JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 45, No. 2, Apr. 2010, pp. 535–553

doi:10.1017/S0022109010000153

Exploitable Predictable Irrationality: The FIFA World Cup Effect on the U.S. Stock Market

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Abstract

In a recently published paper, Edmans, García, and Norli (2007) reveal a strong association between results of soccer games and local stock returns. Inspired by their work, we propose a novel approach to exploit this effect on the aggregate international level with the following three unique features: i) The aggregate effect does not depend on the games' results; hence, the effect is an exploitable predictable effect. ii) The aggregate effect is based on many games; hence, it is very large and highly significant. We find that the average return on the U.S. market over the World Cup's effect period is −2.58%, compared to +1.21% for all-days average returns over the same period length. iii) Exploiting the aggregate effect is involved with trading in a single index for a relatively long period.

I. Introduction

Numerous studies document an association between stock returns and investor sentiment.[1] In a recent study, Edmans, García, and Norli (EGN) (2007) reveal a strong association between results of soccer games and local stock returns.[2] They investigate 39 stock markets and find an asymmetric effect, where losses have a significant negative effect in the losing countries' local markets,

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[1]See, for example, Saunders (1993), Hirshleifer and Shumway (2003), Kamstra, Kramer, and Levi (2000), (2003), (2007), Frieder and Subrahmanyam (2004), Loughran and Schultz (2004), and Cao and Wei (2005). For a comprehensive survey of the literature on behavioral biases and their influence on the stock market, see Shiller (2000), Hirshleifer (2001), and Shefrin (2002).

[2]In the U.K. market, Ashton, Gerrard, and Hudson (2003) reveal a strong association between the performance of England's soccer team and subsequent daily changes in the Financial Times Stock Exchange (FTSE) 100 Index.

whereas victories do not have a significant effect.[3] Generally speaking, one cannot economically exploit the local effect because, once the game result is known, it is too late to sell stocks of the losing country, as prices are already lower. In principle, one can profit by holding short positions on the stocks of both countries: One will make a profit in the losing country and will neither lose nor gain abnormal profits in the winning country. However, as EGN (2007) note, the profits from this strategy are probably insufficient to cover the transaction costs involved in investing in two markets for a single day.

In this study, we develop a practical method to exploit the asymmetric characteristic of the soccer sentiment effect. This method is not only highly profitable on average, even when transaction costs are incorporated, but also dominates the buy-and-hold strategy by the mean-variance criterion. We propose a different approach to exploit the soccer sentiment effect that is based on the aggregate effect that spills over from the numerous local markets to the U.S. market. The main hypothesis is that during the World Cup period a global negative effect is induced by all losing countries' fans at an international level. This hypothesis is based on the relatively large proportion of investors in any given country who invest internationally, mainly in the U.S. market. For example, in 2006 the transactions conducted by foreign investors in the U.S. stock market (equity only) constituted 33% of all transactions. Thus, if there is a negative market sentiment effect driven by the losing country's investors, the change in the investment proportions in risky and riskless assets is not confined to the local stock market: We also expect a negative effect in the U.S. market. Besides the local effect in each losing country's market, we predict that the aggregate effect of all games in a round, which is negative due to the asymmetry found by EGN (2007), will spill over to the U.S. market. In addition to the asymmetry claim, with each round of the World Cup the number of losing countries increases, until eventually there is only one winning country and dozens of losing countries. As the number of losing countries increases, we expect the aggregate effect on the U.S. stock market to be even larger than the local market effect. This is because, although each game may have a lower impact on the U.S. market than on the local market, the U.S. market is affected by many more games.

Our proposed approach to exploiting the effect offers three major features: First, on theoretical grounds, our approach does not depend on the game results, as the investment strategy is employed on the U.S. market and not on the losing country local market. Hence at each round, the aggregate effect is the net sum of all losing countries' negative effects. As the aggregate effect does not depend on the game results, it is an exploitable predictable effect.

Second, as the effect is based on about 30 losing countries and numerous games, it is large, highly significant, and long lasting. The average return on the

[3]EGN (2007) provide three explanations for this asymmetry: i) Many studies show a significant difference in the behavior of fans following wins and losses, where the impact in the latter case is much stronger. ii) If we assume that the reference point of soccer fans is that their team will win (which is usually the case due to fans' "allegiance bias") then, according to Kahneman and Tversky's (1979) prospect theory, the impact of a loss would be much stronger than the impact of a win. iii) There are completely different repercussions to a win than to a loss in the World Cup; a loss means that the team is no longer in the competition, whereas a win merely advances the team to the next step.

U.S. market over the World Cup's global effect days is -2.58%, compared to $+1.21\%$ for all-days average returns over the same period length.[4] Finally, on technical grounds, the proposed strategy to exploit the effect is employed on a single index, in the most liquid market in the world, and for the relatively long period of a month. Thus, the associated transaction costs are small relative to the abnormal profits.

The remainder of the paper is organized as follows. Section II presents some background for the event variable and the theoretical justification for the selection of the U.S. market. Section III presents the methodology used to investigate the significance of the effect. Section IV provides the regression results and robustness checks. Section V presents a trading strategy aiming to exploit the effect, and the resulting abnormal profits. Section VI concludes the paper.

II. Motivation, Theoretical Background, and Handling Spurious Correlations

In this section, we first briefly explain why the World Cup games may affect investor sentiment. Second, we explain why the U.S. market is expected to be affected by this sentiment despite the fact that soccer is not very popular in the U.S. Third, we review the sources of possible spurious correlations that may distort our results and explain how we handle these problems.

A. Soccer Games, the World Cup, and Mood

As EGN (2007) provide a detailed survey of the psychological evidence that soccer affects mood and the reader can find a detailed analysis of this issue in their study, in the following text we only discuss the effect of the World Cup on people. Outside North America, soccer is the most popular sport and the Fédération Internationale de Football Association (FIFA) World Cup is the most prominent sporting event (second, perhaps, only to the Olympic Games). For example, in a 2006 report from the Hudson Company,[5] 70% of men and 62% of women residing in England said that the coming 2006 World Cup would have an impact on their working lives. The importance of the World Cup is also reflected in the vast media coverage, the huge TV audience, and the great interest that can be seen from related activities such as fan clubs, merchandise sales, politicians' involvement, etc. For example, according to a FIFA marketing report,[6] the 2006 FIFA World Cup in Germany had a cumulative (with duplicates) television audience of 26.29 billion, with 376 channels showing the event and a total of 43,600 broadcasts across 214 countries and territories. The most-watched game was the Italy versus France final, with a total cumulative audience of 715.1 million viewers. This number is much larger than the number of citizens of these two countries, indicating that it may have a global rather than a regional effect. Consistent with this immense

[4]The t-values corresponding to the effect range, in absolute terms, from 3.32 to 4.82, depending on the model employed.

