

Department of Business and Management

Master's Degree Thesis in Corporate Finance

Chair of Cases in Business Law

**An Analysis of Corporate Financing and
Financial Stability of the Football Landscape:**

Building a Predictive Salary Cap Model for Serie A

*Clubs Based on the New UEFA Financial and
Sustainability Regulations*

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Introduction

Football is not just a game; it's an international phenomenon that knows no boundaries of culture or geography. It's the pinnacle of entertainment where billions smile from ear to ear but also one hell of a complicated business involving big money and high stakes. The governance structures, financial rules, sustainability models in football have become as nuanced and sophisticated as the strategies executed on the football field. This thesis attempts to analyze these nuances with regards to the finance diversity within the context of Italian football and European framework under UEFA.

Thesis Structure:

Chapter I: "The Playmakers: Football Governing Bodies and Financial Regulations"

This chapter is important to understand the economic consequences arising from various football governing bodies. Functions of such organizations like FIFA, UEFA as well as National Football Associations (NFAs) among regional-founded clubs situated below these mother boards - including CONI, FIGC, and Co.Vi.So.C are expounded in detail - this being apart from with a view of gloomy components of similar regulations such as Break-even Rule; absence of overdue payables; Voluntary and Settlement Agreement amongst others.

Chapter II: "An overview on football industry"

Through this chapter, a detailed financial analysis of some major Italian football clubs will include AC Milan, AS Roma, FC Internazionale Milano, Juventus FC, and SS Lazio. Their relevant individual financial statements, cash flows, and ratios available as per the need are separately presented to assess how these clubs have been impacted by the global pandemic that is COVID-19. The new rules under Club Licensing and Financial Sustainability Regulation appear at the end.

Chapter III: " Salary Cap based on the new UEFA Financial Regulations in European Football "

The final chapter explores the idea and ramifications of introducing a Salary Cap model in European football. It draws parallels to existing models like the NBA Salary Cap, including an assessment on its effects on Italian football's second tier and Spanish topflight, respectively. Finally, predictive financial models are presented and applied to scenarios regarding potential applications of the Squad Cost Rule.

Objectives:

The primary end goals for this thesis include:

- Examine the economic forces and governmental workings that dominate major governing bodies within football.
- Conduct a critical review of key Italian clubs' financial reports.
- Analyze UEFA's Financial Fair Play regime and their impact upon sustainable club behavior.
- To explore the feasibility and implications of implementing a Salary Cap system in European football.

Significance of the Study:

Understanding the financial dynamics of football is crucial for various stakeholders, including club owners, managers, policymakers, and even fans. This thesis aims to fill existing gaps in literature and offer actionable insights that could influence policy decisions and strategic planning in football governance. The reader will be able to navigate through the chapters of this thesis and thus gain a multidimensional understanding in relation to financial complexities that are involved with football governance/club operations. Finally, it may also help in unknitting regulatory actions that have been undertaken so as to ensure that there is sustainability from a finance point of view for European-based clubs and help them remain competitive.

- Chapter I - "The Playmakers: Football Governing Bodies and Financial Regulations"

1. Preface

In this first chapter, we will introduce the organizational structure of the soccer industry, starting from FIFA and going down to the Italian national associations of CONI, FIGC, and COVISOC. Subsequently, the Financial Fair Play (FFP) regulations will be analyzed, focusing on its introduction and its characteristics.

1.1 Football Governing Bodies and their economic influence on the sport sector

Various levels, each with its own unique obligations and powers, make up the hierarchical structure of football governance. FIFA oversees international football management and conducts events like the Women's World Cup as well as the World Cup ¹ (FIFA, 2021). Regional governing entities such as UEFA also preside over particular zones, for instance the Confederation of South American Football (CONMEBOL) and the UEFA, which control their zone tournaments, including the Copa Libertadores and the Champions League, among several other competitions^{2,3} (UEFA) (CONMEBOL, 2021). Governing bodies such as the FA and FIGC oversee national competitions like the FA Cup and the Coppa Italia^{4,5} (FA, 2020-2021) (FIGC, 2021). Finally, local authorities, such as counties and municipal football associations, promote and regulate grassroots football in a particular region.

The various football governance bodies play an important role in determining the economic influence of sport and shaping its future. Broadcasting rights, sponsorship agreements, and ticket sales are crucial income sources for FIFA

¹ (FIFA, 2021)

² (UEFA)

³ (CONMEBOL, 2021)

⁴ (FA, 2020-2021)

⁵ (FIGC, 2021)

during the World Cup and can result in hundreds of millions of dollars⁶ (FIFA, 2021). These revenues are reinvested into development and supporting national associations. UEFA manages the Champions League and European League championships of clubs, generating considerable revenues through broadcasting rights, sponsorship contracts, and ticket sales. In addition, UEFA provides financial support to national clubs to improve the quality of their football and their economic impact^{7,8} (UEFA) (Ernst & Young, 2019). National football associations play an important role in the economic impact of sports by organizing national leagues and tournaments, promoting the development of grassroots football, and increasing the popularity of sport. FIFA regulates player transfers between clubs and countries through the Transfer Matching System (TMS) and promotes fair financial play in the football sector through its rules. The Union provides financial and technical support to grassroots football organizations, particularly those in the least-developed countries⁹ (FIFA).

European football's economic situation is heavily impacted by UEFA's regulation of fair financial practices and licensing process for European clubs. UEFA regulates player transfers between European clubs through the Transfer Matching System (TMS) and supports and funds grassroots development initiatives in European countries¹⁰ (UEFA).

The sports sector and overall economic growth made positive strides with the leadership's efforts to improve athletics. Income from international competitions and clubs as well as national leagues supports the development and growth of international football.

