

Football and Stock Market Performance Correlation: Evidence from Italy

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Abstract

The increasing growth of soccer economy is delivering new challenges for prospective investors in terms of stock price volatility. Such challenges are rooted in behavioral finance and efficient market hypotheses. Given this, the aim of our paper is to test the link between sport performance and correspondent stock price for the Italian listed football clubs (Juventus, Lazio, AS Roma). Our results suggest that soccer wins are likely to have a positive impact over stock price. This impact is more pronounced for local stocks and thus the findings have policy implications for emotional investors.

Keywords: efficient markets hypothesis; volatility; GARCH; football results; soccer clubs.

JEL classification: G12; G32; M14.

1. INTRODUCTION

An emerging area in applied economics is dominated by sports economics given the increasing revenues recorded globally. Today, broadcasting revenues, ticketing, sponsorships, merchandising and marketing revenues, player transfers and competition prizes all contribute to the revenue streams of the football clubs. Consequently the 2000's experienced the first football clubs to exceed an enterprise value of 1 billion EUR.

Due to its popularity (i.e. football is world's most popular sport) soccer economy is huge and there are not many industries with such kind of growth rates or the same potential for further expansion. Such evolution might explain why several football clubs are listed on stock market and thus new opportunities emerged for prospective investors, both institutional and individual. As for any public company good and bad news influence the stock price, it is likely that football results (wins or losses) to directly influence stock price

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as well. There are two explanations for such hypothesis. On the one hand there are psychological effects that affects investor's moods as suggested by behavioral finance. For instance, a big or unexpected win could determine higher emulation among supporters who are willing to buy stocks of their favorite team. On the other hand, there are economic effects that influence club's profitability as suggested by firm theory. Failing to achieve seasonal defined goals (national title, advance in different knock-out competitions) means less revenues-based bonuses for club budget.

In light of the efficient market hypothesis (Karanovic and Karanovic, 2018) there is an emerging empirical literature that investigate whether football results are price sensitive information. Mainly, British soccer clubs listed have been examined (Dobson and Goddard, 2001; Palomino *et al.*, 2009; Bell *et al.*, 2009), as well as other European teams too, like Portugal clubs (Duque and Ferreira, 2005), Turkish clubs (Berument *et al.*, 2006; Demir and Danis, 2011), Italian clubs (Fassano and Boido, 2007) or mixed sample (Floros, 2014). Different approaches lead to mixed results which constitute the motivation for our paper.

In this respect, the aim of our paper is to test the link between sport performance and their stock price whereas we have examined last decade for the Italian listed football clubs: Juventus (JUVE), Lazio (SSL) and AS Roma (ASR). Using last seasons' data between 2007 and 2018, the results suggests that club's share price are sensitive to positive football results. Our paper aims to extend previous work of Fassano and Boido (2007) for Italian clubs for three reasons. First, we use a different methodology, by modelling the volatility through GARCH models and considering additional variables for soccer results. Second, we considered a recent period with different stock markets features, given that the 2008 financial crisis increase the investors' prudence. Third, we considered also an international perspective by testing the impact for STOXX Europe Football market index. Thus, we are able to test the robustness of previous results.

The paper is structured as follows: Section 2 provides an overview of the existing empirical literature that deal with this topic. Section 3 describes the data and methodological framework. Section 4 reports the results, while Section 5 concludes.

2. LITERATURE REVIEW

The effect of football matches' results on the prices of their shares on the stock market is a topic which was studied along the time, especially in the case of English football clubs. This interest has grown as theories based on behavioral finance and financial markets developed, due to the widely known fact that football and sports in general, awake deep and impulsive emotions in the fans of football teams.

These impulsive emotions have been studied and go beyond investment decisions, sometimes generating life and death situations. There is a wide body of medical studies of the effect of football on cardiovascular events, such as cardiac arrest cases. Witte *et al.* (2000) performed a study on the Dutch population during the 1996 European Championship, when the Dutch national football team was eliminated at penalty kicks. On the 22nd of June, when the elimination happened, the number of deaths from coronary diseases increased from an average of 150 to 173 for men, without any significant increase in the case of women. The deaths were higher on average in the following days as well.

