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Soccer Sentiment and Stock Returns

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Abstract

Motivated by the abundance of psychological evidence showing that sports results have a strong impact on mood, I write this paper to investigate the stock market effect of soccer results by national teams. In the first research objective to replicate the main findings of Edmans et al. (2007), I document a strong negative stock market reaction to losses by national soccer teams in 1973 – 2004 period while there is no evidence of a corresponding reaction to wins. Using a set of data that includes observations in the out-of-sample period, 2005 – 2020, I investigate the time variation and the cross-sectional variation of the loss effect to unveil its nature. The results indicate that in the recent period, the effect disappears in the aggregate sample but continues existing in the group "Other nations" and in small stocks. Combined with the fact that the market declines after soccer losses are weaker in these nations and that small stocks are associated with higher barriers to arbitrage, my results are consistent with the interpretation of the loss effect as a behavioral anomaly in the market.

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1. Introduction

Literature in psychology and behavioral economic has shown that the mood of individuals can affect their choices, which, in the context of financial market, affect stock prices and create anomalies. Meanwhile, one of the basic assumptions of efficient capital markets is that investors make rational decisions. Therefore, the empirical evidence that sentiment and mood affect asset pricing directly challenges this assumption and is, thus, a potential violation of market efficiency. One sentiment variable that is discussed in finance research is sports results. Schwarz et al. (1987) demonstrate that sports results, in particular soccer results, have an impact on people's mood and how they judge life in general. This mood change, in turn, affects asset pricing on capital markets (Edmans, Garcia and Norli, 2007). Edmans et al. (2007) also find an economically and statistically significant negative abnormal daily stock market reaction after a loss of the national soccer team.

However, that evidence against the efficient market is discovered does not necessarily mark an end to the theory. The persistence of the documented anomalies, especially the one that is related to soccer results, remains in question. Schwert (2003) finds that the size and value effects have disappeared sometime after they were published, implying that market efficiency is restored. Marquering et al. (2006) also recognize evidence that some anomalies such as weekend effect, holiday effect, time-of-the-month effect, and January effect do not persist after having been published. Moreover, their disappearance often coincides with their academic publications. Based on those papers, many studies (among others, Ehrmann and Jansen, 2016; Kaplanski and Levy, 2014) have also considered the persistence of the soccer effect from different angles, from investigating the long-lasting effect of the 2010 FIFA World Cup on the US stock market to investigating minute-by-minute effect using intraday data.

Continuing on this stream of financial research, in this paper, I focus on (1) identifying the impacts of soccer sentiment on stock returns and (2) analyzing dynamic of this relationship in different time and cross-sectional dimensions to unveil the nature of the soccer effect. My study employs a dataset similar to the one used in Edmans et al. (2007) but with new data of the post-publication period, which enable an investigation on the change behavior of the effect over time, thus revealing new evidence on the nature of the phenomenal. Compared to the papers Kaplanski and Levy (2014) and Ehrmann and Jansen (2016), which also study the persistence of the soccer effect, my

analysis covers 29 national soccer teams with their respective local market indices and in multiple years after the publication of influential papers about the effect in the early 2000s. Meanwhile, Ehrmann and Jansen (2016) study only one stock and two matches and Kaplanski and Levy (2014) focus only on the international effect of the 2010 FIFA World Cup on the US market. Therefore, my results can shed more light on the behavior of the effect and whether it is a violation of the efficient market hypothesis.

In the first part of this research, I investigate the relationship between soccer results and stock returns replicating the major findings of Edmans et al. (2007), who study this relationship and hypothesize that, due to the impact of soccer results on investors' sentiment, soccer wins (losses) lead to a positive (negative) stock market reaction. Following the empirical method employed by Edmans et al. (2007), I first estimate abnormal stock returns while controlling for first-order serial correlation, correlations across stock markets, and calendar effects. Then, I regress the obtained abnormal returns against win and loss dummies to see whether they have an impact on market returns. Additionally, I also repeat the above procedure with time series of normalized index returns to eliminate issues related to time-varying volatility of stock returns. After that, I also examine whether soccer results still influence market returns in 2005 – 2020 period by following a similar procedure. Similar to Edmans et al. (2007), the results I obtain strongly support the loss effect in 1973 – 2004 period. In particular, losses have an economically and statistically significant negative effect in local markets of the losing countries while wins do not. The point estimate of the loss effect is also larger in groups of the more-important games. Most importantly, these findings are robust when using different specification of abnormal return, different sample trimmed of outliers, and different statistical testing methodology, namely binomial test. Meanwhile, the result in the later period, 2005 – 2020, is in stark contrast to the prior one. Loss effect has become weaker and less robust in the recent period.

The second part of my research tries to explain the results in the first part and thus answer questions about the nature of loss effect. In this part, I focus on analyzing the time variance and cross-sectional variance of the effect. In particular, I first split the sample into "Top Seven soccer nations" and "Other soccer nations" to examine whether the soccer effect in my sample is only driven by the Top Seven countries, where soccer is of the greatest importance. I also explore how the behavior of the effect change over time in each group. Furthermore, I hypothesize that, to the extent that my

results are driven by sentiment, stocks with higher local ownership should be affected more than those with lower local ownership. In my test for difference, I use small stocks and growth stocks as proxy for high domestic ownership, and large stocks and value stocks for the opposite. In addition, I also investigate how the reaction of each style-based group of stocks to soccer outcome varies over time. If the disappearance of the loss effect in the recent period is due to the rational arbitrageurs in the market, it would be reasonable to expect that the effect still remains in the groups of countries and stocks where the limit to arbitrage is higher or the effect is smaller, making it harder to implement a profitable arbitrage strategy. The results I receive indicate that, in 1973 – 2004, loss effect appears in both groups of soccer nations but is stronger in "Top Seven" than in "Other nations"; however, this effect disappears only in the "Top Seven" in 2005 – 2019. Regarding my hypothesis on cross-sectional variance of soccer effect, the results show that for small versus large comparison, the point estimate in small stocks is stronger but the difference is only significant in recent period. Meanwhile, estimates of the effect on value stocks and on growth stocks are comparable to each other in both periods. In addition, while losses in 1973 – 2004 impact the returns all four groups of stocks sorted by size and value-growth criteria, they only affect small capitalization stocks in the recent period.

Altogether, my findings support the existence of a strong negative local stock market reaction to losses by national team in 1973 – 2004 but there is no robust evidence of a corresponding reaction to wins. In 2005 – 2020 period, the effect disappears in the aggregate sample but continues existing in the group "Other nations" and in small stocks. Combined with the fact that the market declines after soccer losses are weaker in these nations and that small stocks are associated with higher barriers arbitrage, my results are consistent with the explanation that the loss effect is a behavioral anomaly in the market. Consequently, I contribute to the literature by verifying empirical results of Edmans et al. (2007) regarding the impact of national soccer results on local stock markets in 1973 – 2004 and expanding the topic with an analysis on the change in behavior of the loss effect after being publicly known in the early 2000s.

The rest of the paper is structured as follows. Section 2 and Section 3 present the literature review and hypothesis development. The datasets and summary statistics are described in Section 4 and Section 5, respectively. Section 6 explains the empirical methodologies and discusses the results regarding the local stock market reaction to

national soccer outcomes in two separate periods, 1973 – 2004 and 2005 – 2020. Section 7 investigates the time variance and cross-sectional variance of loss effect and the driver of the effect. Section 8 concludes my research, with a discussion about the main findings and the potential directions for future studies.

2. Literature review

Investor sentiment and stock returns

Classical finance theory, which assumes that investors behave with rational expectations in order to maintain an efficient market, leaves no role for investor sentiment. To the extent that some investors are not rational, Shleifer (2000) argues that either their trades cancel each other out without affecting prices if they are irrational in random ways or their influence on prices will be eliminated by rational arbitrageurs in the market if they are irrational in similar ways. Thus, the efficient market is always maintained. However, these assumptions are challenged by the research field of behavioral finance. In this strand of literature, various studies have revealed empirical evidence that investors' sentiment have an influence on market participants when they value and act on financial markets (among others, (among others, Brown and Cliff, 2004; Brown et al., 2003; Kamstra et al., 2000; Kaplanski and Levy, 2010; Neal and Wheatley, 1998).

In a broad definition, investor sentiment is "a belief about future cash flows and investment risks that is not justified by the facts at hand" (Baker and Wurgler, 2007, p.1). It is present "whenever security prices deviate from present values of future cash flows" (Bernile and Lyandres, 2011, p.1). Based on this definition, sentiment should have positive correlation with stock returns and an evidence for this is itself an evidence of market inefficiency. In addition, Bernile and Lyandres (2011) also suggest two potential forms of investor sentiment. The first one is the biased ex-ante assessment of the distributions of value-related event outcomes. In particular, investors may be overly optimistic (pessimistic) in the sense that their belief on the probability of positive (negative) outcome is above the true likelihood. In this case, the pre-event stock price, which is valued under investors' subjective probability distribution, is inefficient and thus generates negative (positive) expected abnormal returns around the event. The second type of investor sentiment is the irrational ex-post reaction of investors to resolutions of uncertainty. Under this form, investors may assign correct

probability distribution to the event outcome but then react emotionally to some certain outcomes. Thus, the pre-event price can be efficient but the post-event value is not, resulting in abnormal returns with the same sign as investors' sentiment.

Overall, investor sentiment has an impact on financial markets and can drive stock prices away from their fundamental values, potentially creating free lunches. Based on this understanding about the nature of sentiment and the mechanism in which it drives stock market, I would continue with a more specific line of literature about soccer as a sentiment driver. After that, a discussion about limits to arbitrage, free lunch, and the restoration of market efficiency will wrap up this literature review.

Soccer outcome, mood, and stock market performance

While many papers (among others, Baker and Wurgler, 2000, 2006; Neal and Wheatley, 1998) use the sentiment variables that are the reflection of the market sentiment in a relatively long time period[1], there is also a line of literature that studies sentiment driving events in the short-term, normally only in a few days. For example, Kamstra et al. (2000) provide evidence that changes to and from daylight saving time, which disrupt sleep patterns, can impact investors' asset pricing. Saunders (1993) shows, on a related theme, that the percentage cloud cover at New York stock exchange systematically influences the returns of stocks traded on the exchange. Further developing from this idea, Hirshleifer and Shumway (2003) expand the scope of the study to 26 national exchanges and find that local cloudiness is associated with low index returns of the respective exchange. The important advantages of studying these short-term sentiment driving events are that they tend to offer a larger number of observations and that the shorter the effect, the less other unobserved events and bad-model problems can interfere the research outcome.

Another event that also can influence short-term market sentiment and stock market performance is soccer outcome. Like weather, soccer wins (losses) can drive people's mood and how they judge life in a positive (negative) direction (Arkes et al., 1988; Hirt et al., 1992; Schwarz et al., 1987; Schweitzer et al., 1992). People who are having good mood (bad mood) tend to be better able to recall positive (negative) material in

[1] The fund discounts and net redemption that Neal and Wheatley (1998) measure, the equity share in new issues that Baker and Wurgler (2000) measure, and the composite index of sentiment that Baker and Wurgler (2006) measure, are all on annual basis.

their memory (Isen et al., 1978). Similarly, Forgas and Bower (1987) find that people have tendency to make mood-consistent judgements. Particularly, mood affects most strongly the abstract judgments about which people lack concrete information (Clore et al., 1994; Forgas, 1995). Put in the context of financial markets, soccer outcome impacts investors' mood; this mood then influences their subjective judgements and evaluations of future prospects, which basically form investor sentiment.

Beside this simple positive relationship between game outcome and mood, Edmans et al. (2007) go further with three suggestions for the asymmetry in the magnitude of impact between win and loss. First, while psychological studies have documented many extreme reactions associated with losses, such as increases in heart attacks, crimes, and suicides, there is no similar extreme reaction to wins. Second, from the perspective of the prospect theory of Kahneman and Tversky (1979), fans often incorrectly assign win as the reference point because, according to Markman and Hirt (2002), they are subject to an "allegiance bias," the rendering of biased predictions by individuals when they psychologically invested in a desired outcome. Therefore, a failure in game may hurt them more than a success. Third, since most of the international tournaments are organized in a format that gradually eliminates participating teams until there is a champion, a loss, especially in elimination round, may mean the championship is over while a win only enables a country to enter the next round.

Based on these arguments, numerous papers have studied the correlation between outcomes of soccer matches and stock prices performance. At club level, Palomino et al. (2009) study how stock returns of soccer clubs listed on the London Stock Exchange react to their game results and find an average abnormal return of about 1% (−1%) over the first three days following a win (a loss). Extending on this direction, Bernile and Lyandres (2011) use a sample comprised of 20 publicly traded soccer clubs in 8 European countries and focused only on international games, where the achievement of each team is less dependent on other teams' performance. The results they obtain suggest an insignificant return reaction to wins while there are significant abnormal returns of -0.88% and -2.22% after draws and losses, respectively. Castellani et al. (2015) go a bit further as they study all listed European soccer teams and obtain similar findings.

