POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS
Research Papers in Economics and Finance *Vol. 7, No. 1, 2023: 89–100*
https://ref.ue.poznan.pl *https://doi.org/10.18559/ref.2023.1.476*

Does stock market take into consideration football players' injuries?

El Mehdi Mrhari[1] **Mohammed Hassouni**[2]

Abstract

Injuries are a frequent risk in sports. This article analyses the repercussions of football players' injuries on the market returns of six European clubs: Ajax, Borussia Dortmund, Manchester United, Olympique Lyonnais, Benfica and Juventus over a period of three years. The originality of this study comes from the absence of scientific articles in this field. Based on the event study methodology, the results indicate that the sensitivity of stock prices to injuries is very low. Furthermore, the results show that the date of injury is a significant variable causing the effect on returns (Borussia Dortmund). However, injury severity, player status and COVID do not influence the price share.

Article received on 21 April 2023, accepted on 3 September 2023.

Keywords

- economics of sport
- injury
- stock return
- event study methodology
- football
- sport finance

Suggested citation: Mrhari, E. M., & Hassouni, M. (2023). Does stock market take into consideration football players' injuries?. *Research Papers in Economics and Finance*, *7*(1), 89–100. https://doi.org/10.18559/ref.2023.1.476

Introduction

One of the major characteristics of sport is physical confrontation. It represents a professional hazard that affects the performance of sports organisations. As the number of competitions has multiplied over time, injuries to players have become

[1] Ibn Tofail University, Institut des métiers de sport, Campus universitaire, BP.242 Kenitra 14000, Morocco, corresponding author: elmehdi.mrhari@uit.ac.ma

[2] Ibn Tofail University, Institut des métiers de sport, Campus universitaire, BP.242 Kenitra 14000, Morocco, mhassouni86@gmail.com

increasingly frequent. For example, professional football players suffer between 2.5 and 9.4 injuries for every 1,000 hours of effort (Pfirrmann et al., 2016), which can result in either physical inaptitude (Van Basten, Sergio Aguero, etc.) or death (Youssef Belkhouja, Marc-Vivien Foé, etc.). The focus of this article is on football since it is the most popular sport in the world.

Football integrated financial markets early on. Tottenham was the first club listed on the stock exchange in 1983, and investments in football have been on the rise worldwide ever since. The interest of investors in football has garnered the attention of the academic world.

The aim of this article is to validate the hypothesis that injuries to footballers have a significant effect on the stock market prices of football clubs, using the event study methodology. In other words, we will examine the market's response to the risk of injury. The importance of this risk also stems from the context marked by the rise in players' transfer prices and the consecutive financial crises that clubs are facing.

To our knowledge, no article speaks directly about the impact of football players' injuries on stock returns. This study may be of interest to risk-sensitive investors seeking predictably safe equity, sports finance researchers aiming to study informational market efficiency as well as club managers dealing with player injuries; the article may assist them in making decisions related to "injury announcements, physical training, etc." A heightened risk could impact the club's ability to secure funding.

The remainder of the paper is organised as follows: in Section 1, we will present the theoretical frameworks linking both a player's injury and a club's stock return. In Section 2, we will discuss our model specification along with the data and variables. In Section 3, we will interpret the results to identify the explanatory factors.

1. Literature review

The uniqueness of this paper arises from the lack of direct articles in this field. However, multiple manuscripts address this topic, albeit indirectly or briefly. Moreover, general financial theories can illuminate this specific phenomenon.

First, it is pivotal to define the concept of an efficient stock market. Probably the foremost definition in literature is that of (Fama, 1970) who describes an efficient market as "A market in which prices always 'fully reflect' available information". Indeed, a market for football clubs that remains unaffected by critical public information, such as player injuries, would unmistakably be an inefficient one. Over time, the literature has identified three forms of market efficiency. This

article zeroes in on the semi-strong form, which posits no time lag between the release of information and its reflection in stock prices.

