

THE IMPACT OF COVID-19 ON FOOTBALL CLUB STOCK INTEGRATION AND PORTFOLIO DIVERSIFICATION

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Abstract

This paper investigates the impact of the COVID-19 pandemic on the integration and diversification potential of European football club stocks. Football clubs represent a unique asset class with ties to geographic regions yet distinct brand identities. Using stock data for 14 major clubs before and after March 2020, we examine how COVID-19 altered correlations between equities. We find increased market synchronization, with higher correlations over 0.3 post-pandemic, indicating tighter relationships especially along country/league lines. However, some differentiation based on firm-specific factors persists. Our analysis shows constructing optimized portfolios can still enhance returns versus equal weighting, but managing risk is more difficult. Overall, while COVID-19 integration presents diversification challenges, opportunities remain by carefully selecting assets with moderate correlations. This study provides investors and academics insight into how a major crisis reshapes football stock dynamics, increasing systematic risk exposure. It highlights the need to re-evaluate assumptions underlying portfolio construction in light of shifting correlations.

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Introduction

Asset return correlations and portfolio diversification opportunities can shift dramatically during economic

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crises (Al-Taie & Flayyih, 2023). The COVID-19 pandemic represented one such shock that fundamentally altered dynamics in global stock markets. As Markowitz (1952) originally formalized with modern portfolio theory, investors can optimize the trade-off between portfolio risks and returns through careful diversification based on understanding asset relationships (M. A. Ali et al., 2023; Hadi, Ali, et al., 2023). However, as Mensi et al. (2021) discussed, major market disruptions like recessions and pandemics tend to increase correlation across securities, presenting challenges for diversification. This paper examines the impact of COVID-19 specifically on European football club stocks, analyzing how correlations and integration between assets changed through the crisis (Ali et al., 2023; Hadi, Ali, et al., 2023; Maseer et al., 2022). Football club stocks represent an interesting asset class, as teams have affiliations with particular geographies while retaining distinct brand identities (Prabu et al., 2021). Past research has found that football club stocks exhibit mild correlations that can provide diversification, but geographic clusters exist, especially within leagues (Baur & McKeating, 2011; Dimic et al., 2015). However, as with broader markets, the economic shock of COVID-19 may have reshaped relationships between football club stocks by increasing market integration and correlation (Sangeetha et al., 2022; Abass et al., 2023; Hadi, Abdulhameed, et al., 2023). This study aims to quantify this impact on a sample of 14 leading European football clubs. Using stock price data before and after the March 2020 onset of the pandemic in Europe, it compares the correlation structure and diversification opportunities between stocks in the two periods (Arora et al., 2022; Alwan et al., 2023; Alyaseri et al., 2023; Flayyih & Khiari, 2023; Hasan et al., 2023; Salman et al., 2023). The analysis techniques include generation of correlation matrices and Markowitz mean-variance portfolio optimization. This allows measurement of the magnitude of integration changes across the football stock universe (Natarajan et al., 2022). Understanding COVID-19's influence on football club stocks has important implications for investors in this niche asset class looking to adapt their portfolio strategies (Al-Janabi et al., 2022; Al-Janabi & Mhaibes, 2019; H. A. Mhaibes, 2018; H. Mhaibes & Mahmood, 2020). It provides insights into how diversification benefits may have evolved, and which stocks retain differentiated return drivers. As Kaplanski and Levy (2010) found, sports sentiment can directly impact team stock performance, so changing risk correlations matters. More broadly, quantifying how assets behave during crises enhances financial understanding of market contagion effects (Gupta et al., 2022). By examining European football club stocks, this study addresses a gap in the literature on asset market reactions to the pandemic (Jawad et al., 2023). Most existing research focuses on broader indices. Granito and Medda (2021) analyzed US sector ETFs, while Al-Awadhi

et al. (2020) looked at international index funds. This paper provides new evidence on an underexplored market segment. The findings should interest scholars studying market integration phenomena as well as practitioners instructing portfolios with football club stocks (Nguyen et al., 2022). The rest of the paper is structured as follows. First, a review of prior academic research on relevant areas including portfolio theory, sports sentiment, and crisis effects is presented. Next, the data and methodology for analysis are described (Jassim et al., 2021; Al-Taie et al., 2023; Al-shiblawi et al., 2023; Union et al., 2023). Key results are then summarized, including correlation comparisons and portfolio optimizations pre and post COVID-19. The paper concludes by interpreting findings, discussing implications for portfolio management, noting limitations, and suggesting avenues for further research (Al-Shammari et al., 2017; Abdulsttar Al-Obaidi & Mirdan, 2021; Mirdan & Al-Obaidi, 2021; Mary Auxilia et al., 2023).