At national team soccer team level, most of the empirical studies focus on the impact of the outcomes of international matches on the respective local stock markets and, however, obtain mixing results. Ashton et al. (2003) study the correlation between the performance of the Financial Times Stock Exchange (FTSE) 100 index and the performance of England football team. Their evidence suggests that the conditional mean returns after wins (losses) are significantly likely to be above (below) the unconditional mean return of the FTSE 100 index. Ashton et al. (2003) also regress the daily index returns on a dummy of win outcome and find that wins are significantly associated with higher returns; the return increases are also larger for more important games. Nevertheless, Klein et al. (2009) raise concerns about the methodology of this research and claim that after applying necessary modifications with respect to their concerns, they are unable to replicate Ashton et al.'s (2003) findings. In response to this criticism, Ashton et al. (2011) adjust their methodology according to the suggestions of Klein et al. (2009) and still find a significant influence of soccer results. While Ashton et al. (2011) show symmetric soccer effect, Edmans et al. (2007) study a broader sample of 39 soccer nations and only find a significant negative effect of losses. The more important are the matches, the larger the loss effect[2] (Edmans et al., 2007). In spired by the asymmetry in this finding, Kaplanski and Levy (2010) propose an approach to exploit the effect on an aggregate international level. In particular, they hypothesize that, due to high foreign ownership in the U.S. stocks, the negative aggregate effect of World Cup games on sentiment of the foreign investors may influence this market. After each round of the World Cup, the number of losing countries increases until eventually there is only one champion and dozens of losing teams, creating on the U.S. market a long lasting negative effect, which, on aggregate level, could be stronger than in each individual local market (Kaplanski and Levy, 2010). Their finding is also a strong evidence for the sentiment explanation of the loss effect.

Another notable study providing robust evidence to support the influence of the national soccer team failures on stock performance is the research of Ehrmann and Jansen (2016). By using intraday data and international matches that happen while the

[2] According to Edmans et al. (2007), the decrease in local market stock returns after a loss in the World Cup elimination round is 49 basis points while such decrease in the World Cup group game is only 38 basis points.

local stock markets are still open, they are able to show that the minute-by-minute performance closely reflect the negative sentiment from the football fields.

Economic factors as an explanation for the soccer effect

In the above strand of literature, it is worth noting that abnormal positive (negative) returns in response to wins (losses) do not necessarily imply irrational reactions of investors. In fact, such returns may reflect the economic impact of the match outcome on the listed clubs and companies. Palomino et al. (2009) suggest three possible ways in which the performance on the field can impact a soccer club's financial performance. First, the proceeds from the broadcasting income are distributed to clubs based on their performance, i.e., where a club finish in the league table. Second, the top ranking teams at the end of each season are eligible to participate in an upper level league[3], which offer higher income from broadcasting rights. Third, the performance in each game can directly affect the commercial revenue that each team earns from ticket sales, sponsorship, and merchandising, and can also reveal the information about players' quality.

While the economic impact of soccer on publicly traded clubs seems to be straightforward, such impact is harder to measure and evaluate in the case of national soccer team. The above sources of income for soccer clubs cannot be used to justify the effect in this case; as Edmans et al. (2007) make a comparison that the size of the effect in the U.K. market in 2005 is three times larger than the total market capitalization of all soccer clubs in the English Premier League. However, they also notice that the economic impact of sport results through channels such as labor productivity and population health can go beyond soccer industry itself, making the comparison less relevant. Card and Dahl's (2011) findings also reveal that professional soccer losses result in a significant rise in local domestic violence, which comes at economic costs.

One of the very few statistical tests on the economic explanation belongs to Edmans et al. (2007), as they hypothesize that, if the reaction is rational, the ex-ante

[3] The soccer leagues in each European country are often organized according to a promotion-and-relegation scheme. Teams that hold the top (worst) rankings in their league are promoted to the league immediately above (below). If a team is already playing in the highest level league of a country, holding the top rankings still offers the team a chance to play in the Continental Champions League with additional shared revenue from broadcasting rights.

probabilities of the outcomes should be reflected in the ex-ante stock prices. Their rejection of this hypothesis implies that the loss effect after soccer games is not driven by economic factors, leaving sentiment as the most potential explanation. Similarly, empirical findings of many other authors (e.g., Bernile and Lyandres, 2011; Ehrmann and Jansen, 2016; Kaplanski and Levy, 2014; Palomino et al., 2009) also agree that investor sentiment does play a role in the postgame market reaction.

Cross-sectional effect of soccer

As mentioned above, investor sentiment has prediction power on not only time-series but also cross-section of market returns (Baker and Wurgler, 2006). According to Baker and Wurgler (2006), mispricing must result from both a shock in demand from uninformed investors and a limit on arbitrage. Thus, they suggest two channels for the influence of sentiment on the cross-section of stock performance: (1) the cross-sectional variation in sentiment and (2) the cross-sectional variation in arbitrage.

Regarding the first channel, Edmans et al. (2007) argue that soccer sentiment should be stronger in countries where soccer is of the greatest importance. Thus, they select a group of the top seven soccer nations[4] based on the historical achievements and the development of domestic soccer industry. Edmans et al.'s (2007) empirical results show that the loss effect in Top Seven is larger than in Other countries in all groups of games.

For the second channel, an indiscriminate wave of sentiment can still affect the cross-section if arbitrage forces are uneven among subsets of stocks (Baker and Wurgler, 2006). Amihud and Mendelson (1986) reveal that small and extreme growth stocks tend to have higher trading costs. They are especially costly or even impossible to sell short, thus imposing higher barriers on arbitrage (Duffie et al., 2002; Geczy et al., 2002; Jones and Lamont, 2002; Lamont and Thaler, 2003; Mitchell et al., 2002). Not only trading expenses but also idiosyncratic risks play a role in making it harder to arbitrage these stocks (Wurgler and Zhuravskaya, 2002).

[4] The list includes the "Big Five" European countries (England, France, Germany, Italy, and Spain) who collectively account for 80% of total soccer revenue in the continent; together with Brazil and Argentina, these seven soccer nations systematically hold the top rankings in the world (Edmans et al., 2007).

In the context of soccer, small (growth) stocks also have special characteristics that make the effect of soccer sentiment on them different from the effect on large (value) stocks. As small stocks receive less analyst and media coverage (Bhushan, 1989), foreign investors are at greater information disadvantage. Therefore, there is evidence that foreigners underweight small stocks in Japan and Sweden markets (Dahlquist and Robertsson, 2001; Kang and Stulz, 1997). Meanwhile, "hard" accounting measures are of less importance in valuations of growth stocks (Edmans et al., 2007), and the apparently strong growth outlook of those firms allows unsophisticated investors to defend a wide range of valuations, from much too low to much too high, depending on their sentiment (Baker and Wurgler, 2006). Moreover, the evidence from Dahlquist and Robertsson (2001) also reveals that foreign investors tend to overweight stocks with large amount of cash in their balance sheet, thus favoring value firms. In summary, there are reasons to expect that, due to higher domestic and individual ownership in small (growth) stocks, the influence of soccer sentiment on these groups is greater than in larger (value) stocks.

Limits to arbitrage and the disappearance of market anomalies

When an "apparent" anomaly is identified, there could be multiple possible reasons for it. Before considering it a true anomaly, Mclean and Pontiff (2016) suggest two other possible explanations: statistical biases and rational pricing. If the return prediction power of a variable reflects underlying risk factors, it is likely to persist even after the opportunity is widely publicized (Cochrane, 1999). In contrast, if the potential "anomaly" is just the results from data snooping, we should witness a decline or even a disappearance in its return predictability when using out-of-sample data (Fama, 1991). However, the disappearance can also have another reason: investors have learned about those anomalies and arbitraged away (Marquering et al., 2006). Nevertheless, it still implies that stock markets have become more efficient in the post-publication period.

This central idea has sparked the interest of many researchers, who study the behavior of the documented anomalies after having been published on influential journals and widely discussed (e.g., Dimson and Marsh, 1999; Marquering et al., 2006; Mclean and Pontiff, 2016; Mehdian and Perry, 2002; Schwert, 2003). The findings of Mehdian and Perry (2002) and Fountas and Segredakis (2002) reveal that the January effect has lost

their prediction power in the US market and in 18 emerging markets, respectively. Schwert (2003) indicates that the weekend effect and the dividend yield effect also disappear after the papers that made them famous were published; meanwhile, since the publication of the value and size effects, index funds that were created to mimic the size and value strategies fail to generate alpha. Similarly, Marquering et al. (2006) show that multiple calendar anomalies such as the weekend effect, holiday effect, time-of-the-month effect and January effect have disappeared while the small firm effect has resurrected; their disappearance or resurrection often coincides with academic publications.

Similar findings regarding the disappearance of the effect of national soccer team performance on stock markets are also documented by Kaplanski and Levy (2014) and Ehrmann and Jansen (2016), as they study how the FIFA World Cup 2010 influences stock markets. Both of the papers suggested arbitrage forces as a potential reason. This argument is in line with the findings in a recent paper by Chu et al. (2020), who demonstrate a causal relationship between relaxed short-sale constraints and the reduction in arbitrage profits of 11 well-known asset pricing anomalies in the study.

Their results complete the story discussed above: Before anomalies are discovered, they are the violations of market efficiency, implying that free lunches may sometimes exist. After they are discovered and publicly known, their effect is arbitraged away on stocks with lower limits to arbitrage while potentially remains where the limits are higher. In the opposite direction, if an apparent anomaly exists in the post-publication period only in the stocks with higher barriers for arbitrageurs, that evidence would make the alternative explanations about rational pricing and data snooping less likely.

3. Hypothesis development

In this section, I develop two hypotheses regarding the impact of soccer results on national stock market returns as followed:

Hypothesis 1: There is empirical evidence that investor sentiment has an influence on market participants when they value and act on financial markets (G. W. Brown and Cliff, 2004; S. Brown et al., 2003; Neal and Wheatley, 1998). It is also evident that some sentiment variables have predictive power on the time-series of stock returns (Hirshleifer and Shumway, 2003; Kamstra et al., 2000; Saunders, 1993). Meanwhile,

other papers also document sentiment variables that can predict the cross-section of stock returns (Baker and Wurgler, 2006, 2007). Overall, their empirical findings suggest that positive (negative) sentiment is associated with positive (negative) market impact and thus can drive asset prices away from their fundamental values.

Sports results, in particular soccer results, is one sentiment variable that has been discussed by numerous empirical studies. Like weather, soccer wins (losses) can have positive (negative) impact on people's mood and how they judge life in general (Arkes et al., 1988; Hirt et al., 1992; Schwarz et al., 1987; Schweitzer et al., 1992). People who are having good mood (bad mood) tend to be better able to recall positive (negative) material in their memory (Isen et al., 1978). Likewise, Forgas and Bower (1987) find that people have tendency to make mood-consistent judgements. Particularly, mood affects most strongly the abstract judgments about which people lack concrete information (Clore et al., 1994; Forgas, 1995). These studies suggest a chain of reactions, in which soccer wins (losses) can lead to positive (negative) mood, which then takes people to biased positive (negative) judgments.

When putting these biased judgments in the context of financial markets, it is reasonable to expect that soccer outcome has predictability on the time series of returns. The channel of the influence suggested above implies that soccer results create ex-post biased reaction of investors to the game outcome. After a soccer win (loss), investors may become overly optimistic (pessimistic) about future cash flows and investment risks of the stocks in their consideration, resulting in positive (negative) abnormal returns.

Furthermore, empirical studies that find a significant soccer impact at club level also propose an economic link between the performance of a soccer club and its respective stock price (Bernile and Lyandres, 2011; Castellani et al., 2015; Palomino et al., 2009). In particular, Palomino et al. (2009) suggest three sources of financial impact that the performance on the field can create, namely broadcasting right money in the season, prospect of increasing/decreasing this income in the next season, and other commercial revenue such as ticket sales, sponsorship, and merchandising. However, this link does not apply for the relationship between national soccer team performance and its local stock market returns. In fact, Edmans et al. (2007) has rejected the hypothesis that

stock market reaction to national team results is due to rational economic reasons, leaving behavioral reason as the most likely explanation in this case.

Beside the purpose of replicating Edmans et al.'s (2007) results regarding soccer effect in the in-sample period, 1973 – 2004, my other objective is to answer the question about whether the phenomenal exist out-of-sample in the recent period. In addition to the question about when the effect exists, where it exists can also reveal further insights about the nature of the effect, which is another objective of my study.

H1: Soccer wins have positive impact on stock market returns and soccer losses have negative impact on stock market returns.

Hypothesis 2: To the extent that soccer outcome is a sentiment variable, it might also have prediction power on the cross-section of stock returns. Baker and Wurgler (2006) predict that a wave of investor sentiment has stronger effects on securities whose valuations are highly subjective and difficult to arbitrage. Regarding the first criteria, they suggest extreme growth stocks. The seemingly unlimited growth opportunities enable unsophisticated investors to hold a wide range of belief on intrinsic values of these stocks, from very low to very high (Baker and Wurgler, 2006). Holding a similar perspective, Edmans et al. (2007) argue that "hard" accounting measures are of less importance in valuations of growth stocks, making their valuations subjective.

Furthermore, it is evident that small and growth stocks are those with more barriers to arbitrage. They have high trading cost (Amihud and Mendelson, 1986); they are especially costly or even impossible to sell short (Duffie et al., 2002; Geczy et al., 2002; Jones and Lamont, 2002; Lamont and Thaler, 2003; Mitchell et al., 2002); and they also have high idiosyncratic risks (Wurgler and Zhuravskaya, 2002).

In the context of soccer sentiment, there is one more reason that the effect is stronger in small (growth) stocks than in large (value) stocks. Foreigners are at greater information disadvantage in small stocks and thus tend to underweight these shares in their portfolio (Bhushan, 1989; Dahlquist and Robertsson, 2001; Kang and Stulz, 1997). Meanwhile, foreign investors also tend to overweight securities with large cash on balance sheet, which indicates a preference on value firms over growth firms (Dahlquist and Robertsson, 2001). To the extent the mood of local investors drives my results, local ownership should be a determinant on the cross-section of the soccer

effect on different securities. Consequently, I expect that higher local ownership, in addition to high trading costs and subjectivity in valuation, can result in stronger soccer effect on small (growth) stocks than on large (value) stocks.

