



Universidade de Aveiro

2020

**JOÃO PEDRO DA
SILVA FERREIRA**

**Determinantes dos Retornos das Ações de
Clubes de Futebol Europeus**

**Determinants of European Football Clubs'
Stock Returns**



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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Economia, realizada sob a orientação científica da Doutora Mara Teresa da Silva Madaleno, Professora Auxiliar do Departamento de Economia, Gestão, Engenharia Industrial e Turismo da Universidade de Aveiro.

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palavras-chave

Retornos das Ações, Clubes de Futebol Listados em Bolsa, Performance Desportiva, Performance Financeira

resumo

Esta dissertação investiga os determinantes do retorno das ações de seis clubes de futebol europeus. Um modelo de regressão ARCH foi simulado para testar diversas variáveis desportivas. Simultaneamente, uma análise em painel de dados foi conduzida para estudar o impacto das variáveis financeiras. Os resultados sugerem um impacto significativamente positivo (negativo) das vitórias (empates/derrotas) no retorno das ações dos clubes. A sua magnitude é superior após uma derrota, o que denota a existência de uma reação assimétrica do mercado aos diferentes resultados dos jogos. Adicionalmente, existe evidência de um impacto superior nas ações em resposta a jogos de maior importância. O retorno das ações parece reagir positivamente a indicadores de rentabilidade favoráveis, como por exemplo o crescimento das receitas operacionais, do EBITDA e do resultado líquido. Por outro lado, o aumento do valor do ativo total provoca um decréscimo no retorno das ações.

keywords

Stock Returns, Public Listed Football Clubs, Sporting Performance, Financial Performance

abstract

This dissertation investigates the determinants of six European football clubs' stock returns. An ARCH regression model was run to test several sporting variables, while simultaneously a panel-data analysis was conducted to study financial variables' impact. The results suggest a positive (negative) and significant influence of victories (draws/defeats) on the clubs' stock returns. We found an asymmetrical reaction of the stock market following losses and wins, with a greater magnitude being registered after the former. Additionally, more important matches tend to lead to greater impacts on stocks. Stock returns seem to react positively to improved profitability indicators, such as operating revenues, EBITDA, and net income growth. On the other side, an increment in the clubs' total assets value leads to a decrease in stock returns.

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1. Introduction

Football might be the most powerful and simplest sport in the world. Few sports can rival football. Its simplicity and capacity to keep captivating more and more people all over the world are astonishing (Huth, 2020). Football has been changing since its creation. Football has not only been watched and played by millions but it is, at this point, completely embedded in society. However, this relationship is not entirely unilateral. Football has become a great industry, mainly in Europe. Player transfers follow an increasing tendency, having reached outrageous levels, television rights are sold by millions and millions of Euros, and sponsorships into football competitions and clubs are immeasurable (Maci et al., 2020). The internationalization of football through marketing made it possible to create a massive business at this scale (Galoppo and Boido, 2020).

In this dissertation, we will try to demonstrate that football clubs' stock returns cannot be entirely justified by rational methods of business valuation, considering that the football market has its specificities and football clubs should not be analyzed as any other typical company/market (Ozdurak and Ulusoy, 2020). We will analyze six European football clubs' stock returns reaction to sporting events and the annual financial reports separately (Chen et al., 2020). This dissertation aims to answer the following questions:

- 1) Do football match results have an impact on the clubs' stock returns?
- 2) Is there an asymmetrical reaction to football match results?
- 3) Is match importance relevant for the analysis of the market response? Do important matches affect stock returns in a greater magnitude?
- 4) Will there be any impact of the unexpected component of match results on the stock market?
- 5) Do annual financial statements have an impact on clubs' stock returns?
- 6) Is the football stock market driven by investor sentiment or sought through decisions?

The football industry represents a distinctive stock market segment (Prigge and Tegtmeier, 2020). As Brown and Hartzell (2001) referred, sporting publicly traded companies are more exposed to new information than standard companies. Football clubs participate in various competitions throughout the season and at least one match takes place every week, which represents new information to the investors. Oppositely, standard companies' data is more limited, where investors can mainly extract information from the companies' financial reports released quarterly and news that might come out in the press. Therefore, considering football matches as relevant information in the stock market, another feature that differentiates this market from others is the fact that most football matches occur on weekends when markets are closed.

Hence, all agents have access to the outcome at the same time, excluding the possibility of insider information. Additionally, we can expect a clear market reaction to the matches' outcomes in the following working day.

The semi-strong market efficiency theory, defended by Fama (1970), assumes that stock prices reflect all relevant and public information, meaning that all asset prices traded in the market should reflect all historical and publicly available information. Public listed football companies should not be any different. Therefore, we should expect share prices to be impacted and to reflect not only the financial reports but also the match results, consolidating financial and sporting available data. Hence, one of the expected results is a significant impact of match results in the clubs' stock returns. The success of a club on the pitch highly increases the probability of winning titles every season and consequently its prize money. Additionally, great sporting performances by the team will increase the players' market value, increasing corporate assets value, or the opportunity to have a substantial cash inflow.

Moreover, it is convenient to analyze whether stock price variations within this market are driven by investor sentiment or by conscious and weighted decisions. In my opinion, rational behavior from the investors would be reflected in a positive relationship between the clubs' stock returns and their financial and sporting performance. Therefore, sound financial results and good sporting performances will positively impact stock returns. Therefore, instead of only analyzing the sporting performances' impact on the clubs' stock returns, as the majority of the existing studies, we will analyze the same impact from the financial point of view, by collecting data from the annual released reports. Additionally, the large collected sample size, from six European clubs, can determine stronger and more solid results, as it comprehends 16 years of data, from 2002 to 2018, with a maximum of 751 match results for one of the clubs (Juventus FC). Besides, we will study the

impact of match importance, including European football matches, games against rivals, and a new Relative Points to Victory (RPV) measure, and the unexpected component of match results.

The structure of this dissertation will be as follows. Section two presents the framing for the complete work. The third section presents the literature review. The fourth section shows the methodology and data selection. In the fifth section, the empirical results will be reported and discussed, and lastly, the sixth section will be to present the conclusion.

2. Framing

2.1 National and International Competitions

First, when analyzing football match results, it is important to refer to which competitions will be included in this study. When it comes to national competitions, we have decided to only include the domestic league's match results, leaving out all results for the domestic cups. The main reason is the low level of importance that each club gives to these cups. Generally, the clubs' priority for each season is to obtain a good final position in the national league, and performing strongly in domestic cups comes as a secondary objective since we are used to seeing a great part of the teams saving the higher performers in these matches and allowing other players with lower aggregated matches playing time.

As for international competitions, the collected data includes the match results from UEFA Champions League and UEFA Europa League, previously known as UEFA Cup which has suffered a rebranding in season 2009/2010, changing its name to UEFA Europa League and its format, expanding the group stages and the qualifying criteria has changed as well.

Most of the European football clubs have, every year, three internal competitions plus one European competition if qualified. To explain how the national leagues work we will exemplify the specific case of the Premier League, the English football league. Currently, this league comprehends 20 clubs where each club plays 38 domestic games per season, which means that one club plays twice with the other 19, one game home plus one away. At the end of the season, the league top-4 clubs will play in the UEFA Champions League in the following season, either from direct qualification or play-off. This competition is known as the most prestigious and profitable European competition that includes the best clubs in every European country. As for the fifth standing in the league table enters directly in Europa League. The last three clubs of the league are relegated to Championship League (second English football league).

The relevance and priority of the clubs to participate in the European competitions have been escalating over time, probably due to the exponential growth of UEFA prizes (Table 1) and consequent sponsorships and advertising agreements. As stated by Boido and Fasano (2007), boosts in ticket sales, as well as sponsorships and media contracts, is an expected outcome when the club is a winner. In 2006/07 season, UEFA provided a total net value of EUR 590 million to be distributed to the UEFA Champions League' participants, while more recently, in the 2018/19 season, the same payments from UEFA have reached an amount of almost EUR 2.000 million, EUR 600 million more compared with the previous year.

2.2 Business model

There are three major income sources in European football clubs: broadcasting rights, ticket office, and commercial revenues. Clubs' sporting performance plays a key role in their financial results as good performances on the pitch usually trigger the increase in the club's revenues in the three mentioned sources. Besides that, a strong sporting performance throughout the season will most likely assure the national league's title or at least, a place in the first positions of the table. This will allow not only to receive the prize for the league title, but also guarantee a fee for access to the European competitions of next year, either UEFA Europa League or UEFA Champions League.

European competitions' prizes have been progressively increasing since the start of the century, as shown in table 1. The transformation of UEFA's prize payment system throughout the years has generated a reorientation by the clubs of their objectives. Additionally, besides the considerable prize money, clubs can gain visibility and reputation as their presence in the European competitions become more and more frequent, never neglecting sporting performance, generating new income sources, either by new sponsorship agreements or the increase in the number of fans all over the world.

Over the years we have been experiencing changes in the football market. A long time ago matchday revenues were the main income source for the clubs. Nowadays the trend dictates a decrease in its importance as broadcasting deals have been gaining emphasis throughout the years.

Table 1. UEFA competitions prizes between 2005/06 and 2018/19

UEFA Champions League Prize Money															
UEFA Champions League (EUR '000)		Play-offs		Group Stage				Knockout Stage				UEFA Super Cup			
Total Prize	Season	Qualified	Eliminated	Participation	Performance bonus	Win	Draw	Total distributed bonuses	Market pool	Round of 16	Quarter finals	Semi finals	Final	Runner-up	Winner
1,980,000	2018/19	-	5,000	15,250	2,700	900	259,000	292,000	9,500	10,500	12,000	15,000	19,000	3,500	4,500
1,318,900	2017/18	2,000	3,000	12,700	1,500	500	144,000	507,000	6,000	6,500	7,500	11,000	15,500	3,000	4,000
1,396,125	2016/17	2,000	3,000	12,700	1,500	500	143,982	580,043	6,000	6,500	7,500	11,000	15,500	3,000	4,000
1,356,428	2015/16	2,000	3,000	12,000	1,500	500	144,032	577,726	5,500	6,000	7,000	10,500	15,000	3,000	4,000
1,038,625	2014/15	2,100	2,100	8,600	1,000	500	96,000	492,900	3,500	3,900	4,900	6,500	10,500	2,200	3,000
1,002,660	2013/14	2,100	2,100	8,600	1,000	500	96,000	457,250	3,500	3,900	4,900	6,500	10,500	2,200	3,000
974,415	2012/13	2,100	2,100	8,600	1,000	500	96,000	434,570	3,500	3,900	4,900	6,500	10,500		
836,945	2011/12	2,100	2,100	7,200	800	400	76,800	379,000	3,000	3,300	4,200	5,600	9,000		
830,745	2010/11	2,100	2,100	7,200	800	400	76,800	373,300	3,000	3,300	4,200	5,600	9,000		
802,642	2009/10	2,100	2,100	7,290	800	400	76,800	342,767	3,000	3,300	4,000	5,200	9,000		
595,080	2008/09	-	-	5,400	600	300	57,600	274,800	2,200	2,500	3,000	4,000	7,000		
593,985	2007/08	-	-	5,400	600	300	57,600	277,000	2,200	2,500	3,000	4,000	7,000		
592,935	2006/07	-	-	5,400	600	300	57,600	276,335	2,200	2,500	3,000	4,000	7,000		
437,134	2005/06	-	-	3,908	500	250	30,864	217,657	1,608	1,929	2,572	3,858	6,430		

