Corporate Sport Sponsorship and Stock Returns: Evidence from the NFL

Assaf Eisdorfer Elizabeth Kohl

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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

* Assaf Eisdorfer is from University of Connecticut; Assaf.Eisdorfer@business.uconn.edu. Elizabeth Kohl is from University of Connecticut; Elizabeth.Kohl@business.uconn.edu. We thank Ivo Welch, and seminar participants at University of Connecticut, Hebrew University of Jerusalem, and Interdisciplinary Center Herzliya for helpful comments. All errors are our own.

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. Because the outcomes of sport events are clear and decisive, we have a reasonable cause to assume that their effects aggregate across fans/investors, unlike more individual effects, such as prospect theory, loss aversion, skewness, or habit preferences.

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.

[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).

We begin our analysis by looking at home games of the NFL teams and comparing the next-day abnormal stock returns of their stadium 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 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: regular season games that are played on Monday nights, post-season games, and games with unexpected outcome. 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). 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).

The results indicate that games' outcomes affect the market value of the stadium sponsoring companies. Wins in Monday night games have an economically and statistically significant positive effect on sponsor stock price, an average of 0.51 percent across all models of abnormal return, whereas losses have virtually no effect (average of 0.01 percent). The difference however between the win and loss returns shows relatively weak statistical significance. For post-season games the difference is greater and somewhat more significant statistically; 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 playoff 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 in the post-season. 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.

Games with unexpected outcome generate a similar economic effect to that of playoff games, but stronger statistically likely due to the larger sample size. The sponsor of the home team earns on average a positive abnormal return after wins and a negative abnormal return after losses, yielding a significant win-loss return difference of 81 basis points. This emphasizes the importance of the element of surprise in moving the stock price of the sponsoring companies. We find further support for this aspect by looking specifically at games for which the outcome is not unexpected. Games whose outcome is hard to predict ex ante do not generate any significant effect, while games with expected outcome generate a surprising negative effect of 60 basis points. We offer a possible explanation for this result which is based on pre-game fan overreaction to the expected success/failure of their teams.

We confirm the post-game abnormal returns 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 for the most part when controlling for team and sponsorship characteristics, including sponsor and

team market values, size of media market, and the total value and tenure of the sponsorship deal. Team-specific analysis shows a positive effect for the majority of the teams, where there is no clear relation between the magnitude of the effect and the local market size of the team.

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 stock price is relatively strong during the opening trading hours for the samples of post-season games and games with unexpected outcome; and more importantly, these intraday returns are often accompanied by patterns of non-institutional trading and stock liquidity that typically characterize behavioral investments. Monday night games however do not show similar effects.

The effect of investor sentiment on the stock return in the first trading day after the game can also be associated with subsequent returns; i.e., an initial overreaction to the game outcome is more likely to reverse in the following days. Our results however are mixed; while in certain cases the next-day abnormal return tends to reverse, 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 approximately 28 percent per NFL season. To verify the importance of game outcomes for the success of NFL sponsor trading, we show that a pre-game trading strategy based on betting spread predictions does not generate positive profits.

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, we provide new evidence of the presence of investor sentiment in stock pricing. Identifying exogenous factors that can affect the mood among large populations is a key ingredient in studying investor sentiment. Prior studies use such factors typically at the aggregate level, for example: sunshine (Saunders (1993) and Hirshleifer and Shumway (2003)), temperature (Cao and Wei (2005)), and aviation disasters (Kaplanski, and Levy (2010)). We believe that the highly popular NFL games serve well as an exogenous factor that can generate massive mood swings. Furthermore, NFL games and stadium sponsorship allow for analysis at the firm level. Our results indicate 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.

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

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 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. Stocks of sponsoring firms are highly traded and highly liquid; trading volume, Amihud's illiquidity measure, and bid-ask spread are all significantly different than those of the average firm. Sponsors' stocks are also less volatile (measured by the standard deviation of daily stock returns over a month) but with market beta somewhat higher than that of the full sample.

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 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 in the U.S. 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 second tested 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 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.

Our third and final 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 determine whether a game outcome is expected or unexpected we use information obtained from pre-game betting spreads and prior team performance. A game outcome is considered expected if it is consistent with the sign of the betting spread or if it comes after a sequence of at least three games with the same outcome. In the same way, a game outcome is

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

classified as unexpected if it is against the sign of the betting spread or if it comes after a sequence of at least three games with the opposite outcome. To eliminate trivial game predictions, we consider only spreads of at least 5 points. Game outcomes for which the two categories of betting spread and prior win/loss runs conflict are not considered as either expected or unexpected. And games with spreads lower than 5 points and without prior runs are considered as unpredictable ex ante. Our sample of interest, games with unexpected outcome, contains 278 home games.