Last but not least, studying the cross-sectional variance of the impact in combination with understanding about its time variance would shed more light to understand the nature of the effect.

H2: The effect of soccer results on stock market is stronger in small stocks than in large stocks and in growth stocks than in value stocks.

4. Datasets

In this section, I describe all the datasets used in my study as well as the construction of the related variables. The summary statistics of soccer games and market returns will be presented in Table 1.

4.1. Data sources and list of countries in the sample

The primary dataset consists of soccer data and local stock market indices from January 1973 through December 2020. From the website www.eloratings.net, I collect international soccer results of the top 50 countries with the highest ranking. Then, I continue with 30 countries in which Datastream provides the total market indices with mnemonic starting with "TOTMK." Following the treatment of Edmans et al. (2007), I exclude the United States from the list due to the large number and strong popularity of other club sports, namely basketball, baseball, and American football.

The resulting primary dataset includes 29 soccer countries with 148,897 country-date observations during 1973 – 2004 period and 116,211 country-date observations during 2005 – 2020 period. The later period includes out-of-sample and post-publication data as compared to that of Edmans et al. (2007). I use more recent observations since one of my research objectives is to study how the soccer effect behaves after having been publicized and widely discussed.

4.2. Soccer data

The soccer data I collect from the website www.eloratings.net includes all international games with respective dates, places, outcomes, and Elo rating scores of participating teams. As all international soccer games are considered the potential "mood events," I group them according to their relative importance to people's mood. In particular, the matches are classified into World Cup, Continental Cup (including European Championship, Copa America, and Asian Cup), and other games including other tournaments and friendly matches. While the World Cup and Continental Cup have been studied by Edmans et al. (2007), the other games might also have influence on the mood of the public despite their low importance. To further categorize the World Cup and Continental Cup games, I further group them according to their respective stages in the competitions.

The specific format of the World Cup and Continental Cup varies slightly in the past years. However, they generally follow a structure of three stages. In the first stage, national teams have to play against other teams in their region/continent to be qualified for the Cup. Games at this stage is called "qualifying games." In the second stage, all the qualified teams are then allocated into groups and play against other teams in their own groups in order to advance to the next round. I refer these games in the group stage as "group games." Then comes the "elimination games" in the final stage, in which no ties are allowed. The losing team is immediately eliminated while the winning team can advance to the next round. Several rounds in this elimination stage will take place until there is only one team that survives all the elimination games and becomes the champion.

As the "mood events," games in group stage and elimination stage are generally of higher importance relative to other games since they happen in a brief period of roughly one month and attract high level of media coverage as well as public attention. Meanwhile, since the match schedule of the qualifying stage often spreads out in a longer period and not every game is critical to the qualification of a team, games in this stage generally receive less attention from the public and thus are less important to people's mood. Therefore, to identify the games that have higher chance of being critical and having significant mood impact, I follow the method of Edmans et al. (2007), which use closeness in skills of the two opponents as a proxy for importance.

In particular, I compare the Elo ratings of the two opponents after adding 100 points to the team with home advantage. If the rating difference is smaller than 125, a game is marked as close.

One issue that was not mentioned by Edmans et al. (2007) is the "copy and paste" effect. Klein et al. (2009) suggest that for games whose results have to be decided on penalty shoot-outs, the penalty results should be treated as the final outcome and not as drawn games as reported on eloratings.net. I take into account this issue by manually searching for the decisive outcome of elimination games with draw results.

4.3. Stock market indices

The market indices used in my research are downloaded from Datastream. For the main tests on the local markets, I use those that have a Datastream mnemonic starting with "TOTMK." All of these indices are measured in local currency. I select the starting date of each country index so that the market is reasonably liquid at the beginning of the return time series. In particular, the starting date is the first trading day that satisfy two conditions: (1) the 5-day average number of stocks constituting the index is at least 10; and (2) the 5-day average number of firms that experienced a price change is at least 50%. In addition, the returns of Argentina and Romania markets are very volatile and contain extreme returns in the first months of the series. Hence, I trim the beginning months of these time series. Only 13 out of 14,950 games are lost as a result of this treatment. The table in Appendix 1 reports the starting date for the local markets' returns time series.

Another issue with Datastream is that it uses the same calendar for markets. Therefore, on holidays, market returns on holidays on Datastream are often reported as zero instead of not available. To avoid this, I identify a local trading day as holiday when either (1) no stock in the index experienced price movement or (2) less than three stocks moved and there was no trading volume.

Regarding the tests on small and large market capitalization stocks, I apply a set of criteria to select the respective style-based indices in each local market: (1) the index level is measured in local currency; (2) the index must start before 01/01/2000 to ensure its presence in 1973 – 2004 period and must exist at least until 31/12/2020; and (3) the index data must cover a total return index. When a local market has several

indices that satisfy these conditions, I select the one with the longest historical data. When it comes to the selection of value and growth indices, the above procedure results in a list of MSCI indices. Overall, there are 26 countries that Datastream provides at least one index that meets my minimum requirements for each style. The list of style-based indices with their respective sources is presented in Appendix 2.

Furthermore, I use the assumption that all dividends are reinvested and thus obtain the return time series by computing log returns of the respective total return index. Only when the total return index is missing, returns obtained from price index is used instead. The index returns are measured in local currency as the sentiment variables in my study are likely to influence domestic investors, for whom local returns can be considered the proper benchmark.

4.4. Market reaction measurement

In my study, I try to measure stock market reaction to the performance of national soccer teams in international matches. Replicating Edmans et al.'s (2007) empirical approach, I use the broad market index return of the first trading day after the game as a proxy for market reaction. One possible issue with this proxy is that some games are played on weekdays and their results are known before the national stock market of an opponent is closed. In the case of these games, the soccer effect might have well decreased by the next trading day. However, both Edmans et al. (2007) and Ashton et al. (2011) agree that this procedure only attenuates the results and it is best to be consistent and conservative when treating these matches in the same way as other matches. In addition, this proxy also ensures that the game outcome is known for the whole trading day.

To combine soccer data with stock data, I first map each soccer game with the date of the next trading day after the game, accounting for weekends and holidays. I eliminate the observations in which there are more than one match affecting the same trading day to avoid ambiguity in the influence of those games on investors' mood. Only 16 out of 14,950 games are excluded due to this treatment. Among the remaining games, only 6,021 wins and 3,072 losses are considered the mood events according to my hypothesis.

5. Summary statistics

In table 1 is the summary statistics for the number of wins and losses in each group of games. The table also provides information about the mean log daily market returns on non-game days, as well as the average returns of trading days following wins and losses. Since of my research objectives is to replicate the main findings of Edmans et al.'s (2007) paper, I separate the aggregate dataset into in-sample period, 1973 – 2004, to achieve this goal and out-of-sample period, 2005 – 2020, to fulfill the other goals. Panel A reports the descriptive statistics of the prior period while the Panel B covers the more recent observations. Considering the starting date of the return time series (Appendix 1), the key variables, including number of games and mean and volatility of returns, as well as the pattern of means returns in different game groups, the summary statistics I obtain for the in-sample period are comparable to those of Edmans et al. (2007).

In 1973 – 2004 period, 142,657 trading days are not associated with soccer outcome. The mean and standard deviation of the returns for these days are respectively 5.57 and 124.35 basis points. When looking at all soccer games, the mean return is slightly above the non-game mean (7.57 basis points) following wins and slightly below the non-game mean (1.91 basis points) following losses. Return volatility seems to be higher after game days than in other days but the difference is marginal. Considering the World Cup and Continental Cup games, which have higher importance to the mood of investors, the mean return after wins is positive (12.14 basis points), but turns negative and remarkably lower on trading sessions following a loss (-15.48 basis points). In addition, the number of other games seems to be overwhelming compared to the number of World Cup and Continental Cup games, accounting for 78% the number of wins and 69% of losses. Such a large quantity can help explain for low public attention toward these games and their relatively low importance as a mood driver.

Looking across different cups and stages in these tournaments, there is a pattern that the average market return following losses are below the non-game mean in all subgroups of matches. Generally, the difference is largest for the World Cup games and elimination games. It is apparent that the impact of wins in important matches is less pronounced and less consistent than that of losses. It is also worth noting that the

group “Other games,” which are regarded as less important, does not follow this pattern. Both outcomes are associated with next-day mean returns above the non-game mean while returns following losses are above those following wins on average.

In Panel A, I consider seven groups of games related to the World Cup and Continental Cup, which have high importance to people’s mood, and a group of other games, which has low importance. In each of the seven highly important groups, the mean return difference between days following wins and days following losses is positive. The difference is negative only for games with low importance but by less than two basis points. It would be reasonable to assume that market returns associated with match results are independent among these groups. Assume further that the likelihoods of having positive and negative difference are equal, the probability of 7 positive differences out of 8 Bernoulli trials is 3.5%. If only important games are considered, this probability is even well below 1%. Therefore, the null hypothesis of equal mean returns on days following soccer wins and soccer losses can be rejected at conventional statistical significance levels. For that reason, the descriptive analysis in Panel A supports a relationship between the performance of a national soccer team and its respective stock market returns in 1973 – 2004 period.

Table 1: Number of Wins and Losses in Each Group of Games and Mean Daily Return in Basis Point on the First Trading Day after Matches

The table reports the number of wins and losses in international soccer games. The games happened over the period 1973 to 2020 in the World Cup, European Championship, Copa America, Asian Cup, their respective qualifying stages, and other games, including other tournaments and friendly games. The mean returns are in basis point and calculated from the log daily local market return on the first trading day after soccer wins and losses. Appendix 1 provides more details about the list of countries and the number of wins and losses each country contributes to the total sample. Elimination games are those in which the losing team is immediately eliminated from the championship. Group games happen during the tournament wherein national teams play against other opponents in their groups to enter the elimination stage. Close qualifying games are played by two opponents with in Elo rating difference smaller than 125 points, after adding 100 points to teams who have home advantage. Panel A describes the in-sample period data used in Edmans et al.'s (2007) study while Panel B summarizes the data from the more-recent period 2005 – 2020.

	No Games			**Wins**			**Losses**		
	N	**Mean**	**SD**	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Panel A: 1973 – 2004 period									
No games	142,657	5.57	124.35						
All games				3,077	7.57	123.95	1,678	1.91	128.36
All WC and CC games				611	12.14	120.56	481	-15.48	126.18
World Cup elimination games				62	33.28	122.58	55	-34.28	160.88
World Cup group games				119	-13.15	133.04	62	-51.90	124.90
World Cup close qualifying games				120	9.24	115.74	127	4.49	108.84
Continental cups elimination games				83	-10.13	98.98	62	-33.32	118.57
Continental cups group games				157	27.58	110.91	110	-1.08	126.49
Continental cups close qualifying games				70	33.14	138.86	65	-11.21	125.14
Other games				2,411	6.95	124.73	1,164	9.33	129.29
Panel B: 2005 – 2020 period									
No games	110,643	5.34	125.19						
All games				2,944	3.83	128.37	1,394	-1.48	127.44
All WC and CC games				538	-4.68	123.21	432	-9.96	141.16
World Cup elimination games				54	13.25	108.85	47	-1.79	89.66
World Cup group games				108	-23.97	145.85	58	-19.91	115.35
World Cup close qualifying games				114	-0.19	106.23	128	-17.37	171.81
Continental cups elimination games				77	-17.40	135.75	60	-23.25	141.24
Continental cups group games				128	12.46	116.18	79	9.06	139.69
Continental cups close qualifying games				57	-15.43	115.07	60	-2.70	127.17
Other games				2,362	6.06	129.70	936	2.92	120.26

Regarding the 2005 – 2020 period reported in Panel B, 110,643 trading days are not associated with soccer outcome. The mean and standard deviation of the returns for these days are respectively 5.34 and 125.19 basis points, which are comparable to the prior period. Meanwhile, the post-game returns seem to be lower with mean returns following wins and losses being 3.83 and -1.48 basis points, respectively. Considering the mean return differences on days after wins relative to days after losses, they are still positive in all match groups excepts for the World Cup group games. However, when comparing the mean return in each group with the non-game mean return, the pattern seems to have changed in the recent period. In particular, the mean returns following wins are often below the non-game mean. The mean returns following losses are still below the non-game mean but by a significantly smaller magnitude. For example, mean return after losses in World Cup elimination games is 7.10 basis points below non-game mean in the recent period compared to 39.79 basis points in the prior period.

A potential impact of the data treatment used in my study is the introduction of the day-of-the-week relationship between soccer outcome and market performance. In particular, there are roughly 37% of wins and 35% of losses are played between Friday and Sunday. Therefore, the market returns of Monday in the following week will be measured for these games, raising concern that some day-of-the-week anomalies may influence my results. The next subsection provides further details about the empirical approach that I use to deal with this issue.

6. Empirical results: The loss effect

6.1. Empirical approach

The null hypothesis in my research is that stock market performance is unrelated to the national soccer team performance. This reflects the idea that asset pricing is rational and efficient and the economic creation or destruction of soccer outcome is too small to drive stock market returns.

One implication of the null hypothesis is that, since there is zero correlation between soccer results and market returns, any possible omitted variables due to market return model selection should not bias the estimate of the soccer effect. Replicating the empirical approach of Edmans et al. (2007), I first obtain the “abnormal raw returns”

while accounting for possible day-of-the-week effect and holiday effect from the following regression for each country:

$$R_{it} = \gamma_{0i} + \gamma_{1i} R_{it\text{-}1} + \gamma_{2i} R_{mt\text{-}1} + \gamma_{3i} R_{mt} + \gamma_{4i} R_{mt+1} + \gamma_{5i} D_t + \gamma_{6i} Q_t + \epsilon_{it} \qquad (1)$$

in which R_{it} is the "raw" log daily market return on date t in country i, R_{mt} is the log daily U.S. dollar return on the world market index on day t, $D_t = \{D_{1t}, D_{2t}, D_{3t}, D_{4t}\}$ are the dummies for week days from Monday to Thursday, and $Q_t = \{Q_{1t}, Q_{2t}, Q_{3t}, Q_{4t}, Q_{5t}\}$ are dummy variables that equal one if the last 1 through 5 days are non-weekend holidays and zero otherwise.