The same conclusion was reached by Carroll *et al.* (2002) in a study on the English population during the 1998 World Cup, when the England national team was eliminated by

Argentina at penalty kicks. Their study found that there were on average 55 more heart attacks in men in the day of the game and the following two days than before the game. A study by [Wilbert-Lampen et al. \(2008\)](#) found that in the case of Germany, there was an increase of heart attack caused by deaths in both women and men during the 7 days when the German national team played in the 2006 World Cup hosted by Germany.

The feelings generated by football goes even further, affecting the productivity of people in the days following an important success. According to [Berument and Yucel \(2005\)](#) there is a 0.26% increase in industrial productivity in the days following a win in the European competitions by Fenerbahce Istanbul which is considered to be the workers' team, similarly as in Madrid Atletico is the team of the blue collar working people, while Real is considered to be the team of the royalty and of the white collars.

The emotional impact of football affects the health, finances and productivity of the supporters, and in the following pages the body of literature concerning the effect of football games on the share price of football teams will be analyzed. Investor sentiment, defined broadly, represents the feelings of investors when the stock prices deviate from the present value of their future cash-flows ([Bernille and Lyandres, 2011](#)).

One of the first studies on this topic was not in the field of football, but in the field of basketball, more specifically on the Boston Celtics, one of the most successful basketball teams in the history of the NBA, which has a huge fan community and is sponsored by many firms. [Scherr et al. \(1993\)](#) found that the share price of the club increased in the case of a win, and decreased in the case of a loss, especially during the NBA playoff stages when games are much more important, having an eliminatory potential.

The study on the Boston Celtics was followed by [Brown and Hartzell \(2001\)](#) on a timeframe between 1987 and 1998 and found that the investors use the game results to take investment decisions, because they consider that information about the operational efficiency of the team is comprised in those results. During the NBA season the trading volume is higher than in off-season, showing that the game results trigger investment decisions.

[Brown and Hartzell \(2001\)](#) also found that during the regular season, losses matter a lot while wins don't, however when the playoff arrives, the wins and losses matter significantly and symmetrically, thus confirming the findings of [Scherr et al. \(1993\)](#). The authors used betting point spreads to separate the expected results from unexpected results, finding that even expected losses have a significant impact on the share price, while the unexpected wins have almost no effect. The authors also investigated the effects of non-sporting events surrounding the club such as transfers, coach changes and sponsorship announcements and found that they don't impact the share price as significantly as the game results do.

In European football, the years before the turn of the millennium brought significant changes in the financing methods of the football teams. [Renneboog and Vanbrabant \(2000\)](#) described in their paper the wave of IPO's in the English football world. Tottenham Hotspurs opened this wave in 1983 and in the 1996-1997 season 12 successful IPO's were finished while other teams followed this trend in the years to come. In 2000, there were 22 clubs regularly traded, 12 on the London Stock Exchange, 8 on the Alternative Investment Market and 2 on the OFEX. In contrast to this, only 2 non-British football clubs were listed in the European Union at that moment, Lazio Roma and Ajax Amsterdam.

The performance of these clubs on the stock market was poor, as reflected by an investment fund tracking their performance, called "The Football Fund" which was founded in 1998 and generated a negative return of -13% in the first year of trading, while the

Nomura UK Football Index went down by 40% in the same period. The first study on this topic was performed by [Morrow \(1999\)](#) who performed an analysis on 6 months' of data for Sunderland F.C. and Manchester United. He concluded that after controlling for market wide effects, the wins increased and the losses decreased the share prices of the clubs analyzed. The author found that in the period between 1993 and 1997, the shares in the English football sector rose by 774% and outperformed the stock market by a factor of 10.

However, this stock market performance was short-lived. [Hamil and Chadwick \(2009\)](#) described that at the end of 1997, most listed clubs had a market capitalization under its IPO. [Morrow \(1999\)](#) found that the reason for this issue was the low level of share trading as compared to other industry sectors. A subsequent study ([Morrow, 2003](#)) has shown that this effect was due to low interest in the football industry and a phenomenon of supporter shareholding, meaning that at the initial IPO supporters purchased shares at high prices based on an emotional impulse, and held onto them making the secondary market for football clubs' shares highly illiquid. For many supporters, it was a matter of pride to hold shares in their favorite football club, and they were planning to pass them through generation and generation. However, they didn't realize the negative effect of this investment plan. As a result of these factors, 14 of the 22 football clubs delisted from the stock exchange between 2000 and 2007, by means of individual investor takeovers.