Literature review

An extensive body of prior research provides context for examining the impact of COVID-19 on European football club stock correlations and diversification potential. This literature review synthesizes key studies on relevant areas including portfolio theory, sports stock valuation, and crisis effects on markets. Modern portfolio theory, developed by Markowitz (1952), forms the theoretical basis for diversification strategies. By selecting assets whose returns are not perfectly correlated, investors can reduce portfolio risk for a given level of return. Numerous scholars have built on Markowitz's seminal insights to refine portfolio optimization techniques. Sharpe (1964) introduced the capital asset pricing model, linking asset returns to market risk premiums. Merton (1972) analyzed optimal multi-period consumption and investment decisions. These contributions established portfolio selection as a core discipline in finance. A segment of literature specifically investigates stock returns for publicly listed sports teams, including European football clubs. Studies find sports club stocks exhibit some dependencies but also unique dynamics that can diversify broader portfolios. Berument and Yuçel (2005) uncovered significant positive correlations between Turkish club share prices and the Istanbul Stock Exchange Index. However, they determined returns were also related to team-specific factors like league ranking and fan expectations. Baur and McKeating (2011) similarly found low-to-moderate correlations among stocks of major European football clubs, suggesting some diversification benefits but also meaningful regional clustering. Beyond purely financial metrics, research on sports stocks also demonstrates the influence of fan sentiment. Kaplanski & Levy (2010) showed aviation disasters involving teams negatively impact stock prices

for those clubs, indicative of sentiment-driven reactions. Dimitropoulos and Limpaphayom (2015) revealed higher market valuations for football clubs after on-field success, capturing the euphoria of supporters. These studies highlight the nuanced non-financial factors at play in sports stock performance. Asset return correlations and their implications for portfolio construction have also been examined in the context of economic crises. Mensi et al. (2021) analyzed co-movement patterns across stocks, commodities, and cryptocurrencies during the COVID-19 bear market in early 2020. They found correlations rose significantly between asset classes during this period of turmoil, presenting challenges to diversification. Analyzing the 1987 stock market crash, Roll (1988) similarly detected increased synchronization, which he attributed to market-wide factors overwhelming firm-specific news. Financial crises appear to strengthen return linkages between securities, although Granito and Medda (2021) still found evidence of differentiation between U.S. sectors during COVID-19. A few scholars have specifically discussed the impact of COVID-19 on sports finances and stock performance. Parada (2021) outlined significant revenue pressures on European football clubs from the loss of ticket sales and media rights income during the pandemic. However, research quantifying the influence on club stock correlations is limited. This paper aims to address that gap by comparing integration before and after the onset of the health crisis. The findings shall expand financial understanding of football stock dynamics during macroeconomic shocks. In summary, while prior research indicates that football club stocks have certain specific risk characteristics, significant crises appear to boost return correlations across market segments. This suggests COVID-19 likely tightened the relationships between European football club stocks by elevating region- and league-level systematic factors over club-specific ones. However, the magnitude of this effect remains empirically unquantified. This paper's correlation analysis for 14 major clubs provides new evidence of how sharply diversification potential shifted during the pandemic for this sports-linked asset class. The results offer investors in football stocks critical insights into portfolio optimization amidst the ongoing market uncertainty.

Data and methodology

Main study inputs are data for quotation of historical close prices of clubs listed stocks according to their stock exchange. Close prices have been collected through the main website of the stock exchange for current study period that started from June 2017 to October 2023. The study sample covers 14 different sport clubs that have football teams. Choosing the club was based on those who have listed there in the stock market for publicly trading like any other company. Table 1 shows the details of clubs' stocks as a sample for current study. Table 1 exhibit each club symbol, foundation date, estimated market value, outstanding shares, and the stock market where the club already listed.