1.1.1 FIFA

FIFA is a worldwide football administrative organization. The non-profit organization FIFA was founded in Zurich in the year 1904. FIFA Congress is composed of representatives of 211 world member states and is the highest administrative body (FIFA, 2021). It was Congress that elected Giovanni

⁶ (FIFA, 2021)

⁷ (UEFA)

⁸ (Ernst & Young, 2019)

⁹ (FIFA)

¹⁰ (UEFA)

Infantino as the current president of FIFA¹¹ (FIFA, 2021). FIFA's responsibilities in sports development and regulation include organizing international events like the World Cup and Women's World Cup, promoting and standardizing sports, and enforcing rules and regulations¹² (Susan L. Sutton and Tom Long, 2016). FIFA is instrumental in facilitating participation opportunities for people of all ages and backgrounds in less developed countries by promoting sport growth and supporting football development¹³ (Sugden, 2017). In addition to organizing tournaments, FIFA takes charge of player transfers and contracts via TMS and RSTP, besides organizing tournaments. TMS is an online platform that serves as a clearing house for all international player transfers, while RSTP outlines player transfer rules and regulations, including player contracts and player releases for international duties¹⁴ (Wagner, 2010) FIFA also maintains relationships with its federations and members and deals with social, economic, and cultural issues in football. FIFA's Dispute Resolution Chamber (DRC) deals with transfer and contract disputes and has the power to take decisions on a wide range of issues¹⁵ (Sugden, 2017).

Football regulation and promotion globally heavily depend on FIFA. It contributes to the stability and integrity of sport globally by setting standards, generating income, supporting development, regulating transfers and contracts, and maintaining relationship¹⁶ (Macmillan, 2019).

1.1.2 Football Confederations

There are six football federations under FIFA:

1. AFC (Asian Football Confederation)
2. CAF (Confederation of African Football)
3. CONCACAF (Confederation of North, Central, and Caribbean Association Football)
4. CONMEBOL (South American Football Confederation)
5. OFC (Oceania Football Confederation)

¹¹ (FIFA, 2021)

¹² (Susan L. Sutton and Tom Long, 2016)

¹³ (Sugden, 2017)

¹⁴ (Wagner, 2010)

¹⁵ (Sugden, 2017)

¹⁶ (Macmillan, 2019)

6. UEFA (Union of European Football Associations)

These confederations aim to govern and promote football within their own regions. Organizing and supervising international tournaments like the World Cup, club competitions, and national leagues are among their responsibilities. Additionally, they are charged with enforcing game policies, creating criteria for player transitions and deals, and backing the progress of football within their localities. The role of football confederations is to act as a liaison between FIFA and their member associations. Facilitating communication between FIFA and their member associations, they relay information, guidelines, and directives. Also, they are accountable for guaranteeing that their member associations comply with FIFA rules and regulations, and they voice the concerns of their member associations in discussions and decision-making at FIFA. Football confederations help FIFA implement programs like its technical and developmental projects. Through the liaison between FIFA and its members, football confederations play a crucial role in maintaining and strengthening their relationship.

1.1.3 UEFA and the Club Financial Control Body (CFCB)

UEFA and CFCB are crucial associations that oversee and implement financial regulations in European football.

Founded in 1954 and with 55 national soccer associations under its jurisdiction, UEFA regulates and manages European competitions such as the Champions League and Europa League, while also safeguarding and fostering the growth of soccer across Europe. The rules and regulations of European soccer are synchronized with the rest of the world through close collaboration with FIFA, the governing body of world football¹⁷ (UEFA). It works closely with FIFA, the governing body of world football, to ensure that the rules and regulations of European soccer are aligned with the rest of the world¹⁸ (FIFA, 2021). UEFA advocates for European football abroad by promoting and developing the sport globally.

¹⁷ (UEFA)

¹⁸ (FIFA, 2021)

UEFA's financial fair play regulations are enforced by the independent CFCB body. These regulations aim to prevent clubs from spending more than they earn and promote financial sustainability in European soccer¹⁹ (UEFA).

CFCB monitors club accounts and finances through audits. When there is a violation, it has the power to impose fines and restrict UEFA competition participation. Fighting unethical behavior in sports, like match-fixing and corruption, is a top priority for UEFA, whose regulations are very strict. (Sky Sports, 2021). It invests in various initiatives to promote the development of football in Europe, such as supporting the development of youth and women's soccer and investing in facilities and infrastructure²⁰ (The Independent, 2019). The stability and sustainability of European soccer clubs rely on the financial control body. Monitoring club financial statements and enforcing financial regulations, alongside guidance and support, enables the CFCB to ensure fair and responsible competition at the highest level.

In conclusion, UEFA and the club financial control body are essential to promoting sustainable European football. They work hard to uphold football as a sport that is competitive, enjoyable, and ethical for players, fans, and communities throughout Europe.

1.1.4 National Football Association (NFA)

The NFA serves as the governing authority for football in a particular country and is in charge of regulating, advancing, and popularizing the sport. Its principal objective is to preserve accessibility for individuals and ensure the game's fairness and safety²¹ (Dyke, 2016).

The NFA must primarily coordinate the national leagues in a country. To guarantee that teams play at an appropriate level, the nation is split into smaller leagues determined by region or playing level, and a promotion and relegation scheme is implemented²² (Smith, 2015). Rules and regulations set by the NFA govern player transfers, salary caps, and disciplinary procedures for leagues. Youth football development in the country is monitored by the NFA as a major responsibility. This encompasses the management of youth

¹⁹ (UEFA)

²⁰ (The Independent, 2019)

²¹ (Dyke, 2016)

²² (Smith, 2015)

academies, coaching courses, and providing funding for equipment and facilities²³ (Steen, 2013). Investing in upcoming footballers helps the NFA maintain the nation's talent pool. Efficient national leagues are established through collaboration between the NFA, clubs, players, and other stakeholders. The NFA benefits from this collaboration by receiving valuable feedback and suggestions to improve the leagues and cater to all participants. The NFA may also forge partnerships with sponsors and broadcasters to secure funding and increase the profile of the leagues, thereby attracting more fans to the sport²⁴ (Conrad, 2011).

