Reexamining Sports-Sentiment Hypothesis: Microeconomic Evidences from Borsa Istanbul[♦]

Ka Wai Terence Fung[+]**,**

Ender Demir[¨]**,**

Chi Keung Marco Lau[∃]

And

Kwok Ho Chan[*]

Abstract

This paper examines the impact of international soccer matches on the Turkish stock market using firm-level and sorted-portfolio data. Applying Edmans *et al.* (2007) estimation method, we found a significant negative loss effect. However, once using panel data analysis as well as modeling spatial and temporal effects explicitly, the sports-sentiment effect disappeared. The same conclusions could be made by replacing win (loss) dummies with unexpected win (loss) variables, removing Monday matches, dropping sports-related firms, and sorting portfolio returns by market capitalization and past returns. Hence, there is very limited micro-evidence to support the 'overreaction' hypothesis of individual investors using Borsa Istanbul data. However, we found evidence that sporting events have a larger impact on stock return volatility for firms with smaller market capitalization and lower past returns.

Keywords: Individual-investor sentiment, event study, market efficiency, neuroeconomics, sports economics

JEL Classification: D87, G14, L83

♦ We are grateful to the helpful comments from the participants of the Eastern Economics Association Conference (NY, 2013) and the Borsa Istanbul Finance and Economics Conference (Istanbul, 2013). This paper was previously circulated under the title "Sport Event Sentiment and the Turkish Market Return: a Firm Level and Sorted Portfolio Analysis".

+ Corresponding author. Division of Business and Management, Beijing Normal University, Hong Kong Baptist University - United International College. B414, 28 Jinfeng Road, Tangjiawan, Zhuhai, Guangdong Province, P. R. China 519085 econfkw@hotmail.com

¨ Faculty of Tourism, Istanbul Medeniyet University, Turkey ender.demir@medeniyet.edu.tr.

∃ Newcastle Business School, Northumbria University, U.K. chi.lau@northumbria.ac.uk

*Beijing Normal University, Hong Kong Baptist University - United International College, China kwokho1419@gmail.com

1. Introduction

Economic events, such as stock splits, mergers and acquisitions, are believed to have an impact on the value of financial assets[1]. The psychological literature in the past decade showed that even economically-neutral events, including weather (Saunders, 1993; Hirshleifer and Shumway, 2003; Cao and Wei, 2005), the daylight-savings time change (Kamstra *et al.* 2000), the lunar phases of the moon (Yuan *et al.* 2006), and air pollution (Levy and Yagil, 2011) systematically correlate to variation of asset returns. The basic rationale is that these economically-neutral events have potential repercussions on the 'mood' of an investor, which translates into investment behavior that cannot be explained by the rationality principle.

One strand of the event-study literature focuses on the impact of sporting events (especially international game results) on asset prices. In fact, motivated by psychological evidence, the relationship between sporting results (especially soccer) and stock market returns has been developed as an important research field in sports economics (Hirt *et al.* 1992; Ashton *et al.* 2011; Kerr *et al.* 2005)[2]. Edmans *et al.* (2007) is a seminal piece. Using an international soccer sample comprising matches of 39 different countries for the period from 1973 to 2004, the authors found that losses of national soccer teams led to a strong negative stock market reaction and the loss effect increased with the importance of games.

This study aims at reexamining the sports-sentiment hypothesis using firm-level data from Borsa Istanbul - BIST (formerly known as Istanbul Stock Exchange - ISE). We explore how the performances of three big soccer clubs of Turkey, namely Besiktas (BJK), Fenerbahce (FB) and Galatasaray (GS), as well as the Turkish National Soccer team affected the BIST.

To begin, why is Turkey an interesting study? There are two reasons. (1). In developed countries, there are often multiple sporting events, such as football and baseball games, on the same day. They are equally popular. It is difficult to separate the effect of each sporting event. Turkey has no such problem as soccer is the most important and dominant sport in the whole country. It is generally believed that the soccer-sports sentiment is strong. Games against foreign rivals are considered as a fight of national pride in Turkey. Following international game wins, people celebrate the victory with nightlong festivities in the streets. (2). A natural experiment can be conducted to test the investors' overreaction hypothesis. The foreign traders' shares in BIST in

[1] See Eckbo (1983), and Asquith and Mullins (1986).
[2] For more recent studies, see also Berument and Ceylan (2012), and Ehrmann and Jansen (2012).

terms of market capitalization and transaction volume are shown in Figure 1. Foreign investors' involvement in the BIST measured by market capitalization rose from around 41% in 2000 to around 67% in 2010. Domestic individual investors trade more frequently than foreign investors do. In 2010, domestic investors held around 33% of market share but generated 84% of trading volume. In contrast, foreign investors owning 67% of market share generated only 16% of trading volume in stock exchange. Nonetheless, by both measures, the involvement of foreign investors increased sharply in the second half of the 2000's. The recent structural change of the BIST provides fodder for a natural experiment: if investors' sports sentiment exists, then the impact of sporting events (whether a positive win or a negative loss) should be stronger in the first half of the 2000's when the market influence of domestic investors was relatively high[3]. We will split the panel data (in section 4) into two subsample periods to conduct this natural experiment.

Our study differs from the previous literature in four important aspects. First, the scope of analysis is broader. We consider the impact of not only the soccer clubs but also the Turkish national team. This is important as a national team may affect the mood of a larger population in a country. Our dataset covers only international games against foreign clubs and excludes domestic games. International games should affect the mood of the supporters of the club team playing as well as the supporters of other clubs in a similar way due to national pride. Nevertheless, the impact of domestic games can be diluted or eliminated, as the performance of a team will have an opposite effect on other teams' supporters (Eker *et al.* 2007).

Second, most of the early studies are confined to the impact of sporting events on market indices. Little research effort was directed toward a micro-level examination. There is a related stream of literature studying the effect of sports results on the stock returns of publicly-traded sports clubs[4]. Palomino *et al.* (2009) found that stock prices were sensitive to the game results of 16 listed British soccer clubs. There was a positive average abnormal return of 53 basis points following a win, and a loss led to a negative average return of 28 basis points. Scholtens and Peenstra (2009) documented a positive (negative) stock market reaction after a win (loss) for 8 listed soccer teams in 5 European countries during 2000-2004. The reaction to losses was higher than wins indicating an asymmetric market reaction. Demir and Danis (2011) documented that

[3] Foreign investors are not liable to react to the results of a Turkish team.
[4] To our knowledge, Chang *et al.* (2012) is one of the few large-scale firm-level studies, covering all firms listed in Nasdaq. However, their analysis is restricted to domestic games.

there were negative reactions to both an expected loss and an unexpected loss for Turkish listed soccer clubs[5]. One of the drawbacks of these studies is that the partial effect of investor sentiment cannot be separated from that of a change in expected company profit. The successful clubs are able to generate more revenue; therefore, wins (losses) are expected to increase (decrease) the future cash flows of clubs. A win also leads to more prize money, merchandise sales, or advertising income, thus driving up the stock price. At the same time, it affects investors' sentiment. Hence, the performance of a team affects its stock price. Considering all these, we estimate the sports-sentiment effect using all 447 firms' (not only soccer clubs) data from the BIST 100, in a bid to provide micro-evidence for the investors'-sentiment hypothesis.

The third aspect is related to methodology. A common problem of sports-event literature is spurious correlation. The procedure used by Edmans *et al.* (2007), strictly speaking, is a high-dimensional (39 countries) multivariate time-series model. The second step is Seemingly Unrelated Regression (SUR), adjusting for clustering effect only due to curse of dimension. As well known in the literature, serial correlation biases the standard error downward, which may lead to incorrect inference; in this particular case, accepting the existence of sports-sentiment effect. Kaplanski and Levy (2010) tackled the spurious correlation by different strategies. For instance, an outlier year with bad returns in which the World Cup took place was dropped. Trading days with major events that occurred during the World Cup period were eliminated. A June-July monthly dummy was added to handle seasonal effect. Rather than manipulating the dataset and varying the independent variables, we tackle the spurious correlation problem by casting the model in a purely time-series setting. We propose a direct estimation method. The BIST 100 firm returns are sorted by market capitalization and past returns into five portfolios. In this way, the temporal effect can be handled directly.

Fourth, Palomino *et al.* (2009) proposed an unexpected match results variable. The motive was that surprising results should capture stronger sports sentiment. We suggest a refined version of the Palomino *et al.* (2009) unexpected win/loss variable. Our results indicate weak evidence of sports-event sentiment. We demonstrate that sporting events have no power to explain financial asset returns. Nonetheless, sporting events can account for volatility of sorted portfolio returns. The rest of the paper proceeds as follows. The next section describes the data set. Section three

[5] See also Stadtmann (2006), Boido and Fasano (2007), Zuber *et al.* (2005), and Brown and Hartzell (2001).

reports the findings of firm-level analysis. Section 4 presents the sorted portfolio analysis results followed by a discussion in section five.