Due to the style and hypothesis of the study, samples break into two periods, before and after the announcement of COVID-19 pandemic. The first period covers the period from January 2017 to February 2020. This represents the period before WHO announced the new pandemic. Whereas the second period was started from March 2020 to October 2023. Which represent the period of the Covid-19 outbreak and its consequences. For each period, a portfolio of 14 stocks has been constructed. The style of investment takes two approaches, first is buy-and-hold portfolio with equally weighted as portions for fortune allocation amongst stocks. Second and for the same stocks, the optimal portfolio with optimal weights was constructed based on Markowitz optimization. In each case, the performance calculated on the basis of Sharpe

ratio as performance estimation.

Markets integration and diversifications benefits

From Table 2, the correlation matrix provides insights into efficient portfolio diversification and stock market integration for the 14 football club stocks. Looking at the matrix, we see several pairs of stocks with strong positive correlations above 0.4, indicating they tend to move closely together. Specifically, the stocks of Turkish clubs BJKAS and GSRAY have the highest correlation at 0.509331. An investor would likely want to avoid holding both these stocks in their portfolio, as it would provide little diversification benefit. On the other hand, some stock pairs that could provide good diversification are JUVE-BVB and JUVE-LAZI, with correlations around 0.18 and 0.24 respectively. These positive but milder correlations mean the stock prices tend to move in the same direction, providing some upside potential, but not so closely as to lack diversification. The CCP stock could also help diversify a portfolio, as it has very low correlations with most other clubs. Pairing it with a higher-correlated stock like BVB or MUF would seem to be a sound strategy.

Looking beyond specific pairs, there appears to be some market integration and clustering among stocks of clubs within the same region or league. For instance, the three Italian clubs- Juventus, Lazio, and Roma- have positive correlations in the 0.13 to 0.26 range. The two English clubs, Manchester United and Olympique Lyonnais, have a 0.04 correlation. However, even within leagues, correlations are not exceedingly high, implying country/ league affiliation alone does not drive stock prices. Club-specific financial and competitive factors still differentiate performance. In a nutshell, the matrix suggests effective diversification can be achieved by selecting stocks across leagues and regions that display mild to moderate positive correlations in the 0.1-0.3 range. Investors should avoid pairing high-correlated stocks like BJKAS and GSRAY. While geographic clusters exist, club-specific dynamics also impact stock prices. Overall, analyzing the correlation matrix provides valuable insights for forming a diversified portfolio of football club stocks.

The correlation matrix in Table 3 shows the relationships between the 14 football club stocks after the COVID-19 pandemic was announced in March 2020. Compared to the pre-pandemic matrix in Table 1, correlations have generally increased between most pairs of stocks. This suggests the pandemic has led to greater market integration and synchronization among the club stocks. Several stock pairs now have correlations above 0.3, indicating they tend to move closely together. BJKAS-FENER and BVB-JUVE are examples, with correlations of 0.351 and 0.317 respectively. Holding both stocks in each pair would offer little diversification benefit. Moderately correlated pairs like JUVE-LAZI or GSRAY-BVB, with correlations around 0.2-0.25, remain decent options for diversification. Meanwhile, the geographic clustering effect has also become more pronounced after COVID-19. Italian clubs JUVE, LAZI, and ROMA have correlations between 0.25-0.32 now, compared to 0.13-0.26 pre-pandemic. English clubs MUF and OLG have seen their correlation double from 0.04 to 0.08. This suggests country and league-specific factors now play a greater role driving club stock prices compared to company-specific finances and competitiveness. However, even post-pandemic, most correlations are below 0.4, indicating company-specific dynamics still impact valuations. For example, CCP continues to have low correlations with most peers, making it a diversifying asset. Analyzing the matrix shows effective diversification is still possible by selecting stocks from different regions with mild to moderate correlations in the 0.1-0.3 range. But higher market integration means assembling a diversified portfolio has become more challenging. In a word,

Table 1: Study sample details.

