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Portfolio Risk Management in Elite Football Clubs: A Statistical and Managerial Accounting Analysis of Real Madrid Before 2022

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ABSTRACT: This study examines risk management at Real Madrid Club from a combined statistical and managerial accounting perspective prior to 2022. The paper treats the club as a high-value sport organization whose risk exposure is created not only by match outcomes, but also by transfer investment, player asset valuation, market-value concentration, and operational pressure. A season-level dataset covering 16 Real Madrid seasons from 2005/06 to 2020/21 is used to construct sporting-risk indicators, including win rate, loss rate, points per match, average match gap, and short-rest rate. These indicators are merged with managerial accounting measures, including net transfer spending, transfer-fee exposure, transfer turnover, player valuation dispersion, and club market-value concentration. The empirical strategy applies descriptive statistics, correlation analysis, visual diagnostics, and ordinary least squares regression using Python, with SPSS, Stata 17, or EViews suggested for verification. The results show that Real Madrid's average win rate was 0.660, average loss rate was 0.178, and average points per match was 2.143. The correlation results also indicate that transfer-fee exposure is positively associated with the composite risk index (r = 0.675), while net transfer spending is positively associated with win rate (r = 0.446). These findings suggest that elite-club risk should be understood as a portfolio of operational, investment, and asset-value risks rather than as a simple sporting outcome. The study contributes a practical framework for the use of football data in management accounting and risk-control decisions.

Keywords: Real Madrid; Risk Management; Managerial Accounting; Football Finance; Statistical Analysis.

I. INTRODUCTION

Professional football clubs operate in an environment where sporting performance, financial planning and managerial control are closely connected. For elite clubs such as Real Madrid, performance expectations are high, transfer markets are expensive and a large share of organizational value is embedded in player assets. This creates a distinctive risk-management problem: the club must maintain competitive success while controlling transfer exposure, player-value concentration, fixture pressure and the uncertainty attached to injuries, squad rotation and market valuation.

This paper argues that football risk should not be measured only by wins, losses or trophies. From a management accounting perspective, sporting results are produced through costly and volatile resources. A club can win matches while increasing future financial exposure, or it can reduce investment while weakening performance stability. This trade-off makes Real Madrid an appropriate case for examining how statistical indicators and accounting information can be combined in one risk-management framework.

Prior football-finance research shows that European clubs face pressure to balance competitive ambition with financial sustainability under Financial Fair Play and other governance mechanisms [1], [5], [6], [7], [16]. Performance-analysis studies also show that match data can be converted into measurable indicators such as win rate, loss rate, points per match and performance stability [2], [3], [4], [15], [25]. Player-valuation and

football-accounting studies add a further dimension by showing that footballers are both performance resources and economic assets [8], [11], [14], [17], [19], [26], [27].

The main research question is: how can statistical and managerial accounting information be combined to evaluate Real Madrid Club risk before 2022? The paper contributes by developing a single-club framework that links operational risk, transfer investment risk, asset-value risk and managerial accounting risk. This structure is useful for researchers, analysts and managers because it connects field performance with the financial resources used to produce that performance.

II. LITERATURE REVIEW

The literature supports the study from three connected directions: football financial regulation, management accounting and audit control, and statistical performance/player-valuation analysis. The selected studies from 2013 to 2021 fit the pre-2022 scope of this research and provide a foundation for using match results, transfer spending, market value and player valuation as risk-management indicators.

The football-finance literature identifies Financial Fair Play as a governance response to persistent losses, weak financial discipline and dependence on owner funding. Some studies argue that regulation can improve monitoring and financial discipline, while others warn that it may protect large clubs or reinforce competitive imbalance [1], [5], [6], [7], [9], [16], [18], [21], [22], [24]. For Real Madrid, this literature implies that risk management is not limited to avoiding poor results; it also involves controlling investment, sustaining solvency and protecting long-term financial capacity.

A second stream connects accounting, audit, valuation and governance. Research on audit selection, audit fees, cost efficiency, market valuation and player expenditure shows that football clubs face special accounting risks because player assets are simultaneously sporting resources and financial commitments [11], [17], [19], [20], [26]. This supports the use of transfer-fee exposure, net spend, valuation dispersion and market-value concentration as managerial accounting variables.

