The Impact of Expectations, Match Importance and Results in the Stock Prices of European Football Teams

Pedro Godinho and Pedro Cerqueira[*]

Abstract

We analyse the relation between stock returns and results in national league matches for 13 clubs of six European countries. We assume that the stock prices should only respond to the unexpected component of match results, and we use betting odds to separate the expected component of results from the unexpected one. We consider both the unweighted results and the results weighted by a new measure of match importance that we propose. When this measure is used, a significant relation between the results and stock performance is found for most teams.

Keywords: Stock returns, Football results, Football teams, Information and market efficiency, MGARCH

This is a post-peer-review, pre-copyedit version of an article published in Journal of Sports Economics:
Godinho, P., Cerqueira, P. "The Impact of Expectations, Match Importance, and Results in the Stock Prices of European Football Teams", Journal of Sports Economics, first published online February 17, 2016. doi: 10.1177/1527002515626222
The final version of the article is available online at: http://journals.sagepub.com/doi/10.1177/1527002515626222

[*] Pedro Godinho, Group for Monetary and Financial Studies (GEMF) and Faculty of Economics, University of Coimbra, Av. Dias da Silva, 165 3030-512 Coimbra, Portugal, e-mail: pgodinho@fe.uc.pt, phone: +351 239 790571; Pedro Cerqueira, Group for Monetary and Financial Studies (GEMF) and Faculty of Economics, University of Coimbra, Av. Dias da Silva, 165 3030-512 Coimbra, e-mail: pacerq@fe.uc.pt, phone: +351 239 790512.

1. Introduction

Football is a very popular sport in Europe – probably the most popular sport – with a huge following and significant economic importance. Since the 1980s, some football clubs have been listed in stock exchanges all over Europe. One interesting aspect about listed football clubs is that there is one bit of information about the club that is revealed simultaneously to everyone: the club results. For companies that are simultaneously clubs involved in a game that generates strong emotions, it is interesting to determine how the market responds to this information. Zuber et al. (2005) notice that many investors in professional sports may have particular characteristics, related to club loyalty, which lead them to respond differently to information that affect cash flows, so the way club prices respond to match outcomes may reflect aspects other than the expected impact in future financial results. Given these particular characteristics, understanding the way share prices react to match results may be valuable to pure financial investors, since it may give them hints to whether it is possible to take advantage of possibly unique characteristics of the behaviour of the share prices of football clubs.

In this study we analyse the way share prices of 13 clubs of six different European countries respond to match results of the corresponding teams in the national leagues. We aim to answer to three questions. The first one is: Does the market respond to the unexpected component of match results? This question has been addressed by other authors, some of them just considering the raw result, and other considering the unexpected component of the result. In order to separate the expected and the unexpected components of the results, we will resort to betting odds defined before the beginning of the match.

The second question is: Is it relevant to take match importance into account when analysing the market response to match results? There is no straightforward way to measure match importance, so a test to the relevance of match importance is, simultaneously, a test to the method employed for measuring it. A few other authors have considered match importance but, as we will argue, the measures found in the literature have important shortcomings, so we propose a new measure of match importance.

Finally, the third question is: Is there some consistency in the way teams respond to match results, or are there significant differences between different teams or countries? Some other authors focused on the aggregate behaviour of football teams. In our study, we analyse the 13 teams separately, in order to assess whether or not the share price response to match results is similar for all of them. Although we focus on the individual analysis of listed clubs, for countries with multiple teams being analysed, we also consider the aggregate behaviour of the countries' teams. This way we intend to assess if there are identifiable country-wide effects, and their consistence with individual teams' behaviour.

In order to answer these questions, we will use Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) models. For countries with more than one club, we consider that common factors may affect the volatility of residuals of different teams, and we therefore resort to a Multivariate GARCH model (MGARCH, henceforth). For the analysis of country-wide effects, a panel GARCH model is used.

The main contributions of this paper are twofold. First, it proposes a new measure for the importance of the matches that overcomes some shortcomings of the measures used by other authors. Second, it provides an analysis of the response of football clubs to national league match results, considering a significant number of clubs (13) of different European countries (six), and using methodologies that, although particularly appropriate for such a study, have not been widely used in other similar studies. This way, we are able to assess whether the way teams respond varies from country to country or from team to team, or if it is similar for all teams. The paper is structured as follows. The next Section describes some related works. In Section 3, we present the methodology we will use, focusing on the measurement of the unexpected component of the results, the measurement of match importance and the econometric models. The data we use is described in Section 4, and the results are presented in Section 5. In Section 6, we discuss the results. Finally we present the conclusions and some ways of future research in Section 7.

2. Related works

Several studies have analysed the response of the stock prices of listed football clubs to match results. Since our study addresses national league match results, we will now focus on summarizing the results of other studies concerning such matches.

Some studies consider the raw results of the teams. Renneboog and Vanbrabant (2000) consider 19 clubs from the United Kingdom (UK) and they consider league, cup and European competitions matches in the seasons of 1995/96, 1996/97 and 1997/98. The authors conclude that wins lead to price increases and draws and defeats lead to price declines, with defeats having a bigger effect.

Duque and Ferreira (2005) analyse the reaction of two Portuguese football clubs, Porto and Sporting, to the performance of the corresponding teams in the national league between June 1998 and July 2003, using models of the ARCH class. In the case of Sporting, wins lead to significant price increases and both draws and defeats lead to price decreases. In the case of Porto, the authors reach a puzzling result: while draws lead to significant price decreases, both wins and defeats lead to non-significant stock price changes. The authors do not control for the expectations and they hypothesize that the results obtained for Porto may show a profound confidence of investors in extreme results, only showing a "systematic surprise" when the team draws matches. Our study will confirm that, at a club level, Porto is something of an outlier, with the sign of most coefficients regarding the reaction to results being the opposite of what we expected (although these coefficients are usually not significantly different from zero).

Benkraiem et al. (2009) perform an aggregate analysis of the stock prices of 19 European clubs around the days of matches, between July 2006 and July 2007. The authors conclude that significant price declines tend to occur after draws and defeats, the magnitude of the declines being larger in the case of defeats. Wins are not followed by significant price increases; however, significant price increases tend to occur before wins.

Other studies take into account the pre-match expectations, as defined by the betting odds. Such studies often use the probabilities implicit in such odds to define what are expected and unexpected results. Scholtens and Peenstra (2009) consider the impact of match results in the stock prices of 42 European clubs between August 2000 and December 2004, making an aggregate analysis and not a team-specific one. The authors conclude that both expected and unexpected wins lead to price increases and that both expected and unexpected losses lead to price decreases. In the case of ties, if a win was expected then a significant price decline tends to occur; if a defeat was expected, average stock price changes are insignificant.

Palomino et al. (2009) consider the performance of 16 British clubs between 1999 and 2002. The authors conclude that if expectations are not considered, share prices tend to increase after a win and decrease after a draw or a loss. The authors use the betting odds to define four possible pre-match scenarios: strongly expected to win, weakly expected to win, weakly expected to lose and strongly expected to lose, and show that defeats have a larger negative impact if the team was expected to win than if it was expected to lose. However, expected wins seem to lead to larger price increases than unexpected ones. Palomino et al. also analyse the predictive power of betting odds, concluding that betting odds are very good predictors of the game outcomes.

Demir and Danis (2011) consider the performance of three Turkish clubs from their first quotation to the end of the 2008/09 season. The authors consider several models, including one model with just the raw results and a model that includes dummies for expected, weakly unexpected and strongly unexpected results. When expectations are not considered, the win dummy has a coefficient that is not statistically significant, whereas tie and defeat dummies have significantly negative coefficients. When expectations are taken into account, strongly unexpected wins usually lead to significant price increases, and strongly unexpected defeats lead to larger price declines than expected ones.

Castellani et al. (2015) analyse the performance of 23 listed European teams between 2007 and 2009 and use betting odds to define what are expected and unexpected wins and losses. The authors conclude that wins are usually followed by price increases and ties and losses are followed by price decreases (larger in the case of losses). They also conclude that unexpected results lead to larger price changes (increases in the case of wins, decreases in the case of losses) than expected ones.

Stadtmann (2004) analyses the behaviour of the stock prices of Borussia Dortmund between October 2000 and October 2002. The author controls for market-wide effects and for club-specific events (player transfers and contract renewals, and coach contract renewal) and, in the case of league games, considers models that use win/tie/defeat dummies and models that instead include the unexpected number of points (difference between the number of points obtained in the match and the expected number of points, as defined by the probabilities implicit in the betting odds). The author concludes that in both types of models all the variables related to national league results have coefficients that are significantly different from zero: tie and defeat dummies have negative coefficients, win dummies have positive ones and the unexpected number of points has a positive coefficient.

Some studies also try to take into account the importance of the games. The previously mentioned work by Palomino et al. (2009) is such an example. Palomino et al. split the season into matches played before April and matches played between April and June (the latter ones being possibly more important since they are closer to the end of the season). The authors conclude that the magnitude of the reaction to the results is usually larger for games played between April and June. In our robustness checks, we consider a similar measure of match importance, but we are unable to find significant differences in the magnitude of reaction between the games played before and after the end of March.

Zuber et al. (2005) analyse the stock price behaviour of 10 teams of the English Premier League, between August 1997 and July 2000. The authors estimate a single model for all clubs, with dummies to differentiate them. The outcome of the match is incorporated through the goal difference and expectations are considered by two dummies that concern surprise results (a dummy for positive surprises and another one for negative surprises). The authors also introduce dummies concerning the current place of the team in the national league – whether the team is in the top five or in the bottom three; the reasons for including these dummies are related to the important financial impacts arising from finishing the league in these positions (so, in a way, games are considered more important if teams are currently in such positions). The authors conclude that the variables concerning both the results, the current place of the teams and the expectations show little significance in explaining stock market returns – none of them has a coefficient that is significant at the 5% level. In our work, we also consider dummies concerning whether the team is in the top five or the bottom three places, concluding that in a few cases (Lazio, Rome and Sporting) the magnitude of the reaction is significantly increased when the team is in the top five places.

Bell et al. (2012) analyse the link between league results and stock prices for 19 English football clubs, from the start of the 2000/01 season to the end of the 2007/08 season. The authors consider the results and the expectations through two variables: a "point surprises" variable that is defined as the difference between the number of points gained in the game and the expected number of points according to pre-match betting odds; and a "goal difference surprise" variable that compares the goal difference in the match with the club’s average goal difference in the five previous games. The match importance is taken into account by resorting to two variables: the first is a "degree of rivalry" between the two clubs playing a given match, which takes into account the difference in their final league positions in the previous season and the current league positions; the second, "final position", is a variable that takes into account the number of games remaining and the extent to which the club's league position differs from the mean. The results show very significant differences from club to club, but the authors also pool the different clubs, allowing them to reach some conclusions: point surprises have a positive influence in the returns, the importance of the game seems to have a modest impact on the returns (independently of the variable used to measure it) and the goal difference surprise seems not to have a positive effect on the returns.

In this paper, we also use the unexpected number of points, concluding that, when that is the only variable used to assess the market reaction to teams' results, in most cases it leads to a coefficient that is positive and significantly different from zero (the exceptions are Porto and Benfica). We propose a new measure of match importance that also leads to promising results.

3. Methodology

In this paper, we take a view similar to Bell et al. (2012) that stock returns on football clubs should depend only on the unexpected component of the results and not on the component that is already anticipated. First we will analyse whether the coefficient of the unexpected component of the results is statistically significant and if it has a positive relation with the price changes, or if we find anomalous results like other studies presented in Section 2. Afterwards, we will weigh the anomalous component of the results by a new measure of match importance that we propose, and we will analyse whether or not the results obtained by the models are improved. As an analysis of the robustness of our results, we also consider some alternative measures of match importance and unexpected component of the results that were used by other authors, which we will also present in the following sections.

3.1 Unexpected points

In order to incorporate the expectations concerning the match results, we chose a method that avoids the definition of what are expected and unexpected results, and that uses detailed information about the pre-match expectations. In fact, it is different for a team to have an 85% probability of winning a league title-defining match or having a 99% probability of winning such a match, although in both cases the team can be considered "strongly expected to win" that match. In order to differentiate such cases, we chose not to define dummies for expected and unexpected results (like other authors do) and instead resorting to the unexpected component of the results. This component is hereafter termed "unexpected points", and it is defined as the difference between the number of points that the considered team gained in the match and the number of points it was expected to achieve. In order to calculate the expected number of points that a team was expected to achieve, we used the pre-match odds for home win (o_h), draw (o_d) and away win (o_a), and resorted to the same method used by Stadtmann (2004) and Bell et al. (2012) to convert these odds into probabilities. The probabilities of home win (P_h), draw (P_d) and away win (P_a) can be calculated as:

$$P_h = \frac{\frac{1}{o_h}}{\frac{1}{o_h}+\frac{1}{o_d}+\frac{1}{o_a}};\ P_d = \frac{\frac{1}{o_d}}{\frac{1}{o_h}+\frac{1}{o_d}+\frac{1}{o_a}};\ P_a = \frac{\frac{1}{o_a}}{\frac{1}{o_h}+\frac{1}{o_d}+\frac{1}{o_a}} \quad (1)$$

Given that, in all the leagues we are considering, a win is worth three points, a draw is worth one point and a loss is worth zero points, the expected number of points (*EP*) for the team playing at home venue can be defined as

$$EP = 3 \cdot P_h + P_d \quad (2)$$

If the team we are analysing plays at an away venue, (*EP*) is

$$EP = P_d + 3 \cdot P_a \quad (3)$$

The unexpected points (*UP*) are defined as the difference between the number of points gained in the match and *EP*:

$$UP = \begin{cases} 3 - EP, & \text{if the team wins the game} \\ 1 - EP, & \text{if the game ends with a draw} \\ -EP, & \text{if the team loses the game} \end{cases} \quad (4)$$

As robustness analysis, we will also consider an alternative measure based on Castellani et al. (2015). These authors include dummy variables concerning whether wins or losses were unexpected, using as a reference the most probable result according to the betting odds. In order to allow comparability with the unexpected points measure presented before, we define an alternative unexpected points measure (*AUP*): the difference between the points obtained by the team in the match and the points that would be obtained if the most probable result had happened. This measure can be obtained by replacing the number of expected points by the number of points obtained according to the most probable result, in (4).