NFA's responsibility is to represent the nation at international events like the World Cup and to collaborate with other nations in promoting the game globally. NFAs collaborating can aid in the sport's expansion and guarantee its lasting triumph for upcoming generations. In conclusion, Football's fortunes in a country depend heavily on the role its National Football Association plays. The NFA guarantees the availability and fun of the game by managing it, supporting young athletes, and setting up national tournaments.

1.1.4.1 CONI

CONI, the Italian National Olympic Committee, was formed in 1914 to monitor and encourage sporting activities in Italy. As the principal governing authority for sports in the country, CONI is essential to regulating and promoting sports in Italy. A diverse group of organizations, including the Italian Football Federation (FIGC) and other national sports federations, regional sports committees, and local sports clubs, make up CONI. The group collaborates closely with these groups to enhance sports development in Italy and guarantee fair and secure operations.

Organizing the Olympic Games, World Championships, and other international competitions in Italy is a major responsibility of CONI. CONI works with local and regional governments and other stakeholders to guarantee successful events and positive experiences for athletes, fans, and the community. To promote Italian sports, CONI is accountable for developing and supporting athletes and coaches with their education and

²³ (Steen, 2013)

²⁴ (Conrad, 2011)

training. Through the provision of funding for equipment, facilities, and programs and its work with national sports federations, CONI helps establish a strong pool of talent in various sports. Of particular significance is CONI's role in the sport of football in Italy. Through its affiliation with the FIGC, CONI regulates and promotes the sport in the country, ensuring that it is played fairly and safely. This includes arranging the Italian soccer leagues, encouraging youth development, and representing Italy globally.

In conclusion, CONI is a crucial organization for the promotion and development of sports in Italy. Through partnerships with national sports federations, regional sports committees, and local sports clubs, CONI enables all individuals in the country to access and enjoy sports. CONI's regulation and promotion of sports in Italy are highlighted by its relationship with the FIGC and impact on football.

1.1.4.2 FIGC

The Federazione Italiana Giuoco Calcio (FIGC) is responsible for managing football in Italy. It has been instrumental to the growth of football in Italy since 1898 and remains a dominant force.

The FIGC is in charge of managing and regulating Italian football leagues, including Serie A, Serie B, and minor leagues. The FIGC sets rules and regulations for these leagues, such as player transfers, salary caps, and disciplinary procedures, to ensure fair and competitive play. The FIGC is also responsible for conducting the Coppa Italia, the premier cup competition in Italy. The FIGC is committed to promoting youth football in Italy by managing youth academies, providing coaching courses, and financing sports equipment and infrastructure. By collaborating closely with clubs and other parties with a vested interest, the FIGC aims to identify and develop burgeoning talent, thereby ensuring the future of Italian football. The FIGC also represents Italy on an international level, including participating in competitions like the World Cup. By collaborating with other national associations, the FIGC promotes the sport globally and maintains Italy's status as a major player in the world of football. Besides serving its purpose in sport, the FIGC endeavors to foster and popularize football in Italy through corporate alliances and mediators backing for sponsorship and better

visibility. It collaborates with clubs and enthusiasts to augment the game's significance and woo larger audiences.

In conclusion, the FIGC plays a vital role in football in Italy by regulating the leagues, promoting youth development, and representing Italy at the international level. The FIGC is a significant power in Italian football that honors its rich legacy and has a never-changing vow to the sport's greatness.

1.1.4.3 Co.Vi.So.C

To supervise and regulate the financial management of professional football clubs in Italy, the FIGC founded Co.Vi.So.C., or the Supervisory Commission on Football Clubs, in 2006. Its purpose is to promote financial fair play, ensure transparency in clubs' financial operations, and prevent the accumulation of unsustainable debts²⁵ (CoViSoC).

All professional football clubs in Italy have their financial activities monitored by finance, law, and accounting experts who make up Co.Vi.So.C. Their purpose is to verify clubs' financial status, analyze their budgets, and ensure adherence to financial fair play rules. Compliance with regulations is necessary to avoid sanctions imposed by the commission, like fines, point deductions, and even being relegated from the league. Its crucial role is to ensure the financial stability, transparency, and effective management of Italian football clubs' finances. The commission's activities help improve the overall economic and financial health of Italian football by preventing clubs from engaging in unsustainable spending practices.

Italian football witnesses' financial transparency due to Co.Vi.So.C.'s efforts, which provide accurate information to stakeholders, investors, and fans on club financial activities, minimizing the risk of financial impropriety and corruption²⁶ (Lega Serie A). Italian football clubs have significantly improved their financial management since the establishment of Co.Vi.So.C. Many clubs that were previously struggling financially become more stable,

²⁵ (CoViSoC)

²⁶ (Lega Serie A)

and the overall level of debt in Italian football decreases significantly ²⁷ (Taylor & Francis Online, 2019).

1.2 The UEFA Regulation: Introduction to Financial Fair Play

UEFA introduced the Financial Fair Play (FFP) rules in 2010 to secure the financial future of European football clubs²⁸ (UEFA, 2010). To prevent excessive spending by clubs and reduce the effect of rich owners investing a great deal of money in a short period of time to gain an advantage over other clubs, the regulations were introduced²⁹ (Taylor, 2019). Clubs must balance expenses and revenue over three years per FFP regulations. Player transfers and wages are included in expenses, but they cannot exceed income, which comprises revenue from ticket sales, broadcast rights, and sponsorships. Clubs have to forecast their income and outgoings, maintain precise financial records, and submit these records to UEFA regularly to satisfy FFP standards. A club suspected of breaking the rules can face penalties such as fines, bans from European competitions, or limits on future spending enforced by UEFA.

To increase their revenue, clubs should consider diversifying their sources, including by increasing ticket sales and securing better broadcast deals, among others. They can control their expenses by reducing player transfers and wage costs. Both up-to-date financial records and regular submissions to UEFA are important for accurate financial reporting by clubs.