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 influenced 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 in the first trading day after each game played in their stadium, and compare between the 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 the 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. 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 a loss of the home team is higher by 10 basis points than that after a win, yet is not statistically significant.

The results show an effect for highly visible and important games. 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 (average of 0.01 percent). Although the average difference between the win and loss post-game day abnormal returns is large in economic terms, its *t*-statistic is only 1.40. This is partially due to the relatively small sample of Monday night games (92 home games).

For post-season games the impact is larger economically and somewhat more significant statistically. 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 meaningful effects (differences in win-loss abnormal returns of 58 to 127 basis points). Unlike the Monday night games, the effect of playoff games 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 playoff

[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).

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]

Games with unexpected outcome show a similar impact to that of the post-season games, but results are more significant statistically, likely due to the larger sample size. The sponsor of the home team earns on average 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 0.81 percent with a *t*-statistic of 2.50. This result indicates the importance of the element of surprise in moving the stock price of the sponsoring company. Further support to this aspect is provided by the effect of games whose outcome is not considered unexpected. Outcomes of unpredictable games do not lead to any significant effect on the sponsors' stock price, but more interestingly, expected outcomes lead to a negative effect: a win-loss return difference of -0.60 percent with a *t*-statistic of -3.07.

The negative effect of expected outcomes may seem puzzling, i.e., why would expected wins lead to negative returns and expected losses to positive returns? We offer a possible explanation for this result based on fans' behavior prior to sport matches. Several studies argue that fans often tend to overreact to the expected performance of their teams in certain events (see, e.g., Krizan

[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.

and Windschitl (2007) and Bernile and Lyandres (2011)). This means that fans can be overly optimistic for a game that their team expects to win and overly pessimistic if the team expects to lose. Because a game with an expected outcome should not have a material effect on the sponsor stock price, a post-game correction to pre-game overreaction will lead by itself to a negative effect of the game outcome. We illustrate this argument using a numerical example.

Assume that the stock price of a sponsoring company after a game will be $100 if the team wins and $99 if the team loses. (Note that these prices do not necessarily represent the fundamental value of the sponsor but rather the post-game market prices). Consider first the case where there is no pre-game overreaction. In this case the sponsor's stock price before the game should be close to $100 if the team expects to win and close to $99 if the team expects to lose. Therefore, if the game outcome meets its pre-game expectation, it should not have any effect on the sponsor's stock price. Consider now the case where prior to the game, investors overreact to the expected outcome of the game; specifically, if the team expects to win, the pre-game stock price of the sponsor will be $100.5 (>$100). And if the teams expects to lose, the pre-game stock price will be $98.5 (<$99). This overreaction will result in a negative effect for expected game outcomes; that is, if the team expects to win and wins, the post-game return will be negative: 100/100.5-1=-0.5%, and if the team expects to lose and loses, the post-game return will be positive: 99/98.5-1=0.5%. The win-loss return difference is thus negative (-1%), which is consistent with the observed results for games with expected outcomes.

In contrast, unexpected outcomes will lead to a positive effect in either case. Without a pre-game overreaction, an unexpected win will generate a return on the sponsor's stock of 100/99-1=1%, and an unexpected loss will generate a return of 99/100-1=-1%, i.e., a win-loss return difference of 2%. In the presence of pre-game overreaction, the positive effect will be even

stronger. An unexpected win will generate a return of 100/98.5-1=1.5%, and an unexpected loss will generate a return of 99/100.5-1=-1.5%, yielding a win-loss difference of 3%.

The mean differences in abnormal returns after wins and losses reported in Table 2 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 in the U.S. We show that the outcome of a single game affects the sponsor's stock by an average return of 0.50 to 0.82 across the samples of Monday night, post-season, and unexpected outcome games. 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 team and 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 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 in Table 3 are consistent with the effects reported in Table 2 (all reported coefficients are multiplied by 100). For post-season games and unexpected outcome games, the

[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.

coefficients of the win dummy variable are even greater than the average abnormal returns with comparable *t*-statistics. Monday night games show a coefficient similar to the average abnormal return, but the significance is lower (*t*-statistic of 1.16). Tables 2 and 3 therefore provide a first indication that stock returns to the sponsoring firms are affected by the outcomes of highly visible and important games played in their stadiums.

3.3 Team analysis and market size

Among the team-specific characteristics included in the cross-sectional regressions, the influence of the size of the media market is particularly interesting. An argument could be made for a stronger effect of game outcome in various markets. The effect could be stronger in smaller markets, where the fans are generational, teams are more involved in the community, and media coverage is more likely to be supportive. Yet areas with a lower population density may have a weaker influence on the stock market and generally have fewer media channels to report on team activities and mention stadium sponsors. The effect could be stronger in larger markets. These markets have a greater population density and more media outlets/reporters. Yet large markets usually have multiple sports teams, creating a dilutive effect to game and media coverage.

