second tested sample contains all regular season games that are played on Monday night (92 home games). Monday night games are distinct. A game held on Monday night is the last game played in the NFL week (Thursday to Monday), receives exclusive game-day publicity at a national level, is always played in prime-time hours (typically at 8:30pm EST), and is nationally televised. In addition, Monday night games are usually chosen based on the importance and the general interest of the game. For many years 'Monday Night Football' has been one of the highest-rated television shows. This means that sponsoring companies are more visible for games held on Monday night in their stadiums, and thus are more likely to be affected by the outcome of the games. Important to this study, there is also typically a 24 hour gap between the start time of the last game on Sunday and the Monday night game. This allows the market reaction measured to be isolated from the reaction to other NFL-week games.

Our third and final sample includes games that are also very visible, but much more important – the post-season (playoff) elimination games (57 home games).[7] As with Monday night games, post-season games are stand-alone and are typically nationally broadcasted by a major television network, thus providing high visibility to the stadium's sponsoring firm. But more importantly, post-season games are the most meaningful games for the teams, as their outcome solely determines if the team will continue to compete for the championship (in case it wins) or will be eliminated from the competition (if it losses). The perception of a successful season versus a failed

[7] The post-season sample does not include the Super Bowl game as it is played at a neutral stadium.

one is often determined by a single post-season game. The outcome of post-season games therefore can have a direct impact on the visibility of the sponsors in the rest of the season.

Table A2 shows a fairly uniform distribution of the samples' games over the years, which provides a solid ground for our examination. That is, the results are not likely affected by an unusual effect in a specific season, or by cross-sectional dependence induced by same-day clustering (see Brown and Warner (1985)). This is verified by robustness tests accounting for time-clustering.

3. Effect of home-game outcome on sponsoring firm return

We investigate the effect of game outcome on the stock price of the stadium's sponsoring firm using two methodologies. In the first we directly estimate the abnormal return to the sponsoring companies after each game played in their stadium, and compare between the post-game day abnormal returns after wins and losses. In the second we calculate abnormal returns for all sponsor-days in the sample, and regress them against variables indicating first-trading days after home game wins/losses. Details and results are below.

3.1 Calculating abnormal return

We begin our empirical analysis by estimating abnormal stock returns of the stadium sponsoring companies in the first trading day after the game (referred to as 'post-game day'). The firm's abnormal stock return is the difference between its raw return and its expected return for that day. To mitigate the sensitivity of the results to a specific model of expected return, we employ six different models that are commonly used in the literature (for detailed analyses of the models see Brown and Warner (1985) and Barber and Lyon (1997)). The first model is the *mean-adjusted model*: expected return is estimated by averaging the firm's raw returns during the past 250 trading

days prior to the game. The second is *market-adjusted model*: expected return is estimated by the value-weighted market index on the post-game day. The third is *market model*: expected return is estimated by the fitted value of the stock return on the post-game day, based on a regression of the sponsoring firm's raw return on the value-weighted market index return during the past 250 days prior to the game. The fourth is *factor model*: expected return is estimated in a similar way to the market model with a larger set of explanatory variables, including the Fama and French (1993) three factors, the momentum factor (all factor returns are downloaded from Kenneth French's website), dummy variables indicating January and Monday, and lagged return on the sponsor's stock. The fifth is *reference portfolio*: expected return is estimated by the equal-weighted average return of firms in a size/book-to-market portfolio that includes the sponsoring firm; portfolios are formed by first sorting all stocks into ten equal deciles according to the firm's size as of the beginning of the post-game day, and then within each decile, sorting all stocks into five equal book-to-market quintiles. The sixth is *matched (control) firm*: expected return is measured by the return of a firm with the closest book-to-market ratio within the same size decile as the sponsoring firm.

3.2 Post-game day abnormal return

Table 2 presents the abnormal returns according to the six models described above for the game samples, as well as the results based on the average across all models.[8] All returns are reported in percent terms. As expected, when all home games are included in the sample, the results do not indicate any abnormal return after wins or losses. In fact, the average abnormal return after

[8] For robustness we also applied Bayesian model averaging on the six models (see Avramov (2002)). Assuming a prior uniform distribution of the validity of the different models, we regressed daily raw returns on the models' benchmarks of expected return, calculated the posterior probabilities that each benchmark is the correct one given the data, and used these posterior probabilities as weights for averaging the models' abnormal returns. The Bayesian averaging yields almost identical results as the equal-weighted averaging (not reported).

a loss of the home team is higher by 5 basis points than that after a win, yet is not statistically significant.

The results show a strong effect for highly visible and important games. After games with unexpected outcome, the sponsor of the home team typically earns a positive abnormal return if the team had won and a negative return after a loss, yielding a win-loss post-game day return difference of 0.99 percent with a *t*-statistic of 2.02. Examining the abnormal return models separately reveals that the factor model shows the lowest return (0.45 percent), yet with the highest *t*-statistic (2.27). This can be attributed to the large set of explanatory variables included in the model, leaving fairly small variation in the model's residuals. After Monday night games, the home team's sponsor earns a positive abnormal return if the team had won, an average of 0.51 percent with a *t*-statistic of 2.18, and no abnormal return if the team had lost. Although the average difference between the win and loss post-game day abnormal returns is large, its *t*-statistic is only 1.40. This is partially due to the relatively small sample of Monday night games (92 home games).

The post-season games also show a large difference in returns. Averaging across all models, the losing teams' sponsors earn an abnormal return lower by 0.82 percent than that of the winning teams' sponsors (*t*-statistic of 1.72). All six abnormal return models yield strong results (differences in win-loss abnormal returns of 58 to 127 basis points). Unlike the Monday night games, the post-season effect seems driven by negative returns, as the average post-game day abnormal return is negative both after wins and losses (-0.19 and -1.01 percent, respectively). This can be explained by the crucial effect a payoff game loss has on the team. A playoff loss eliminates the team from the playoff contention, effectively ending the team's season. A playoff win only guarantees to keep the team in the competition for one more game. While wins and losses in the regular season serve to seed the team for playoff matchups, wins and losses in the post-season

ultimately determine the success or failure of the team's entire season. The post-season results may also indicate that there is a surprise effect. As a playoff game is typically played at the stadium of the team with the better record, there is a greater expectation that the home team will win in a post-season game; thus a win does not have much effect while a loss leads to a significant negative return to the home team's sponsor.[9]

These mean differences in abnormal returns after a win and a loss of home games in sponsored stadiums are meaningful. Clark et al. (2002) find that the sponsorship agreement announcement increases the sponsor's stock price by 1.65 percent on average in the four major sports. We show that the outcome of a single game affects the sponsor's stock by an average return of 0.50 to 0.99 percent across our samples. These effects are also comparable and even stronger than those reported in Edmans et al. (2007). They find that at the national level a loss in the soccer World Cup elimination stage leads to a next-day abnormal stock return of -0.49 percent, whereas a win does not lead to a significant positive return.

We verify that the results remain significant taking into account sponsorship characteristics using a cross-sectional regression. We regress the post-game day six-model average abnormal stock return of the sponsoring firm on a dummy variable that equals one if the sponsored home team had won and zero if it had lost, and a set of variables that represent the nature of the sponsorship. These include the market values of the sponsor and the team (estimates of NFL team market values are obtained from Forbes[10]), the size of the media market of the team, measured by population in TV households within a 75-mile radius of the team's stadium,[11] the total value of the

[9] Note that although post-season games are played during the weekend, their post-game day negative abnormal returns are not driven by the weekend effect (see, French (1980)). This is because for most models of abnormal return, the expected returns are estimated from Monday returns as well.
[10] See Forbes.com, "NFL Team Values: The Business of Football", August 14, 2013.
[11] The NFL defines a team's "local" market as all the TV markets that lie within a 75-mile radius of the stadium.

sponsorship, and the number of years since the beginning of the sponsorship (sponsorship tenure). We also control for the abnormal return in the previous trading day.