European football's financial performance has significantly improved since the implementation of FFP regulations. A net profit of 579 million EUR in 2016/17 was achieved by top European division clubs due to reduced overdue payables. However, the COVID-19 pandemic has dramatically impacted the financial performance of European football, resulting in estimated aggregate net losses above 6 billion EUR in two seasons. Nevertheless, the previous achievements of UEFA's Financial Fair Play have likely prevented more

²⁷ (Taylor & Francis Online, 2019)

²⁸ (UEFA, 2010)

²⁹ (Taylor, 2019)

severe and potentially irreparable financial distress^{30,31} (KPMG Football Benchmark, 2018) (Deloitte, 2021).

In conclusion, FFP regulations were implemented to prevent European football clubs from overspending and to promote their long-term financial stability. Clubs must balance their expenses and revenue, focus on increasing revenue and controlling expenses, and be transparent and honest in their financial reporting to UEFA. The overall financial performance of European football has improved since the introduction of the regulations, and their achievements have likely prevented more severe financial distress in the face of the COVID-19 pandemic³² (Szymanski, 2020).

1.2.1 Break-even Rule

UEFA's Financial Fair Play (FFP) regulations require adherence to the break-even rule for financial stability among football clubs³³ (UEFA, 2015). A club must ensure its expenditures, which include player transfers and wages, do not exceed its income from sources like ticket sales, broadcast rights, and sponsorship deals throughout the three-year period. Preventing clubs from accumulating expenses that surpass their earnings is the primary benefit of the break-even rule, especially in professional football. Without the break-even rule, clubs may spend excessive amounts of money on player transfers and wages, leading to increased expenses and potential financial instability^{34,35} (UEFA, 2020) (The Economist, 2018). A club may face future financial difficulties and harm its competitiveness in such a setting. The break-even rule promotes financial stability by requiring clubs to operate within their means. The move helps reduce clubs' reliance on affluent owners who may inject substantial funds over a brief period to gain an edge over the

³⁰ (KPMG Football Benchmark, 2018)

³¹ (Deloitte, 2021)

³² (Szymanski, 2020)

³³ (UEFA, 2015)

³⁴ (UEFA, 2020)

³⁵ (The Economist, 2018)

competition. Moreover, the break-even regulation creates an equitable platform for every team, despite their extent and financial means. This helps prevent wealthy clubs from dominating the competition and ensures that smaller clubs have an equal chance of success³⁶ (Journal of Sports Economics, 2015).

The FFP regulations hinge on the break-even rule, which is crucial for a football club's financial stability. It helps by preventing excessive club expenses, promoting revenue generation, and ensuring a level playing field. In addition, it safeguards the maintenance of professional football by implementing measures to promote financial stability and limit clubs from exceeding their financial capabilities.

1.2.2 Absence of overdue payables

The Financial Fair Play (FFP) regulations emphasize the significance of avoiding overdue payables, as this is crucial in maintaining the financial stability of football clubs. Unsettled debts owed by a club to other clubs, players, or suppliers that are pending payment are referred to as overdue payables. The importance of the absence of overdue payables is that it helps prevent clubs from incurring debt and becoming financially unstable. If a club has a significant amount of overdue payables, it may face difficulties meeting its financial obligations³⁷ (García-del-Barrio, 2019). This could affect the club's competitiveness and result in future financial problems. Additionally, not having any outstanding payments contributes to the club's and sport's overall image. A club that has gained a reputation for not paying debts might struggle to conduct business with other clubs, players, and suppliers, causing financial implications. If many clubs have a similar reputation, it could tarnish the image of the sport as a whole³⁸ (Zardini, 2020).

In conclusion, the absence of overdue payables is a vital characteristic of the Financial Fair Play regulations and an essential aspect of maintaining the financial stability of football clubs. The FFP regulations maintain

³⁶ (Journal of Sports Economics, 2015)

³⁷ (García-del-Barrio, 2019)

³⁸ (Zardini, 2020)

professional football's sustainability and continued success by preventing clubs from incurring debt and damaging their reputation.

1.2.3 Voluntary and Settlement Agreement

The Financial Fair Play (FFP) legislation relies on the importance of the Voluntary and Settlement Agreements to support the financial stability of football clubs. The club had agreed with the governing body of UEFA, responsible for enforcing the FFP standards, to address any potential infractions³⁹ (UEFA, 2021). The significance of the Voluntary and Settlement Agreement lies in its capacity to give a flexible and constructive resolution to any possible FFP rule infractions. Clubs can manage issues without formal disciplinary procedures that can waste time, money, and damage their reputation. The Voluntary and Settlement Agreement mandates that the club partner with UEFA to create a plan that deals with the club's financial state and supports it in meeting FFP regulations. This may include initiatives such as reducing expenses, raising revenues, and restructuring debt. The arrangement offers the organization a straightforward course to follow and secures its enduring fiscal steadiness. In addition, the Voluntary and Settlement Agreement serves to safeguard the club's and sport's reputations⁴⁰ (UEFA, 2021). By collaborating with the club to solve any potential FFP rule infractions, UEFA ensures the club's financial stability and continued participation in professional football.

Financial Fair Play legislation requires the Voluntary and Settlement Agreement, which is critical to football clubs' financial sustainability. The Voluntary and Settlement Agreement safeguards the club's and sport's reputation, long-term financial stability, and continued success and sustainability by providing a flexible and constructive solution to possible FFP rule infractions.

³⁹ (UEFA, 2021)

⁴⁰ (UEFA, 2021)

- Chapter II - An overview over the Football Industry

2.Preface

The second chapter will focus on the analysis of financing methods, both of equity and third parties, for the five-year period from 2018 to 2022, for five of the most important soccer clubs in Italy. Among them are Juventus, Roma, and Lazio, the only Serie A clubs that are publicly traded. Through the study of financial statements, it will be possible to highlight common characteristics and any differences between companies that are and are not publicly traded. In the second part of the chapter, the new UEFA regulations will be introduced, which are intended to replace Financial Fair Play, with particular emphasis on the last point, that of Cost Control and the Squad cost Rule (SCR), which is the basis of the Salary Cap model that will be introduced in the next chapter.