The next major study on the effect of the football game results on the share price of the clubs was performed by [Renneboog and Vanbrabant \(2000\)](#) who analyzed 17 football clubs from England for a time span of 3 seasons between 1995 and 1998, also controlling for market wide effects. The authors found an interesting effect, showing that at the first day of trading after a game, average positive abnormal returns of 1% were found after wins, and negative abnormal returns of 1.4% and 0.6% were found for losses and draws respectively. Over the week these abnormal returns intensified. These findings were consistent across English, Scottish, European and national cup competitions. For promotion matches the positive/negative abnormal returns increased in the area of +/- 3% while in the case of relegation duels the effect intensified to +/- 10-13%. [Samaigo et al. \(2009\)](#) also confirmed that high stakes games like those in European Competitions, generate immediate positive turnovers for English football teams. These findings related to the higher importance of European Cup results were contradicted in latter studies by [Stadtman \(2006\)](#) and [Demir and Danis \(2011\)](#).

Most researchers used simple linear regressions in their studies, but a different approach was used by [Zuber et al. \(2005\)](#) who found that the prices of shares are a positive function of goal differences or wins. They analyzed 10 English football clubs from the Premiership, for a timespan of three seasons, using dummy variables for home or away games, surprise losses and wins, cup and league games, and the position of the teams in the Premiership league table, creating a classification of whether the team was standing in the top five or bottom three of the league. They included the FTSE index and goal difference variables in the regression. Their only major finding was that cup matches had a positive impact on the share price, while there were no significant effects in the case of unexpected wins/losses.

[Palomino et al. \(2005\)](#) studied the effects of betting odds and match results on the share price of listed football clubs from the UK. They found that betting odds are considered to incorporate information about expected future performance and being released a couple of days before a game, could influence the share price. However, this is not confirmed by their study, as there are no significant abnormal returns after the announcements of betting odds. One explanation for this might be the fact that what betting odds predict is also the

consensus surrounding a game. Game results were found to have a strong significant impact on share price, with a quick reaction of the market in the case of a win, and a slow reaction in the case of a loss.

Another study by [Palomino et al. \(2005\)](#) used betting odds to build four dummy variables which represent a strong or weak probability for a win or a loss for each football game in UK. The market increased when an expected win happened and increased by a lower rate when a loss was expected but the final result was a win. They did not control for any other factors.

[Brown and Hartzell \(2001\)](#) and [Edmans et al. \(2007\)](#) suggest that the market's asymmetric reaction is due to investors' optimism. These studies, together with [Palomino et al. \(2005\)](#), used betting odds as a proxy for the investors' beliefs regarding the game outcomes. There are, however, reasons to believe that these expectations are not fairly reflected in the odds published by the bookmakers even if they are the closest match predictor. Over time, the bookmakers have proven to be more skilled at predicting game results, and in order to make a profit, the odds don't reflect this superior information.

[Szymanski and Kuypers \(1999\)](#) demonstrated that the revenues of English football clubs are a function of their league position, due to both prize income and higher attendances. This was also found in the case of Australian football teams by [Pinnuck and Potter \(2006\)](#). Another study performed by [Barajas et al. \(2005\)](#) on 134 teams from the Spanish Primera and Segunda divisions on the 1998-2002 timeframe has found only a minor link between on the pitch performance and club revenue, highlighting that in the case of these clubs, the revenue is built mainly on sponsorships and TV rights, which are only partially influenced by football performance. Their study is consistent with previous studies performed by Deloitte in 2000.

In the case of the Portuguese championship, [Duque and Ferreira \(2005\)](#) analyzed two teams, Sporting Lisbon and F.C. Porto, two classic rivals. They found that in the case of Sporting Lisbon, the share price reaction for wins is positive, with an average share price increase of 1.5% immediately after winning a match. Defeats and draws have a negative impact on the share price. Paradoxically, draws have a deeper negative impact, because the market had already anticipated the losses, while draws are more often unexpected. On average, in the case of a draw, prices depreciate by 1.3%, while in the case of losses with 1%.