The regression results reported in Table 3 are consistent with the effects reported in Table 2 (all reported coefficients are multiplied by 100). The coefficients of the win dummy variable in all samples are even greater than the average abnormal returns with comparable *t*-statistics, except the Monday night games in which the significance is relatively low (*t*-statistic of 1.16). Tables 2 and 3 therefore provide a first indication that stock returns to the sponsoring firms are substantially affected by the outcomes of highly visible and important games played in their stadiums.

3.3 Pooled regression

To confirm the impact of game outcomes on stadium sponsors' stock returns documented above we employ a pooled time-series regression (for similar specifications see Edmans et al. (2007) and Bernile and Lyandres (2011)). Using the six models of expected return described above, we estimate the abnormal return for each of the sponsor-days in the sample. For the full sample of sponsor-days (game and no-game days), we run a pooled regression of the six-model average abnormal return on two dummy variables: *Win* indicates a first trading day after a home-game win of the sponsored team, and *Loss* is the equivalent indicator for a home loss of the sponsored team. The loadings on these dummy variables thus capture the marginal effects of win and loss on the sponsoring company's stock price.

This regression offers the advantage of exploiting the full time-series of the sponsors' stock returns, it allows estimating the effects of wins and losses independently, and it controls for potential systematic biases in the estimates of expected returns. For example, if a specific sponsor is relatively small in its reference portfolio, then a positive abnormal return to this sponsor's stock after a game win can be partially attributed to its relatively small size. Comparing the sponsor's

post-game day abnormal return to its time series of abnormal returns that are estimated in the same way should eliminate this size effect.

The regression model also allows us to address a potential effect of cross-sectional dependence. Our samples generally show a lower level of time-clustering. The playoff sample consists of 57 games that are played over 42 different weekends, where no more than three games are held in any of the weekends. The sample of Monday night games has almost no clustering because there is usually a single Monday night game every week, and the sample of games with unexpected outcome is not highly clustered as well (316 games played over 212 different weekends). Yet, as prior studies show that even relatively small cross-correlation can lead to over-rejection of the null hypothesis (see e.g., Kolari and Pynnönen (2010)), we examine the robustness of the results to game-day clustering. In addition to the OLS regression we estimate a Generalized Least Squares (GLS) regression that accounts for group-wise clustering by trading day.

The OLS regression estimates reported in Panel A of Table 4 are consistent with the abnormal return averages in Table 2. As the results above, Monday night games show a strong win effect and no significant loss effect (the *t*-statistics of the win and loss coefficients are 2.37 and 0.08, respectively), whereas post-season game effect is driven solely by home team losses (*t*-statistics of win and loss of -0.54 and -2.26, respectively). For games with unexpected outcome, a win has a very strong effect (*t*-statistics of 4.07), where a loss has a negative effect but not as significant (*t*-statistics of -1.22).

Moreover, across the three samples, the differences between the coefficients of the win and loss dummy variables, which represent the marginal influence of the game outcome on the sponsor's stock return, are very similar to the win-loss average abnormal return differences reported in Table 2; difference in coefficients of 0.50 to 0.97 percent (with *p*-values of 0.059 and

lower), compared with win-loss abnormal return difference of 0.50 to 0.99 percent. Finally, the GLS regressions reported in Panel B show similar and even slightly more significant results than the OLS regressions, confirming that the *t*-statistics are not inflated by time-clustering.

The results in this section consistently indicate that the market values of NFL sponsors are affected directly by the outcomes of meaningful games played in their stadiums.

4. Testing for investor sentiment

The findings in Section 3 raise the question regarding the mechanism driving the impact of home-game outcomes on the sponsoring firms' stock price. On the one hand, outcomes of important games can have real financial implications for the sponsoring companies. A team that just lost an important regular season game that affects its chances to compete for the championship in the current season will naturally attract less attention in the remainder of the season. And a team that just lost a post-season elimination game has also ended the NFL-affiliated media mentions of their stadium, effectively ending the sponsor's naming rights campaign until the next game is played in the stadium. These losses mean reduced media coverage, TV ratings, home game attendance, and demand for team products – all of which should affect the sponsoring firm's future cash flows. A reverse effect is expected had the firm won the game. A rational expectations argument suggests therefore that the post-game day change in the sponsor's stock price reflects changes in expected cash flows.

On the other hand, outcomes of sport events are correlated with sudden change in investor mood, which is often reflected in stock price movements (see Boyle and Walter (2002) and Edmans et al. (2007)). This argument can apply specifically to the NFL due to its high popularity and the strong emotions it generates. For example, Chang et al. (2012) find that game outcome of NFL

teams affects the value of locally headquartered stocks, where White (1989) documents that elimination from NFL playoff games leads to a significant increase in homicides in the cities following the games. The question is, therefore, whether the ability of NFL games to generate strong sentiment among the teams' fans lead to stock market overreaction for the sponsoring companies attached to the teams.

The results so far can provide some indication for whether the post-game day abnormal stock return to the sponsoring firm is driven by rational expectations or investor sentiment. For example, the evidence that Monday night home games affect sponsors' return, but not necessarily any regular season home game, is more consistent with the investor sentiment argument. This is because the main difference between Monday night games and all other regular season games is visibility, not the level of importance. That is, if two games are equally important for their teams, they should create the same impact on the sponsoring firms' value. But if the more visible game generates a stronger impact, it is likely driven by correlated change in fan sentiment towards the team and thereby its sponsor. In contrast, the evidence that outcomes of post-season elimination games create stronger impact than those of Monday night games is consistent with the rational expectations argument. This is because both types of games are very visible, but the post-season games are, on average, much more important than Monday night games (and any other regular season games).

To explore more directly the presence of investor sentiment in the effect of match outcomes on sponsors' stock returns, we employ three sets of tests, which are based on comparison between home and away games, post-game trading behavior, and sponsor stock return in subsequent days.

4.1 Effect of away games

In the first test for investor sentiment we look at the returns on the sponsors' stock after wins/losses in away games (games played at the opponent's stadium). Rational expectations suggest a similar effect of wins/losses in away games and home games, as both should have similar implications for the team and the sponsor for the remaining of the season (i.e., wins/losses have the same count in home and away games). Behavioral bias suggests a stronger effect for home games than for away games; this is because the stadium sponsoring company is only visible during home games, and thus investors may associate the game outcome with the sponsor.

Table 5 replicates the main results of the prior tables for away games. Both mean difference and pooled regression results indicate that Monday night games and games with unexpected outcome that are played away lead to much weaker and insignificant abnormal return on the sponsors' stocks; an effect of 17 to 19 basis points after away games, compared to 50 to 99 basis points after home games. These results strongly support the role of investor sentiment.

The post-season sample, however, shows a similar effect also in away games, albeit weaker than that found in home games. The average difference in abnormal returns between wins and losses is actually higher in away games than in home games (0.87 percent compared with 0.82 percent) yet is less significant in statistical terms (*t*-statistics of 1.06 and 1.72, respectively). The difference between the pooled regression coefficients of the win and loss indicators is reduced from 0.82 to 0.52 percent in away games but remains significant. This suggests that the effect of playoff games on the teams' sponsors is driven mostly by rational expectations and only to a minor degree by investor sentiment.

Figure 1 visualizes the key results in Table 5 and captures much of the message of the findings so far: outcomes of important home games affect the market value of the team stadiums' sponsors;

away games generate a significantly weaker effect for the most part, leading to the conclusion that abnormal returns to the sponsors' stocks are driven at least to a certain extent by investor sentiment.

4.2 Post-game trading behavior

Our second input for detecting investor sentiment is the pattern of trading on the sponsor stock in the day following the home game. Prior studies have argued that investor sentiment is correlated with trading characteristics, including the timing and volume of trading, the type of traders, the extent of order imbalance, and others. Building on these studies, we examine whether the effect of home game outcome on the stadium sponsor market value is associated with unusual levels of several trading variables.