According to Aglietta et al. (2008), the football club stock market exhibits signs of efficiency. However, its diminutive size and the liquidity paucity of the stocks hinder true efficiency. After analysing the impact of goals scored (Croxson & James Reade, 2014) inferred that markets manifest semi-strong efficiency.

Ball and Brown (1968) discern between good and bad information, correlating it with anticipated price increases or declines, respectively. Boya and Monino (2011) introduced the notion of information colouring. Given that an injury might precipitate a decline in both sports and commercial performance, such information is perceived negatively. In a semi-strong market, stock prices would instantly mirror this news with a slump commensurate with the injury's repercussions. To illustrate this, Bedir et al. (2022) found that COVID-19 significantly and adversely affected the football index revenue.

The prosperity of a sports club is anchored in its intangible assets, predominantly player values (Benkraiem et al., 2012). For instance, intangible assets constitute over two-thirds of the total fixed assets value for the French Ligue 1 clubs (Aglietta et al., 2008). Numerous studies highlight the influence of football player transfers on market returns (Allouche & Soulez, 2008; Fotaki et al., 2023; Gimet & Montchaud, 2016). Football players' value grapples with uncertainties and monumental devaluation due to injuries whose occurrence and intensity remain unpredictable (Benkraiem et al., 2012). In a parallel vein, Tunaru et al. (2005) formulated a Poisson model underscoring the relationship between injuries and player worth.

Regarding direct costs, Ryan et al. (2019) estimated the average hospitalisation and emergency room costs for football players aged 5 to 18 in the United States to be $5,502 and $248, respectively. Similarly, Ross et al. (2022) found that joint sprains incurred the highest direct costs amounting to $6,665. Additionally, they reported that the average indirect costs – "drop in player income…" – are ten times greater than the direct costs.

Moreover, Herm et al. (2014) observed that clubs sometimes face substantial expenses when recruiting a replacement for an injured player, representing a significant financial commitment. Furthermore, Garcia-del-Barrio & Pujol, (2007) pointed out that a player's financial value is contingent upon the minutes they play. It follows that an extended absence due to injury results in a depreciation of this intangible asset.

On the one hand, we underscore the indirect relationships between injuries, sporting performance and stock prices. Several studies examine the impact of injuries on sporting performance (Figure 1). For example, Hägglund et al. (2013) noted a marked influence of injuries on the sporting achievements of clubs in the UEFA Champions League. Likewise, Sarlis et al., (2021) found a link between injuries and the sporting success of basketball clubs.

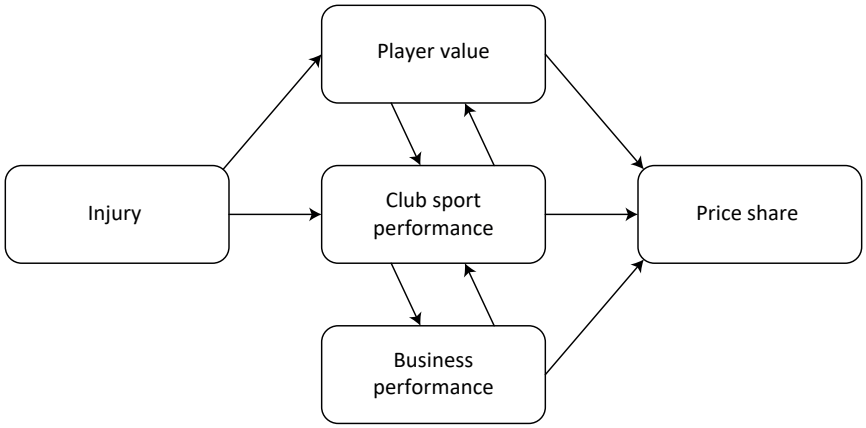

Figure 1. Influence of injuries on stock prices

Source: own elaboration.