In the case of F.C. Porto, the results are contradictory. For wins and defeats, there is no effect on stock returns. But when the team draws, shares tend to depreciate with 1.2% on average on the day after. Other studies, like [Renneboog and Vanbrabant \(2000\)](#) show that positive results exert a positive impact on the entire sample. But this is not the case on these Portuguese teams. The study has shown that in the case of victories close to the end of the season when one team is chasing the other the effect of results on stock price is stronger than at the beginning of the season when the stakes are not so high.

[Bernille and Lyandres \(2011\)](#) performed a study on 20 teams from 8 countries, investigating the effects of biased estimates of game results on the stock returns of stock market traded football teams. The result of their study suggests that the market reaction to soccer games' outcomes is asymmetric, meaning that the market reacts negatively to losses, while in the case of wins, the impact on the stock market is near zero. This result is consistent with the findings of [Scholtens and Peenstra \(2009\)](#) who performed a study across multiple countries in which they analyzed data on eight football teams from five championships over four seasons. They used a stock market index in order to remove systematic factors, and they

found that unexpected and expected wins generated a share price increase, while unexpected losses generated a decrease in the price of the shares. The price response for the losses was much stronger than the response for the wins. Similarly, [Edmans *et al.* \(2007\)](#) performed a larger study, on a timeframe between 1973 and 2004, including games from the World Cup, and the major continental competitions concerning national teams from various sports. They found that there is a strong negative stock market reaction to losses, especially in the case of football while in the case of wins there is no significant effect.

Some researchers introduced dummies with implied probabilities, such as home and away games, where of course there is a larger probability for a win by the host, and a lower probability for an away win. It is well known in football that away games have a lower probability of success than home games.

[Dobson and Goddard \(2001, 2003\)](#) explain statistically what impact home games have on the probability to win. According to their analysis, the theory of home advantage is relevant to many team sports. They found that in the past 35 years there was a steady decrease of the influence of home advantage over match results in the English Premier League, but there is still a large gap between team performance away and at home. Home advantage depends on the geographical distance needed to be travelled by the away team. Greater distance means poorer team performance for the away team.

One of the few studies on Italian football is a paper by [Fassano and Boido \(2007\)](#) who performed a study on Lazio, Juventus and Roma in Italy, on the 2005-2006 season and found that the sports performance of these clubs affected the financial performance of their stock on the financial markets. Their data shows for all three clubs, that the price/return ratio following wins is higher than the price/return ratio after unsuccessful matches. They examined in particular the impact of tied and lost matches and found that Italian investors don't like games ending in a draw. This result is consistent with previous findings. The Italian football was shaken by the Calciopoli scandal when Juventus was relegated, and also witnessed the rebirth of Juventus after its promotion, going on to win 7 straight championships.

A particular case of investor sentiment related to football is the case of Turkey. Turkish people worship their favorite football clubs and the entire society reverberates the emotions of the football games. The largest football clubs in Turkey are listed on the stock exchange, and there are a number of important papers which studied the impact of game results on the stock price of these teams.

One of the first studies was proposed by [Devecioglu \(2004\)](#) who performed a study on Besiktas and Galatasaray and found that there is a moderate reaction on the stock market after internal competition games and there is a much more significant reaction after games in the European Competitions. [Tufan \(2004\)](#) performed a study on whether the game results of the Turkish national football team affected the returns on the Istanbul Stock Exchange during the 2002 World Cup. They found that the ISE 100 returns were not affected by the results during the World Cup, mainly because almost half of the shares on ISE 100 are held by foreigners.

[Demir and Danis \(2011\)](#) investigated the stock price reaction of football clubs from Turkey, namely Besiktas, Galatasaray and Fenerbahce to their sports performance. They were first to examine this relationship outside the developed countries' stock markets. Their stock market may not be at the level of the stock markets of the developed countries of Western Europe, but their football championship is in the top leagues in Europe. In the last

decade, the value of the football industry reached 500 million EUR, and Turkey is fifth in Europe based on total broadcasting rights revenues.

[Demir and Danis \(2011\)](#) also introduced for the first time in a study on Turkish teams a new category of results, called “expected versus unexpected” game results by using odds. They estimated separate regression models for each football club because clubs chose different financial reporting policies in terms of revenues and costs, avoiding so the bias that would be created if a pooled regression model was to be used.