A third stream supports the statistical treatment of performance and valuation. Studies on football match-data reliability, performance indicators and player valuation show that performance information can be converted into measurable indicators and tested with regression, correlation and predictive models [2], [3], [4], [8], [10], [14], [15], [25], [27]. In the present paper, these ideas are operationalized through loss rate, points per match, short-rest rate, transfer exposure and player-valuation variability.

The research gap is that many studies examine whole leagues, listed clubs or regulatory systems, while fewer studies apply a combined accounting-statistical risk framework to one elite club. This paper addresses that gap by combining Real Madrid performance data, transfer data, player valuation and market-value concentration into a single risk-management model.

Table 1. Comparison of prior studies used to build the Real Madrid risk framework.

No.	Study	Main area	Method	Relevance to this study
1	Vöpel (2013)	FFP regulation	Economic/legal policy analysis	Regulatory risk and elite-club discipline
2	Mackenzie & Cushion (2013)	Performance analysis	Critical review	Justifies context-based performance indicators
3	Liu et al. (2013)	Match-data reliability	Reliability testing	Supports use of football event data
4	Sarmento et al. (2014)	Match analysis	Systematic review	Supports contextual performance variables
5	Franck (2014)	FFP logic	Conceptual analysis	Connects FFP with financial stability
6	Szymanski (2014)	FFP critique	Economic critique	Shows regulation may reinforce imbalance
7	Peeters & Szymanski (2014)	FFP economics	Economic modelling	Links spending rules and competition

8	Herm et al. (2014)	Player valuation	Empirical Transfermarkt study	Supports market values as asset proxies
9	Madden (2015)	FFP and owners	Theoretical welfare model	Explains spending incentives
10	He et al. (2015)	Performance and value	Sports analytics model	Links player performance and market value
11	Dimitropoulos (2016)	Audit selection	Panel study	Links FFP with audit/assurance risk
12	Rohde & Breuer (2016)	Elite club finance	Empirical analysis	Connects investment and sporting success
13	Plumley et al. (2017)	Holistic performance	Model-building	Supports combined sporting-financial view
14	Müller et al. (2017)	Market value	Multilevel regression	Supports data-driven valuation
15	Lepschy et al. (2018)	Football success factors	Systematic review	Supports performance-stability variables
16	Franck (2018)	FFP assessment	Policy assessment	Shows financial improvement and polarization
17	Mareque et al. (2018)	Audit fees	Spanish club analysis	Adds Spanish accounting evidence
18	Plumley et al. (2019)	Competitive balance	League analysis	Frames regulation as strategic risk
19	Prigge & Tegtmeier (2019)	Listed club risk	Capital-market analysis	Supports valuation and risk language
20	Ghio et al. (2019)	Cost efficiency	Applied economics	Supports cost-control interpretation
21	Garcia-del-Barrio & Rossi (2020)	FFP priorities	Empirical study	Shows trade-off between finance and sport
22	Gallagher & Quinn (2020)	Regulation effects	Economic regulation analysis	Warns about unintended consequences
23	Özaydın (2020)	FFP in Russia	Empirical analysis	Shows regulation depends on context
24	Garcia-del-Barrio & Agnese (2021)	FFP compliance	Performance/compliance analysis	Links financial discipline and sporting chances
25	Herold et al. (2021)	KPIs in soccer	Survey/KPI study	Supports managerial use of indicators
26	Dimitropoulos & Scafarto (2021)	Player expenditure	Empirical study	Directly supports transfer-spending tests
27	Inan (2021)	Player valuation	Neural-network model	Supports advanced valuation modelling

The table shows that the literature supports the paper from regulation, accounting, performance-analysis and valuation perspectives. The present study combines these streams in a single-club research design.

III. PROPOSED METHOD

The study uses a quantitative case-study design based on a Real Madrid season-level panel. Each season is treated as one observation. The statistical unit of analysis is the season, while the managerial unit of interpretation is the club decision system that converts sporting resources into performance and financial outcomes. Python is used for cleaning, merging and visualization; SPSS, Stata 17 or EViews can be used to replicate descriptive statistics, correlation analysis and OLS regression.