However, Dauty and Collon (2011) alluded to the impact of absence of injury on the rankings of French football clubs in the league. The reasons for this observation might be inferred from the insights of Frick and Simmons (2008) who stressed the significance of pivoting from individual talent to team synergy. This collective performance relies on the coach's aptitude to manage the team as a unit and devise effective strategies. Thus, while injuries undoubtedly impact an individual's performance, their effect on the team's overall success is uncertain.

On the other hand, we aim to compile the literature concerning the influence of sporting performance on financial performance. Based on several studies (Callejo & Forcadell, 2006; Chadwick & Thwaites, 2005; Vrooman, 2007), sporting achievements shape indirect revenues, encompassing sponsorships, TV rights and other related products. Consequently, injuries that impair sporting outcomes can diminish stadium attendance and lead to a drop in the club's commercial income.

Additionally, fans are often regarded as the "12th player" due to their supportive roles (Davies et al., 1995). Therefore, their absence might intensify the team's underperformance. Gimet and Montchaud (2016) also verified that stadium attendance significantly influences stock prices.

Furthermore, the impact of sporting performance on stock market performance has been extensively studied. In this context, Morrow (1999) was the first to establish this connection in football. Aglietta et al. (2008) illustrated the pronounced effect of the "Rank" variable on stock prices. Benkraiem et al.(2012) detected abnormal volatility in stock prices following matches. They revealed that the market's reaction is twice as pronounced following defeats as it is in the case of victories. From this, we can infer the magnified effects of injuries on stock market performance. Floros (2014) verified the influence of match outcomes on stock prices,

highlighting variations in sensitivity, especially in the event of a draw – positive for Benfica and Ajax, but negative for Juventus.

Additionally, numerous studies highlight the inefficiency of football clubs' stock markets (Benkraiem et al., 2012; Ferreira et al., 2017). Several factors contribute to this phenomenon, including:

1. Bounded rationality (Simon, 1978). It reflects the reduced capacities of man to process information. In other words, the imperfect informational analysis process sometimes leads to misinterpretation or even ignorance of important data. This process is influenced by media coverage and behavioural factors. For example, analysis of good news in football is faster than that of bad news (Palomino et al., 2009).
2. Shareholder profile. One of the particularities of listed clubs is the diversity of investor behaviour, which is reflected in the stock price. Prigge and Tegtmeier (2019) distinguish four types of investors: financial investors, strategic investors, patron investors and fan investors. This implies that certain club shareholders prioritise financial dividends, while others are motivated by emotional dividends. The behaviour of the latter group is influenced by psychological elements, such as allegiance bias (Benkraiem et al., 2012; Kaplanski & Levy, 2010).
3. Lack of liquidity. Many clubs have small capital which affects stock prices (Bell et al., 2012). In other words, low capital creates an imbalance between supply and demand, causing stock prices to become detached from relevant information.

2. Method

The objective of this article is to validate the hypothesis of a significant effect of injuries on market return. The analysed phenomenon of "injury" is marked by unpredictability (injuries occurring on different dates, varying numbers of injuries), complicating its projection and making it challenging to measure quantitatively using a panel model. Indeed, this study relies on a methodological framework tailored to these nuances, specifically the "event study methodology". This approach is prevalent in finance for examining phenomena that could impact a company's value. The analytical process can be divided into five steps presented below.

First, it is essential to ascertain the announcement date of the event. In this context, the Transfer Market website displays the injury date. Occasionally, injuries happen when the market is inactive (on game days during the weekend, for instance), and the medical assessment that reveals the injury's severity typically takes a few hours. In such instances, the subsequent business day following the injury date is examined.

Second, defining the event periods is crucial. A defining trait of the sports realm is the plethora of events (like game outcomes, transfer speculations, coaching changes, etc.) that can occasionally coincide with the injury date. As a result, this paper opts for a brief window of "one day to sidestep the informational clutter". Moreover, the estimation period spans 60 working days, excluding the windows of preceding events.