No.	Club Name	Symbol	Foundation Date	Market Value (USD)	Outstanding Shares	Stock Market
1	Manchester United	MUF	1878	\$4.3 *	163,000,000	NYSE (USA)
2	Borussia Dortmund	BVB	1909	\$1.9 *	92,000,000	Frankfurt Stock Exchange (Germany)
3	Juventus	JUVE	1897	\$1.7 *	1,067,896,664	Borsa Italiana (Italy)
4	A.S. Roma	ASR	1927	\$613 **	147,535,343	Borsa Italiana (Italy)
5	Celtic PLC	CCP	1887	\$328 **	107,250,000	London Stock Exchange (UK)
6	AFC Ajax	AJAX	1900	\$413 **	45,000,000	Euronext Amsterdam (Netherlands)
7	S.S. Lazio	LAZI	1900	\$354 **	40,643,345	Borsa Italiana (Italy)
8	F.C. Porto	FCPP	1893	\$330 **	20,000,000	Euronext Lisbon (Portugal)
9	SL Benfica	SLBEN	1904	\$586 **	23,000,000	Euronext Lisbon (Portugal)
10	Sporting Clube de Portugal	SPSO	1906	\$277 **	39,000,000	Euronext Lisbon (Portugal)
11	Galatasaray	GSRAY	1905	\$252 **	35,000,000	Istanbul Stock Exchange (Turkey)
12	Fenerbahçe	FENER	1907	\$198 **	251,000,000	Istanbul Stock Exchange (Turkey)
13	Beşiktaş	BJKAS	1903	\$164 **	2,100,000,000	Istanbul Stock Exchange (Turkey)
14	Olympique Lyonnais	OLG	1950	\$284 **	58,175,792	Euronext Paris (France)

* Billion; ** Million.

Table 2: The correlation matrix among the 14 clubs pre-COVID-19 pandemic from (January 2017-Februaury 2020).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AJAX	1													
ROMA	2	0.01												
BJKAS	3	0.00	0.03											
BVB	4	0.02	0.07	0.02										
CCP	5	0.00	-0.02	0.00	0.05									
FCPP	6	0.03	-0.01	-0.01	0.04	-0.07								
FENER	7	0.07	0.01	0.41	0.07	-0.01	-0.05							
GSRAY	8	0.05	0.00	0.51	-0.04	-0.04	-0.02	0.33						
JUVE	9	-0.01	0.13	0.01	0.18	0.05	0.00	0.05	-0.01					
LAZI	10	0.03	0.26	0.00	0.13	0.03	0.02	-0.02	0.00	0.24				
MUF	11	0.01	0.06	-0.01	0.10	0.00	-0.05	0.01	0.00	0.13	0.03			
OLG	12	0.06	0.10	0.01	0.07	0.02	0.03	0.02	-0.01	0.02	0.13	0.04		
SLBEN	13	0.03	0.06	0.02	0.03	0.00	-0.03	-0.01	0.00	0.06	0.00	0.03	0.01	
SPSO	14	-0.02	-0.08	0.01	0.02	0.03	0.02	-0.05	-0.04	-0.03	0.01	0.05	0.04	-0.02

Table 3: The correlation matrix among the 14 clubs after announcing COVID-19 pandemic for period (March 2020-October 2023).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
AJAX	1													
ROMA	2	0.12												
BJKAS	3	0.03	0.06											
BVB	4	0.12	0.17	0.11										
CCP	5	-0.01	0.08	0.07	0.10									
FCPP	6	0.02	0.01	0.03	0.04	-0.02								
FENER	7	0.06	0.01	0.35	0.15	0.07	0.01							
GSRAY	8	0.05	0.10	0.30	0.15	0.05	0.01	0.29						
JUVE	9	0.13	0.25	0.09	0.32	0.03	0.05	0.14	0.17					
LAZI	10	0.22	0.32	0.17	0.31	0.13	0.03	0.12	0.19	0.31				
MUF	11	0.12	0.09	0.01	0.20	0.04	0.03	0.03	0.03	0.15	0.16			
OLG	12	0.06	0.12	0.03	0.12	0.07	0.00	0.05	0.05	0.08	0.14	0.06		
SLBEN	13	0.04	0.04	0.06	0.09	0.05	-0.04	0.05	0.07	0.00	0.06	0.00	0.06	
SPSO	14	0.01	0.04	0.03	-0.04	0.01	0.01	0.04	0.01	-0.01	-0.02	-0.03	-0.04	-0.01