2.1 Financial Analysis of Italian Football Industry

In order to accurately assess a company's overall fiscal wellness, including strengths and weaknesses, analysts employ four essential tools: financial statement analysis, profit and loss analysis, cash flow analysis, and financial ratio analysis⁴¹ (Brigham, 2018). As valuable tools for assessing the monetary stability and upswing potential of firms, statement analysis, including profit/loss and cash flow ratios, proves essential. These analyses help all concerned parties, from fund managers to investors, determine how best to proceed in their service with regard to capital stocks and bonds, among other equally important securities. Moreover, in order to have a clear view of the situation of a company has been necessary to provide an analysis of the financial effects of Covid-19 and an analysis of the forms of equity and debt financing.

Financial Statement Analysis

⁴¹ (Brigham, 2018)

Financial statement analysis is a systematic process of reviewing and evaluating a company's financial statements to gain an understanding of its financial performance, stability, and efficiency. Included in this systematic evaluation is an analysis of the company's balance sheet, income statement, and cash flow statements. To interpret the financial data, various methods like horizontal analysis, vertical analysis, and financial ratio analysis are employed in this analytical process. The financial data can be interpreted by employing different methods, including horizontal analysis, vertical analysis, and financial ratio analysis⁴² (Gibson, 2017).

Profit and Loss Analysis

Income Statement Analysis, or Profit & Loss Analysis, looks into a firm's revenue generation patterns along with those responsible for incurring costs to arrive at earnings or losses accumulated. By reviewing the income statement, information on revenue streams and expense distribution can be examined, ultimately identifying profitability. Income statement analysis allows identifying a company's profitability generation, expense control, and operational efficiency achievement capabilities. To assess how profitable and potentially growing a business can be, this analysis must be conducted⁴³ (Damodaran, 2012).

Cash Flow Analysis

Managing its financial obligations is crucial for a company's survival and expansion. Understanding a business's liquidity levels, financial stability, and general fund control are additional takeaways from this review⁴⁴ (Brigham, 2018). A thorough analysis of a firm's monetary assets requires an understanding of their incoming versus outgoing funds, which are detailed in the organization's Cash Flow Statement. This sector breakdown consists solely of operating activities, investing activities, and financing activities. Cash generated from operations, investment in growth opportunities, and overall handling of financial responsibilities are details that stakeholders find

⁴² (Gibson, 2017)

⁴³ (Damodaran, 2012)

⁴⁴ (Brigham, 2018)

when they scrutinize each section under review. A company's survival and expansion depend on having a healthy cash flow.

Equity and Debt Financing

To operate and expand, football clubs require financing, much like any other business. In this section, an investigation will be conducted on the regulation of equity and debt financing in football clubs. Furthermore, will be analyzed how these financing methods have been affected during the COVID-19 pandemic.

Equity financing involves raising capital by selling ownership stakes in the club. This can take several forms⁴⁵ (Morrow, 2003):

1. **Private Ownership:** The traditional model involves a private individual or a group of investors purchasing the club. Additional capital injections may come from investors with the goal of increasing club value and future profits.
2. **Fan Ownership:** In this model, supporters can buy shares of the club, giving them a direct stake in the club's success. The ownership of clubs like FC Barcelona and Real Madrid is given to their members, or socios, who can participate in choosing key decisions and electing new board members. Long-term commitment and a sense of community are promoted by this model in the club.
3. **Public Listing:** Some clubs, such as Manchester United and Juventus, have opted to go public by listing their shares on stock exchanges. It offers the opportunity to increase their financial support base, though it also brings greater regulation and monitoring.

Football governing bodies like FIFA, UEFA, and national associations regulate equity financing in football clubs. Assuring financial stability and equitable competition among clubs is the chief objective. Key regulations include⁴⁶ (UEFA, 2012):

1. **Financial Fair Play (FFP):** UEFA's FFP rules aim to prevent clubs from spending beyond their means. Demonstrating that they are not accumulating excessive losses and that their spending is sustainable in the long term is

⁴⁵ (Morrow, 2003)

⁴⁶ (UEFA, 2012)

mandatory for clubs. This prevents wealthy owners from artificially inflating a club's financial capabilities, ensuring a level playing field.

2. **Ownership and Control:** Football associations have rules to ensure that club owners are "fit and proper" persons. Prospective owners must fulfill precise requirements, which include having no criminal history and displaying financial stability. Moreover, clubs can't be owned by several parties that have contrasting interests, including parties that own stocks in other clubs.

Debt financing involves borrowing money to fund club operations or investments with the promise to repay the principal amount along with interest. Common forms of debt financing at football clubs include⁴⁷ (Morrow, 2003):

1. **Bank Loans:** Clubs can borrow money from banks, which typically require collateral, such as the club's assets or future revenue streams. The creditworthiness of the club determines both the interest rates and repayment terms.
2. **Bonds:** Some clubs issue bonds to raise capital. Investors acquire these debt securities and receive periodic interest along with the principal paid at maturity. Long-term financing and lower interest rates than bank loans make bonds attractive for clubs.
3. **Player Transfer Debt:** Clubs may also finance player transfers by agreeing to deferred payments or installment plans. Acquiring new talent can be spread over several years, but future revenue shortfalls can burden companies with debt.

Regulatory agencies also monitor football club debt financing to ensure financial stability and prevent excessive risk-taking. Key regulations include:

1. **Debt-to-Equity-Ratios:** Football governing bodies may impose limits on the amount of debt a club can take on relative to its equity. This measure ensures that clubs do not become overly leveraged and susceptible to financial shocks.

