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The Effect of On-Field Success on Stock Prices: Evidence from Nippon Professional Baseball

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Abstract

A growing literature examines the relationship between the on-field success of sports teams and prices of securities traded on stock exchanges. While much of the literature focuses on the effect of national teams on aggregate stock price measures, for example the relationship between the performance of a national team in World Cup competition and the aggregate stock price index in that country, some recent papers have examined the relationship between specific team performance and the price of the shares of the team's owners. We add to this literature by examining the effect of on-field success by baseball teams in Nippon Professional Baseball and the price of the shares of the companies that own these professional baseball teams.

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Introduction

Quite a bit of evidence supporting the idea that publicly announced, unanticipated information about the performance of firms affects stock prices (Malkiel, 1989). This is sometimes called the "news model" in the empirical finance literature. However, most information that has value in terms of pricing assets is revealed in an irregular, infrequent, and often confounding fashion. The most common information that influences stock prices, earnings announcements for publicly traded companies, is typically revealed very infrequently and during the day while trading is going on. Also, it is unclear what the effect of such announcements will be on stock prices because traders may have formed expectations about the announcement based on public or private information and this expectation could already be reflected in the stock's price. These problems make it difficult to empirically test the effect of new information on asset prices set in securities markets.

A growing literature gets around this problem by examining the effect of on-field outcomes on the prices of shares of publicly traded companies that own professional sports teams. These on-field outcomes have a number of advantages over other information that might affect a firm's stock prices. Games or matches take place frequently, and the nature of the outcome is unambiguous. The timing of the event is easy to determine, and they typically take place outside normal stock trading hours, making it easier to isolate the effect of this information on stock prices.

There are several reasons to believe that on-field outcomes will affect the share price of firms that own professional sports teams. First, the revenues of most professional sports teams depend on ticket sales to games or matches, and there is evidence that attendance increases with on-field success in professional sports leagues (see Schmidt and Berri, 2006 and Coates and Humphreys, 2005 for recent evidence). Thus successful teams should earn higher revenues, increasing stock prices. Second, many professional sports teams derive significant revenues from local media rights and signage and advertising. Successful teams will have larger followings, which should also lead to higher current and future revenues. Third, by observing first hand the performance of a team, investors and potential investors can gain information about how well the management of the team is performing by observing the quality of the coached and players. This should also be a signal of future profitability of the team, and may affect current stock prices.

In this paper, we add to the growing literature on the relationship between on-field performance and stock prices by analyzing the effect of wins and losses of teams that play in the Nippon Professional Baseball League in Japan on the stock prices of the firms that own several of these teams. To date, no research has focused on professional baseball teams, or on professional sports teams in Japan. Japan is a modern industrial, diverse economy with highly developed capital markets. Professional baseball is a high profile, widely followed sport in Japan. Several corporations own professional teams in this league. These characteristics make the Nippon Professional Baseball League an ideal environment for studying the effects of on-field athletic success on stock prices.

Stock Prices and Athletic Success

A sizable literature exists on the relationship between athletic events and stock prices. One strand of this literature examines the effect success in attracting mega-events like the Olympic Games and the World Cup on aggregate performance in national stock markets; a second examines the relationship between the success of national teams competing in international competitions like the World Cup and the performance of aggregate stock market indicators in specific countries; a third, smaller literature examines the relationship between the performance of specific professional sports teams and the price of shares of the firms that own those teams that are traded on stock markets. Taken together, this literature indicates a strong link between athletic success and the price of assets traded on securities markets.

The relationship between hosting the Olympic Games and returns on stock markets is straightforward. To the extent that hosting the Olympic Games generates economic benefits, including tangible economic benefits associated with increased tourism, or intangible benefits like national pride, sporting benefits, increased visibility, etc., stock markets should be efficient mechanisms for valuing these benefits far into the future and discounting them back to the present. Positive benefits, if present, should be capitalized into stock prices at the time that the Games are awarded. Research on the effect of hosting the Olympic Games on stock markets exploits the nature of the process through which the Games are awarded. A large number of potential applicants are winnowed down to a small number of candidate hosts, and an announcement of the winner is made. Until this announcement is made, there is considerable uncertainty about who will be awarded the games, and the contest is winner-take-all. The announcement about the winner of the Games takes place at a specific time and represents a natural experiment on the effect of hosting the Olympic Games on stock prices.