[5]The report can be found at http://www.sirc.org/publik/sport_and_the_workplace.pdf

[6]See http://www.fifa.com/aboutfifa/marketing/factsfigures/tvdata.html

role soccer plays in many people's lives, EGN (2007) reveal that important soccer games affect market sentiment, thus affecting stock prices.

B. The World Cup Soccer Games and the U.S. Market

As soccer is not very popular in the U.S., selecting this market to exploit EGN's local effect appears unnatural at first glance. However, looking at international investments in the U.S., we find that the U.S. market is the most appealing market to exploitation of the effect for the following reasons: First, the U.S. market is probably unaffected by unknown U.S. team results, as soccer is not very popular in the U.S. Second, the U.S. market is very liquid, with relatively low transaction costs. Third and most important, many foreign investors invest in the U.S. market. Thus, if soccer games are involved in producing a negative sentiment effect, there is no reason that this effect should be confined to the local market.

To give a sense of the magnitude of international investments in general, and the investments in the U.S. equity market in particular, Table 1 reports the proportion of investments held abroad in 2004 by investors from various countries and the amount invested by foreign investors in the U.S. equity market over 3 years.

TABLE 1

Foreign Holdings of U.S. Securities by Country of Holder

Table 1 reports the value of the foreign holdings of U.S. corporate equity securities and the percentage of the equity portfolios of each country held in foreign markets. NA indicates not available.

	Value of Held U.S. Corporate Equity[a] (in billions of dollars)			Share of Equity Portfolio Held in Foreign Markets[b] (%)
Country	2004	2005	2006	2004
United Kingdom	292.4	291.4	390.3	25.30%
Belgium and Luxembourg	162.6	191.9	241.3	29.00%
The Netherlands	156.5	163.1	173.7	62.80%
Switzerland	134.4	139.8	159.2	20.10%
France	67.4	82.9	118.8	15.90%
Germany	81.9	80.2	77.3	26.10%
Sweden	49.9	47.7	50.3	32.10%
Denmark	23.1	26.4	32.7	31.90%
Italy	34.2	30.2	30.5	18.40%
Canada	220.2	253.6	311.0	23.00%
Japan	179.4	187.6	214.8	9.20%
Caribbean financial centers	281.7	317.2	388.8	NA
Latin America	31.8	33.9	40.0	NA
Other European countries	96.3	108.8	126.9	NA
Other Asian countries	76.7	80.8	95.3	NA
Africa	4.9	4.7	5.1	NA
Other countries (mainly Australia)	67.0	69.7	82.7	NA
Total corporate stocks	1,960.4	2,109.9	2,538.7	

[a]Source: U.S. Bureau of Economic Analysis, *Survey of Current Business* (July 2007).
[b]Source: Faruqee, Li, and Yan (2004), based on the Coordinated Portfolio Investment Survey (CPIS) data of the International Monetary Fund (IMF).

For example, in 2006 the total amount invested by foreign investors in the U.S. equity market was about $2,538.7 billion. As can be seen from Table 1, this large amount should not come as a surprise, since many European countries invest about one-third of their portfolio abroad, with the Netherlands showing 62.8%. Thus, a lot of foreign money is invested in the U.S., and if part of a portfolio is liquidated, it is reasonable to assume that the investment in this market will not escape this decision.

The role of foreign investors in the U.S. market is even more apparent when looking at the proportion of transactions conducted by foreign investors in the U.S. For example, out of the total activity in U.S. equity securities in all U.S. exchanges, the share of transactions in which at least one side was a foreign investor equaled 17% ($362 billion) in 1990, and this increased more or less linearly up to 33% in 2006 ($13,657 billion).[7] Finally, about one-third of the companies listed on the New York Stock Exchange (NYSE) are foreign.[8] Hence, selling stocks of a local and well-known firm may affect the U.S. market. Moreover, some of these firms have dual listings; hence, selling the stock on the local market will also affect the stock price in the U.S. market; otherwise, arbitrage opportunity emerges. Thus, if a soccer game affects the losing country's local market, the World Cup effect on the U.S. market may be even larger, as the U.S. market is affected by the investors of all losing countries.

C. Exploitable Effect or Spurious Correlations?

In this study, we document significant negative rates of return in the U.S. during the World Cup. Although the findings of EGN (2007) regarding the negative effect in the local markets are well established, our hypothesis that the local effect spills over to the U.S. market through foreign trading is yet to be tested. Thus, our results may be spurious. Below, we identify several factors that may induce spurious correlation and then explain the empirical methods we employ to verify that they are not spurious.

i) It is possible that one of the World Cups occurred in an exceptionally bad year in the U.S. stock market, and this year affects the mean rate of return of all World Cup days. Thus, the results may be due to this outlier year rather than due to the effect. We test such a possibility in two ways. First, we analyze the rate of return on each World Cup period relative to the rate of return on this World Cup year. Thus, if the World Cup occurs in a bad year, we examine the hypothesis asserting that the days of the World Cup within this year are even worse than the average return during this bad year. Second, we run the regressions after eliminating the outlier years in which the World Cup took place.

ii) It is possible that the non-World Cup years are better years, on average, than the World Cup years; hence, the relatively low returns on the World Cup days, and the difference between returns on World Cup days and on non-World Cup days, could have occurred by mere chance. We handle this issue in two ways. First, we calculate the mean returns corresponding to the World Cup years and the non-World Cup years and conduct a t-test. The null hypothesis that the means are equal cannot be rejected with a t-value of 0.94. Second, we also run the regression

[7]The data on total transaction activity are taken from the U.S. Securities and Exchange Commission, and the data on foreign investor activity are taken from the U.S. Department of the Treasury, Treasury Bulletin.