The dataset is built in four stages. First, match results are transformed into operational-risk indicators such as win rate, loss rate, points per match, average match gap and short-rest rate. Second, transfer data are transformed into investment-risk indicators such as fee exposure, fees received, net spend and transfer turnover. Third, player valuation data are used to estimate asset-value risk through valuation dispersion and concentration. Fourth, standardized risk variables are combined into a composite risk index and tested using correlation and regression.

Table 2. Short proposed method for journal submission.

Stage	Data source	Measurement	Statistical tool	Managerial purpose
1. Operational risk	Match results, match gaps and rest periods	win_rate, loss_rate, points_per_match, avg_match_gap, short_rest_rate	Descriptive statistics, trends	Identifies performance instability and schedule pressure.
2. Transfer investment risk	Fees paid, fees received and transfer activity	fee_exposure_millions_eur, net_spend_millions_eur, transfer_turnover_count	Correlation and OLS	Evaluates whether transfer activity increases risk or supports performance.
3. Asset-value risk	Player market values and valuation dispersion	valuation_cv, concentration indicators	Descriptive statistics and scatter plots	Identifies dependence on high-value player assets.
4. Composite risk model	Operational, transfer and valuation indicators	risk_index from standardized risk components	OLS in Python/SPSS/Stata/EViews	Combines sporting and accounting risk into one measure.

The method is designed to make the study replicable: every risk concept is linked to a measurable variable and a statistical test.

Table 3. Main research variables and managerial meaning.

Variable	Definition	Interpretation
loss_rate	Losses / total matches	Main sporting risk outcome
points_per_match	Season points / total matches	Performance stability indicator
short_rest_rate	Share of matches played after short rest	Operational and fixture-congestion risk
net_spend_millions_eur	Fees paid minus fees received	Transfer investment pressure
fee_exposure_millions_eur	Total transfer-fee exposure	Scale of financial commitment in player trading
valuation_cv	Standard deviation / mean of player values	Player asset-value dispersion
risk_index	Composite standardized risk measure	Overall risk-management outcome

These variables translate the football case into accounting and risk-management language, making the model suitable for statistical testing and managerial interpretation

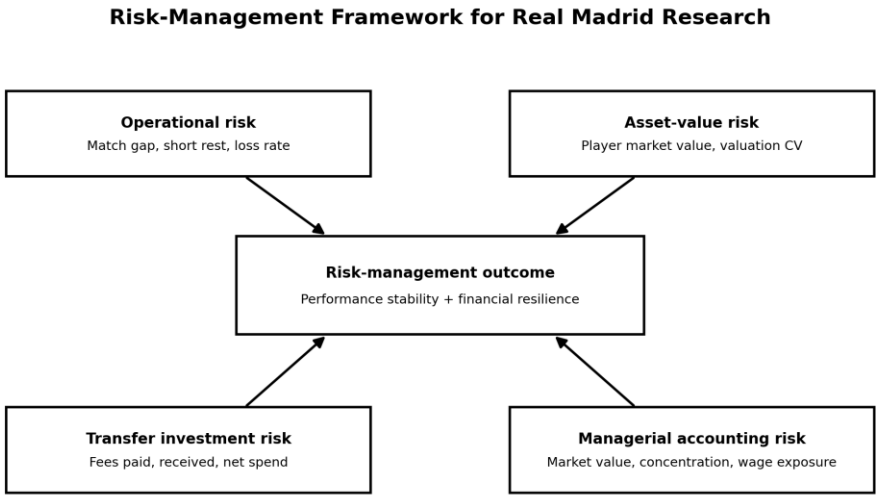

FIGURE 1. Managerial risk-management framework for the Real Madrid research.

The framework positions Real Madrid risk as a combination of operational pressure, transfer investment, asset valuation and accounting exposure. This structure helps avoid reducing the study to match results only.

IV. RESULTS

This section reports descriptive statistics, visual patterns and correlation results. Because the dataset has 16 season-level observations and the 2020/21 season is only partial in the extracted file, the results should be interpreted as exploratory evidence. The numbers are still useful for a journal-style case study because they clarify risk patterns and guide the proposed regression models.