To examine the effect of the local market size, we look separately at each individual team. Because many teams have only a few observations, we combine for each team the three groups of Monday night games, post-season games, and games with unexpected outcome, and we include only teams with at least five wins and five losses across these groups. This provides us with a total of 15 teams. Figure 1 shows the team-specific mean difference in the sponsoring companies' abnormal stock returns after home game wins and losses, averaged across the six models of abnormal return. The teams are order by the size of their media market.

The figure indicates that home game outcome has a positive effect on sponsor stock price for the majority of the teams, reinforcing the general results: nine teams show a large positive effect (win-loss returns between 0.6 and 2.0 percent); three teams show a positive, but low effect; two teams show a low negative effect; and one team shows a negative effect of -0.53 percent. The impact of the game outcome however is not clearly related with the local market size of the team. Teams located in the middle of the scale seem to have relatively small effects, and the two teams with the largest markets in the sample (New England Patriots and Oakland Raiders) do not exhibit any significant effect. This is not surprising given the aforementioned opposing effects of market size.

As a final note, we acknowledge that New York is a special case. Both the Giants and the Jets play in MetLife Stadium, which is close to a market epicenter and a high population density. In addition, the stock market is located in New York thus local sports fans may be more involved in stock trading. The New York market and MetLife Stadium also have the highest exposure to dilution as eight major sports teams claim affiliation with the city. Unfortunately, the MetLife sponsorship started in August of 2011, providing us with too few observations for a city-specific analysis at this time. Perhaps in the future, these data could provide a unique opportunity to examine investment behavior of regionally specific populations.

3.4 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 (278 games played over 184 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 strong positive effect (*t*-statistic of 3.03), 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 0.84 percent (with *p*-values of 0.06 and lower), compared with win-loss abnormal return difference of 0.50 to 0.82 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 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 19 to 22 basis points after away games, compared to 50 to 84 basis points after home games. These results strongly support the role of investor sentiment.

In the post-season, however, the effect of away games is more similar to that of 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. 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 2 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. 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 reduce 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

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

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 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. 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 1.07 percent than that after game losses (*t*-statistic of 2.01). 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 larger effect is found for playoff games; a difference of 3.40 percent, which is less significant in statistical terms (*t*-statistic of 1.54), likely due to the small sample size. The Monday night games do not exhibit any relation between intraday return pattern and game outcome. We view the relatively 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 Table 6. The median trade size during the opening trading hours following game wins is lower than that following game losses, yet the differences are not statistically significant for the most part. This relation is marginally significant for post-season games (*t*-statistic of the difference is -1.65), is weak for Monday night games (*t*-statistic of -1.16), and is insignificant for games with unexpected outcome.

This finding thus provides only weak evidence that game wins attract more individual traders than game losses.

The shape of bid-ask spreads during the post-game day reported in Panel C 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 strongest effect is found for post-season games, a gap of -0.14 percent with a *t*-statistic of -1.96. A somewhat weaker effect is found for unexpected outcome games (a gap of -0.10 with a *t*-statistic of -1.71), whereas the effect following Monday night games is insignificant (*t*-statistic of -0.64).

The results in Table 6 provide partial 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 reversal 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 significant relations (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 weekly 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, capturing the general impact of games played in sponsored stadiums. The second group contains the home games whose outcome is most unpredictable ex ante. The motivation for this distinction is that any outcome in unpredictable games, win or loss, provides some element of news that can lead to sharper stock market reaction. We therefore include in this group only games with very low betting spreads, 3 points and lower 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)

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

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 most unpredictable home games. The mean excess return and factor-model alphas are 1.45 to 1.52 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 approximately 28 percent per season. Abnormal returns following home games, especially unpredictable ones, can thus be translated into profitable trading opportunities.

To verify the importance of game outcomes for the success of NFL sponsor trading, we examine if one can achieve abnormal profits by trading sponsors' stocks prior to the game. Every Friday during the NFL season we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose teams expect to win over the weekend and selling the stocks of all sponsoring companies whose teams expect to lose. Expected wins and losses are based on pre-game betting spreads of at least 3 points. We hold the portfolio until the next Friday.