3.2 Match importance

Concerning the measurement of match importance, we did not feel comfortable with the approaches we found in the literature. Several authors have considered, implicitly or explicitly, that matches near the end of the league will be more important (e.g., Palomino 2009 and, partly, the "final position" measure of Bell et al. 2012). Sometimes leagues are unbalanced and decisions about the final classification are reached several weeks before the end of the league. So, equating important matches with matches played in the last weeks may lead us to consider that some important matches occur after everything is, in fact, decided. Zuber et al. (2005) include dummy variables indicating whether the team is in the top five or in the bottom three league positions, arguing that there are important financial impacts arising from finishing the league in these positions; so, in fact, these dummies are somehow measuring the match importance. However, this measure does not take into account how and whether the current team position may be affected by the match result – for example, a match may be very important for a team in a relegation position if a positive result may help the team escape relegation, but it may be irrelevant if the team is already relegated independently of the result. Bell et al. (2012) weigh the number of remaining matches and the extent to which the club's league position differs from the mean. This measure also considers the matches of teams in the top and in the bottom of the table to be more important, as well as games occurring near the end of the league. So, the last games of already relegated teams and of teams with a perfectly defined position near the league top (e.g., a team that already won the league) occurring in the last weeks will be considered very important when they are, in fact, nearly irrelevant.

The previous arguments led us to define a new measure of match importance. We also analysed other possible pitfalls in defining such a measure, considering some extreme cases that may arise. Based on this analysis, we started by defining two basic principles for the measurement of match importance:

1 – Match importance should be measured in relation to a target final league position for the team.

2 – Match importance for a given team should be measured after taking into account the results of all matches of rival teams occurring at the same time. For an analysis

of the impact of a match in the stock prices, and assuming that matches occur when the stock market is closed, match importance must be measured after taking into account the results of all matches that occurred between the end of the previous market session and the beginning of the following one.

The first principle was established because not all league positions are equally important (the difference between the first and second places is usually more relevant than the difference between the seventh and eighth places), and we wanted a measure that might be used for teams with different goals. So, we ended up defining a measure of the importance of the match in order to reach a given final position.

The second principle came from the finding that the result of a potentially important match may be rendered irrelevant by the results of rival teams. With respect to this second principle consider, for example, the analysis of the impact of the last match of Benfica in the 2012/1013 Portuguese league. Benfica was in the second place of the league, one point behind the league leader Porto, and with a huge difference for the third placed team. Benfica and Porto played simultaneously, in a Sunday, with Benfica playing at home against Moreirense and Porto playing away against Paços de Ferreira. If Porto was to win the match, Benfica’s match was irrelevant (Benfica would be in the second place independently of the result), whereas if Porto was unable to win then the result achieved by Benfica would decide the league title. So, in fact, when the stock market would open next Monday, investors buying and selling Benfica shares were reacting to both the results of Porto and Benfica. Both Benfica and Porto won the respective matches (as, in fact, they were expected to), and in the next market session Benfica's shares ended up unchanged – the investors reacted to Benfica winning a match that was rendered irrelevant by Porto's result. If the possibility of Benfica's match defining the league title led us to define the game as very important, we would be wrongly considering that Benfica's shares remained unchanged after Benfica had won a very important match. Notice that, if Porto's result had been different, Benfica's match might have had a completely different importance; so, in order to properly quantify the importance of the game, the result of the rival in a match played in the same weekend is indispensable.

Although one may argue that the issues concerning importance measurement presented before may only occur in a small number of games (typically near the end of the season), they may nonetheless have a significant impact in the models' results. In fact, both in the case of the approaches followed by other authors and in the case of the incorrect incorporation of the influence of other teams results, the maximum importance will sometimes be considered for matches that are in fact irrelevant. A small number of such measurement errors will be enough to completely alter the results of an econometric model.

Let us now present our proposed measure for match importance. When measuring match importance, we are considering a given team, which we will hereafter denoted as team A, and a target position, denoted by position *p*. We start by identifying most likely rival of team A for position *p*, which will be hereafter identified as team B(*p*). The importance of the match, Imp_p, is then defined as a product of two factors:

$$Imp_p = Unc_{\mathrm{A,B}(p)} \cdot Red_{\mathrm{A,B}(p)} \quad (5)$$

The first factor, $Unc_{\mathrm{A,B}(p)}$, measures the uncertainty concerning the relative final positions of teams A and B(*p*) and the second one, $Red_{\mathrm{A,B}(p)}$, concerns how the game outcome will reduce this uncertainty. Let us now address the identification of team B(*p*) and the exact definition of the two factors that define match importance.

Team B(*p*), the most likely rival of team A in the competition for position *p*, would ideally be identified by resorting to market expectations (as defined by betting odds). However, apart from very specific cases, the betting odds proposed by odds-makers will not allow us to identify the most likely rival of a team in fighting for a given position. So, we chose to use the league results up to that match to identify team B(*p*). We calculate, for each team, the percentage of points gained over the potential points (the points that the team would have achieved if it had won all the matches up to then). Team B(*p*) is the team that occupies position *p* according to a sorting based on these percentage points, if we exclude team A from this sorting – if team A is at the target position *p* or above, team B(*p*) is the team immediately below this position; if team A is below position *p*, team B(*p*) is the team currently occupying it (if we consider the league title, *p*=1 and, if team A is the leader then team B(1) is the second placed team; if team A is not the leader then team B(1) is the current leader). Notice that the use of the percentage over the maximum number of points, instead of the simple number of points, allows us to account for possible match delays that may affect different teams in very different ways. Also notice that, following principle 2 defined above, in the identification of team B(*p*), we consider all matches played up to the next opening of the stock market, with the exception of the game whose importance we are measuring.

In order to measure $Unc_{\mathrm{A,B}(p)}$, the uncertainty concerning the relative final positions of teams A and B(p), we will consider the region over which the final number of points of teams A and B(p) may overlap. We define the following additional notation:

- pt_{A}, $pt_{\mathrm{B}(p)}$: number of points gained by teams A and B(p), respectively;
- m_{A}, $m_{\mathrm{B}(p)}$: number of matches still to be played until the league end by teams A and B(p), respectively.

In defining $pt_{\mathrm{B}(p)}$ and $m_{\mathrm{B}(p)}$, we consider all matches played up to the next opening of the stock market, with the exception of the game whose importance we are measuring, as explained before.

The final number of points attainable by team A is between a minimum of pt_{A} and a maximum of $pt_{\mathrm{A}}+3\cdot m_{\mathrm{A}}$. For team B($p$), the final number of points will be between a minimum of $pt_{\mathrm{B}(p)}$ and a maximum of $pt_{\mathrm{B}}+3\cdot m_{\mathrm{B}(p)}$. Both ranges intersect between a minimum of $\max\{pt_{\mathrm{A}}; pt_{\mathrm{B}(p)}\}$ and a maximum of $\min\{pt_{\mathrm{A}} + 3 \cdot m_{\mathrm{A}}; pt_{\mathrm{B}(p)} + 3 \cdot m_{\mathrm{B}(p)}\}$. The number of points in this intersection range is

$$\max\left\{\min\left\{pt_{\mathrm{A}} + 3 \cdot m_{\mathrm{A}}; pt_{\mathrm{B(p)}} + 3 \cdot m_{\mathrm{B}(p)}\right\} - \max\left\{pt_{\mathrm{A}}; pt_{\mathrm{B}(p)}\right\} + 1; 0\right\} \quad (6)$$

The number of points of teams A and B(p) may already be so far apart that their relative final positions are already defined, and in that case the value of $\min\left\{pt_{\mathrm{A}} + 3 \cdot m_{\mathrm{A}}; pt_{\mathrm{B(p)}} + 3 \cdot m_{\mathrm{B}(p)}\right\} - \max\left\{pt_{\mathrm{A}}; pt_{\mathrm{B}(p)}\right\} + 1$ will be zero or negative. The outmost maximum in (6) is used to avoid considering negative ranges: if the relative positions of A and B(p) are already defined, the overlap range is zero.

The uncertainty implied by the overlap range depends on the number of games that will still be played. In fact, it is very different to have an overlap range of three points when there is just one game to be played or when there are still four games to be played – uncertainty concerning final positions is much higher in the former case. So, in order to define $Unc_{\mathrm{A,B}(p)}$, we normalize the intersection range defined in (6) by the range of points attainable by team B(p). We get:

$$Unc_{\mathrm{A,B}(p)} = \frac{\max\left\{\min\left\{pt_{\mathrm{A}}+3\cdot m_{\mathrm{A}}; pt_{\mathrm{B(p)}}+3\cdot m_{\mathrm{B}(p)}\right\}-\max\left\{pt_{\mathrm{A}}; pt_{\mathrm{B}(p)}\right\}+1;0\right\}}{3\cdot m_{\mathrm{B}(p)}+1} \quad (7)$$

To measure the contribution of the considered match to reduce the uncertainty defined in (7), $Red_{\mathrm{A,B}(p)}$, we calculate the percentage of team A's points that will be defined by the match:

$$Red_{\mathrm{A,B}(p)} = \frac{3}{3\cdot m_{\mathrm{A}}} = \frac{1}{m_{\mathrm{A}}} \quad (8)$$

Definitions (7) and (8) ignore that a match between A and B(p) will have an increased impact in defining their relative final positions. In order to incorporate this fact, we consider that a match between A and B(p) is roughly equivalent, in terms of resolving the uncertainty concerning their relative final positions, to decreasing one in the number of matches to be played by team B(p) and give three points to this team, while considering that the match is worth the double of the number of points to team A. In order to do this, we define a dummy variable $F_{\mathrm{A,B}(p)}$ that indicates whether or not the match we are considering is between teams A and B(p), and make the following adjustments in the calculation of $Unc_{\mathrm{A,B}(p)}$ and $Red_{\mathrm{A,B}(p)}$:

$$Unc_{\mathrm{A,B}(p)} = \frac{\max\{\min\{pt_{\mathrm{A}}+3\cdot m_{\mathrm{A}}+3\cdot F_{\mathrm{A,B}(p)};pt_{\mathrm{B}(p)}+3\cdot m_{\mathrm{B}(p)}\}-\max\{pt_{\mathrm{A}};pt_{\mathrm{B}(p)}+3\cdot F_{\mathrm{A,B}(p)}\}+1;0\}}{3\cdot\left(m_{\mathrm{B}(p)}-F_{\mathrm{A,B}(p)}\right)+1} \quad (9)$$

$$Red_{\mathrm{A,B}(p)} = \frac{1+F_{\mathrm{A,B}(p)}}{m_{\mathrm{A}}+F_{\mathrm{A,B}(p)}} \quad (10)$$

We must stress that any attempt to measure football match importance may sometimes produce undesired results, and ours is no exception. However, we believe that the measure thus proposed will produce more consistent results than the others we found in the literature.

Finally, the importance measure (5), with $Unc_{\mathrm{A,B}(p)}$ and $Red_{\mathrm{A,B}(p)}$ defined by (9) and (10), is never used by itself, since we considered that the impact of match importance only makes sense when combined with the game outcome. So, Imp_p is used as a weight for the number of unexpected points (*UP*) achieved by a team.

For robustness analysis, we considered other measures that may reflect the match importance. Following Zuber et al. (2005), we considered dummy variables concerning whether the team is in the top five or in the bottom three places (*T5* and *B3*). In order to avoid cases in which the current place cannot be considered representative since very few games have been played, in each season these dummies were assigned a zero value in the first three matches of the team. Following Palomino et al. (2009), we also considered a dummy concerning whether the match is being played before or after the end of March (*PMarch*, which is assigned the value 1 if the match is played after the end of March and before the end of the season).

3.3 Econometric models

The models we use can be defined as

$$r_t = \beta x_t + u_t, \quad (11)$$

where r_t is the close to close return on the club's share prices, β is a parameter matrix, x_t is a vector of explanatory variables and u_t is the error term. The vector of explanatory variables includes lagged stock returns, return on the market index, unweighted and/or importance weighted unexpected points (in the days after a match) and, in the case of Italy, dummy variables to control for the effect of the "calciopoli" (a match fixing scandal known that occurred in Italy and was brought to light in 2006).