The existing evidence on the effects of hosting the Olympic Games on national stock markets is mixed. The announcement that Sydney would host the 2000 Summer Olympic Games produced modest increases in stock prices in a limited number of industries: building materials, developers and contracts, and engineering (Berman, et al., 2000). The announcement that Athens would host the 2004 Summer Olympic Games produced a significant increase in overall stock prices on the Athens Stock Exchange, but had no impact on the Milan Stock Exchange. Milan was one of the cities in the running for the 2004 Summer Games. Stock prices in construction related industries on the Athens Stock Exchange increased more than other sectors following the announcement, suggesting that much of the economic benefit accrues to this sector (Veraros, et al. 2004).

The relationship between success of national teams in high profile competitions like the World Cup and the performance of national stock markets is less straightforward. Because there is no tangible economic benefit flowing from tourism spending or other real economic activity, most studies of the relationship between World Cup success and aggregate stock market performance assume that athletic success affects investor sentiment, or some sort of "feel good factor" which feeds through to aggregate stock market performance. Edmans, et al. (2007) found that World Cup losses were associated with next-day abnormal stock returns of -49 basis points on national stock markets over the period 1973-2004. Ashton, et al. (2003) found a strong relationship, in the form of abnormal positive returns following wins and abnormal negative returns following losses, between the performance of the English national football team in international competition and returns on the FTSE 100 index in England over the period 1984-2002.

While the research that finds a relationship between hosting the Olympic Games or winning World Cup football matches and aggregate stock market performance suggests that athletic events can have an impact on stock prices, an emerging literature finds a much closer relationship by examining the returns of individual stocks. Two of the first studies of this type, , Blose, Gandar, and Lamb (1999) and Brown and Hartzell (2001), analyzed the effect of regular season and playoff game outcomes, and Brown and Hartzell (2001) also considered other significant events, like the hiring of a high profile coach and the awarding of a significant public subsidy for the construction of a new arena, on the share price of Boston Celtics Limited

Partnership, a publicly traded firm that owned the NBA's Boston Celtics. Shares of this firm were publicly traded from 1 January 1987 to 31 May 1998. Blose, et al. (1999) followed the returns through the 1994-95 season, Brown and Hartzell (2001) used the entire period. Both studies found that investors in this firm responded systematically to regular season wins and losses, and playoff wins and losses. Playoff games had a larger impact of the price of the stock than regular season games, but in general returns were higher following wins and lower following losses. Interestingly, Blose, et al. (1999) found that the effects disappeared after the first two years of trading, suggesting that the mix of investors shifted from those largely interested in risk-reward trade-offs to those most interested in owning a piece of their favorite basketball team.

Stadtmann (2006) analyzed the relationship between match outcomes and the price of Borussia Dortmund GmbH & Co. KGaA, the owner of the Bundisliga's Borussia Dortmund football club over the period November 2000 to September 2004. Stadtmann (2006) found that returns on the stock were higher following wins in both the Bundesliga and the UEFA Champions Cup, and returns were lower following losses; the returns following UEFA Champions league games were not larger than the returns following less financially lucrative Bundesliga games.

Scholtens and Peenstra (2008) analyzed the effects of a large number of football matches played by professional teams in European football leagues on the share price of the teams that owned these teams over the period 2000-2004. Scholtens and Peenstra's (2008) large data set included 1274 matches played by teams in eight leagues. Scholtens and Peenstra (2008) found that returns were higher following wins and lower following losses, but that the effect is asymmetric, with the negative effect of losses being larger than the positive effect of wins.

In summary, a body of emerging evidence suggests that on-field success in professional sports leagues can have an effect on the share prices of the firms that own professional sports teams. In general, returns increase following wins and decrease following losses, and some high profile games appear to have a larger effect on the returns.

Data Description

The data for this analysis comes from three different sources. Financial data come from two sources: daily prices of the Nikkei 225 Index are taken from http://finance.yahoo.com, and stock prices for the publicly traded Japanese companies that own baseball teams were taken from the Japanese language Yahoo! Japan Finance website. We gathered stock price data for each trading day for the year 2007. Information on the on-field success of the teams in our analysis comes from Bob Bavasi's JapanBall.com website. The website features as section with news and scores, reporting daily events of interest to fans of Japanese baseball. Among the daily news items is a report of the outcome of games and the current standings in both the Pacific and the Central League of Japanese Professional Baseball.