In this regression model, I account for the first-order serial correlation by including the lagged index return variable R_{it-1}. In addition, I also want to control for the integration of stock market to the global equity market, which create some correlations among markets. While some countries may move concurrently with the global market, some others may be leading or lagging the world index. Therefore, the three consecutive daily returns of the global broad market index, R_{it-1}, R_{it}, and R_{it+1}, are included to the model.

The estimated raw residual $\hat{\epsilon}_{it}$ obtained from equation (1) is then used for the second regression to estimate the stock market reaction to soccer results, wins and losses:

$$\hat{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} \qquad (2)$$

in which u_{it} is the error term, W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In my research, I iterate this regression for different groups of games, different groups of countries, and different time periods to answer the questions about the robustness as well as the nature of the soccer effect.

One potential issue with the specification of regression (1) is its constant volatility assumption. In fact, it is evident that stock market volatility is time-varying (Bollerslev et al., 1994; French et al., 1987). Therefore, for games happening in periods that have high volatility, the standard error of their effect might be underestimated. In addition, the volatilities in different stock markets are not always the same. Thus, one basis point impact in a highly volatile market may be less meaningful than the same magnitude of impact in a low volatility market. To take into account this concern, I apply the practice

of Edmans et al. (2007), who use the GARCH model developed by Engle (1982) and generalized by Bollerslev (1986). In particular, I use the raw residual $\hat{\epsilon}_{it}$ obtained from equation (1) as input for the GARCH(1,1) process:

$$\sigma^2_{it} = \lambda_{0i} + \lambda_{1i}\,\epsilon^2_{it-1} + \lambda_{2i}\sigma^2_{it-1} \qquad (3)$$

in which σ^2_{it} is the volatility of the index of country i on day t.

The estimated values of σ^2_{it} are then used for a normalization process of the raw returns R_{it}. Specifically, for each country i, I choose two constants a_i and b_i so that the time series of the normalized return $R_{it}^0 = a_i + b_i\,(1/\hat{\sigma}_{it})R_{it}$ have zero mean and unit standard deviation. This practice helps eliminate the heterogeneity in volatility across countries by using the time-series of variance obtained from GARCH process. After having the time series of normalized return R_{it}^0, I use them as input for the regression (1), from which the values of "abnormal normalized returns" are estimated. I denote them as $\tilde{\epsilon}_{it}$ to distinguish with the "abnormal raw returns" $\hat{\epsilon}_{it}$ mentioned above. Except for the main tests of the soccer effect on aggregate markets, I use $\tilde{\epsilon}_{it}$ for my remaining analyses to avoid the above mentioned issues with volatilities.

In addition, the numbers of wins/losses reported in regression (2) slightly differ from those reported in the summary statistics since in some observations, the index returns on day t-1 or the World index returns are missing, resulting in some missing values in the residual return time series.

6.2. Soccer results and stock market performance in 1973 – 2004 period

In table 2, I report the findings of the main tests in my research for 1973 – 2004 period. Panel A includes results when using abnormal raw returns $\hat{\epsilon}_{it}$ for all international soccer matches played between 1974 and 2004. The analysis also covers 11 groups of games classified according to their relative importance to people's mood. Looking at the right-hand side of Panel A, it is evident that national stock market performance exhibits a statistically and economically significant reaction to soccer losses. The coefficient estimation of the loss dummy is -42.77 basis points for the 117 elimination game losses and is up to -54.55 basis points for 55 World Cup elimination game losses. The point estimates of the effect are negative for 9 out of 11 groups of games, six of which are statistically significant. For an idea of the economic significant, 42.77 basis points of the total market capitalization of the U.K at the end of 2004 is over USD15 billion.

Another striking finding is that the estimates for the effect increases with the importance of the games. First, although the impact when considering all games is statistically significant at 10% level, it can be seen that such effect is driven by the games that are consider highly important, World Cup and Continental Cup games, whose losses are followed by a significant 20.76 basis points decrease in market return. The group Other games even post a positive but insignificant point estimate for losses. Among the important matches, the groups related to World Cup exhibits stronger market reaction than those related to Continental Cup in the two most important stages, elimination stage and group stage. Moreover, the loss impact estimation in close games in qualifying stage is smaller than in group stage, which is in turn smaller than in elimination stage.

Considering only 480 important losses, the point estimate of their impact is 20.76 basis points, which is not only statistically significant at 1% level but is also significant economically. Meanwhile, the estimated coefficient of wins is a positive 0.63 basis points for all games and a positive 7.10 basis points for the highly important ones. Nevertheless, none of the win coefficients is statistically different from zero. In addition, the strong negative market reaction to losses and weak positive market reaction to win are consistent with asymmetry in soccer sentiment suggested by the literature. While wins only mean being able to play the next round and public attention may be distracted by the next game instead of the current game, losses mean higher possibility to be excluded from the tournament. The exclusion even happens immediately for losses in the elimination stage, making attention of fans and media stuck in the current failures. In addition, the allegiance bias in expectation of fans can also make the asymmetry more extreme. As people tend to overestimate the probability of win of their national team, this becomes their benchmark from the perspective of Prospect Theory, resulting in more-dramatic reaction to losses.

The results in Panel B further strengthen the confidence in the patterns observed in Panel A. The results reported in this Panel are obtained when using the abnormal normalized return as explained in Section 6.1. Using this specification, the weights of extreme returns on days with high volatility and/or in markets with high volatility are reduced, thus lowering their influence on the overall estimates. The right hand side of Panel B helps confirm once again that there is no significant market reaction to wins. Meanwhile, the implementation of GARCH(1,1) volatility adjustment process seems

not to change the direction of the estimated loss effect. The only case in which it qualitatively changes the statistical significance of losses is when all games are considered. In this case, the average market reaction to all losses turns from weakly significant to insignificant; however, discussion of the findings in Panel A has shown that loss effect only exists in highly important games and not in every game. Consequently, the GARCH adjustment and the normalization of returns do not make the null hypothesis more likely to be rejected.

Regarding the interpretation of the economic significance of the estimate, it is important to notice that β_L = -0.159 for group All World Cup and Continental Cup games means the average market returns after losses is below mean by 0.159 standard deviations. In an average stock market with average daily volatility of 124.35 basis points (Panel A Table 1), this effect is equal to 0.159 x 124.35 = 19.77 basis points, which is highly comparable to the estimate in Panel A.

Overall, the results I obtain are nearly identical to those of Edmans et al. (2007) in terms of the direction of the effect, the magnitude of the effect, and the statistical significance of effect in groups of games.

Table 2: Abnormal Daily Stock Market Return Following International Soccer Games in 1973 – 2004

The table reports the analysis on 148,897 trading days from 29 countries (see Appendix 1) in 1973 – 2004 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\epsilon_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which u_{it} is the error term, W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In Panel A, the values of ϵ_{it} are the "residual returns" estimated from the regression:

$$R_{it} = \gamma_{0i} + \gamma_{1i} R_{it-1} + \gamma_{2i} R_{mt-1} + \gamma_{3i} R_{mt} + \gamma_{4i} R_{mt+1} + \gamma_{5i} D_t + \gamma_{6i} Q_t + \hat{\epsilon}_{it},$$

where R_{it} is the "raw" log daily market return on date t in country i, R_{mt} is the log daily U.S. dollar return on the world market index on day t, $D_t = \{D_{1t}, D_{2t}, D_{3t}, D_{4t}\}$ are the dummies for week days from Monday to Thursday, and $Q_t = \{Q_{1t}, Q_{2t}, Q_{3t}, Q_{4t}, Q_{5t}\}$ are dummy variables that equal one if the last 1 through 5 days are non-weekend holidays and zero otherwise. In Panel B, ϵ_{it} is the "abnormal normalized returns", which are estimated in a similar regression but with the raw returns, R_{it}, being normalized using GARCH(1,1) procedure as described in Section 6.1. Sample details are provided in Table 1 and Appendix 1.

	Wins			Losses		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Abnormal Raw Returns						
All games	3,053	0.63	0.30	1,669	-5.13	-1.71
All WC and CC games	609	7.10	1.55	480	-20.76	-3.85
Elimination games	144	2.02	0.23	117	-42.77	-3.60
World Cup	61	13.96	0.96	55	-54.55	-2.82
Continental cups	83	-6.59	-0.63	62	-32.29	-2.25
Group games	277	10.59	1.52	172	-21.17	-2.34
World Cup	119	-3.87	-0.34	62	-40.61	-2.76
Continental cups	158	21.62	2.49	110	-10.20	-0.90
Close qualifying games	188	5.95	0.72	191	-6.83	-0.87
World Cup	118	6.12	0.63	127	1.21	0.13
Continental cups	70	5.66	0.38	64	-22.79	-1.56
Other games	2,389	-0.93	-0.39	1,156	0.98	0.27
Abnormal Normalized Returns						
All games	3,053	0.001	0.05	1,669	-0.036	-1.59
All WC and CC games	609	0.029	0.80	480	-0.159	-3.78
Elimination games	144	0.005	0.07	117	-0.278	-3.29
Group games	277	0.049	0.87	172	-0.156	-2.29
Close qualifying games	188	0.018	0.30	191	-0.087	-1.28
Other games	2,389	-0.006	-0.33	1,156	0.010	0.35

6.3. Robustness tests for the effect in 1973-2004 period

In this section, I examine the robustness of the loss effect by eliminating the effect of outliers in the data and by using nonparametric binomial test.

A potentially important problem with my estimate of the loss effect using Ordinary Least Square (OLS) regressions is their sensitivity to outliers (Ashton et al., 2011; Klein et al., 2009). Moreover, Pinegar (2002) even shows that the clock change effect estimated by Kamstra et al. (2000) is sensitive to outliers in their data. Therefore, my first robustness test is on the sample trimmed of outliers. As explained in Section 6.1, I only report results on abnormal normalized returns. Outliers in this test is identified as observations where W_{it} or L_{it} equals one and the value of the abnormal normalized return, $\tilde{\epsilon}_{it}$, is "large". Put differently, I define observations with large negative or large positive returns following soccer wins and soccer losses. As a results, the exclusion of these outliers effectively eliminates the observations that have the greatest influence on the estimates of the market reaction to soccer results.

Table 3 reports the regression results using a 10%-trimmed sample, in which 10% extreme negative observations and 10% extreme positive observations are removed. This trimming reduces 20% of observations in the sample. Only important matches are considered and they are grouped by type of tournaments and by their respective stage in the tournaments. The results in Table 3 demonstrate the robustness of the loss effect documented above.

The average return following losses in the World Cup and Continental Cup is 0.061 standard deviations below mean with a t-statistic of −2.45. The 10%-trimmed means following soccer losses remain negative in all groups of games with 4 out of 5 groups exhibit statistical significance below 10% level. Meanwhile, wins are still not followed by a significant market reaction. Since the observations with the greatest influence on the results have been excluded, the estimated loss effect is less negative than estimation using untrimmed sample. Nevertheless, both economic and statistical significance in the results remain strong and consistent with my findings above.

Table 3: Abnormal Normalized Stock Market Return Following International Soccer Games Using Samples Trimmed of Outliers

The table reports 10%-trimmed means of the abnormal normalized residuals $\tilde{\epsilon}_{it}$ following wins and losses in 5 groups of games. Observations for which variable the residual is below the 10th percentile or above the 90th percentile are excluded from the sample. Compared to Table 2, this trimming reduces 20% of observations in the sample.

	Wins			Losses		
	Number of games	β_W	**t-Values**	**Number of games**	β_L	**t-Values**
All WC and CC games	473	0.012	0.51	374	-0.061	-2.45
World Cup games	223	-0.008	-0.23	189	-0.060	-1.66
Continental cup games	250	0.030	0.94	185	-0.062	-1.81
Elimination games	110	0.021	0.43	94	-0.118	-2.51
Group games and close qualifiers	363	0.010	0.35	280	-0.042	-1.44

Another statistical approach to deal with the potential outlier issue is to use nonparametric binomial test. These statistics are highly robust in that they require no assumptions about the underlying statistical distribution of returns (Ashton et al., 2003, 2011). In this test, I examine whether the probabilities of positive market reaction following wins and negative market reaction following losses, regardless of their magnitude, are larger than 0.5. If the one-sided test results reject the null hypothesis that the probability is equal to 0.5, this implies a significant win or loss effect of soccer games.

The results in Table 4 once again confirm the remarkable robustness of the loss effect in 1973 – 2004 period. The binomial statistics reveal that, after losses in 5 out of 6 groups of games, the null hypothesis of 0.5 probability of market returns below unconditional mean is rejected at below 10% level of significance. This implies that market returns following soccer losses are significantly more likely to be smaller than the unconditional mean return.

Table 4: One-sided Binomial Tests of Market Reaction to Soccer Results in 1973 – 2004 period

The table reports the one-sided binomial test results on the soccer effect on stock markets in 1973 – 2004 period. For each country, the number of trading days after wins with return above the country-specific unconditional mean is counted. This number is then summed up across all countries in the sample. The null hypothesis is that the probability of daily market return after a win that is above unconditional mean is 0.5. The test procedure for returns after losses is identical. The null hypothesis is that the probability of daily return after a loss below unconditional mean is 0.5. The figures in column p-Values belong the one-sided tests against these hypotheses.