UEFA Europa League Prize Money															
UEFA Europa League (EUR '000)				Group stage				Knockout Stage							
Total Prize	Season			Participation	Performance bonus	Win	Draw	Total distributed bonuses	Market pool	Round of 32	Round of 16	Semi finals	Final	Runner-up	Winner
UEFA Europa League															
560,000	2018/19			2,920	570	190	99,300	168,000		500	1,100	1,500	2,400	4,500	9,000
399,800	2017/18			2,600	360	120	62,600	160,000		500	750	1,000	1,600	3,500	6,500
423,188	2016/17			2,600	360	120	62,587	183,401		500	750	1,000	1,600	3,500	6,500
411,155	2015/16			2,400	360	120	60,844	183,111		500	750	1,000	1,500	3,500	6,500
239,750	2014/15			1,300	200	100	36,000	114,250		200	350	450	1,000	2,500	5,000
232,500	2013/14			1,300	200	100	36,000	107,000		200	350	450	1,000	2,500	5,000
226,300	2012/13			1,300	200	100	36,000	100,800		200	350	450	1,000	2,500	5,000
164,260	2011/12			1,000	140	70	20,160	73,900		200	300	400	700	2,000	3,000
157,580	2010/11			1,000	140	70	20,160	67,220		200	300	400	700	2,000	3,000
147,127	2009/10			1,052	120	60	17,280	58,871		180	270	360	630	2,000	3,000
UEFA Cup															
41,793	2008/09			237	40	20	3,200	15,133		70	70	300	600	1,500	2,500
41,155	2007/08			224	40	20	3,200	15,022		70	70	300	600	1,500	2,500
40,465	2006/07			215	40	20	3,200	14,548		70	70	300	600	1,500	2,500

Note: Information collected from UEFA's official website and retrieved in September 2018

Table 2 is a clear example of this tendency, in which is presented SL Benfica's operating income in broadcasting deals, matchday, and commercial dealings between 2007 and 2018.

Table 2. SL Benfica's operating income between 2007 and 2018

Operational Income (EUR '000)								
Date	Total	Other		Media TV		Matchday		Commercial
jun/18	121,541			62,197	51%	24,032	20%	35,312 29%
jun/17	128,235			70,721	55%	24,405	19%	33,109 26%
jun/16	126,075	6,812	5%	68,460	54%	22,022	17%	28,781 23%
jun/15	101,974	8,161	8%	49,150	48%	20,943	21%	23,720 23%
jun/14	105,039	7,586	7%	50,543	48%	23,245	22%	23,665 23%
jun/13	88,306	3,514	4%	29,883	34%	29,663	34%	25,246 29%
jun/12	91,119	3,640	4%	31,940	35%	32,064	35%	23,475 26%
jun/11	82,767	3,121	4%	24,395	29%	32,612	39%	22,639 27%
jun/10	66,382	5,330	8%	12,290	19%	24,175	36%	24,587 37%
jun/09	46,880	4,865	10%	10,941	23%	16,765	36%	14,309 31%
jun/08	49,503	2,613	5%	16,292	33%	18,402	37%	12,196 25%
jul/07	56,874	4,657	8%	17,716	31%	20,971	37%	13,530 24%

Note: Data collected from Benfica's financial reports and retrieved in September 2018

Additionally, a club's dimension is a key factor of their revenue sources and corporate strategies. Dobson and Goddard (2001) analyzed the relationship between sporting performance and matchday revenues, concluding that this link was only verified in 8% of the sample. In other words, only small-sized clubs will largely depend on match day revenues.

Broadcast rights negotiations between the clubs and TV stations can be quite critical for the formers. From Table 2, we can seize that the income from media TV represents a large portion of the clubs' total revenues. In 2007, income from broadcasting rights agreements represented 31% of the total revenue, being match day income the primary revenue source, around 37%. If we move forward to a more recent year, in 2018 we behold a completely different picture, with the main revenue source of the club grounded in the TV rights income, representing more than half of the club's total revenue, while match day income followed the opposite direction and was representing then around 20% of the total revenue. This example is a clear image of the changing business strategy in football panorama. It is well known that football is no longer just a sport, but are management strategies within the football market only profit-maximize oriented?

There are various statements and conclusions within the literature when it comes to this subject, and the authors' opinions are not unanimous. El-Hodiri and Quirk (1971) assume clubs are profit-maximize companies, while Szymanski (2010) stated clubs strive to maximize sporting performance. Sloane (1971) and Kesenne (2007) described clubs as utility maximizers, pursuing good sporting results and the development of its reputation, considering all financial restrictions. Morrow (1999) and Dobson and Gerrard (1999) followed a similar line of thought, considering the sporting performance maximization as a priority to the clubs once achieved a minimum stipulated profit.

On the other hand, some authors acknowledge the presence of a mixed management strategy. Vrooman (1997) and Vrooman (2000), and Szymanski and Kuypers (1999) share equivalent opinions, recognizing that clubs follow a mixed strategy, linking good performances in and out of the pitch. The former author complemented this idea, in which the operating strategy will strongly depend on corporate governance. In the presence of a "sportsman-ownership" type of management, the strategy will be likely oriented to a mix of sporting and financial maximization. Gerrard (2005) has shown clubs that pursuit a mixed management strategy, for a determined level of available resources, can obtain better sporting results to the detriment of financial ones.

2.3 Sporting success, financial success

Many authors consider clubs' sporting success as a fundamental driver of their financial success. Szymanski and Smith (1997) have shown a linear relationship between profit margin and sporting performance of the clubs, after developing an explanatory theoretical model of English clubs' financial performances in the decades of 70 and 80. Szymanski (1998) refers that an increase in sporting performance originated from an increase in the clubs' profit in more than 50% of the cases. The authors also stated that a higher investment in the squad leads to a greater performance on the pitch. Szymanski and Kuypers (1999) stated that the clubs' final league standing would have an impact on their financial income.

Stadtman (2006) found a link between the clubs' sporting success and their revenues and profit. If a club achieves one of the top standings in the league, securing the qualification to the European competitions will capture an increase of its financial income, either from UEFA prizes (per qualification and competition performance) or from broadcast rights agreements. On the other hand, great performances on the pitch and the qualification to European competitions will captivate more people to the stadium and an expected increase in the ticket prices, leading to an increase in matchday and merchandising income. Moreover, commercial revenues are as well impacted, since sporting success will attract more sponsorship and advertising contracts.

Rohde and Breuer (2016) stipulated three hypotheses, referring financial success of the major European football clubs is positively linked with national and international sporting success and with clubs' brand value and commercial revenues.

Many authors presented sporting success as one of the most important determinants of clubs' financial success. However, there are more relevant drivers of financial performance, namely the investment in the development and promotion of the clubs' brand. Gladden, Milne, and Sutton (1998) referred to American Major League clubs' brand market value had a positive impact on their merchandising income.

Hence, if sporting results are below the expectations, either by players' injuries or poor management, it would be likely financial performance to follow this decline. Overall, good performances on the pitch will be followed by good results out of it, sound financial results, which will allow clubs to see their asset value increase, either from players increasing market value over the season or/and the investment in new players.

2.4 Initial Public Offering (IPO)

Initial Public Offering (IPO) refers to the process of a private company going public by selling its stocks to public investors. Once a company goes through an IPO, it will allow it to raise capital from the general public by issuing shares. However, going public also implies greater transparency from the companies as well as scrutiny and discipline from the financial markets, which is a powerful tool to promote better management teams in the companies.

Within sporting companies, namely football clubs, the picture may be distinctive as an IPO does not seem to improve the level of management in clubs and share prices tend to underperform the market (Ritter, 1991; Loughran and Ritter, 1995; Ritter and Welch, 2002). Brav, Geczy, and Gompers (2000) and Eckbo and Norli (2000) stated that the involved risk is the reason behind the stock returns underperformance after an IPO, as these firms are mainly small. The picture would be different if the sample was controlled by company size. From Hall, Szymanski, and Zimbalist (2002) study, it was visible that English football clubs obtained better sporting results after undergoing an IPO. However, they have suffered financial losses and the profit decreased. The fact that clubs spend their financial gains on the purchase of new assets (players) can be the reason behind these results. The author has also shown an increase in personnel expenses, which is an expected outcome when new players arrive.

Baur and Mckeating (2009) obtained partially different results, referring that a club that undergoes an IPO sees its sporting performance diminish either in domestic or international competitions. As per its financial performance, it also underperforms comparing to similar firms. Aglietta, Andreff, and Drut (2010) studied the relevance and effect of IPOs in European football clubs. The authors refer that the football market is not appealing from the investor's perspective in the long-run, and the main obstacle for a successful IPO is mainly the soft management within clubs, whose mild posture in the budget constraints harms the clubs' financial sustainability.

2.5 Weekend effect

The companies incorporated in the football industry have a particularity comparing with the standard companies, as price-sensitive information frequently arises during the weekends because, as we know, football matches occur mostly on the weekends, especially domestic competition matches. Since the market is closed meanwhile, this information will be reflected in the share prices on Monday.

Fields (1931) referred share prices usually suffer an increase on Saturdays (New York Stock Exchange was open on Saturdays at this time), due to the high instability in Wall Street during that period, which led investors to close their positions on the weekend. French (1980), while trying to prove the presence of a linear relationship between average stock returns and investment period, stated these returns on Stock Exchange, should be three times higher during the week compared with the returns on the weekend. Gibbons and Hess (1981) stated stock returns were significantly negative on Mondays, which could be explained by biased reactions from the investors to overcome the weekend.