Observing intraday returns can provide important information for the investor sentiment question. Changes in mood as a result of game outcomes should have a more pronounced influence on investors' trading behavior at the start of the trading day. First, investors experiencing psychological changes tend to translate their sentiment quickly into the stock market (see Lo and Repin (2002) and Chang et al. (2008)). In addition, the impact of the game outcome diminishes during the day as more relevant information about the sponsoring company arrives in the market. Investor sentiment suggests therefore that stock returns to the sponsoring companies following game wins (losses) should be higher (lower) in the opening trading hours than in the rest of the trading day. Yet, one can argue that strong impact in the opening trading hours is consistent also with rational market reaction, as the real value generated by the game outcome should be reflected immediately in the stock price. Therefore, to disentangle the two hypotheses we examine whether the opening period returns are accompanied by specific trading characteristics associated with investor sentiment.

Cohen, Gompers, and Vuolteenaho (2002) and Loughran and Schultz (2004) argue that individual investors are more likely to deviate from rational stock valuation than are institutional investors. This is because institutions are typically better informed and apply more sophisticated investment techniques, while individuals tend to have psychological biases. Baker and Stein (2004) further note that because short-selling is costlier than buying stocks, irrational investors are more likely to participate in the stock market when they are optimistic about stocks rather than when they are pessimistic about them. These arguments suggest that if the positive impact of game wins on sponsor stock return is driven by investor sentiment, the high returns should be accompanied by higher percentage of non-institutional trades. In the same way, a negative return to the sponsor after a game loss should be accompanied by lower percentage of non-institutional trades. Per the discussion above, this effect should be particularly strong during the opening trading hours.

Baker and Stein (2004) also link between investor sentiment and market liquidity. They show that high liquidity is a symptom of the fact that the market is dominated by irrational investors. This is because irrational market makers are assumed to underreact to the information contained in order flows, and thereby boost liquidity. The relation between sentiment and liquidity can be also implied indirectly; since investor sentiment is an indicator of overconfidence and overconfident investors trade more (see Odean (1998)), we should expect liquidity to increase when investor sentiment is higher. Applying this relation to our study suggests that if stock prices in the opening trading hours are driven by investor sentiment, then game wins, that attract more non-institutional investors, should lead to higher liquidity, whereas game losses, that put non-institutional investors away of the market, should generate lower liquidity.

We use trading and quote data provided by Tick Data Inc. to obtain intraday returns, non-institutional trading, and liquidity for the opening trading hours (9:30 to 11:30) and the rest of the trading day (11:30 to 16:00).[12] Identifying the type of investors is often based on the size of the trade, where small trades are typically attributed to individual (non-institutional) investors and large trades are attributed to institutional investors (see, e.g., Lee (1992) and Battalio and Mendenhall (2005)). Prior studies use various cutoff points to classify transactions as small vs. large. For our intraday-based test we can skip the task of choosing an appropriate trade size cutoff, and simply compare between the trade sizes during the opening hours and the rest of the trading period. That is, if the participation of individual investors is driving the positive opening hour return following game wins (versus the absence of individual investors after game losses), then we should expect relatively smaller trade sizes in the opening trading hours after game wins. To eliminate the effect of extreme trade sizes we use the medians of the trade sizes during the opening hours and the rest of the trading day.

We measure liquidity by intraday bid-ask spreads scaled by stock prices. To eliminate the effect of single quote outliers, we measure the bid-ask spread at the end of the opening hours by the median bid-ask spread of the last ten quotes before 11:30, and in the same way, measure the bid-ask spread at the end of the trading day by the median bid-ask spread of the last ten quotes before market closing. All intraday characteristics are obtained at raw levels, which is sufficient for our analysis as the tests are based on the differences between the opening and rest of the trading day periods.

Panel A in Table 6 table shows stock returns to the sponsoring companies during the opening trading hours (9:30-11:30) and during the rest of the day (11:30-16:00) in the first trading day after

[12] The choice of the first two trading hours is arbitrary; the results are robust to different definitions of opening trading hours.

home games of their sponsored teams. Our variable of interest is the difference between these intraday returns. For the sample of unexpected outcome games, the average difference between the returns in the opening trading hours and the rest of the day after game wins is higher by 0.81 percent than that after game losses (*t*-statistic of 1.81). This indicates that not only game outcome affects sponsor stock return, but also that this impact is more widespread during the opening trading hours. A much stronger effect is found for playoff games; a difference of 3.4 percent, which is less significant in statistical terms (*t*-statistic of 1.54), likely due to the relative small sample. The Monday night games however do not exhibit any relation between intraday return pattern and game outcome. We view the relative strong price impact during the opening trading hours as a further evidence that the outcome of home games affects the market value of the sponsoring firms. As this impact can be consistent with both rational and behavioral market reactions, we turn our attention to the trading characteristics associated with the latter.

The extent of post-game non-institutional trading is explored in Panel B of the table. The results show evidence that the outcome of a game affects the type of investors during the trading day. The median trade size during the opening trading hours following game wins is lower than that following game losses. This relation is strong for post-season games (*t*-statistic of the difference is -1.65), is somewhat weaker for Monday night games (*t*-statistic of -1.16), and is insignificant for games with unexpected outcome. This finding provides some indication that game wins attract more individual traders than game losses, which is consistent with a sentiment effect.

The shape of bid-ask spreads during the post-game day reported in Panel C also indicates some presence of sentiment investors. In all samples the gap between the bid-ask spreads at the end of the opening hours and at the end of the trading day is lower after game wins than after game losses. The stronger effect is found for post-season games, a gap of -0.14 percent with a *t*-statistic of -

1.96. A lower effect is found for unexpected outcome games (*t*-statistic of -1.13), whereas the effect following Monday night games is insignificant (*t*-statistic of -0.64).

The results in Table 6 provide evidence that abnormal returns to the sponsoring companies in the first trading day after the games are associated with unusual trading patterns that typically characterize behavioral investors.

4.3 Subsequent return reversal

In our third and last test for investor sentiment we examine whether the post-game day abnormal return tends to reverse in the following days, as evidence of initial overreaction to game outcome. We first estimate the cumulative average abnormal return during the four days following the first post-game trading day (days 2 to 5). We choose a window of four days as it gives sufficient time for return reversal, yet is not affected by the next game outcome (NFL games are typically played once a week). In addition, we estimate a cross-sectional regression of the cumulative abnormal return in days 2 to 5 on the first trading day abnormal return. A negative slope coefficient would suggest a return reversal, where a slope coefficient equals to -1 would indicate a complete reversal.

The results in Panel A of Table 7 do not indicate any evidence for return reversal. For playoff games, the difference between abnormal returns after wins and losses continues to be positive in the subsequent days; a cumulative abnormal return of 3.0 percent in days 2 to 5 with a *t*-statistics of 1.28. For the other samples the cumulative win-loss abnormal return difference in the subsequent days is very low and insignificant.

The cross-sectional regression in Panel B however yields mixed results. An indication for partial return reversal appears for games with unexpected outcome, where the slope coefficient is negative and significant for the sample of game wins. The post-season games show weak evidence

for return reversals after wins, yet a strong evidence for return continuation after losses. After Monday night games the results indicate mainly return continuation. While these results do not support an initial overreaction for the most part, we cannot rule out the presence of behavioral biases, as almost all cases exhibit a significant relation (positive or negative) between the next-day and subsequent days returns.

Considering the results of all three tests distinguishing between rational market reaction and investor sentiment (home/away games, intraday trading behavior, and subsequent returns), our conclusion is that investor sentiment plays a role in shaping the market value of the sponsoring firms after important games.

4.4 Concluding remarks on investor sentiment

Investor sentiment has been discussed theoretically and explored empirically in the literature mostly at the aggregate or market level; Saunders (1993), Hirshleifer and Shumway (2003), Kamstra, Kramer, and Levi (2000, 2003), Baker and Wurgler (2007), Edmans et al. (2007) and Kaplanski and Levy (2010) to name only a few. We believe that extending marketwide or countrywide analyses such as in Edmans et al. (2007) to the firm-level can enhance our understanding of investor sentiment.