2. Data

The game results are collected from www.mackolik.com; they are cross-checked from various sources, for example the official website of the Turkish Football Federation[6]. The first (Besiktas vs. Hapoel Haifa) and last (Besiktas vs. Dynamo Kyiv) match took place on 28 July, 1999 and 24 February, 2011, respectively. The betting-odds ratios for the games prior to April, 2004 are collected from www.betexplorer.com. The data afterward are collected from www.mackolik.com. Initially, there are 430 international team and national matches over the sample period. It is generally believed that only important events that capture public attention can have repercussions in the stock markets. Some screening procedure has to be implemented. We dropped the private games and UEFA Euro Qualifying matches, winding up with 323 matches.

Most of the European Cup games were played on Tuesday, Wednesday, or Thursday evenings; however, games of the national team were more homogenously distributed during the week. The effect of a game result is observed on the first trading day just after the game. Thus, if a match is played on the weekend, the effect will be observed on Monday. Likewise, the impact of weekday games is observed on the next trading day. The impact of a particular game cannot be separated if there are multiple games on the same day. One possible solution is deleting all sporting events of a trading day if there is more than one game (Demir *et al.* 2014). However, this can result in a considerable loss of observations. We adopt a different strategy. On any trading day with multiple matches, if the game results are the same, they are combined as one single match with one single result. Otherwise, all matches are deleted[7].

After applying these selection criteria, 278 matches remain. The sporting events are 2006 FIFA World Cup qualification, 2010 FIFA World Cup qualification, 2002 FIFA World Cup, Champions League, Euro 2000, Euro 2008, UEFA, and FIFA Confederation Cup. Among the

[6] See www.tff.org.

[7] An additional criterion can be adopted to eliminate multiple-game effect. First, a cut-off time is set (for instance, 9 a.m.). If a match kicks off at 10 a.m., it will be treated as a match on the next trading day. Let's say trading day *t* is matched with sporting event on day *t-1*; and suppose that day *t* has another sporting event played during its trading hour (of course, this sporting event will be matched with trading day *t+1*). Then, the pair of trading day *t* and sporting event on day *t-1* will be deleted, because the return on day *t* will be affected not only by the sporting event on day *t-1*, but also one on day *t*.

278 matches, there were 45 national team matches, 66 for FB, 74 for BJK and 93 for GS. The overall win, draw and loss proportions are 43.5%, 20.5% and 36%, respectively.

We collect daily stock prices (closing) of 447 Turkish firms listed at Borsa Istanbul from the Wharton Research Data Services (WRDS)[8], to compute the daily returns (dividend adjusted). The sample period is from July 1, 1999 to June 30, 2011. Discontinuous trading (examples: a company is delisted or stops trading for a certain period such as after a long holiday) will render the daily returns meaningless. Various methods can be used to deal with this problem. One can drop observations when they are too far apart or keep the longest trading streak in the sample. The former approach is adopted in this study. To minimize the loss of observations, we take the approach that if two trading days are more than 10 days apart, the observation will be deleted. The BIST100 index source is the Borsa Istanbul website[9].

In section four, sorted portfolios by market capitalization (the product of stock price and number of shares outstanding) and past returns (the moving average of the last 22 trading days) will be constructed by the daily firm returns. To be specific, on each trading day, the firms are sorted by market capitalization or past returns and split into quintiles. Then, a value-weighted return will be computed for each quintile. The process is repeated every day and a portfolio will be formed[10].

Controlling for the outlier effect is necessary in the case of Turkey. Turkey went through economic crises in 1994, 2001, and 2008, after opening up its capital account in 1989 (Rodrik, 2012). The 1994 and 2001 crises were severe and literally dramatic. Although Turkey experienced strong and stable expansion until 2007, the 2008 crisis interrupted the long expansion. There are many ways to deal with outliers. One method is simply dropping the extreme values. The second approach is creating a dummy for the extreme trading days[11]. The first approach is adopted in this study. To minimize the loss of observations, we exclude the highest and lowest (in terms of return) five trading days from the sample. An additional advantage is that, by dropping the extreme values, convergence will be improved for the GARCH-Variance and multivariate GARCH models examined in section four.

[8] https://wrds-web.wharton.upenn.edu/wrds/
[9] http://www.borsaistanbul.com/
[10] We intended to construct a portfolio by past turnover, defined as daily trading volume (closing)/shares outstanding. However, there are many missing values of daily trading volume.
[11] For instance, Demir et al (2014), Kaplanski, and Levy (2010) generate two dummies for ten trading days with highest (lowest) returns.

3. Micro-Level Analysis

The first part of our analysis estimates the sport-sentiment effect using Turkish firm-level data by Edmans *et al.* (2007) procedure. The procedure consists of two steps. There were 39 countries in their sample. The first equation involves the estimation of major market index returns of each country using market factors as control (for instance, a local market index and a world market index). The residuals were then collected for the second step[12] which is essentially SUR adjusting for cross-sectional clustering effect. The key independent variables are win and loss dummies of games. One of the problems is that the second step neglects country-specific factors (which can be unobservable) and temporal persistence.

3.1. Edmans *et al.* (2007) Approach

This section is devoted to exploring the sports-sentiment effect with firm-level data from BIST100 by using Edmans *et al.* (2007) estimation strategy. The null hypothesis is that the stock return will not be affected by economic-neutral events like international sporting-event results and no exploitable abnormal profits exist assuming that individual investors are rational such that their buying and selling positions are based only on fundamentals. The alternative hypothesis is that game results matter and the stock return variation reflects overreaction of individual investors.

Let R_{it} be the continuously compounded post-dividend daily return of an individual stock *i* on day *t*; the first step is to estimate the following equation:

$$R_{i,t} = a_i + \beta_{i,1}R_{i,t-1} + \beta_{i,2}W_t + \beta_{i,3}H_t + \beta_{i,4}R_{m,t} + \beta_{i,5}R_{m,t-1} + \varepsilon_{i,t} \quad (1)$$

where *i* is an index of firms and $R_{\mathrm{m,t}}$ is the continuously compounded daily BIST on day *t*. We include dummy variables for each day of the week to control for the day of the week effect (Berument *et al.* 2007; Ke *et al.* 2007; Aydogan and Booth, 2003). $W_t = \{W_{1t}, W_{2t}, W_{3t}, W_{4t}\}$ are dummy variables for the days of the week: Monday, Tuesday, Wednesday, and Thursday, respectively. $H_t = \{H_{1t}, H_{2t}, H_{3t}, H_{4t}, H_{5t}\}$ are dummy variables for days for which the previous 1 through 5 days are non-weekend holidays. The lagged stock return $R_{\mathrm{it-1}}$ is included in the specification (1) to account for first-order autocorrelation. The BIST 100 return is also included to control for the correlation between individual stock returns and the market index portfolio

[12] This is a procedure to purge the systematic market risk. In a purely temporal setting, demeaned or differenced returns may deliver similar results.

return attributed to systematic risk that is well documented in the literature[13].

For each company *i*, equation (1) is estimated by OLS. In the second stage, we extract the estimated residuals from equation (1) which represent abnormal returns that should be the results from football-sentiment effects. Instead of using only national team matches like Edmans *et al.* (2007), we collect data of Turkish major soccer teams playing foreign rivals, which significantly increases the effective sample size. The effects of the outcome of international soccer matches on individual stock returns can be estimated using the following regression model:

$$\hat{\varepsilon}_{i,t} = b_0 + b_1 WIN_t + b_2 LOSS_t + b_3 National_t + b_4 FB_t + b_5 BJK_t + b_6 GS_t + b_7 FB_t * WIN_t + b_8 BJK_t * WIN_t + b_9 GS_t * WIN_t + b_{10} FB_t * LOSS_t + b_{11} BJK_t * LOSS_t + b_{12} GS_t * LOSS_t + \nu_{i,t} \quad (2)$$

where $\hat{\varepsilon}_{i,t}$ is the residual from regression (1); WIN_t (win) and $LOSS_t$ (loss) are game result dummies[14]; National denotes a match between two national teams; FB, GS, and BJK are team dummies representing Fenerbahce, Galatasaray, and Besiktas. To control for individual-team sentiment, six win and loss interaction terms are added to the model. The standard error in equation (2) is adjusted for heteroskedasticity.