the pandemic has increased synchronization and integration between the football club stocks, leading to higher correlations, especially along geographic lines. But club-specific factors still somewhat differentiate performance. Investors must be more selective when pairing stocks to gain diversification benefits in the current environment. Prior to the pandemic, a few stock pairs had correlations exceeding 0.25, indicating relatively independent movement based on company-specific financial and competitive factors. However, after COVID-19, many more pairs display correlations above 0.3, signifying increased co-movement and synchronization. For instance, the correlation between German club BVB and Italian powerhouse JUVE rose markedly from 0.178 pre-pandemic to 0.317 post-pandemic. This shift suggests club stocks have become more tied to broader geographic and league market factors compared to individual club dynamics. In addition, the geographic clustering effect is much more pronounced after the pandemic emerged. Looking within leagues, English clubs MUF and OLG saw their correlation double from 0.04 to 0.08. More strikingly, correlations between the three Italian clubs - JUVE, LAZI, Roma - are now in the 0.25-0.32 range, considerably higher than the pre-COVID 0.13-0.26 range. Country and league affiliation seems to now be a key driver of stock valuations and performance. Notwithstanding, some nuances remain even after the pandemic's onset. The CCP stock maintains low correlations with most peers, indicating its valuations still partly depend on company financials and other club-specific factors. Furthermore, most post-COVID correlations remain under 0.4, meaning club-level dynamics still have some influence, albeit relatively less than before. Constructing a diversified portfolio by pairing stocks across regions is thus still possible but requires much more careful selection than pre-pandemic. Accordingly, COVID-19 has clearly increased market integration and synchronicity within the football club stock universe, making diversification more difficult. Investors can no longer rely on geography alone to provide diversification. Prudent analysis of the correlation matrices is essential to identify opportunities to combine assets whose prices still move somewhat independently. While the pandemic has tied club stocks closer together, especially within leagues and countries, company-specific characteristics still impact valuations to a moderate degree.

Portfolios construction and performance appraisal

The analysis of Tables 4 and 5 reveals the optimization process was able

Table 4: Equally weighted portfolio and optimal weighted pre-COVID-19 from (January 2017 to February 2020).

Portfolio	Equally Weighted	Optimal Weighted
Portfolio Return	0.000526	0.000957
Portfolio Risk	0.009241	0.007185
Sharp Ratio	0.05687	0.13324
Equivalent Risk free	4%	4%

Table 5: Weights of equally weighted portfolio and optimal portfolio pre-COVID-19.

No.	Club Name	Weight of Each stock	
		Equally Weighted	Optimal Portfolio
1	AJAX	7.1%	17%
2	ROMA	7.1%	1%
3	BJKAS	7.1%	0%
4	BVB	7.1%	1%
5	CCP	7.1%	57%
6	FCPP	7.1%	1%
7	FENER	7.1%	0%
8	GSRAY	7.1%	3%
9	JUVE	7.1%	5%
10	LAZI	7.1%	8%
11	MUF	7.1%	1%
12	OLG	7.1%	0%
13	SLBEN	7.1%	6%
14	SPSO	7.1%	1%
Total		100%	100%

to construct a portfolio with substantially improved risk-return efficiency compared to the naive approach of equal weighting of all 14 club stocks. Specifically, the optimal portfolio achieved a higher annualized return of 0.000957 versus just 0.000526 for the equally weighted set of assets. This indicates the optimization successfully identified a combination of stocks with higher total return potential. Notably, the optimal portfolio accomplished this superior return without taking on additional risk. In fact, its annualized standard deviation or risk was 0.007185, markedly below the 0.009241 risk of the equal weighting scheme. This significant enhancement in both dimensions of return and risk led to a much higher reward-to-risk ratio, as measured by the Sharpe ratio. The optimal portfolio had a Sharpe ratio of 0.13324 compared to only 0.05687 for the equal weighting. This substantial improvement in a key efficiency metric highlights the benefits of using Markowitz optimization rather than simply allocating equal proportions to each stock.

Where:

Portfolio Return is measured by lognormal average return of stock close prices to consider compounding.

Portfolio Risk is measured by standard deviation of close prices for 14 stocks that consist of the portfolio.

Sharp Ratio is a reward to risk modified ratio to calculate risk price of the portfolio.

Equivalent Risk free refers to the average rate of treasury bonds of several markets of 14 stocks.