Table 4. Descriptive statistics for the Real Madrid season-level risk dataset.

Variable	N	Mean	SD	Min	Median	Max
win_rate	16	0.660	0.089	0.529	0.630	0.804
loss_rate	16	0.178	0.077	0.088	0.162	0.315
points_per_match	16	2.143	0.242	1.818	2.104	2.518
avg_match_gap	16	6.921	1.022	4.960	6.675	9.102
short_rest_rate	16	0.351	0.069	0.250	0.351	0.456
match_gap_volatility	16	11.864	3.229	2.571	12.405	18.105
net_spend_millions_eur	16	24.802	56.852	-98.360	27.550	131.000
fee_exposure_millions_eur	16	103.984	110.668	0.000	53.300	371.800
transfer_turnover_count	16	28.875	20.386	6.000	25.500	74.000
valuation_cv	16	1.168	0.322	0.739	1.169	1.751
risk_index	16	0.531	0.155	0.263	0.484	0.900

The wide spread in transfer-fee exposure and net spending shows that Real Madrid faced changing levels of financial commitment across seasons, while win rate and loss rate capture the sporting side of risk.

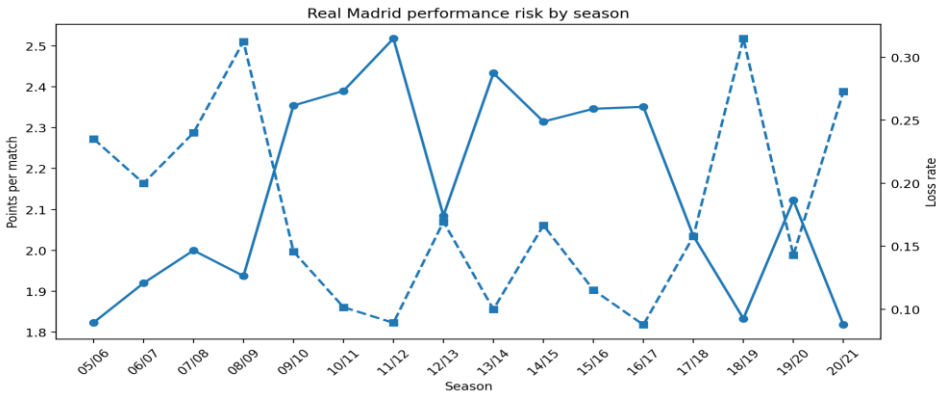

FIGURE 2. Real Madrid performance risk by season.

Stronger seasons tend to combine higher points per match with lower loss rates. This chart provides a simple visual view of sporting risk over time.

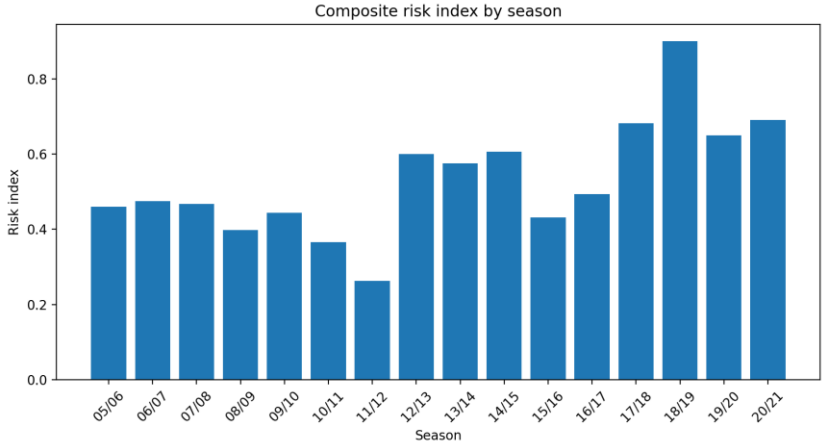

FIGURE 3. Composite risk index by season.