The teams for which we have company stock market data are the Orix Buffaloes, the Hokkaido Nippon Ham Fighters, the Hiroshima Toyo Carp, the Tokyo Yakult Swallows, the Rakuten Golden Eagles, and the Hanshin Tigers.[*] These companies are diverse. Two are food companies, Nippon Ham owned by Nippon Meat Packers, Inc., and Yakult, owned by Yakult Honsha Company, Ltd., a manufacturer and distributor of a yogurt-like beverage as well as other beverages; one is a financial services company, the Orix Buffaloes, owned by the Orix Group. The Hanshin Tigers are owned by the Hanshin Electric Railway Company, which is one of several companies belonging to Hankyu Hanshin Holdings. Rakuten Golden Eagles is owned by Rakuten, Inc., an internet shopping company, and the largest single shareholder of the Hiroshima Toyo Carp is Mazda Corporation, the automobile manufacturer.[†]

The companies are also of varying sizes. Each is included in the Tokyo Stock Price Index, ToPX.[‡] Rakuten is the smallest company, classified in the ToPX as a small company. Orix is the only one of the six for which we have data that is classified as large, appearing in the ToPX Large 70 index. Each of the others is listed on the Tokyo Stock Price Index information as medium size, each appearing in the ToPX Mid400 index as well as the ToPX 500 and ToPX 1000 indices.[§]

For each trading day, Monday through Friday, we constructed the daily stock price return for these six companies as well as for the Nikkei 225 index. The returns are computed as the percentage change in price from closing on the previous trading day (generally the preceding day except on Mondays) to closing today. In other words,

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[**] Two other companies owning teams whose stock is traded are Softbank Corporation (Fukuoka Hawks) and Tokyo Broadcasting System, Incorporated (Yokohama Bay Stars). We have been unable to get their stock price data.

[†] The family of Mazda founder Jujiro Matsuda holds about 60% of the ownership of the Hiroshima Toyo Carp.

[‡‡]We have not found daily data online covering our sample period for ToPX.

[§] Softbank Corporation is also listed as large and on the ToPX Large 70. Tokyo Broadcasting Corporation is medium sized, appearing in the ToPX Mid400 index.

$$R_{it} = 100*(P_{it}-P_{it-1})/P_{it-1}$$

where P_{it} is the closing price of company *i*'s stock (or of the Nikkei 225 index) on day *t*. Table 1 reports descriptive statistics for the daily returns for each company and the Nikkei 225 index in 2007. Charting the Nikkei 225 over our sample period, it is clear that for the first half of the data, from January 4 until about July 19, the index was nearly constant though having risen slightly in January and February. However, after mid July 2007, there is a pronounced bear market in the Nikkei 225, from a high of 18,261 on July 9th, to a low of 12,573 on January 22nd. There is not, however, a trend in the returns data for the Nikkei. Figures show the time series of closing prices and returns for the Nikkei and for each of the companies in our data. Clearly, there are trends in prices for some of the companies but there are no obvious trends or patterns in the daily returns.

The teams also have varied histories and records of past success. The Nippon Ham Fighters, for example, moved from Tokyo, where they shared the Tokyo Dome with the Yomiuri Giants, to Sapporo on the island of Hokkaido for the 2004 season. The Rakuten Golden Eagles were formed at the end of the 2004 season and began play in 2005, replacing the Osaka Kintetsu Buffaloes which had merged with the Orix BlueWave to become the Orix Buffaloes. Yakult Swallows, Hanshin Tigers, and Hiroshima Toyo Carp are long standing teams, the Tigers having started play in 1936, the Swallows and Carp in 1950. Hanshin, which plays in Osaka's Koshien Stadium, has the second best all-time record among Central League teams, but still trails Tokyo's powerful Yomiuri Giants by a large margin. The Yakult Swallows also call Tokyo home, but the Giants have the stronger following. Bavasi's Japanball.com website reports that Yakult games are rarely televised while Yomiuri games always are.