The results in Table 9 show that the ex-ante trading strategy yields negative profits, although not strongly significant; the mean excess return is -0.54 percent per week, and factor-model alphas are fairly similar, where the *t*-statistics are -1.36 to -1.51. This result is in fact consistent with the post-game returns presented earlier. At least for the first trading day after the game, expected wins (losses) do not lead to positive (negative) returns on the sponsors' stocks, but rather generate the opposite effects (as shown in Table 2). Thus even if all games' outcomes will match the pre-game expectations, the strategy will not generate a positive profit. And moreover, if some of the games

turn against their expectations, they will add to the negative profit. This is because the sponsors of teams that win (lose) against the expectation earn on average a positive (negative) return, but are held in short (long) position in the portfolio. In other words, an ex-ante strategy that is based on betting spread predictions seems to have mostly a losing side option. One would therefore be better off betting against the spreads and hoping for unexpected outcomes. But in any case, the potential profit of an ex-ante strategy is significantly lower than that achieved by the post-game winning-losing team strategy.

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 six 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 10 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/alphas 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 Tables 8 and 10, 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, the teams' stadium sponsors. 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 82 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 approximately 28 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). 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).

Interpretation: Firms that sponsor stadiums of NFL teams are larger, have less growth opportunities, and are more leveraged than the average firm. Sponsors' stocks are also highly liquid and highly traded, and are less volatile.

	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 six samples. The first sample contains all games (including pre-season, regular season, and post-season games). The second sample contains all regular season games played on Monday night. The third sample contains all post-season (playoff) games. The fourth sample contains all games with unexpected outcome; a game outcome is classified as unexpected if it is either against the prediction of a pre-game betting spread of at least 5 points or comes after at least three consecutive games with the opposite outcome. The fifth sample contains all games with expected outcome; a game outcome is classified as expected if it either meets the prediction of a pre-game betting spread of at least 5 points or comes after at least three consecutive games with the same outcome. The sixth sample contains all games whose outcomes are unpredictable ex ante; these includes games with betting spreads smaller than 5 points and with no prior runs of at least three wins or losses. 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.

Interpretation: The outcomes of highly visible and important NFL home games affect the stock price of the stadium sponsoring companies. Wins in Monday night games have a significant positive effect on sponsor stock price, an average of 0.51 percent across all models of abnormal return, whereas losses have virtually no effect (average of 0.01 percent). The difference however between the win and loss returns shows weak statistical significance (*t*-statistic of 1.40). Post-season games generate a larger win-loss return difference of 82 basis points (*t*-statistic of 1.72), and similarly, games with unexpected outcome yield a return difference of 81 basis points (*t*-statistic of 2.50). In contrast, games with expected outcome generate a negative effect of 60 basis points (*t*-statistic of -3.07).

		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	-0.014	-0.029	-0.042	-0.041	-0.005	-0.028	-0.027
		(-0.16)	(-0.39)	(-0.63)	(-0.74)	(-0.08)	(-0.29)	(-0.40)
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		-0.123	-0.156	-0.116	-0.028	-0.105	-0.042	-0.095
		(-0.80)	(-1.31)	(-1.05)	(-0.31)	(-0.93)	(-0.27)	(-0.87)
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)

Unexpected game outcome								
Wins	124	0.821	0.679	0.556	0.222	0.663	0.540	0.580
		(2.24)	(2.05)	(1.71)	(1.26)	(2.07)	(1.43)	(1.98)
Losses	154	-0.128	-0.161	-0.179	-0.230	-0.240	-0.409	-0.225
		(-0.48)	(-0.82)	(-1.09)	(-1.71)	(-1.44)	(-1.43)	(-1.34)
Win-Loss		0.950	0.841	0.734	0.452	0.904	0.949	0.805
		(2.13)	(2.29)	(2.14)	(2.07)	(2.64)	(2.05)	(2.50)
Expected game outcome								
Wins	472	-0.176	-0.197	-0.178	-0.090	-0.170	-0.264	-0.179
		(-1.41)	(-2.18)	(-2.33)	(-1.16)	(-2.00)	(-1.95)	(-2.13)
Losses	183	0.456	0.498	0.431	0.223	0.556	0.363	0.421
		(1.52)	(2.00)	(1.77)	(1.32)	(2.36)	(1.28)	(1.85)
Win-Loss		-0.633	-0.695	-0.609	-0.313	-0.726	-0.627	-0.600
		(-2.31)	(-3.28)	(-3.13)	(-1.92)	(-3.62)	(-2.23)	(-3.07)
Unpredictable games								
Wins	396	-0.106	-0.057	-0.078	-0.068	-0.023	0.102	-0.039
		(-0.77)	(-0.52)	(-0.75)	(-0.77)	(-0.22)	(0.73)	(-0.38)
Losses	338	0.023	0.077	0.024	-0.011	0.029	-0.003	0.023
		(0.14)	(0.70)	(0.24)	(-0.12)	(0.28)	(-0.02)	(0.22)
Win-Loss		-0.130	-0.134	-0.102	-0.057	-0.053	0.106	-0.062
		(-0.62)	(-0.85)	(-0.70)	(-0.44)	(-0.35)	(0.50)	(-0.41)

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 models 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: regular season games played on Monday night, all post-season (playoff) games, and games with unexpected outcome (a game outcome is classified as unexpected if it is either against the prediction of a pre-game betting spread of at least 5 points or comes after at least three consecutive games with the opposite outcome). All coefficients are multiplied by 100 and *t*-statistics are in parentheses.