Third, it is pivotal to model the stock returns. In this respect, the Period Mean Adjusted Model was chosen because of the weak correlation between football clubs' stock prices and the European market index (Aglietta et al., 2008; Prigge & Tegtmeier, 2019).

Fourth, the methodology involves calculating the abnormal return (ARt).

Finally, this research employed a one-tailed 5% Student test:

$$t_{Student} = \frac{AR_t}{\sigma(AR_t)} \tag{1}$$

Subsequently, we performed logistic regression to determine the sensitivity factors of stock return to injury:

$$y_i = \sum_i a_i x_i + b \tag{2}$$

where:

y_i – "binary" sensitivity,

x_i – factors "missed games, COVID, star, quarter",

a_i – regression coefficient,

b – intercept.

In 2019, there were only 22 European Football Clubs being publicly traded (see STOXX Europe Football Index composition). Hence, the selection criteria for the clubs in the sample are:

1. Liquidity: many clubs are illiquid; as a result, we have excluded FC Porto, Ruch Chorzow, etc.
2. Economic interest: we have analysed the clubs that attract international investors with a large fan community and important market capitalisation.
3. Sport performance: we have chosen clubs playing on top European levels (Champion's League) with media issues. We have ruled out clubs having a sporting crisis to avoid biased results.
4. Data availability: injury information must be accessible.

Therefore, six liquid clubs have been selected: Ajax, Borussia Dortmund, Manchester United, Olympique Lyonnais, Benfica and Juventus. Each club belongs to a different stock market and country.

Based on the event study methodology, the data have included 791 observations. The study period was from 1 July 2019 to 30 June 2022. The data was taken from Yahoo Finance, Transfer Market and The Guardian websites.

3. Results and discussion

The first reading shows a high prevalence of injuries amounting to 791 cases. Indeed, the club must manage this frequent risk. Furthermore, a great disparity in the number of injuries per team was detected from Olympique Lyonnais (39) to Borussia Dortmund (192) the high standard deviation at 53.58 confirms this observation. This finding deserves a detailed analysis to determine the causes and find some remedies to them.

As for the injury's duration, a player misses an average of 4.99 games. The Table 1 suggests a possible negative correlation between the number of injuries and the duration of absence, with the exception of Manchester United, which suffered many injuries with long durations. The medical staff and personal trainers must solve this problem. Furthermore, the results show very low sensitivity of stock market returns to injuries. Specifically, 67 events have a significant effect on returns, i.e. 8.47% of all injuries as shown in Table 1.

Table 1. Distribution of injuries per club

Team	Total injuries	Effect		Missed games	COVID		Star injury		Quarter			
		yes	no		yes	no	yes	no	Q1	Q2	Q3	Q4
Olympique Lyonnais	39	4	35	6.46	5	34	6	33	13	1	5	20
Ajax	124	4	120	4.54	5	119	9	115	39	13	35	37
Benfica	128	4	124	5.54	31	97	0	128	50	16	25	37
Manchester United	131	15	116	5.60	11	120	29	102	45	14	26	46
Juventus	177	24	153	3.89	22	155	51	126	59	28	34	56
Borussia Dortmund	192	16	176	3.89	10	182	26	166	50	31	47	64
Total	791	67	724		84	707	121	670	256	103	172	260

Source: own elaboration.

Most injuries affecting the return are related to Juventus, Manchester United and Borussia Dortmund. In other words, the Italian, American and German stock markets punish these clubs for their bad injury management.

To understand the explanatory factors of the sensitivity, we used the Logit model on all 791 events.