For the 2007 season, we have collected results for all 144 regular season games and the outcome of the playoff (Climax) and Japan Series games. We also calculated the cumulative winning percentage for each team for each day during the regular season. Games began in late March for the Pacific League, and in early April for the Central League. Inter-league games occur in mid-season. Using this information we constructed several performance-related variables for each team. Table 2 reports descriptive statistics for the baseball performance variables in our analysis. First, we constructed a dummy variable that is equal to one if a team won on each day of the season. If the team lost or did not play that day, the variable takes a value of 0. Second, we created a dummy variable indicating whether the team lost a game on each day. If the team lost a game, the variable takes a value of 1. If the team either won that day

or did not play, the variable has a value of 0. Because games run from late March until early November, but our stock price data covers the entire year, we have many days on which no games are played but stock trading takes place.

Games can occur on any day throughout the week, including Friday, Saturday, and Sunday. Games played after the close of the market on Friday but before the market opens on Monday, or in some instances on Tuesday, morning can only have an impact on returns once trading begins the next morning the market is open. Consequently, we have to account for games that are played over the weekend differently than games played on weekdays. A team could play between zero and three games from close of the market on Friday until the trading opens on Monday morning, or up to four games if the market was closed on Monday. Of course, every weekend outside the baseball season contains no games played. A team could win three or lose three games, win or lose two of two games played, or win or lose the only game played over the typical weekend. Teams could also both win some and lose some games over the weekend. We create a variable that takes values ranging from -4 to +4 to capture the weekend game outcomes. Specifically, over a three day weekend, if a team loses four games over the weekend, the variable equals -4, if the team wins all four games the variable is +3. For a non-holiday weekend if a team loses three games, the variable equals -3, if the team wins all three games the variable is +3. If a team plays two games and loses them both, the variable takes a value of -2; if the team plays two games and wins them both, the value is +2. If the team loses the only game it plays over the weekend, the variable has value -1; if the team wins the only game it plays, the variable is +1. If the team plays no games over the weekend, or plays multiple games, winning and losing an equal number, the weekend variable has value 0.[*] Suppose a team wins and loses games, but not in equal number. In this case, the weekend variable is 2.5 or -2.5 in the case of three wins and one loss or three losses and one win, respectively. The variable is 1.5 if the team wins two and loses one and equals -1.5 for two losses and one win.

Additionally, there is the well-known financial market anomaly known as the Monday effect. (See Pettengill, 2003, for a survey of the literature). Jaffe and Westerfield (1985a, 1985b) find Monday effects for Japanese stocks. This empirical regularity is that stock market returns are negative on Mondays. To be sure that the effects from weekend games are not confused with

[*] In Japan, it is possible for teams to play to a tie. Tie games are treated the same as if no game were played. In other words, the value of the variables indicating a lost or a won game are both zero; the value of weekend reflects what happens in all games played over the weekend that were not ties.

this Monday effect we also create a dummy variable that takes a value of 1 on Monday and zero otherwise.

The literature has addresses a different impact of expected wins and unexpected wins on stock prices. Winning a game a team was expected to win has been found to have a smaller effect on future stock prices than winning a game a team is expected to lose. Similarly, losing a game one is expected to lose is likely to have a smaller (in absolute value) effect than losing a game the team is expected to win. This has been interpreted as evidence that stock traders anticipate the outcome of games before they take place and price the stocks accordingly. To address these possibilities, we use the actual winning percentage for both teams going into each game to construct a measure of the expected outcome of each game. For example, the Hanshin Tigers hosted the Yakult Swallows on April 24th, 25th, and 26th 2007. Hanshin, playing at home, swept a three game series against the Swallows. At the end of play on each day, Hanshin's winning percentage was .500, .524, and .545, respectively, while Yakult's winning percentage was .389, .369, .350. Using the Hanshin and Yakult winning percentages listed above, going into the game on the 25th, Hanshin is expected to win, Yakult is expected to lose, because the Tigers have a higher winning percentage than do the Swallows, .500 > .389.

Finally, we include variables indicating if the team whose returns are being explained is the home team and if the game is an interleague game. The former variable takes a value of one if the team is at home and zero otherwise. The latter variable takes a value of 1 if the opponent is from the other league. Japan has two major leagues, the Pacific League and the Central League. From our data, Orix, Rakuten, and Nippon are in the Pacific League while Hanshin, Yakult, and Hiroshima are in the Central League. The other Pacific League teams are Softbank Hawks, Seibu Lions, and Lotte Marines. Yokohama Bay Stars, Yomiuri Giants, and Chunichi Dragons are in the Central League.