3. Literature Review

3.1. Sporting events

3.1.1. Match result/sporting performance

There have been some articles related to the study of football clubs' sporting performance and its effect on stock prices. A great part of the papers has focused on the public English football clubs (Renneboog and Vanbrabant, 2000; Andreff and Szymanski, 2006; Bell *et al.*, 2012; Palomino, Renneboog, and Zhang, 2009). While Duque and Ferreira (2005) studied the Portuguese market, Berument, Basak, and Ogut-eker (2009) concentrate on the Turkish football league. Stadtmann (2006) analyzed a specific club, Borussia Dortmund from Germany, and Bernile and Lyandres (2011) investigated football clubs from different European countries. The results converge in the same direction, pointing to football match results as a determinant for the clubs' stock price behavior. Wins often lead to a positive variation in the stock price, whilst a draw or a defeat has the opposite effect.

Morrow (1999) was the first study to analyze the effect of football match results on the clubs' stock prices. The sample only included two clubs, Manchester United and Sunderland, from England, for a short period of six months. The author concluded that the prices of stocks would increase after a match victory and decrease after a loss. Renneboog and Vanbrabant (2000) analyzed the impact of sporting results on the clubs' stock prices. They researched seventeen British football clubs for three seasons, between 1995 and 1998. Victories resulted in positive abnormal returns of 1% on the first transaction day after the match, whereas draws and losses triggered negative abnormal returns of -0.6% and -1.4%, respectively. They also found that abnormal returns would be magnified if they were calculated cumulatively in the following five days to the game.

Since then many authors have studied the impact of sporting results on the clubs' stock prices. Ribeiro (2001) while analyzing Portuguese football clubs, was one of the few authors unable to find any relationship between sporting and financial performance of stock prices. Victories, draws, or defeats appear to have no explanation power, only if the club wins the national league. Brown and Hartzell (2001) studied Boston Celtics' stock returns reaction to the team's sporting performance. The authors referred that it impacts not only the stock returns but also the volume of transactions and price volatility. They also pointed out the asymmetric reaction of stock returns to wins and losses. Ashton, Gerrard, and Hudson (2003) analyzed the economic impact of national sporting

events in the stock market. They have focused on the English national football team results and their impact on the FTSE100 index. The results indicate a positive variation in the stock market returns after a victory, and oppositely a negative effect subsequently to a defeat. Duque and Ferreira (2005) studied two Portuguese clubs, Sporting CP and FC Porto, and the results showed that any match outcome would have an impact on Sporting's share prices, while for FC Porto only draws had a significant impact. Stadtmann (2006) also confirms a "close link between the sporting success and subsequent changes in the stock market", when analyzing Borussia Dortmund. Edmans et al. (2007) have chosen a slightly different path, studying the impact of international football games in the stock market, showing that a loss led to a negative reaction of the market. The authors have found no evidence that wins generate any impact on the share prices. Additionally, more important matches would generate a bigger impact on the investors' mood in case of defeat. They have concluded the negative effect of the international football club losses would lead to changes in the investors' mood.

Amir and Livne (2005) considering 24 British clubs and a total sample of 1,348 matches have shown that victories lead to an increase in the share price while a defeat would originate the opposite effect. Berument, Basak, and Gozpinar (2006) studied the impact of match results of three Turkish football clubs in the ISE-100 index between 1987 and 2003. The results were statistically significant for one of the clubs (Besiktas JK) whose victories triggered an increase in the index prices.

Fotaki, Markellos, and Mania (2009) came up to the same conclusion, with the formers referring that the share prices are a positive function of won matches. They still added that the greater the goal difference in a match, the greater would be the impact on share prices. Palomino, Renneboog, and Zhang (2009) and Bell et al. (2012), who followed Renneboog and Vanbrabant study, analyzed British football clubs and provided similar conclusions. Benkraiem, Louhichi, and Marques (2009) studied the share prices of nineteen European football clubs before and after the matches between 2006 and 2007. The results are following most of the literature, revealing a significant negative impact on draws and losses. On the other side, victories led to a significant rise in share prices not after, but before the match. Samagaio, Couto, and Caiado (2009) studying English football clubs affirm that there is an immediate positive turnover in the four major clubs after good performances in UEFA matches. Baur and Mckeating (2009) while analyzing European football clubs' performances after undergoing an IPO refer that clubs' stock prices are not only dependent on their performance in European competitions but also of the teams' results from the previous season.

Bernile and Lyandres (2011) also converged into the same conclusion with an expanded sample of 20 European football clubs. Berument and Ceylan (2012) gathered data from Chile, Spain, Turkey, and the United Kingdom to analyze the impact of domestic football match results between rivals in the clubs' stock returns. The results were not consistent between countries. In Spain and the United Kingdom, they indicate a decrease in stock returns following negative match results, and investors become more risk averse. As for positive match results, the authors have not found statistical evidence for these countries. On the other side, for the remaining countries (Chile and Turkey), the results were the opposite, showing an increase of the clubs' stock returns after a win, and the agents being more willing to take risks.

Saraç and Zeren (2013) achieved the same results while analyzing Turkish football clubs respectively. Godinho and Cerqueira (2014) investigated clubs from six different European countries and converged to the same results, confirming the significant influence of football match results in the stock market response. Floros (2014) found a positive effect of draws on SL Benfica and AFC Ajax stock returns, and a negative impact of draws and losses on Juventus FC stock returns.

In the same direction, Gallopo and Boido (2020) refer to a significant and negative effect of losses and draws in the stock returns, with a greater magnitude in the former, while victories led to a positive impact. On the other side, Skrinjaric and Barisic (2019) found no evidence that football match results for Croatian National League have an impact on stock returns.

In a great part of the papers and articles surrounding this topic, independently of the sample and the different countries and sports, the results converge into the same conclusion, proving the connection between sporting results and the club's performance in the stock market. The truth is that sporting results will determine the financial results of the clubs. Since the stock fair value price represents the sum of future discounted cash flows, financial performance should have an impact on the stock prices.

3.1.2. Match importance

Considering the hypothesis that match results have an impact on the stock returns, it is expectable that matches with a higher level of importance will have a higher impact as well. Renneboog and Vanbrabant (2000) state that European competitions' matches, either for UEFA Champions League or UEFA Europa League, will result in a greater impact on stock returns when compared to domestic matches (National League and National Cup). The same conclusion was made by Scholtens et al.

(2009) who presented higher negative abnormal returns for the clubs after a loss in European matches.

Hence, one of the variables to measure the match importance is the competition, segregating matches into two types, European and domestic matches. The former comprised all games for UEFA Champions League and UEFA Europa League and the second the National League matches.

Why should we expect a greater impact in clubs' stock returns after European matches? This question could be, in our opinion, explained by two reasons. First of all, the considerable and growing prizes in these competitions are captivating. As we could see previously, the minimum participation prize in UEFA Champions League in the 2018/19 season was EUR 15 million-plus EUR 2.7 million more for each victory. In season 2005/06 these prizes were of EUR 3 million and EUR 0.5 million, respectively. Secondly, we would say it is a matter of prestige as these competitions gather the best European clubs every year. According to Gallapo and Boido (2020), defeats in continental competitions, such as the UEFA Champions League, produced a greater impact on stock prices, comparing to National competitions.

Another variable that could measure the match importance is to split the sporting seasons in two, considering the last three months, for example, of the season as of greater importance matches. Renneboog and Vanbrabant (2000) divided each season in two, considering the matches played in the last three months as the most important ones. The authors referred that wins in matches where the promotion was possible, resulted in abnormal returns of 3.2% in the following day of the match, while defeats led to abnormal returns of -3.1%. The results were even more meaningful for matches where the relegation was at stake, showing abnormal returns after the match of 5.8% and -6.5%, respectively.

Ferreira (2005) used the RPV (Relative points to victory) variable to distinguish the importance matches magnitude. This variable enables us to understand the difference within league points between the analyzed club and the league leader at the match date. He concluded that stock returns increase when RPV is higher. Zuber *et al.* (2005) applied dummy variables to recognize if the club is in the top 5 or the bottom 3 of the national league, stating the stock market would be more impacted for match results between clubs in these positions.

Palomino, Renneboog, and Zhang (2009) have split each season in two, one half for all matches until April, and the other half for the last three months of the season between April and June. According to the authors, the last three months should comprehend the most important matches

of the season, simply because it is generally in the last matches that all decisions are made. In our opinion, there is an issue with this approach, since the club could have an enormous advantage/disadvantage from its direct rival weeks before the end of the season, which implies that those last matches become meaningless.

Bell *et al.* (2012) take into consideration two variables when distinguishing important matches. The first one measures the rivalry level between clubs, considering the clubs' position in the previous and current year. The second variable counts the number of matches left till the end of the season and weighs the extent to which the club's position diverges from the mean. This measure also differentiated clubs standing in league top and bottom positions, and as Renneboog and Vanbrabant (2000), only considers the last matches of the season.

3.1.3 Unexpected results (betting odds)

Betting odds have been used as investors' expectations' proxy and also provides the probabilities for match results. Stadtmann (2006) has utilized betting odds to control match results expectations for Borussia Dortmund, a German football club. The author argues that only unexpected match results should impact stock prices. Using betting odds to calculate the expected outcome from a match, he was able to distinguish expected from unexpected results. However, the results were not under his expectations, which dictated statistical significance only for European football matches, more precisely for the UEFA Cup.

Scholtens *et al.* (2009) have applied the same method, although they have not found any statistical evidence of odds being integrated into the share prices, since either expected or unexpected wins led to an increase in the share prices whilst expected and unexpected defeats originated a decrease. Palomino, Renneboog, and Zhang (2009) refer to odds as a great match result forecast tool, nevertheless, there is no indicative signal of stock markets reacting to this information, as the stock market reacted more sharply to expected victories than to a defeat when a victory was expected. We can perceive from here that betting odds are price-insensitive information. Bell *et al.* (2012), analyzing English football clubs, refer that both match results and unexpected points have a positive impact on the clubs' stock returns.

Demir and Danis (2011) studied the match results' effects of three Turkish football clubs, using two models. In the first one, they apply a raw function, with no controlling variables, whose results demonstrated that draws and defeats would lead to significant negative stock returns whilst wins led to no significant results. In the second model, they applied dummy variables to control match expectations, identifying expected and unexpected match results. On this one, unexpected victories originated an increase in share prices, while unexpected defeats had the opposite result.

Frijns (2020) found evidence of a higher impact on stocks from surprising results, comparing to expected outcomes. The stock market seems to react timidly to highly expected results.

Betting odds may not be the most precise proxy to measure investors' expectations. Bookmakers are entities driven by profit maximization, meaning odds can be biased and might not represent the most accurate match result probability. Betting exchange odds are probably the most reliable available data to use as a proxy, however, they are not as precise as betting odds when predicting match results (Palomino, Renneboog, and Zhang, 2009).

3.1.4. Attendance

We have decided to include the attendance in the football matches as one of the regression explanatory variables. The assumption is simple, the number of spectators per match should positively impact clubs' stock returns.