Examining the precise composition of the optimal portfolio provides further insights. Most strikingly, the club stock CCP received an outsized 57% allocation, compared to just 7.1% in the equal weighting approach. This indicates the model identified CCP as providing important diversification. Meanwhile, stocks like BJKAS, FENER and OLG received zero allocations, suggesting the model determined they had high correlations and overlap with other selected assets. To summarize, optimization enabled the construction of a club stock portfolio with superior risk-return profile and efficiency by emphasizing assets like CCP that provide diversification gains while avoiding redundant stocks. This analysis demonstrates the power of Markowitz portfolio techniques to systematically improve investment outcomes. The analysis of the post-pandemic results in Tables 6 and 7 reveals optimization retained its ability to identify assets with higher return potential, but the changing correlations limited its capacity to reduce risk versus equal weighting. Specifically, the optimized portfolio attained an annualized return of 0.28%, dramatically higher than the 0.02% return of the equal weighted portfolio. This demonstrates the model continued to successfully select club stocks with strong cumulative

Table 6: Equally weighted portfolio and optimal weighted post-COVID-19 (March 2020 to October 2023).

Portfolio	Equally Weighted	Optimal Weighted
Portfolio Return	0.02%	0.28%
Portfolio Risk	0.012362	0.031479
Sharp Ratio	0.019488	0.087785
Equivalent Risk free	4%	4%

Table 7: Weights of equally weighted portfolio and optimal portfolio post-COVID-19.

No.	Club Name	Weight of Each stock	
		Equally Weighted	Optimal Portfolio
1	AJAX	7.10%	0%
2	ROMA	7.10%	0%
3	BJKAS	7.10%	58%
4	BVB	7.10%	0%
5	CCP	7.10%	0%
6	FCPP	7.10%	3%
7	FENER	7.10%	35%
8	GSRAY	7.10%	2%
9	JUVE	7.10%	0%
10	LAZI	7.10%	0%
11	MUF	7.10%	2%
12	OLG	7.10%	0%
13	SLBEN	7.10%	0%
14	SPSO	7.10%	0%
Total		100%	100%

performance in the new COVID environment. Nevertheless, unlike the pre-pandemic results, this return enhancement came with higher portfolio risk. The optimal portfolio saw its standard deviation rise to 0.031479, above the 0.012362 risk of equal weighting. This indicates the high-returning assets also had increased correlations, limiting diversification benefits. The higher correlations manifested in a narrower gap between Sharpe ratios as well, though the optimal portfolio maintained an edge at 0.087785 versus 0.019488. Overall, while optimization still improved return, the diminished diversification meant it was less effective at efficiently balancing risk and reward.

Examining the composition of assets reveals stocks that emerged as winners in the pandemic environment. Most strikingly, BJKAS and FENER received allocations of 58% and 35% respectively in the optimized portfolio, while receiving just 7.1% each in equal weighting. Meanwhile, pre-pandemic stars like CCP and BVB got zero allocations. In conclusion, while no longer able to enhance diversification amidst higher correlations, optimization remained valuable by shifting capital to Turkish clubs with leading returns after COVID-19. However, the inability to efficiently manage risk means this approach may not suit all investor objectives going forward.

Conclusions

This study into football club stock dynamics before and after COVID-19 yields several key insights. Our analysis reveals increased market integration and synchronization during the pandemic. More high correlations above 0.3 indicate tighter relationships between equities, aligned with broader research on crisis effects. However, some differentiation based on firm factors persists. Although diversification is more challenging, carefully selected assets can still provide moderate correlations around 0.2 for balancing risk and return. Furthermore, Markowitz portfolio optimization maintains efficacy in the pandemic era at enhancing returns, by shifting weights towards stocks like BJKAS with leading performance. Yet the ability to efficiently manage risk is hampered by the higher systemic correlations. Investors must adjust expectations accordingly. Overall, while assumptions valid pre-COVID require reassessment, opportunities exist to adapt strategies to the current climate. The pandemic has clearly increased the importance of country, league and geographic factors driving club stock prices. But idiosyncratic dynamics still have some influence. Flexible portfolio construction approaches that capitalize on these nuances can navigate the new environment successfully. As with any crisis, adaptability is key. Further research could explore club stock correlations in other regions beyond Europe. But already, our findings should interest scholars analyzing market contagion and practitioners investing in football equities. With prudent adjustments, portfolios containing these niche assets can emerge resiliently from the COVID turmoil.

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