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Effects of soccer on stock markets: The return–volatility relationship☆,☆☆

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ABSTRACT

This paper assesses the effects of domestic soccer teams' performances against foreign rivals on stock market returns as well as on the return–volatility relationship. Data from Chile, Spain, Turkey and the United Kingdom support propositions that soccer teams results in international cups affect stock market returns and the return–volatility relationship. Evidence from Spain and the UK, soccer powerhouses, suggests that losses are associated with lower returns and higher risk aversion but evidence from Chile and Turkey, where soccer is the most important sport but teams are not as successful, reveals that wins are associated with higher returns and lower risk aversion.

1. Introduction

A fundamental assumption of economics is that agents are rational in decision making. Recent literature, however, has challenged this assumption. Stracca (2004) reviews a large body of evidence and finds examples of irrational behavior in numerous studies. Behavioral economics and behavioral finance try to explain how emotions and cognitive errors influence investors and their decision-making processes. Researchers can explain various stock market anomalies, bubbles and crashes using psychology and other relevant social sciences methods. As the psychology literature suggests, "mood" is one of the sources of agent irrationality. Following Edmans, Garcia, and Norli (2007) and Berument, Ceylan, and Gozpinar (2006), this paper claims that mood changes stemming from the results of soccer matches affect stock market returns. The present study further claims that mood changes also affect the return–volatility relationship: agents become more risk averse after a loss and less risk averse after a win.

In this study, we test whether mood has a significant effect on asset prices. To accomplish this, we first find an event that can affect thousands of people's moods simultaneously. Sports events provide such an example; soccer matches in particular. The psychology literature documents that soccer results have a much larger impact on mood than supposed by most economists because they affect millions of people in a similar way. Some studies discuss the effect of sports results and mood. For instance, Wann, Dolan, Mcgeorge, and Allison (1994) document that fans often experience strong positive reactions to watching their team perform well. Hirt, Erickson, Kennedy, and Zillmann (1992) find that Indiana University college students estimate their own performances to be significantly better after watching a win by their college basketball team than after watching a loss.

☆ Although the sport is called soccer in North America, it is called football in the rest of the world.

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Mainstream economics supports the effect of soccer on economic performance. Pollard (2002) documents the relationship between the growth rate of European countries and World Cup success. Moreover, Berument, Inamlik, and Yucel (2003) and Berument and Yucel (2005) find that success in soccer affects industrial production in Turkey.

Similar to the present paper, Edmans et al. (2007), Berument and Yucel (2005) and Berument et al. (2006) examine the effects of international soccer matches on a set of macroeconomic variables via mood. Edmans et al. (2007) investigate stock market reactions to the outcome of the international soccer matches of 42 countries, and find that losses in international soccer matches have an economically and statistically significant negative effect on that country's stock market. However, the same study does not find a corresponding effect after wins: returns on days following wins are close to zero and not statistically significant. Edmans et al. (2007) suggest that a soccer loss effect is caused by a change in investor mood. For Turkey, Berument et al. (2006) examine the effects of Besiktas' success on stock returns and show that this team's wins over foreign rivals increase stock market returns. Edmans et al. (2007) and Berument et al. (2006) consider the effect of losses and wins only on stock market returns. In contrast, our study considers not only the level of return but also the pricing of risk changes with soccer scores.

The existing literature on behavioral finance mostly concentrates on returns. However, agents' risk perceptions, which the return–volatility relationship may capture, may also change with mood. Loewenstein (2000), Romer (2000) and Loewenstein, Weber, Hsee, and Welch (2001) note that the probability weighting function may depend on an agent's emotional state. Leahy (2002) models the investment behavior of a depressed individual. According to that model, people who are depressed believe that they have few present and future resources and believe they have a low utility of gain in a market that is volatile and declining. Therefore, depressed individuals adopt strategies to minimize their losses. Johnson and Tversky (1983) indicate that mood influences judgments of outcome probability. In one experiment, they find that agents are less likely to gamble after a loss and more likely to gamble after a gain. Arkes, Herren, and Isen (1988) demonstrate that the sales of Ohio's state lottery tickets increase in the days after a victory by the Ohio State University soccer team. Similarly, Dohmen et al. (2006) report the results of a telephone survey conducted in Germany just one day after the German soccer team's unexpected good performance during the FIFA 2006 World Cup. The interviews were re-performed on the afternoon of the next day. The authors note that current perception and future economic expectations improved at the personal and economy-wide levels.