One of the first studies of match attendance was from Bird (1982). The author tried to estimate an explanatory regression of the number of spectators of the four English football leagues. Using a sample of 92 clubs for 32 years, between 1948 and 1980, the author concluded that ticket prices and the number of goals throughout the current and previous seasons are the main reasons behind the number of spectators per game. Domazlicky and Kerr (1990) analyzed the same dependent variable for Major League Baseball, the American Baseball League, between 1960 e 1980. Apart from the ticket prices, these authors have added other statistically significant variables such as the number of people that reside in the clubs' region, GDP per capita, the number of wins and observed matches, match results, number of teams, stadium conditions, and the clubs' division, that stand as the drivers of the number of spectators. On the other side, analyzing a different sport, Burkitt, and Cameron (1992), analyzing British Rugby League between 1966 and 1990, stated that the club's ranking position is the key factor when explaining the number of spectators in the stadiums.

From the conclusions drawn by these authors, it becomes clear that clubs' sporting performance is one of the most important drivers of the attendance in the matches. Pinnuck and Potter (2006) in their study mention that great sporting performances will positively influence the number of spectators. Therefore, stadiums that present higher occupation rates may represent better performances from their clubs, which consequently could lead to better results and an increment in the stock returns. Czarnitzki and Stadtmann (2002) analyzed the relationship between sporting success and the number of spectators for German football matches and they found a positive link among these variables.

Gimet and Montchaud (2016) found a significant connection between stadium attendance and stock returns, in which the former positively influences the latter.

3.1.5. Player Transfers

March (2014) referred that only substantial player transfers would have an impact on English football clubs' share prices, particularly the acquisition of players would generate a positive impact. Overall, player transfers do not foster variations in the share prices. Oppositely, Athanasios (2013), studying the European transfer market, stated that the clubs' share prices abnormally increased (decreased) upon a player sale (acquisition). Bakker (2016), on the other hand, stated stock returns of football clubs tend to increase following a player sale or acquisition, and the higher the transfer amount received, the higher the stock's impact's magnitude.

Allouche and Soulez (2005) and Fotaki, Markellos, and Mania (2009) refer that the market reacts positively to the sale of players, which could mean agents consider a capital input and the cost reduction more critical than a loss in the club's asset value. Following the same logic, the market reacts negatively to the purchase of players, meaning investors give priority to short-term results, responding strongly to the outflow of capital and the increase in the salaries, and not taking the transfer as an investment with possible future earnings.

Furesz and Rappai (2020) stated that in 66% of the cases, stock prices reacted to the player transfer announcement, and in most cases, this impact is denoted before the actual announcement. On the other hand, Gimet and Montchaud (2016) found no significance in players' sales and purchases.

3.2. Financial Literature

The main question here, for which there is no unique and exact answer, is what drives the stock market? As we said, up to now, no one can give a precise formula able to predict stock prices' behavior. Technically, the level of supply and demand is going to determine the stock price on a certain day. However, we need to understand what moves agents to sell and buy determined stocks.

In an efficient market, the main determinants of stock returns are growth potential indicators, also called fundamental factors (Thampanya, Wu, Nasir, and Liu, 2020). Indicators such as earnings per share (EPS) or Price-to-earnings (P/E), useful to understand if a company's share price is under/over-valuated, are examples of fundamental factors. More and more studies have shown shreds of evidence that stock returns are based on market and firm-level characteristics, such as risk (debt), dimension (market capitalization and book-to-market ratio), and growth potential measures (cash flow-to-price and earnings-to-price), making these good forecasting measure of asset pricing (Fama and French, 1992; Fama and French, 1993; Ferson and Harvey, 1999; Wang *et al.*, 2009; Bekaert, Hodrick, and Zhang, 2009). Brogaard, Nguyen, Putnins, and Wu (2019) point firm-specific information as the key driver of stock price variation, mainly through the increase and improvement of corporate disclosure. Daniel, Titman, and Wei (2001) associate the stock returns to the market inefficiency in incorporating information into prices, while Davis, Fama, and French (2000) refer risk factors exogenous to the market as drivers of stock returns subsistence. Stock prices are substantially bigger in firms with greater cash-flow-to-price, earnings-to-price, and book-to-market ratios (Fama and French, 1998; Griffin and Lemmon, 2002).

According to the Capital Asset Pricing Model (CAPM), which describes the relationship between systematic risk and the expected return of an asset, stock returns are mainly explained by the systematic risk/volatility of a security or portfolio compared to the market.

One of the purposes of this study is to measure the financial performance of European football clubs and analyze its impact on stock returns. We have decided to utilize financial ratios to measure this performance, taking into consideration three financial indicators, profitability, liability, and liquidity. Profitability indicators, as the name indicates, express the degree of the company's profits in various forms, such as the operating cash flow to total assets and the return on equity, which are a couple of examples that will be applied in this study. Secondly, liability indicators, which for Ecer and Boyukaslan (2014) are the most important financial indicators, demonstrate the relationship

between equity and liabilities, measuring a company's financial leverage, as it is the case of debt-to-equity ratio (D/E). Finally, liquidity indicators express the ability of a company to pay its current debt obligations without requiring external funds. Higher liquidity means greater ease in transacting it, which will be determined by its risk-return relationship. The liquidity ratio, current assets over current liabilities, and transacted stock volume will be used in this paper as liquidity indicators. The higher the liquidity ratio, the better the club's liquidity situation. Aglietta, Andreff, and Drut (2010) pointed out that stock returns tend to decrease when facing illiquidity and low capitalization in the financial markets.

3.3. Asymmetrical reaction

The first study to denote an asymmetrical reaction of the stock prices to match results was from Renneboog and Vanbrabant (2000). They stated that a defeat leads to a higher absolute effect on the stock prices than victories. Scholtens et al. (2009) found a significant impact of wins and defeats in the stock market response, being more expressive in the second case.

According to Palomino, Renneboog, and Zhang (2009), the market strongly reacts to football match results, leading to great trading volumes and abnormal returns in the match the following day. Therefore, after a win, we can observe a positive average abnormal return on the day after the game, but not in the following days. While a defeat generates negative average abnormal returns in the next three days after the match. This could mean that the market reacts quicker to good news than bad ones since the market reaction to defeats extends to three days after the match whilst for wins it only takes one day. From this information, we may say that match results are sensitive information for the markets.

Bernile and Lyandres (2011) examining all games from European competitions (Champions League and UEFA Cup) suggest that it exists an asymmetry in the reaction of the market to the football matches' outcomes, reflecting a significant negative return of stocks after a loss, while wins are followed by returns near to zero.

Berkowitz, Depken, and Gandar (2015) studied the stock market asymmetrical reaction to football match results. According to the authors, a defeat will generate a greater negative impact than a positive one after a victory. Besides its magnitude, they also refer to the greater celerity in the reflection of a defeat in the stock price. For a stock price to reflect a victory in a football match it takes about two or three days, while for a defeat, the price assembles the new information quickly.

In the same way, Castellani, Pattitoni, and Patuelli (2013) have analyzed three publicly listed European football clubs. The results are within the major literature work with victories leading to the increase in share prices and a decrease upon draws and defeats, with the last one raising greater impact.

Dimic et al. (2017) consider that the investors' reaction magnitude, and celerity of the market absorption to the news, varies according to its nature. The authors stated good news are quickly assimilated by the market, contrasting with the slow absorption of bad news, which generates greater impacts on the share prices than good news.

3.4. Sentiment analysis

A relevant part of this dissertation is to analyze whether investors reveal conscientious or emotional decisions in the stock market following football matches. Renneboog and Vanbrabant (2000) refer that public listed football clubs usually underperform comparing to the market index, and that a great part of the investors holds their stocks for supporting purposes, revealing the emotional position of the investors. However, sporting outcomes is not the only empirical measure of investor sentiment. Apart from using football match results to measure it, as done by the following authors, there have been studies around meteorological conditions, from Hirshleifer and Shumway (2003), and the consequences of seasonal diseases, from Kamstra, Kramer, and Levi (2000), to measure the investor sentiment. Edmans, García, and Norli (2007) state the stock market reaction to sporting outcomes has a larger effect in small stocks, predominantly held by local investors, which demonstrates that stocks are affected by investor sentiment.

Berument et al. (2006, 2009, 2012) sought to connect a link between clubs' international success and their stock returns. The authors stated the prevailed level of fanaticism impacts the stock market results. Passionate fans react more impulsively, which implies a significant impact on the investors' sentiment in the market. However, fanaticism is not easy to quantify, and it always must be based on subjective assumptions. The authors found evidence that in more competitive football competitions like in the UK and Spain, the expectations are higher, which leads to more frequent negative reactions in the market, as the expectations are not fulfilled. On the other hand, in competitions with lower levels of competitiveness, investors' expectations are diminished, withdrawing the possible market losses.

Baker and Wurgler (2007) point out the differences between companies on the stock price reactions to match results. According to the authors, companies with lower capitalization levels are more sensitive to investor sentiment. Large companies have in their majority bigger and more stable institutional stockholders, whose objectives are different than small and individual investors. Individual investors may have a higher probability of emotional connection to the club, which enables the possibility of irrational or partial decision making. Palomino, Renneboog, and Zhang (2009) refer that small-sized companies go through higher abnormal returns than larger companies.

Palomino, Renneboog, and Zhang (2009) stated football match results are valuable information on the clubs' future cash-flows, which are reflected in the share prices. Part of their results is consistent with the investor's rationality on their expectations since they obtained average abnormal returns of 1% and -1% on the three following days after the match, respectively. However, the results indicated otherwise when applying other tests. The authors demonstrated small companies were associated with higher market reactions to match results. Additionally, they have formulated the hypothesis that the bigger the probability of a match result, calculated from betting odds, the fewer reactions should be expected in the market if the most probable result occurs. Abnormal returns over a win were higher when the victory was most expected, meaning market reactions for the winning teams are triggered by overreactions. On the other hand, market reactions from defeats are not induced by the investor sentiment but are consistent with the rational expectations, that is, inferior abnormal returns were followed by expected defeats.

Bernile and Lyandres (2011) argue that investors have high and unrealistic expectations, being too optimistic/pessimistic, which easily results in post-match disappointment, leading to different stock market reactions than expected after the matches.

Curatola et al. (2016) looked for a link between sports sentiment, measured by FIFA World Cup match results, and US sectoral stock returns. The authors found evidence that the sports sentiment affects mainly the Financials sector, being foreign investors more susceptible to it.

Dimic et al. (2017) state investor irrationality is partly responsible for the after-match abnormal returns. The asymmetrical reaction from good and bad news, from the unbalanced magnitude of the impact to the contrasting market's absorption celerity, and as well as the high abnormal return reaction to variables like location and goal difference, leads to the belief that there are investors that react illogically to football matches.