⁴⁷ (Morrow, 2003)

2. **Financial Reporting:** Clubs are required to submit financial reports to their respective governing bodies, which scrutinize their debt levels and overall financial health.

Impact of the COVID-19 Pandemic on Football Club Financing

The COVID-19 pandemic has had a significant impact on football clubs' finances, affecting both equity and debt financing methods. The main consequences include:

1. **Loss of Revenue:** With matches being played behind closed doors or with limited attendance, clubs experienced a sharp decline in matchday revenue. In addition, certain broadcasting arrangements were reconsidered, and business partnerships were influenced, causing a decline in overall income. This reduced the clubs' ability to finance operations and investments through internal resources, forcing them to seek external financing.
2. **Challenges in Equity Financing:** The pandemic-induced economic downturn made it difficult for clubs to attract new investors or sell shares, as the perceived risk and uncertainty in the football industry increased. Cash flow issues resulted in certain clubs struggling to meet their financial commitments.
3. **Increase in Debt Financing:** With limited access to equity financing, clubs turned to debt financing to meet their financial needs. Many clubs took out loans, issued bonds, or relied on deferred payments for player transfers. Long-term financial instability could be a result of increased debt financing if revenues don't improve fast enough.
4. **Relaxation of Financial Regulations:** Recognizing the extraordinary circumstances, some football governing bodies temporarily relaxed financial regulations, such as UEFA's FFP rules. This provided clubs with additional flexibility to navigate the financial challenges caused by the pandemic. Nevertheless, there is a danger that a few clubs may become excessively leveraged, possibly resulting in enduring financial instability.

Football clubs' financial stability and growth are ensured through the use of equity and debt financing. The COVID-19 pandemic has highlighted the importance of having diverse sources of financing and the need for robust financial regulations to maintain the long-term stability of clubs. The

pandemic has shown the hazards of excessive dependence on debt funding and the requirement for stricter supervision.

The football industry's probable long-term impact prompted UEFA to introduce a new financial sustainability regulation, replacing the previous Financial Fair Play rules. This new regulation endeavors to tackle the limitations of the former system and adapt to the financial setting that has emerged after the pandemic.

The key features of the new UEFA financial sustainability regulation include the following:

1. Clubs can now invest in infrastructure, youth development, and other long-term projects without fearing any penalties, thanks to the greater flexibility provided by the new regulation. Clubs are encouraged to prioritize sustainable growth over short-term gains.
2. Enhanced Monitoring: The regulation introduces more comprehensive financial monitoring, including stricter financial reporting requirements and regular audits. To guarantee financial health, clubs undergo close scrutiny while maintaining healthy debt-to-equity ratios.

2.1.1 AC Milan

This financial report aims to give a full and detailed look at AC Milan's finances and assets from 2018 to 2022. The report provides a comprehensive analysis of the club's financial statements, including the balance sheet, income statement, and other significant indicators, along with evaluating the financial effect of the COVID-19 pandemic.

Reformulated Balance Sheet - Milan					
€'m	30 Jun 2018	30 Jun 2019	30 Jun 2020	30 Jun 2021	30 Jun 2022
Assets					
Fixed assets	283	288	236	250	346
Intangible assets	259	271	219	179	320
Tangible assets	15	14	14	67	23
Other assets	10	3	3	4	3
Current assets	152	168	144	156	157
Stock	0	0	0	0	0
Debtors	46	58	52	56	64
Other current assets	105	110	92	100	93
<i>a/w Cash & cash equivalent</i>	<i>25</i>	<i>13</i>	<i>11</i>	<i>24</i>	<i>43</i>
Total assets	435	456	381	406	503
Liabilities & equity					
Shareholders funds	36	(83)	(34)	(67)	(131)
Capital	(113)	(113)	(113)	(113)	(113)
Other shareholders funds	149	30	79	46	(18)
Non-current liabilities	(46)	(27)	(46)	(104)	(139)
Long term debt	(14)	-	(19)	(54)	(45)
Other non-current liabilities	(32)	(27)	(27)	(51)	(94)
<i>a/w Provisions</i>	<i>(20)</i>	<i>(23)</i>	<i>(24)</i>	<i>(19)</i>	<i>(73)</i>
Current liabilities	(425)	(346)	(301)	(234)	(233)
Loans	(140)	(96)	(97)	(72)	(26)
Creditors	(59)	(51)	(44)	(51)	(60)
Other current liabilities	(225)	(200)	(160)	(111)	(146)
Total shareh. funds & liab.	(435)	(456)	(381)	(406)	(503)

Table 1: Own analysis carried out by reformulating balance sheets figures of the 2018-19-20-21-22 A.C. Milan annual reports

2.1.1.1 Financial Statement Analysis

Asset Analysis: From 2018 to 2022, AC Milan's total assets grew by around 13,5%. The stadium, player registration rights, cash, and financial equivalents are among the most valuable assets discovered during a comprehensive analysis of the club's asset structure. The increase in assets reflects the club's expansion and resource investments to enhance its competitive position.

Fixed assets: AC Milan's fixed assets rose from €283.4 million in 2018 to €346.2 million in 2022. In 2022, intangible fixed assets at AC Milan accounted for a significant portion of its total fixed assets. The growth in intangible fixed assets, such as trademarks and licenses, as well as players' contracts, is responsible for this increase. In the five-year period, the value of tangible fixed assets underwent changes, peaking at €66.7 million in 2021 and dropping to €22.8 million in 2022. Tangible fixed assets changed due to variations in property, plant, and equipment values and investment and

depreciation policies. AC Milan's current assets increased from €151.8 million in 2018 to €156.7 million in 2022. Rising debtors, from €46.2 million in 2018 to €63.8 million in 2022, largely contributed to the company's growth, which may be due to increased accounts receivable from sponsorships, merchandise sales, and broadcasting rights.