[8]For example, in 2006 the market capitalization of non-U.S. companies was about 38% of the NYSE total market capitalization (NYSE Fact Book, http://www.nyse.com/about/publication/1179138438842.html).

for the years of the World Cup only, making the argument that the World Cup years are relatively bad years irrelevant.

iii) Another possibility is that some events that affect the U.S. market, for example, a war, have occurred during the World Cup; hence, the association found could be spurious. We handle this issue in two ways. First, we search for all major events with effects on the U.S. stock market that occurred during the 58-year period studied, and if they occurred close to the time of the World Cup the year is eliminated from the regression. Indeed, we also run the regression without 1950, as in this year the World Cup and the beginning of the Korean War overlapped. In addition, we run the regressions with a dummy variable for extreme days in the stock market (including the day the Korean War began), aiming to capture extreme events unrelated to the World Cup.

iv) The World Cup always takes place in June and July.[9] Thus, one may suspect that the results are due to a seasonal effect occurring in June and July rather than due to the World Cup. We handle this possibility in two ways. First, in the general tests we add a June–July annual dummy variable aiming to capture any annual seasonal effect during this period of the year. Second, we also run the regressions when the data are composed of only June and July days of the 58-year period (recall that the World Cup falls during the June–July period once every 4 years). Thus, we compare the returns on June–July during the World Cup to the returns on June–July in years without the World Cup.

III. Methodology

Our null hypothesis is that the U.S. market is efficient and no exploitable abnormal profits exist. The alternative hypothesis is that the event coefficient is statistically significant. To test the null hypothesis, we first adopt the same methodology used in previous event studies (e.g., Kamstra, Kramer, and Levi (2003) and EGN (2007); for more on event study methodologies, see Brown and Warner (1985)) and run the following regression:

$$(1) \qquad R_t = \gamma_0 + \sum_{i=1}^{2} \gamma_{1i} R_{t-i} + \sum_{i=1}^{4} \gamma_{2i} D_{it} + \gamma_3 H_t + \gamma_4 T_t + \gamma_5 P_t + \gamma_6 E_t + \sum_{i=1}^{2} \gamma_{7i} J_{it} + \varepsilon_t,$$

where R_t is the daily return; γ_0 is the regression intercept coefficient; R_{t-1} and R_{t-2} are the first and second previous day returns, respectively; D_{it}, $i = 1, \ldots, 4$, are dummy variables for the days of the week: Monday, Tuesday, Wednesday, and Thursday, respectively;[10] H_t is a dummy variable for days after a nonweekend holiday (see Kim and Park (1994)); T_t is a dummy variable for the first 5 days of the taxation year (see Dyl and Maberly (1992)); P_t is a dummy variable for the annual event period (June–July); E_t stands for the event days; and J_{it}, $i = 1, 2$,

[9] In very few occasions, it also includes the last day of May or the first days of August.

[10] For more details on the Monday effect see, for example, Chang, Pinegar, and Ravichandran (1993) and Abraham and Ikenberry (1994).

are dummy variables for the 10 days with the highest (i = 1) and lowest (i = 2) returns during the studied period. As explained above, the purpose of P_t is to guarantee that the World Cup results are driven by the event itself, rather than due to the specific period of the year (i.e., an annual June–July effect). Similarly, the purpose of J_{it}, is to guarantee that no single extraordinary day will distort the results. This is especially important as one of the extreme negative-return days occurred during the World Cup period. As there is no clear-cut rule asserting how many extreme days should be eliminated to avoid a bias in the results, we report the results once without eliminating these days and again after eliminating them.

As in this study we are mainly interested in exploiting the effect, we conduct all tests twice: once, when we adhere to EGN's (2007) local effect methodology and restrict the statistical analysis only to game days, and once when we bear in mind the induced transaction costs. Hence, we do not employ any selection of specific days but rather include the entire World Cup period. Specifically, the World Cup is characterized with games throughout the event period, with only one or two breaks that last longer than 1 day: a 2-day break just before the final game, and a 2- or 3-day break at about the middle of the games period. Therefore, we have two alternate, yet similar, definitions for the event days:

i) Event effect days (EED) are defined as game days that are also trading days and the subsequent trading days. Thus, the EED are composed of all game days and days following those games. This definition is based on EGN's (2007) finding that the local effect occurs on the day just after the game. The reason we also include the day of the game is that, depending on where the games are hosted, the U.S. market may still be open when the game ends.[11]

ii) Event period effect days (EPED) are defined as all days of the World Cup, from the first game to the first day after the final game (i.e., including the break before the final game), plus two additional trading days. Thus, the EPED are composed of all EED plus one or two break days plus two trading days after the EED. This definition allows us to implement a simple and practical trading strategy aiming to exploit the effect, as is elaborated in the coming sections. As will be shown below, the two definitions yield similar results, and the effect is generally robust to the selected period as long as it is close to the event itself.

The data cover 14,679 trading days, from January 1950 to December 2007. They include all 15 FIFA World Cups occurring after World War II, with a total of 243 EED and 304 EPED.[12] To test the impact of the World Cup games on stock returns, we employ the returns on the NYSE Composite Index, taken from the Center for Research in Security Prices (CRSP). We arbitrarily select the equal-weighted index as the main index and repeat the main model regression for the value-weighted index. First, we run regression (1) as an ordinary least squares (OLS) regression with and without various control variables. In addition, returns may have time-varying volatility. To handle possible conditional heteroskedasticity, we adopt the EGN (2007) procedure and repeat the main tests when employing

[11] We also conducted the tests when only days after the games are considered as EED. As the results are very similar, we do not report them here.

[12] The data on the FIFA World Cup are taken from the Web site of the Rec.Sport.Soccer Statistics Foundation (http://www.rsssf.com).

a GARCH(1,1) model (see Engle (1982), Bollerslev (1986)).[13] Broadly speaking, the generalized autoregressive conditional heteroskedasticity (GARCH) model yields similar results, but for brevity's sake we only report the basic model results for the GARCH model.

IV. The Empirical Results

In this section, we present the main regression results related to the mean return of the 304 World Cup trading days relative to all other 14,375 trading days during the study period. Table 2 summarizes the main regression results. Panels A, B, and C report the results for the EED, and Panels D, E, and F report the results for the EPED. The most relevant column is the "World Cup Days" column.

The following conclusions emerge from the results:[14]

i) In all tests, the World Cup effect coefficient is negative, very large in absolute terms, and always highly significant (with t-values ranging from -3.32 to -4.82).

ii) The significance is robust to all tested variables and models. This includes the assumed length of the effect period (EED or EPED), the assumed model (with or without serial correlation, day of the week, tax year, and holiday variables), the assumed index (equal- or value-weighted), and the elimination of the 10 most extreme positive- and negative-return days, including the extreme negative-return day that falls during the World Cup of 1950.

iii) The results change only slightly when a GARCH model is employed (see the tests in Panels C and F).

iv) The coefficient of the annual World Cup period of the year (June–July) is insignificant. Hence, the effect is not due to a seasonal June–July effect.