Huth (2019) has formed a profile while analyzing the type of people who would invest in financial instruments of sports clubs. The author stated that people keen on football, knowledgeable about financial instruments, and willing to take some risks are the clubs' target audience. Moreover, individual investors are not expecting financial returns from their investments, but it is their way to help the club to reach its sporting objectives.

Several authors suggest public listed football clubs' stocks are more susceptible to irrational investors' behavior, which can happen when the investor is also a supporter, leading to unreasonable actions from the investors (Berument et al. 2006, 2009, 2012; Baker and Wurgler, 2007; Palomino, Renneboog, and Zhang, 2009; Huth, 2019).

4. Data and methodology

4.1 Sample

The sample comprehends six clubs from six European countries, presented in table 3, AFC Ajax from Netherlands, Borussia Dortmund from Germany, Juventus FC from Italy, SL Benfica from Portugal, Olympique Lyonnais from France, and Manchester United from England, whose detailed information is presented in Table 3.

Table 3. Clubs introductory information

Club	City, Country	Foundation	Stadium*	Titles**		Market Cap EUR Mio
				National	International	
AFC Ajax	Amsterdam, Netherlands	1900	Johan Crujff Arena (54,033)	62 (9)	12	349
BVB	Dortmund, Germany	1909	Signal Iduna Park (83,000)	18 (7)	3	901
Juventus FC	Turin, Juventus	1897	Allianz Stadium (41,475)	57 (16)	11	1,400
SL Benfica	Lisbon, Portugal	1904	Estádio da Luz (65,647)	81 (19)	2	68
Olympique Lyonnais	Lyon, France	1950	Groupama Stadium (59,186)	24 (2)	1	192
Manchester United	Manchester, England	1878	Old Trafford (75,643)	60 (11)	8 (2)	2,600

Note: Information collected from transfermarkt.com in September 2019.

*Stadium's name (total capacity)

** Total number of titles (number of titles in the last 10 years)

The sample period differs from club to club as the Initial Public Offering date varies among clubs, which means the sample size, the number of matches, will diverge between clubs (Table 4). Juventus FC represents the widest sample size, comprehending a total number of 751 considered

matches. On the other side, Manchester United's sample size is the narrowest, including a total of 277 considered matches over 6 years, since it was the most recent club going public, in 2012.

AFC Ajax and Borussia Dortmund represent the second and third largest samples, comprehending 16 years, between 2002 and 2018, followed by SL Benfica and Olympique Lyonnais, having gone public in the same year of 2007, including data from 11 years (see Table 4).

Table 4. Detailed sample data

	SL Benfica	AFC Ajax	Juventus FC	Man.United	BVB	Olymp. Lyon
<i>IPO date</i>	22/05/2007	10/09/2001	21/12/2001	13/08/2012	31/10/2000	12/02/2007
<i>Number of Removed Days</i>	1	155	80	1	372	1
<i>Last game 2017/18</i>	14/05/2018	07/05/2018	21/05/2018	14/05/2018	14/05/2018	21/05/2018
<i>Sample starting date</i>	23/05/2007	23/04/2002	23/04/2002	14/08/2012	23/04/2002	13/02/2007
<i>Sample final date</i>	31/05/2018	31/05/2018	31/05/2018	31/05/2018	31/05/2018	31/05/2018
<i>Total number of days</i>	2803	4079	4091	1458	4093	2890
<i>Number of matches</i>	465	699	751	277	645	539
<i>League matches</i>	345	544	606	225	546	431
<i>UCL matches</i>	70	84	123	34	66	66
<i>UEL matches</i>	50	71	22	18	33	42
<i>Number of wins</i>	300	422	466	156	317	277
<i>Number of draws</i>	86	150	175	61	163	130
<i>Number of losses</i>	79	127	110	60	165	132

Note: Information collected from espn.com and football-data.co.uk in September 2018

4.2 Data sources

All share prices and traded volume were collected from the Wall Street Journal, and the values of the market index of reference, for five of these six clubs, from the Stoxx Europe Football Index. As for Manchester United, it was used the NYSE Composite Index as representative.

Data for domestic matches and pre-match betting odds were collected from football-data.co.uk, while for European matches, all information was taken from the ESPN database. As for the rest of the information, such as match attendance and weekly/annual competitions' standings were collected from transfermarkt.com and zerozero.pt.

All financial data, including yearly balance sheets and income statements, was hand collected from the clubs' annual reports directly.

4.3 Variables

4.3.1 Sporting Variables

To analyze the impact of sporting performances on the stock returns, we have applied three binary variables for the three possible outcomes in a football match (win, draw and defeat) for us to have a clear overview of each result (Renneboog and Vanbrabant, 2000; Galloppo and Boido, 2020). In case the match result of a determined day is a defeat, the dummy will assume the value “1”, and dummies for win and draw will be “0”. The same logic was followed for European match results, which in this case will be one of the match importance measures since we expect greater impacts on these matches comparing to domestic games.

There were additional variables taken into consideration to analyze whether more important matches will have a greater impact on the clubs’ stock returns. In one of these measures, we have defined two dummy variables for matches against the rivals, one for victories and the other for draws and defeats (Godinho and Cerqueira, 2014). Additionally, one variable demonstrates the stadiums’ attendance, represented by the occupancy percentage (Gimet and Montchaud, 2016). Lastly, it was considered the RPV ratio (Duque and Ferreira, 2005) also represented by two binary variables (one for victories and the other for draws and losses), that will only take into consideration the matches in the last three months of the season and if it is still mathematically possible for the club to reach the first place in the standings. RPV variable was only considered for the national league matches, as it is not feasible for European competitions, driven by its structure.

4.3.2 Financial Variables

Similarly to the sporting model, the market index was integrated into the financial regression, as a stock market performance variable, to capture the systematic risk. The market index varies as per the sample, for instance. In this dissertation two market indexes were utilized, Stoxx Europe Football and New York Stock Exchange, as one of the clubs (Manchester United) was not listed in the former as the rest of the sample. Bell et al. (2012) and Gimet and Montchaud (2016) found a significant positive influence of financial markets’ performances on the clubs’ stock returns. Furthermore, we will study different financial ratios such as return on equity, debt-to-equity, and liquidity ratio, among others. This way, we will be able to analyze various types of indicators between profitability, liability, and liquidity. All variables are described in the next section.

4.4 Methodology

To analyze the sporting variables' impact on stock returns, I have applied two multiple regression models, EQ. 1 and EQ. 2, in E-Views, for each of the six clubs separately. We have decided to use an ARCH-Autoregressive Conditional Heteroskedasticity family models regression, to estimate more robust models for time series modeling. The multicollinearity was tested and all variables with a linear relationship were excluded.

4.4.1 Sporting Regressions

$$\begin{aligned} \text{Return}_{i,t} = & \alpha + \beta_1 \text{STOXX/NYSE}_{i,t} + \beta_2 \text{STOXX/NYSE}_{i,t-1} + \beta_3 \text{DWin}_{\text{League } i,t} + \beta_4 \text{DDraw}_{\text{League } i,t} + \\ & \beta_5 \text{DLoss}_{\text{League } i,t} + \beta_6 \text{DWin}_{\text{Europe } i,t} + \beta_7 \text{DDraw}_{\text{Europe } i,t} + \beta_8 \text{DLoss}_{\text{Europe } i,t} + \beta_9 \text{DRPV}_{\text{Win } i,t} + \\ & \beta_{10} \text{DRPV}_{\text{Draw/Loss } i,t} + \beta_{11} \text{Attend}_{i,t} + \beta_{12} \text{DRival}_{\text{Win } i,t} + \beta_{13} \text{DRival}_{\text{Draw/Loss } i,t} + \beta_{14} \text{Volume}_{i,t} + \\ & \beta_{15} \text{Volume}_{i,t-1} + \varepsilon_{i,t} \end{aligned} \quad (\text{EQ. 1})$$

$$\begin{aligned} \text{Return}_{i,t} = & \alpha + \beta_1 \text{STOXX/NYSE}_{i,t} + \beta_2 \text{STOXX/NYSE}_{i,t-1} + \beta_3 \text{Unexp}_{\text{Win } i,t} + \beta_4 \text{Unexp}_{\text{Loss } i,t} + \\ & \beta_5 \text{DWin}_{\text{Europe } i,t} + \beta_6 \text{DDraw}_{\text{Europe } i,t} + \beta_7 \text{DLoss}_{\text{Europe } i,t} + \beta_8 \text{DRPV}_{\text{Win } i,t} + \beta_9 \text{DRPV}_{\text{Draw/Loss } i,t} + \\ & \beta_{10} \text{Attend}_{i,t} + \beta_{11} \text{DRival}_{\text{Win } i,t} + \beta_{12} \text{DRival}_{\text{Draw/Loss } i,t} + \beta_{13} \text{Volume}_{i,t} + \beta_{14} \text{Volume}_{i,t-1} + \varepsilon_{i,t} \end{aligned} \quad (\text{EQ. 2})$$

Dependent variable

Return_{i,t} | Stock return of club i at day t

Independent variables

STOXX/NYSE STOXX/NYSE(-1) | Market stock return at day t and t-1 respectively

Dwin/draw/loss_{League/Europe} | Binary variables for every domestic (League) and international (Europe) match result. Variable assumes value 1 once one of these three possible outcomes for the two competitions occur

Unexp_{Win} Unexp_{Loss} | Unexpected component of the matches, higher values represent higher unexpected won/loss points

DRPV_{Win} DRPV_{Draw/Loss} | Binary variable to measure match importance, that assumes value 1 if the match is considered as important.

Attend | Stadium occupancy percentage

DRival_{Win} DRival_{Draw/Loss} | Binary variable to measure match importance. It will assume value 1 for the different match outcomes against the direct rival

Volume_t Volume_{t-1} | Variation of the number of transacted stocks at day t and t-1, respectively, compared to the previous weekday

Furthermore, we have also analyzed the financial component of the clubs, running a third regression (EQ. 3) in STATA by panel data, also known as cross-sectional time-series data in which the companies' financial behavior is observed across time, to understand the impact of the annual financial reports released in the clubs' stock returns.