Hypothesis 1*: The sports-sentiment effect exists if the win coefficient is significantly positive and/or the loss coefficient is significantly negative.*

As argued in section 1, the foreign-investor ratio has increased significantly since 2006. If the sports-sentiment hypothesis is true, the measured sports-sentiment effect should be stronger (no matter positive win or negative loss effect) in the pre-2006 period.

Hypothesis 2*: Domestic investors have stronger reactions to a national team win or loss: the sports-sentiment effect is stronger in the pre-2006 period.*

Table 1 reports the Edmans *et al.* (2007) style results. Our analysis is based on three sub-sample periods. The right-hand side panel, middle panel, and left-hand side panel report the estimates for the whole sample (7/1/1999-6/30/2011), pre-2006 (7/1/1999-12/31/2005), and post-2006 period (1/1/2006-6/30/2011), respectively. There are 158 matches in the pre-2006 period

[13] Instead of a world-market index, the Dow Jones Index was used as an international-market effect in the preliminary analysis.
[14] Strictly speaking, the time index should be *t-1* as explained in section 2. We follow the convention of the literature (Edmans *et al*. 2007; Kaplanski and Levy, 2010) to use time *t*.

and 120 in the post-2006 period. The general findings are in line with the existing literature on sports sentiment and stock market return. The estimated coefficient of loss is negative and statistically significant at the 1% level and 5% level for the whole sample period and pre-period respectively, consistent with the Edmans *et al*. (2007) findings.

While the estimated coefficient on the loss-dummy variable is -95.7 basis points for the whole period and -91.6 basis points for the pre-2006 period, the loss effect disappears in the post-2006 period[15] which is evidence supporting the sports-sentiment hypothesis. The average loss effect of football sentiment on the stock market as found in Edmans *et al.* (2007) ranges from -20 basis points to -50 basis points, depending on games at different levels of importance. Therefore, we can conclude that the football mood in Turkey is stronger than the world's average, and the market efficiency is weaker than that of developed markets. Although the national team dummy is not significant, there is evidence of team effect. For instance, a win of Fenerbahce and Galatasaray over foreign rivals, and a loss of Galatasaray are all significant at 10%. As a result, we can conclude that the loss effect is overwhelming in the Turkish stock market[16] following the Edmans *et al.* (2007) procedure.

3.2. Panel Data Analysis

There are two potential drawbacks of the estimation strategy adopted in the previous sub-section. (1) The temporal dependence is not adjusted in the second step which may possibly render the standard error incorrect. (2) There are 447 firms in our sample; the idiosyncratic factors are not modeled at all. Since the number of cross-sections is larger than that of Edmans *et al.* (2007) (39 countries), a natural extension is panel-data analysis, by which both spatial and temporal effects are modeled. The importance of controlling correlated residuals has been well explained in Petersen (2009). The author found that 42% of finance papers that had been published by that time did not adjust the standard errors for possible dependence in the residuals, resulting in either an overestimate or underestimate of the standard errors of the estimated coefficients, and hence the corresponding confidence intervals. Petersen (2009), by simulation, demonstrated that estimates that are robust in the form of dependence in the data produce unbiased standard errors and correct confidence intervals.

[15] On the other hand, this may imply that market efficiency has been improved over time.
[16] The low coefficient of variation can be indicators of important firm-specific effects, justifying the random-effect approach in section 4.2.

In the following analysis, we will consider Random Effect (RE) correcting the standard error by the Newey-West method and the Fixed Effect (FE) analysis using Driscoll and Kraay (1998) standard errors. The error structure is assumed heteroskedastic, autocorrelated up to two lags and possibly correlated between the firms (panels). The Driscoll and Kraay (1998) correction method is a nonparametric technique of estimating standard error that places no restriction on the limiting behavior of the number of panels. It is suitable for our use since it can handle both balanced and unbalanced panels with missing values[17]. Spatial and temporal dependence may arise in our study because of the complex patterns of mutual dependence between listed companies at a particular time. These unobservable common factors may cause biased and inefficient estimates when we use the conventional covariance matrix estimation technique. Equation (2) is modified as:

$$\hat{\varepsilon}_{i,t} = c_i + b_1 WIN_t + b_2 LOSS_t + b_3 National_t + b_4 FB_t + b_5 BJK_t + b_6 GS_t + b_7 FB_t * WIN_t + b_8 BJK_t * WIN_t + b_9 GS_t * WIN_t + b_{10} FB_t * LOSS_t + b_{11} BJK_t * LOSS_t + b_{12} GS_t * LOSS_t + \nu_{i,t} \quad (3)$$

where c_i is the firm effect. Write equation (3) in a vector form:

$$\hat{\varepsilon}_{i,t} = x_{i,t}^{'}\beta + \nu_{i,t}$$

where both β and $x_{i,t}$ are (K+1)×1 vector. Let $\hat{h}_{i,t} = x_{i,t}^{'}\nu_{i,t}$

Define $\hat{S}_T$ as the Newey-West adjustment matrix:

$$\hat{S}_T = \hat{\Omega}_0 + \sum_{j=1}^{m(T)} w(j,m)\left[\hat{\Omega}_j + \hat{\Omega}_j^{'}\right]$$

$$\hat{\Omega}_j = \sum_{t=j+1}^{T} \hat{h}_t(\hat{\beta})\hat{h}_{t-j}^{'}(\hat{\beta})$$

where $m(T)$ is the lag length of autocorrelation (two, in this case), $w(j,m)$ is the modified Bartlett weight and $\hat{h}_t(\hat{\beta})$ the cross-sectional average of $\hat{h}_{i,t}(\hat{\beta})$.

Driscoll and Kraay (1998) standard error is simply the square root of the diagonal elements of the following asymptotic (robust) covariance matrix:

$$Var(\hat{\beta}) = (X^{'}X)\hat{S}_T(X^{'}X)^{-1} \quad (4)$$

where X is the stack of $x_{i,t}$ for $i = 1,...,N$ and $t = 1,...,T$.

[17] The trading of some stock is not continuous, resulting in an unbalanced panel.

Table 2 shows the estimated panel data results for the whole sample (7/1/1999-6/30/2011), pre-2006 period (7/1/1999-12/31/2005), and post-2006 period (1/1/2006-6/30/2011), respectively. The coefficients are the same using Newey-West since this method aims at computing correct standard errors. The results show weak evidence of sports-sentiment effect. Although the estimated coefficient of loss is negative, it is only statistically significant at 10% level for the whole sample period using the Newey-West standard errors, which are robust to autocorrelation and heteroskedasticity. Moreover, no national team or soccer club effect is detected. The win coefficient of Galatasaray is highly significant, but the sign (negative win) is incorrect. However, the results from Table 2 show that neither loss effect nor win effect is significant after using robust standard errors as proposed by Driscoll and Kraay (1998). We can conclude that neither loss effect nor win effect is significant. Only a mild but inconsistent Galatasaray team effect is found.

3.3. Robustness Test

There is reason to believe that the sports-sentiment effect is stronger under different circumstances. For instance, the investors' sentiment should weaken over time. To be specific, the impact of a Friday match will be diluted on the following Monday rendering it weaker than weekday game results. We propose two ways to deal with the weekend-dilution effect: (1) Assume that there is no match on Monday, treating it as a regular trading day without any match. (2) Drop all Monday observations. Our analysis suggested that these two criteria gave similar results. We, therefore, report the results of the former scenario. In addition, four soccer teams and ESEM SPOR GIYIM (which sells sport apparel) are excluded. As argued in section one, sporting events would affect the earnings of sports-related firms, which are not related to sports sentiment.

Table 3 reports the results of excluding Monday matches and soccer-related firms for the whole sample period. Evidently, the loss effect is stronger when concentrating on weekday soccer matches using the Edmans *et al.* (2007) methodology. When compared to the findings of Table 1, the loss effect increases by 50 basis points. Without accounting for cross-sectional and temporal dependence, the evidence lends support to the sports-sentiment hypothesis. In fact, the loss coefficient is still significant at one percent using Newey-West correction error. However, column six of Table 3 indicates that the negative sports-sentiment hypothesis is rejected using fixed-effect model. That said, we found a positive win effect for Galatasaray.

3.4. How about unexpected match results?

Palomino *et al.* (2009) proposed an alternative method. They argued that an 'unexpected' win (loss) should have a larger impact on financial asset returns. The odds ratio released from

betting companies can summarize the opinion of bookmakers. There is a fixed-odds betting market in Turkey where the odds are posted several days before the games and they are rarely altered by bookmakers after the announcement. For example, on April 25, 2010, Galatasaray played at home against Bursaspor in the Turkish Super League. The odds were 1.55 for a home win, 3.4 for a draw, and 3.8 for an away win. If a person bets 1 euro on a home win and Galatasaray defeats the opponent, he will win 1.55 euro. If the result is a draw or an away team win, he loses 1 euro.