Table 2. Relationship between injury type and stock return

Variable		b	E.S.	Wald	ddl	Sig.	Exp(ai)
Step 1	games	–0.041	0.030	1.881	1	0.170	0.959
	star (1)	–0.182	0.324	0.315	1	0.574	0.834
	team	–	–	13.513	5	0.019	–
	team (1)	–1.356	0.582	5.426	1	0.020	0.258
	team (2)	–1.385	0.590	5.517	1	0.019	0.250
	team (3)	–0.347	0.384	0.817	1	0.366	0.707
	team (4)	0.163	0.355	0.211	1	0.646	1.177
	team (5)	–0.095	0.601	0.025	1	0.875	0.910
	quarter	–	–	2.272	4	0.686	–
	quarter (1)	–19.513	40192.970	0.000	1	1.000	0.000
	quarter (2)	0.293	0.314	0.868	1	0.351	1.340
	quarter (3)	–0.382	0.485	0.618	1	0.432	0.683
	quarter (4)	0.084	0.366	0.052	1	0.819	1.088
	COVID (1)	–0.066	0.418	0.025	1	0.875	0.936
	constant	–1.746	0.570	9.381	1	0.002	0.175

Source: own elaboration.

Despite the poor results from Table 2, the variable (team) explains the effect of injuries on abnormal returns, so the club's socio-economic environment "stock exchange, media, league, investors..." and its internal factors "business model…" determine the impact of injuries.

On the other hand, the duration of the injury is not a significant variable. Thus, the injury severity does not influence the price share, which contradicts the sports logic. Furthermore, COVID has no real effect on returns even though this infectious disease can cause several games to be postponed or championships to be stopped if it spreads.

Furthermore, the status of the injured player (star or not) is not reflected in the stock price, which contradicts the sporting reality since stars contribute to sporting victories and to the club's income. The data also refutes the relationship between the injury date and return. Given that the variable (team) is significant, we utilised regression for each club.

The Table 3 shows that the date of injury affects stock returns. In other words, an injury occurring on the eve of major playoff games, "usually in the second quarter", will have greater impact on the stock price.

Table 3. Relationship between injury type and stock return "Borussia Dortmund"

Variable		b	E.S.	Wald	ddl	Sig.	Exp(ai)
Step 1	games	–0.081	0.096	0.715	1	0.398	0.922
	star (1)	–0.693	0.715	0.939	1	0.332	0.500
	quarter	–	–	4.539	3	0.209	–
	quarter (1)	1.706	0.839	4.137	1	0.042	5.506
	quarter (2)	0.842	1.032	0.666	1	0.415	2.321
	quarter (3)	1.422	0.871	2.667	1	0.102	4.144
	COVID (1)	–1.036	0.884	1.374	1	0.241	0.355
	constant	–1.715	1.252	1.879	1	0.171	0.180

Source: own elaboration.

These signs of inefficiency can be explained by the following assumptions:

1. In line with bounded rationality (Simon, 1978), investors are inundated with a large information flow related to injuries. The analysis of this data is difficult because of the informational asymmetry, as only the club doctor has the complete information and the skills to assess the injury. Faced with this gigantic flow of information, we propose the concepts of "relative injuries" – to qualify the comparison of the club's injuries with those of its opponent at a given time, as well as "concurrent injuries" – to designate the injuries of players from the same club at the same time. Failure to take these concepts into account in this study would be the cause of weak results.
2. The behavioural factor (Benkraiem et al., 2012; Prigge & Tegtmeier, 2019) of investors since the fan shareholder acts according to emotional mechanisms at the expense of rational rules. They support their clubs regardless of the results and incidents. These phenomena can occur when the floating stock is small, so fan investors are the majority, to the detriment of other investor profiles.
3. Coach intervention can theoretically minimise the effect of injury (Frick & Simmons, 2008). He can use football tactics to fill in the absences, especially if he has high level substitutes.

Conclusion

This paper discusses the effect of football players' injuries on the stock performance of six European clubs. Referring to an event study methodology, this work raised a small impact of injuries on stock prices during the three years under analysis, mainly for Borussia Dortmund.

Moreover, the date of injury explains the effect on return, but the duration of injury, player status and COVID are insignificant variables. Furthermore, we proposed hypotheses that could explain this lack of efficiency.