Hanke and Kirchler (2010) argue that as the importance of a match increases and its result is more unexpected, its impact will be higher. Edmans et al. (2007) also note that under objective probabilities, market decline is strong for unexpected losses. Thus, the effect is more pronounced after a loss for a team that is more likely to win, i.e., a usually successful team. The effect is also more pronounced after a win for a team that is less likely to win. To this end, we document results from four countries where the soccer is the most important sport. Teams from Spain and the UK are considered to be more successful than teams from Chile and Turkey. We expect to see that losses have larger negative effects for Spain and the UK and we expect that wins have larger positive effects for Chile and Turkey.

In this study, we examine the effects of the results of international soccer matches against foreign rivals on stock exchanges and we report the effect of wins and losses of four countries' important soccer teams on stock returns, along with their effects on risk perception. We organize the rest of the paper as follows: Section 2 elaborates on the model that we use and Section 3 provides the empirical evidence. The last section concludes the paper.

2. Methodology

In order to assess the effects of soccer matches on stock market returns and return–volatility relationships, we use a class of Autoregressive Conditional Heteroskedastic (ARCH) specifications. The ARCH specification captures the conditional variance of stock returns as a measure of risk.

In this paper, we use Nelson's (1991) EGARCH specification for conditional modeling because of various appealing features. First, it removes part of the non-negativity parameter restrictions of the conditional variance within the traditional Bollerslev's (1986) GARCH model. Second, it allows stock market shocks to have asymmetric effects on conditional variance. That is, positive and negative shocks may affect risk perception differently, i.e., the leverage effect.

Here, we want to see the effects of mood on real stock returns and return–volatility relationships. Our model specification is:

$$R_t = x'_t\beta + \lambda h_t + \phi \cdot \text{outcome}_t + \varphi \cdot \text{outcome}_t \cdot h_t + \varepsilon_t \quad (1)$$

$$\varepsilon_t \sim (0, h_t^2)$$

$$\log h_t^2 = \kappa + \sum_{i=1}^{p} \delta_i \log h_{t-i}^2 + \sum_{j=1}^{q} \gamma_j \left(\left| \frac{\varepsilon_{t-j}}{h_{t-j}} \right| - E \left| \frac{\varepsilon_{t-j}}{h_{t-j}} \right| + \chi \frac{\varepsilon_{t-j}}{h_{t-j}} \right) \quad (2)$$

where R_t is the stock return calculated by taking the logarithmic first difference of the daily closing price of stock markets and x'_t is a vector for exogenous variables at time t. The model includes daily dummies for Monday, Tuesday, Wednesday, Thursday and Friday to account for the day-of-the-week effect. The x vector also includes lagged values of the return because Cosimano and Jansen (1988) argue that if errors are autocorrelated, then Engle's (1982) ARCH-LM test suggests the presence of the ARCH effect even when it is not present. The conditional standard deviation of the residual term, h_t, is taken as a proxy for risk at time t; outcome_t is the dummy variable for the wins or losses and takes the value of one for the next business day after a win or a loss in international matches, and zero otherwise.[1]

[1] We note that within the sample period there were never two or more wins (or losses) to be considered on the next business day. Therefore, outcome_t never takes the value of two or above.

Outcome$_t \cdot h_t$ is the interactive term for wins or loses with the conditional standard deviation of the residual term. The interactive term is intended to capture the change in the return–volatility relationship with wins or losses and ε_t is the error term at time t. As we expect a positive relationship between wins and returns, we also expect a negative relationship between losses and returns. This expectation implies that the sign of the estimated outcome$_t$ coefficient, ϕ, will be positive for the wins of Chile and Turkey and negative for the losses of Spain and the UK. On the other hand, the theory on change in risk aversion suggests that the sign of the coefficient of the interactive term between h_t and outcome$_t$, φ, will be negative for Chile and Turkey and positive for Spain and the UK. This prediction is because wins make people less risk averse, or more risk loving, and losses make people more risk averse, or less risk loving; thus we expect to accept the same return with a higher risk or a lower return and a lower risk or a higher return with the same risk level.