	Wins			Losses		
	No. of Returns After Wins Above Unconditional Mean	**Total No. of Wins**	**p-Values**	**No. of Returns After Losses Below Unconditional Mean**	**Total No. of Losses**	**p-Values**
All WC and CC games	312	609	0.29	271	480	0.00
World Cup games	146	298	0.66	133	244	0.09
Continental cup games	166	311	0.13	138	236	0.01
Elimination games	69	144	0.72	68	117	0.05
Group games	148	277	0.14	103	172	0.01
Close qualifying games	95	188	0.47	100	191	0.28

Overall, for 1973 – 2004 period, the results from these robustness tests, in combination with those from the main tests reported in Section 6.2, indicate negative impact of soccer losses on stock markets. Among those losses, the ones in the group stage and the elimination stage of World Cup and Continental Cup exhibit statistically and economically significant effect. Meanwhile, losses in Close qualifying games and Other games, which have lower importance, as well as wins in all groups of game, are not followed by a significant market reaction.

While my findings in 1973 – 2004 period are highly consistent with those documented by Edmans et al. (2007), it remains in question whether the loss effect is still robust out-of-sample in the recent period. Results from numerous studies have revealed that many market anomalies have disappeared, resurrected, or at least decreased in magnitude after their publication on influential journals (among others, Chu et al., 2020; Marquering et al., 2006; Mclean and Pontiff, 2016; Mehdian and Perry, 2002; Schwert, 2003). Therefore, it is important to explore if the same issue happened to the soccer effect in the recent period. The results would be helpful to reveal the nature of this phenomenal.

6.4. Soccer results and stock market performance in 2005-2019 period

To the extent that soccer outcome influences market performance through investor sentiment, it needs attention from the public to be able to impact the mood of a large proportion of the population. In 2020, the outbreak of the Covid-19 pandemic has disrupted the sport industry in general and soccer in particular. Multiple important soccer events had to be suspended, namely European 2020 Championship, Copa America 2020, and many more. For many games that still happened in the year, spectators were not allowed to enter the stadium or only allowed with limited capacity, creating an unusual silence during soccer matches. Meanwhile, the public attention was diverted to the fight against the global pandemic, leaving less space for media to cover soccer events.

In my sample, there were 96 wins and 60 losses that happened during 2020. Among them, only 5 wins and 8 losses belong to the group Continental Cup qualifier, which is of high importance. Since the attention for those games is supposed to be lower than it used to be, I remove them from my sample when estimating the impact of soccer sentiment on stock market returns. Table 5 reports the analysis on 108,948 trading days from 29 countries in 2005 – 2019 period. The results if observations in 2020 were included is reported in Appendix 3 for comparison. Overall, the exclusion of the year 2020 does not qualitatively change the statistical significance of any result; if any, it slightly increases the magnitude of the impact estimation and t-statistics. This is consistent with my expectation that the extremely unusual situation in 2020 decreases the influence of soccer results on investor sentiment and stock market.

Looking at the right-hand side of Panel A Table 5, it is evident that the loss effect has become weaker and less robust in the recent period. The effect still remains when considering All games with β_L estimate of 5.83 basis points and t-statistic of 2.01. However, the group of All World Cup and Continental Cup games, which was the main driver of the results in the prior period, seems to have reduced in its influence. The point estimate of the loss effect in the group in the recent period is only 10.11 basis points, less than a half of its influence in the prior time. Considering all groups of games in elimination stage and group stage, market reaction to their losses have declined remarkably and become insignificant. The decline is stronger in groups where the initial estimates are larger. For example, the average abnormal return after World

Cup elimination losses is -0.32 basis points in 2004 – 2020 period, compared to 54.55 basis point in 1973 – 2004 period. The statistical significance of the impact in recent period seems to be driven only by World Cup qualifying games. Similar results can also be drawn from the right-hand side of Panel B.

It is also surprising that results in the left-hand side of Panel B show significantly negative abnormal returns following wins of important games (World Cup and Continental Cup). This result seems to be driven only by strong negative estimate in Close qualifying games. Moreover, considering in Panel A each tournament-stage group of games, none of the groups really show a significant win effect. The signs of the point estimates for wins are inconsistent across groups and across time period. Therefore, the significance of negative reaction to World Cup and Continental Cup wins in Panel B is likely to be a pure coincidence.

More importantly, negative estimate of abnormal returns following wins also implies that stock market reaction does not discriminate between wins and losses. This further proves the disappearance of the loss effect in the recent period.

Table 5: Abnormal Daily Stock Market Return following International Soccer Games in 2005 – 2019

The table reports the analysis on 108,948 trading days from 29 countries (see Appendix 1) in 2005 – 2019 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\epsilon_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which u_{it} is the error term, W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In Panel A, the values of ϵ_{it} are the "residual returns" estimated from the regression:

$$R_{it} = \gamma_{0i} + \gamma_{1i} R_{it-1} + \gamma_{2i} R_{mt-1} + \gamma_{3i} R_{mt} + \gamma_{4i} R_{mt+1} + \gamma_{5i} D_t + \gamma_{6i} Q_t + \hat{\epsilon}_{it},$$

where R_{it} is the "raw" log daily market return on date t in country i, R_{mt} is the log daily U.S. dollar return on the world market index on day t, $D_t = \{D_{1t}, D_{2t}, D_{3t}, D_{4t}\}$ are the dummies for week days from Monday to Thursday, and $Q_t = \{Q_{1t}, Q_{2t}, Q_{3t}, Q_{4t}, Q_{5t}\}$ are dummy variables that equal one if the last 1 through 5 days are non-weekend holidays and zero otherwise. In Panel B, ϵ_{it} is the "abnormal normalized returns", which are estimated in a similar regression but with the raw returns, R_{it}, being normalized using GARCH(1,1) procedure as described in Section 6.1. Sample details are provided in Table 1 and Appendix 1.

	Wins			Losses		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Abnormal Raw Returns						
All games	2,848	-1.35	-0.74	1,334	-5.83	-2.01
All WC and CC games	532	-5.52	-1.30	424	-10.11	-1.84
Elimination games	130	1.48	0.19	107	-8.54	-1.01
World Cup	54	12.00	1.11	47	-0.32	-0.03
Continental cups	76	-5.99	-0.56	60	-14.98	-1.16
Group games	236	-3.65	-0.51	137	-3.60	-0.37
World Cup	108	-13.65	-1.10	58	-14.60	-1.16
Continental cups	128	4.80	0.60	79	4.50	0.32
Close qualifying games	166	-13.52	-2.02	180	-15.91	-1.71
World Cup	109	-9.95	-1.28	121	-23.96	-2.01
Continental cups	57	-20.31	-1.63	59	0.67	0.05
Other games	2,272	-0.48	-0.24	884	-3.75	-1.09
Panel B: Abnormal Normalized Returns						
All games	2,848	-0.013	-0.86	1,334	-0.029	-1.27
All WC and CC games	532	-0.056	-1.66	424	-0.071	-1.73
Elimination games	130	-0.018	-0.26	107	-0.058	-0.87
Group games	236	-0.032	-0.64	137	-0.023	-0.33
Close qualifying games	166	-0.118	-1.99	180	-0.115	-1.63
Other games	2,272	-0.003	-0.19	884	-0.009	-0.32

As the loss effect seems to have disappeared in the recent period, this raises the question why the effect is no longer there. Based on the literature review, I find three possible explanations that have been proposed and discussed by researchers. It is worth noting that there could be even more alternatives than these three. First, when an anomaly is not robust out-of-sample, it could be the case that the effect does not exist and is, instead, the results of data mining (Fama, 1991; Klein et al., 2009; Marquering et al., 2006). Second, the publication of the effect may imply free lunches in the market, which attract attention of rational arbitrageurs, who then exploit this knowledge and make the effect disappear (Ehrmann and Jansen, 2016; Kaplanski and Levy, 2014; Mclean and Pontiff, 2016; Schwert, 2003). Finally, mispricing results from both a shock in demand from uninformed investors and a limit on arbitrage (Baker and Wurgler, 2006), implying that a change in either factor could lead to a change in the degree of mispricing. While I do not find any clear evidence of a change in limits to arbitrage between the two time periods, I do find from literature a potential evidence of a long-term variation of sentiments related to local investors, namely the internationalization of financial markets.

According to Davydoff et al. (2013), the relative weight of foreign ownership in 27 European countries has more than quadrupled, from 10% in 1975 to 45% in 2012 (Figure 1). Meanwhile, the data from Figure 1 also shows that the ownership of domestic individual investors (group Households), who are supposed to be impacted the most by soccer sentiment, has been in a continuous decline, from 28% in 1975 to 11% in 2012. Following the instruction from Davydoff et al. (2013, pp. 74-84), I obtain the data of the recent years[5] to ensure that these trends still remain (see Appendix 5).

This evidence in the European markets is also align with the process of financial globalization, which, according to Coudert et al. (2015), has spurred international capital flows among countries since the late 1980s. One implication of this trend is the likely reduction in the role of domestic investor sentiment on their domestic markets. Thus, for a sentiment variable that is supposed to influence markets through retail

[5] Although I follow exactly the instruction and obtain exactly the same variables, the recent data is not comparable with the data in Davydoff et al. (2013) due to potential changes in estimation methodology. Therefore, I only use the updated figure to confirm the trend and report them in Appendix 5.

domestic investors like soccer, internationalization of stock markets is a possible reason for its weaker influence in the recent period.

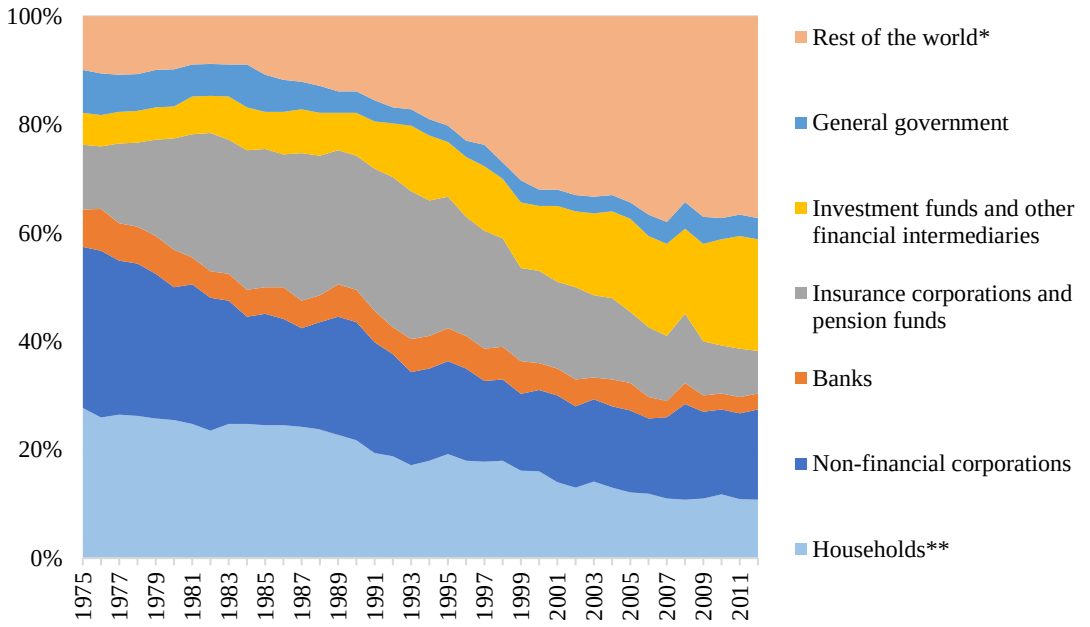

Figure 1: Share ownership structure in the European Union in 1975 – 2012

This figure explores the long-term trends of listed share ownership structure in stock markets of 27 European Union countries. The figure shows how the ownership weight of each group of investors change over the 1975 – 2012 period. Data are obtained from Davydoff et al. (2013, p.4). Group "Rest of the world" includes non-domestic EU investors and non-EU investors. Group "Households" includes domestic households and non-profit institutions serving households.

Overall, the disappearance of loss effect out-of-sample reveals further insights about its nature. Up to this point, it seems that the story about economic impact and rational asset pricing, which can explain for the existence of the loss effect in 1973 – 2004 period, has become inconsistent with the disappearance of the effect in recent years. In the next Section, I analyze the behavior of the loss effect across different groups of stocks and countries and over different time periods to obtain further hints about the nature of the market reaction to soccer losses. Since the evidence has shown that the "Other games" with low importance does not drive market returns, I no longer consider these games in Section 7 of my study.

7. The time variance and cross-sectional variance of loss effect and the driver of the effect

7.1. Loss effect in group of top seven countries and group of other countries

Since analysis of the results in Section 6.2 has reveals an "apparent" pattern that the loss effect seems to increase with the importance of games, I want to examine further this pattern by splitting countries in my sample into group of "Top Seven" soccer nations and "Other countries", which include the remaining 22 soccer nations. As discussed in the literature review in Section 2, Top Seven soccer nations are those in which soccer is of the greatest importance. This group includes Argentina, Brazil, England, Italy, France, Germany, and Spain.

In Table 6, I analyze the impact of soccer results on each country group in 1973 – 2004 period. The results for the recent 2005 – 2019 period are reported in Table 8. Then, I compare the finding in both periods to explore whether the changes over time in the behavior of the loss effect are the same in both groups of countries, thus extracting further insights about the nature of the effect.