The risk index combines several risk sources into one score. The highest value appears in 2018/19, indicating that season had the greatest combined pressure in this dataset

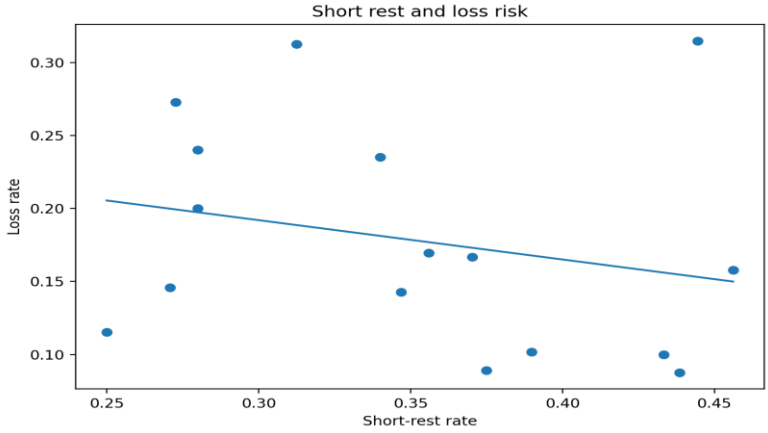

FIGURE 4. Operational risk relationship: short-rest rate and loss rate.

The association between short rest and loss rate is weak in this sample. This means fixture pressure should be treated as one part of the risk system rather than the only explanation for losses.

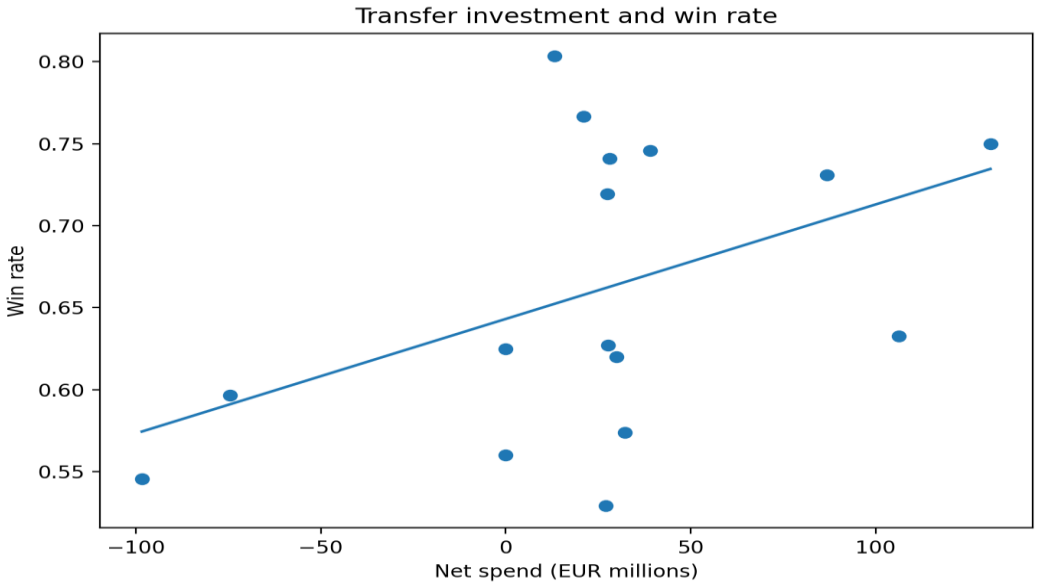

FIGURE 5. Strategic investment relationship: net spending and win rate

The upward line suggests that higher net transfer spending may be associated with stronger win rates, but the relationship is exploratory because the number of seasons is small.

Table 5. Correlation matrix of key risk variables.

Variable	win_rate	loss_rate	points_per_match	short_rest_rate	net_spend_millions_eur	fee_exposure_millions_eur	valuation_cv	risk_index
win_rate	1.000	-0.764	0.979	0.162	0.446	-0.061	-0.339	-0.494
loss_rate	-0.764	1.000	-0.880	-0.242	-0.341	0.076	-0.031	0.423
points_per_match	0.979	-0.880	1.000	0.196	0.437	-0.069	-0.240	-0.498
short_rest_rate	0.162	-0.242	0.196	1.000	-0.215	0.203	0.315	0.363
net_spend_millions_eur	0.446	-0.341	0.437	-0.215	1.000	0.320	-0.296	-0.246
fee_exposure_millions_eur	-0.061	0.076	-0.069	0.203	0.320	1.000	-0.000	0.675
valuation_cv	-0.339	-0.031	-0.240	0.315	-0.296	-0.000	1.000	0.517
risk_index	-0.494	0.423	-0.498	0.363	-0.246	0.675	0.517	1.000