In Eq. (2), the χ parameter captures residual asymmetric effects. When $\chi = 0$, a negative surprise, that is, $(\varepsilon_{t-1}/h_{t-1}) < 0$, has the same effect on volatility as a positive surprise of equal magnitude. When $-1 < \chi < 0$, a negative surprise increases volatility more than a positive surprise does. When $\chi < -1$, a positive surprise decreases volatility and a negative surprise increases volatility.

Teams generally play all their matches after business hours. Most matches are on Tuesdays, Wednesdays and Thursdays. Therefore, the dummy variable for wins and losses, outcome$_t$, for the next business day can capture higher returns associated with these days. However, it is important to recognize dummy variables for the day-of-the-week effect; thus, estimates for wins and losses capture the effects of wins and losses after the day-of-the-week effect is accounted for.

3. Empirical evidence

To assess the effect of international soccer scores on the stock market, we gather data from four countries where soccer is an important sports activity; international or domestic successes belong to a few teams that have supporters all over the country. Most people associate themselves with one of the few teams, which further ensures that the soccer results will have a country-wide effect. For these reasons, we choose Chile, Spain, Turkey and the UK. We select Cobreloa, Colo Colo, Universitad Catolica and Universitad de Chile soccer teams for Chile; Barcelona and Real Madrid soccer teams for Spain; Besiktas, Fenerbahce and Galatasaray soccer teams for Turkey and Arsenal, Chelsea, Liverpool and Manchester United soccer teams for the UK. The time span of the data is from 01 January 1985 to 02 February 2007, but may vary among countries. We gather the data for the stock exchanges from Datastream. We compute the stock market returns by taking the percentage change of the daily closing price of the General Stock Price Index (IGPA) for Chile, the Madrid Stock Exchange General Index for Spain, the Istanbul Stock Exchange 100 Index for Turkey, and the FTSE 100 Index for the UK. We obtain the international soccer match results for these four countries mainly from http://www.rsssf.com.[2]

Table 1 reports the time period, teams, and number of international wins, losses, and ties, along with their percentages to total matches. Table 1 suggests that in terms of results, Spain and the UK have more successful soccer teams than Chile and Turkey. Because of the differences in results, we might observe different effects of losses and wins between the two country sets.

Table 2 reports descriptive statistics for the stock market returns of each country. Note that excess kurtosis, the kurtosis value is greater than three, and the statistically significant Jarque-Bera Tests for normality suggest time-varying variances for the returns.

Table 3 reports the estimates of soccer match outcomes$_t$ on stock market returns and return–volatility relationships for the four countries. The estimated coefficients of outcome$_t$ and outcome$_t \cdot h_t$ are important; however, we discuss other coefficients to show that our findings parallel the existing literature on the respective models.

First, the Monday effect is negative for all countries but Spain, and Tuesday has a negative and statistically significant effect for Spain. Wednesday also has a negative and statistically significant effect for Spain only. Thursdays' coefficients are positive for all but Spain. For Chile, the Thursday effect is positive and statistically significant. Friday effects are positive and are statistically significant for Chile at 1%, for Turkey at 5% and for the UK at 10% significance levels. Therefore, Monday returns are lower than Friday returns for all countries but Spain. However, Friday returns are higher than Tuesday returns for Spain. Thus, our findings are parallel to the findings in the literature on the day-of-the-week or weekend effects.

Second, the risk term coefficient, h_t, is positive for all countries. The effect is statistically significant at the 1% significance level for Spain, and for the UK it is statistically significant at the 10% significance level. The positive coefficients suggest that risk increases expected stock market returns. This finding is in line with the mainstream asset-pricing model, which indicates the association of higher returns with riskier portfolios.