Interpretation: The impact of post-season games and games with unexpected outcome reported in Table 2 remains significant when controlling for team and sponsorship characteristics (*t*-statistics of win coefficient are 1.76 and 2.30), but not the impact of Monday night games (*t*-statistic of 1.16).

	Monday night games	Post-season games	Unexpected outcome games
Intercept	-0.106	-1.274	1.386
	(-0.05)	(-0.33)	(0.74)
Win	0.462	0.973	0.828
	(1.16)	(1.76)	(2.30)
Sponsor value	0.013	0.031	-0.169
	(0.10)	(0.12)	(-1.44)
Team value	0.149	-0.244	0.659
	(0.17)	(-0.20)	(0.76)
Media market	-0.029	0.104	-0.010
	(-0.40)	(0.68)	(-0.15)
Sponsorship deal value	0.000	-0.005	0.001
	(-0.11)	(-0.91)	(0.42)
Sponsorship tenure	-0.010	-0.013	0.063
	(-0.19)	(-0.14)	(1.14)
Lagged abnormal return	-0.253	0.375	-0.276
	(-2.78)	(1.67)	(-3.19)
# games	92	57	278
R-square	0.116	0.160	0.084

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.

Interpretation: The pooled regression estimates corroborate the mean abnormal returns. For all three samples, the difference between the coefficients of the win and loss dummy variables is very similar to the win-loss average abnormal return difference reported in Table 2. The GLS regression estimates verify that the results are not driven by time-clustering.

	Monday night games	Post-season games	Unexpected outcome games
Panel A: OLS			
Intercept	-0.005 (-1.14)	-0.030 (-5.02)	-0.004 (-0.57)
Win	0.513 (2.37)	-0.159 (-0.54)	0.617 (3.03)
Loss	0.017 (0.08)	-0.977 (-2.26)	-0.223 (-1.22)
Win-Loss *p*-value	0.496 (0.049)	0.818 (0.059)	0.840 (0.001)
Panel B: GLS			
Intercept	-0.005 (-0.59)	-0.030 (-4.21)	-0.004 (-0.46)
Win	0.539 (2.59)	-0.146 (-0.50)	0.599 (2.95)
Loss	-0.007 (0.05)	-1.027 (-2.38)	-0.236 (-1.30)
Win-Loss *p*-value	0.546 (0.015)	0.881 (0.045)	0.835 (0.001)

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: Monday night games, post-season games, and games with unexpected outcome. 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 home 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, regression coefficients are multiplied by 100, and *t*-statistics are in parentheses.

Interpretation: Monday night games and games with unexpected outcome that are played away have a much lower and insignificant effect on the sponsors' stocks. This is consistent with the presence of investor sentiment in market reaction to home games. Post-season away games generate a win-loss average abnormal return similar to that of home games, yet the regression coefficients show some reduction. This may suggest that stock returns to the sponsors after playoff games are driven mostly by rational expectations.

	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
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)
Unexpected outcome	278	0.58	-0.225	0.805	0.617	-0.223	0.840	292	-0.119	-0.337	0.218	-0.112	-0.326	0.214
		(1.98)	(-1.34)	(2.50)	(3.03)	(-1.22)	(3.08)		(-0.51)	(-1.68)	(0.71)	(-0.57)	(-1.79)	(0.80)

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.

Interpretation: This table provides some indication of behavioral trading after home games. The effect of game outcome on sponsor stock price is relatively strong during the opening trading hours for the samples of post-season games and games with unexpected outcome, where these returns are accompanied by low bid-ask spreads and partially by small-size trades. Monday night games however do not show similar patterns.