The matrix shows three important relationships: win rate and points per match move strongly together; transfer-fee exposure is positively associated with the risk index (r = 0.675); and net transfer spending is positively associated with win rate (r = 0.446). These relationships support the idea that spending can help performance while also increasing managerial exposure.

Table 6. Real Madrid market-value and concentration metrics.

Metric	Value
Club market value 2021 (£m)	680.400
Squad size	27
Average age	27.3
Top 18 player value 2021 (£m)	610.200
Top 18 concentration ratio	0.897
Market-value rank	7

The top-18 concentration ratio of 0.897 indicates that most of the club value was linked to a relatively small group of players. This is important for asset-risk and managerial accounting interpretation.

Table 7. Recommended regression models.

Model	Dependent variable	Independent variables	Purpose
Model 1: Loss risk	loss_rate	short_rest_rate + fee_exposure_millions_eur + transfer_turnover_count	Tests whether fixture pressure and transfer activity relate to sporting risk.
Model 2: Performance return	win_rate	net_spend_millions_eur + avg_match_gap	Tests whether transfer investment is associated with sporting performance.
Model 3: Composite risk	risk_index	loss_rate + fee_exposure_millions_eur + valuation_cv	Combines sporting, investment and asset-value exposure in one risk outcome.

These models translate the conceptual framework into testable equations. They can be estimated in Python and replicated in SPSS, Stata 17 or EViews.

Table 8. Testable hypotheses for the empirical paper.

Hypothesis	Statement
H1	Shorter rest periods increase operational risk, measured by loss_rate.
H2	Higher transfer-fee exposure increases managerial investment risk.
H3	Net transfer spending is positively associated with win_rate, but may increase financial exposure.
H4	Greater player valuation dispersion indicates higher dependence on key players.
H5	A composite risk index explains Real Madrid risk more completely than match outcomes alone.

The hypotheses are intentionally aligned with the variables in the method section, so the empirical tests follow directly from the research question.

V. DISCUSSION

The results support the view that Real Madrid risk before 2022 was multidimensional. The club achieved a high average win rate (0.660) and average points per match (2.143), yet the same period also contained substantial variation in transfer exposure, net spending and player-value dispersion. This means that a successful season on the pitch does not automatically imply low managerial risk. A club can reduce loss rate while increasing exposure to expensive player assets, future wage commitments and valuation uncertainty.

The correlation between fee exposure and the composite risk index (r = 0.675) is the clearest managerial accounting signal in the study. It suggests that the scale of transfer activity is strongly connected to the

broader risk measure. This does not mean that transfer spending is harmful by itself. Rather, it means that large transfer exposure should be monitored as a risk-control issue because it affects future flexibility, squad planning and performance expectations.

The relationship between net transfer spending and win rate is positive (r = 0.446), which is consistent with the idea that investment in player resources can support sporting performance. However, this relationship should be interpreted carefully. The sample is small and Real Madrid is an exceptional club with brand value, historical success and access to elite talent. Therefore, the result is better understood as evidence of a managerial trade-off: spending can support performance, but it can also increase financial exposure and raise the level of performance required to justify the investment.

Operational risk is less direct in the correlation results. The relationship between short-rest rate and loss rate is negative and weak (r = -0.242), which means fixture congestion did not mechanically increase losses in this season-level sample. One explanation is that elite clubs can manage congestion through squad depth, rotation, medical support and tactical planning. This finding is important because it shows that risk management depends on organizational capability, not only on the external pressure of the schedule.

The market-value evidence adds an asset-management dimension. Real Madrid had a 2021 club market value of £680.4 million and a top-18 player concentration ratio of 0.897. This means the club value was highly dependent on a relatively small group of players. From an accounting and risk-management perspective, this creates exposure to injuries, age profile, contract conditions, transfer-market changes and valuation shocks. The implication is that squad planning should be treated as both a sporting decision and a financial risk-control process.