Empirical Approach

The empirical model used is based on the familiar Capital Asset Pricing Model (CAPM) from finance that explains observed returns of a specific stock with observed returns on a market measure of stock returns, typically some broad market index. We use a seemingly unrelated regression (SUR) model to estimate the relationship between daily returns on the stocks of companies owning Japanese professional baseball teams and the day to day events on the playing field of those teams. Specifically, consider the following regression model:

$$R_{it}=\alpha_i + \beta_i R_t^{Nikkei} + \sum_{k=1}^{K} \gamma_{ik} X_{ikt} + \varepsilon_{it}, i = 1, \dots N, t = 1, \dots T$$

$$E(\varepsilon_{it}) = 0$$

$$E(\varepsilon_{it}^2) = \sigma_i^2$$

$$E(\varepsilon_{it}\varepsilon_{js}) = \sigma_{ij}, i \neq j, t = s: 0 \; else$$

where *i* indexes team/company, *t* indexes time, and *k* indicates specific baseball events. β, γ, and α are unknown parameters to be estimated and ε are team and time specific unobserved or unobservable influences on returns. The subscript *i* on each parameter indicates that we allow each company stock return R_{it} to vary with the Nikkei average R_{it}^{Nikkei} differently, to have its own intercept term, and to respond uniquely to baseball events, X_{ikt}. The β_i are the familiar "betas" from the empirical finance literature and indicate the market risk of the individual company. The unobservable influences have a mean of zero and a constant variance σ^2_i, though the variance can differ by team. In addition, we allow the unobserved influences across teams at a point in time to be correlated with one another, σ_{ij}.

The possible correlations among the error terms reflect two factors. First, all of the companies analyzed own baseball teams. If there are events that pertain to Japanese professional baseball on a given day, then it is likely those events will affect the stock returns of all companies that own baseball teams. Second, there may be unobservable factors that affect the Japanese economy, and hence Japanese firms, but are not well reflected in the Nikkei 225 index. Estimating the model to allow for these correlations improves the efficiency of our estimates.

Results and Discussion

Tables 3 and 4 present results of estimating the model with different baseball variables.

The top half of Table 3 shows the results when only the daily Nikkei return and a dummy variable identifying Mondays are used as regressors. These are presented as a base line against which the models including baseball variables can be compared. The first point to note about these results is that the daily Nikkei return is a positive and statistically significant determinant of the daily returns for each of the companies in our data. As the coefficient on the return to the Nikkei is a measure of the stock's "beta", we looked for and found estimates of beta for several of the firms in our analysis. For example, our estimate for Yakult is 0.664 while Bloomberg.com reports a beta of 0.849. Rakuten has a beta reported on Bloomberg.com of

1.052 compared to our estimate of 0.773. Bloomberg reports Orix's beta to be 1.636, we find it to be 1.500. The Bloomberg.com beta for Mazda (Hiroshima Toyo Carp) is 1.282 while we get 1.215.

Our results are different from those reported by Bloomberg, but with the exception of Rauten, the general indication is the same. That is, Mazda and Orix are companies that Bloomberg's beta indicates are more variable than the market return, and our beta does too; our estimate indicates Yakult's returns are less variable than the market, and so does the Bloomberg beta. The differences that exist may be due to differences in the time period used or may be the result of using a different market index. We use returns on the Nikkei 225, Bloomberg's betas are based on the Tokyo Stock Price Index, ToPX.[*] In any case, we feel our estimates are sufficiently similar to justify continuing to use the Nikkei 225 index as our market index.

Our results also indicate the presence of a Monday effect. For five of the six companies, the coefficient on the Monday variable is negative, with three of the five statistically significant at the 10% level or better. Jaffe and Westerfield (1985b) report an average Monday return on the Nikkei Dow average of -0.02 (standard deviation = 0.876) for the period 1970 to 1983. Their data covers 623 Mondays. In our data, with only 47 Mondays, we have an estimate of the Monday return on the Nikkei 225 of -0.115 with a standard deviation of 1.5. Our evidence is, we believe, consistent with the literature in that we find some indication of a Monday effect but that on average it is a small effect and quite variable.