The conclusion of their study was that match results affect abnormal returns, and there is a rather asymmetrical stock market reaction to losses and wins. The results indicate that a European Cup win does not change or affect in any way the stock returns. As a paradox, a domestic victory has a much more significant effect over the stock price than a European cup win, which is at least odd, because European cup wins bring cash prizes even from the early stages. The lack of impact of European Cup games was also highlighted by [Stadtman \(2006\)](#) in a study on Borussia Dortmund over the 2000-2005 timeframe, adding that only the unexpected part of the information drives the change in stock price.

[Berument et al. \(2006\)](#) studied the effect of game results on the stock market price for Galatasaray, Besiktas and Fenerbahce, finding that in the case of Besiktas, a win against its rivals in the domestic cup increased the stock market returns, while the same effect does not hold in the case of the other two teams. The authors used a method which was not encountered in many previous football based studies, the GARCH-M model (Generalized Autoregressive Conditional Heteroscedasticity in Mean). This model is expected to provide more efficient estimates, allows an assessment of the effects of risk over return and provides a richer set of robustness statistics. An ARCH (Autoregressive Conditional Heteroscedasticity) model was also used by [Asteriou et al. \(2013\)](#) in order to study the effect of the announcement of London hosting the 2012 Olympic Games on the London Stock Exchange. The researchers found only a limited number of significant indices affected by the announcement.

Another interesting approach regarding this topic was brought into light by [Baur and McKeating \(2009\)](#) who investigated whether clubs perform better after an IPO than before. They used panel data regression models and the Eurostoxx Index as a benchmark and found that the majority of clubs don't perform better after an IPO on the domestic scene, but there is an improvement in performance in international games. Only clubs in inferior leagues benefit from the IPO through better on the pitch performance. The authors suggested that the share price of football clubs depends on the previous season's domestic results and the current season's international performance. [Gimet and Montchaud \(2016\)](#) performed a more complex study on a sample of 24 football clubs from Europe, from mixed leagues, and found that stock returns are influenced mainly by economic determinants such as profitability, stadium attendance and TV revenue (reputation), while the volatility of the stocks is mainly influenced by market-wide effects, and just in a small measure by internal factors such as game results, net transfers and other sporting events. The authors highlighted the fact that investors tend to dump these illiquid assets in periods of financial turmoil and turn their attention towards more liquid assets.

3. DATA AND METHODOLOGY

The data used consists of match results for the three Italian listed football clubs, i.e. Juventus (JUVE), Lazio Roma (SSL) and AS Roma (ASR), comprising all competitive

matches for the period 25.08.2007-31.12.2017 together with the STOXX Europe Football market index (FCTP) and the individual share prices as quoted on the Milan stock exchange for each football club for the same timeframe.

The starting period is related to the previous research on this sample performed by Fassano and Boido (2007) which ended at the middle of 2007, and our study aims to continue their work on the topic. The STOXX Europe Football index data were collected from www.boerse.de, while the individual market prices were collected from Yahoo Finance. The football game results for the aforementioned clubs examined were collected from www.worldfootball.net. The daily return is computed as continuous compounding return using the following formula:

$$R_t = \ln \frac{P_t}{P_{t-1}} \quad (1)$$

where R_t is the index return and P_t and P_{t-1} reflect closing price index at times t and $t-1$ respectively.

In order to model the volatility, the Generalized Autoregressive Heteroskedasticity (GARCH) econometric procedure is employed (Engle, 1982), which deal with distributional characteristics of return (Brooks, 2014). Based on previous findings (Guidi *et al.*, 2011; Anton, 2012), in the first step a GARCH-M (1,1) model with the following specification is estimated:

$$\text{Mean equation: } R_t = \mu + \delta \times \sigma_t^2 + u_t \approx N(0, \sigma_t^2) \quad (2)$$

$$\text{Conditional variance equation: } \sigma_t^2 = \alpha_0 + \alpha_1 \times u_{t-1}^2 + \beta \times \sigma_{t-1}^2 + \gamma_t \times X_t \quad (3)$$

where u_{t-1}^2 represent the lag of the squared residual from the mean equation (i.e. ARCH term), σ_t^2 is one-period ahead forecast variance based on past information (i.e. GARCH term), X_t includes a vector of dummy variables for the win results (overall, home and away) of the Italian soccer teams. Furthermore, for synchronizing football results with stock data, for each dummy value the impact of win have been associated with the first trading day, given that several matches are scheduled during weekends.