Let $\delta_i, i = w, d, l$ be the bookmakers' perceived probability of the outcomes (win, draw and loss), which is the inverse of odds. To convert perceived probabilities to implied probabilities of a win, we normalize the former by dividing each odd by the sum:

$$\Delta_w = \frac{\delta_w}{\delta_w + \delta_d + \delta_l}$$

The normalized probability of loss (Δ_l) is defined likewise. Using Δ_w and Δ_l and the difference of these two, Palomino *et al.* (2009) specified four dummy variables, namely strongly expected to win, weakly expected to win, strongly expected to lose and weakly expected to lose. For instance, if the coefficient of strongly expected to win is positive and significant, the authors contend that it is evidence of 'overreaction'. Nonetheless, *an expected outcome can hardly change the mood of individual investors*. The notion is similar to the monetary economics hypothesis that only an unexpected policy shock can have an impact on real variables (King and Plosser, 1984; Altig *et al.* 2004; Clarida *et al.* 2002). Therefore, we deviate from Palomino *et al.* (2009) by generating an 'unexpected win' and 'unexpected loss' variable.

The average implied win-loss probability differences (Δ_w - Δ_l) is 0.2031. A match is defined as an 'expected win' if the actual win-loss probability difference is larger than the average. Then an 'unexpected loss' ($Un\exp ectedLoss_t$) is defined as an interaction term of 'expected win' and 'actual loss'. Similarly, 'unexpected win' is multiplying 'expected loss' by 'actual win'. The bottom line is that only a surprising outcome would change investors' moods. We proceed to estimate the following equation the same way as in section 3.2:

$$\hat{\varepsilon}_{i,t} = c_i + b_1 Un\exp ectedWin_t + b_2 Un\exp ectedLoss_t + b_3 National_t + b_4 FB_t + b_5 BJK_t + b_6 GS_t + b_7 FB_t * WIN_t + b_8 BJK_t * WIN_t + b_9 GS_t * WIN_t + b_{10} FB_t * LOSS_t + b_{11} BJK_t * LOSS_t + b_{12} GS_t * LOSS_t + \nu_{i,t} \quad (4)$$

Hypothesis 3*: The coefficients of unexpected win and/or unexpected loss should be significantly positive and negative, respectively. Moreover, the size should be bigger than those of equation (2).*

The results are reported in Table 4. Whether using Newey-West or Driscoll and Kraay (1998) correction error, the unexpected outcomes have no impact on firm excess returns in a panel setting where both spatial and temporal effects are adjusted. The above analysis suggests that there is no micro-evidence of sports-sentiment or individual investor-overreaction effect once both spatial and temporal correlations are controlled.

As suggested by Petersen (2009), controlling for firm-specific effect is critical for financial-panel data. Evidently, the sports-sentiment effect is non-existent by Driscoll and Kraay (1998). One of the possibilities is missing relevant economic variables. It is generally accepted that macroeconomic factors constitute a systematic risk that is fundamental to asset pricing. Unfortunately, the macroeconomic variables are unobservable for high-frequency data. Our argument in sections 3.2 - 3.4 will be stronger if we can demonstrate the disappearance of the negative-loss effect using the original Edmans *et al.* (2007) data[18]. We requested the data from the authors; unfortunately, the original dataset is no longer available.

The next section is devoted to multivariate time-series models in which two purposes can be achieved: (1) We will demonstrate the existence (or nonexistence) of sports-sentiment effect in a purely time-series setting; (2) We will test several interesting hypotheses related to investor irrationality.

4. Sorted Portfolio Analysis

In this section, the estimation is done in a purely time-series setting in order to tackle the possible spurious correlation problem. The estimation method in Edmans *et al.* (2007) is a high dimensional (39 countries) multivariate time-series model. The curse of dimensionality is solved in this paper by categorizing firm returns into several portfolios. Specifically, the 447 BIST 100 firm returns are sorted into five portfolios. Two sets of results are estimated using market capitalization and past returns as sorting criteria. With five portfolios, the estimation can handle the temporal effect (serial correlation) of the data directly. There are two advantages using sorted portfolios. First, the Capital Asset Pricing Model (CAPM) performs poorly using firm data; but

[18] A suggestion from an anonymous referee.

the performance improves significantly when using sorted portfolios. It is possible that the sports-sentiment or individual investor-overreaction effect can be detected in sorted portfolios for which idiosyncratic factors are controlled. Second, a couple of testable hypotheses can be proposed to verify the sports-sentiment effects.

4.1. Impact on the Mean Equation

The criteria used for sorting the firm-level data into five portfolios are market capitalization and past returns. Market capitalization is defined as the product of the stock price and the number of shares outstanding. Past returns are constructed using the moving average of the daily firm returns of the last 22 trading days. Specifically, the firms are sorted by returns on each trading day and we split them into quintiles. A value-weighted portfolio return will be computed for each quintile by these two criteria. The process is then repeated every day and a portfolio is formed. To avoid the excess influence of outliers, the smallest and highest five trading days are dropped. The series are demeaned to ensure stationarity[19].

After sorting the firm-level data into five portfolios, results are estimated by GARCH (1, 1) model. The BIST 100 daily and lagged-portfolio returns are used as a proxy for market factors. The win and loss dummy variables are indicators of sports-sentiment effect. Club dummies are used to control for team effect. The implications are the same under different sports-selection criteria.

Hypothesis 4: *With firm-level data sorted into five portfolios according to market capitalization, if the sports-sentiment effect truly exists, smaller firms (first quintile) should have a larger sports-sentiment effect.*

The reason behind this is that more local, individual investors should be involved in the stock trading for small firms rather than large firms (Baker and Wurgler, 2006). Table 5a summarizes the results of the sorted portfolio by market capitalization. The first quintile denotes the return of the portfolio with the smallest market size; the fifth quintile is the highest.

[19] We tried to reinforce our arguments by different sorting criteria. One option is past turnover ratio. However, the analysis is infeasible due to excessive missing values. We also tried sorting by 22-day moving average of past variance. No significant result was found.

Table 5a shows that the coefficients for BIST100 daily and lagged-portfolio returns are significant across all five portfolios consistent with the CAPM. The focus of this paper is the effect of sporting events on the returns[20]. We found that with the GARCH model, the effect of sporting events (win or loss effect) is mostly insignificant. The win/loss effect is only significant for fourth quintile but the win effect is a negative one. There is not much difference in sports-sentiment effect between small firms and large firms since the sports-sentiment effect is not significant for most firms. The ARCH and GARCH coefficients are all significant which is evidence of strong sorted portfolio volatility persistence. To check robustness, we sort the portfolios into quarters. As shown in Table 5b, the findings remain the same; international soccer matches have no impact on mean returns of portfolios sorted by market capitalization. Hence, there is no evidence for hypothesis 4.

The above analysis ignores correlation across portfolios, which may render the standard error inappropriate. To control for this, we use multivariate VAR(1)-GARCH (0,1) with Constant Conditional Correlation (CCC) proposed by Bollerslev (1990), which is a multivariate GARCH model with time-varying conditional variances and covariance but constant conditional correlations. Since convergence is difficult to achieve with all five portfolios, we only use the smallest and highest portfolios (1st and 5th quintiles). The estimated system of equations is:

$$\begin{aligned} R_{1,t} &= \alpha_{1,0} + \alpha_{1,1}WIN_t + \alpha_{1,2}LOSS_t + \alpha_{1,3}FB_t + \alpha_{1,4}BJK_t + \alpha_{1,5}GS_t + \alpha_{1,6}R_{1,t-1} + \alpha_{1,7}R_{5,t-1} + \upsilon_{1,t} \\ R_{5,t} &= \alpha_{5,0} + \alpha_{5,1}WIN_t + \alpha_{5,2}LOSS_t + \alpha_{5,3}FB_t + \alpha_{5,4}BJK_t + \alpha_{5,5}GS_t + \alpha_{5,6}R_{1,t-1} + \alpha_{5,7}R_{5,t-1} + \upsilon_{5,t} \end{aligned} \quad (5)$$

$$\text{where } [\upsilon_{1,t}, \upsilon_{5,t}]' = \upsilon_t ; \upsilon_t / F_{t-1} \sim N(0, \Phi_t)$$

For simplicity, we assume that the ARCH matrix is diagonal. As shown in Table 5c, all the ARCH and GARCH coefficients are significant, indicating strong persistence effect. The estimated cross correlation is 0.507 indicating a positive relation between these portfolios. However, the win and loss coefficients are not significant for either portfolio. No team effect is detected neither.