Third, consistent with the existing literature, outcome$_t$ coefficients are negative when the Spanish and British soccer teams lose and positive when the Chilean and Turkish soccer teams win. This finding supports the proposition that higher morale increases stock market returns for the cases of wins and decreases returns after a loss. These results make sense because Spain and the UK are successful countries in soccer. Thus, wins may not affect the mood of soccer fans as much as losses. For this reason, we expect the effects of losses to be higher for those countries. On the other hand, Chile and Turkey are not as successful in soccer as Spain and the UK. Thus, wins are more likely than losses

[2] We also use http://www.statto.com/, http://kassiesa.home.xs4all.nl/bert/uefa/data/index.html and http://www.eurocupshistory.com/uefa_cup/ to find or validate some of the match results.

Table 1
The number of wins, ties and losses for each country.

	Sample period	Number scores on		
		Wins	Ties	Losses
Chile	02 January 1987–31 December 2006	94	73	90
		(37%)	(28%)	(35%)
Cobreloa		22	18	26
		(33%)	(27%)	(40%)
Colo Colo		31	22	25
		(40%)	(28%)	(32%)
Universitad Catolica		30	24	25
		(38%)	(30%)	(32%)
Universitad de Chile		11	9	14
Spain	01 November 1977–02 February 2007	298	112	127
		(55%)	(21%)	(24%)
Barcelona		151	62	60
		(55%)	(23%)	(22%)
Real Madrid		147	50	67
		(56%)	(19%)	(25%)
Turkey	03 July 1987–02 February 2007	99	65	109
		(36%)	(24%)	(40%)
Besiktas		27	19	30
		(36%)	(25%)	(39%)
Fenerbahce		24	11	35
		(34%)	(16%)	(50%)
Galatasaray		48	35	44
		(38%)	(28%)	(34%)
United Kingdom	01 January 1985–02 February 2007	249	120	107
		(52%)	(25%)	(23%)
Arsenal		59	33	31
		(48%)	(27%)	(25%)
Chelsea		47	17	20
		(56%)	(20%)	(24%)
Liverpool		63	29	25
		(54%)	(25%)	(21%)
Manchester United		80	41	31
		(53%)	(27%)	(20%)

Source: The data on the soccer scores are from http://www.rsssf.com.
Numbers in parentheses are the percentages of the corresponding outcomes (wins, ties or losses) to total matches.

to affect the stock market return and the return–volatility relationship.

Finally, we consider the interactive term, outcome$_t \cdot h_t$. The coefficients are negative for Chile and Turkey and positive for Spain and the UK. The negative coefficients for Chile and Turkey suggest that markets compensate agents less after a win for bearing the same level of risk; that is, agents are more risk loving after a win. The positive coefficients for Spain and the UK suggest that markets compensate agents more after a loss for bearing the same level of risk; agents become more risk averse. We estimate the same specifications for Spain's and the UK's wins and Chile's and Turkey's losses. We do not report these estimates here to save space but they are available from the authors upon request. Neither the outcome coefficients nor the interactive terms are statistically significant, supporting the proposition

Table 2
Descriptive statistics of the countries' stock market returns in the respective sample periods.

	Chile	Spain	Turkey	United Kingdom
Mean	0.075580	0.050450	0.217808	0.032523
Standard deviation	0.842854	1.057097	2.987632	1.006494
Skewness	−0.258825	−0.118161	0.180407	−0.586982
Kurtosis	11.659901	5.622417	3.028642	9.673965
Jarque-Bera	29457.843566	10020.099049	1837.702786	22676.560464

Source: Data for the stock exchanges are from Datastream.
Notes: Returns are calculated by taking the percentage change of the daily closing price of the stock exchange indexes. We used the General Stock Price Index (IGPA) for Chile, the Madrid Stock Exchange General Index for Spain, the Istanbul Stock Exchange 100 Index for Turkey, and the Financial Times Stock Exchange 100 Index for the UK.

Table 3
Effects of soccer match outcomes on stock returns and the return–volatility relationship.[†]