To verify that no spurious correlation accounts for these results, we next examine additional factors with a potential effect on market prices. We first discuss some descriptive statistics regarding the World Cup period and then analyze them quantitatively.

The negative regression event coefficients may be spurious due to various factors. For example, one or two World Cup years that were bad years in the stock market may account for the results. There are several ways to check for the effect of such outlier bad years. We first compare each World Cup EED rate of return to the rate of return of the stock market for the whole period studied and, alternatively, to the riskless interest rate. Figure 1 depicts the value of a \$100

[13] Specifically, we use the residuals of the model specified in equation (1) to model the volatility of the error term as a GARCH(1,1) process: $\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2$, where σ_t^2 is the return volatility on day t. We then normalize the index returns according to $R_t^N = a + bR_t/(\hat{\sigma}_t)$, where $\hat{\sigma}_t^2$ is the estimated volatility of the GARCH process, and a and b are selected so that the mean and variance of the normalized returns are identical to those of the raw returns. The normalized returns, R_t^N, are then used in the model specification (1).

[14] As the results corresponding to the control variables are very similar to those obtained in previous empirical studies, we only briefly report them in the tables.

TABLE 2

Main Regression Results

Table 2 reports the results of the following regression:

$$R_t = \gamma_0 + \sum_{i=1}^{2} \gamma_{1i} R_{t-i} + \gamma_2 H_t + \sum_{i=1}^{4} \gamma_{3i} D_{it} + \gamma_4 T_t + \gamma_5 P_t + \gamma_6 E_t + \sum_{i=1}^{2} \gamma_{7i} J_{it} + \varepsilon_t,$$

where R_t is the daily return; γ_0 is the regression intercept; R_{t-1} and R_{t-2} are the first and second previous day returns, respectively; H_t is a dummy variable for days after a nonweekend holiday; D_{it}, $i = 1, \ldots, 4$, are dummy variables for the day of the week; T_t is a dummy variable for the first 5 days of the taxation year; P_t is a dummy variable for the annual period of the games (June–July); E_t stands for the games days; and J_{it}, $i = 1, 2$, are dummy variables for the 10 days with the highest ($i = 1$) and lowest ($i = 2$) returns during the studied period. The observed period includes 14,375 non-event period effect days (EPED) and 304 EPED, from January 1950 to December 2007. The first line of each test reports the regression coefficients, and the second line reports the corresponding t-values (in brackets). * and ** indicate a significance level of 2% and 1%, respectively (a one-sided test for the World Cup days).

	Case	γ_0	R_{t-1}	R_{t-2}	Non-Weekend Holidays	Mon.	Tues.	Wed.	Thurs.	First 5 Days of the Tax Year	Annual Period of the World Cup	World Cup Days	10 Best Days	10 Worst Days	R^2 / F
Panel A. Event Effect Days (EED)—All Game Days															
1a	Base model (BM) (equal-weighted NYSE Index)	0.0015			0.0023	–0.0024	–0.0013	–0.0003	–0.0007	0.0044	–0.0002	–0.0019			0.022
		(11.02**)			(4.42**)	(–12.67**)	(–6.89**)	(–1.58)	(–3.55**)	(7.60**)	(–0.96)	(–3.89**)			40.879
2a	BM with serial correlation	0.0013	0.2520	–0.0365	0.0018	–0.0026	–0.0009	–0.0002	–0.0008	0.0034	–0.0001	–0.0016			0.081
		(10.01**)	(30.58**)	(–4.43**)	(3.55**)	(–13.97**)	(–4.86**)	(–0.99)	(–4.27**)	(5.96**)	(–0.70)	(–3.42**)			129.297
3a	BM without control dummy variables	0.0006										–0.0022			0.001
		(10.43**)										(–4.69**)			21.953
4a	BM on the value-weighted NYSE Index	0.0009			0.0019	–0.0015	–0.0005	0.0001	–0.0004	0.0008	–0.0001	–0.0020			0.007
		(6.08**)			(3.14**)	(–7.13**)	(–2.21)	(0.64)	(–1.96)	(1.20)	(–0.32)	(–3.66**)			13.409
Panel B. EED + Extreme Days Dummy Variables															
1b	BM	0.0015			0.0019	–0.0023	–0.0013	–0.0004	–0.0007	0.0038	–0.0002	–0.0019	–0.0641	0.0520	0.108
		(11.58**)			(3.75**)	(–12.45**)	(–7.07**)	(–1.99)	(–3.83**)	(6.87**)	(–1.12)	(–3.98**)	(–29.26**)	(23.73**)	177.871
2b	BM with serial correlation	0.0013	0.2288	–0.0256	0.0014	–0.0024	–0.0009	–0.0002	–0.0008	0.0029	–0.0001	–0.0016	–0.0587	0.0509	0.157
		(10.54**)	(28.89**)	(–3.22**)	(2.92**)	(–13.73**)	(–5.17**)	(–1.35)	(–4.47**)	(5.27**)	(–0.84)	(–3.54**)	(–27.42**)	(23.72**)	227.616
3b	BM without control dummy variables	0.0006										–0.0022	–0.0652	0.0532	0.092
		(11.06**)										(–4.82**)	(–29.54**)	(24.11**)	493.081
4b	BM on the value-weighted NYSE Index	0.0009			0.0015	–0.0014	–0.0004	0.0001	–0.0004	0.0003	–0.0001	–0.0020	–0.0604	0.0420	0.062
		(6.29**)			(2.61**)	(–6.64**)	(–2.16)	(0.42)	(–2.07)	(0.46)	(–0.44)	(–3.63**)	(–23.97**)	(16.63**)	96.568

(continued on next page)

TABLE 2 (continued)