The choice of lagged stock returns was based on an analysis of which lagged returns were significantly different from zero: lags were kept until they were no longer significantly different from zero. Lagged returns on the market index were never found to be significantly different from zero, and so they were not included. In the case of Italy, dummy variables were added for each team, for each of the most important "calciopoli" dates. In order to account for the effect of expectations, rumours, and for the time it took the market to completely absorb the impact of the "calciopoli" events, dummy variables were also added for the five days preceding each of these dates and for the ten days after these dates. These dummies were omitted when they overlapped with each other (lags of the date of the original punishment decision overlapped with leads of the date of the appeal result). For Juventus, the unexpected points and the importance-weighted unexpected points were multiplied by a "Serie B" dummy ($D_{Serie\ B}$) whenever they referred to Serie B matches.

For match importance, we initially considered the importance for the first, second and third places − Imp_1, Imp_2 and Imp_3 − but concluded that there was a significant amount of correlation among these values and that using several of them simultaneously might somehow influence the coefficients of the variables and their significance. Since most of the teams we consider usually aim at the title of the respective leagues, we considered only the importance of the matches for the league title, Imp_1.

Concerning match results, three different models were estimated. One of the models included only the unweighted unexpected points, *UP*, the second one included only the importance-weighted unexpected points, $Imp_1 \cdot UP$, and the third one included both *UP* and $Imp_1 \cdot UP$. The reason for this procedure is that we believed that for an important subset of games there would be a significant correlation between *UP* and $Imp_1 \cdot UP$ – for example, in the first weeks of the league, the match importance will usually not change much and, therefore, the correlation between the two variables will be high. This might affect the coefficients of the variables, and their significance, if both are included in the same model. By considering the three different models, we not only hope to be able to assess how useful it is to include match importance, but also to be able to assess the effect of simultaneously including the two variables.

Although such models may be estimated by Ordinary Least Squares (OLS) under the classical assumptions, we took into account that ARCH effects are usually found on asset returns. In fact, when testing for the presence of ARCH effects, the tests did not reject the null. Therefore we must use models from the ARCH class to derive consistent estimates of the coefficients, which are asymptotically more efficient than the OLS estimates since the ARCH structure is no longer linear.

In the context of our data, we have to distinguish between countries where we have just one team and the ones for which there is more than one team. For the first set, the countries for which there was only one team, we estimated a GARCH(1,1)[1] model:

$$\begin{aligned} r_t &= \beta x_t + u_t \\ u_t | u_{t-1} &\sim (0, \sigma_t^2) \\ \sigma_t^2 &= \alpha_0 + \alpha_1 u_{t-1}^2 + \delta \sigma_{t-1}^2 \end{aligned} \qquad (12)$$

In this formulation the residuals do not need to be normal. Nevertheless, if normality is rejected (as, in fact, it always was), estimating the model by pseudo-maximum likelihood estimation, by maximizing the same log-likelihood as if it were correct, produces a consistent estimator (see Weiss, 1982). However, the asymptotic covariance matrices need to be adjusted as described in Gourieroux et al. (1984) (see Greene 2012, p. 978, for more details). Robust standard errors were estimated, and used to assess the significance of the variables reported in the tables.

For the second set of countries, because there is the possibility that the residuals' volatility of one team contaminating the others', we resorted to a MGARCH:

$$\begin{aligned} r_t &= \beta x_t + u_t \\ u_t &= H_t^{1/2} v_t \end{aligned} , \quad (13)$$

Where r_t is an n×1 vector of the dependent variable, β is an n×k matrix of parameters, x_t is a k×1 vector of independent variables that may include lags of the dependent variable, and $H_t^{1/2}$ is the Cholesky factor of the time-varying conditional covariance matrix H_t , and v_t is an n×1 vector of zero-mean, unit-variance i.i.d. innovations. Therefore, we have a system of *n* equations, *n* being the number of clubs, and in a way it can be seen as related to the traditional SUR models.

[1] We tested the presence of ARCH effects and corrected them by using a GARCH(1,1) specification. Further testing showed there were no further ARCH effects remaining.

In this general framework, H_t is a matrix generalization of univariate GARCH models. Anyway, for the various parameterizations of MGARCH which provide alternative restrictions on *H*, it must be ensured that the conditional covariance matrix is positive-definite for all *t*.

In this study we resort to an estimator proposed by Borllerslev (1990) in which the conditional correlations are constant and thus the conditional covariances are proportional to the product of the corresponding conditional standard deviations: the Constant Conditional Correlation (CCC) MGARCH estimator[2]. This restriction greatly reduces the number of unknown parameters and thus simplifies the estimation.

Following Bauwens et al. (2006), the CCC estimator can be described as:

$$H_t = D_t R D_t, \quad (14)$$

where

$$D_t = \mathrm{diag}(h_{11t}^{\frac{1}{2}}, h_{22t}^{\frac{1}{2}}, \dots, h_{NNt}^{\frac{1}{2}}) \quad (15)$$

$h_{iit}^{\frac{1}{2}}$ can be defined as any univariate GARCH model, and

$$R = (\rho_{ij}) \quad (16)$$

is a symmetric positive definite matrix with $\rho_{ii} = 1, \forall i$. *R* is the matrix containing the constant conditional correlations ρ_{ij}.

The specification for each conditional variance in D_t in the CCC model for a GARCH(1,1) is

$$h_{iit} = \omega_i + \alpha_i u_{i,t-1}^2 + \delta_i h_{iit-1}, \quad i = 1, \dots, N \quad (17)$$

This CCC model contains $N(N+5)/2$ parameters. In this framework, H_t will be positive definite if and only if all the *N* conditional variances are positive and *R* is positive definite.

As for the conditional covariances, they are modelled as nonlinear functions of the conditional variances

$$h_{ijt} = \rho_{ij}\sqrt{h_{iit}}\sqrt{h_{jjt}} \quad (18)$$

and, as such, they will be time varying.

As in the univariate GARCH models, residual normality (in this case, multivariate normality) was tested, and it was always rejected. This meant we had to resort to a quasi–maximum likelihood estimator, which is assumed to produce consistent and

[2] We also estimated the model using alternative estimators: the Dynamic Conditional Correlation, Varying Constant Correlation and VecH MGARCH models. These estimators did not converge for all the cases, but when they did the results were similar to the ones obtained by the CCC MGARCH estimator.

normally distributed estimators in large samples (see Fiorentini and Sentana 2007). Nevertheless, as before, the asymptotic covariance matrices had to be adjusted. Robust standard errors were estimated and used to assess the significance of the variables.

For countries with more than one team, and as a robustness check to the model specification, we estimated a panel GARCH (as proposed by Cermeño and Grier, 2006) in order to estimate the aggregate market reaction:

$$\begin{gathered} r_{it} = \mu_i + \sum_{j=1}^{l} \phi_j r_{it-j} + x_{it}\beta + \varepsilon_{it} \\ \sigma_{it}^2 = \alpha_i + \delta\sigma_{it-1}^2 + \gamma u_{it-1}^2 \qquad , \\ \sigma_{ijt} = \eta_{ij} + \lambda\sigma_{ijt-1} + \rho u_{it-1}u_{jt-1} \end{gathered} \qquad (19)$$

where r_{it} is the dependent variable for club i at time t, μ_i is the specific individual effect, x_{it} is a 1×k row vector of the independent variables and β is the k×1 vector of parameters. Note that if there is cross sectional independence then the model is described just by the first two equations of (19).

Noteworthy about this model is that it does not suffer of the problem of overlapping events (most games are played in the same day) as, like the previous approach (the MGARCH), it takes into account the cross-sectional correlation due to the clustering of event days, as it not only allows the covariances between the returns to be non-null but also time varying. Therefore, by aggregating the estimations for a country it gives us the idea of how a market, as a whole, reacts and allows the comparison between these estimates and the individual ones from the MGARCH to check if there are any disparities in terms of results and significance.

Data

We considered that the most relevant listed clubs in Europe would be the ones included in the Stoxx Europe Football Index. In February 28, 2013, the Stoxx Europe Football Index included 21 companies from 10 different European countries (information collected from http://www.stoxx.com/download/indices/factsheets/stx_sports_fs.pdf in March 12, 2013). Pre-match betting odds were available from the site http://www.football-data.co.uk for seven of these countries (14 clubs). One of these teams – Celtic Glasgow

– was then removed for two reasons: differently from the other leagues we considered, in Scotland, the league title, the access to European cups and relegations are defined by a play-off and a play-out, which would require some adaptations in the importance measurement; also, the behaviour of the stock prices was clearly being influenced by a high tick size (in relation to the stock price), leading to many days without price changes and large relative changes in most of the remaining days, and this might distort the results. So, we considered 13 clubs: Olympique Lyonnais, from France; Borussia Dortmund, from Germany; Juventus, Lazio and Roma, from Italy; Ajax, from Netherlands; Benfica, Porto and Sporting, from Portugal; Besiktas, Fenerbahce, Galatasaray and Trabzonspor, from Turkey. Stock prices of each club, from the beginning of August 2000 or from the date of the first quote (whichever occurred later) to March 13, 2013, were collected from Datastream for all these teams.

Pre-match betting odds, from the beginning of the 2000/01 season to March 13, 2013, were collected from http://www.football-data.co.uk in April 20, 2013, for all the involved countries. Betting odds from more than one bookmaker were available for each season and for each country. So, in order to get something like "average market odds", we averaged the odds concerning each result, for each match. These odds were then converted to probabilities and to an expected number of points per match, as explained in the previous Section.

In the case of Italy, we considered that the "calciopoli" scandal might have influenced the stock prices of Italian clubs. In fact, Juventus and Lazio were directly affected (Juventus was even relegated to "Serie B") and, in the case of Rome, the impact of the scandal might have led investors to assume that the probability of a good classification in the Italian league would be increased. The impacts of the "calciopoli" were incorporated through several dummy variables, and the definition of the most important dates was based on several sources, but mainly on the Italian Wikipedia page about the scandal: http://it.wikipedia.org/wiki/Calciopoli. The most important dates were considered to be: the date the first telephone interceptions were brought to light by the press (May 2, 2006); the date of the original punishment decision (July 14, 2006); the date of the appeal result (July 27, 2006); the day of the final punishment decision (October 27, 2006). Point deductions due to "calciopoli" were taken into account to calculate the teams' classification and to determine the match importance.

In the case of Turkey, the 2011/12 league used a play-off to define the champion. In this case, and since this only happened in this particular season, we ignored the play-off and only considered the regular season results (the best placed team in the regular season ended up winning the league title).

The descriptive statistics concerning both the stock returns of the different teams, the unexpected points (both unweighted and importance weighted) and the returns of the stock market indexes are presented in Table 1. It is possible to observe that, in the considered periods, the average returns on both the teams stocks and on the stock market indexes were mostly negative, the exception being the Turkish teams and the Turkish stock market, which presented positive average returns. Additionally, the average value of the unexpected points is positive for all teams, which may mean that bookmakers may be overly pessimistic concerning their prospects.

4. Results

The most relevant results we obtained are presented in Tables 2-10. In countries with only one team, the normality test whose results are presented is the joint skewness/kurtosis test of D'Agostino et al. (1990). In the case of countries with multiple teams, we use the multivariate normality test of Henze and Zirkler (1990), which was chosen based on the results of the comparative analysis of Farrell et al. (2007). A portmanteau test, based on Ljung and Box (1978), was applied to the residuals of the models to assess whether there were some remaining ARCH effects. In all cases, we detected non-normality and also that the residuals of the GARCH models did not present any remaining ARCH effects.

We use three base models: one with the unweighted unexpected points (*UP*), a second one with the importance-weighted unexpected points ($Imp_1 \cdot UP$) and a third one including both the *UP* and $Imp_1 \cdot UP$. For ease of reference, these models will hereafter be denoted by Model I, Model II and Model II, respectively. The results concerning these base models are presented in Tables 1 to 10.

Tables 2 and 3 present the results concerning the three countries for which only one club was considered. In Table 2 we can see that, if only either *UP* or $Imp_1 \cdot UP$ are considered (that is, in Models I and II), then the coefficients of *UP* and $Imp_1 \cdot UP$ were always significant at the 5% level and, with the exception of Model II for Olympique Lyonnais, they were also significant at the 1% level. The signs of these coefficients are always positive, as expected.

When both variables are simultaneously introduced (Model III), the results are quite different from club to club. In the case of Ajax, only the importance-weighted unexpected results, $Imp_1 \cdot UP$, are significant. In fact, Ajax has consistently been a title contender, which may explain that unexpected points are especially relevant when they are important to achieve the title. Borussia Dortmund and Olympique Lyonnais have been less consistent title contenders, and for both these teams the unweighted unexpected points, *UP*, are significantly different from zero. In Model III, $Imp_1 \cdot UP$ is no longer significant for Olympique Lyonnais, but it is still significant at the 1% level for Borussia Dortmund. In order to check whether the correlation between *UP* and $Imp_1 \cdot UP$ might play some role in the obtained results, we calculated the respective correlation coefficient, also included in Table 1. For these three teams, we can see that the correlation coefficient varies between 0.641 (for Borussia Dortmund) and 0.800 (for Olympique Lyonnais), meaning that correlations may have some impact in the estimated coefficients. However, as shown in Table 3, Variance Inflation Factors (VIF) are always well below 10, so there are no multicollinearity issues in the estimations. Similar results were obtained for the remaining teams in the sample.