Liabilities Analysis: Non-current liabilities surged to €139 million in 2022 from €46 million in 2018. The growth in non-current liabilities could be attributed to the club's long-term debt and other liabilities, possibly indicating additional debt to finance its operations and investments. AC Milan's long-term debt escalated significantly from €14 million in 2018 to €45.2 million in 2022. An increase in long-term debt signals potential borrowing for operations or investments, which could include player acquisitions or stadium improvements for the club. Other non-current liabilities experienced a noticeable surge, reaching €93.9 million in 2022 from €32 million in 2018. Deferred tax liabilities, long-term lease obligations, or other long-term financial commitments could be behind the increase. In 2022, provisions of €72.5 million show an increase in potential future obligations or contingencies recognized by the club from just €20.3 million in 2018.

In 2018, AC Milan's current liabilities were €425.2 million, and in 2022 they will be reduced to €232.6 million. Loan and current liability reduction, possibly due to better management of short-term obligations, debt restructuring, and loan repayment, contributed to the observed decrease. €140.3 million worth of short-term loans in 2018 decreased to €26 million in 2022. The decrease may indicate improved cash handling or a transition to long-term lending.

The sum owed to suppliers and other parties rose marginally from €59.5 million in 2018 to €60.2 million in 2022. The slight escalation may be due to typical business procedures. A decrease in current liabilities happened between 2018 and 2022, from €225.4 million to €146.4 million. Short-term obligation settlements and liability reclassifications could have caused the decrease.

Equity Analysis: AC Milan's equity increased by approximately 72,5% from 2018 to 2022, from -€36 million to €131.2 million. AC Milan's capital

remained constant at €113.4 million from 2018 to 2022. This indicates that there were no new share issuances or capital reductions during this period.

Other shareholders' funds experienced a considerable improvement from -€149.5 million in 2018 to €17.8 million in 2022. Reduced accrued losses, augmented reserves, or a mixture of the two are responsible for this progress. The positive increase in shareholders' funds was hugely influenced by the turnaround in other shareholders' funds.

2.1.1.2 Profit and Loss Analysis

Revenue Analysis: AC Milan's operating revenue saw a declining trend in the years 2018 to 2020, decreasing from €249.6 million to €188.9 million. This decline can be attributed to a reduction in matchday and commercial revenues during this period. However, operating revenue rebounded and increased to €297.6 million in 2022, driven by improved broadcasting rights and sponsorship deals.

Matchday Revenue: Matchday revenue decreased from €36.8 million in 2018 to €22.7 million in 2020, primarily due to lower ticket sales and reduced stadium attendance. Matchday revenue surged to €32.1 million in 2022, due to a boost in ticket sales and attendance at the club.

Broadcasting Revenue: Broadcasting revenue fell from €109.3 million in 2018 to €76.5 million in 2020, owing to the club's absence from the UEFA Champions League and lower league positions. Broadcasting revenue recovered to €146.3 million in 2022 as the club qualified for the UEFA Champions League and secured higher league positions.

Sponsorship deals and merchandise sales decreased, resulting in a drop in commercial revenue from €103.5 million in 2018 to €89.7 million in 2020. Increased merchandise sales and new sponsorship agreements helped the commercial revenue reach €119.2 million in 2022.

Sales experienced variations year after year, with a peak of €34.1 in 2019 and a sharp drop to €0 in 2021. However, sales increased again to €32.5 in 2022.

Modifications in product offerings, pricing strategies, or market circumstances may have led to the fluctuation observed.

Expense Analysis: AC Milan's financial loss rose to €29.8 million in 2020, mainly due to higher interest expenses. The financial loss reduced to €5.1 million in 2022 as the club managed to lower its interest expenses. Player Wages: Player wages increased from €145.8 million in 2018 to €165.1 million in 2020, reflecting the club's investment in new players and contract renewals. However, player wages decreased to €152.4 million in 2022 as the club implemented cost-saving measures and offloaded high-wage players.

The rising administrative costs and investments in infrastructure caused the other operating expenses to increase from €103.9 million in 2018 to €124.8 million in 2020. These expenses decreased to €113.7 million in 2022 as the club implemented cost-cutting strategies. The decline in operating revenue and increased player wages caused the club's operating loss to soar from €98.7 million in 2018 to €186.6 million in 2020. The operating loss improved to €54.9 million in 2022 as a result of higher operating revenue and cost management initiatives.

From 2018 to 2022, employee costs have steadily increased to €170.2 million. The escalation in expenses is due to both the increase in the workforce and possible pay raises. In 2022, depreciation and amortization costs dropped to €76.4 million from their peak of €125.7 million in 2020. Depreciation and amortization costs decreased from their peak in 2020 to €76.4 million in 2022, likely due to the company's variable investments in fixed and intangible assets. Interest paid fell sharply from €23.8 million in 2018 to €4.5 million in 2022. The company may have lowered its debt or achieved better loan interest rates, resulting in a decline in interest paid.

The club faced a loss of €126 million in net income in 2018 and a loss of €194.6 million in 2020. Higher operating revenue and improved financial management led to a net income loss of €66.5 million in 2022.

2.1.1.3 Cash Flow Analysis

Insight into the management and generation of cash during 2018-2022 can be gained from a cash flow analysis of AC Milan. Operating, investing, and financing activities' cash flows will be analyzed in this study.

Operating Activities: Operating activities generally include the transactions associated with generating revenue, paying expenses, and managing working capital. AC Milan had varying operating revenues from 2018 to 2022, ranging from €188.9 million to €297.6 million. The costs of employees consistently represented a significant portion of the operating expenses, ranging from €150.4 million in 2018 to €170.3 million in 2022. The depreciation and amortization expenses also varied across the years, with the highest value in 2020 at €125.7 million. The operating profit (EBIT) had a downward trend from 2018 to 2020, with the lowest value of -€186.6 million in 2020 but started improving in 2021 and 2022.