Main Regression Results

	Case	γ_0	R_{t-1}	R_{t-2}	Non-Weekend Holidays	Mon.	Tues.	Wed.	Thurs.	First 5 Days of the Tax Year	Annual Period of the World Cup	World Cup Days	10 Best Days	10 Worst Days	R^2 / F
Panel C. EED—GARCH Model															
1c	BM	0.0017			0.0019	–0.0027	–0.0016	–0.0005	–0.0007	0.0043	–0.0001	–0.0020			0.025
		(12.37**)			(3.67**)	(–14.42**)	(–8.50**)	(–2.57*)	(–3.98**)	(7.47**)	(–0.83)	(–4.09**)			46.828
Panel D. EPED: All World Cup Period + 2 Days Afterward															
1d	BM	0.0015			0.0023	–0.0024	–0.0013	–0.0003	–0.0007	0.0044	–0.0001	–0.0017			0.022
		(11.07**)			(4.40**)	(–12.75**)	(–6.92**)	(–1.61)	(–3.60**)	(7.60**)	(–0.79)	(–3.93**)			40.916
2d	BM with serial correlation	0.0013	0.2518	–0.0364	0.0018	–0.0026	–0.0009	–0.0002	–0.0008	0.0034	–0.0001	–0.0014			0.081
		(10.06**)	(30.56**)	(–4.43**)	(3.53**)	(–14.04**)	(–4.90**)	(–1.01)	(–4.31**)	(5.97**)	(–0.59)	(–3.32**)			129.224
3d	BM without control dummy variables	0.0006										–0.0019			0.001
		(10.46**)										(–4.54**)			20.627
4d	BM on the value-weighted NYSE Index	0.0009			0.0019	–0.0016	–0.0005	0.0001	–0.0004	0.0008	0.0000	–0.0017			0.007
		(6.13**)			(3.11**)	(–7.20**)	(–2.25)	(0.61)	(–2.00)	(1.20)	(–0.25)	(–3.42**)			13.198
Panel E. EPED + Extreme Days Dummy Variables															
1e	BM	0.0015			0.0019	–0.0023	–0.0013	–0.0004	–0.0007	0.0038	–0.0002	–0.0017	–0.0641	0.0520	0.108
		(11.64**)			(3.72**)	(–12.54**)	(–7.11**)	(–2.02)	(–3.88**)	(6.87**)	(–0.94)	(–4.02**)	(–29.26**)	(23.72**)	177.906
2e	BM with serial correlation	0.0013	0.2287	–0.0255	0.0014	–0.0024	–0.0009	–0.0002	–0.0008	0.0029	–0.0001	–0.0014	–0.0587	0.0509	0.157
		(10.59**)	(28.87**)	(–3.22**)	(2.90**)	(–13.81**)	(–5.20**)	(–1.37)	(–4.51**)	(5.27**)	(–0.73)	(–3.45**)	(–27.42**)	(23.71**)	227.551
3e	BM without control dummy variables	0.0006										–0.0019	–0.0652	0.0532	0.091
		(11.09**)										(–4.68**)	(–29.55**)	(24.10**)	492.605
4e	BM on the value-weighted NYSE Index	0.0009			0.0015	–0.0014	–0.0005	0.0001	–0.0004	0.0003	–0.0001	–0.0017	–0.0605	0.0419	0.062
		(6.34**)			(2.59**)	(–6.72**)	(–2.20)	(0.40)	(–2.12)	(0.47)	(–0.37)	(–3.39**)	(–23.98**)	(16.62**)	96.390
Panel F. EPED—GARCH Model															
1f	BM	0.0015			0.0022	–0.0024	–0.0012	–0.0003	–0.0006	0.0039	–0.0001	–0.0016			0.020
		(10.72**)			(4.07**)	(–12.40**)	(–6.53**)	(–1.34)	(–3.36**)	(6.57**)	(–0.56)	(–3.54**)			36.559

portfolio hypothetically invested in the NYSE Composite Index during the World Cup EED.[15]

FIGURE 1

The Value of $100 Invested during the World Cup Event Effect Days

Figure 1 depicts the value of a $100 portfolio hypothetically invested in the NYSE Composite Index during the World Cup event effect days (EED), which are defined as game days and the next trading days. If no game is played in a day and in the previous day, then the value is assumed to be unchanged (in most events this includes one-day breaks before the final game and at about the middle of the World Cup period). The straight lines represent hypothetically investing $100 at the riskless interest rate (lower line) and at the average rate of return on equity calculated for the entire period of 1950–2007 (upper line). In 12 out of the 15 World Cups, the rate of return during the EED is less than the riskless interest rate, and in 14 World Cups it is below the average rate of return on equity. Note that the length of the World Cup period varies across the years.

Graph A. 1978–2006

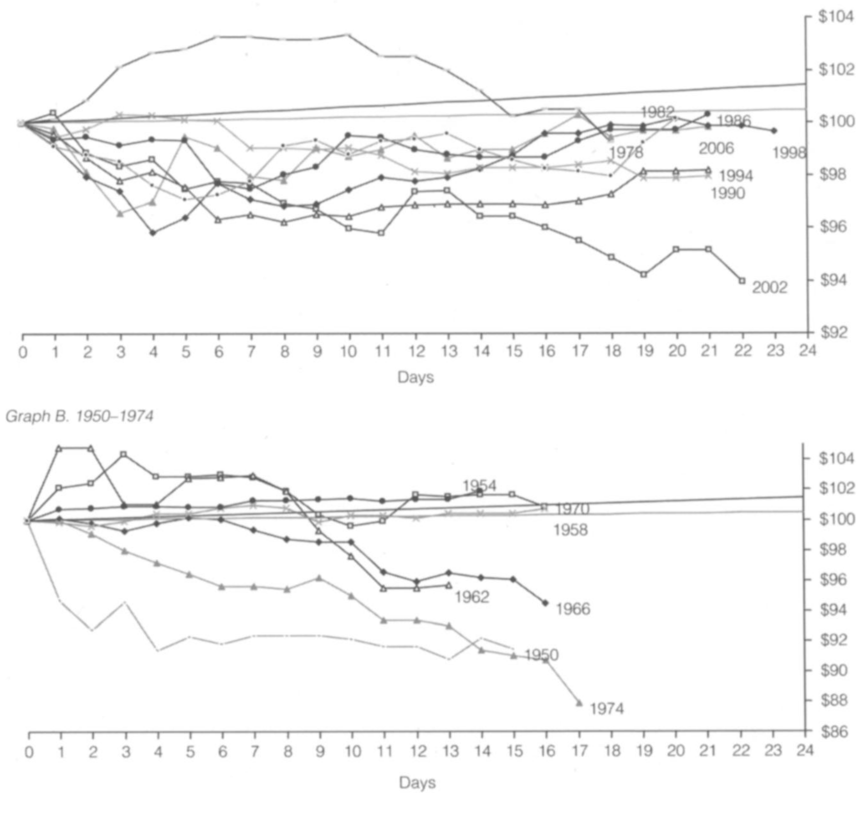


Figure 1 reveals that in 12 out of the 15 events, the rate of return during the EED is less than the riskless interest rate (at least –2% in seven events), and in 14 out of 15 years, it is below the average rate of return on equity. Thus, in 14 out of 15 years of the World Cup we have a similar phenomenon: The rate of return on the EED is below the average rate of return in the stock market, indicating that, indeed, the relatively low negative rates of return on the World Cup EED reflect a

[15]Note that if no game is played in a specific day and in the previous day, the value is assumed to be unchanged.

pattern that is probably due to the event itself and not due to 1 or 2 outlier years. Despite the clear pattern shown in Figure 1, it is possible that the rates of return for most of the 15 World Cup years were relatively low or even negative; hence, the found negative event regression coefficient could be spurious. Table 3 reveals that this is not the case. Actually, 7 out of the 15 World Cup years are very good years in the stock market, with rates of return ranging from 15.30% in 1978 to 61.71% in 1958.