	Monday night			Post-season			Unexpected outcome		
	Wins	Losses	Win-Loss	Wins	Losses	Win-Loss	Wins	Losses	Win-Loss
Panel A: Returns									
9:30-11:30	0.250	-0.016		-0.238	-0.791		0.349	-0.241	
11:30-16:00	0.564	0.076		-0.157	2.690		0.139	0.620	
Difference	-0.315	-0.092	-0.222	-0.080	-3.480	3.400	0.210	-0.861	1.070
	(-0.90)	(-0.28)	(-0.46)	(-0.33)	(-1.08)	(1.54)	(1.17)	(-1.90)	(2.01)
Panel B: Trade size									
9:30-11:30	5.375	6.545		6.267	6.553		5.232	5.566	
11:30-16:00	5.656	6.515		6.379	5.851		5.154	5.507	
Difference	-0.281	0.030	-0.312	-0.112	0.701	-0.814	0.078	0.059	0.018
	(-1.48)	(0.16)	(-1.16)	(-0.55)	(-1.07)	(-1.65)	(0.88)	(0.58)	(0.14)
Panel C: Bid-ask spread									
At 11:30	0.208	0.235		0.124	0.201		0.189	0.207	
At 16:00	0.222	0.164		0.154	0.089		0.297	0.213	
Difference	-0.014	0.071	-0.085	-0.030	0.112	-0.142	-0.108	-0.005	-0.102
	(-0.14)	(0.84)	(-0.64)	(-0.86)	(1.48)	(-1.96)	(-2.32)	(-0.14)	(-1.71)

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 and *t*-statistics are in parentheses.

Interpretation: Cumulative average abnormal returns in subsequent days do not show return reversal. Cross-sectional regressions show mixed relations. These results do not support an initial overreaction to game outcome. Yet the strong relations (positive or negative) between returns in consecutive days may indicate other forms of behavioral bias.

	Panel A: Cumulative average abnormal return					
	Monday night		Post-season		Unexpected outcome	
	day 1	days 2-5	day 1	days 2-5	day 1	days 2-5
Wins	0.508	-0.482	-0.189	0.182	0.580	-0.252
t-statistic	(2.18)	(-0.72)	(-0.90)	(0.30)	(1.98)	(-0.58)
Losses	0.011	-0.502	-1.010	-2.850	-0.225	-0.067
t-statistic	(0.04)	(-0.56)	(-1.86)	(-1.24)	(-1.34)	(-0.19)
Win-Loss	0.497	0.021	0.819	3.030	0.805	-0.185
t-statistic	(1.40)	(0.02)	(1.72)	(1.28)	(2.50)	(-0.33)
	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		0.993		1.602		-0.128
t-statistic		(3.31)		(3.53)		(-1.32)
p-value for β_1=-1		(<0.001)		(<0.001)		(<0.001)
Wins		0.495		-0.489		-0.251
t-statistic		(1.24)		(-1.05)		(-2.03)
p-value for β_1=-1		(0.001)		(0.278)		(<0.001)
Losses		1.674		2.926		0.158
t-statistic		(3.65)		(3.81)		(0.93)
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 long-short trading strategy to two samples: all home games and home games whose outcomes are most unpredictable ex ante (games with betting spreads of 3 points and lower 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.

Interpretation: Abnormal sponsor stock returns following home games can be translated into profitable trading opportunities, particularly if applied to the most unpredictable games. The trading strategy generates mean excess return and factor-model alphas of approximately 28 percent per NFL season.

	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)
Long-short portfolio	0.414	0.444	0.436	0.421	0.417
	(1.70)	(1.83)	(1.79)	(1.73)	(1.71)
Most 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)
Long-short portfolio	1.452	1.500	1.516	1.512	1.461
	(3.23)	(3.32)	(3.34)	(3.33)	(3.20)

Table 9. Pre-game trading rule

Every Friday during the NFL season we form a value-weighted portfolio of buying the stocks of all sponsoring companies whose teams expect to win over the weekend and selling the stocks of all sponsoring companies whose teams expect to lose. Expected wins and losses are based on pre-game betting spreads of at least 3 points. We hold the portfolio until the next Friday. We apply this long-short trading strategy to all home games between 1997 and 2013. The table shows the portfolio's mean excess weekly return (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.

Interpretation: An ex-ante strategy that is based on betting spread predictions does not generate profits. One would be better off betting against the spreads and hoping for unexpected outcomes.

	Excess return	CAPM alpha	3-factor alpha	4-factor alpha	5-factor alpha
Sponsors of teams that expect to win	-0.014	-0.332	-0.370	-0.399	-0.353
	(-0.04)	(-1.37)	(-1.54)	(-1.66)	(-1.48)
Sponsors of teams that expect to lose	0.521	0.185	0.169	0.174	0.172
	(1.33)	(0.63)	(0.58)	(0.60)	(0.59)
Long-short portfolio	-0.535	-0.517	-0.539	-0.574	-0.525
	(-1.40)	(-1.36)	(-1.42)	(-1.51)	(-1.38)

Table 10. 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 long-short portfolio for six 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.

Interpretation: 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. That is, the performance of NFL teams during a season has predictive ability over their sponsors' stock returns in the off-season period.