Next, we sorted the firm-level data into five portfolios according to past returns (22-day moving average) of investors. It is expected that firms with higher past returns (fifth quintile) are more attractive to small individual investors than firms with smaller past returns (1st quintile).

[20] In this set of analyses, the interaction terms of win/loss with the team are not included to improve the convergence property of GARCH model.

Hypothesis 5: *With firm-level data sorted into five portfolios according to the moving average of 22-day past returns, if the sports-sentiment effect truly exists, firms with high profit should have larger sports-sentiment effect.*

Thus, the fifth quintile should have a larger sports-sentiment effect (Chang *et al*., 2012). However, results from GARCH (1, 1) model (as shown in Table 6a) show very weak evidence in support of significant sports-sentiment effect. Only the loss coefficient of the 5th quintile is significant. Sorting the portfolios into quartile (Table 6b) gives the same result. Similarly, using the multivariate GARCH, Table 6c shows mostly insignificant sports-sentiment effect.

4.2. Impact on the Variance Equation

Sporting events may not affect the mean returns. Is it possible that variance of sorted portfolio returns is affected by international soccer match results? A variance equation is augmented to equation (3). Our first finding is that *the impact of sporting events on stock return variance is stronger for small firms*. From Table 5a, the win effect is highest for the second quintile (2.978) and virtually zero for large firms. Similarly, the loss coefficient (3.24) of the variance equation is only significant for the second quintile. Note that some of the parameters are zero, which is the value that actually maximizes the log-likelihood[21]. The decreasing pattern of variance effect is more obvious when we sort the portfolios into quartiles, as indicated in Table 5b. Small firms have the highest loss effect (2.0) and there is no impact on firms with the largest capitalization.

Our second finding is that when firms are sorted into five portfolios according to moving average of 22-day past returns, *firms with lower profit (first quintile) tend to have larger variance after a match.* From Table 6a, the win coefficient is as high as 2.78 for the first quintile, declining gradually to 0.5039 of the forth quintile and eventually disappearing for the fifth quintile. There is no loss effect. The result remains the same when we sort the firms into four portfolios as shown in Table 6b.

The win (loss) variables of Tables 5b and 6b are replaced by the unexpected win (unexpected loss) as a final check of robustness. The findings of Tables 7a and 7b are consistent

[21] We restrict the variance equation parameters to some fixed values and see what effect it has on the loglikelihood. The loglikelihood for the first quintile is actually at maximum when the parameter on loss is restricted to zero. When it is restricted to some negative numbers, they lead to optimization failures with infeasible initial values; when it is restricted to small positive numbers, they lead to smaller loglikelihood than when restricted to zero. So the estimate and standard error on the variance equation parameter are both zero.

with those of Tables 5b and 6b that sporting events have no impact on the mean equation but have a significant effect on the variance equation.

5. Discussion

This study reexamines the sports-sentiment and investor-overreaction hypotheses in the event-study literature. Using 447 firm data from Borsa Istanbul from July 1, 1999-June 30, 2011, we do not find evidence for the null hypothesis once spatial and temporal effects are modeled explicitly. Instead of the conventional win/loss variables, two surprise variables are generated to test the overreaction hypothesis, which is rejected overwhelmingly under different criteria. We proceed to investigate the null hypothesis by sorted portfolios in a purely time-series setting. Economic-neutral events like international soccer matches still have no impact on firm return. However, we find evidence that sporting events have a significant impact on the variances of firms with smaller market capitalization and lower past returns.

There are a few limitations of this paper. For the estimation of equations (1) and (2), Edmans *et al.* (2007) and Kaplanski and Levy (2010) normalize the stock market returns by GARCH(1,1) volatility because the estimates will be biased downward if the stock returns exhibit time-varying volatilities. First, a GARCH (1, 1) model is estimated using equations (1) and (2). Then, the estimated conditional volatilities will be used to normalize the stock returns to have zero mean and standardized variance. No such adjustment is made in this paper. First, achieving convergence of equation (1) for all 447 firms simultaneously is almost impossible. Second, the temporal variation has been modeled by the Newey-West, and Driscoll and Kraay (1998) correction error.

The choice of sporting event is always subject to controversy. After all, there is no objective measure of match importance. For instance, the FIFA World Cup Qualifying games are not important to Germany or Italy; it can be big news if it is a win for China. A popular strategy is to test robustness by using different sporting event choices. As a robustness test, we decided to further screen out the sample. A stricter criterion is adopted in the preliminary analysis. The FIFA Confederation Cup and UEFA matches are dropped[22]. Nonetheless, the conclusions remain the same.

[22] The results were reported in the earlier version of this paper.

A minor concern is the estimation error carried over from equation (1) to equation (2), i.e., the measurement error of residuals from equation (1). As well documented in the literature, unless the measurement error is correlated to the explanatory variables, OLS is asymptotically valid under appropriate homoskedasticity assumptions. It is possible that omitted systematic factors can be correlated to market return in equation (1). With that said, the consequence is only large asymptotic variance, which has been adjusted in the second-step estimation.

References

Ashton, J.K., Gerrard, B., and Hudson, R., 2011. Do national soccer results really impact on the stock market? *Applied Economics*, 43(26), pp.3709-3717.

Asquith, P. and Mullins, D., 1986. Equity Issues and Offering Dilution. *Journal of Financial Economics*, 15(1-2), pp.61-89.

Altig, D., Chritiano, J., Eichenbaum, M., Linde, J., 2004. Firm Specific Capital, Nominal Rigidities, and the Business Cycle. *Mimeo*, Northwestern University.

Aydogan, K. and Booth, G.G., 2003. Calendar anomalies in the Turkish foreign exchange markets. *Applied Financial Economics*, 13(5), pp.353-360.

Baker, M. and Wurgler, J., 2006. Investor Sentiment and the Cross-section of Stock Returns. *Journal of Finance*, 61, pp.1645–1680.

Berument, H. and Ceylan, N.B., 2012. Effects of soccer on stock markets: The return–volatility Relationship. *The Social Science Journal*, 49(3), pp.368–374.

Berument, H., Coskun, M.N., and Sahin, A., 2007. Day of the week effect on foreign exchange market volatility: Evidence from Turkey. *Research in International Business and Finance*, 21(1), pp.87–97.

Boido, C., and A. Fasano. 2007. Football and Mood in Italian Stock Exchange. *The Icfai Journal of Behavioral Finance*, 4(4), pp. 32-50.

Bollerslev, T., 1990. Modeling the Coherence in Short-run Nominal Exchange Rates: A Multivariate Generalized ARCH Model. *The Review of Economics and Statistics*, 72 (3), pp.498–505.

Brown, G. and Hartzell, J. 2001. Market reaction to public information: The atypical case of the Boston Celtics, *Journal of Financial Economics*, 60(2-3), pp.333-370.

Cao, M. and Wei, J., 2005. Stock market returns: A note on temperature anomaly. *Journal of Banking & Finance*, 29(6), 1559-1573.

Chang, S.C., Chen, S.S., Chou, R.K., and LIn, Y.H., 2012. Local Sports Sentiment and Returns of Locally Headquartered Stocks: A Firm-Level Analysis. *Journal of Empirical Finance*, 19(3), pp.309-318.

Clarida, R., Gali, J., Gertler, M., 2002. A Simplified Framework for International Monetary Policy Analysis. *Journal of Monetary Economics*, 49, pp.879-904.

Demir, E. and Danis, H. 2011. The Effect of Performance of Soccer Clubs on Their Stock Prices: Evidence from Turkey. *Emerging Markets Finance and Trade*, 47(04S4), pp.58-70.

Demir, E., Lau, C.K.M, and Fung, K.W.T, 2014. The Effect of International Soccer Games On Turkish Lira/Euro & Turkish Lira/Us Dollar. *MPRA Working paper*.

Driscoll, J.C. and Kraay, A.C., 1998. Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *Review of Economics and Statistics*, 80(4), pp.549–560.

Eckbo, B., 1983. Horizontal Mergers, Collusion, and Stockholder Wealth. *Journal of Financial Economics*, 11(1-4), pp.241-276.

Edmans, A., Garcia, D., and Norli, O., 2007. Sports sentiment and stock returns. *Journal of Finance*, 62(4), pp.1967-1998.

Ehrmann, M. and Jansen, D.J., 2012. The Pitch Rather Than the Pit Investor Inattention During Fifa World Cup Matches. *ECB Working Paper Series*, 1424.

Eker, G., Berument, H., and Dogan, B., 2007. Football and Exchange Rates: Empirical Support for Behavioral Economics. *Psychological Reports*, 101(2), pp.643-654.