4. RESULTS

A useful preliminary tool for empirical analysis is represented by the descriptive statistics in order to assess distributional characteristics and stochastic properties. These descriptive statistics are presented in Table no. 1 and one can note that the selected time series exhibit a large volatility given that their standard deviation exceeds the mean. This phenomenon is explored in depth in Figure no. 1, whereas we plot the daily returns for each variable. In other words, as usual for financial times series it is likely to record extreme events, rooted even in behavioral finance.

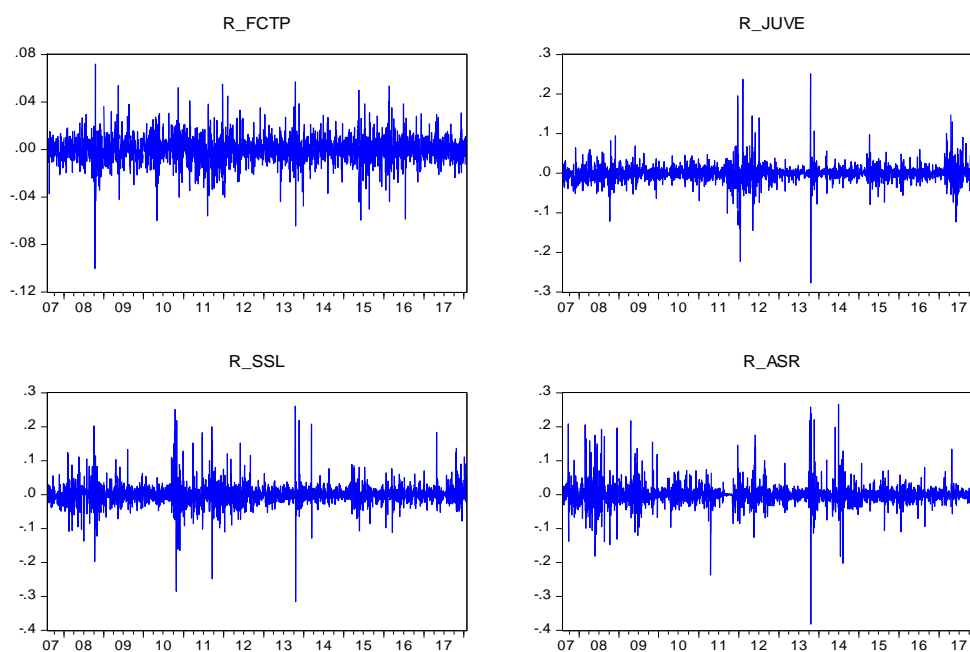
The unconditional non-normal distribution is not rejected by the Jarque-Bera statistics. Furthermore, the Breusch-Godfrey test (with 4 lags) rejects the null hypothesis of no serial correlation, while the ARCH LM test suggests the presence of ARCH effects in the residuals. This motivates the estimation of conditional variance using a GARCH-M (1,1) model.

Table no. 1 – Descriptive statistics

	R_FCTP	R_JUVE	R_SSL	R_ASR
Mean	-0.000153	0.000140	0.000591	0.000184
Median	0.000000	0.000000	0.000000	-0.000230
Maximum	0.071909	0.251185	0.260825	0.265417
Minimum	-0.100322	-0.277632	-0.316197	-0.381791
Std. Dev.	0.011872	0.024625	0.033919	0.034812
Skewness	-0.380699	0.578269	0.712485	0.796004
Kurtosis	8.933050	27.52332	18.91934	20.28151
Jarque-Bera	4004.469*	67455.64*	28589.79*	33707.62*
Observations	2686	2686	2686	2686

Note: ***, **, * The rejection of the null hypotheses of normality at the 10%, 5% and 1% respectively levels of significance for statistical tests.

Figure no. 1 displays several volatility clustering issues, particularly for FCTP index. For the individual stocks there appears to have been a combination between periods of relative tranquility (small positive and negative returns) and periods of high volatility (large positive and negative returns). Regarding the extreme values, there could be observed that for each individual stock the pair maximum-minimum has been recorded successive during 15th-16th October 2013 (most likely due to Italian stadiums law proposal), whereas for the FCTP index the pair minimum-maximum has been recorded during 8th-13th October 2008 (most likely due to financial crisis).