	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)
Long-short portfolio	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)
Long-short portfolio	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)
Long-short portfolio	1.315	1.288	1.814	1.847	1.920
	(1.49)	(1.44)	(2.02)	(2.10)	(2.19)

Figure 1. Team-specific effect by market size

The sample includes all teams with at least five home wins and five home losses across Monday night games, post-season games, and games with unexpected outcome (as described in Table 3). The 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 teams are order by the size of their media market, measured by population in TV households within a 75-mile radius of the team's stadium. All returns are in percent.

Interpretation: Most teams show a positive effect of game outcome on the market value of their stadium sponsoring companies. There is no monotonic relation between the magnitude of the effect and the local market size of the team.

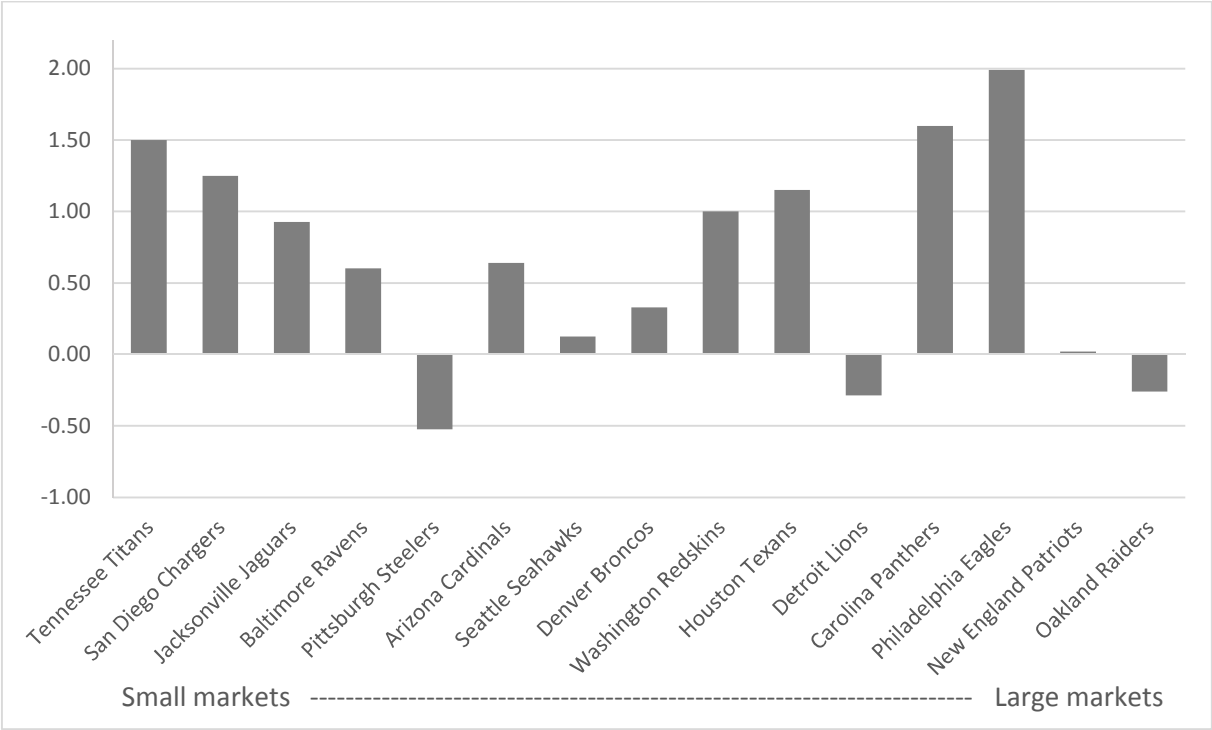
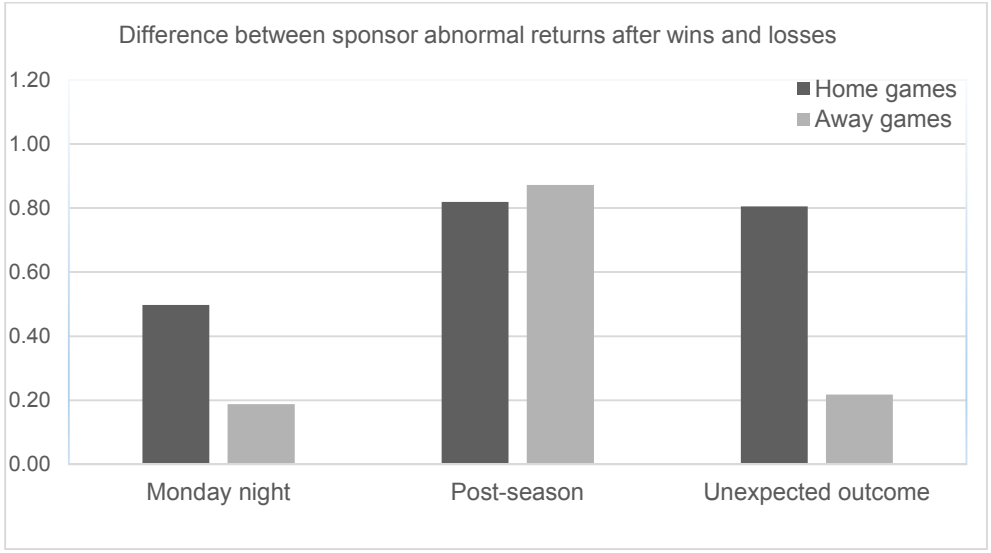
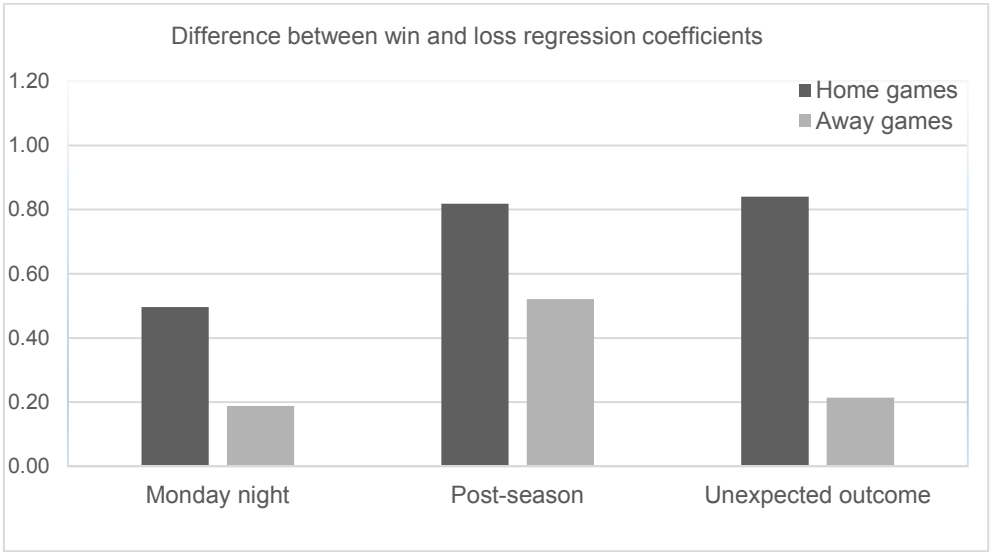