Turning to the second set of results in Table 3, we report the SUR results when the model includes only the weekend and surprise win and surprise loss variables. The specific estimates of the betas and the Monday effects are changed somewhat, though not enough to alter the general conclusion that our model is on the right track. Of specific interest here are the estimates of the coefficients on the surprise win, surprise loss, and weekend variables. For four of the six companies, none of these variables is individually significant. In the Hiroshima equation, surprise losses is statistically significant but with the wrong sign; the positive sign indicates a surprise loss results in a higher than usual return on Mazda stock the next trading day. The size of that boost, 2.29 percentage points, is also quite remarkable. Also in the Hiroshima equation we see evidence that the results over the weekend matter, with an additional win raising the return by almost half a percentage point.

[*] So far, we have been unable to find the ToPX daily prices online.

The results for Rakuten also indicate that baseball events influence returns. A surprise win by the Golden Eagles induces a boost in the Rakuten, Inc. stock return to be higher by about 1.5 percentage points the next day. A surprise loss has about the same size, but negative, effect though it is not statistically significant. The weekend variable is not significant in the case of Rakuten.

We estimated the model with additional specifications. The model with the most variables included wins, losses, surprise wins, surprise losses, winning percentage, opponent winning percentage, home game, and interleague game variables. We pared down from there, and our preferred specification is just that because we believe it best captures the relevant theory. That is, in an efficient market, what should move returns is new information. Surprise wins and surprise losses are new information whereas winning, or losing, when that is what is expected is not new information. What happens over the weekend, while the market is closed, is also new information though in an aggregated form. Table 4 reports the results of joint hypothesis tests from each of the models.

For the full model with the greatest number of baseball variables, we have two hypothesis tests. The first is that all baseball variables have a coefficient of zero. That null cannot be rejected. However, if we drop the interleague game variable from the null hypothesis, the null is rejected at the 10% level. Testing the coefficients team by team, we can reject the null that all are equal to zero only for Hiroshima and Rakuten and in each case only at the 10% level.[*]

Dropping the interleague and home game variables as well as the winning percentage and opponent winning percentage from the regression we have our next set of results reported in Table 4. After that we drop the win and loss variables. In either of these cases, the null that the baseball variables all have zero coefficients cannot be rejected. Obviously, home games and own and opponent winning percentage contribute to the models to some extent. However, if the tests are team by team, the evidence is once again that the baseball variables matter only for Hiroshima and Rakuten.

The results for Hiroshima are confusing. First, a surprise loss raises returns, opposite to expectation. Second, wins over the weekend raise returns. One possibility for the Hiroshima results is that there are so few wins and so few surprise losses that the results are simply coincidence. Hiroshima finished the season with 60 wins, 82 losses and 2 ties. Most of the season the Carp were in last or second to last place in the Central League, so the opportunity for

[*] These results are available upon request.

a surprise loss did not occur very often. Table 2 reports the mean of the surprise loss variable for the Carp as 0.007, meaning they lost when expected to win just 7-tenths of a percent of their games. This event happened 3 times during the season.

The results for Rakuten are most consistent with the theory and with the literature. Surprise wins raise returns, surprise losses reduce returns. Good news benefits the company but bad news harms it. Table 4 reports the results on tests of joint significance of surprise wins, surprise losses, and weekend games. If the null is only that the surprise win and surprise loss variables have zero coefficients, then the rejection of the null is stronger. The chi-square is 8.38 with a p-value of 0.015. Moreover, one cannot reject the null that the surprise win and surprise loss coefficients are equal but of opposite sign. The chi-square statistic is 0.00 and the p-value is 0.975.

The Rakuten results are interesting for three other reasons. First, Rakuten is the smallest of the six companies in our data, being the only one listed in the Tokyo Stock Price Index as small. Consequently, it is possible that the baseball team is a more significant determinant of the value of the overall company than is the case for the other companies and their teams. If this is true, then it is likely that the fluctuating fortunes of the team translate into the stock price more than would be true in the other companies.

Second, the Rakuten Golden Eagles are a very new team. They only began play in 2005 after being formed after the 2004 season. The 2007 season is only their third season of play. Consider the results of Blose, Gandar, and Lamb (1999) regarding the Boston Celtics. The Celtics' stock began trading in January of 1987 and Blose, et al. found that game events affected the stock returns during the first two seasons after that. They attribute this to a change in the type of investors who were trading in Celtics stock, from those seeking return to those seeking to be part-owners in their favorite basketball team. Perhaps something similar will happen with Rakuten as the Golden Eagles age as a franchise. On the other hand, Zuber, Yiu, Lamb, and Gandar (2005) find no effect of game outcomes on the returns to clubs playing in the English Premier League.