Gerlach, J.R., 2011. International sports and investor sentiment: do national team matches really affect stock market returns? *Applied Financial Economics*, 21(12), pp.863-880.

Hirshleifer, D. and Shumway, T., 2003. Good day sunshine: stock returns and the weather. *Journal of Finance*, 58(3), 1009–1032.

Hirt, E.R., Zillmann, D., Erickson, G.A., and Kennedy, C., 1992. Costs and benefits of allegiance: Changes in fans' self-ascribed competencies after team victory versus defeat. *Journal of Personality and Social Psychology*, 63(5), pp.724-738.

Kamstra, M.J., Kramer, L.A., and Levi, M.D., 2000. Losing sleep at the market: The daylight-savings anomaly. *American Economic Review*, 90(4), pp.1005–1011.

Kaplanski, G. and Levy, H., 2010. Exploitable Predictable Irrationality: The FIFA World Cup Effect on the U.S. Stock Market. *Journal of Financial and Quantitative Analysis*, 45(2), pp.535-553.

Ke, M.-C., Chiang, Y.-C., and Liao, T.L., 2007. Day-of-the-week effect in the Taiwan foreign exchange market. *Journal of Banking and Finance*, 31(9), pp.2847-2865

Kerr, J.H., Wilson, G.V., Nakamura, I., and Sudo, Y., 2005. Emotional dynamics of soccer fans at winning and losing games. *Personality and Individual Differences*, 38(8), pp.1855-1866.

King, R.G., Plosser, C., 1984. Money, Credit, and Prices in a Real Business Cycle. *American Economic Review,* 64, 363-380.

Levy, T. and Yagil, J., 2011. Air pollution and stock returns in the US. *Journal of Economic Psychology*, 32(3), pp.374-383.

Palomino, F., Renneboog, L., and Zhang, C., 2009. Information salience, investor sentiment, and stock returns: The case of British soccer betting. *Journal of Corporate Finance*, 15(3), pp.368-387.

Petersen, M.A., 2009. Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies,* 22(1), pp.435-480.

Rodrik, D., 2012. The Turkish Economy after the Global Financial Crisis. *Ekonomi-tek Volume,* 1(1), pp.41-61.

Saunders, E.M., 1993. Stock prices and Wall Street weather. *American Economic Review*, 83(5), pp.1337–1345.

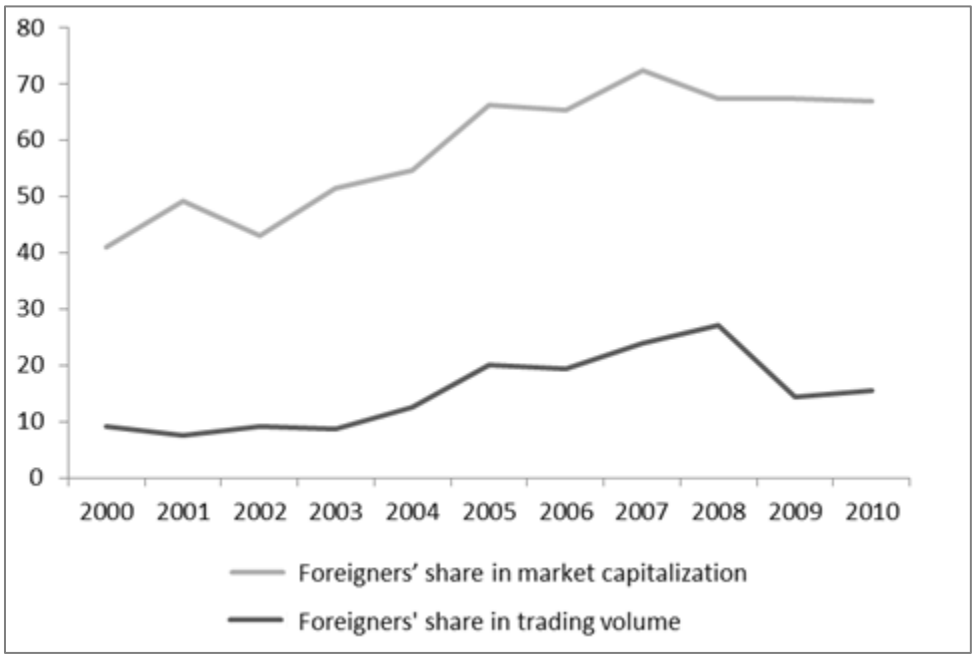
Scholtens, B. and Peenstra, W., 2009. Scoring on the Stock Exchange? The effect of football matches on stock market returns: An event study. *Applied Economics,* 41(25), pp.3231-3237.

Stadtmann, G., 2006. Frequent News and Pure Signals: The Case of a Publicly Traded Football Club. *Scottish Journal of Political Economy,* 53(4), pp.485-504.

Yuan, K., Zheng, L., and Zhu, Q., 2006. Are investors moonstruck? lunar phases and stock returns. *Journal of Empirical Finance,* 13(1), pp.1–23.

Zuber, R. A., Yiu, P., Lamb, R.P. and Gandar, J.M., 2005. Investor-fans? An examination of the performance of publicly traded English Premier League teams. *Applied Financial Economics*, 15(5), pp.305-313.

Figure 1. Foreigners' share in the Istanbul Stock Exchange



Source: Istanbul University SERPAM, Turkish Capital Market Report 2012 and Gedik Yatırım, BIST Equity Market Foreigners' Trade, May 2013.

Table 1. Test of Sport Sentiment Effect by Seemingly Unrelated Regression

Period	**7/1/1999-6/30/2011**		**7/1/1999-12/31/2005**		**1/1/2006-6/30/2011**	
Parameter	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.0204	0.0449**	-0.3281	0.1032	0.3308	0.0951*
win	0.2860	0.1225	0.7279	0.0128**	-0.3653	0.1033
loss	-0.9575	0.0007***	-0.9167	0.0597*	-0.7793	0.5046
National	-0.1037	0.5611	-0.0883	0.7835	-0.0508	0.8736
fb	0.2347	0.4343	0.1669	0.907	0.0088	0.9668
BJK	0.0878	0.5247	0.3249	0.0875*	0.1287	0.7837
gs	-0.6656	0.0427**	0.5065	0.0011***	-0.0243	0.7801
fbwin	-0.8351	0.088*	-0.6509	0.7367	-0.3201	0.2375
BJKwin	-0.1168	0.6418	-0.7194	0.0224**	0.3589	0.2437
gswin	-1.4008	0.0147**	-2.3987	0.0262**	0.0592	0.8098
fbloss	0.5819	0.1897	0.6733	0.5324	0.7945	0.5759
bjkloss	0.4296	0.0695*	0.5933	0.3986	-0.1776	0.8206
gsloss	0.7592	0.1049	0.0026	0.9986	1.4703	0.1917
F-Statistics	25.66	0.00	14.84	0.00	37.68	0.00

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variable is the residuals collected from equation (1). Win and loss are indicators of international soccer match results. National, FB, BJK and GS are dummies for national team, Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). The other variables are interaction terms, for instance, fbwin is Fenerbahce multiplying the win parameter.

Table 2. Test of Sport Sentiment Effect by Panel Data Analysis

Period	7/1/1999-6/30/2011				7/1/1999-12/31/2005				1/1/2006-6/30/2011			
	Newey-West		Driscoll-Kraay		Newey-West		Driscoll-Kraay		Newey-West		Driscoll-Kraay	
Parameter	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.0204	0.471	0.0205	0.941	-0.3281	0.00***	-0.3289	0.574	0.3308	0.00***	0.3309	0.00***
win	0.2860	0.336	0.2861	0.55	0.7279	0.106	0.7176	0.376	-0.3653	0.357	-0.3647	0.361
loss	-0.9575	0.085*	-0.9574	0.263	-0.9167	0.117	-0.9401	0.459	-0.7793	0.521	-0.6837	0.46
National	-0.1037	0.688	-0.1039	0.844	-0.0883	0.832	-0.1004	0.919	-0.0508	0.863	-0.0559	0.847
fb	0.2347	0.46	0.2349	0.611	0.1669	0.907	0.1954	0.812	0.0088	0.972	0.0035	0.994
BJK	0.0878	0.682	0.0873	0.817	0.3249	0.17	0.3545	0.589	0.1287	0.795	0.1356	0.687
gs	-0.6656	0.891	-0.0251	0.947	0.5065	0.051*	0.5444	0.41	-0.6656	0.00***	-0.6721	0.002***
fbwin	-0.8351	0.064*	-0.8353	0.233	-0.6509	0.668	-0.6868	0.517	-0.3201	0.510	-0.3216	0.657
BJKwin	-0.1168	0.763	-0.1161	0.837	-0.7194	0.178	-0.7408	0.408	0.3589	0.587	0.3566	0.523
gswin	-1.4008	0.002***	-1.4011	0.043**	-2.3987	0.001***	-2.3732	0.023**	0.0592	0.898	0.0609	0.94
fbloss	0.5819	0.384	0.5816	0.558	0.6733	0.666	0.6427	0.665	0.7945	0.528	0.7027	0.505
bjkloss	0.4296	0.49	0.4300	0.648	0.5933	0.403	0.5870	0.664	-0.1776	0.893	-0.2792	0.798
gsloss	0.7592	0.234	0.7594	0.415	0.0026	0.997	0.0179	0.99	1.4703	0.234	1.3746	0.156

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variable is the residuals collected from equation (1). Win and loss are indicators of international soccer match results. National, FB, BJK and GS are dummies for national team, Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). The other variables are interaction terms, for instance, fbwin is Fenerbahce multiplying the win parameter.