First, analyzing cross-sectional variation in sentiment among stocks traded in the same market eliminates marketwide or countrywide sensitivity to sentiment. For instance, stock markets around the world are likely to exhibit different levels of market efficiency, and thereby have different exposures to investor sentiment. Moreover, sentiment can affect individual stocks in different ways (see, e.g., Baker and Wurgler (2006)). Second, we have an opportunity to utilize detailed data of intraday trading of specific stocks in the U.S. stock markets to detect unusual trading patterns for individual sponsors following games.

In addition, and perhaps most importantly, we explore the presence of investor sentiment in a unique setting that puts together two extreme sides of the scale of sentiment. On the one hand there are firms that are least likely to be affected by behavioral biases, namely the sponsoring companies. These companies are among the largest companies traded in the U.S. stock market, they are highly liquid, highly traded, highly visible, and are less affected by market frictions (e.g., Baker and Wurgler (2006) suggest that sentiment is more likely to affect small and young companies with relatively low levels of asset tangibility and profitability). On the other hand, due to sport stadium sponsorship agreements, these firms are directly linked to frequent events that generate strong emotions at the moment of time among large populations, especially the highly popular NFL games. Having this contrast, our findings indicate that investor mood and emotions do affect the market values of the sponsoring firms. We show therefore that investor sentiment is not limited only to small and less popular stocks, it can also affect the largest and most transparent stocks on the exchange.

It is important to acknowledge however that although this study presents new aspects of investor sentiment, the magnitude of the impact of sentiment as well as the mechanisms triggering sentiment, especially across firms, are far from being completely understood. For example, while post-game trading behavior and the reduced effect in away games indicate behavioral biases, the patterns of subsequent returns are quite puzzling. Specifically, next-day abnormal return tends to reverse for certain samples, while other samples exhibit return continuation. This can raise several questions; for example, does return continuation reflect initial underreaction to true value generated by the game outcome, or continued overreaction driven by change in investor mood? More generally, is the impact of investor sentiment on stock prices as a result of isolated events limited to one or only a few trading days, or reflected in longer horizons? We do not provide

answers to these questions in this study. We do however explore in the next section whether these unusual patterns in subsequent returns embed profitable trading opportunities, which are often used as evidence for stock mispricing.

Another question the results can raise is regarding the channel through which sentiment affects sponsors' stock prices: change of expectation about cash flows and/or discount rate (see Campbell's (1991) variance decomposition framework). Prior studies argue that investor sentiment is more associated with changes in discounted rate, whereas cash flow news is more related to firm fundamentals (see, e.g., Lamont and Stein (2006) and Chen and Zhao (2009)). We find this argument applicable to our analysis. As discussed above, a win or a loss in an important game can have real implications for future cash flows, whereas the effect of game outcome on firm risk is not as direct. Because stock prices move primarily by cash flow news (see Vuolteenaho (2002)), it will be interesting to explore if post-game abnormal returns are exceptional in that sense.

Conducting a thorough variance decomposition analysis for the sponsoring companies is outside the scope of this study. Yet we can achieve some indication for the sentiment-risk relation from timely measures of risk, such as implied volatility from the options market. Baker and Wurgler (2007) argue that the implied volatility of options on the Standard and Poor's 100 stock index ("VIX") indicates market sentiment. The VIX is often called the "investor fear gauge" by practitioners, since high levels of VIX can act as an indicator of market turmoil (see Whaley (2000)). Implementing this notion to individual stocks would suggest that high implied volatility on a company's stock options can reflect pessimism about the future prospect of the company, and vice versa. This means that a positive sentiment created by game wins is more likely associated with lower implied volatility, while negative sentiment following game losses should be accompanied by higher implied volatility. Investor sentiment therefore suggests a negative

correlation between post-game day abnormal return and option implied volatility for the sponsor stock. In unreported results we find support to this conjecture. We measure implied volatility by the average of the implied volatilities of 30 days at-the-money call and put options, obtained from OptionMetrics database; and we find a strong negative relation between implied volatility and abnormal return for most game samples, providing further evidence to the presence of sentiment in post-game stock price movements.

5. Team performance-based trading strategies

Given the price impact that game outcomes generate, we examine the existence of profitable trading opportunities embedded in the patterns of post-game stock returns. We begin with a week-by-week trading strategy based on game outcomes in the recent week, and we continue to explore off-season trading based on team performance during the recent season.

5.1 Post-game trading rule

The findings above suggest that the market reaction to game outcome is not limited to the next trading day, but rather seems, at least for some of the samples, to continue in the following days. Assuming that the next-day return cannot be realized by investors, we examine whether one can earn abnormal profits by trading sponsors' stocks in the subsequent days.

Because profitable trading rules require a sufficiently large number of traded securities at the moment of time, we do not limit our examination to the game samples analyzed in the previous section as they cannot provide more than one or only a few games in a given week. We rather consider two large groups of games. The first group contains all home games, motivated by the strong impact of games played in the sponsored stadium. The second group contains all home

games whose outcome is most unpredictable ex ante. We consider this group because any outcome in these games, win or loss, contains some element of news that can lead to sharper stock market reaction. We classify games as unpredictable if the betting spread for the game score is no higher than 3 points in absolute value.[13]

We examine the performance of the following long-short investment strategy. Every week during the NFL season we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose teams won that week and selling the stocks of all sponsoring companies whose teams lost that week. We hold this portfolio from the second trading day after the game until the fifth trading day. Table 8 shows the portfolios' mean excess weekly returns (in excess of the risk-free rate) and alphas from factor models over the years 1997-2013. The CAPM one-factor model uses the market factor. The three factors in the 3-factor model are the Fama and French (1993) factors. The 4- and 5-factor models include the Fama-French factors augmented with momentum and reversal factors. All returns and alphas are in percent per week.

When applied to all home games, the portfolio shows some evidence of abnormal profit; the mean weekly excess return is around 0.4 percent, and factor-model alphas are slightly higher, where the *t*-statistics are 1.70 to 1.83. The results are very strong when the investment is applied to unpredictable home games. The mean excess return and factor-model alphas are 1.45 to 1.53 percent per week with *t*-statistics between 3.23 and 3.34. Considering that a regular NFL season runs for 17 weeks, this investment strategy yields an abnormal profit of 28 to 30 percent per season. Abnormal returns following home games, especially unpredictable ones, can thus be translated into profitable trading opportunities.

[13] A cutoff of 3 is natural as it represents the points awarded for a field goal in an NFL game.

5.2 Off-season trading

The results above show that outcomes of single games can lead to patterns of abnormal stock returns to the sponsoring firms. We explore the stock market reaction to the team's overall performance during an entire season. The NFL season is relatively short, about four months (typically September to January). The performance of a team in a certain season has important implications for the long off-season period. Implications include reputational effects (both for the team directly and for the managers, coaches, and players affiliated with the team), probability of future success (particularly regarding player retention and draft placement), and the fans' mood. We examine whether a team's performance during a season is carried to its sponsor's stock returns in the off-season period.

We perform a simple trading rule. In the beginning of March of every year over the period 1997-2013, we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose team had a "successful" season and selling the stocks of all sponsoring companies whose team had a "non-successful" season. We hold this portfolio for 6 months (until the end of August). We use three criteria for classifying a team's season as successful. The first is if the team has a winning record (i.e., more wins than losses) in the last season. The second is if the team's record has improved in the last season (number of wins has increased from the previous season). And the third is if the team participated in the playoff games.

Table 9 shows the portfolios' mean excess monthly returns and alphas from factor models. The investment exhibits surprisingly strong results: mean excess return of 1.4 percent per month and factor-model alphas of 1.6 percent averaging across all three performance criteria, where almost all returns/alpha are statistically significant. The profits for the record-improvement and playoff criteria are higher than that generated by the winning record; 5-factor alphas of 1.8, 1.9, and 1.1,

respectively. The performance of NFL teams during a season therefore provides a substantial predictive ability over the team sponsors' stock returns in the off-season period.