**Figure no. 1 – Daily return dynamics**

It's worth to be mentioned that FCTP index display a higher volatility noise since the index includes 22 European football teams (Italian teams represent only 33% from overall market capitalization Index).

Regarding the individual stocks, first, Juventus the 2017-2018 volatility is due to the great success of the club, when the stocks became a highly desirable asset, the club winning 6 straight championships and was on route to win the 7th, with a deep Champions League run and a Coppa Italia win. Second, for the case of Lazio, the volatility during the 2008-2009 period was due to the weak performances of the team, struggling to remain in the middle of the Serie A league table and to gain access to the European Championships. The financial situation of Lazio was not the most comfortable, with limited funds for transfers, in a time when Italian teams were strengthening their squads. In 2010-2011 and 2011-2012 the team performed better, reaching the Europa league group stages and getting out of the group stages. In late 2013 the team struggled in Serie A but went through the UEFA Europa League group stages.

Third, for the case of AS Roma, volatility appeared mostly during the 2007-2009 and the 2013-2014 periods. On the 2007-2009 period was a period of great success, winning a Supercoppa, finishing second in Serie A in two consecutive seasons and winning a Coppa Italia trophy. This period was one with many transfers, an increase in the supporter's pool and revenue growth. In 2013-2014 the team experienced a growth in financial stability after the recapitalization following the takeover by the American investor group, and recorded one of best ever in Serie A, the club achieving an impressive 85 points and finishing second to Juventus, who won the league with a record-breaking 102 points. Overall, these events influenced to a certain extent the evolution of the stocks, prior through the mechanism of demand and supply, and secondary through several mechanisms including behavioral finance.

4.1 Results using the EUROSTOXX market index

The results of the GARCH-M (1,1) specification with the Student t distribution and conditional standard deviation term in the mean equation are reported in [Table no. 2](#). For this step, we've considered EUROSTOXX Europe Football market index, whereas in the Model 1 we include 3 dummy variables for overall wins for each club and in the Model 2 we refine the analysis by the location of the wins (e.g. home and away).

The ARCH and GARCH coefficients are statistically significant and their sum is closer to 1, indicating that the shocks to the volatility have a constant effect over the conditional variance. The estimated GARCH coefficients in the equation are larger than the ARCH coefficient. Furthermore, an ARCH coefficient higher than 0.5 suggest that the volatility is sensitive enough to the new information on the market, such as sport performance. When looking at dummy variables that are used as proxies for wins, the overall variable is significant only for Lazio stocks, suggesting a positive impact. We explore in depth according to the location status and one can observe that for the Lazio's stocks the impact remain significant for both home and away win, as well as for Roma's stocks for away win. As usually for football mood, an away win cause higher emotions than home win.

Table no. 2 – GARCH-M results using EUROSTOXX Football Index

Variables	Model 1	Model 2
ARCH	0.133461* (0.010436)	0.127816* (0.010098)
GARCH	0.787081* (0.012666)	0.795430* (0.012342)
Juventus	-2.76E-06 (4.36E-06)	
Lazio	1.86E-05* (5.46E-06)	
Roma	2.55E-06 (4.46E-06)	
Home win (Juventus)		-6.43E-06 (6.02E-06)
Away win (Juventus)		1.99E-06 (6.35E-06)
Home win (Lazio)		1.31E-05** (6.33E-06)
Away win (Lazio)		2.34E-05* (8.54E-06)
Home win (Roma)		-7.52E-06 (5.99E-06)
Away win (Roma)		2.15E-05** (8.55E-06)
AIC	-6.194224	-6.193761
BIC	-6.176664	-6.169615
LL	8326.843	8329.220

Notes: Robust standard errors in parentheses. AIC, BIC and LL represent Akaike criterion, Schwarz criterion and Log likelihood ratio respectively. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$.

Our initial results should be interpreted with prudence, given the heterogeneity issue of the EUROSTOXX market index. As previously mentioned FCTP comprise 22 European football clubs and Italian clubs stand for only for one third of total market capitalization. In other words, the potential results information impact for the Italian clubs might be minimized for FCTP volatility. This motivate the next step of our analysis where instead of FCTP index data individual stock data are considered for each club.