Tables 4 and 5 present the results achieved for Italian clubs. In these tables we can see that, for all models, there is significant correlation for the residuals concerning the three teams, pointing out to the pertinence of using a multivariate model. In Table 4 we can see that, when only one variable concerning the results is used (Models I and II), this variable always has a positive coefficient, different from zero at the 1% significance level. In the 2006/07 season, Juventus played the Serie B due to the "calciopoli" scandal. The unexpected points achieved in these games are considered by a different variable and, in this case, we get an unexpected result: the coefficient of this variable is negative in both models, and statistically significant when game importance is taken into account. This may show that the market might have considered, from the start, that Juventus would end up being able to get promoted to Serie A. Given the particular characteristics of this season for Juventus, the results Juventus achieved when in Series B will not be considered in the discussion.

Table 5 shows the results achieved when both *UP* and $Imp_1 \cdot UP$ are taken into account. We can see that the coefficient of *UP* is positive and significantly different from zero at the 5% level for Juventus and Rome, but not for Lazio. The coefficient of $Imp_1 \cdot UP$ is positive and significantly different from zero at the 1% level for Lazio and at the 10% level for Rome. The results concerning Juventus are somewhat surprising, since this team has been a title contender in several of the last seasons, so it could be expected that $Imp_1 \cdot UP$ would have a higher impact in the stock returns.

Tables 6 and 7 show the results obtained for the models that include the three Portuguese teams. Both when we use just *UP* (Model I) and when we simultaneously consider *UP* and $Imp_1 \cdot UP$ (Model III), the coefficients of these variables are not significantly different from zero. When we just use $Imp_1 \cdot UP$ (Model II), then we get coefficients that are positive and larger than zero for Sporting (if we consider a 5% significance level) and for Benfica (in this case, just for a 10% significance level). For Porto, the coefficients of the results-related variables are never significantly different from zero and they are often negative. We also notice that while the residuals of Benfica and Sporting show significant correlation, Porto's residuals never show significant correlation with those of the other teams.

While both Porto and Sporting were listed in 1998, Benfica was just listed on the 21st of May, 2007. In Tables 6 and 7 we are considering multivariate models and, therefore, we can only consider the observations simultaneously available for all teams: the observations from the day Benfica was listed to the 13th of March of 2013. In order to assess whether the results were influenced by using a relatively small number of observations, we re-estimated the models using just Porto and Sporting, which allowed us to use data from the beginning of August 2000, more than doubling the number of observation points. The results are reported in Table 8 There are two noticeable changes in the results: in the models in which we consider just one variable, either *UP* or $Imp_1 \cdot UP$, the coefficients of this variable become significant at the 1% level for Sporting; and the residuals of the two teams now show significant correlation. Still, for Porto, the variables related to match results always have negative, albeit non-significant, coefficients. This means that the small number of observations used when the three teams are simultaneously considered may play some role on the significance of Sporting coefficients, but it is not enough to explain the negative coefficients shown by Porto.

Tables 9 and 10 show the results concerning Turkish teams. In Table 9 we can see that when only one variable concerning the results is used (Models I and II), this variable always has a positive coefficient, different from zero at the 10% significance level. In fact, the coefficient of *UP* is significant at the 1% level for all teams with the exception of Galatasaray (for which it is significant at the 10% level). The coefficient of $Imp_1 \cdot UP$ is significant at the 1% level for all teams with the exception of Fenerbahce, for which it is still significant at the 5% level. In Table 10 we can see that when *UP* and

$Imp_1 \cdot UP$ are simultaneously included (Model III), some coefficients of these variables cease to be significantly different from zero. In this case, the coefficient of $Imp_1 \cdot UP$ is always positive and still significant at the 5% level for Besiktas and Galatasaray; the coefficient of *UP* turns negative for two teams (Besiktas and Galatasaray) and is no longer significant at the 5% level for any team. Finally, for Turkey we can see that, similarly to what happened in the case of Italy, the correlations between the residuals concerning different teams are always significantly positive.

For countries with more than one team, we then ran panel GARCH models. These models aggregate the results of different teams, giving some idea of the market reaction for the considered teams of that country. The most relevant results obtained with these models are shown in Table 11. For Turkey and Italy Serie A, unexpected points, either importance-weighted or unweighted, always have positive coefficients, significantly different from zero, meaning that pooling the different teams leads to an aggregate market reaction that is according to the preliminary expectations. For Portugal, the coefficients of the variables measuring importance-weighted and unweighted unexpected points are never significantly different from zero. As explained before, when teams were considered separately, the coefficients concerning Porto were often negative, and the ones concerning Benfica and Sporting were, in many cases, not significantly different from zero. This may explain the aggregate results obtained for Portugal.

Finally, we performed some robustness checks by adding other variables, or replacing the variables concerning the result or measuring the importance. The results are presented in Tables 12-16.

The first model in these tables adds information concerning whether the team is on the top five or bottom three places – four variables are added to Model III, the dummy variables *T5* and *B3*, and two variables multiplying these dummies by the importance-weighted unexpected points ($Imp_1 \cdot UP$). In analysing the results, we must note that the teams in our sample are usually contenders for the top places, so there are few observations in which the dummy *B3* has value one – in fact, for some teams, there are no observations with $B3 = 1$. This means that some care must be taken in analysing the coefficients of the variables involving *B3*, since the large majority of observations of these variables has a value of zero. Possibly for this reason, the coefficient of *B3* is usually not significant and, in the two cases in which it is significant, it does not have a consistent sign. For the variable resulting from multiplying *B3* by $Imp_1 \cdot UP$, only twice the coefficient is significantly different from zero (for Benfica and Olympique Lyon), and in these cases it is negative. However, we must notice that Benfica only played one game with *B3* = 1 and Olympique only played three, so no inferences can be made from these coefficients.

The results concerning *T5* are more significant. For the dummy variable *T5*, there are several instances in which the coefficient is negative and statistically significant, which may mean there is some negative pressure on the stock prices of some teams, when they reach the top five places of the national leagues. When the variable is multiplied by $Imp_1 \cdot UP$, the coefficient presents different signs for different teams and often it is not significantly different from zero. Significant results are reached for Lazio, Rome and Sporting, with a positive sign for the coefficient, meaning that the importance of the games for these teams is magnified when they reach the top five places. Another interesting result is obtained for Porto, with a negative statistically significant coefficient. Additionally, for Porto, the inclusion of $T5 \cdot Imp \cdot UP$ makes the coefficient of $Imp \cdot UP$ become positive (in Table 15 the coefficients are almost symmetrical). This means that the "odd" behaviour of Porto stock prices occurs when the team is in the top five of the national league – when it is outside the top five, the prices seem to react in the expected way.

The second model of Tables 12-16 intends to analyse the usage of a dummy variable signalling games occurring after March (*PMarch*). In order to do this, we define this model by replacing $Imp \cdot UP$ by $PMarch \cdot UP$ in Model III. We can see that the coefficient of $PMarch \cdot UP$ is never significantly different from 0, meaning that *PMarch* has a much worse performance than *Imp* in assessing game importance.

The last model uses an alternative measure of the unexpected component of the result – in Model III, *UP* is replaced by the alternative measure *AUP*, described in the end of Subsection 3.1. *AUP* is based on the dummy variables used by Castellani et al. (2015), and it consists on the difference between the number of points obtained in the game and the number of points corresponding to the most probable result. Comparing the results of this model with those of Model III, there seems to be no clear indication of which variable is the best choice. In some cases (e.g., Olympique Lyon), replacing *UP* by *AUP* results in a clear decrease in the significance of the coefficients. In others (e.g., the bivariate model for Portugal, some Turkish teams) there is an improvement in the significance of the coefficients. In the case of Portugal, the signs of the coefficients even become positive, so they seem to make more sense.

5. Discussion

The first objective of this work was to find out whether stock prices reacted to the unexpected component of match results. With respect to this objective, we get quite consistent results: if match results are introduced in an econometric model of stock returns through the importance-weighted unexpected points, then this variable has a positive coefficient, statistically significant at the 10% level, for 12 out of the 13 considered clubs. Moreover, this coefficient is significant at the 5% level for 11 of these clubs. The result that national league match results do influence the stock prices of football clubs is in line with the results of most other studies, the most important exception being probably Zuber et al. (2005), who do not find such a relation.

The only club whose share prices do not seem to react to unexpected points is Porto, whose coefficients concerning the variables used to measure match results are usually negative and always insignificantly different from zero. This is not the first time that an unexpected result concerning Porto is achieved in such a study: Duque and Ferreira (2005) also report a strange reaction of Porto shares to match results, as explained in Section 2. In fact, Porto has been able to won the Portuguese league title in nine out of the last eleven seasons, which is unparalleled in the other leagues we consider here. As an example, Ajax, which has been quite a consistent title contender in the Netherlands league, has won only four titles in the same period. So, perhaps there is some idea among Porto investors that, despite positive or negative surprises, the league usually ends up being won by Porto. The fact that the unexpected behaviour occurs mainly when Porto is on the top five, after the first games of the league (as shown in Tables 14 and 15) seems to reinforce this explanation. However, we must point out that Tables 14 and 15 also point out that this behaviour disappears if we use a measure of the results based on the most probable result (instead of the expected number of points). So, an alternative explanation is that, in the case of Porto, investors look to the most probable result, instead of the expected number of points.

Regarding this first objective, we performed some robustness analysis by replacing the unexpected number of points by the difference between the points obtained and the number of points resulting from the most probable outcome. While the unexpected number of points seems a much more sensible measure the latter measure, sometimes seems to perform better, indicating that in some cases investors may only compare the actual result with the most probable result, not considering the complete ex ante probability distribution.

The second objective concerned an analysis of the relevance of incorporating match importance in the models. As we pointed out, there is no straightforward way of measuring match importance and so it is only possible to perform a simultaneous analysis of the measure of match importance and its relevance. We argued that match importance should take into account a goal of the club and, in order to avoid subjective definitions of team goals (which might amount to "cherry picking"), we considered for all of them the importance of the matches in order to achieve the league title. This may somehow affect the results, particularly for clubs that are not consistent title contenders.

When we considered models with just one variable, either the unweighted unexpected points or the importance-weighted unexpected points, the most relevant differences occur for two clubs, Benfica and Galatasaray. In both cases, considering match importance improves the statistical significance of the match results variable. For Sporting, we can also see a similar improvement when we consider a multivariate model with the three Portuguese teams; however, when we consider a model with just two teams (an a lot more observation points), the unweighted and the importance-weighted unexpected points lead to statistically significant coefficients.

We admitted that, when both variables were included in the same model, the correlation between them might affect their estimated coefficients and their significance. We found that correlations between these variables are always between 0.602 and 0.832, which means that they may have some impact on the results (although not enough to cause multicollinearity problems, as shown by the VIF criterion). In fact, when both variables were included, often one or both of them ceased to be significant. In some cases, the importance-weighted unexpected points are more significant, and in others unweighted unexpected points are more significant, with the former cases being slightly more numerous. Excluding case of Porto, the coefficient of importance-weighted unexpected points always have the expected positive sign; for the unweighted unexpected points, the coefficient is negative (although not significantly so) for four teams. So, all things considered, importance-weighted unexpected results have a slightly better performance than unweighted ones, both when they are considered separately and when both are included in the same model. We must thus consider that match importance adds relevant information to the models. These results are in line with

Palomino et al. (2009) and Bell et al. (2012), who conclude that match importance seem to have some impact on the returns.

In order to check the robustness of the results concerning the importance measure, we considered adding information regarding whether the team is in the top five or bottom three, and whether games occur before or after the end of March. Results shown that this latter factor never led to significant results, so it does not constitute a good measure of match importance. The variable indicating whether the team is in the top five seems to magnify the importance of the games especially for three teams: Rome, Lazio and Sporting. Since the latter two teams are not consistent title contenders, this top five variable may help overcoming some expected shortcomings of the importance measure we proposed for such teams. For the bottom three variable, the number of matches with teams in these positions was too low to allow useful conclusions.

Concerning the consistency of results across different countries and different clubs, we find that although we have some changes in the relative performance of importance-weighted versus unweighted unexpected results, we quite consistently conclude that match results are significant in explaining share price performance. This is particularly so when importance-weighted results are used, and the only exception is Porto, as explained before. At a country level, the only country for which the link between unexpected results and stock returns is slightly weaker is Portugal. We were able to confirm this using a panel GARCH model for countries with more than one team in the sample. For Turkey and Italy, the aggregate results always show highly significant positive coefficients for the variables related to the unexpected component of match results. For Portugal, these coefficients are never significantly different from zero.

While we focused on the results obtained for individual teams, most published studies consider an aggregate analysis of the results (not performing a team by team analysis). So there are only a few studies with which we can compare the consistency of our main results. Demir and Danis consider the performance of three Turkish teams and they show quite a consistent relation between match outcomes and stock returns performance. Bell et al. (2012) achieve less consistent results when they analyse 20 English teams. They consider several models and the importance-weighted surprise results variables they use have significant coefficients (at the 10% level) for at most 13 of them. The differences between our results and those of Bell et al. may be due to differences in the clubs considered – Bell et al. consider some smaller teams that are not consistently present in the Premier league, like Millwall or Watford – or they may be due to the different ways in which match importance is measured, as explained before.