TABLE 3

The World Cup Event Effect Days and Unrelated Events

Table 3 reports the annualized rate of return on each World Cup event effect days (EED) (column 2), the rate of return on the same year (column 3), whether the annualized return on the EED is below the return on the full year (column 4), events occurring during the games period that have important economic implications, whether these events are in favor of the null hypothesis, and the way this possible bias is handled (columns 5–7).

Year	Return on EED (annualized)	Return on the Full Year	Is Return on EED Below Rerun on the Full Year?	Important Event During the World Cup Period	In Favor/ Against the Null Hypothesis	Tests to Handle the Possible Bias
2006	–2.17%	22.11%	Yes	None		
2002	–54.58%	–5.84%	Yes	None		
1998	–4.29%	–1.72%	Yes	None		
1994	–22.75%	–1.75%	Yes	None		
1990	–25.04%	–12.22%	Yes	None		
1986	4.08%	16.23%	Yes	None		
1982	1.69%	31.96%	Yes	The Falklands War ends: A formal surrender is agreed.	In favor	
1978	–9.64%	15.30%	Yes	None		
1974	–88.57%	–22.77%	Yes	None		
1970	16.28%	–0.29%	No	None		
1966	–61.40%	–6.00%	Yes	None		
1962	–60.56%	–10.87%	Yes	None		
1958	16.16%	61.71%	Yes	None		
1954	48.41%	59.20%	Yes	None		
1950	–84.56%	39.52%	Yes	Beginning of the Korean War: Americans begin hoarding supplies.	Against	1. Running regression without this year (see Table 4). 2. Running regression without the 10 worst trading days, which eliminates the day of the beginning of the war.

An even stronger result is revealed in Table 3. In 14 out of the 15 World Cup years, the annualized rate of return on the World Cup EED is lower than the rate of return corresponding to the whole relevant year, indicating that in bad or good years there is a specific negative effect related to the event itself. By calculating the binomial statistic, the null hypothesis, asserting that the chances of having a rate of return on the World Cup period that is below or above the annual rate of return are equally likely, is rejected at a significance level of $P < 0.000488$.[16]

[16]The probability of obtaining this result under the null hypothesis is given by

$$P = \sum_{X=14}^{15} \binom{15}{X} (0.5)^X (0.5)^{15-X} \cong 0.000488.$$

Finally, Table 3 and Figure 1 reveal that in 3 years, 1950, 1974, and 2002, the rate of return on the EED is dramatically negative and, hence, suspicious as being negative unrelated to the World Cup. To verify that these years' negative rates of return are not driven by unrelated events, we searched for all significant events with economic implications that may have occurred during the World Cup period and report them in Table 3. Indeed, in 1950 the beginning of the Korean War may be the reason for the low returns.[17] However, no other important event that may have a negative effect on the market has been recorded. Namely, the low returns recorded in 1974 and 2002 are not associated with events that occurred during the World Cup period.[18]

The above analysis eliminates the possibility in at least 14 World Cups that any other major event (i.e., except the Korean War in 1950) has potentially affected returns during World Cup periods. We now quantitatively analyze this issue and empirically confirm that the results are robust to the arbitrary elimination of any one or two World Cups, including that of 1950. As the results of all the tests given below corresponding to EED and EPED are very similar, for brevity's sake we report only the results corresponding to EPED. Table 4 reports these robustness tests. Panel A of Table 4 reports the results of the main model regression, given by equation (1), where either one or two World Cup events are considered as non-EPED.

The outlier sensitivity results are straightforward. The effect is negative and significant even in the worst case, when we eliminate the World Cups of both 1950 and 1974, which are characterized by extremely low returns on the EPED. The effect coefficient is -11 basis points (bp), with a t-value of -2.21. Thus, neither two World Cup events, nor any unrelated event that occurred during the World Cup, accounts for the effect.

As previously explained, one may argue that by mere chance the non-World Cup years are better years, on average, than the years of the World Cup; hence, the association of the relatively low returns on World Cup days with the event would be spurious. To unequivocally confirm that this is not the case, we run the regression for the years of the World Cup only. Panel B of Table 4 reports the regression results corresponding to only the 3,817 trading days of the 15 years of the World Cup. The table reveals that the magnitude of the World Cup effect coefficient is almost unchanged and is significant in all tests, with a coefficient ranging from -18 bp to -19 bp and corresponding t-values ranging from -2.84 to -3.63. These results are obtained despite the dramatic reduction in the number of observations.

The World Cup occurs every 4 years during June and July. Hence, the effect may be correlated with some seasonal phenomenon. Although we employ a dummy variable for June and July, we also directly eliminate the June–July

[17] It is worth mentioning that, while the beginning of the Korean War (June 6, 1950) can be considered the day Americans began hoarding supplies, this specific day was part of a process that started earlier and lasted long after the World Cup event.

[18] In the event lists, we consider any possible event that might be important to the economy, including market crashes, wars, nature disasters, political events, economic events, and many others. The events are taken from Barro (2006), Haugen, Talmor, and Torous (1991), and Wikipedia (http://en.wikipedia.org/), which covers almost 2.5 million articles.