4.2 Results using the individual stock prices of the football clubs

The results of the GARCH-M (1,1) specification with the Student t distribution and conditional standard deviation term in the mean equation are reported in Table no. 3. For each club two models have been estimated, one with overall wins dummy and other with away and home wins dummies respectively.

Several remarks could be drawn up. First, once again the persistence effect is not rejected, given that for all models the ARCH and GARCH coefficients are significant and closer to the unity. Second, the overall win variable is significant for all 3 clubs, suggesting that the team's winning is likely to change supporter's financial behavior. Fourth, such price sensitive information has a pronounced impact for national level than for international one.

Fourth, for Juventus and Lazio emotional impact is caused by away wins whereas for Roma is caused by home wins.

Table no. 3 – GARCH-M results using the individual stock prices of the football clubs

Variables	Juventus		Lazio		Roma	
ARCH	0.148340*	0.147346*	0.234243*	0.232498*	0.393275*	0.408127*
	(0.006317)	(0.006312)	(0.013759)	(0.014560)	(0.013157)	(0.013606)
GARCH	0.843386*	0.842497*	0.638165*	0.638105*	0.579726*	0.567973*
	(0.004331)	(0.004498)	(0.015089)	(0.015487)	(0.012965)	(0.012992)
Overall	1.66E-05*		0.000198*		9.64E-05*	
	(5.02E-06)		(2.37E-05)		(9.58E-06)	
Home win		-3.84E-06		4.44E-05		0.000115*
		(7.92E-06)		(3.04E-05)		(1.06E-05)
Away win		3.96E-05*		0.000368*		1.14E-05
		(1.01E-05)		(4.66E-05)		(3.47E-05)
AIC	-5.160785	-5.161065	-4.322824	-4.324574	-4.319186	-4.318887
BIC	-5.147614	-5.145700	-4.309654	-4.309209	-4.306016	-4.303521
LL	6936.934	6938.310	5811.553	5814.903	5806.667	5807.265

Notes: Robust standard errors in parentheses. AIC, BIC and LL represent Akaike criterion, Schwarz criterion and Log likelihood ratio respectively. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

Analyzing the structure of past results, we can highlight that they all have a higher home win percentage than away win percentage. The difference between the wins is more dramatic in the cases of Lazio (36% away win; 58% home win) and AS Roma (42% away wins; 66% home win) that Juventus (53% away win; 70% away win). These analytics might provide and explanation for our results.

Completing these results to other metrics (such as beta) we can summarize that club's share price are sensitive to broader market movements, including market volatility. Particularly, small-cap stocks are popular for their explosive growth and therefore are influenced by sentiment because might be speculative. Two recent events are suggestive in this respect. First, Roma's shares record 20% one-day change after unexpectedly beating FC Barcelona in the quarterfinals of European soccer's Champions League competition. Second, Juventus share prices rocket at €1.2 Billion market capitalization as club make Cristiano Ronaldo move. To sum up, the results are consistent with previous studies (Fassano and Boido, 2007) even after considering different methodology.

5. CONCLUSIONS

There is a theory, proven in literature by many researchers, that the results of football matches have a significant influence over the share price movements of the football clubs. Researchers examined Italian football before, but only on a short timeframe, covering the years between 2005 and 2006, while others covered the Turkish, English and Portuguese championships.

Our study focus on the three listed football clubs from Italy, Juventus, AS Roma and Lazio Roma, in attempt to establish whether the results of football games during 2007-2018 seasonal calendars have an influence on the stock prices of the teams, using two approaches. The first approach involves studying the impact of the football game results of these teams

over a market index which tracks the share prices of the listed football clubs in Europe, i.e. EUROSTOXX Europe Football index.

The second approach involves studying the impact of the football game results of the teams over their individual stocks. Modelling the volatility with GARCH-M method, the results suggests that club's share price are sensitive to positive football results, rather for individual stocks. It's worth to be mentioned that such effects are modest given that volatility is sensitive to broader movements.

The implications of these results are twofold. On the one hand, they make sense for emotional investments, i.e. the feeling of ownership of favorite team's stocks influences the future stock price. On the other hand, speculative investments might be considered by several investors, when there are available any predictions about the expected football result.

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