	Outcome – losses		Outcome – wins	
	Spain	UK	Chile	Turkey
Panel A: estimates for the return equation				
Monday	0.0390*	−0.0145	−0.1268***	−0.1728
	(0.0761)	(0.6509)	(0.0000)	(0.1122)
Tuesday	−0.0814***	0.0303	0.0092	−0.1428
	(0.0000)	(0.4433)	(0.7355)	(0.1997)
Wednesday	−0.0485*	0.0425	0.0290	0.0744
	(0.0643)	(0.1824)	(0.2944)	(0.5199)
Thursday	−0.0107	0.0223	0.0671**	0.0774
	(0.6087)	(0.4859)	(0.0155)	(0.4917)
Friday	0.0224	0.0732*	0.0782***	0.2383**
	(0.5070)	(0.05384)	(0.0051)	(0.0370)
$Outcome_t$	−0.1298**	−0.5265***	0.3110**	1.2969**
	(0.0306)	(0.0007)	(0.0421)	(0.0423)
h_t	0.0438***	0.0139*	0.0246	0.0457
	(0.0000)	(0.0815)	(0.5294)	(0.2550)
$Outcome_t \cdot h_t$	0.0969*	0.6350***	−0.6318**	−0.6102**
	(0.0571)	(0.0002)	(0.0233)	(0.0330)
Panel B: estimates for the EGARCH specifications				
Parameters				
K	0.0102***	−0.0048	−0.0212**	0.1027***
	(0.0051)	(0.2605)	(0.0120)	(0.0000)
$\log h^2_{t-1}$	0.9893***	0.1230***	0.5426***	1.0198***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
$\log h^2_{t-2}$		0.8470***	0.4028***	−0.3890**
		(0.0000)	(0.0000)	(0.0148)
$\log h^2_{t-3}$				0.3224***
				(0.0002)
$\left(\left\lvert\frac{\varepsilon_{t-1}}{h_{t-1}}\right\rvert - E\left\lvert\frac{\varepsilon_{t-1}}{h_{t-1}}\right\rvert + \chi\frac{\varepsilon_{t-1}}{h_{t-1}}\right)$	0.3015***	0.1477***	0.4011***	0.3638***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
$\left(\left\lvert\frac{\varepsilon_{t-2}}{h_{t-2}}\right\rvert - E\left\lvert\frac{\varepsilon_{t-2}}{h_{t-2}}\right\rvert + \chi\frac{\varepsilon_{t-2}}{h_{t-2}}\right)$	−0.0746**	0.1237***		
	(0.0204)	(0.0000)		
$\left(\left\lvert\frac{\varepsilon_{t-3}}{h_{t-3}}\right\rvert - E\left\lvert\frac{\varepsilon_{t-3}}{h_{t-3}}\right\rvert + \chi\frac{\varepsilon_{t-3}}{h_{t-3}}\right)$	−0.0510*	−0.0200		
	(0.0752)	(0.4829)		
χ	−0.0939**	−0.3877***	0.0211	−0.0764**
	(0.0152)	(0.0000)	(0.5730)	(0.0387)
TT	4.8537***	11.1588***	5.6742***	7.4441***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Function value	−5155.5998	−3952.5773	−2176.8415	−8510.7244
Panel C: Ljung-Box Q-statistics				
Lags				
5	0.1118	0.5300	0.0297**	0.0195**
10	0.3229	0.9171	0.1784	0.1531
20	0.0859*	0.8559	0.1642	0.5242
60	0.4049	0.8722	0.2672	0.8138
Panel D: ARCH-LM tests				
Lags				
5	0.9974	0.0016***	0.0383**	0.4072
10	1.0000	0.0331**	0.1909	0.0152**
20	1.0000	0.1747	0.5037	0.0584*
60	1.0000	0.8863	0.4444	0.2204
Panel E: non-parametric (sign) tests				
Sign bias test	0.3570	0.7859	0.0298**	0.3159
Negative size bias test	0.4256	0.2170	0.4949	0.4659
Positive size bias test	0.4521	0.2515	0.0812*	0.3155
Joint test	0.3625	0.3856	0.1546	0.3595

Source: The data on soccer scores are from http://www.rsssf.com and the data on returns from Datastream.

[†] We report p-values in parentheses. The estimated coefficients for the lagged values of the dependent variables have not been reported to save space.

*** Indicates the level of significance at the 1% level.

** Indicates the level of significance at the 5% level.

* Indicates the level of significance at the 10% level.

that losses have more of an effect on the countries with more successful soccer teams; however, wins have more of an effect on countries with less successful teams.