4.4.2 Financial Regression

$$\text{Return}_{i,t} = \beta_1 \text{OCFAsset}_{i,t} + \beta_2 \text{ROE}_{i,t} + \beta_3 \text{DE}_{i,t} + \beta_4 \text{NIGrowth}_{i,t} + \beta_5 \text{SalesGrowth}_{i,t} + \beta_6 \text{AssetsGrowth}_{i,t} + \beta_7 \text{LR}_{i,t} + \beta_8 \text{EBITDAGrowth}_{i,t} + \beta_9 \text{AsseTurnover}_{i,t} + \beta_{10} \text{PER}_{i,t} + \beta_{11} \text{BMR}_{i,t} + \beta_{12} \text{Return}_{i,t-1} + \beta_{13} \text{STOXX/NYSE}_{i,t-1} + \beta_{14} \text{STOXX/NYSE}_{i,t} + \beta_{15} \text{Volume}_{i,t} + \beta_{16} \text{Volume}_{i,t-1} + \alpha + \varepsilon \quad (\text{EQ. 3})$$

Dependent variable

Return_{i,t} | Stock return of club i
at day t

Independent variables

OCFAsset | Operating cash flow to total assets - measures the efficiency to which
a company utilizes its assets

ROE | Return on equity - financial performance measure that
provides the return on net assets, allowing to understand
the effectiveness of asset application

DE | Debt to equity ratio - measure a company's financial
leverage

NIGrowth | Net income growth - variation of net income from
the previous year

SalesGrowth | Sales growth - variation of operating income (excluding player
transfers income) from the previous year

AssetsGrowth | Assets growth - a variation of total assets value from
the previous year

LR | Liquidity ratio - financial metric to verify if the company
can pay its debts without resorting to external funding

EBITDAGrowth | EBITDA growth - alternative financial performance
measure to net income growth, excluding interests,
taxes, depreciation, and amortization

AsseTurnover | Asset turnover - alternative asset use efficiency measure,
dividing the company's revenues by total assets

PER | Price to earnings ratio - measure to evaluate the company's
stock prices

BMR | Book to market ratio - measure to evaluate the
company's value

Return_{i,t-1} | Stock return of club i
at day t-1

STOXX/NYSE_{t-1} STOXX/NYSE_t | Market stock return at day t and t-1
respectively

Volume_t Volume_{t-1} | Variation of the number of transacted stocks at day t and
t-1, respectively, compared to the previous weekday

4.4.3 Match importance

Regarding match importance, we have applied three different types of variables to understand whether matches with greater importance will reflect a higher impact on the stock prices. Firstly, we split all the matches in two, on one side the domestic league matches and on the other side the games for European competitions. Therefore, one of the match importance variables is the impact on clubs' stock returns followed by an European match result, being expected a higher impact of the last comparing to the domestic league match results repercussion on the shares. Following the same approach, the second variable will measure the impact of matches against rivals on the stock returns. In the same way, it is expected a greater effect of these games when comparing with the overall domestic matches impact on stock returns. Lastly, we have applied the "Relative Points to Victory" (RPV), firstly introduced by Ribeiro (2001) and later also utilized by Duque and Ferreira (2005). This measure (EQ. 4) considers the number of points of the studied club and its main opponent, and the number of matches still to play until the end of the season, which will allow us to understand if the club we are analyzing still has the chance, mathematically, to win the championship before each match. This way, we are already excluding all matches where the respective club cannot become champion.

$$RPV_{a,t} = \frac{P_{a,t} - P_{b,t}}{3 \cdot NML_t} \quad (\text{EQ. 4})$$

Where:

$P_{a,t}$ represents the number of points of the analyzed team at time t (matchday).

$P_{b,t}$ represents the number of points of the challenger of the analyzed team, by season, at time t.

NML_t reflects the number of matches left to play until the end of the season at time t.

RPV will be positive if the analyzed club is ahead of its opponent, and negative if otherwise. If the result is zero, it means the club and its challenger share the same number of points before the match.

Oppositely to previous studies on this matter, the analyzed club's opponent will be the same for the entire season and it does not take into consideration who is in the lead of the championship at each round. We searched for the winners of the championship for each season and considered it as the opponent for that year. If the champion was the analyzed club, we chose the second place of that year as the challenger.

Furthermore, this measure still considers many matches that should not be included in our point of view, as there are matches where the RPV is zero, the club and its opponent share the same number of points, but it can be in an earlier stage of the season. Therefore, we have followed a different approach and applied a binary variable that assumes the value 1 when RPV is within -1 and 1, which represents the possibility of the club and its opponent of being leaders, and only includes the matches in the last three months of the season. The binary variable will be 0 for all the matches that are not included in the last three months of the season and/or the RPV is not within the mentioned interval.

4.4.4 Unexpected results

The unexpected component of match results will be analyzed in an alternative regression. In the first regression, we analyze the impact of overall match results in the stock returns, while on the second and alternative regression, the last are swapped by two variables, one for victories and the other for defeats, which measure the effects on stocks of unexpected results. We have gathered betting odds from eight different bookmakers for all the analyzed seasons for domestic league matches. From here, we were able to determine the probability of win/loss (EQ. 6), using the same method as Stadtmann (2006) and Godinho and Cerqueira (2014), after calculating the average betting odds for every possible match result in each journey, home win (O_h), draw (O_d) and away win (O_a).

$$Mark - up = \frac{1}{O_h} + \frac{1}{O_d} + \frac{1}{O_a} \quad (\text{EQ. 5})$$

$$P_h = \frac{\frac{1}{O_h}}{Mark-up} \quad P_d = \frac{\frac{1}{O_d}}{Mark-up} \quad P_a = \frac{\frac{1}{O_a}}{Mark-up} \quad (\text{EQ. 6})$$

Afterwards, we were able to know the expected number of match points (EXP) for the analyzed team in each match (EQ. 7). $Prob_i$ represents the probability of winning for the team we are analyzing at venue i , home or away. Consequently, the unexpected number of match points (UNEXP) can be also calculated by the difference between the presently obtained points and the expected number of points before the match (EQ. 8).

$$EXP_i = 3 \times Prob_i + Prob_{draw} \quad , \quad i = \{home\ win \ , \ away\ win\} \quad (EQ. 7)$$

$$UNEXP = \begin{cases} 3 - EXP, & \text{in case of win} \\ 1 - EXP, & \text{in case of draw} \\ 0 - EXP, & \text{in case of loss} \end{cases} \quad (EQ. 8)$$

UNEXP will assume a value between -3 and 3, bearing in mind that the closest the value is to 0, the more expected is the match result. Therefore, if the value diverges from 0, it means the match result was not according to the initial expectations, that is, the furthest from 0, the more unexpected the result was.

5. Results

5.1 Pre-analysis

Firstly, we would like to demonstrate an introductory analysis for each clubs' share prices and stock returns variations over the studied period.

Table 5. Annual stock prices variation (AFC Ajax, BVB, and Juventus FC)

Season	AFC Ajax			Borussia Dortmund			Juventus FC		
	National League	European Comp.*	Stock Price Variation**	National League	European Comp.*	Stock Price Variation**	National League	European Comp.*	Stock Price Variation**
2002/03	2nd	Quarter-finals / -	-0.78	3rd	2nd group stage / -	-1.16	1st	Final / -	0.023
2003/04	1st	Group Stage / -	3.14	6th	3rd Qround / 2nd round	-0.1216	3rd	Round of 16 / -	-0.1216
2004/05	2nd	Group Stage / Round of 32	1.1	7th	- / -	-0.0606	1st	Quarter-finals / -	-0.0606
2005/06	4th	Round of 16 / -	-0.83	7th	- / -	-0.0653	20th (CC)	Quarter-finals / -	-0.0653
2006/07	2nd	3rd Qualif. Round / Round of 32	-0.11	9th	- / -	0.1275	1st (Serie B)	- / -	0.1275
2007/08	2nd	3rd Qualif. Round / 1st round	-1.01	13th	- / -	-0.1342	3rd	- / -	-0.1342
2008/09	3rd	- / Round of 16	-0.55	6th	- / 1st round (UEFA Cup)	-0.07	2nd	Round of 16 / -	-0.07
2009/10	2nd	- / Round of 32	0.04	5th	- / -	-0.0077	7th	Group stage / Round of 16	-0.0077
2010/11	1st	Group Stage / Round of 16	1.2	1st	- / Group Stage	0.0246	7th	- / Group stage	0.0246
2011/12	1st	Group Stage / Round of 32	0.11	1st	Group stage / -	-0.1529	1st	- / -	-0.1529
2012/13	1st	Group Stage / Round of 32	0.3	2nd	Final / -	0.0187	1st	Quarter-finals / -	0.0187
2013/14	1st	Group Stage / Round of 32	1.6	2nd	Quarter-finals / -	0.0376	1st	Group stage / Semi-finals	0.0376
2014/15	2nd	Group Stage / Round of 16	-0.44	7th	Round of 16 / -	0.0758	1st	Final / -	0.0758
2015/16	2nd	3rd Qualif. Round / Group stage	-0.511	2nd	- / Quarter-finals	-0.0225	1st	Round of 16 / -	-0.0225
2016/17	2nd	Play-off Round / Final	1.218	3rd	Quarter-finals / -	0.5019	1st	Final / -	0.5019
2017/18	2nd	3rd Qualif. Round / Play-off round	1.63	4th	Group stage / Round of 16	-0.0185	1st	Quarter-finals / -	-0.0185

Note: Calculated from data collected in the Wall Street Journal in September 2018.

*European Competitions - Champions League position / Europa League position.

**Stock Price Variation - Price at the end of the season subtracted from the price at the beginning.

From table 5, we can start an initial analysis of the stock prices of each club, comparing the values between the beginning and the end of the season. For each season we can see the national league standing and the position reached in UEFA Champions League and UEFA Europa League at the end of the season. Then we may consult the stock price variation between August 1st (season start) and May 31st (end of the season). In this column, we have highlighted in bold the values that conform with the season results considering each clubs' standards and expectations.

In AFC Ajax it is notable that when the club stands in 1st place in National League, it will result in higher and positive stock price variations. The only exception happens in 2016/17 when the stock price increases and AFC Ajax stands in 2nd place. However, the fact that the club reached the final of the UEFA Europa League on that season could be a solid explanation for the high and positive variation.

In Juventus, the stock price variations are on a lower scale. Negative variations have a higher impact than positive ones. This could be explained by the hegemony that has been developed from Juventus over the years. The higher positive stock price variation happened in season 2016/17 when the club was champion of the Italian national league and reached the final of UEFA Champions League. This could mean that every year, shareholders expect Juventus to be champion, so when that does not happen, we verify a higher negative response in the stock market. When they win the national league and their performance in the European competitions is not great, it will result in a positive or even negative small variation. If we extrapolate this information, we may say that Juventus stock price's performance largely depends on a good performance in the European competitions, more precisely in UEFA Champions League.