In addition, we recommend a study to confirm or refute these hypotheses. Furthermore, the present article invites researchers to analyse the relative injuries and recurrences. It is important to improve the injury prediction and prevention system on the eve of major games (especially in the second quarter) for Borussia Dortmund. We also recommend that rational speculators take injuries into consideration in their strategies for the shares of Borussia Dortmund, Juventus and Manchester United.

References

Aglietta, M., Andreff, W., & Drut, B. (2008). Bourse et football. *Revue d'économie politique*, *118*(2), 255–296. https://doi.org/10.3917/redp.182.0255

Allouche, J., & Soulez, S. (2008). Determinants of share price variations of listed football clubs: Empirical evidence from English football leagues. *Post-Print*, hal-01075264, HAL. https://ideas.repec.org//p/hal/journl/hal-01075264.html

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research*, *6*(2), 159–178. https://doi.org/10.2307/2490232

Bedir, F., Bozma, G., Turan, M., & Mızrak, O. (2022). Effects of COVID-19 on football stock market's return and uncertainty. *International Journal of Sport Finance*, *17*(3) , 140–153. https://doi.org/10.32731/IJSF/173.082022.02

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

Benkraiem, R., Le Roy, F., & Louhichi, W. (2012). Football et bourse: Analyse de la volatilité autour des annonces de résultats. *Recherches en Sciences de Gestion*, *91*(4), 83–106. https://doi.org/10.3917/resg.091.0083

Boya, C., & Monino, J.-L. (2011). La coloration de l'information dans l'efficience semi forte: *Innovations*, *36*(3), 147–157. https://doi.org/10.3917/inno.036.0147

Callejo, M. B., & Forcadell, F. J. (2006). Real Madrid football club: A new model of business organization for sports clubs in Spain. *Global Business and Organizational Excellence*, *26*(1), 51–64. https://doi.org/10.1002/joe.20121

Chadwick, S., & Thwaites, D. (2005). Managing sport sponsorship programs: Lessons from a Critical Assessment of English Soccer. *Journal of Advertising Research*, *45*(3), 328–338. https://doi.org/10.1017/S0021849905050312

Croxson, K., & James Reade, J. (2014). Information and efficiency: Goal arrival in soccer betting. *The Economic Journal*, *124*(575), 62–91. https://doi.org/10.1111/ecoj.12033

Dauty, M., & Collon, S. (2011). Incidence of injuries in French professional soccer players. *International Journal of Sports Medicine*, *32*(12), 965–969. https://doi.org/10.1055/s-0031-1283188

Davies, B., Downward, P., & Jackson, I. (1995). The demand for rugby league: Evidence from causality tests. *Applied Economics*, *27*(10), 1003–1007. https://doi.org/10.1080/00036849500000081

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, *25*(2), 383–417. https://doi.org/10.2307/2325486

Ferreira, P., Loures, L., Nunes, J. R., & Dionísio, A. (2017). The behaviour of share returns of football clubs: An econophysics approach. *Physica A: Statistical Mechanics and Its Applications*, *472*, 136–144. https://doi.org/10.1016/j.physa.2017.01.022

Floros, C. (2014). Football and stock returns: New evidence. *Procedia Economics and Finance*, *14*, 201–209. https://doi.org/10.1016/S2212-5671(14)00703-5

Fotaki, M., Kourtis, A., & Markellos, R. (2023). Human resources turnover as an asset acquisition and divestiture process: Evidence from the U.K. football industry. *International Journal of Finance & Economics*, *28*, 2696–2711. https://doi.org/10.1002/ijfe.2558

Frick, B., & Simmons, R. (2008). The impact of managerial quality on organizational performance: Evidence from German soccer. *Managerial and Decision Economics*, *29*(7), 593–600. https://doi.org/10.1002/mde.1431

Garcia-del-Barrio, P., & Pujol, F. (2007). Hidden monopsony rents in winner-take-all markets – Sport and economic contribution of Spanish soccer players. *Managerial and Decision Economics*, *28*(1), 57–70. https://doi.org/10.1002/mde.1313