Figure 2. Effect of game outcome on sponsor stock return in home and away games

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 and regression coefficients are multiplied by 100.

Interpretation: Outcomes of important home games affect the market value of the team stadiums' sponsors, whereas away games typically generate a much weaker effect. This suggests that abnormal returns to the sponsors' stocks are driven at least to a certain extent by investor sentiment.





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 yearly 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: regular season games played on Monday night, all post-season (playoff) games, and games with unexpected outcome, where a game outcome is classified as unexpected if it is either against the prediction of a pre-game betting spread of at least 5 points or comes after at least three consecutive games with the opposite outcome.

	Full sample			Monday night			Post-season			Unexpected outcome		
	# games	Home	Away	# games	Home	Away	# games	Home	Away	# games	Home	Away
1997	31	16	15	1	1	0	1	0	1	2	0	2
1998	30	15	15	2	2	0	0	0	0	4	1	3
1999	47	23	24	2	1	1	2	1	1	7	2	5
2000	49	26	23	5	2	3	4	3	1	18	9	9
2001	89	44	45	5	2	3	0	0	0	17	12	5
2002	161	80	81	8	4	4	0	0	0	24	14	10
2003	195	97	98	8	4	4	2	1	1	27	15	12
2004	228	113	115	10	5	5	6	5	1	35	14	21
2005	242	128	114	14	7	7	9	7	2	33	21	12
2006	275	138	137	18	11	7	14	5	9	55	27	28
2007	286	144	142	17	8	9	10	5	5	46	22	24
2008	285	144	141	15	10	5	10	5	5	56	22	34
2009	262	131	131	16	6	10	15	7	8	44	21	23
2010	267	133	134	14	5	9	7	3	4	43	24	19
2011	309	157	152	16	7	9	8	5	3	60	24	36
2012	319	160	159	18	10	8	11	5	6	43	22	21
2013	324	161	163	16	7	9	10	5	5	56	28	28
Total	3,399	1,710	1,689	185	92	93	109	57	52	570	278	292