Table 6. Annual stock prices variation (SL Benfica, O. Lyon, and Manchester United)

Season	Sport Lisboa Benfica			Olympique Lyonnais			Manchester United		
	National League	European Comp.*	Stock Price Variation**	National League	European Comp.*	Stock Price Variation**	National League	European Comp.*	Stock Price Variation**
2007/08	4th	Group stage / Round of 16	-1.26	1st	Round of 16 / -	0.99			
2008/09	3rd	- / Group stage	-0.25	3rd	Round of 16 / -	-5.451			
2009/10	1st	- / Quarter-finals	0.5	2nd	Semi-finals / -	0.231			
2010/11	2nd	Group stage / Semi-finals	-1.16	3rd	Round of 16 / -	-0.741			
2011/12	2nd	Quarter-finals / -	-0.5	4th	Round of 16 / -	-1.245			
2012/13	2nd	Group stage / Final	0.23	3rd	- / Round of 32	-0.25	1st	Round of 16 / -	2.62
2013/14	1st	Group stage / Final	0.4	5th	Play-off round / Quarter-finals	0.062	7th	Quarter-finals / -	-0.06
2014/15	1st	Group stage / -	0.155	2nd	- / Play-off round	1.06	4th	- / -	-1.43
2015/16	1st	Quarter-finals / -	0.069	2nd	Group stage / -	0.96	5th	Group stage / Round of 16	-1.37
2016/17	1st	Round of 16 / -	0.106	4th	Group stage / Semi-finals	0.00	6th	- / Winner	0.62
2017/18	2nd	Group stage / -	0.319	3rd	- / Round of 16	0.22	2nd	Round of 16 / -	3.8

Note: Calculated from data collected in the Wall Street Journal in September 2018.

*European Competitions - Champions League position / Europa League position.

**Stock Price Variation - Price at the end of the season subtracted from the price at the beginning.

As in the AFC Ajax case, when observing SL Benfica data, from Table 6, similar results occur. Stock prices in these two clubs seem to react in the same direction. We observe positive stock price variations when the club achieves 1st place in the national league and/or a good performance in the European competitions. Otherwise, the variation will be lower or in most cases negative.

Olympique Lyonnais is a great example of how the market and its stockholders adapt to the club's momentum. Initially, the stock price variation is negative when Lyon does not conquer the championship, as the club normally won, but since the clubs stand between 3rd and 5th place for a few seasons, when in 2014/15 and 2015/16 achieves the 2nd place, we observe a positive and significant variation.

The same case for Manchester United, which starts its first sporting season, as a public company, winning the national league, they perform poorly in the consequent years. Afterward, in season 2017/18, the stock price increases by EUR 3.8 between the end and beginning of the season when standing in 2nd place.

As part of this initial analysis, we have consolidated the average stock returns, between 2002 and 2020, for each club and match result. As per Table 7, taking AFC Ajax as an example, the general results meet the expectations, as the stock returns followed by a win, either for the National League or European competitions, represent positive averages, while negative average stock returns follow a draw/defeat.

Table 7. Average stock returns for each result

Average Stock Returns								
<i>Match Result</i>	<i>Variable</i>	<i>Expected Signal</i>	AFC Ajax	SL Benfica	O. Lyon	Juventus FC	BVB	Manchester United
<i>Win</i>	<i>League</i>	<i>+</i>	0.002	0.004	0.008	0.004	0.011	-0.001
<i>Draw</i>	<i>League</i>	<i>-</i>	-0.006	-0.017	-0.005	-0.008	-0.010	-0.003
<i>Loss</i>	<i>League</i>	<i>-</i>	-0.005	-0.023	-0.012	-0.010	-0.018	0.000
<i>Win</i>	<i>Europe</i>	<i>+</i>	0.007	-0.003	0.002	-0.003	0.003	0.003
<i>Draw</i>	<i>Europe</i>	<i>-</i>	0.000	-0.018	0.000	-0.018	-0.017	-0.003
<i>Loss</i>	<i>Europe</i>	<i>-</i>	-0.004	-0.031	-0.015	-0.021	-0.026	0.000
<i>Win</i>	<i>RPV*</i>	<i>+</i>	0.002	-0.002	0.010	0.007	0.010	0.002
<i>Draw or Loss</i>	<i>RPV</i>	<i>-</i>	-0.007	-0.027	-0.011	-0.004	-0.018	-0.001
<i>Win</i>	<i>Rival**</i>	<i>+</i>	0.002	0.039	0.004	0.010	0.024	0.008
<i>Draw or Loss</i>	<i>Rival</i>	<i>-</i>	-0.010	-0.018	-0.007	-0.004	-0.008	-0.002

Note: Calculated from data collected in the Wall Street Journal in September 2018.

*Only counts matches in the last months of each season considering the possibility of still being able to become champion.

**Matches against major rivals.

5.2 Sporting Results

As previously mentioned, this section aims to analyze the impact of sporting variables in the clubs' stock returns, presented in tables 8 and 9. We have created two models for each club to highlight the impact of the unexpected component of football matches on the share prices.

As presented in tables 8 and 9, we obtained a R-squared between 2% and 15% in the six regressions. This statistical measure allows us to understand how close the collected data is to the adjusted regression line, which means that the models explain 2% to 15% of the data variation around its average. However, a low R-squared was predicted since low values are expected when human behavior is part of the equation, as it is in the financial markets.

In table 8, the results for these first three clubs have a few similarities. Both internal and external defeats generate a negative impact on share prices. SL Benfica's stock returns decrease, on average, 1.3% and 1.4% following a defeat in the European competitions and the Portuguese League, respectively. The slightly higher impact in the league result may have to do with a higher tolerance from the investors to a defeat in the European competitions, due to the greater level of difficulty of these matches. AFC Ajax's stock returns fall, on average, 0.5% after a defeat for both

competitions, while for Olympique Lyonnais, they decrease 0.7% and 0.9% for the same outcome for the French League and European Competitions, respectively.

In the same way, league draws tend to decrease stock returns, on average, 0.5% and 0.8% for Ajax and Benfica, respectively. Following a win in the European competitions, we observe an average increase in AFC Ajax and SL Benfica's stock returns of 0.4% and 1.4%, while victories for the internal league have no statistical significance. On the other hand, Lyon's stocks register an increase, on average, of 0.6% following a victory in the French league. We can also observe a tendency of increase of 4.2%, on average, in SL Benfica's stock returns after a win against its rivals.

Table 8. Results of sporting variables for AFC Ajax, SL Benfica, and Olympique Lyonnais

	AFC AJAX		SL BENFICA		O. LYONNAIS	
	All	Unexpected	All	Unexpected	All	Unexpected
Constant	0.001 **	0.001 **	0.001	0.000	0.000	0.000
STOXX	0.176 ***	0.176 ***	0.239 ***	0.239 ***	0.210 ***	0.210 ***
STOXX(-1)	-0.024	-0.026	0.036	0.041	-0.001	0.000
Return(-1)	-0.296 ***	-0.297 ***	-0.293 ***	-0.293 ***	-0.016	-0.015
League Win	0.001	0.001	0.003	0.003	0.006 ***	0.005 ***
League Draw	-0.005 ***		-0.008 ***		0.001	
League Defeat	-0.005 ***	-0.002 **	-0.014 ***	-0.006 ***	-0.007 ***	-0.005 ***
Europe Win	0.004 **	0.005 **	0.014 ***	0.014 ***	0.003	0.002
Europe Draw	-0.001	-0.001	-0.006	-0.006	0.006 ***	0.005 **
Europe Defeat	-0.005 ***	-0.005 **	-0.013 ***	-0.013 ***	-0.009 ***	-0.009 ***
RPV Win	0.000	0.000	-0.002	0.000	0.001	0.001
RPV Draw/Defeat	0.004	0.001	-0.007	-0.010 *	-0.005 *	-0.005 *
Attendance	-0.001	-0.002	-0.008 **	-0.007 **	-0.005 ***	-0.004 ***
Rival Win	0.003	0.003	0.042 ***	0.039 ***	0.002	0.000
Rival Draw/Defeat	-0.001	-0.003	0.003	-0.003	0.003	0.001
Volume	0.002 ***	0.002 ***	0.003 ***	0.003 ***	0.000 *	0.000 *
Volume (-1)	0.001 ***	0.001 ***	0.001 *	0.001 *	0.001 ***	0.001 ***
Observations	4079	4079	2803	2803	2890	2890
Number of t	699	699	465	465	539	539
R ²	0.11	0.11	0.10	0.10	0.06	0.06

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

In table 9, we can observe the results of the sporting regression of the remaining three clubs, Juventus FC, Borussia Dortmund, and Manchester United. In the Juventus FC case, the club with the higher quantity of observed matches, we curiously have no evidence of an impact in the stock

returns after a match victory. This result might be easily explained by the monopolization of Serie A (Italian football domestic league) by Juventus, which won this competition by eleven times in the last 20 years and nine out of the last nine years. As the favorite team to win the championship, it is already expected that Juventus wins every match, which can be an explanation for the fact there is no significant impact of victories. However, if we only include, within domestic matches, the ones we consider as the unexpected outcome, the result is different, and we observe a positive and significant impact of 0.3% increase in the stock returns for every unexpected point following a victory (won match points less expected match points). On the other side, draws and defeats generated, on average, a decrease in the club's stock returns of 0.8% and 1.2%, respectively. As expected, the magnitude of the impact of a loss was higher than a draw in the national league, as well as European matches over the domestic competition matches (1.6% and 1.4% decrease in the stock returns is expected after a draw and a loss in the European competitions).

Borussia Dortmund's regression led us to identical results, indicating an increase in the stock returns after a win and the opposite effect following a loss/defeat. In the same way, we noticed a greater impact on stock returns of European matches opposite to national league matches. However, in this case, the unexpected component of matches did not affect the dependent variable as we foresaw, as the results barely changed from the first regression. Additionally, when analyzing the matches of Dortmund against its rival, we spot a positive impact in stock returns for all match outcomes, with a higher effect after wins. Our match importance measure (RPV) was also significantly negative for Dortmund after a draw/loss in the alternative regression, meaning the stock returns suffered a decline after a draw/loss in the last three months, with the championship conquest still at stake.

In Manchester United case, the results are not as robust as the other football clubs, presumably due to the fact this is the most limited sample of all six clubs.

Two variables which impact is transversal to all the six clubs are stock market returns and transacted volumes. Higher stock market returns, in the following and previous day to the match, tend to increase clubs' stock returns at day t. In the same direction, a higher transacted volume of stocks in the same days, lead to higher stock returns.