5.3 Discussion

The sources of anomalous patterns in stock return are typically assessed in terms of risk and mispricing. As shown in Table 9, standard models of risk have difficulty in explaining the variation in returns associated with game outcomes and season-wide performances. There is always a considered possibility that unknown risk factors drive the results. However, as high risk implies high expected return, we find it unlikely that sponsors of teams that just finished a successful season become more risky than sponsors of unsuccessful teams.

The mispricing argument implies that it takes investors several months to realize the true value of the benefits (costs) to the sponsoring firm after a successful (unsuccessful) season of its sponsored team. That is, the off-season returns are driven by systematic market underreaction. This behavioral-bias argument has been previously considered as possible driver of stock return anomalies (see, for example, Ikenberry, Lakonishok, and Vermaelen (1995); Barberis, Shleifer, and Vishny (1998)). Yet, we should take into account that our sample contains a period of 17 years in which the number and scale of sponsorship has gradually increased. Hence, the high returns to the successful teams' sponsoring companies during the off-season period can reflect new ways the sponsors find to capitalize on the successful season, which are not expected at this stage by the market.

Another important aspect of the off-season abnormal returns, as well as the post-game effect, is that it involves only very large companies. These companies are typically highly traded, highly liquid, have less information asymmetry, and are strong financially. This means that the portfolios'

profits document above are not likely driven by market frictions and are easier to implement, compared to other pricing effects. For example, Griffin and Lemmon (2002) document that the value anomaly is stronger among distressed stocks; Avramov et al. (2007) point to momentum being present mostly among low credit rating stocks; and Eisdorfer (2008) shows that approximately 40 percent of the momentum profit is generated by delisting returns. The NFL teams' stadium sponsors are not likely to default or be delisted from the stock exchange. In addition, the profits generated by anomalous stock return portfolios typically require massive short selling, which is not always feasible for many stocks (e.g., low liquid stocks, distressed stocks). In that respect, therefore, it is fairly easy to form the long-short NFL sponsors' portfolios.

6. Conclusions

We document that stock prices of companies that sponsor NFL stadiums are affected by the outcomes of important games played in the stadiums. Employing six different models of abnormal return shows that the mean difference between next-day return after a win and after a loss of the home team is 50 to 99 basis points. Pooled regressions exploiting the full time-series of the sponsors' stock returns yield very similar estimates.

We explore whether the post-game day abnormal returns represent rational changes in expectations of future cash flows, or overreaction by investors associating the team's performance with its sponsoring company. We find that the effect of game outcomes on sponsors' stock prices is significantly reduced after away games, which is consistent with investor sentiment. We also find that post-game abnormal returns are often accompanied by trading patterns that typically characterize behavioral investors. We do not find however a clear evidence of return reversal that

is assumed to correct for initial overreaction. We conclude therefore that the impact of home game outcomes is partially driven by investor sentiment.

The post-game return patterns provide profit opportunities. We form a weekly zero-investment portfolio of buying the stocks of all sponsoring companies whose teams won that week and selling all sponsoring companies whose teams lost that week. Applying this investment strategy to home games considered as unpredictable ex ante (using pre-game betting spread data) generates mean excess return and factor-model alphas of 28 to 30 percent per NFL season. We further find that the performance of a team during the entire season is carried to the sponsoring company's value after the season. Off-season long-short portfolios of stadium sponsors of teams that had successful and unsuccessful seasons yield abnormal profit of approximately 1.5 percent per month.

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Table 1. Descriptive statistics

The table presents descriptive statistics for the sample of NFL stadium sponsoring firms and for all CRSP/Compustat firms over the period 1997-2013. For all variables, observations outside the top and the bottom percentiles are excluded. Size is market equity value (in millions of dollars). Book-to-market is book equity value divided by market equity value. Leverage is the ratio of book value of total debt to book value of total assets. Daily stock return is the daily return over the sample period, and Stdev of stock returns is the standard deviation of the daily stock returns in a calendar month (both are reported in percent terms). Market beta is measured by regression of stock return on market return over the past 60 months. Trading volume is the monthly volume over the sample period (in thousands). Amihud's illiquidity is the monthly average of daily ratios of absolute return to dollar trading volume (in millions). Bid-ask spread is the difference between the stock's closing ask price and bid price, divided by the average bid and ask prices (reported in percent terms).

	NFL sponsors (26 firms)			Full sample (18,426 firms)		
	Mean	Median	Stdev	Mean	Median	Stdev
Size	27,740.6	12,919.7	40,677.8	1,786.2	207.9	5,485.3
Book-to-market ratio	0.667	0.417	1.028	1.023	0.541	1.497
Leverage ratio	0.295	0.311	0.197	0.217	0.166	0.214
Daily stock return	0.032	0.000	2.508	-0.120	0.000	3.781
Stdev of stock returns	2.115	1.775	1.268	2.949	2.438	2.021
Market beta	1.151	0.988	0.757	1.036	0.905	0.895
Trading volume	138.27	38.46	389.41	10.80	1.45	29.10
Amihud's illiquidity	0.049	0.004	0.185	11.475	0.320	43.722
Bid-ask spread	0.430	0.116	0.712	2.101	0.714	3.457

Table 2. Post-home game day abnormal returns

The table presents the average abnormal stock returns of NFL stadium sponsoring companies in the first trading day after a home game of their sponsored teams over the period 1997-2013. Abnormal returns are presented for all home games and separately for wins and for losses of the home teams, within four samples: all games (including all pre-season, regular season, and post-season games); games with unexpected outcome: a game outcome is classified as unexpected if it either against the pre-game betting spread prediction or comes after at least three consecutive games with the opposite outcome; regular season games played on Monday night; and all post-season (playoff) games. Abnormal return is the difference between the raw return and the expected return, as measured by the six models described in Section 3.1. The table also reports the results based on the average of all models. All returns are in percent and *t*-statistics are in parentheses.

		Model of abnormal return						
	N	Mean-adjusted	Market-adjusted	Market model	Factor model	Reference portfolio	Matched firm	Average Abn return
All games								
Wins	1,019	0.045	0.019	0.007	-0.041	0.038	0.025	0.016
		(0.36)	(0.19)	(0.07)	(-0.74)	(0.40)	(0.20)	(0.17)
Losses	691	0.108	0.127	0.073	-0.013	0.099	0.014	0.068
		(0.85)	(1.33)	(0.82)	(-0.18)	(1.11)	(0.11)	(0.77)
Win-Loss		-0.063	-0.108	-0.067	-0.028	-0.061	0.011	-0.053
		(-0.35)	(-0.77)	(-0.50)	(-0.31)	(-0.46)	(0.06)	(-0.41)
Unexpected outcome games								
Wins	148	1.150	0.908	0.817	0.188	0.864	0.732	0.777
		(1.76)	(1.62)	(1.44)	(1.21)	(1.62)	(1.18)	(1.58)
Losses	168	-0.091	-0.165	-0.206	-0.266	-0.244	-0.321	-0.215
		(-0.37)	(-0.92)	(-1.35)	(-2.09)	(-1.58)	(-1.23)	(-1.39)
Win-Loss		1.240	1.070	1.020	0.454	1.110	1.050	0.992
		(1.86)	(1.92)	(1.84)	(2.27)	(2.11)	(1.63)	(2.02)
Monday night games								
Wins	52	0.866	0.552	0.211	0.353	0.537	0.530	0.508
		(2.07)	(2.10)	(0.97)	(1.82)	(2.20)	(1.55)	(2.18)
Losses	40	0.120	-0.028	0.071	0.079	-0.081	-0.093	0.011
		(0.33)	(-0.10)	(0.29)	(0.32)	(-0.31)	(-0.21)	(0.04)
Win-Loss		0.746	0.580	0.140	0.274	0.618	0.623	0.497
		(1.31)	(1.52)	(0.43)	(0.89)	(1.71)	(1.13)	(1.40)
Post-season games								
Wins	39	-0.353	-0.198	-0.284	-0.246	-0.241	0.188	-0.189
		(-1.48)	(-0.80)	(-1.27)	(-1.01)	(-1.11)	(0.67)	(-0.90)
Losses	18	-1.290	-1.090	-0.930	-0.839	-0.817	-1.080	-1.010
		(-1.63)	(-1.68)	(-1.77)	(-2.29)	(-1.57)	(-1.39)	(-1.86)
Win-Loss		0.937	0.888	0.646	0.593	0.576	1.270	0.819
		(1.47)	(1.56)	(1.34)	(1.36)	(1.21)	(1.90)	(1.72)