The estimates for the EGARCH model and a battery of specification tests for the model are reported in Table 3's Panels B–E. We show the estimated coefficients for the EGARCH specification in Panel B. For

the countries under consideration, the coefficients of $\log(h_{t-i})^2$ and $\left(\left|\varepsilon_{t-j}/h_{t-j}\right| - E\left|\varepsilon_{t-j}/h_{t-j}\right| + \chi\varepsilon_{t-j}/h_{t-j}\right)$ are significantly different from zero.[3] The lagged-value estimated coefficients of $\log(h_t^2)$ are statistically significant and the characteristic roots of the polynomial are all inside the unit circle. Thus, none of the conditional variance specifications is explosive. Evidence on the leverage effect, the estimated coefficient for the leverage effect, χ, is negative for Spain, Turkey and the UK, indicating that negative surprises increase volatility more than positive surprises. However, we do not observe a statistically significant leverage effect for Chile.

To set up the maximum likelihood estimator for Eqs. (1) and (2), we assume that errors have a General Error Distribution. TT is the parameter for return tail thickness. A TT > 2 implies that errors have a thicker distribution than normal.

Panel C reports the *p*-values of the Ljung-Box *Q*-statistics for the standardized squared residuals, (ε_t^2/h_t^2), calculated to test the null hypothesis of zero autocorrelation up to 60 lags. Overall, we cannot reject the null of no autocorrelation for any country. The only exceptions are Spain at 20 lags with a significance level at 10%, and Chile and Turkey at five lags with a significance level at 5%.

Next, to test for the null hypothesis that there is no ARCH effect for the standardized residuals (ε_t/h_t), we apply Engle's (1982) ARCH-LM test. Test statistics for the standardized residuals are reported in Panel C. To test the null hypothesis that there is no ARCH effect, we regressed the squared standardized residuals on a constant term and on its fifth, tenth, twentieth and sixtieth lags. Here, the aim is to test whether lag terms are jointly statistically significant; the results show that the null of no ARCH effect is rejected only for Chile at five lags at the 5% significance level, for Turkey at 10 lags at the 5% significance level and 20 lags at the 10% significance level and for the UK at five and 10 lags at the 1% and 5% significance levels, respectively.

Panel E reports the non-parametric sign and size bias tests performed for the standardized residuals (ε_t/h_t). Calculating the test statistics, we use standardized residuals (ε_t/h_t). We add two dummy variables, m_t and p_t, to the equation such that $m_t = 1$ if the normalized residual is negative, 0 otherwise, and $p_t = 1$ if it is positive, 0 otherwise. We also define two interactive dummy variables: sm_t and sp_t.

$$sm_t = p_t * (\varepsilon_t/h_t) \quad \text{and} \quad sp_t = p_t * (\varepsilon_t/h_t)$$

$$sm_t = p_t \cdot (\varepsilon_t/h_t) \quad \text{and} \quad sp_t = p_t \cdot (\varepsilon_t/h_t)$$

Later, we regress (ε_t/h_t) on the constant term, m_t, sm_t and sp_t. In the sign test, we determine whether the coefficient of m is zero or not. With the negative sign test, we test whether the coefficient of sm_t is zero; with the positive sign test we test whether the coefficient of sp is zero and with the joint test we test these null hypotheses jointly. The results show that no country's test statistics are statistically significant, except for the sign biased test and positive size bias test for Chile, which are statistically significant at the 5% and 10% levels, respectively. Hence, since most test statistics reported in Panels B–E are not statistically significant, we conclude that they support our specifications.

[3] We determine the selection of the lag order for both terms such that the specification tests reported in Panels B, C, D and E do not reveal that standardized residuals are not *iid*.

4. Conclusions

This paper presents empirical evidence that soccer match scores affect stock market returns and stock market return–volatility relationships. Evidence from countries with relatively more successful soccer teams, Spain and the UK, indicate stock market returns decrease and the risk–return relationship changes with the match score so that agents become more risk averse after a loss. However, we cannot find statistically significant evidence for this change after a win. The data from countries with relatively less successful soccer teams, Chile and Turkey, reveal that stock market returns increase and agents become more risk loving after a win. Similarly, we cannot find statistical significance after losses. The more-pronounced loss effect for Spain and the UK and win effect for Chile and Turkey may be due to successful histories or fan expectations from these countries' soccer teams.

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