Table 9. Results of sporting variables for Juventus FC, B. Dortmund, and Manchester United

	JUVENTUS FC		B. DORTMUND		MANCHESTER U.	
	All	Unexpected	All	Unexpected	All	Unexpected
Constant	0.000	0.000	0.000	0.000	0.000	0.000
STOXX/NYSE	0.412 ***	0.410 ***	0.414 ***	0.413 ***	0.001 *	0.001 **
STOXX/NYSE(-1)	0.057 ***	0.052 **	0.075 ***	0.071 ***	0.001 **	0.001 **
Return(-1)	0.022	0.021	-0.135 ***	-0.138 ***	-0.087 ***	-0.087 ***
League Win	0.001	0.003 ***	0.011 ***	0.011 ***	-0.001	-0.003 *
League Draw	-0.008 ***		-0.006 ***		-0.001	
League Defeat	-0.012 ***	-0.005 ***	-0.015 ***	-0.014 ***	0.001	0.001
Europe Win	-0.003	-0.002	0.008 ***	0.009 ***	0.003	0.003
Europe Draw	-0.016 ***	-0.015 ***	-0.009 **	-0.007 *	-0.001	-0.001
Europe Defeat	-0.014 ***	-0.014 ***	-0.017 ***	-0.016 ***	0.001	0.001
RPV Win	0.000	-0.001	-0.002	0.000	0.004	0.004
RPV Draw/Defeat	0.004 *	-0.001	-0.002	-0.009 ***	-0.002	-0.003
Attendance	-0.002 **	-0.004 ***	-0.006 ***	-0.008 ***	0.000	0.000
Rival Win	0.003	0.001	0.011 ***	0.006 *	0.008	0.011 **
Rival Draw/Defeat	0.000	-0.005 *	0.007 ***	0.008 **	-0.004	-0.005
Volume	0.003 ***	0.003 ***	0.001 **	0.000	0.002 ***	0.002 ***
Volume (-1)	0.001 ***	0.001 ***	0.000	0.000	0.001 ***	0.001 ***
Observations	4091	4091	4093	4093	1458	1458
Number of t	751	751	645	645	277	277
R ²	0.15	0.15	0.12	0.11	0.02	0.02

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

5.3 Financial Results

Regarding the financial data analysis, we tested a couple of models. Firstly, we tested the regression for two different dates, the financial report publication date and the final day of the sporting season, which would potentially change the entire results. Moreover, we needed to understand the best way on how to present our dependent variable. Therefore, we have tried with a single stock return for day t (the day after the publication date vs day after the end of the sporting season), followed by the annualization of the same stock return for the same days, multiplying it by the number of observations in that year, and at last, we calculated an average of the stock returns on the following days after the event (from 2 to 7 days after).

From the obtained results we concluded that the stronger and more robust results came out of the model we originally had planned, that is, the stock return of day t, after the publication date (Table 10).

Table 10. Results of financial variables - Publication Date Cross-sectional time-series data

Method	Random-effects ML regression			
Dependent Variable	R1			
P-value	0.0000			
	Log likelihood	183.3576	LR chi2(16)	53.39
	Number obs	76		
	Number of groups	6		
Variables	Coefficient	p-value		
<i>OCFAsset</i>	0.0260	0.4230		
<i>ROE</i>	-0.0010	0.3570		
<i>DE</i>	0.0000	0.9410		
<i>NIGrowth</i>	0.0003	0.0000	***	
<i>SalesGrowth</i>	0.0381	0.0090	***	
<i>AssetsGrowth</i>	-0.0256	0.0470	**	
<i>LR</i>	-0.0033	0.5030		
<i>EBITDAGrowth</i>	0.0002	0.0000	***	
<i>AssetTurnover</i>	-0.0049	0.7490		
<i>PER</i>	0.0000	0.5870		
<i>BMR</i>	0.0008	0.7030		
<i>Return_{t-1}</i>	-0.2059	0.1130		
<i>STOXX/NYSE_{t-1}</i>	0.6297	0.0420	**	
<i>STOXX/NYSE_t</i>	-0.6541	0.0030	***	
<i>Volume_{t-1}</i>	-0.0031	0.1260		
<i>Volume_t</i>	0.0062	0.0020	***	
<i>cons</i>	0.0011	0.9010		

We decided to proceed with a random-effects cross-sectional time-series data model to observe the European football clubs' stock returns' behavior over the years. Unlike the fixed-effects model, in the random-effects model is assumed a random and uncorrelated relationship between the variation across companies and the model's explanatory variables. "The crucial distinction between fixed effect and the random effect is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not" (Greene, 2008).

From the results demonstrated in table 10, we can state the overall regression is statistically significant with a p-value < 0.05. Moreover, we can observe a positive and statistically significant relationship between net income growth, sales growth, and EBITDA growth and clubs' stock

returns. If net income increases by 100% from year to year, we might expect an increase in the clubs' stock returns of 0.3% on average, remaining constant all the other variables. In the same way, sales and EBITDA growth have a positive impact on the clubs' stock returns. A positive variation of 100% between years in the operating results and of EBITDA (Earnings before Interest, Taxes, Depreciation, and Amortization) will generate, on average, an increase of 3.8% and 0.02% in the stock returns, respectively. On the other side, asset growth had the opposite effect on the clubs' stock returns, where we can observe a negative relationship between these two variables. We may expect an average decrease of 2.56% for every 100% variation in the value of the total assets between years. This result is following the theoretical literature that suggests expected returns should decrease in response to the investment increase (Li, Livdan, and Zhang, 2006; Liu, Whited, and Zhang, 2009; Cooper, Gulen, and Schill, 2008).

Moreover, we can observe a positive relationship between volume and stock returns. A higher transacted volume of stocks in the following day to the match leads to an increase in stock returns. In the opposite direction, an increase in the stock market returns in the subsequent day to the match seems to conduct to a decline of clubs' stock returns.

6. Conclusion

This dissertation aims to analyze the influence of sporting and financial performance in the clubs' stock market, listed in the Stoxx Europe Football Index and NYSE Composite Index, over 16 years. In this study, we have used an ARCH model regression to analyze the relationship between the clubs' sporting performance, considering all national league matches and UEFA competitions, and their stock returns performance. On the other side, to investigate clubs' financial performance impact on the stock market, we used a cross-sectional time series model. When testing the match results impact on the clubs' stock returns, there was only one club, Manchester United, whose results were not significant for any outcome. The logical reason behind the immaterial results is the frankly reduced sample, six years of data, comparing to the other clubs. As for the remaining five clubs, the defeats, either for National League and European competitions, were significantly negative, following the same conclusions of a great part of the existent literature.

The bigger records were registered in Borussia Dortmund football match defeats, reflecting an average decline in the stock returns of 1.7% and 1.5% following a loss in the European and National competitions, respectively. In the National league, victories had only statistical significance in Olympique Lyonnais and Borussia Dortmund, with an average impact in their stock returns of 0.6% and 1.1%, respectively. Regarding victories in the European competitions, the results were significant in 50% of the sample, AFC Ajax, SL Benfica, and B. Dortmund, with the highest impact being reported in SL Benfica, with an average increase of 1.4% in stock returns after a win in Champions League or UEFA Europa League. If we observe the magnitude of the match results' impact on the clubs stock returns, the outcome favors results provided by Berkowitz, Depken, and Gandar (2015), Bernile and Lyandres (2011), and Castellani, Pattitoni, and Patuelli (2013) conclusions, that suggest the existence of an asymmetry in the reaction of the market to the football matches' outcomes, revealing a higher impact following a defeat. On average, we observe that the magnitude of the impact in the clubs' stock returns followed by a defeat is 0.2% greater than after a win (-1.1% against 0.9%, respectively).

Following the assumption European matches represent higher importance when comparing with domestic ones, not only for the bigger prizes but the prestige these competitions bear, we observe conclusive results for five of the six tested clubs. In SL Benfica and AFC Ajax, oppositely to the National league wins, we denote a positive and significant impact of European victories in their stock prices (0.4% and 1.4%). For the remaining three clubs (Olympique Lyonnais, Juventus FC, and

Borussia Dortmund), there is a clearer and more considerable impact in the clubs' stock returns following a win for the European competitions against domestic football matches, which is in line with Renneboog and Vanbrabant (2000). On average, we reported a difference of 0.2% between these two variables' impact on our dependent variable. Moreover, in our second match importance measure (matches against rivals), we also found evidence that a win of SL Benfica and Borussia Dortmund against its rivals, generates, on average, an increase in their stock returns of 4.2% and 1.1%, respectively. As per our third match importance variable (RPV), we found an average negative and statistically significant impact of 0.5% in Olympique Lyonnais' stock returns after a defeat in the last three months of the competition, considering only the matches where it was mathematically possible for Lyon to be champion that season.

Regarding the unexpected component of the matches, the results were not entirely within what we initially predicted. Our expectations expressed a higher impact of unexpected results in the stock market than anticipated ones. However, the results for almost every sample dictated an equal or minor effect of the unexpected component in the stock returns, comparing to expected results, which is in line with Palomino, Renneboog, and Zhang's (2009) work. The fact that the stock market reacts in a more perceptible way to expected victories than to unexpected ones, may be indicative of betting odds being price-insensitive information. Nevertheless, Juventus's unexpected wins, in the Italian football league, had an impact, on average, of 0.3% in their stock returns. On the other side, when considering all matches, the results do not report any significance.

In what concerns the financial variables, capitalization and liquidity ratios do not seem to influence clubs' stock returns, contrary to the results from Ecer and Boyukaslan (2014), as debt-to-equity and liquidity ratios did not have statistical significance in our results. Therefore, investors do not take into consideration the clubs' financial leverage and the ability to pay their short-term liabilities when investing in the football stock market. On the other hand, profitability ratios suggest having a positive significant impact on the stock market. An increase in operating revenues, EBITDA, and net income, from one year to another, seems to have a positive effect on the European clubs' stock returns, with a clear predominance of operating revenues growth, as we may expect an increase in stock returns, on average, of 3.8% if revenues are doubled in consecutive years. Following an increase in the assets' total value, we may expect a negative significant impact in the stock returns, which can be explained by the investors' mindset directed to profitability, as new investments imply a lower net income at the end of the year.

Therefore, we cannot affirm that the football stock market is driven by investor sentiment, as the results show evidence that stockholders respond positively not only to clubs' victories on the pitch, but they are motivated by sound profitability indicators as well. However, in our opinion, the results suggest an elementary and short-term driven analysis of the clubs' annual financial reports by the investors. Regarding the financial data, we have collected it from the annual financial reports since we were not able to find quarterly data for all clubs and all seasons. In the future, for more robust results, we would need to gather all the financial data quarterly. Moreover, it would be convenient to include in our analysis of stock returns determinants, the player transfers impact, as well as obtaining a macroeconomic perspective, measuring the effect of, for example, unemployment rate and GDP per capita's effect on football stock market. Additionally, more club's data could be included in the analysis, and market financial measures like Tobin's Q could provide additional insights.

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