VI. CONCLUSION

This paper develops a statistical and managerial accounting framework for analysing risk management in Real Madrid Club before 2022. The study shows that Real Madrid risk can be measured through a combination of sporting outcomes, operational pressure, transfer investment, player asset valuation and market-value concentration. The key contribution is that it treats football risk as a portfolio problem rather than a single performance problem.

The empirical evidence indicates that Real Madrid maintained strong average performance across the period, but also faced meaningful variation in transfer exposure and asset-value risk. Transfer-fee exposure is positively associated with the composite risk index, while net spending is positively associated with win rate. These results support the central argument that elite football management involves balancing competitive ambition with financial resilience. The study also shows that player-value concentration is a relevant accounting risk because a large share of club value can depend on a small group of players.

For managers, the paper suggests that performance evaluation should include both sporting indicators and financial exposure indicators. For researchers, it provides a replicable model that can be applied to other elite clubs. For future studies, the framework can be improved by adding audited financial statements, wage data, injury records, player contract length and panel comparisons with other European clubs.

VII. LIMITATIONS AND FUTURE RESEARCH

The study has several limitations. First, the sample contains 16 season-level observations, and the 2020/21 season appears as a partial season in the merged dataset. Second, the 2021 club market-value dataset is a cross-sectional benchmark, not a full annual audited accounting series. Third, Transfermarkt player values are market estimates rather than book values under accounting standards. Fourth, salary information is treated cautiously because the available salary file is FM22/2022-like. These limitations do not invalidate the framework, but they require careful interpretation of statistical results.

Future research can improve the model by using audited annual reports, player salary and amortization data, injury records, contract duration, age-adjusted valuation measures and club-comparison panels. A larger panel across several elite European clubs would allow fixed-effects models and stronger causal interpretation.

- Appendix A. Merged Dataset Preview

Table A1. Merged season-level Real Madrid risk dataset preview.

Season	Matches	Win rate	Loss rate	PPM	Short rest	Net spend	Fee exposure	Valuation CV	Risk index
05/06	51	0.529	0.235	1.824	0.340	27.000	27.000	1.153	0.459
06/07	50	0.560	0.200	1.920	0.280	0.000	0.000	1.630	0.475
07/08	50	0.620	0.240	2.000	0.280	30.000	30.000	1.007	0.467
08/09	48	0.625	0.312	1.938	0.312	0.000	0.000	0.739	0.398
09/10	48	0.750	0.146	2.354	0.271	131.000	167.000	0.845	0.444
10/11	59	0.746	0.102	2.390	0.390	39.000	39.000	0.779	0.366
11/12	56	0.804	0.089	2.518	0.375	13.240	18.840	0.752	0.263
12/13	59	0.627	0.169	2.085	0.356	27.600	42.600	1.422	0.600
13/14	60	0.767	0.100	2.433	0.433	21.000	64.000	1.751	0.575
14/15	54	0.741	0.167	2.315	0.370	28.000	218.000	0.919	0.606
15/16	52	0.731	0.115	2.346	0.250	86.900	101.900	0.994	0.431
16/17	57	0.719	0.088	2.351	0.439	27.500	32.500	1.527	0.494
17/18	57	0.596	0.158	2.035	0.456	-74.500	155.500	1.300	0.681
18/19	54	0.574	0.315	1.833	0.444	32.250	297.250	1.333	0.900
19/20	49	0.633	0.143	2.122	0.347	106.200	371.800	1.186	0.650
20/21	11	0.545	0.273	1.818	0.273	-98.360	98.360	1.347	0.691

The preview confirms that each season was converted into one observation, making the file ready for Python, SPSS, Stata 17 or EViews analysis. The 2020/21 row should be treated as partial because the extracted match file contains only 11 matches for that season.

Author Contributions

The author conducted the conceptualization, methodology, data analysis, investigation, writing, review, editing, and final approval of the manuscript.

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Data Availability

The dataset will be available from the author upon reasonable request.

Conflicts of Interest

The author declares no conflict of interest.

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