6. Conclusions and future research

In this paper we analysed the link between match results and stock returns for 13 European teams belonging to the Stoxx Europe Football Index. We defined a new measure for match importance and concluded that when this measure was used to weight the unexpected number of points there was a significant link between the results and stock performance for 12 out of the 13 considered clubs. We also concluded that using this measure of the importance to weight the unexpected number of points led to slightly better results than using the unweighted number of unexpected points. This measure also proved to be useful in comparison to other alternatives, and when used in a panel GARCH model that pooled teams from the same country.

We believe that these results are encouraging for the measure of match importance that we used. However, our use of this measure is not without difficulties. We consider that match importance must refer to a given target position, and we assumed, for all teams, they were aiming at the first place. This may lead to worst results in the case of teams that are not usual title contenders (in two such teams, information regarding whether the team is in the top five places of the league was shown to lead to improved results). In the future, we intend to develop a procedure for objectively and automatically updating the club goals according to results attained in the successive weeks. It will also be important to control for club-specific events, like transfers and contract renewals, similarly to what is done by Stadtmann (2004). Finally, it will also be interesting to analyse whether the specificities associated with the behaviour of football clubs, and the way they respond to match results, may be exploited to achieve abnormal stock returns.

References

Bauwens, L., S. Laurent, and J. Rombouts (2006). "Multivariate GARCH models: a survey." *Journal of Applied Econometrics* 21 (1): 79-109.

Bell, A.R., C. Brooks, D. Matthews, and C. Sutcliffe (2012). "Over the moon or sick as a parrot? The effects of football results on a club's share price." *Applied Economics* 44 (26): 3435-3452. doi: 10.1080/00036846.2011.577017.

Benkraiem, R., W. Louhichi, and P. Marques (2009). “Market reaction to sporting results: The case of European listed football clubs.” *Management Decision* 47 (1): 100-109. doi: 10.1108/00251740910929722.

Bollerslev, T. (1990). “Modelling the coherence in short-run nominal exchange rates: a multivariate generalized ARCH model.” *The Review of Economics and Statistics* 72: 498-505.

Castellani, M., P. Pattitoni, and R. Patuelli (2015). “Abnormal Returns of Soccer Teams: Reassessing the Informational Value of Betting Odds.” *Journal of Sports Economics* 16 (7): 735-759.

Cermeño, R., and K.B. Grier (2006). “Conditional heteroskedasticity and cross-sectional dependence in panel data: an empirical study of inflation uncertainty in the G7 countries.” In: Baltagi, B. (Ed.), Panel Data Econometrics: Theoretical Contributions and Empirical Applications. Springer Publishing, New York, 259–278.

D’Agostino, R., A. Belanger, and R. D’Agostino Jr. (1990) “A suggestion for using powerful and informative tests of normality.” *The American Statistician* 44 (4): 316-321.

Demir, E., and H. Danis (2011). “The Effect of Performance of Soccer Clubs on Their Stock Prices: Evidence from Turkey.” *Emerging Markets Finance and Trade* 47: 58-70. doi: 10.2753/REE1540-496X4705S404.

Duque, J., and N.A. Ferreira (2005). “Explaining share price performance of football clubs listed on the Euronext Lisbon.” Working Paper nº 05-01, Technical University of Lisbon.

Farrell, P., M. Salibian-Barrera, and K. Naczk (2007). “On tests for multivariate normality and associated simulation studies.” *Journal of Statistical Computation and Simulation* 77 (12): 1065-1080.

Fiorentini, G., and E. Sentana (2007). “On the efficiency and consistency of likelihood estimation in multivariate conditionally heteroskedastic dynamic regression models.” CEMFI Working Paper No. 0713.

Gourieux, C., A. Monfort and A. Trognon (1984). “Pseudo Maximum Likelihood Methods: Applications to Poisson Models.” *Econometrica* 52 (3): 701-720.

Greene, W.H. (2012). *Econometric Analysis*, 7th ed. Boston: Pearson.

Henze, N., and B. Zirkler (1990). “A class of invariant consistent tests for multivariate normality.” *Communications in Statistics - Theory and Methods*, 19 (10): 3595-3617.

Ljung, G., and G. Box (1978). “On a measure of lack of fit in time series models.” *Biometrika* 65 (2): 297–303

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

Renneboog, L., and P. Vanbrabant (2000). “Share price reactions to sporting performances of soccer clubs listed on the London Stock Exchange and the AIM.” CentER DP 2000-19, University of Tilburg.

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

Stadtmann, G. (2004). “An Empirical Examination of the News Model: The Case of Borussia Dortmund GmbH & Co. KGaA.” *Zeitschrift für Betriebswirtschaft* 74 (2): 165-185.

Weiss, A.A. (1982). “Asymptotic Theory for ARCH Models: Stability, Estimation and Testing”, Discussion paper 82-36, University of California, San Diego, CA.

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

Tables

Table 1: Descriptive statistics.

		AJA	BOR	OLY	JUV	LAZ	ROM
No. Observations		3229	2931	1561	2849	2849	2849
Daily stock price return	Mean	-0.011%	-0.050%	-0.151%	-0.065%	-0.133%	-0.052%
	Std. Dev.	2.306%	2.810%	2.148%	2.500%	4.504%	3.438%
	Min.	-11.333%	-19.307%	-10.265%	-22.314%	-55.782%	-23.696%
	Max.	21.357%	24.191%	14.110%	23.716%	64.004%	28.707%
Unexp. pts. (*UP*)	Mean	0.019	0.015	0.003	0.016	0.006	0.007
	Std. Dev.	0.411	0.443	0.461	0.439	0.463	0.458
	Min.	-2.500	-2.225	-2.320	-2.518	-2.265	-2.358
	Max.	1.965	2.349	1.882	2.051	2.238	2.252
Imp.-weighted unexp. pts. ($Imp_1 \cdot UP$)	Mean	0.002	0.001	-2e-4	0.002	-2e-4	7e-4
	Std. Dev.	0.038	0.033	0.030	0.037	0.016	0.028
	Min.	-0.297	-0.286	-0.252	-0.507	-0.135	-0.540
	Max.	1.257	0.861	0.421	0.771	0.120	0.349
Correl. between *UP* and $Imp_1 \cdot UP$		0.642	0.641	0.800	0.665	0.832	0.675

		POR	BEN	SPO	BES	FEN	GAL	TRA
No. Observations		3208	1440	3208	1993	1993	1993	1993
Daily stock price return	Mean	-0.083%	-0.102%	-0.090%	0.039%	0.061%	0.026%	0.023%
	Std. Dev.	3.217%	4.110%	3.905%	4.694%	2.872%	2.903%	3.125%
	Min.	-50.279%	-47.446%	-48.551%	-40.822%	-21.529%	-19.906%	-21.687%
	Max.	51.083%	30.010%	44.183%	121.131%	20.128%	17.658%	19.725%
Unexp. pts. (*UP*)	Mean	0.036	0.015	0.004	4e-4	0.015	0.001	0.002
	Std. Dev.	0.380	0.366	0.431	0.449	0.443	0.434	0.452
	Min.	-2.434	-2.453	-2.379	-2.311	-2.430	-2.512	-2.320
	Max.	1.826	1.680	2.069	2.031	2.062	1.729	2.173
Imp.-weighted unexp. pts. ($Imp_1 \cdot UP$)	Mean	0.002	7e-4	4e-4	1e-5	0.002	9e-4	6e-4
	Std. Dev.	0.033	0.028	0.031	0.037	0.065	0.047	0.029
	Min.	-0.478	-0.292	-0.790	-0.601	-1.389	-0.666	-0.320
	Max.	0.595	0.336	0.343	0.671	0.739	0.789	0.600
Correl. between *UP* and $Imp_1 \cdot UP$		0.746	0.801	0.687	0.705	0.602	0.648	0.692

		Holland	Germany	France	Italy	Portugal	Turkey
Stock Index Return	Mean	-0.020%	-0.002%	-0.025%	-0.023%	-0.021%	0.064%
	Std. Dev.	1.564%	1.655%	1.705%	1.567%	1.161%	1.786%
	Min.	-9.590%	-8.875%	-9.472%	-8.598%	-10.379%	-9.014%
	Max.	10.028%	10.798%	10.595%	10.877%	10.196%	12.127%

AJA: Ajax; BOR: Borussia Dortmund; OLY: Olympique Lyonnais; JUV: Juventus; LAZ: Lazio; ROM: Rome; POR: Porto; BEN: Benfica; SPO: Sporting; BES: Besiktas; FEN: Fenerbahce; GAL: Galatasaray; TRA: Trabzonspor.

Table 2: Most important results concerning Models I and II, estimated for Netherlands, Germany and France.

Model	Unweighted unexpected points (*UP*)			Importance-weighted unexpected points ($Imp_1 \cdot UP$)		
Team	AJA	BOR	OLY	AJA	BOR	OLY
Constant	3e-4 (3e-4)	**-9e-4**** **(4e-4)**	**-0.001**** **(5e-4)**	2e-4 3e-4	**-9e-4**** **(4e-4)**	**-0.001**** **(5e-4)**
Market index	**0.110***** **(0.035)**	**0.200***** **(0.035)**	**0.125***** **(0.040)**	**0.110***** **(0.035)**	**0.192***** **(0.034)**	**0.123***** **(0.039)**
Unexpected points (*UP*)	**0.003***** **(0.001)**	**0.011***** **(0.001)**	**0.003***** **(0.001)**	———	———	———
Imp.-weighted unexp. points ($Imp_1 \cdot UP$)	———	———	———	**0.034***** **(0.006)**	**0.120***** **(0.033)**	**0.035**** **(0.017)**
Included Lags	4	5	5	4	5	5
GARCH parameters						
Constant (α_0)	**2e-5*** **(1e-5)**	**4e-5*** **(2e-5)**	**3e-5***** **(1e-5)**	**2e-5*** **(1e-5)**	**4e-5*** **(2e-5)**	**3e-5***** **(1e-5)**
α_1	**0.136***** **(0.045)**	**0.168***** **(0.057)**	**0.247***** **(0.076)**	**0.140***** **(0.046)**	**0.175***** **(0.053)**	**0.247***** **(0.074)**
δ	**0.837***** **(0.060)**	**0.785***** **(0.076)**	**0.724***** **(0.059)**	**0.833***** **(0.060)**	**0.774***** **(0.070)**	**0.724***** **(0.057)**
No. Observations	3224	2926	1556	3224	2926	1556
Normality Test	1018.84 [0.000]	253.76 [0.000]	311.99 [0.000]	1022.08 [0.000]	273.59 [0.000]	302.29 [0.000]
Log-pseudolikelihood	8013.52	6787.28	3949.84	8016.11	6772.29	3947.40
Akaike Info. Crit.	-16007.05	-13552.56	-7877.68	-16012.22	-13522.57	-7872.80
Wald test	260.35 [0.000]	157.11 [0.000]	20.29 [0.005]	274.31 [0.000]	99.34 [0.000]	18.35 [0.011]
Portmanteau Test	26.348 [0.952]	32.214 [0.805]	38.881 [0.521]	26.369 [0.952]	32.894 [0.780]	38.879 [0.521]

AJA: Ajax; BOR: Borussia Dortmund; OLY: Olympique Lyonnais.
The normality test is the joint skewness/kurtosis test of D'Agostino et al. (1990). The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Robust standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 3: Most important results concerning Model III, estimated for Netherlands, Germany and France.

Team	AJA	BOR	OLY
Constant	0.0002 (0.0003)	**-0.001**** **(0.0004)**	**-0.001**** **(0.0005)**
Market index	**0.109***** **(0.035)**	**0.198***** **(0.034)**	**0.125***** **(0.040)**
Unexpected points (UP)	0.001 (0.001)	**0.008***** **(0.002)**	**0.003**** **(0.002)**
Imp.-weighted unexp. points ($Imp_1 \cdot UP$)	**0.025***** **(0.006)**	**0.072***** **(0.025)**	0.003 (0.016)
Included Lags	4	5	5
GARCH parameters			
Constant (α_0)	**2e-05*** **(1e-05)**	**4e-05**** **(2e-05)**	**3e-05***** **(1e-05)**
α_1	**0.138***** **(0.046)**	**0.173***** **(0.057)**	**0.247***** **(0.076)**
δ	**0.835***** **(0.060)**	**0.778***** **(0.076)**	**0.724***** **(0.059)**
No. Observations	3224	2926	1556
Normality Test	1020.68 [0.000]	256.75 [0.000]	312.06 [0.000]
Log-pseudolikelihood	8017.19	6796.30	3949.86
Akaike Info. Crit.	-16012.39	-13568.60	-7875.72
Wald test	284.92 [0.000]	169.02 [0.000]	20.42 [0.009]
Portmanteau Test	26.329 [0.953]	33.105 [0.772]	38.869 [0.521]
Maximum VIF	1.70	1.70	2.79

AJA: Ajax; BOR: Borussia Dortmund; OLY: Olympique Lyonnais.
The normality test is the joint skewness/kurtosis test of D'Agostino et al. (1990). The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Robust standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 4: Most important results concerning Models I and II, estimated for Italy.