Table 3. Test of Sport Sentiment Effect Excluding Monday Matches and Sport-Related Firms

	Seemingly Unrelated Regression (cluster effect)		**Newey-West**		**Driscoll-Kraay**	
Parameter	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.0204	0.045**	0.0204	0.471	0.0205	0.941
win	0.1681	0.339	0.1681	0.556	0.1686	0.683
loss	1.4141	0.003***	1.4141	0.021**	1.4137	0.103
National	0.0130	0.933	0.0130	0.958	0.0126	0.978
fb	0.2347	0.434	0.2347	0.46	0.2349	0.611
BJK	0.0878	0.525	0.0878	0.682	0.0873	0.817
gs	0.0243	0.78	0.0243	0.891	0.0250	0.947
fbwin	0.7172	0.155	0.7172	0.105	0.7177	0.274
BJKwin	0.0011	0.996	0.0011	0.998	0.0014	0.998
gswin	1.2829	0.02**	1.2829	0.004***	1.2835	0.048**
fbloss	1.0385	0.123	1.0385	0.148	1.0380	0.301
bjkloss	0.8862	0.018**	0.8862	0.189	0.8863	0.353
gsloss	1.2158	0.00***	1.2158	0.078*	1.2157	0.197

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

The dependent variable is the residuals collected from equation (1). Win and loss are indicators of international soccer match results. National, FB, BJK and GS are dummies for national team, Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). The other variables are interaction terms, for instance, fbwin is Fenerbahce multiplying the win parameter.

Table 4. Impact of Unexpected Match Results on Firm Returns

	Seemingly Unrelated Regression (cluster effect)		Newey-West		Driscoll-Kraay	
Parameter	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.0204	0.045**	0.0204	0.471	0.0205	0.941
Unexpectedwin	0.3158	0.521	0.3158	0.567	0.3153	0.683
Unexpectedloss	-0.6797	0.014**	-0.6797	0.24	-0.6803	0.295
national	-0.1481	0.112	-0.1481	0.37	-0.1482	0.7
fb	0.2347	0.434	0.2347	0.46	0.2349	0.611
BJK	0.0878	0.525	0.0878	0.682	0.0873	0.817
gs	-0.0243	0.78	-0.0243	0.891	-0.0251	0.947
fbwin	-0.5155	0.266	-0.5155	0.135	-0.5156	0.332
BJKwin	0.1958	0.257	0.1958	0.439	0.1966	0.523
gswin	-1.1043	0.056*	-1.1043	0.001***	-1.1045	0.025**
fbloss	-0.1936	0.505	-0.1936	0.635	-0.1935	0.703
bjkloss	-0.3891	0.001***	-0.3891	0.194	-0.3884	0.385
gsloss	-0.0584	0.911	-0.0584	0.879	-0.0580	0.892

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variable is the residuals collected from equation (1). Unexpectedwin and Unexpectedloss are indexes measuring surprise match results. National, FB, BJK and GS are dummies for national team, Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). The other variables are interaction terms, for instance, fbwin is Fenerbahce multiplying the win parameter.

Table 5a. GARCH(1,1) Estimation of Sorted Portfolios (Quintile) by Market Capitalization

Quintile		Mean Equation								Variance Equation				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	-0.1019	0.5634	-0.498	0.107	0.1934	-0.5901	-0.1739	0.2072	0.4767	0.35	0.6293	0	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.734	0.5873	0.0772*	0.7011	0.5439	<.0001***	<.0001***	<.0001***	0	0
2	Estimate	-0.0251	0.673	-0.5045	0.527	-0.9214	0.4465	0.2711	0.2319	1.2195	0.318	0.6093	2.978	3.2407
	Pr > |t|	0.5334	<.0001***	<.0001***	0.418	0.1031	0.4599	0.6248	0.724	<.0001***	<.0001***	<.0001***	0.002***	0.0002***
3	Estimate	-0.062	0.5928	-0.5075	0.3341	0.0575	-0.5014	-0.3066	-0.1696	0.067	0.2054	0.815	0.4797	0.015
	Pr > |t|	0.0127**	<.0001***	<.0001***	0.3662	0.8576	0.1218	0.443	0.7072	<.0001***	<.0001***	<.0001***	0.0149**	0.9163
4	Estimate	-0.0422	0.6527	-0.5141	-0.6094	-0.7973	0.009148	0.758	0.8904	0.0794	0.2272	0.7971	1.4899	0
	Pr > |t|	0.1046	<.0001***	<.0001***	0.075*	0.0011***	0.9761	0.0007***	<.0001***	<.0001***	<.0001***	<.0001***	<.0001***	0
5	Estimate	-0.124	0.8546	-0.4975	0.5335	0.1584	-0.594	-0.1924	-0.2431	0.1161	0.1481	0.8209	0	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.0905*	0.6415	0.0871*	0.6003	0.4077	<.0001***	<.0001***	<.0001***	0	0

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).

Table 5b. GARCH(1,1) Estimation of Sorted Portfolios (Quartile) by Market Capitalization

Quartile		Mean Equation								Variance Equation				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	-0.0762	0.5943	-0.4729	0.073	-0.224	-0.6329	0.244	0.3986	0.3829	0.2796	0.6837	0.	2.0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.8260	0.5654	0.0786	0.6193	0.2402	<.0001***	<.0001***	<.0001***	0	<.0001***
2	Estimate	-0.05	0.6602	-0.4883	-0.0206	-0.3633	-0.2066	-0.2338	1.2351	0.0779	0.1294	0.8746	0.7693	1.0273
	Pr > |t|	0.1631	<.0001***	<.0001***	0.9712	0.4525	0.6666	0.6774	0.0273	<.0001***	<.0001***	<.0001***	0.0003***	<.0001***
3	Estimate	-0.039	0.6183	-0.5135	-0.0768	-0.0658	-0.3559	-0.1592	-0.1007	0.0555	0.1744	0.8367	0.742	0
	Pr > |t|	0.1312	<.0001***	<.0001***	0.8164	0.8365	0.2964	0.6438	0.7627	<.0001***	<.0001***	<.0001***	<.0001***	0
4	Estimate	-0.1167	0.8187	-0.4958	0.3943	-0.0369	-0.4452	-0.0524	-0.0991	0.091	0.1444	0.8342	0.0823	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.1967	0.9091	0.1797	0.8848	0.7413	<.0001***	<.0001***	<.0001***	0.5402	0

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).