Panel A of Table 6 reports the results for the Top Seven countries while Panel B covers the Other countries. From a general perspective, wins have insignificant influence on market returns in both nation groups and the point estimates also show no clear pattern on the difference between the two groups. However, the results show a robust and significant loss effect in both groups of countries. Interestingly, the point estimates for loss effect in the Top Seven nations are larger in magnitude in all games except for Continental Cup games. Considering all important games, the point estimate of the loss effect in Top Seven is -0.266 standard deviations, more than double the estimate of -0.120 standard deviations in Other nations. The estimate of market reaction following World Cup game losses in Top Seven even quadruples that number in Other countries (-0.377 standard deviations versus -0.090 standard deviations).

Table 6: Abnormal Daily Stock Market Performance after International Soccer Matches for the Top Seven Soccer Nations in 1973 – 2004

The table reports the analysis on 148,897 trading days in 1973 – 2004 period, separated by Top Seven soccer nations and Other 22 nations. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\tilde{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

where $\tilde{\epsilon}_{it}$ is the "abnormal normalized returns" defined in Section 6.1. W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In Panel A, the Top Seven soccer nations include Argentina, Brazil, England, France, Germany, Italy, and Spain. Panel B reports results for the other 22 soccer nations in the sample. The table reports results for soccer games separated by tournament, namely World Cup and Continental Cup, and by stage in the tournaments, namely elimination stage and group and qualifying stage.

	Wins			**Losses**		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Top Seven Soccer Nations						
All WC and CC games	238	0.023	0.40	128	-0.266	-3.15
World Cup games	137	0.039	0.48	70	-0.377	-3.21
Continental Cup games	101	0.003	0.04	58	-0.131	-1.11
Elimination games	77	0.031	0.28	44	-0.430	-2.92
Group games and close qualifiers	161	0.020	0.30	84	-0.179	-1.76
Panel B: Other Soccer Nations (22 Countries)						
All WC and CC games	370	0.032	0.70	352	-0.120	-2.49
World Cup games	161	0.007	0.09	174	-0.090	-1.26
Continental cup games	209	0.052	0.87	178	-0.148	-2.31
Elimination games	67	-0.025	-0.27	73	-0.186	-1.85
Group games and close qualifiers	303	0.045	0.86	279	-0.102	-1.87

To further confirm the difference between the loss effect in Top Seven and in Other nations, I perform a one-sided Wald test on the difference of β_L between two nation groups. Table 7 reports the results for this test. Considering all World Cup and Continental Cup games, the difference is statistically significant at 10% level. This difference seems to be driven by the World Cup and elimination games. Therefore, the difference in loss effect in Top Seven compared to Other nations is not only economically significant but also statistically significant.

Table 7: One-Sided Wald Tests on The Difference in Soccer Effect Between Top Seven Soccer Nations and Other 22 Soccer Nations

The table reports the results from the one-sided Wald test on the difference in magnitude of soccer effect in the group Top Seven and group Other nations. The null hypothesis is that β_W is equal in both nation groups and β_L is equal in both groups. For soccer wins, the alternative hypothesis is that β_W is larger for Top Seven than in the other group. For soccer losses, the alternative hypothesis is that β_L is smaller (stronger in magnitude) for Top Seven than in the other group.

	Wins		**Losses**	
	β_W **difference**	**p-Values**	β_L **difference**	**p-Values**
All WC and CC games	-0.01	0.45	-0.15	0.07
World Cup games	0.03	0.38	-0.29	0.02
Continental cup games	-0.05	0.69	0.02	0.55
Elimination games	0.06	0.35	-0.24	0.09
Group games and close qualifiers	-0.02	0.39	-0.08	0.25

Furthermore, what could also be interesting is how the loss effect change over time in each nation group. Table 8 shows the results for the soccer effect estimate in each group of country in 2005 – 2019. Considering the loss effect, Top Seven nations, where the effect was stronger in 1973 – 2004, exhibit no significant market reaction to losses in the recent years. In contrast to the disappearance of the loss effect in Top Seven, the negative impact of soccer losses remains significant in 2005 – 2019 in Other countries. Moreover, their economic significance only decreases slightly in the period.

Table 8: Abnormal Daily Stock Market Performance after International Soccer Matches for the Top Seven Soccer Nations in 2005 – 2019

The table reports the analysis on 108,948 trading days in 2005 – 2019 period, separated by Top Seven soccer nations and Other 22 nations. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\tilde{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

where $\tilde{\epsilon}_{it}$ is the "abnormal normalized returns" defined in Section 6.1, W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In Panel A, the Top Seven soccer nations include Argentina, Brazil, England, France, Germany, Italy, and Spain. Panel B reports results for the other 22 soccer nations in the sample. The table reports results for soccer games separated by tournament, namely World Cup and Continental Cup, and by stage in the tournaments, namely elimination stage and group and qualifying stage.

	Wins			**Losses**		
	N	$\boldsymbol{\beta_W}$	**t-Values**	**N**	$\boldsymbol{\beta_L}$	**t-Values**
Abnormal Raw Returns						
All WC and CC games	180	-0.035	-0.60	84	0.014	0.17
World Cup games	99	0.049	0.62	49	-0.102	-1.11
Continental cup games	81	-0.138	-1.55	35	0.176	1.30
Elimination games	68	-0.055	-0.62	37	0.105	0.92
Group games and close qualifiers	112	-0.024	-0.30	47	-0.059	-0.54
Abnormal Normalized Returns						
All WC and CC games	352	-0.066	-1.62	340	-0.092	-1.95
World Cup games	172	-0.118	-2.20	177	-0.119	-1.75
Continental cup games	180	-0.016	-0.26	163	-0.062	-0.96
Elimination games	62	0.022	0.21	70	-0.144	-1.82
Group games and close qualifiers	290	-0.085	-1.94	270	-0.078	-1.41

Up to this point, the financial market internationalization explanation cannot justify for the disappearance of loss effect in one group of nations and the remain of the effect in another group of nations. Meanwhile, the concern that loss effect is just the result of data snooping has also become less likely since the effect is still robust in the group of other 22 countries. This leaves the story about limits to arbitrage as the most potential candidate. The survival of the effect in a nation group where its impact is

weaker could possibly be explain by its small potential arbitrage profit, which make it harder to justify a strategy dedicated for soccer loss anomaly in these markets. Meanwhile, in markets where the anomalous returns are large, arbitrageurs may find a potential strategy to earn positive returns after costs.

Talking about limits to arbitrage, I further explore on whether the loss effect is stronger in stocks that are harder to arbitrage. In addition, to the extent that the market reaction to soccer losses is due to irrational sentiment-driven behavior of domestic investors, I would expect stocks with higher local ownership to exhibit stronger reaction to the match outcome of national teams. Section 7.2 will focus on exploring this aspect of the soccer sentiment.

7.2. Loss effect in size sorted portfolios and value-growth sorted portfolios

Empirical studies have shown that small market capitalization stocks and growth stocks are harder to arbitrage due to their higher trading costs, difficulty to sell short, and high idiosyncratic risks (Amihud and Mendelson, 1986; Duffie et al., 2002; Geczy et al., 2002; Lamont and Thaler, 2003; Wurgler and Zhuravskaya, 2002). In addition, valuations of growth firms are highly subjective, making their stock performance more sensitive to shock waves of investor sentiment (Baker and Wurgler, 2006; Edmans et al., 2007). Furthermore, there is evidence that foreign investors tend to underweight small stocks relative to larger ones (Bhushan, 1989; Dahlquist and Robertsson, 2001; Kang and Stulz, 1997), and overweight value firms relative to growth firms (Dahlquist and Robertsson, 2001). Consequently, I expect that the differences in local ownership and sensitivity to shock waves in investor sentiment would make the soccer effect stronger in small (growth) stocks than in large (value) stocks.

7.2.1. Size sorted portfolios

Panel A of Table 9 summarizes the results from estimating the model in regression (2) using small and large market capitalization indices from 26 countries in 1973 – 2004 period. The selection of the indices is described in Section 4.3.

From a general overview, the results show that the soccer losses are followed by negative abnormal returns in both small and large capitalization stocks and in all groups of games. Considering all World Cup and Continental Cup games, it seems that

the impact is stronger in small-cap indices. The point estimate after losses is -0.124 standard deviations as compared to the estimate of −0.097 for large-cap indices. However, the loss effect is still economically and statistically significant in both types of indices at below 5% level. The magnitude of the effect in elimination game losses is the largest in both index types, which is consistent with the findings when using broad market indices. In addition, the point estimate of the loss effect on small stock is larger than on large stocks in all groups of matches, excepting for Continental Cup games.

Table 9: Abnormal Daily Stock Market Performance after International Soccer Matches for Size Sorted Portfolios in 1973 – 2004

The table reports the analysis on small and large market capitalization indices from 26 countries (see Panel A of Appendix 2) in 1973 – 2004 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\tilde{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses, $\tilde{\epsilon}_{it}$ is the "abnormal normalized returns" defined in Section 6.1, where the stock market indices are now a small-cap index or a large-cap index. The list of indices employed, as well as their starting dates, are presented in Panel A of Appendix 2.

	Wins			**Losses**		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Small market capitalization stocks						
All WC and CC games	384	-0.053	-1.12	289	-0.124	-2.37
World Cup games	174	-0.046	-0.61	154	-0.177	-2.44
Continental cup games	210	-0.059	-0.98	135	-0.062	-0.83
Elimination games	109	-0.123	-1.53	80	-0.276	-3.08
Group games and close qualifiers	275	-0.025	-0.43	209	-0.065	-1.03
Panel B: Large market capitalization stocks						
All WC and CC games	454	0.045	1.08	348	-0.115	-2.32
World Cup games	222	0.071	1.10	179	-0.097	-1.35
Continental cup games	232	0.020	0.38	169	-0.134	-1.97
Elimination games	120	-0.075	-0.91	93	-0.184	-1.91
Group games and close qualifiers	334	0.089	1.83	255	-0.049	-1.55

Regarding the returns following wins, it is surprising that the point estimate of the effect is negative for small stock while being positive in large stocks. However, none of the coefficients is statistically significant except for the group games and qualifiers in large stocks. Since the signs of the reaction estimates are inconsistent, this significant coefficient may appear by pure coincidence.

While the existence of the loss effect in both small-cap and large-cap indies further strengthen the robustness of the effect in 1973 – 2004 period, it is also important to explore how these results change over time. Table reports the analysis of small and large stock return after soccer games in 2005 – 2019 period. In general, the effect estimate of losses has declined in both index types and in all groups of games but still remain negative. However, the most interesting finding is that loss effect seems to have disappeared in large stock while still managed to remain in small stocks. In particular, the point estimate for all World Cup and Continental Cup games in small indices is -0.105 standard deviations with t-statistic of -2.43. It is also significant in World Cup games, group games, and close qualifying games.

Table 10: Abnormal Daily Stock Market Performance after International Soccer Matches for Size Sorted Portfolios in 2005 - 2019

The table reports the analysis on small and large market capitalization indices from 26 countries (see Panel A of Appendix 2) in 2005 – 2019 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\tilde{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses, $\tilde{\epsilon}_{it}$ is the "abnormal normalized returns" defined in Section 6.1, where the stock market indices are now a small-cap index or a large-cap index. The list of indices employed, as well as their starting dates, are presented in Panel A of Appendix 2.

	Wins			Losses		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Small market capitalization stocks						
All WC and CC games	474	-0.021	-0.53	378	-0.105	-2.43
World Cup games	239	-0.053	-0.93	199	-0.118	-1.90
Continental cup games	235	0.013	0.25	179	-0.090	-1.52
Elimination games	117	0.018	0.24	93	-0.117	-1.49
Group games and close qualifiers	357	-0.033	-0.73	285	-0.101	-1.97

Panel B: Large market capitalization stocks						
All WC and CC games	474	-0.069	-1.98	378	-0.035	-0.90
World Cup games	239	-0.078	-1.70	199	-0.107	-1.55
Continental cup games	235	-0.058	-1.13	179	0.045	0.78
Elimination games	117	-0.081	-1.17	93	-0.035	-0.49
Group games and close qualifiers	357	-0.064	-1.61	285	-0.035	-0.76

In addition, it is also noteworthy that there are two statistically significant negative coefficients of wins in large indices. Nevertheless, this is still not a consistently significant effect across different game groups, country groups, and different time periods.

Beside the time variation of loss effect in small-cap and large-cap stocks, my study is also interested in the cross-sectional variation of the effect. To examine whether the difference in the effect estimated for small-cap indices and large-cap indices is statistically significant, I perform a one-sided Wald test on the difference of β_L between small-cap indices and large-cap indices. Since the data sample of both index types used in estimating equation (2) covers identical set of countries and identical time periods, I am able to test the effect difference on the same set of games. In order to do so, I select a set of games followed by trading days that have abnormal normalized returns $\tilde{\epsilon}_{it}$ for both small-cap index and large-cap index. While this treatment can enhance the comparability between coefficients obtained from each type of index, it also excludes some game days in the 1973 – 2004 period, for which data of both indices is not available. For this reason, the observations used for the comparison are mostly from 1990 onward.

Using this set of data, I repeat the regression (2) to obtain the estimate for β_W and β_L before testing for their differences between two groups of indices. The results reported in Table 11 are thus a comparison between small-cap and large-cap stocks in the 1990 – 2004 period. The estimates of the soccer effect for each group of stocks in the 1990 – 2004 period are also slightly different from those in Table 9 and Table 10. I report them in Appendix 4 for reference.

Looking at the right-hand side both panels in Table 11, it is evident that the estimated impact of soccer losses is generally stronger in small stocks than in large stocks. However, the difference in 1990 – 2004 period is only statistically significant for

World Cup games with one-sided Wald test p-value of 0.07. For other groups of games, the negative difference is not large enough relative to its standard error to be able to reject the null hypothesis.