Table 3. Cross-sectional regression of post-home game day abnormal return on game win and sponsorship characteristics

The table presents regressions of NFL sponsoring companies' abnormal stock return in the first trading day after a home game of their sponsored teams over the period 1997-2013. Abnormal return is measured by averaging the abnormal returns of the six model described in Section 3.1. The independent variables are a dummy variable that equals one if the team won and zero if it lost, (log) of the market value of the sponsoring company, the market value of the NFL team, the size of the media market associated with the sponsored team, the total value of the sponsorship, the number of years since the beginning of the sponsorship (sponsorship tenure), and the abnormal return in the previous trading day. The results are presented for three samples of home games: games with unexpected outcome (a game outcome is classified as unexpected if it either against the pre-game betting spread prediction or comes after at least three consecutive games with the opposite outcome); regular season games played on Monday night; and all post-season (playoff) games. All coefficients are multiplied by 100 and *t*-statistics are in parentheses.

	Unexpected outcome games	Monday night games	Post-season games
Intercept	2.185	-0.106	-1.274
	(0.79)	(-0.05)	(-0.33)
Win	1.016	0.462	0.973
	(1.96)	(1.16)	(1.76)
Sponsor value	-0.204	0.013	0.031
	(-1.17)	(0.10)	(0.12)
Team value	0.201	0.149	-0.244
	(0.16)	(0.17)	(-0.20)
Media market	-0.041	-0.029	0.104
	(-0.42)	(-0.40)	(0.68)
Sponsorship deal value	0.005	0.000	-0.005
	(1.12)	(-0.11)	(-0.91)
Sponsorship tenure	0.099	-0.010	-0.013
	(1.26)	(-0.19)	(-0.14)
Lagged abnormal return	-81.500	-25.273	37.452
	(-6.12)	(-2.78)	(1.67)
# games	316	92	57
R-square	0.153	0.116	0.160

Table 4. Pooled time-series regression of abnormal return on home game wins and losses

Using the six models of expected return described in Section 3.1, we estimate the abnormal return for each of the sponsor-days in the sample. For the full sample of sponsor-days (game and no-game days), we run a pooled regression of the six-model average abnormal return on two dummy variables: *Win* indicates a first trading day after a win of the sponsored home team, and *Loss* is the equivalent indicator for a loss of the home team. Panel A shows estimates of OLS regression, and Panel B shows estimates of Generalized Least Squares (GLS) regression accounting for group-wise clustering by trading day. The results are presented for the three samples of home games described in Table 3. All coefficients are multiplied by 100 and *t*-statistics are in parentheses.

	Unexpected outcome games	Monday night games	Post-season games
Panel A: OLS			
Intercept	-0.004 (-0.56)	-0.005 (-1.14)	-0.030 (-5.02)
Win	0.757 (4.07)	0.513 (2.37)	-0.159 (-0.54)
Loss	-0.214 (-1.22)	0.017 (0.08)	-0.977 (-2.26)
Win-Loss *p*-value	0.971 (<0.001)	0.496 (0.049)	0.818 (0.059)
Panel B: GLS			
Intercept	-0.004 (-0.45)	-0.005 (-0.59)	-0.030 (-4.21)
Win	0.729 (3.93)	0.539 (2.59)	-0.146 (-0.50)
Loss	-0.231 (-1.32)	-0.007 (0.05)	-1.027 (-2.38)
Win-Loss *p*-value	0.960 (<0.001)	0.546 (0.015)	0.881 (0.045)

Table 5. Comparison of abnormal return after home and away games

The table replicates the main results of the prior tables for away games, applied to the three samples described in Table 3: games with unexpected outcome, Monday night games, and post-season games. Columns three to five show the mean difference in the sponsoring companies' abnormal stock returns after home game wins and losses, averaged across the six models of abnormal return described in Section 3.1. Columns six to eight show the coefficients of the win and loss dummy variables of the regression model described in Section 3.3. The right part of the table shows the equivalent estimates for away games. Returns are in percent terms, regression coefficients are multiplied by 100, and *t*-statistics are in parentheses.

	Home games							Away games						
		Average abnormal return			Regression coefficient				Average abnormal return			Regression coefficient		
	N	Win	Loss	Win-Loss	Win	Loss	Win-Loss	N	Win	Loss	Win-Loss	Win	Loss	Win-Loss
Unexpected outcome	316	0.777	-0.215	0.992	0.757	-0.214	0.971	198	-0.107	-0.296	0.189	-0.101	-0.275	0.174
		(1.58)	(-1.39)	(2.02)	(4.07)	(-1.22)	(3.89)		(-0.49)	(-1.62)	(0.67)	(-0.53)	(-1.60)	(0.68)
Monday night	92	0.508	0.011	0.497	0.513	0.017	0.496	93	0.197	0.009	0.188	0.202	0.014	0.188
		(2.18)	(0.04)	(1.40)	(2.22)	(0.06)	(1.66)		(0.71)	(0.03)	(0.50)	(0.74)	(0.06)	(0.51)
Post-season	57	-0.189	-1.010	0.819	-0.159	-0.977	0.818	52	-0.111	-0.983	0.872	-0.141	-0.662	0.521
		(-0.90)	(-1.86)	(1.72)	(-0.54)	(-2.26)	(1.57)		(-0.15)	(-2.16)	(1.06)	(-0.33)	(-1.98)	(0.97)

Table 6. Intraday trading

Panel A shows stock returns to the sponsoring companies during the opening trading hours (9:30-11:30) and during the rest of the day (11:30-16:00) in the first trading day after home games of their sponsored teams, as well as the difference between these returns. Panel B shows the median trade size on the sponsors' stocks during the opening period and the rest of the day. Trade size is defined by number of shares traded multiplied by trade stock price. Panel C shows post-game day bid-ask spreads on the sponsors' stocks at 11:30 and at 16:00, given by the median spread of the last ten quotes. Bid-ask spread is defined as the difference between the stock's ask price and bid price, divided by the average bid and ask prices. Results are presented separately for game wins and losses for the three samples described in Table 3. All returns and bid-ask spreads are in percent, trade sizes are in thousands of dollars, and *t*-statistics are in parentheses.

	Unexpected outcome			Monday night			Post-season		
	Wins	Losses	Win-Loss	Wins	Losses	Win-Loss	Wins	Losses	Win-Loss
Panel A: Returns									
9:30-11:30	0.228	-0.191		0.250	-0.016		-0.238	-0.791	
11:30-16:00	0.193	0.586		0.564	0.076		-0.157	2.690	
Difference	0.035	-0.777	0.812	-0.315	-0.092	-0.222	-0.080	-3.480	3.400
	(0.20)	(-1.89)	(1.81)	(-0.90)	(-0.28)	(-0.46)	(-0.33)	(-1.08)	(1.54)
Panel B: Trade size									
9:30-11:30	5.316	5.521		5.375	6.545		6.267	6.553	
11:30-16:00	5.218	5.460		5.656	6.515		6.379	5.851	
Difference	0.097	0.061	0.037	-0.281	0.030	-0.312	-0.112	0.701	-0.814
	(1.25)	(0.66)	(0.30)	(-1.48)	(0.16)	(-1.16)	(-0.55)	(-1.07)	(-1.65)
Panel C: Bid-ask spread									
At 11:30	0.175	0.195		0.208	0.235		0.124	0.201	
At 16:00	0.275	0.231		0.222	0.164		0.154	0.089	
Difference	-0.100	-0.036	-0.064	-0.014	0.071	-0.085	-0.030	0.112	-0.142
	(-2.56)	(-0.89)	(-1.13)	(-0.14)	(0.84)	(-0.64)	(-0.86)	(1.48)	(-1.96)

Table 7. Subsequent abnormal returns

Panel A shows the mean difference in the sponsoring companies' abnormal stock returns in the first trading day after home game wins and after home game losses (averaged across the six models of abnormal return described in Section 3.1), and the cumulative average abnormal return during the following four days (days 2 to 5). Panel B shows the slope coefficient estimates of cross-sectional regression of the cumulative abnormal return (*CAR*) in days 2 to 5 on the first trading day average abnormal return (*AR*). The panel also reports the Wald test *p*-value for the hypothesis that the coefficient equals -1. Results are presented for the three samples described in Table 3. Returns are in percent terms and *t*-statistics are in parentheses.