Model	Unweighted unexpected points (UP)			Importance-weighted unexpected points ($Imp_1 \cdot UP$)		
Team	JUV	LAZ	ROM	JUV	LAZ	ROM
Constant	**-0.001*** (3e-4)**	**-0.001** (5e-4)**	**-0.002** (8e-4)**	**-0.001*** (3e-4)**	**-0.001** (5e-4)**	**-0.002** (8e-4)**
Market index	**0.235*** (0.049)**	**0.226*** (0.041)**	**0.228*** (0.064)**	**0.231*** (0.050)**	**0.245*** (0.041)**	**0.224*** (0.062)**
Unexpected points (UP)	**0.005*** (0.001)**	**0.009*** (0.001)**	**0.010*** (0.002)**	______	______	______
Unexp. points in Serie B ($UP \cdot D_{Serie\ B}$)	-0.004 (0.002)	______	______	______	______	______
Imp.-wt. unexp. pts. ($Imp \cdot UP$)	______	______	______	**0.071*** (0.018)**	**0.333*** (0.043)**	**0.166*** (0.033)**
Imp.-wt. unexp. pts. in Serie B ($Imp \cdot UP \cdot D_{Serie\ B}$)	______	______	______	**-0.068*** (0.024)**	______	______
Included Lags	4	4	4	4	4	4
GARCH parameters						
Constant (ω_i)	**4e-5** (1e-5)**	1e-5 (1e-5)	**1e-4*** (4e-5)**	**4e-5** (1e-5)**	1e-5 (1e-5)	**1e-4*** (4e-5)**
α_i	**0.334*** (0.084)**	**0.096* (0.053)**	**0.288*** (0.062)**	**0.343*** (0.087)**	**0.096* (0.054)**	**0.306*** (0.065)**
δ_i	**0.615*** (0.093)**	**0.908*** (0.048)**	**0.627*** (0.053)**	**0.618*** (0.091)**	**0.908*** (0.049)**	**0.610*** (0.053)**
Correlation Matrix						
		LAZ	ROM		LAZ	ROM
	JUV	**0.068** (0.028)**	**0.130*** (0.020)**	JUV	**0.066** (0.028)**	**0.130*** (0.021)**
	LAZ		**0.068*** (0.022)**	LAZ		**0.068*** (0.022)**
No. Observations	2840			2840		
Henze-Zirkler Test	140.922 [0.000]			141.298 [0.000]		
Log-pseudolikelihood	19415.68			19413.51		
Akaike Info. Crit.	-38385.36			-38381.02		
Wald test	1.59e+11 [0.000]			1.67e+11 [0.000]		
Portmanteau Test	14.628 [0.999]	0.335 [1.000]	23.978 [0.979]	13.364 [1.000]	0.305 [1.000]	25.360 [0.965]

JUV: Juventus; LAZ: Lazio; ROM: Rome.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 5: Most important results concerning Model III, estimated for Italy.

Team	JUV	LAZ	ROM
Constant	**-0.001*** (3e-4)**	**-0.001** (5e-4)**	**-0.002** (7e-4)**
Market index	**0.234*** (0.050)**	**0.243*** (0.042)**	**0.225*** (0.065)**
Unexpected points (UP)	**0.004** (0.001)**	0.001 (0.002)	**0.007** (0.003)**
Unexp. points in Serie B ($UP \cdot D_{Serie\ B}$)	0.003 (0.006)	———	———
Imp.-wt. unexp. pts. ($Imp \cdot UP$)	0.031 (0.027)	**0.293*** (0.076)**	**0.073* (0.041)**
Imp.-wt. unexp. pts. in Serie B ($Imp \cdot UP \cdot D_{Serie\ B}$)	-0.098 (0.060)	———	———
Included Lags	4	4	4
GARCH parameters			
Constant (ω_i)	**4e-5** (2e-5)**	1e-5 (1e-5)	**1e-4*** (3e-5)**
α_i	**0.352*** (0.088)**	**0.096* (0.054)**	**0.295*** (0.064)**
δ_i	**0.601*** (0.091)**	**0.908*** (0.049)**	**0.620*** (0.053)**
Correlation Matrix			
		LAZ	ROM
	JUV	**0.067** (0.028)**	**0.131*** (0.020)**
	LAZ		**0.069*** (0.022)**
No. Observations		2840	
Henze-Zirkler Test		141.127 [0.000]	
Log-pseudolikelihood		19435.01	
Akaike Info. Crit.		-38416.02	
Wald test		2.13e+11 [0.000]	
Portmanteau Test	14.910 [1.000]	0.303 [1.000]	24.168 [0.977]
Maximum VIF	1.80	3.37	2.14

JUV: Juventus; LAZ: Lazio; ROM: Rome.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 6: Most important results concerning Models I and II, estimated for Portugal.

Model	Unweighted unexpected points (UP)			Importance-weighted unexpected points ($Imp_1 \cdot UP$)		
Team	POR	BEN	SPO	POR	BEN	SPO
Constant	**-0.003*** (0.001)**	**-0.001* (8e-4)**	**-0.003*** (0.001)**	**-0.003*** (0.001)**	**-0.001* (8e-4)**	**-0.003*** (1e-4)**
Market index	**0.244*** (0.091)**	**0.129** (0.050)**	**0.227*** (0.084)**	**0.245** (0.096)**	**0.132*** (0.050)**	**0.229*** (0.083)**
Unexpected points (UP)	-0.007 (0.007)	0.003 (0.002)	0.004 (0.002)	______	______	______
Imp.-weighted unexp. points ($Imp \cdot UP$)	______	______	______	-0.115 (0.093)	**0.066* (0.039)**	**0.084** (0.041)**
Included Lags	8	3	6	8	3	6
GARCH parameters						
Constant (ω_i)	5e-5 (3e-5)	**1e-4** (5e-5)**	**6e-5** (2e-5)**	4e-5 (3e-5)	**1e-4** (5e-5)**	**5e-5** (2e-5)**
α_i	0.165 (0.137)	**0.355*** (0.103)**	**0.158*** (0.042)**	0.170 (0.140)	**0.360*** (0.105)**	**0.158*** (0.042)**
δ_i	**0.844*** (0.085)**	**0.613*** (0.100)**	**0.832*** (0.039)**	**0.841*** (0.084)**	**0.610*** (0.099)**	**0.831*** (0.038)**
Correlation Matrix						
		BEN	SPO		BEN	SPO
	POR	0.007 (0.029)	0.034 (0.030)	POR	0.006 (0.029)	0.033 (0.030)
	BEN		**0.101*** (0.028)**	BEN		**0.102*** (0.028)**
No. Observations	1437			1437		
Henze-Zirkler Test	46.153 [0.000]			45.558 [0.000]		
Log-pseudolikelihood	8368.83			8372.24		
Akaike Info. Crit.	-16661.65			-16668.48		
Wald test	498.04 [0.000]			504.73 [0.000]		
Portmanteau Test	1.905 [1.000]	51.341 [0.108]	46.618 [0.219]	1.928 [1.000]	51.334 [0.108]	43.212 [0.336]

POR: Porto; BEN: Benfica; SPO: Sporting.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 7: Most important results concerning Model III, estimated for Portugal.

Team	POR	BEN	SPO
Constant	**-0.003***** **(0.001)**	**-0.001**** **(8e-4)**	**-0.003***** **(0.001)**
Market index	**0.243***** **(0.091)**	**0.134***** **(0.050)**	**0.229***** **(0.084)**
Unexpected points (*UP*)	-0.003 (0.005)	-0.002 (0.004)	4e-4 (0.004)
Imp.-weighted unexp. points (*Imp·UP*)	-0.080 (0.054)	0.094 (0.062)	0.080 (0.067)
Included Lags	4	4	4
GARCH parameters			
Constant (ω_i)	4e-5 (2e-5)	**0.0001**** **(5e-5)**	**5e-5***** **(2e-5)**
α_i	0.169 (0.135)	**0.364***** **(0.106)**	**0.158***** **(0.042)**
δ_i	0.**843***** **(0.081)**	**0.608***** **(0.010)**	**0.831***** **(0.038)**
Correlation Matrix			
		BEN	SPO
	POR	0.005 (0.029)	0.033 (0.030)
	BEN		**0.102***** **(0.028)**
No. Observations		1437	
Henze-Zirkler Test		45.389 [0.000]	
Log-pseudolikelihood		8373.10	
Akaike Info. Crit.		-16664.20	
Wald test		508.36 [0.000]	
Portmanteau Test	2.012 [1.000]	51.3164 [0.108]	41.725 [0.396]
Maximum VIF	2.27	2.82	1.93

POR: Porto; BEN: Benfica; SPO: Sporting.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 8: Most important results concerning the models estimated for Portugal, including only Porto and Sporting.

Model	Unweighted unexpected points (*UP*)		Importance-weighted unexpected points (*Imp·UP*)		*UP* and *Imp·UP*	
Team	POR	SPO	POR	SPO	POR	SPO
Constant	**-0.001*** (5e-4)**	**-0.001*** (5e-4)**	**-0.001*** (5e-4)**	**-0.001*** (5e-4)**	**-0.001*** (5e-4)**	**-0.001*** (5e-4)**
Market index	**0.268*** (0.095)**	**0.241*** (0.065)**	**0.270*** (0.101)**	**0.237*** (0.065)**	**0.268*** (0.095)**	**0.237*** (0.065)**
Unexpected points (*UP*)	-0.001 (0.002)	**0.005*** (0.001)**	______	______	-9e-4 (0.002)	0.001 (0.002)
Imp.-weighted unexp. points (*Imp·UP*)	______	______	-0.012 (0.020)	**0.079*** (0.024)**	-0.005 (0.017)	0.063 (0.040)
Included Lags	3	4	3	4	3	4
GARCH parameters						
Constant (ω_i)	**1e-5** (6e-6)**	**3e-5*** (8e-6)**	**1e-5** (6e-6)**	**3e-5*** (9e-6)**	**1e-5** (6e-6)**	**3e-5*** (9e-6)**
α_i	**0.238** (0.107)**	**0.192*** (0.033)**	**0.238** (0.109)**	**0.193*** (0.034)**	**0.238** (0.107)**	**0.193*** (0.033)**
δ_i	**0.822*** (0.051)**	**0.804*** (0.029)**	**0.821*** (0.052)**	**0.802*** (0.030)**	**0.822*** (0.051)**	**0.803*** (0.029)**
Correlation Matrix						
		SCP		SCP		SCP
	FCP	**0.078*** (0.023)**	FCP	**0.078*** (0.024)**	FCP	**0.079*** (0.024)**
No. Observations	3196		3196		3196	
Henze-Zirkler Test	195.258 [0.000]		194.800 [0.000]		194.589 [0.000]	
Log-pseudolikelihood	14315.98		14320.32		14321.32	
Akaike Info. Crit.	-28591.96		-28600.64		-28589.64	
Wald test	426.71 [0.000]		400.36 [0.000]		418.67 [0.000]	
Portmanteau Test	4.982 [1.000]	45.317 [0.260]	4.931 [1.000]	46.367 [0.227]	4.990 [1.000]	46.282 [0.229]

POR: Porto; SPO: Sporting.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 9: Most important results concerning Models I and II, estimated for Turkey.

Model	Unweighted unexpected points (UP)				Importance-weighted unexpected points ($Imp_1 \cdot UP$)			
Team	BES	FEN	GAL	TRA	BES	FEN	GAL	TRA
Constant	3e-4 (0.001)	-5e-4 (7e-4)	-5e-4 (5e-4)	-1e-4 (6e-4)	3e-4 (0.001)	-5e-4 (7e-4)	-5e-4 (5e-4)	-6e-5 (6e-4)
Market index	**0.523*** (0.072)**	**0.085* (0.045)**	0.089 (0.064)	**0.227*** (0.036)**	**0.517*** (0.071)**	**0.082* (0.044)**	0.088 (0.063)	**0.225*** (0.036)**
Unexpected points (UP)	**0.005*** (0.002)**	**0.005*** (0.002)**	**0.003* (0.001)**	**0.006*** (0.001)**	______	______	______	______
Imp.-weighted unexp. points ($Imp \cdot UP$)	______	______	______	______	**0.094*** (0.027)**	**0.043** (0.018)**	**0.036*** (0.017)**	**0.115*** (0.040)**
Included Lags	6	6	3	7	6	6	3	7
GARCH parameters								
Constant (ω_i)	**1e-4** (6e-5)**	**7e-5*** (2e-5)**	**1e-4** (5e-5)**	**6e-5*** (2e-5)**	**1e-4** (6e-5)**	**7e-5*** (2e-5)**	**1e-4** (5e-5)**	**6e-5*** (2e-5)**
α_i	**1.943* (1.127)**	**0.426*** (0.162)**	**0.319*** (0.109)**	**0.219*** (0.046)**	**1.935* (1.102)**	**0.416*** (0.148)**	**0.324*** (0.109)**	**0.217*** (0.045)**
δ_i	0.293 (0.195)	**0.613*** (0.069)**	**0.594*** (0.080)**	**0.733*** (0.041)**	0.292 (0.184)	**0.612*** (0.065)**	**0.598*** (0.080)**	**0.737*** (0.039)**
Correlation Matrix								
		FEN	GAL	TRA		FEN	GAL	TRA
	BES	**0.207*** (0.028)**	**0.166*** (0.030)**	**0.191*** (0.024)**	BES	**0.204*** (0.028)**	**0.169*** (0.030)**	**0.192*** (0.024)**
	FEN		**0.255*** (0.033)**	**0.225*** (0.035)**	FEN		**0.254*** (0.033)**	**0.231*** (0.034)**
	GAL			**0.240*** (0.029)**	GAL			**0.233*** (0.029)**
No. Observations	1986				1986			
Henze-Zirkler Test	100.807 [0.000]				101.973 [0.000]			
Log-pseudolikelihood	17407.94				17420.97			
Akaike Info. Crit.	-34711.88				-34737.94			
Wald test	256.87 [0.000]				263.87 [0.000]			
Portmanteau Test	2.298 [1.000]	28.824 [0.905]	32.466 [0.796]	12.473 [1.000]	2.2136 [1.000]	27.6983 [0.930]	32.390 [0.798]	12.441 [1.000]

BES: Besiktas; FEN: Fenerbahce; GAL: Galatasaray; TRA: Trabzonspor.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 10: Most important results concerning Model III, estimated for Turkey.