Only in the recent period can the null hypothesis be rejected for the whole set of important games at 3% significant level. This is consistent with the results from Table 10, which show that in 2005 – 2019, the loss effect survives only in small stocks. Overall, the evidence that loss effect is stronger in small stocks than in large stocks is only clear in the recent period, 2005 – 2019.

Table 11: One-Sided Wald Tests on The Difference in Soccer Effect Between Small-Cap Indices and Large-Cap Indices

The table reports the results from the one-sided Wald test on the difference in magnitude of soccer effect in the small-cap indices and large-cap indices. The null hypothesis is that β_W is equal in both index types and β_L is equal in both index types. For soccer wins, the alternative hypothesis is that β_W is larger in small-cap indices than in large-cap indices. For soccer losses, the alternative hypothesis is that β_L is smaller (stronger in magnitude) in small-cap indices than in large-cap indices.

	Wins			**Losses**		
	Number of Games	β_W **difference**	**p-Values**	**Number of Games**	β_L **difference**	**p-Values**
Panel A: Difference in 1990 – 2004 period						
All WC and CC games	367	-0.051	0.91	273	-0.046	0.17
World Cup games	166	-0.075	0.89	143	-0.105	0.07
Continental cup games	201	-0.032	0.74	130	0.019	0.61
Elimination games	106	-0.039	0.70	76	-0.104	0.15
Group games and close qualifiers	261	-0.056	0.89	197	-0.024	0.34
Panel B: Difference in 2005 – 2019 period						
All WC and CC games	474	0.048	0.07	378	-0.070	0.03
World Cup games	239	0.025	0.30	199	-0.011	0.42
Continental cup games	235	0.072	0.05	179	-0.135	0.01
Elimination games	117	0.099	0.06	93	-0.082	0.12
Group games and close qualifiers	357	0.031	0.20	285	-0.065	0.07

Until this point, the limits to arbitrage story is still consistent with my findings. The fact that loss effect can only survive in small stocks and not in large stocks provides further evidence supporting this explanation. From the literature review in Section 2, small stocks are associated with higher trading costs, more difficulties for short-selling, and high idiosyncratic risks, making them harder to arbitrage. Meanwhile, large stocks are those with less barrier for arbitrageurs, which may explain why the loss effect is no longer there.

Similar to the pair small/large stocks, the pair value/growth stocks also have divergence in their properties with respect to local ownership and sensitivity to market sentiment. Relative to value stocks, growth stocks seem to have more-subjective valuation and higher local ownership. Section 7.2.2 investigates whether the above differences in properties of value and growth stocks can translate into differences in soccer effect between the two stock groups.

7.2.2. Value-growth sorted portfolios

Table 12 reports the results on growth and value indices for 1973 – 2004 period. It is evident that soccer losses have a robust impact in both groups of stocks and across different groups of games. For growth stocks, the estimate of the effect in all important games is -0.142 standard deviations, with t-statistic of -2.81. This magnitude of effect is comparable to the estimate -0.159 standard deviations obtained when using broad market indices (see Table 2). More importantly, the effect estimate in value stocks is also the same as in growth stocks when all World Cup and Continental Cup games are considered.

When looking at specific groups of game, it can be seen that losses in World Cup games and in elimination stage are followed by significantly negative returns in both types of indices. The differences in the effect estimate across game groups are also marginal.

Table 12: Abnormal Daily Stock Market Performance after International Soccer Matches for Size Sorted Portfolios and Value-Growth Sorted Portfolios in 1973 – 2004

The table reports the analysis on value and growth indices from 26 countries (see Panel B of Appendix 2) in 1973 – 2004 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\tilde{\epsilon}_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses, $\tilde{\epsilon}_{it}$ is the "abnormal normalized returns" defined in Section 6.1, where the stock market indices are now a small-cap index or a large-cap index. The list of indices employed, as well as their starting dates, are presented in Panel B of Appendix 2.

	Wins			**Losses**		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Growth stocks						
All WC and CC games	511	-0.025	-0.64	398	-0.124	-2.81
World Cup games	248	-0.013	-0.20	209	-0.211	-3.13
Continental cup games	263	-0.037	-0.76	189	-0.027	-0.50
Elimination games	125	-0.050	-0.63	100	-0.300	-3.22
Group games and close qualifiers	386	-0.017	-0.37	298	-0.065	-1.30
Panel B: Value stocks						
All WC and CC games	490	0.020	0.54	385	-0.124	-2.63
World Cup games	232	0.028	0.48	202	-0.220	-3.25
Continental cup games	258	0.013	0.28	183	-0.017	-0.27
Elimination games	120	0.023	0.33	95	-0.339	-3.64
Group games and close qualifiers	370	0.019	0.44	290	-0.053	-0.98

Meanwhile, the results presented in Table 13 for the recent period, 2005 – 2019, also reveal that the reaction to losses disappears in both groups of indices. Looking at the results in specific groups of games, the effect disappearance happens in both index types and across most of the games. One exception is the reaction of growth stocks to World Cup losses, with an estimated abnormal normalized returns of -0.166 standard deviations and t-statistic of -2.73. Nevertheless, this is not sufficient to conclude that loss effect still remains in growth stocks.

Table 13: Abnormal Daily Stock Market Performance after International Soccer Matches for Size Sorted Portfolios and Value-Growth Sorted Portfolios in 2005 – 2019

The table reports the analysis on value and growth indices from 26 countries (see Panel B of Appendix 2) in 1973 – 2004 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\epsilon_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses, ϵ_{it} is the "abnormal normalized returns" defined in Section 6.1, where the stock market indices are now a small-cap index or a large-cap index. The list of indices employed, as well as their starting dates, are presented in Panel B of Appendix 2.

	Wins			**Losses**		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Growth stocks						
All WC and CC games	474	-0.091	-2.23	378	-0.073	-1.57
World Cup games	239	-0.066	-1.17	199	-0.166	-2.73
Continental cup games	235	-0.115	-1.97	179	0.031	0.44
Elimination games	117	-0.097	-1.22	93	-0.094	-1.04
Group games and close qualifiers	357	-0.088	-1.87	285	-0.066	-1.22
Panel B: Value stocks						
All WC and CC games	474	-0.049	-1.18	378	-0.039	-0.85
World Cup games	239	-0.055	-1.05	199	-0.087	-1.43
Continental cup games	235	-0.042	-0.65	179	0.013	0.19
Elimination games	117	-0.070	-0.79	93	-0.076	-0.84
Group games and close qualifiers	357	-0.041	-0.89	285	-0.027	-0.50

Perhaps the most striking results in Table 13 is the consistently negative estimate of abnormal normalized returns following wins. This happens in both value and growth stocks. In growth indices, the estimate is even statistically significant at below 5% level when considering all important games and Continental Cup games. The negative estimate is also significant at 10% level when looking at Group games and close qualifiers. Nevertheless, it is still too early to conclude that soccer wins can negatively

influence returns stock markets since, to the best of my knowledge, the literature does not suggest any potential negative link between soccer wins and market returns. Further studies are needed to fully understand if these results are just by pure coincidence or if they reflect a new pattern in the recent years.

To further examine any potential differences in the loss effect in growth and value stocks, compare the coefficients of wins and losses estimated from exactly the same games. The results reported in Table 14 are clear, the null hypothesis of equal loss effect on both growth and value indices cannot be rejected in both time periods and in almost all groups of games.

Table 14: One-Sided Wald Tests on The Difference in Soccer Effect Between Growth Indices and Value Indices

The table reports the results from the one-sided Wald test on the difference in magnitude of soccer effect in the growth indices and value indices. The null hypothesis is that β_W is equal in both index types and β_L is equal in both index types. For soccer wins, the alternative hypothesis is that β_W is larger in growth indices than in value indices. For soccer losses, the alternative hypothesis is that β_L is smaller (stronger in magnitude) in growth indices than in value indices.

	Wins			**Losses**		
	Number of Games	β_W **difference**	**p-Values**	**Number of Games**	β_L **difference**	**p-Values**
Panel A: Difference in 1990 – 2004 period						
All WC and CC games	376	-0.033	0.85	287	-0.024	0.24
World Cup games	169	0.006	0.46	148	-0.015	0.38
Continental cup games	207	-0.066	0.98	139	-0.033	0.22
Elimination games	102	-0.052	0.81	80	-0.054	0.20
Group games and close qualifiers	274	-0.026	0.76	207	-0.012	0.38
Panel B: Difference in 2005 – 2019 period						
All WC and CC games	474	-0.042	0.90	378	-0.034	0.15
World Cup games	239	-0.011	0.60	199	-0.080	0.04
Continental cup games	235	-0.074	0.93	179	0.018	0.64
Elimination games	117	-0.027	0.65	93	-0.017	0.39
Group games and close qualifiers	357	-0.047	0.91	285	-0.039	0.16

Overall, the results from the comparison between value and growth stocks are not consistent with my initial expectation. Both types of indices show identical behavior of loss effect. In addition, the magnitude of the effect on both growth and value stocks is highly comparable to the effect estimate for the overall market index. Therefore, the

results may possibly be explained by foreign investors having equal access to the individual firms that constitute the value-growth indices.

8. Conclusion

Regarding my first research objective of examining the relationship between soccer outcome and stock market returns, I have replicated the empirical approach of Edmans et al. (2007) and obtained strong empirical evidence that the stock markets react negatively to losses of national soccer teams in 1973 – 2004 period. All of my results are highly identical to those of Edmans et al. (2007).

First of all, I find a strong negative market reaction to losses of national soccer teams. The magnitude of the negative reaction increases with the importance of the matches. The size of the loss effect is also economically significant. The daily average abnormal market return following World Cup and Continental Cup losses is -42.77 basis points, which is equivalent to a monthly magnitude of over 8%. Meanwhile, losses in other games are not followed by a significant reaction from the stock market. There is also no evidence of a positive market reaction to wins. Furthermore, using a sample trimmed of outliers and a nonparametric statistical approach, I still find a remarkably robust loss effect in the 1973 – 2004 period. Finally, I investigate whether my results are solely driven by Top Seven nations, where soccer is of the greatest importance. The results I obtain show that while the loss effect is stronger in Top Seven countries than in the other 22 countries in my sample, it is statistically and economically significant in both nation groups. Overall, my results for 1973 – 2004 period are highly identical to those of Edmans et. al (2007).

Concerning my second research objective of investigating the nature of the loss effect, I first discover that the loss effect is not robust over time when using the full sample of 29 countries in the recent period, 2005 - 2019. To explain for this, I propose three possibilities based on literature review. The first one questions the existence of the effect when it disappears. However, my results show that the loss effect still persist in the recent period in the group of other 22 countries mentioned above and in small stocks. The second explanation states that the rise in foreign ownership and fall in domestic retail ownership has led to the decrease in prediction power of a sentiment variable like soccer, which is supposed to influence stock market through domestic and retail investors. However, this argument fails to justify for why the loss effect

disappears in Top Seven countries but remains in the others. The last proposed interpretation is the story of limits to arbitrage, which states that as a market anomaly, soccer sentiment creates free lunch opportunities. The publication of those opportunities on influential journal has attracted the attention of rational arbitrageurs, who then exploit the soccer sentiment anomaly.

My findings are highly consistent with this explanation. First, small stocks, where the loss effect persists, are depicted in the literature as having higher limits to arbitrage, making it harder for arbitrageurs to earn positive riskless profits from exploiting the loss effect. Meanwhile, large stocks' relatively lower barriers to arbitrage makes them a more potential target for arbitrageurs to exploit the excess returns from soccer losses. Second, the evidence that loss effect tends to remains in countries where its impact is weaker may implies that arbitrageurs find these countries less potential to earn positive arbitrage profits after costs. Finally, that loss effect is statistically stronger in nations where soccer is particularly important to investors' mood is also align with the sentiment interpretation of the effect.

However, I also obtain some mixing results that may not directly contradict to the limits to arbitrage story I proposed but are appealing for further investigation. First, soccer outcome, as a sentiment variable, influence growth and value stocks identically. This raises questions on whether there is really an ownership structure difference between value and growth stocks and whether growth stocks are actually more sensitive to shock waves in sentiment. If they are the case, that would require further investigations on the interpretation of soccer effect as a sentiment variable. Second, although wins do not have a consistent impact on stock returns, it appears multiple times in my results that soccer wins have negative market impact in the recent period. However, further robustness check should be applied to verify this result since a negative win effect may question the whole mood mechanism that literature used to describe soccer effect. Finally, although not officially discussed in this paper, I also find no evidence of the reversal after the loss effect. In their paper, Edmans et al. (2007) note that they find a statistically significant reversal of 5 basis points. However, this is still too small relative to the magnitude of the effect estimate.

Overall, the interpretation of loss effect as an anomaly and the story of limits to arbitrage are also align with empirical findings of Mclean and Pontiff (2016) and Chu

et al. (2020), who argue that the market may be inefficient sometimes; however, the discovery of market anomalies in academic researches makes it more efficient. Nevertheless, there are still unanswered questions as mentioned above. Therefore, for further study, I would like to focus on the potential effect of wins on stock markets, including literature review on whether there is a justification for a negative relationship between wins and market returns. In addition, in future works regarding the subject of soccer sentiment, I may explore the mechanism by which the irrational reaction to soccer losses may reverse.