	Panel A: Cumulative average abnormal return					
	Unexpected outcome		Monday night		Post-season	
	day 1	days 2-5	day 1	days 2-5	day 1	days 2-5
Wins	0.777	-0.183	0.508	-0.482	-0.189	0.182
t-statistic	(1.58)	(-0.49)	(2.18)	(-0.72)	(-0.90)	(0.30)
Losses	-0.215	-0.112	0.011	-0.502	-1.010	-2.850
t-statistic	(-1.39)	(-0.35)	(0.04)	(-0.56)	(-1.86)	(-1.24)
Win-Loss	0.992	-0.071	0.497	0.021	0.819	3.030
t-statistic	(2.02)	(-0.14)	(1.40)	(0.02)	(1.72)	(1.28)

	Panel B: $\hat{\beta}_1$ from the regression $CAR(days\ 2-5)_i = \beta_0 + \beta_1 AR(day\ 1)_i + \varepsilon_i$		
All games	-0.092	0.993	1.602
t-statistic	(-1.64)	(3.31)	(3.53)
p-value for β_1=-1	(<0.001)	(<0.001)	(<0.001)
Wins	-0.122	0.495	-0.489
t-statistic	(-1.97)	(1.24)	(-1.05)
p-value for β_1=-1	(<0.001)	(0.001)	(0.278)
Losses	0.144	1.674	2.926
t-statistic	(0.89)	(3.65)	(3.81)
p-value for β_1=-1	(<0.001)	(<0.001)	(<0.001)

Table 8. Post-game trading rule

Every week during the NFL season we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose teams won that week and selling the stocks of all sponsoring companies whose teams lost that week. We hold the portfolio from the second trading day after the game until the fifth trading day. We apply this zero-investment trading strategy to two samples: all home games (games played at the sponsored team's home stadium) and home games where the outcome of the game is most unpredictable. We classify games as unpredictable if the pre-game betting spread is no higher than 3 in absolute value. The table shows the portfolios' mean excess weekly returns (in excess of the risk-free rate) and alphas from factor models. The CAPM one-factor model uses the market factor. The three factors in the 3-factor model are the Fama and French (1993) factors. The 4- and 5-factor models include the Fama-French factors augmented with momentum and reversal factors. All returns and alphas are in percent per week and the corresponding *t*-statistics are in parentheses. The sample period is 1997 to 2013.

	Excess return	CAPM alpha	3-factor alpha	4-factor alpha	5-factor alpha
All home games (N=1,710)					
Sponsors of winning teams	0.577	0.253	0.231	0.234	0.278
	(2.58)	(1.52)	(1.40)	(1.42)	(1.70)
Sponsors of losing teams	0.163	-0.191	-0.204	-0.187	-0.139
	(0.66)	(-1.03)	(-1.11)	(-1.01)	(-0.76)
Difference	0.413	0.445	0.437	0.421	0.417
	(1.70)	(1.83)	(1.79)	(1.73)	(1.71)
Unpredictable home games (N=537)					
Sponsors of winning teams	1.525	0.750	0.770	0.782	0.859
	(3.99)	(2.51)	(2.57)	(2.61)	(2.88)
Sponsors of losing teams	0.073	-0.750	-0.746	-0.730	-0.603
	(0.17)	(-2.13)	(-2.11)	(-2.07)	(-1.72)
Difference	1.452	1.508	1.525	1.521	1.468
	(3.23)	(3.32)	(3.34)	(3.33)	(3.20)

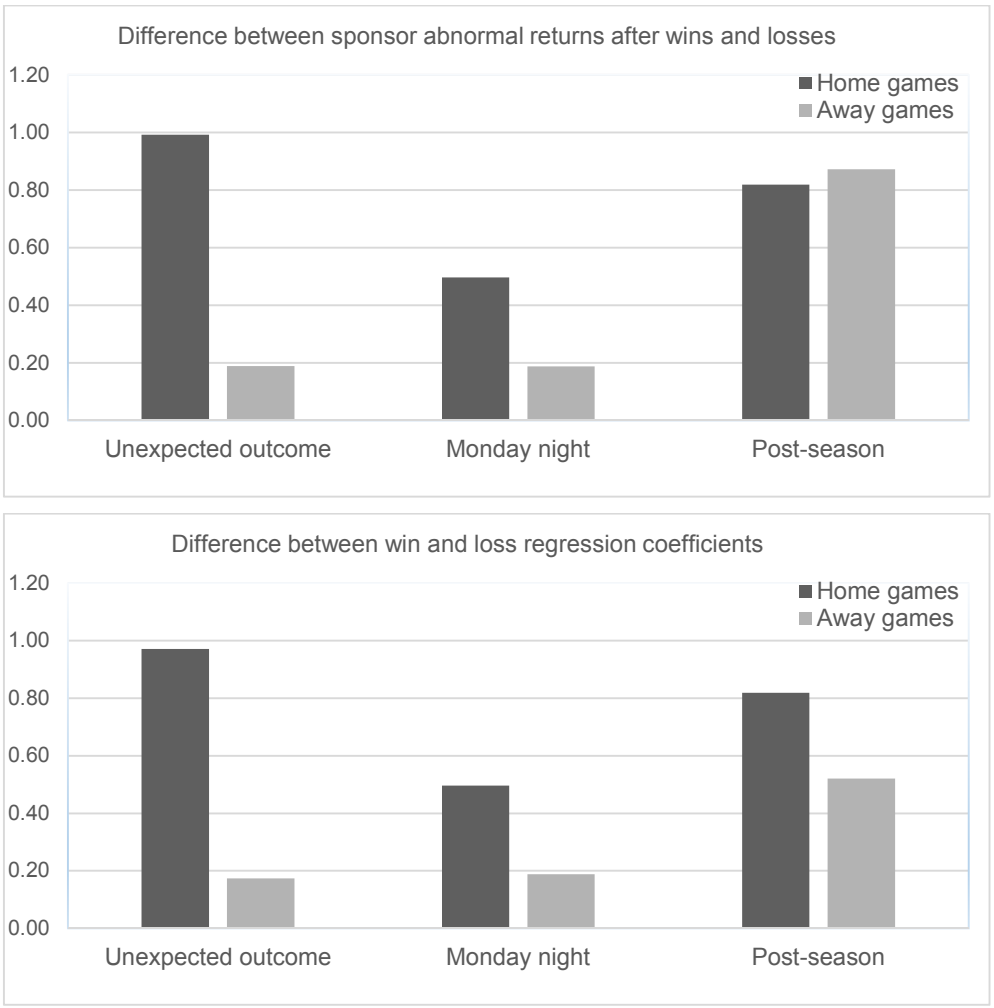
Table 9. Off-season trading rule

In the beginning of March of every year over the period 1997-2013 we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose team had a winning record (i.e., more wins than losses) in the last NFL season and selling the stocks of all sponsoring companies whose team had a non-winning record. We hold this portfolio for 6 months (until the end of August). We repeat this procedure using two alternative criteria to the winning record. The first is if the team's record has improved in the last season (number of wins has increased from the previous season) and the second is if the team participated in the playoff games. The table shows the portfolios' mean excess monthly returns (in excess of the risk-free rate) and alphas from factor models. The CAPM one-factor model uses the market factor. The three factors in the 3-factor model are the Fama and French (1993) factors. The 4- and 5-factor models include the Fama-French factors augmented with momentum and reversal factors. All returns and alphas are in percent per month and the corresponding *t*-statistics are in parentheses.