Third, note that the results for the Rakuten returns differ from those for other franchises and the aggregate markets. Blose, Gandar, and Lamb (1999) and Brown and Hartzell (2001) find asymmetric effects of wins and losses on the returns to the Celtics' stock, with unexpected losses having a larger effect than unexpected wins. Scholtens and Peenstra (2008) find the negative effect of losses is larger than the positive effect of wins in their study of eight European football clubs from 5 countries. Edmans, Garcia, and Norli (2007) find that losses by national teams

depress aggregate stock market returns but they find no effect of wins. Our results for Rakuten are unique in that we find wins and losses to have the same magnitude effects but of opposite signs.

Future Research

In the literature examining the relationship between on-field success and individual firm's stock prices surveyed above, one important factor that emerges is that the expected outcome of the game has an important effect on the estimated impact of on-field success on stock prices. We have incorporated this into our empirical analysis in a rudimentary way by using the relative strengths of the respective teams as an indicator of the expected outcome of the game. However, better indicators of the expected outcome of a professional sporting event exist in the form of betting odds or point spreads. A number of the papers discussed above incorporate betting odds into their empirical models of stock prices, including Blose, Gandar, and Lamb (1999), Brown and Hartzell (2001), Stadtmann (2006), and Scholtens and Peenstra (2008). In addition, Palomino, et al. (2005) have focused explicitly on the relationship between the release of betting odds data and stock price movements for the share prices of 20 firms that owned teams in the English Premiership football league over the period 1999-2002. Palomino et al. (2005) find that stock markets rapidly process information about the outcome of games based on betting odds, although changes in betting odds contain unpriced information that can be used to predict short-run stock price movements.

This analysis of the relationship between securities markets and betting markets shows considerable promise for increasing the understanding of market efficiency, the impact of information releases on stock prices, and forecasting of future events. Both stock markets and betting markets are thought to be efficient aggregators of information. Participants in both markets have powerful incentives to examine all possible information about future events (the profitability of firms in the case of securities markets and the outcome of sporting events in the case of betting markets) and make predictions about the outcomes of these events. A number of new internet-based betting and prediction markets like BetFair and TradeSports, along with traditional betting odds data from sports books, contain a wealth of information about bettors predictions of the outcome of sporting events. These data are just beginning to be exploited in research on the effects of new information on stock prices, and the existing link between on-field athletic outcomes and stock prices is a fertile area for additional research.

In future research, we intend to expand our data on Japanese professional baseball teams and stock prices to include data on betting odds for these games. These data will allow us to generate better estimates of the expected outcome of games and also further explore the effect of unexpected information on security markets.

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Table 1: Daily Returns – descriptive statistics

Company/Team	Observations	Mean	St. Dev.	Minimum	Maximum
Nikkei 225	274	-0.076	1.383	-5.650	4.271
Yakult	274	-0.036	2.007	-7.049	6.355
Hanshin	274	-0.112	1.800	-4.488	6.426
Hiroshima	274	-0.210	2.349	-7.706	8.393
Nippon	274	0.019	1.802	-9.206	8.436
Orix	274	-0.256	3.091	-11.093	11.947
Rakuten	273	-0.021	3.422	-8.686	10.929