TABLE 4

Robustness Checks

Table 4 reports the results of the following regression:

$$R_t = \gamma_0 + \gamma_1 H_t + \sum_{i=1}^{4} \gamma_{2i} D_{it} + \gamma_3 T_t + \gamma_4 P_t + \gamma_5 E_t + \sum_{i=1}^{2} \gamma_{6i} J_{it} + \varepsilon_t,$$

where γ_0 is the regression intercept, H_t is a dummy variable for days after a nonweekend holiday, D_{it}, $i = 1, \ldots, 4$, are dummy variables for the day of the week, T_t is a dummy variable for the first 5 days of the taxation year, P_t is a dummy variable for the annual period of the games (June–July), E_t stands for the game days, and J_{it}, $i = 1, 2$, are dummy variables for the 10 days with the highest ($i = 1$) and lowest ($i = 2$) returns during the studied period. The observed period is composed of 14,375 non-event period effect days (EPED) and 304 EPED, from January 1950 to December 2007. The regression period corresponding to the World Cup years only is composed of the 15 years of the World Cup (1950, 1954, 1958, 1962, 1966, 1970, 1974, 1978, 1982, 1986, 1990, 1994, 1998, 2002, and 2006), with 3,513 non-EPED and 304 EPED. The regression period corresponding to the June–July period only is composed of daily data of months June and July of each year, which includes 2,159 non-EPED and 304 EPED. The first line of each test reports the regression coefficients, and the second line reports the corresponding t-values (in brackets). * and ** indicate a significance level of 2% and 1%, respectively (a one-sided test for the World Cup days).

Case	γ_0	Non-Weekend Holidays	Mon.	Tues.	Wed.	Thurs.	First 5 Days of the Tax Year	Annual Period of the World Cup	World Cup Days	10 Best Days	10 Worst Days	R^2 / F
Panel A. Outliers Sensitivity												
Without the World Cup of 1974	0.0015	0.0019	−0.0023	−0.0013	−0.0004	−0.0007	0.0038	−0.0002	−0.0013	−0.0641	0.0520	0.108
	(11.60**)	(3.72**)	(−12.48**)	(−7.09**)	(−2.01)	(−3.84**)	(6.87**)	(−1.49)	(−2.77**)	(−29.27**)	(23.70**)	176.960
Without the World Cup of 1950	0.0015	0.0019	−0.0023	−0.0013	−0.0004	−0.0007	0.0038	−0.0002	−0.0018	−0.0643	0.0520	0.108
	(11.58**)	(3.73**)	(−12.46**)	(−7.07**)	(−1.99)	(−3.83**)	(6.87**)	(−1.19)	(−3.83**)	(−29.34**)	(23.72**)	177.742
Without the World Cups of 1974 and 1950	0.0015	0.0019	−0.0023	−0.0013	−0.0004	−0.0007	0.0038	−0.0003	−0.0013	−0.0642	0.0520	0.108
	(11.60**)	(3.71**)	(−12.49**)	(−7.09**)	(−2.01)	(−3.84**)	(6.87**)	(−1.57)	(−2.60**)	(−29.33**)	(23.70**)	176.853
Without the World Cups of 2002 and 1974 (worst case)	0.0015	0.0019	−0.0023	−0.0013	−0.0004	−0.0007	0.0038	−0.0003	−0.0011	−0.0641	0.0520	0.107
	(11.60**)	(3.72**)	(−12.49**)	(−7.09**)	(−2.01)	(−3.84**)	(6.87**)	(−1.68)	(−2.21*)	(−29.27**)	(23.69**)	176.644
Panel B. World Cup Years Only												
Base model (BM)	0.0014	0.0047	−0.0027	−0.0015	0.0002	−0.0010	0.0050	0.0001	−0.0019			0.028
	(4.61**)	(3.61**)	(−6.33**)	(−3.45**)	(0.40)	(−2.40*)	(3.82**)	(0.21)	(−2.84**)			13.860
BM without control dummy variables	0.0005								−0.0018			0.003
	(3.83**)								(−3.63**)			13.212
BM with extreme days dummy variables	0.0014	0.0037	−0.0026	−0.0015	0.0000	−0.0012	0.0040	0.0001	−0.0018	−0.0512	0.0470	0.097
	(4.89**)	(2.99**)	(−6.27**)	(−3.64**)	(0.10)	(−2.82**)	(3.19**)	(0.24)	(−2.91**)	(−11.01**)	(13.00**)	41.000

(continued on next page)

TABLE 4 (continued)

Robustness Checks

Case	γ_0	Non-Weekend Holidays	Mon.	Tues.	Wed.	Thurs.	First 5 Days of the Tax Year	Annual Period of the World Cup	World Cup Days	10 Best Days	10 Worst Days	R^2 / F
Panel C. June–July Period Only												
BM	0.0015 (4.82**)	0.0019 (1.56)	−0.0026 (−6.07**)	−0.0017 (−3.83**)	−0.0001 (−0.28)	−0.0006 (−1.51)			−0.0018 (−4.39**)			0.030 / 12.817
BM without control dummy variables	0.0005 (3.46**)								−0.0018 (−4.36**)			0.008 / 19.040
BM with extreme days dummy variables	0.0015 (5.03**)	0.0005 (0.38)	−0.0026 (−6.29**)	−0.0017 (−4.00**)	−0.0001 (−0.29)	−0.0007 (−1.73)			−0.0018 (−4.42**)	−0.0501 (−7.61**)	0.0461 (9.83**)	0.088 / 29.603

possible effect by repeating the regression analysis with only days of June and July of each year where the EPED fall on June–July days once in 4 years.[19] Panel C of Table 4 reports the tests results corresponding to this case and reveals that there is no June–July effect. We obtain the same results as before, with t-values ranging from -4.36 to -4.42. These significant results are obtained despite the fact that the number of observations is six times smaller. Thus, we conclude that no seasonal effect accounts for the World Cup effect.

To sum up, no one or two outlier years, no significant world event, no possible bad World Cup years, and no June–July seasonality effect account for the negative rates of return recorded in the U.S. market during the World Cup. The association between the event itself and the rates of return is robust and not spurious.

V. Exploiting the World Cup Effect

As the effect is predictable, we next analyze how one can exploit the effect. The meaning of the significant negative coefficient, γ_6, is that whenever an event occurs, one could benefit, on average, from being out of the market during the World Cup period.[20] Note that in this section we employ EPED rather than EED, as it is more applicable for actual trading when taking into account transaction costs.

One can employ a very simple investment strategy to exploit the event effect and to obtain abnormal returns. The basic principle of the suggested investment strategy is to decrease the equity exposure during the EPED. Figure 2 illustrates this idea by comparing the value of \$1 invested in the NYSE Composite Index under a simple buy-and-hold strategy (black line) and under the World Cup effect strategy (gray line), which merely assumes getting out of the market and investing in short-term Treasury bills during the event effect periods (the dashed bars). Figure 2 also depicts the value of \$1 invested under the World Cup effect strategy without the outliers (the World Cups of 1950 and 1974, light gray line).