	Excess return	CAPM alpha	3-factor alpha	4-factor alpha	5-factor alpha
Sponsors of winning teams	1.029	0.777	0.508	0.521	0.563
	(2.04)	(1.88)	(1.25)	(1.29)	(1.42)
Sponsors of losing teams	0.206	-0.277	-0.623	-0.606	-0.531
	(0.26)	(-0.50)	(-1.15)	(-1.14)	(-1.02)
Difference	0.822	1.054	1.131	1.127	1.093
	(1.35)	(1.91)	(1.97)	(1.95)	(1.89)
Sponsors of improved teams	2.015	1.496	1.158	1.171	1.201
	(2.31)	(2.37)	(1.88)	(1.91)	(1.95)
Sponsors of non-improved teams	-0.030	-0.381	-0.672	-0.660	-0.587
	(-0.05)	(-0.72)	(-1.26)	(-1.24)	(-1.13)
Difference	2.046	1.877	1.829	1.831	1.788
	(2.60)	(2.44)	(2.30)	(2.28)	(2.22)
Sponsors of playoff teams	1.131	0.666	0.900	0.938	1.077
	(1.41)	(1.12)	(1.47)	(1.64)	(2.11)
Sponsors of non-playoff teams	-0.184	-0.622	-0.914	-0.910	-0.844
	(-0.24)	(-1.09)	(-1.59)	(-1.57)	(-1.48)
Difference	1.315	1.288	1.814	1.847	1.920
	(1.49)	(1.44)	(2.02)	(2.10)	(2.19)

Figure 1. Effect of game outcome on sponsor stock return in home and away games

The upper figure shows the mean difference in the sponsoring companies' abnormal stock returns after game wins and losses, averaged across the six models of abnormal return described in Section 3.1. The lower figure shows the coefficients of the win and loss dummy variables of the regression model described in Section 3.3. Results are presented for the three samples of both home and away games as described in Table 5. Returns are in percent terms and regression coefficients are multiplied by 100.



Appendix

Table A1. Publically traded companies sponsoring NFL teams' stadiums

The table lists all NFL teams' home stadiums sponsored by publically traded companies over the years 1996-2013.

NFL Team	City	State	Stadium Name	Start Date	Sponsoring Firm	Sponsorship Total	Sponsorship Years	Sponsorship Avg. Annual
Bills	Toronto	Ontario	Rogers Centre	Jan 2008	Rogers Communications	n/a	n/a	n/a
Broncos	Denver	CO	Invesco Field at Mile High	Sep 2001	Invesco Ltd.	$ 120,000,000	20	$ 6,000,000
Browns	Cleveland	OH	FirstEnergy Stadium	Feb 2013	First Energy Corporation	n/a	n/a	n/a
Cardinals	Glendale	AZ	University of Phoenix Stadium	Aug 2006	Apollo Group	$ 154,000,000	26	$ 5,923,077
Chargers	San Diego	CA	Qualcomm Stadium	Jan 1997	Qualcomm	$ 18,000,000	20	$ 900,000
Dolphins	Miami	FL	Sun Life Stadium	Jan 2010	Sun Life Financial	$ 37,500,000	5	$ 7,500,000
Eagles	Philadelphia	PA	Lincoln Financial Field	Aug 2003	Lincoln National Corp	$ 139,000,000	21	$ 6,619,048
Giants	E. Rutherford	NJ	MetLife Stadium	Aug 2011	MetLife Inc.	$ 400,000,000	25	$16,000,000
Jaguars	Jacksonville	FL	Alltel Stadium	Jan 1997	Alltel Corp	$ 6,200,000	10	$ 620,000
Jaguars	Jacksonville	FL	EverBank Field	Aug 2010	EverBank Financial Corp	$ 16,600,000	5	$ 3,320,000
Jets	E. Rutherford	NJ	MetLife Stadium	Aug 2011	MetLife Inc.	$ 400,000,000	25	$16,000,000
Lions	Detroit	MI	Ford Field	Aug 2002	Ford Motor Company	$ 40,000,000	20	$ 2,000,000
Panthers	Charlotte	NC	Ericsson Stadium	Sep 1996	LM Ericsson	$ 20,000,000	10	$ 2,000,000
Panthers	Charlotte	NC	Bank of America Stadium	Jan 2004	Bank of America	$ 140,000,000	20	$ 7,000,000
Patriots	Foxborough	MA	Gillette Stadium	May 2002	The Gillette Company	n/a	15	n/a
Patriots	Foxborough	MA	Gillette Stadium	Oct 2005	Proctor & Gamble	$ 105,000,000	15	$ 7,000,000
Raiders	Oakland	CA	McAfee Coliseum	Jan 2005	McAfee Inc.	$ 13,700,000	5	$ 2,740,000
Raiders	Oakland	CA	Overstock.Com	Apr 2011	Overstock.com	$ 7,200,000	6	$ 1,200,000
Ravens	Baltimore	MD	M&T Bank Stadium	May 2003	M&T Bank	$ 75,000,000	15	$ 5,000,000
Redskins	Landover	MD	FedEx Field	May 1999	FedEx	$ 205,000,000	27	$ 7,592,593
Saints	New Orleans	LA	Mercedes-Benz Superdome	Oct 2011	Daimler AG	n/a	10	n/a
Seahawks	Seattle	WA	Qwest Field	Jun 2004	Qwest	$ 75,000,000	15	$ 5,000,000
Seahawks	Seattle	WA	CenturyLink Field	Jun 2011	CenturyLink Inc.	$ 75,000,000	15	$ 5,000,000
Steelers	Pittsburgh	PA	Heinz Field	Aug 2001	H.J. Heinz Company	$ 57,000,000	20	$ 2,850,000
Texans	Houston	TX	Reliant Stadium	Aug 2002	Reliant Energy	$ 320,000,000	32	$10,000,000
Texans	Houston	TX	Reliant Stadium	Aug 2010	NRG Energy	$ 320,000,000	32	$10,000,000
Titans	Nashville	TN	LP Field	Jun 2006	Louisiana-Pacific	$ 30,000,000	10	$ 3,000,000

Table A2. Game sample distribution

The table presents the time-series distribution of all NFL games (home and away) of teams with publically traded stadium sponsors. Distributions are presented for the full sample and separately for three subsamples: games with unexpected outcome; a game outcome is classified as unexpected if it either against the pre-game betting spread prediction or comes after at least three consecutive games with the opposite outcome; regular season games played on Monday night; and all post-season (playoff) games.

	Full sample			Unexpected outcome			Monday night			Post-season		
	# games	Home	Away	# games	Home	Away	# games	Home	Away	# games	Home	Away
1997	31	16	15	2	0	2	1	1	0	1	0	1
1998	30	15	15	4	1	3	2	2	0	0	0	0
1999	47	23	24	8	3	5	2	1	1	2	1	1
2000	49	26	23	18	9	9	5	2	3	4	3	1
2001	89	44	45	21	13	8	5	2	3	0	0	0
2002	161	80	81	22	13	9	8	4	4	0	0	0
2003	195	97	98	31	17	14	8	4	4	2	1	1
2004	228	113	115	41	18	23	10	5	5	6	5	1
2005	242	128	114	36	22	14	14	7	7	9	7	2
2006	275	138	137	61	31	30	18	11	7	14	5	9
2007	286	144	142	53	28	25	17	8	9	10	5	5
2008	285	144	141	62	25	37	15	10	5	10	5	5
2009	262	131	131	51	25	26	16	6	10	15	7	8
2010	267	133	134	51	28	23	14	5	9	7	3	4
2011	309	157	152	58	25	33	16	7	9	8	5	3
2012	319	160	159	48	25	23	18	10	8	11	5	6
2013	324	161	163	62	33	29	16	7	9	10	5	5
Total	3,399	1,710	1,689	629	316	313	185	92	93	109	57	52