Team	BES	FEN	GAL	TRA
Constant	3e-4 (0.001)	-6e-4 (7e-4)	-5e-4 (5e-4)	-1e-4 (6e-4)
Market index	**0.518***** **(0.071)**	**0.086**** **(0.043)**	0.089 (0.063)	**0.226***** **(0.036)**
Unexpected points (*UP*)	-1e-4 (0.002)	**0.004*** **(0.002)**	-4e-4 (0.002)	0.003 (0.003)
Imp.-weighted unexp. points (*Imp·UP*)	**0.095**** **(0.042)**	0.023 (0.025)	**0.040**** **(0.019)**	0.070 (0.067)
Included Lags	6	6	3	7
GARCH parameters				
Constant (ω_i)	**1e-4**** **(6e-5)**	**7e-5***** **(2e-5)**	**1e-4**** **(5e-5)**	**6e-5***** **(2e-5)**
α_i	**1.935*** **(1.103)**	**0.421***** **(0.152)**	**0.324***** **(0.111)**	**0.219***** **(0.046)**
δ_i	0.292 (0.184)	**0.613***** **(0.066)**	**0.599***** **(0.080)**	**0.735***** **(0.040)**
Correlation Matrix				
		FEN	GAL	TRA
	BES	**0.205***** **(0.028)**	**0.169***** **(0.030)**	**0.193***** **(0.024)**
	FEN		**0.255***** **(0.032)**	**0.231***** **(0.035)**
	GAL			**0.234***** **(0.029)**
No. Observations	1986			
Henze-Zirkler Test	101.209 [0.000]			
Log-pseudolikelihood	17426.94			
Akaike Info. Crit.	-34741.88			
Wald test	279.25 [0.000]			
Portmanteau Test	2.211 [1.000]	27.818 [0.927]	32.384 [0.799]	12.237 [1.000]
Correl. between *UP* and $Imp_1 \cdot UP$	0.705	0.602	0.648	0.692
Maximum VIF	1.96	1.55	1.70	1.92

BES: Besiktas; FEN: Fenerbahce; GAL: Galatasaray; TRA: Trabzonspor.
The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 11: Most important results concerning the panel GARCH models estimated for Italy, Portugal and Turkey.

Model	Model I			Model II		
Country	ITA	POR	TUR	ITA	POR	TUR
Market index	**0.242***** **(0.017)**	**0.184***** **(0.033)**	**0.205***** **(0.021)**	**0.240***** **(0.017)**	**0.184***** **(0.033)**	**0.200***** **(0.021)**
Unexpected points (UP)	**0.007***** **(5e-4)**	-2e-4 (0.001)	**0.005***** **(5e-4)**	______	______	______
Unexp. points in Serie B ($UP\cdot D_{Serie\ B}$)	**-0.005**** **(0.002)**	______	______	______	______	______
Imp.-wt. unexp. pts. ($Imp\cdot UP$)	______	______	______	**0.102***** **(0.008)**	-0.003 (0.018)	**0.054***** **(0.005)**
Imp.-wt. unexp. pts. in Serie B ($Imp\cdot UP\cdot D_{Serie\ B}$)	______	______	______	**-0.091***** **(0.030)**	______	______
Included Lags	3	4	7	3	4	7
Log-likelihood	-20286.3	-11504.2	-19486.8	-20318.9	-11504.2	-19486.8

Model	Model III		
Country	ITA	POR	TUR
Market index	**0.241***** **(0.017)**	**0.184***** **(0.033)**	**0.205***** **(0.021)**
Unexpected points (UP)	**0.006***** **(7e-4)**	-1e-4 (0.002)	**0.003***** **(6e-4)**
Unexp. points in Serie B ($UP\cdot D_{Serie\ B}$)	0.184 (0.473)	______	______
Imp.-wt. unexp. pts. ($Imp\cdot UP$)	**0.035***** **(0.012)**	-9e-4 (0.031)	**0.033***** **(0.007)**
Imp.-wt. unexp. pts. in Serie B ($Imp\cdot UP\cdot D_{Serie\ B}$)	**-0.116*** **(0.063)**	______	______
Included Lags	3	4	7
Log-likelihood	-20282.2	-11504.2	-19476.1

ITA: Italy; POR: Portugal; TUR: Turkey.
Estimations for Portugal included the three teams. In the case of Portugal, since the coefficients regarding the existence of GARCH effects in the covariances process were jointly not significant the model without GARCH in covariances was used. For reasons of space, only the coefficients of the main variables being analysed are reported. The complete results are available from the authors upon request.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 12: Most important results concerning the models estimated for Netherlands, Germany and France using additional or alternative measures of unexpected points and importance.

Model	Adding variables indicating if the team is in the top 5 or bottom 3 to Model III			
Team	AJA	BOR	OLY	
Constant	4e-4 (4e-4)	**-7e-4*** **(4e-4)**	**-9e-4*** **(5e-4)**	Included Lags: AJA: 4; BOR: 5; OLY: 5
Market index	**0.110***** **(0.035)**	**0.201***** **(0.035)**	**0.122***** **(0.039)**	Normality test: 1022.21 [0.000]; BOR: 254.71 [0.000]; OLY: 304.60 [0.000]
Unexpected points (*UP*)	**0.002*** **(0.001)**	**0.009***** **(0.002)**	**0.003*** **(0.002)**	Log-pseudolikelihood: AJA: 8017.89; BOR: 6800.38; OLY: 3954.09
Imp.-wt. unexp. pts. (*Imp·UP*)	-0.015 (0.049)	0.010 (0.064)	0.040 (0.057)	Akaike Info. Crit.: AJA: -16009.78; BOR: -13568.76; OLY: -7876.18
Top 5 (*T5*)	-0.001 (0.001)	-0.004 (0.003)	-0.002 (0.002)	Wald test: AJA: 287.23 [0.000]; BOR: 183.79 [0.000]; OLY: 38.74 [0.000]
Bottom 3 (*B3*)	---	-4e-4 (0.013)	-0.005 (0.008)	Portmanteau test: AJA: 26.693 [0.947]; BOR: 33.636 [0.751]; OLY: 39.157 [0.508]
T5·Imp·UP	0.040 (0.048)	0.064 (0.058)	-0.037 (0.054)	
B3·Imp·UP	---	-0.193 (0.389)	**-0.344**** **(0.136)**	

Model	Replacing the importance measure by a Post-March dummy variable in Model III			
Team	AJA	BOR	OLY	Included Lags: AJA: 4; BOR: 5; OLY: 5
Constant	3e-4 (3e-4)	**-0.001**** **(4e-4)**	**-0.001**** **(5e-4)**	Normality test: 1018.86 [0.000]; BOR: 252.17 [0.000]; OLY: 309.87 [0.000]
Market index	**0.110***** **(0.035)**	**0.202***** **(0.035)**	**0.123***** **(0.040)**	Log-pseudolikelihood: AJA: 8013.55; BOR: 6788.65; OLY: 3950.48
Unexpected points (*UP*)	**0.003***** **(0.001)**	**0.010***** **(0.001)**	**0.003*** **(0.002)**	Akaike Info. Crit.: AJA: -16005.10; BOR: -13553.30; OLY: -7876.96 Wald test: AJA: 260.65 [0.000]; BOR: 158.75 [0.000]; OLY: 24.12 [0.002]
Post-March unexp. pts. (*PMarch·UP*)	-4e-4 (0.003)	0.004 (0.003)	0.002 (0.002)	Portmanteau test: AJA: 26.362 [0.952]; BOR: 31.863 [0.817]; OLY: 39.146 [0.509]

Model	Using alternative measure of unexpected points in Model III			
Team	AJA	BOR	OLY	Included Lags: AJA: 4; BOR: 5; OLY: 5
Constant	5e-4 (4e-4)	-4e-4 (4e-4)	-8e-4 (5e-4)	Normality test: 1022.44 [0.000]; BOR: 259.20 [0.000]; OLY: 297.83 [0.000]
Market index	**0.111***** **(0.035)**	**0.200***** **(0.035)**	**0.120***** **(0.039)**	Log-pseudolikelihood: AJA: 8012.84; BOR: 6776.44; OLY: 3948.89
Alternative unexp. points (*AUP*)	0.001 (0.001)	**0.004***** **(0.001)**	0.001 (0.001)	Akaike Info. Crit.: AJA: -16003.68; BOR: -13528.88; OLY: -7873.78
Imp.-wt. alt. unexp. pts. (*Imp·AUP*)	**0.021**** **(0.010)**	**0.070***** **(0.018)**	0.017 (0.011)	Wald test: AJA: 253.84 [0.000]; BOR: 137.90 [0.000]; OLY: 24.22 [0.002] Portmanteau test: AJA: 26.921 [0.944]; BOR: 29.047 [0.900]; OLY: 40.447 [0.451]

AJA: Ajax; BOR: Borussia Dortmund; OLY: Olympique Lyonnais.
Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
---: Omitted due to insufficient number of observations in which the team is at the bottom 3.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 13 (part 1): Most important results concerning the models estimated for Italy using additional or alternative measures of unexpected points and importance.

Model	Adding variables indicating if the team is in the top 5 or bottom 3 to Model III			
Team	JUV	LAZ	ROM	
Constant	**-6e-4* (3e-4)**	**-0.001** (5e-4)**	-0.001 (8e-4)	
Market index	**0.220*** (0.057)**	**0.244*** (0.042)**	**0.219*** (0.064)**	
Unexpected points (*UP*)	0.003 (0.003)	0.003 (0.002)	**0.010*** (0.003)**	
Unexpected points in Serie B ($UP \cdot D_{Serie\ B}$)	0.002 (0.006)	---	---	Included Lags: JUV: 4; LAZ: 4; ROM: 4
Imp.-wt. unexp. pts. ($Imp \cdot UP$)	0.074 (0.070)	0.107 (0.076)	-0.098 (0.075)	Henze-Zirkler test: 142.92 [0.000]
Imp.-wt. unexp. pts. in Serie B ($Imp \cdot UP \cdot D_{Serie\ B}$)	-0.098 (0.859)	---	---	Log-pseudolikelihood: 19483.08; Akaike Info. Crit.: -38484.16
Top 5 (*T5*)	**-0.002** (0.001)**	0.001 (0.002)	**-0.006*** (0.002)**	Wald test: 3.41e+12 [0.000]
Top 5 in Serie B ($T5 \cdot D_{Serie\ B}$)	-0.001 (0.002)	---	---	Portmanteau test: JUV: 16.030 [1.000]; LAZ: 0.293 [1.000]; ROM: 25.997 [0.957]
Bottom 3 (*B3*)	-0.064 (0.095)	**0.007** (0.003)**	**-0.018*** (0.003)**	
$T5 \cdot Imp \cdot UP$	-0.027 (0.040)	**0.301*** (0.084)**	**0.169** (0.066)**	
$T5 \cdot Imp \cdot UP \cdot D_{Serie\ B}$	0.003 (0.835)	---	---	
$B3 \cdot Imp \cdot UP$	7.128 (5.021)	0.006 (0.193)	0.087 (0.081)	

Model	Replacing the importance measure by a Post-March dummy variable in Model III			
Team	JUV	LAZ	ROM	
Constant	**-0.001*** (3e-4)**	**-0.001** (5e-4)**	**-0.001** (7e-4)**	Included Lags: JUV: 4; LAZ: 4; ROM: 4
Market index	**0.234*** (0.050)**	**0.230*** (0.041)**	**0.225*** (0.063)**	Henze-Zirkler test: 141.082 [0.000]
Unexpected points (*UP*)	**0.005*** (0.001)**	**0.010*** (0.001)**	**0.009*** (0.002)**	Log-pseudolikelihood: 19419.91; Akaike Info. Crit.: -38385.82
Unexpected points in Serie B ($UP \cdot D_{Serie\ B}$)	-0.002 (0.004)	---	---	Wald test: 1.79e+11 [0.000]
Post-March unexp. pts. ($PMarch \cdot UP$)	-4e-4 (0.002)	-0.004 (0.003)	0.006 (0.007)	Portmanteau test: JUV: 14.765 [1.000]; LAZ: 0.319 [1.000]; ROM: 25.013 [0.969]
Post-March unexp. pts. in Serie B ($PMarch \cdot UP \cdot D_{Serie\ B}$)	-0.004 (0.005)	---	---	

JUV: Juventus; LAZ: Lazio; ROM: Rome.
Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
---: Omitted due to insufficient number of observations in which the team is at the bottom 3 (variables concerning the cases in which are in the bottom 3 position of Serie B were not included since there were never sufficient observations for proceeding with the estimation).
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 13 (part 2): Most important results concerning the models estimated for Italy using additional or alternative measures of unexpected points and importance.