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Appendix 1: Mean Daily National Index Return in Basis Point and Number of Soccer Wins and Losses in World Cup and Continental Cup

	Time Series Begins	1973 - 2004				2005 - 2020			
		N	Mean Log Return	W	L	N	Mean Log Return	W	L
Argentina	19900108	3,717	9.68	31	18	3,914	11.29	37	20
Australia	19730109	8,079	5.13	23	10	4,049	3.44	20	17
Austria	19830427	5,256	5.50	8	14	3,974	2.07	11	10
Belgium	19730109	7,968	3.99	26	30	4,095	2.97	20	11
Brazil	19940711	2,594	7.58	38	7	3,956	5.52	31	12
Chile	19890711	3,850	8.59	17	27	3,987	2.97	29	20
Colombia	19890712	3,146	5.44	29	18	3,897	5.93	25	23
Czech Republic	19940315	2,612	2.23	10	12	4,011	3.27	11	17
Denmark	19820108	5,804	5.41	23	22	3,999	5.01	14	9
England	19730103	8,094	4.84	24	25	4,072	2.80	15	14
France	19730109	7,967	5.08	37	21	4,095	3.02	23	11
Germany	19730109	8,027	3.18	51	19	4,061	3.15	34	10
Greece	19880112	4,226	7.14	14	9	3,960	-3.66	12	14
Ireland	19730103	7,602	6.26	19	17	4,061	2.47	4	14
Italy	19730109	8,024	5.12	40	23	4,061	1.64	15	9
Japan	19730110	7,998	1.94	27	15	3,917	2.66	21	19
Mexico	19880415	4,184	10.33	22	18	4,025	4.10	14	17
Netherland	19730109	8,095	4.25	41	31	4,122	3.33	20	13
Peru	19940201	2,722	3.58	13	20	4,083	4.41	23	21
Poland	19940308	2,662	1.60	7	7	4,002	2.17	11	15
Portugal	19900123	3,717	2.83	16	10	4,095	1.18	21	16
Romania	19970509	1,908	8.44	5	7	4,006	3.53	6	13
Russia	20000523	1,142	10.77	6	5	4,011	5.21	12	14
Korea	19870916	4,225	2.77	17	17	3,957	4.02	21	19
Spain	19870309	4,471	4.53	17	15	4,085	1.94	27	8
Sweden	19820112	5,748	5.88	18	16	4,019	4.48	14	19
Switzerland	19730202	8,013	3.43	12	20	4,027	3.14	15	14
Turkey	19880112	4,221	20.72	13	11	4,025	5.99	13	17
Venezuela	19930126	2,854	12.16	4	16	3,674	56.79	17	15
All countries		142,657	5.57	609	480	110,643	5.34	536	431

Appendix 2: List of small capitalization, large capitalization, growth, and value indices used in this study

Panel A: List of small capitalization and large capitalization indices of 26 countries

	Small Capitalization Indices			Large Capitalization Indices		
	Datastream Mnemonic	**Source**	**Time Series Begins**	**Datastream Mnemonic**	**Source**	**Time Series Begins**
Austria	ASXSORD	Datastream	19901231	MSLAUSL	MSCI	19940531
Austria	SBEAUTL	S&P	19890630	ATXIN5Z	Datastream	19730101
Belgium	SBEBELL	S&P	19890630	BGBEL2Z	Datastream	19730101
Brazil	MSSBRAL	MSCI	19940531	MSLBRAL	MSCI	19891204
Chile	MSSCHLL	MSCI	19940531	MSLCHLL	MSCI	19870709
Colombia	MSSCOLL	MSCI	19940531	MSLCOLL	MSCI	19730101
Czech Republic	SBECZRL	S&P	19941230	CZPXIDX	Prague Stock Exchange	19730102
Denmark	SBEDENL	S&P	19890630	DKKFXIN	Nasdaq OMX	19890630
England	FTSESCO	FTSE	19851231	FTSE100	FTSE	19870909
France	SMCAPFR	Datastream	19910101	FRCAC40	Euronext Paris	19870302
Germany	SBEGERL	S&P	19890630	DAXINDZ	Datastream	19831230
Greece	SBEGREE	S&P	19890630	FTASE20	FTSE	19970923
Ireland	SBEIREL	S&P	19890630	MSLIREL	MSCI	19800130
Italy	SBEITAL	S&P	19890630	MIBCI3Z	Datastream	19940531
Japan	SBEJAPL	S&P	19890630	FRNOLCA	Russell	19921231
Mexico	MSSMXFL	MSCI	19960531	MSLMXFL	MSCI	19940531
Netherlands	SMCAPNL	Datastream	19910101	SBPNTHL	S&P	19940531
Peru	MSSPERL	MSCI	19950531	MSLPERL	MSCI	19940531
Poland	MSSPOLL	MSCI	19940531	MSLPOLL	MSCI	19940406
Portugal	SBEPTLE	S&P	19890630	POPSI20	Euronext Lisbon	19960531
Russia	MSSRUSL	MSCI	19960531	MSLRUSL	MSCI	19940531
South Korea	KORSCAZ	Datastream	19870909	KORLCAZ	Datastream	19950531
Spain	SBESPAE	S&P	19890630	IBEX35Z	Datastream	19860102
Sweden	SBESWEL	S&P	19890630	SWEDOMX	Nasdaq OMX	19960531
Switzerland	SMLCPSW	Datastream	19800101	SBC100I	SWX Swiss Exchange	19870401
Turkey	MSSTURL	MSCI	19940531	MSLTURL	MSCI	19940531

Panel B: List of value and growth indices of 26 countries

	Value Stock Indices		Growth Stock Indices	
	Datastream Mnemonic	**Time Series Begins**	**Datastream Mnemonic**	**Time Series Begins**
Austria	MSGAUSL	19741231	MSVAUSL	19741231
Austria	MSGASTL	19741231	MSVASTL	19741231
Belgium	MSGBELL	19741231	MSVBELL	19741231
Brazil	MGIBRAL	19940531	MVIBRAL	19940531
Chile	MGICHLL	19940531	MVICHLL	19940531
Colombia	MGICOLL	19940531	MVICOLL	19940531
Czech Republic	MGICZKL	19961129	MVICZKL	19961129
Denmark	MSGDENL	19741231	MSVDENL	19741231
England	MSGUKNL	19741231	MSVUKNL	19741231
France	MSGFRAL	19741231	MSVFRAL	19741231
Germany	MSGGERL	19741231	MSVGERL	19741231
Greece	MGIGREL	19940531	MVIGREL	19940531
Ireland	MSGIREL	19901231	MSVIREL	19901231
Italy	MSGITLL	19741231	MVIITLL	19940531
Japan	MSGJAPL	19741231	MSVJAPL	19741231
Mexico	MGIKORL	19940531	MVIKORL	19940531
Netherlands	MSGMXFL	19961231	MSVMXFL	19961231
Peru	MSGNETL	19741231	MSVNETL	19741231
Poland	MGIPERL	19950531	MVIPERL	19950531
Portugal	MGIPOLL	19950531	MVIPOLL	19950531
Russia	MGIPORL	19940531	MVIPORL	19940531
South Korea	MGLRUSL	19960531	MSVRUSL	19961231
Spain	MSGSPAL	19741231	MSVSPAL	19741231
Sweden	MSVSWDL	19741231	MSVSWDL	19741231
Switzerland	MSGSWTL	19741231	MSVSWTL	19741231
Turkey	MGITURL	19940531	MVITURL	19940531

Appendix 3: Abnormal Stock Market Return after International Soccer Games, 2005 – 2020

The table reports the analysis on 116,211 trading days from 29 countries (see Appendix 1) in 2005 – 2020 period. The impact of wins and losses are, respectively, β_W and β_L, which are defined from the ordinary least squares (OLS) regression:

$$\epsilon_{it} = \beta_0 + \beta_W W_{it} + \beta_L L_{it} + u_{it} ,$$

in which u_{it} is the error term, W_{it} is a dummy variable for wins that equals one if country i wins a soccer game on a day that makes t the first trading day following the game and zero otherwise, and dummy variable L_{it} is defined similarly when the country loses. In Panel A, the values of ϵ_{it} are the "residual returns" estimated from the regression:

$$R_{it} = \gamma_{0i} + \gamma_{1i} R_{it-1} + \gamma_{2i} R_{mt-1} + \gamma_{3i} R_{mt} + \gamma_{4i} R_{mt+1} + \gamma_{5i} D_t + \gamma_{6i} Q_t + \hat{\epsilon}_{it},$$

where R_{it} is the "raw" log daily market return on date t in country i, R_{mt} is the log daily U.S. dollar return on the world market index on day t, $D_t = \{D_{1t}, D_{2t}, D_{3t}, D_{4t}\}$ are the dummies for week days from Monday to Thursday, and $Q_t = \{Q_{1t}, Q_{2t}, Q_{3t}, Q_{4t}, Q_{5t}\}$ are dummy variables that equal one if the last 1 through 5 days are non-weekend holidays and zero otherwise. In Panel B, ϵ_{it} is the "abnormal normalized returns", which are estimated in a similar regression but with the raw returns, R_{it}, being normalized using GARCH(1,1) procedure as described in Section 6.1. Sample details are provided in Table 1 and Appendix 1.

	Wins			Losses		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Abnormal Raw Returns						
All games	2,944	-1.16	-0.64	1,394	-5.11	-1.80
All WC and CC games	538	-5.77	-1.36	432	-9.70	-1.78
Elimination games	131	1.44	0.19	107	-8.59	-1.01
World Cup	54	11.96	1.11	47	-0.37	-0.04
Continental cups	77	-6.04	-0.56	60	-15.02	-1.16
Group games	236	-3.70	-0.52	137	-3.64	-0.37
World Cup	108	-13.70	-1.10	58	-14.65	-1.16
Continental cups	128	4.75	0.60	79	4.45	0.31
Close qualifying games	171	-14.01	-2.13	188	-14.69	-1.61
World Cup	114	-10.79	-1.42	128	-21.38	-1.84
Continental cups	57	-20.35	-1.63	60	-0.48	-0.03
Other games	2,362	-0.22	-0.11	936	-2.94	-0.88
Abnormal Normalized Returns						
All games	2,944	-0.011	-0.74	1,394	-0.023	-1.06
All WC and CC games	538	-0.057	-1.70	432	-0.064	-1.55
Elimination games	131	-0.018	-0.26	107	-0.057	-0.87
Group games	236	-0.032	-0.63	137	-0.023	-0.33
Close qualifying games	171	-0.120	-2.06	188	-0.096	-1.37
Other games	2,362	-0.001	-0.06	936	-0.005	-0.20

Appendix 4: Normalized Abnormal Stock Market Return Following Soccer Games for Size Sorted Portfolios and Value-Growth Sorted Portfolios in 1990 – 2004

	Wins			Losses		
	N	β_W	**t-Values**	**N**	β_L	**t-Values**
Panel A: Small market capitalization stocks						
All WC and CC games	367	-0.055	-1.21	273	-0.134	-2.52
World Cup games	166	-0.060	-0.88	143	-0.189	-2.57
Continental cup games	201	-0.050	-0.82	130	-0.072	-0.94
Elimination games	106	-0.120	-1.40	76	-0.290	-2.89
Group games and close qualifiers	261	-0.029	-0.53	197	-0.073	-1.16
Panel B: Large market capitalization stocks						
All WC and CC games	367	-0.004	-0.08	273	-0.087	-1.69
World Cup games	166	0.015	0.21	143	-0.084	-1.10
Continental cup games	201	-0.019	-0.29	130	-0.091	-1.14
Elimination games	106	-0.081	-0.92	76	-0.186	-1.78
Group games and close qualifiers	261	0.028	0.50	197	-0.049	-0.76
Panel C: Growth stocks						
All WC and CC games	376	-0.015	-0.31	287	-0.162	-2.94
World Cup games	169	0.070	0.98	148	-0.244	-3.19
Continental cup games	207	-0.084	-1.29	139	-0.073	-0.93
Elimination games	102	-0.027	-0.29	80	-0.372	-3.58
Group games and close qualifiers	274	-0.010	-0.17	207	-0.080	-1.24
Panel D: Value stocks						
All WC and CC games	376	0.019	0.40	287	-0.138	-2.57
World Cup games	169	0.064	0.92	148	-0.229	-3.07
Continental cup games	207	-0.018	-0.29	139	-0.041	-0.53
Elimination games	102	0.025	0.28	80	-0.317	-3.13
Group games and close qualifiers	274	0.017	0.30	207	-0.068	-1.08

Appendix 5: Data on listed share ownership structure in 27 member countries of European Union, 2011 to 2019

The table reports the recent trend of listed share ownership in 27 EU member countries by interested stakeholders of this study, namely Households and Foreign investors. This data is obtained from Eurostat (ec.europa.eu/eurostat/web/main/data/database), following the instruction of Davydoff et al. (2013, pp. 74-84). Households segment here includes direct and indirect share ownership by domestic individuals. Foreign group includes non-domestic EU investors and non-EU investors.

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Panel A: Absolute ownership in million EUR									
Total economy	5,506,292	6,212,053	7,296,328	8,064,374	8,809,113	9,058,333	10,114,048	9,147,856	11,132,018
Households; non-profit institutions serving households	897,142	1,006,616	1,205,429	1,313,469	1,434,591	1,415,216	1,560,674	1,355,379	1,624,179
Rest of the world	3,349,921	4,052,556	4,933,799	5,303,675	6,007,052	5,993,401	6,666,587	5,787,634	7,195,220
Panel B: Share ownership in percentage									
Household	16.29%	16.20%	16.52%	16.29%	16.29%	15.62%	15.43%	14.82%	14.59%
Other domestic institutional investors	22.87%	18.56%	15.86%	17.95%	15.52%	18.21%	18.66%	21.92%	20.77%
Foreign (European and non-European investors)	60.84%	65.24%	67.62%	65.77%	68.19%	66.16%	65.91%	63.27%	64.64%
Total economy	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%