Gimet, C., & Montchaud, S. (2016). What drives European football clubs' stock returns and volatility? *International Journal of the Economics of Business*, *23*(3), 351–390. https://doi.org/10.1080/13571516.2016.1204686

Hägglund, M., Waldén, M., Magnusson, H., Kristenson, K., Bengtsson, H., & Ekstrand, J. (2013). Injuries affect team performance negatively in professional football: An 11-year follow-up of the UEFA Champions League injury study. *British Journal of Sports Medicine*, *47*(12), 738–742. https://doi.org/10.1136/bjsports-2013-092215

Herm, S., Callsen-Bracker, H.-M., & Kreis, H. (2014). When the crowd evaluates soccer players' market values: Accuracy and evaluation attributes of an online community. *Sport Management Review*, *17*(4), 484–492. https://doi.org/10.1016/j.smr.2013.12.006

Kaplanski, G., & Levy, H. (2010). Exploitable predictable irrationality: The FIFA World Cup Effect on the U.S. Stock Market. *Journal of Financial and Quantitative Analysis*, *45*(2), 535–553. https://doi.org/10.1017/S0022109010000153

Morrow, S. (1999). Accounting in the football industry. In: S. Morrow (Ed.), *The new business of football: Accountability and finance in football* (pp. 121–156). Palgrave Macmillan UK. https://doi.org/10.1057/9780230371743_5

Palomino, F., Renneboog, L., & Zhang, C. (2009). Information salience, investor sentiment, and stock returns: The case of British soccer betting. *Journal of Corporate Finance*, *15*(3), 368–387. https://doi.org/10.1016/j.jcorpfin.2008.12.001

Pfirrmann, D., Herbst, M., Ingelfinger, P., Simon, P., & Tug, S. (2016). Analysis of injury incidences in male professional adult and elite youth soccer players: A systematic review. *Journal of Athletic Training*, *51*(5), 410–424. https://doi.org/10.4085/1062-6050-51.6.03

Prigge, S., & Tegtmeier, L. (2019). Market valuation and risk profile of listed European football clubs. *Sport, Business and Management: An International Journal*, *9*(2), 146–163. https://doi.org/10.1108/SBM-04-2018-0033

Ross, A. G., McKay, M. J., Pappas, E., Fortington, L., & Peek, K. (2022). Direct and indirect costs associated with injury in sub-elite football in Australia: A population study using 3 years of sport insurance records. *Journal of Science and Medicine in Sport*, *25*(9), 743–749. https://doi.org/10.1016/j.jsams.2022.06.005

Ryan, J. L., Pracht, E. E., & Orban, B. L. (2019). Inpatient and emergency department costs from sports injuries among youth aged 5–18 years. *BMJ Open Sport & Exercise Medicine*, *5*(1), 1–7. https://doi.org/10.1136/bmjsem-2018-000491

Sarlis, V., Chatziilias, V., Tjortjis, C., & Mandalidis, D. (2021). A data science approach analysing the impact of injuries on basketball player and team performance. *Information Systems*, *99*, 1–16. https://doi.org/10.1016/j.is.2021.101750

Simon, H. A. (1978). Rationality as process and as product of thought. *The American Economic Review*, *68*(2), 1–16.

Tunaru, R., Clark, E., & Viney, H. (2005). An option pricing framework for valuation of football players. *Review of Financial Economics*, *14*(3), 281–295. https://doi.org/10.1016/j.rfe.2004.11.002

Vrooman, J. (2007). Theory of the beautiful game: The unification of European football. *Scottish Journal of Political Economy*, *54*(3), 314–354. https://doi.org/10.1111/j.1467-9485.2007.00418.x

Yahoo Finance – Stock Market Live, Quotes, Business & Finance News. (n.d.). Retrieved August 14, 2022 from https://finance.yahoo.com/