Figure 2 reveals that the suggested strategy yields higher returns for the whole period.[21] Thus, investing \$1 at the beginning of the period (January 1950) and reducing the exposure to equity to 0% during the EPED and remaining with 100% equity exposure during all other days yields \$6,948 at the end of the period, in comparison to only \$4,386 if one invests in equity on all days. Of course, if one chooses a negative exposure to equity by short selling, rather than zero exposure, the results will be intensified. Moreover, as there are only a few, relatively long effect periods, transaction costs do not substantially change the results: Assuming even a 0.5% transaction cost for getting in or out of the market (i.e., $0.5\% \times 2 = 1\%$ per event), the end of the period investment would increase to

[19]We also include the few days of May and August that are EPED.

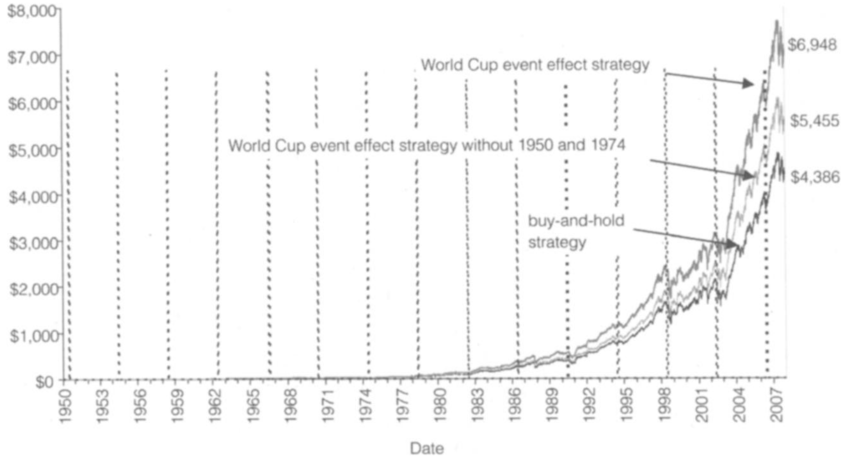
[20]This can also be seen from the raw data, as the average daily return on the NYSE Composite Index during the non-EPED is about 6.4 bp, whereas the average daily return during the EPED is -12.9 bp. A mean two-sample test reveals a t-value of either -3.46 or -3.79 when we eliminate the 10 most positive and 10 most negative days from the sample.

[21]Note that from the beginning (the 1950 World Cup), there is a relatively large difference between the two investment strategies. However, this cannot be seen due to the scale of the vertical axis.

FIGURE 2

Cumulated Value of World Cup Effect Strategy

Figure 2 depicts the value of $1 invested in the NYSE Composite Index for the period of 1950–2007 (14,679 trading days) under a buy-and-hold strategy (black line), under the World Cup effect strategy (gray line), and under the World Cup effect strategy without the outlier years of 1950 and 1974 (light gray line). The World Cup effect strategy assumes a buy-and-hold strategy during the non-event period effect days (EPED), getting out of the market, and investing the portfolio at the 3-month Treasury bill rate during the EPED, which are defined as the periods from the first game of each World Cup to the first day after the final game, plus two additional trading days that come immediately afterwards (marked by the dashed bars). The 3-month Treasury bill secondary market rate is taken from the Federal Reserve Board data series.



$5,978—still substantially more than the $4,386 obtained by a simple buy-and-hold strategy.[22] The critical transaction costs at which employing the trading strategy does not produce abnormal profits is 1.53% per transaction (i.e., 3.06% per event). Of course, the above profits are hypothetical and are given for illustration purposes. The actual profits depend on the specific implementation, which could have been very difficult and expensive in the past, when trading an index required trading each security separately.

Thus, as the effect in the U.S. market is predictable and does not depend on unknown information about the game results, it is also exploitable. Moreover, as our proposed strategy involves only shifting from equity to risk-free Treasury bills, it inherently decreases the portfolio risk. Specifically, while the daily standard deviation under the buy-and-hold strategy is equal to 0.00732, it is equal to 0.00718 under event effect strategic trading, with corresponding Sharpe ratios of 0.0546 and 0.0599. As the proposed strategy both yields higher average returns and reduces risk, it dominates the buy-and-hold strategy by the well-known Markowitz (1952) mean-variance criterion.

VI. Concluding Remarks

In a recently published study, EGN (2007) find that international sporting events asymmetrically affect local stock prices, with a significant negative effect

[22]Assuming transaction costs of 10 bp, 20 bp, 30 bp, 40 bp, and 50 bp reveals the following terminal wealth, respectively: $6,742, $6,543, $6,348, $6,161, and $5,978.

on the losing country's market and an insignificant positive effect on the winning country's market. However, one cannot exploit this information in local markets, as the game results are unknown in advance. In this study, we introduce a new dimension: We do not check for the effect on the markets of the two teams that play, but rather on the U.S. market. As the effect on the U.S. market, if it exists, does not depend on the game result, it is exploitable. We develop a method of exploiting this sentiment effect by looking at the international level for the aggregate effect of all local effects. As about one-third of the transactions in the U.S. market are involved with non-U.S. investors, we expect the local sentiment also to affect the U.S. market. We first document the effect of the World Cup on the U.S. market and then develop a strategy to exploit it.

The most important feature of our proposed approach is that, unlike the local effect, the aggregate effect does not depend on the game results, as it is always negative (due to the asymmetry found by EGN (2007)) and known in advance. Namely, the aggregate effect in our case is an exploitable predictable effect. We find that the World Cup effect is large, highly significant, and long lasting. From 1950 to 2007, the average return on the U.S. market over the World Cup's effect days is −2.58%, compared to +1.21% for all days over the same period length. While we study the World Cup effect on the U.S. market, a possible future research topic would be to study the effect on the Morgan Stanley Capital International (MSCI) World Index and other international indices.

Finally, while the World Cup's effect on the U.S. market is probably unknown at the present time, it is possible that by recognizing and understanding this phenomenon, investors will find some financial devices to exploit it and, as a result, it may disappear. However, the most natural strategy in this case is to sell stocks short just before the World Cup starts, which will only intensify the stock price decline due to the World Cup event and may also induce the decline to start earlier, even before the games begin. Thus, like option irrational mispricing that does not disappear over time (see Constantinides, Jackwerth, and Perrakis (2009)), this irrational market behavior also will probably be with us for a long period to come.

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