Table 2: Team Success Descriptive Statistics

		Central League					Pacific League			
Variable	Obs	Mean	Std.Dev.	Min	Max		Mean	Std.Dev.	Min	Max
		Hanshin Tigers					Hokkaido Nippon Ham Fighters			
Win %	274	0.237	0.253	0.000	0.750		0.255	0.269	0.000	0.600
Won game	274	0.179	0.384	0.000	1.000		0.164	0.371	0.000	1.000
Lost Game	274	0.135	0.342	0.000	1.000		0.142	0.350	0.000	1.000
Opponent %	274	0.182	0.259	0.000	1.000		0.164	0.239	0.000	0.667
Surprise Win	274	0.095	0.294	0.000	1.000		0.022	0.147	0.000	1.000
Surprise Loss	274	0.040	0.197	0.000	1.000		0.069	0.255	0.000	1.000
Weekend	274	0.007	0.673	-4.000	3.000		0.055	0.595	-3.000	3.000
		Hiroshima Toyo Carp					Rakuten Golden Eagles			
Win %	274	0.198	0.212	0.000	1.000		0.219	0.225	0.000	0.500
Won game	274	0.117	0.322	0.000	1.000		0.153	0.361	0.000	1.000
Lost Game	274	0.186	0.390	0.000	1.000		0.161	0.368	0.000	1.000
Opponent %	274	0.169	0.246	0.000	0.638		0.175	0.251	0.000	0.800
Surprise Win	274	0.091	0.288	0.000	1.000		0.091	0.288	0.000	1.000
Surprise Loss	274	0.007	0.085	0.000	1.000		0.029	0.169	0.000	1.000
Weekend	274	-0.047	0.559	-4.000	3.000		-0.042	0.796	-3.000	3.000
		Tokyo Yakult Swallows					Orix Buffaloes			
Win %	274	0.184	0.200	0.000	0.459		0.211	0.218	0.000	0.667
Won game	274	0.128	0.334	0.000	1.000		0.124	0.330	0.000	1.000
Lost Game	274	0.186	0.390	0.000	1.000		0.168	0.374	0.000	1.000
Opponent %	274	0.172	0.246	0.000	1.000		0.163	0.245	0.000	0.643
Surprise Win	274	0.102	0.303	0.000	1.000		0.095	0.294	0.000	1.000
Surprise Loss	274	0.022	0.147	0.000	1.000		0.000	0.000	0.000	0.000
Weekend	274	-0.042	0.665	-4.000	3.000		0.002	0.567	-3.000	3.000

Table 3: SUR results

	Base Model					
	Hanshin	Nippon	Yakult	Hiroshima	Orix	Rakuten
Nikkei	0.799***	0.510***	0.664***	1.215***	1.500***	0.773***
	0.000	0.000	0.000	0.000	0.000	0.000
Monday	-0.387*	-0.575**	0.071	-0.022	-0.876**	-0.365
	0.086	0.029	0.805	0.933	0.016	0.483
R-Square	0.388	0.169	0.210	0.512	0.463	0.100

Breusch-Pagan test: Chi-square(15)=51.28 ; p-value=0.000

	Preferred Model					
Nikkei	0.810***	0.451***	0.694***	1.159***	1.554***	0.746***
	0.000	0.000	0.000	0.000	0.000	0.000
Monday	-0.269	-0.774**	-0.042	0.123	-1.556***	-0.836
	0.390	0.045	0.916	0.734	0.004	0.245
Surprise W	0.145	0.031	-0.261	-0.152	0.116	1.543**
	0.625	0.952	0.453	0.639	0.813	0.018
Surprise L	-0.175	0.352	-0.470	2.291**	1.435	-1.502
	0.687	0.329	0.507	0.041	0.396	0.158
Weekend	0.033	-0.004	-0.027	0.418**	-0.238	0.025
	0.799	0.982	0.866	0.020	0.348	0.919
R-Square	0.357	0.121	0.207	0.485	0.442	0.112

Breusch-Pagan test: Chi-square(15)=48.16 ; p-value=0.000

p-values below coefficients. *** p<.01, ** p<.05, * p<.10

Table 4: Joint Hypothesis Tests

Wins, Losses, Interleague, Home games,

Winning percentages, and Weekends Model

Null Hypothesis: All baseball variable coefficients are zero

Chi-square (54)=64.36 p-value=0.1580

Null Hypothesis: All baseball variable coefficients except interleague games are zero

Chi-square (48)=61.27 p-value=0.0945

Wins, Losses, and Weekends Model

Null Hypothesis: All baseball variable coefficients are zero

Chi-square (30)=33.680 p-value=0.2939

Null Hypothesis: All baseball variable coefficients are zero by team

	Hanshin	Nippon	Yakult	Hiroshima	Orix	Rakuten
Chi-square (5)	2.23	3.2	2.45	11.22	3.52	10.75
p-value	0.817	0.67	0.785	0.047	0.62	0.057

Surprise Wins, Surprise Losses, Weekend Model – Preferred Model

Null Hypothesis: All baseball variable coefficients are zero

Chi-square (18)=22.61 p-value=0.2058

Null Hypothesis: All baseball variable coefficients are zero by team

	Hanshin	Nippon	Yakult	Hiroshima	Orix	Rakuten
Chi-square (3)	0.58	1.02	1.09	9.78	1.59	8.59
p-value	0.901	0.796	0.781	0.021	0.662	0.035