Model	Using alternative measure of unexpected points in Model III			
Team	JUV	LAZ	ROM	
Constant	**-7e-4**** **(3e-4)**	**-0.001**** **(5e-4)**	-6e-4 (7e-4)	Included Lags: JUV: 4; LAZ: 4; ROM: 4
Market index	**0.235***** **(0.049)**	**0.234***** **(0.042)**	**0.225***** **(0.055)**	Henze-Zirkler test: 142.814 [0.000]
Alternative unexp. points (*AUP*)	**0.003**** **(0.001)**	-5e-4 (0.001)	**0.006***** **(0.002)**	Log-pseudolikelihood: 19403.42
				Akaike Info. Crit.: -38352.84
Alt. unexp. points in Serie B ($AUP \cdot D_{Serie\ B}$)	0.004 (0.004)	---	---	Wald test: 8.59e+10 [0.000]
Imp.-wt. alt. unexp. pts. ($Imp \cdot AUP$)	0.021 (0.018)	**0.193***** **(0.051)**	0.012 (0.046)	Portmanteau test: JUV: 15.738 [1.000]; LAZ: 0.309 [1.000]; ROM: 24.620 [0.973]
Imp.-wt. alt. unexp. pts. in Serie B ($Imp \cdot AUP \cdot D_{Serie\ B}$)	**-0.092**** **(0.042)**	---	**---**	

JUV: Juventus; LAZ: Lazio; ROM: Rome.

Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.

---: Omitted due to insufficient number of observations in which the team is at the bottom 3 (variables concerning the cases in which are in the bottom 3 position of Serie B were not included since there were never sufficient observations for proceeding with the estimation).

***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 14: Most important results concerning the models estimated for Portugal using additional or alternative measures of unexpected points and importance.

Model	Adding variables indicating if the team is in the top 5 or bottom 3 to Model III			
Team	POR	BEN	SPO	
Constant	**-0.002**** **(9e-4)**	-0.001 (8e-4)	**-0.003***** **(0.001)**	
Market index	**0.216***** **(0.073)**	**0.133***** **(0.051)**	**0.242***** **(0.084)**	Included Lags: POR: 8; BEN: 3; SPO: 6
Unexpected points (*UP*)	-0.004 (0.005)	-0.002 (0.005)	6e-5 (0.004)	Henze-Zirkler test: 45.503 [0.000] Log-pseudolikelihood: 8383.94
Imp.-wt. unexp. pts. (*Imp·UP*)	0.262 (0.178)	0.115 (0.101)	0.068 (0.156)	Akaike Info. Crit.: -16667.88
Top 5 (*T5*)	-0.006 (0.006)	-0.001 (0.003)	-0.005 (0.003)	Wald test: 645.98 [0.000]
Bottom 3 (*B3*)	---	---	0.564 (0.355)	Portmanteau test: POR: 2.764 [1.000]; BEN: 42.458 [0.366]; SPO: 37.780 [0.571]
T5·Imp·UP	**-0.308*** **(0.179)**	-0.022 (0.078)	0.012 (0.147)	
B3·Imp·UP	---	**-0.286***** **(0.073)**	-11.733 (7.664)	
Model	**Replacing the importance measure by a Post-March dummy variable in Model III**			
Team	POR	BEN	SPO	Included Lags: POR: 8; BEN: 3; SPO: 6
Constant	**-0.003***** **(0.001)**	**-0.001*** **(8e-4)**	**-0.003***** **(0.001)**	Henze-Zirkler test: 46.031 [0.000]
Market index	**0.233***** **(0.082)**	**0.129**** **(0.050)**	**0.227***** **(0.084)**	Log-pseudolikelihood: 8374.24 Akaike Info. Crit.: -16666.48
Unexpected points (*UP*)	-0.010 (0.009)	**0.005*** **(0.003)**	0.004 (0.003)	Wald test: 507.44 [0.000]
Post-March unexp. pts. (*PMarch·UP*)	0.011 (0.011)	-0.010 (0.006)	-0.001 (0.006)	Portmanteau test: POR: 2.305 [1.000]; BEN: 47.303 [0.199]; SPO: 51.291 [0.109]
Model	**Using alternative measure of unexpected points in Model III**			
Team	POR	BEN	SPO	Included Lags: POR: 8; BEN: 3; SPO: 6
Constant	**-0.003**** **(0.001)**	-0.001 (8e-4)	**-0.003***** **(9e-4)**	Henze-Zirkler test: 46.171 [0.000]
Market index	**0.263**** **(0.127)**	**0.131***** **(0.050)**	**0.230***** **(0.083)**	Log-pseudolikelihood: 8362.30 Akaike Info. Crit.: -16642.60
Alternative unexp. points (*AUP*)	0.002 (0.003)	0.001 (0.004)	0.001 (0.004)	Wald test: 494.42 [0.000]
Imp.-wt. alt. unexp. pts. (*Imp·AUP*)	0.007 (0.031)	0.035 (0.073)	0.027 (0.059)	Portmanteau test: POR: 1.274 [1.000]; BEN: 46.366 [0.226]; SPO: 51.024 [0.114]

POR: Porto; BEN: Benfica; SPO: Sporting.
Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
---: Omitted due to insufficient number of observations in which the team is at the bottom 3.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 15: Most important results concerning the models estimated for Portugal, including only Porto and Sporting, using additional or alternative measures of unexpected points and importance.

Model	Adding variables indicating if the team is in the top 5 or bottom 3 to Model III		
Team	POR	SPO	
Constant	-7e-4 (4e-4)	-6e-4 (5e-4)	
Market index	**0.267*** (0.076)**	**0.235*** (0.065)**	Included Lags: POR: 3; SPO: 4
Unexpected points (*UP*)	-5e-5 (0.002)	0.003 (0.002)	Henze-Zirkler test: 193.43 [0.000]
Imp.-wt. unexp. pts. (*Imp·UP*)	**0.126* (0.067)**	-0.082 (0.079)	Log-pseudolikelihood: 14359.47
			Akaike Info. Crit.: -28662.94
Top 5 (*T5*)	**-0.006*** (0.002)**	**-0.005*** (0.001)**	Wald test: 552.61 [0.000]
Bottom 3 (*B3*)	---	-0.335 (0.515)	Portmanteau test: POR: 6.506 [1.000]; SPO: 42.270 [0.373]
T5·Imp·UP	**-0.125** (0.063)**	**0.143** (0.063)**	
B3·Imp·UP	---	7.619 (11.251)	

Model	Replacing the importance measure by a Post-March dummy variable in Model III		
Team	POR	SPO	Included Lags: POR: 3; SPO: 4
Constant	**-0.001*** (5e-4)**	**-0.001** (4e-4)**	Henze-Zirkler test: 195.84 [0.000]
Market index	**0.275*** (0.097)**	**0.240*** (0.064)**	Log-pseudolikelihood: 14312.42
			Akaike Info. Crit.: -28580.84
Unexpected points (*UP*)	-3e-4 (0.002)	**0.004*** (0.001)**	Wald test: 443.18 [0.000]
Post-March unexp. pts. (*PMarch·UP*)	-0.005 (0.007)	0.001 (0.003)	Portmanteau test: POR: 4.935 [1.000]; SPO: 46.349 [0.227]

Model	Using alternative measure of unexpected points in Model III		
Team	POR	SPO	Included Lags: POR: 3; SPO: 4
Constant	**-0.001** (5e-4)**	-7e-4 (4e-4)	Henze-Zirkler test: 196.59 [0.000]
Market index	**0.286*** (0.110)**	**0.244*** (0.064)**	Log-pseudolikelihood: 14322.79
			Akaike Info. Crit.: -28601.58
Alternative unexp. points (*AUP*)	**0.002* (0.001)**	**0.002* (0.001)**	Wald test: 431.60 [0.000]
Imp.-wt. alt. unexp. pts. (*Imp·AUP*)	0.012 (0.008)	0.034 (0.022)	Portmanteau test: POR: 4.997 [1.000]; SPO: 44.814 [0.277]

POR: Porto; SPO: Sporting.
Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
---: Omitted due to insufficient number of observations in which the team is at the bottom 3.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.

Table 16: Most important results concerning the models estimated for Turkey using additional or alternative measures of unexpected points and importance.

Model	Adding variables indicating if the team is in the top 5 or bottom 3 to Model III				
Team	BES	FEN	GAL	TRA	
Constant	0.001 (0.001)	-2e-4 (6e-4)	3e-5 (0.001)	-2e-5 (0.001)	
Market index	**0.526*** (0.063)**	**0.104*** (0.038)**	0.098 (0.060)	**0.230*** (0.036)**	Included Lags: BES: 6; FEN: 6; GAL: 3; TRA: 7
Unexpected points (*UP*)	0.0004 (0.002)	**0.003* (0.002)**	-0.0015 (0.002)	0.0028 (0.004)	Henze-Zirkler test: 100.342 [0.000]
Imp.-wt. unexp. pts. (*Imp·UP*)	0.0696 (0.077)	0.127 (0.087)	0.2112 (0.132)	0.0646 (0.106)	Log-pseudolikelihood: 17456.99; Akaike Info. Crit.: -34781.98
Top 5 (*T5*)	**-0.006*** (0.002)**	**-0.005*** (0.002)**	**-0.005*** (0.002)**	-0.002 (0.004)	Wald test: 403.22 [0.000]
Bottom 3 (*B3*)	---	---	---	-0.006 (0.019)	Portmanteau test: BES: 2.416 [1.000]; FEN: 27.101 [0.940]; GAL: 30.685 [0.855]; TRA: 12.298 [1.000]
T5·Imp·UP	0.023 (0.063)	-0.115 (0.085)	-0.168 (0.130)	0.006 (0.089)	
B3·Imp·UP	---	---	---	0.222 (0.445)	

Model	Replacing the importance measure by a Post-March dummy variable in Model III				
Team	BES	FEN	GAL	TRA	Included Lags: BES: 6; FEN: 6; GAL: 3; TRA: 7
Constant	3e-4 (0.001)	-5e-4 (6e-4)	-4e-4 (5e-4)	-1e-4 (6e-4)	Henze-Zirkler test: 100.738 [0.000]
Market index	**0.523*** (0.073)**	**0.087** (0.042)**	0.091 (0.065)	**0.227*** (0.036)**	Log-pseudolikelihood: 17411.93; Akaike Info. Crit.: -34711.86
Unexpected points (*UP*)	**0.004*** (0.002)**	**0.004*** (0.001)**	**0.003* (0.002)**	**0.006*** (0.002)**	Wald test: 269.58 [0.000]
Post-March unexp. pts. (*PMarch·UP*)	0.002 (0.005)	0.006 (0.006)	-0.001 (0.004)	-0.003 (0.004)	Portmanteau test: BES: 2.288 [1.000]; FEN: 27.970 [0.924]; GAL: 32.451 [0.796]; TRA: 12.755 [1.000]

Model	Using alternative measure of unexpected points in Model III				
Team	BES	FEN	GAL	TRA	Included Lags: BES: 6; FEN: 6; GAL: 3; TRA: 7
Constant	4e-4 (0.001)	-1e-4 (7e-4)	-02e-4 (5e-4)	2e-4 (6e-4)	Henze-Zirkler test: 100.560 [0.000]
Market index	**0.541*** (0.068)**	**0.099** (0.041)**	0.095 (0.060)	**0.234*** (0.035)**	Log-pseudolikelihood: 17449.19; Akaike Info. Crit.: -34786.38
Alternative unexp. points (*AUP*)	0.001 (0.002)	**0.003** (0.001)**	**-0.003* (0.002)**	-0.003 (0.002)	Wald test: 391.26 [0.000]
Imp.-wt. alt. unexp. pts. (*Imp·AUP*)	**0.056* (0.030)**	**0.024* (0.013)**	**0.085*** (0.016)**	**0.136*** (0.051)**	Portmanteau test: BES: 2.363 [1.000]; FEN: 29.656 [0.885]; GAL: 32.009 [0.812]; TRA: 13.205 [1.000]

BES: Besiktas; FEN: Fenerbahce; GAL: Galatasaray; TRA: Trabzonspor.
Correlation matrix and GARCH coefficients are available from the authors upon request. The alternative measure for unexpected points is based on Castellani et al. (2015) and described in the text in detail. The null hypothesis of the portmanteau test is that there are no ARCH effects in the residuals.
---: Omitted due to insufficient number of observations in which the team is at the bottom 3.
***, **, *: Significant at 1%, 5% and 10% respectively. Standard errors are shown between curved parentheses and p-values are shown between squared brackets.