Table 5c. Multivariate GARCH Estimation of Sorted Portfolios by Market Capitalization

Quintile		Mean Equation								GARCH Model Parameter Estimates				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	0.60931	0.14603	0.15697	-0.517	-0.1339	0.15678	-0.4698	0.00633	0.50615	2.71415	2.01605	0.664	0.52793
	P value	0.0001***	0.6383	0.6412	0.143	0.7145	0.6173	0.0001***	0.6724	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
5	Estimate	0.90539	0.49666	0.16362	-0.729	-0.2002	-0.3652	-0.0633	-0.4406					
	P value	0.0001***	0.0624*	0.5855	0.021**	0.5436	0.1902	0.0001***	0.0001***					

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns with lowest and highest market capitalization. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). R1(t-1) and R5(t-1) are the lagged returns of portfolios with lowest and highest market size, respectively. CCC represents the constant conditional correlation. GCHC(1,1) and GCHC(2,2) are the diagonal elements of the GARCH components. ARCH (1,1,1) and ARCH(1,2,2) are the diagonal elements of the ARCH components

Table 6a. GARCH(1,1) Estimation of Sorted Portfolios (Quintile) by Past Returns (22-Day Moving Average)

Quintile		Mean Equation								Variance Equation				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	-0.1398	0.6798	-0.4958	-0.0593	0.2443	-0.2182	-0.2596	0.1578	0.4463	0.2577	0.6809	2.7837	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.8905	0.5498	0.6181	0.5518	0.6949	<.0001***	<.0001***	<.0001***	<.0001***	0
2	Estimate	-0.0869	0.6475	-0.5029	0.2116	0.2292	-0.4375	-0.5752	-0.1461	0.13	0.3255	0.6741	0.5342	0.1029
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.3621	0.3001	0.0489**	0.0243**	0.5693	<.0001***	<.0001***	<.0001***	0.0016***	0.4984
3	Estimate	-0.0653	0.6478	-0.5249	0.2397	-0.0141	-0.3243	-0.1825	-0.0578	0.106	0.2621	0.7261	0.4638	0
	Pr > |t|	0.0022***	<.0001***	<.0001***	0.3191	0.9471	0.1307	0.4859	0.8087	<.0001***	<.0001***	<.0001***	0.0004***	0
4	Estimate	-0.0673	0.6647	-0.5242	0.1457	0.0418	-0.3225	-0.2509	-0.138	0.1012	0.2259	0.7514	0.5039	0
	Pr > |t|	0.0016***	<.0001***	<.0001***	0.5019	0.8485	0.1816	0.3513	0.4643	<.0001***	<.0001***	<.0001***	0.0005***	0
5	Estimate	-0.0298	0.651	-0.4958	-0.038	-0.9596	0.1246	0.4012	0.04	0.0424	0.0732	0.9272	0.003442	0.2745
	Pr > |t|	0.5183	<.0001***	<.0001***	0.9438	0.0463**	0.8334	0.4306	0.9544	<.0001***	<.0001***	<.0001***	0.9922	0.4075

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).

Table 6b. GARCH(1,1) Estimation of Sorted Portfolios (Quartile) by Past Returns (22-Day Moving Average)

Quartile		Mean Equation								Variance Equation				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	-0.1204	0.653	-0.4991	0.0068	0.266	-0.2827	-0.3928	0.0679	0.3662	0.3023	0.649	2.254	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.9853	0.4508	0.4582	0.2867	0.8448	<.0001***	<.0001***	<.0001***	<.0001***	0
2	Estimate	-0.0816	0.6487	-0.5044	0.2449	0.1153	-0.2799	-0.4593	-0.134	0.1214	0.3018	0.689	0.6401	0.175
	Pr > |t|	0.0002***	<.0001***	<.0001***	0.3251	0.6368	0.2319	0.0926*	0.632	<.0001***	<.0001***	<.0001***	<.0001***	0.221
3	Estimate	-0.0675	0.6467	-0.5248	0.1418	0.0081	-0.3	-0.2283	-0.0687	0.1084	0.2793	0.7083	0.5361	0
	Pr > |t|	0.001***	<.0001***	<.0001***	0.4664	0.9676	0.1823	0.3588	0.6981	<.0001***	<.0001***	<.0001***	0.0004***	0
4	Estimate	-0.035	0.6594	-0.4952	-0.1207	-0.8568	0.0304	0.3669	0.1022	0.0344	0.0712	0.9282	0.0258	0.1325
	Pr > |t|	0.3869	<.0001***	<.0001***	0.7931	0.0484**	0.9513	0.4222	0.8625	<.0001***	<.0001***	<.0001***	0.9187	0.5939

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).

Table 6c. Multivariate GARCH Estimation of Sorted Portfolios by Past Returns (22-Day Moving Average)

Quintile		Mean Equation								GARCH Model Parameter Estimates				
		Intercept	IST(t)	LR(t-1)	WIN(t)	LOSS(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	0.6850	0.5017	0.6162	-0.7287	-0.5103	-0.2654	-0.4710	-0.0282	0.1472	3.4866	11.6595	0.5009	1.2322
	P value	0.0001***	0.1565	0.1362	0.0764*	0.2578	0.4608	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
5	Estimate	0.7085	-1.2328	-1.7239	0.5965	-1.6981	-3.3436	0.0580	-0.4124					
	P value	0.0001***	0.0679*	0.0102**	0.4436	0.0144**	0.0001***	0.0071***	0.0001***					

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns with lowest and highest past return. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS). R1(t-1) and R5(t-1) are the lagged returns of portfolios with lowest and highest past returns, respectively. CCC represents the constant conditional correlation. GCHC(1,1) and GCHC(2,2) are the diagonal elements of the GARCH components. ARCH (1,1,1) and ARCH(1,2,2) are the diagonal elements of the ARCH components

Table 7a. GARCH(1,1) Estimation of Sorted Portfolios (Quartile) by Market Capitalization –Unexpected Match Results

Quintile		Mean Equation											Variance Equation	
		Intercept	IST(t)	LR(t-1)	Unexpected Win(t)	Unexpected Loss(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	Unexpected WIN(t)	Unexpected LOSS(t)
1	Estimate	-0.0817	0.5907	-0.471	-0.2	-0.7935	-0.0705	0.1472	0.4146	0.342	0.2695	0.7007	2.5944	11.3408
	Pr > |t|	0.0031***	<.0001***	<.0001***	0.5006	0.5599	0.813	0.6653	0.1055	<.0001***	<.0001***	0	<.0001***	<.0001***
2	Estimate	-0.0409	0.653	-0.4908	1.5005	-0.6309	-0.1273	-0.396	1.1699	0.131	0.1478	0.8569	3.0255	3.2912
	Pr > |t|	0.2631	<.0001***	<.0001***	0.3331	0.5158	0.6534	0.1227	0.0028***	<.0001***	<.0001***	<.0001***	0.0004***	<.0001***
3	Estimate	-0.038	0.6142	-0.5179	-0.8152	-0.1445	-0.3908	-0.1485	-0.1722	0.0614	0.1702	0.8421	0.9879	0
	Pr > |t|	0.1403	<.0001***	<.0001***	0.3052	0.8154	0.0034***	0.418	0.5019	<.0001***	<.0001***	<.0001***	0.1129	0
4	Estimate	-0.1191	0.8206	-0.4955	-0.5633	-0.3108	-0.2556	0.0794	0.0452	0.1056	0.159	0.8186	1.3828	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.67	0.6434	0.2639	0.7482	0.8502	<.0001***	<.0001***	<.0001***	0.0002***	0

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).

Table 7b. GARCH(1,1) Estimation of Sorted Portfolios (Quartile) by Past Returns –Unexpected Match Results (22-Day Moving Average)

Quartile		Mean Equation								Variance Equation				
		Intercept	IST(t)	LR(t-1)	Unexpected Win(t)	Unexpected Loss(t)	fb(t)	BJK(t)	gs(t)	ARCH(0)	ARCH(1)	GARCH(1)	WIN(t)	LOSS(t)
1	Estimate	-0.1192	0.6581	-0.4964	0.0162	-0.0916	-0.2205	-0.1745	0.1562	0.4289	0.2903	0.6513	2.2897	0
	Pr > |t|	<.0001***	<.0001***	<.0001***	0.9859	0.8955	0.1854	0.4778	0.4184	<.0001***	<.0001***	<.0001***	0.089*	0
2	Estimate	-0.0727	0.6462	-0.505	-0.4909	-0.0839	-0.1686	-0.3593	-0.0378	0.131	0.3049	0.6921	1.3603	0.1306
	Pr > |t|	0.001***	<.0001***	<.0001***	0.0619*	0.8329	0.0611*	0.0155**	0.8502	<.0001***	0	0	0	0.7299
3	Estimate	-0.0654	0.6451	-0.5258	0.3271	-0.4514	-0.1414	-0.1	-0.0097	0.1122	0.2715	0.7172	0.0581	0
	Pr > |t|	0.0016***	<.0001***	<.0001***	0.6318	0.2612	0.2402	0.6009	0.9434	<.0001***	<.0001***	<.0001***	0.8779	0
4	Estimate	-0.0355	0.6597	-0.4946	0.6012	-1.3197	-0.1507	-0.0634	-0.1472	0.0353	0.0708	0.9288	0	0
	Pr > |t|	0.3787	<.0001***	<.0001***	0.6383	0.1608	0.6822	0.8363	0.7825	<.0001***	<.0001***	<.0001***	0	0

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
The dependent variables are the portfolio returns sorted by market capitalization. The 1st quintile has the smallest market size. IST denotes the daily (closing) Istanbul Stock Exchange 100 returns; LR denotes the lagged portfolio return. Win and loss are indicators of international soccer match results. FB, BJK and GS are dummies for Fenerbahce (FB), Besiktas (BJK), and Galatasaray (GS).
are the diagonal elements of the ARCH components.