Investing Activities: The acquisition and disposal of long-term assets like property, plant, equipment, and intangible assets fall under investing activities. The fixed assets of AC Milan increased from €283.4 million in 2018 to €346.2 million in 2022. The largest component of fixed assets was intangible fixed assets, which also experienced growth from €258.8 million in 2018 to €320.1 million in 2022. AC Milan directed their investments towards intangible assets, specifically player contracts.

Financing Activities: Financing activities include cash flows related to raising capital, repaying debt, and distributing dividends to shareholders. The long-term debt of AC Milan decreased from €14 million in 2018 to €0 in 2019, but then increased again to €45.2 million in 2022. External financing has been utilized by the club for their operations and investments. Additionally, the shareholders' funds had a negative value in 2018 but improved significantly over the years, reaching a positive value of €131.2 million in 2022.

Overall, AC Milan experienced a challenging period between 2018 and 2020, with declining operating profits and increasing losses. However, the club has shown signs of financial improvement in 2021 and 2022, with increased operating revenues and reduced losses. The investments in intangible fixed

assets and the use of external financing have supported the club's operations and growth during this period.

2.1.1.4 Financial Ratios Analysis

An analysis of AC Milan's financial performance and stability will be conducted by calculating financial ratios. The club's ability to remain solvent is demonstrated by these numbers reflecting its profitability, liquidity, and solvency.

Profitability Ratios

1. **Operating Profit Margin:** The operating profit margin is the proportion of revenue that remains after subtracting COGS and operating expenses. In 2018, the operating margin was a dismal -39.6%. It worsened further and plummeted to -98.7% in 2020, indicating poor financial performance. The situation improved in 2022, when the club effectively managed expenses and increased operating revenue, resulting in an operating margin of -18.4%.
2. **Net Profit Margin:** The net profit margin is the the proportion of income left after deducting all expenses, including taxes and interest. In 2020, AC Milan experienced a significant decline in its net profit margin from -50.4% in 2018 to -103%, which indicated an overall lack of profitability. However, the club put in efforts to enhance net income, and as a result, the net profit margin improved to -22.3% by 2022.

Liquidity Ratios

1. **Current Ratio:** The current ratio measures a company's capacity to meet short-term commitments. A ratio of 1 or more indicates that the club's current assets can cover its current liabilities. AC Milan's current ratio raised from 0.65 in 2018 to 0.80 in 2022, indicating that the club's ability to fulfill temporary commitments has enhanced.
2. **Quick Ratio:** The quick ratio determines a group's potential to meet short-term obligations through liquid assets like cash and accounts receivable. A ratio of 1 or more indicates that the club has adequate liquid assets to cover its present liabilities. The club's quick ratio surged from 0.62 in 2018 to 0.76 in 2022, indicating a marked increase in their capacity to meet such obligations.

Solvency Ratio

1. **Debt-to-Equity Ratio:** The debt-to-equity ratio compares the amount of debt to the amount of shareholder equity. This shows how a club finance itself. Starting from a ratio of 1.47 in 2018, the club's financial risk increased as the ratio rose to 1.92 in 2020. However, the ratio has since improved to 1.59 in 2022 with the club's reduction of debt and increase in equity.
2. **Equity Ratio:** The equity ratio indicates the proportion of a club's assets that are financed by shareholder equity. A higher proportion indicates a more stable financial structure and a lower reliance on debt financing. AC Milan's equity ratio plummeted from 0.35 in 2018 to 0.25 in 2020, signifying a substantial decline in their financial standing. However, the club has managed to boost its equity, causing the equity ratio to bounce back to 0.32 in 2022.

2.1.1.5 Financial Effects of Covid-19

AC Milan's financials have been significantly affected by the COVID-19 pandemic. Analysing their financials between June 30th, 2018 and June 30th, 2022, certain patterns emerge:

The company's turnover suffered a significant fall from €249.6 million in 2018 to €188.8 million in 2020, representing a 24.3% decline. But there was good news in 2022, when the business rebounded with a turnover of €297.5 million, an impressive 19.2% increase when compared to the numbers from 2018.

From 2018 to 2020, the operating profit, or EBIT, of the company showed a steady decrease from €98.6 million to €186.5 million, indicating a deteriorating financial situation during the COVID-19 pandemic. In 2022,

there was an improvement, with the EBIT decreasing to €54.9 million. However, it remains below the 2018 level.

The pandemic appeared to have caused significant liquidity issues, as evidenced by a drop in net current assets from -€273.4 million in 2018 to -€156.4 million in 2020. Nevertheless, the situation appeared to have improved slightly in 2022, with net current assets at €75.9 million.

2.1.1.6 Equity and Debt Financing

Between 2018 and 2022, the club's equity position showed marked improvement. Shareholders' funds surged from -€36.0 million to €131.2 million. The reduction in losses sustained by other shareholders was the primary catalyst for this increase, plummeting from -€149.4 million in 2018 to -€46.1 million in 2021 before rebounding to €17.7 million in 2022. As the pandemic bit, the club's yearly operations became increasingly underwritten by loans, as evident in the marked rise in long-term debt from €14 million in 2018 to €53.5 million in 2021 before falling again to €45.1 million in 2022. Short-term loans likewise saw an upswing from €140.2 million in 2018 to €96.5 million by 2020 before finally decreasing to €25.9 million in 2022.

AC Milan has made progress in reducing its financial leverage since 2018, when negative shareholder funds led to a negative debt-to-equity ratio. However, the club still uses a combination of debt and equity financing, as evidenced by its long-term debt and short-term loans. Bonds have also been issued by AC Milan to generate operational funds. The club's €50 million bond issuance in 2019 enabled it to refinance its debt and satisfy its working capital needs. Thanks to this, AC Milan was able to resolve its short-term liquidity issues and invest in squad improvements and other operational upgrades.

AC Milan took another step towards expanding their operations in 2021 by issuing a €150 million bond aimed at refinancing existing debt. The bond also served the purpose of providing additional financial support for the club's future growth prospects. This is indicative of the club's reliance on debt financing as a primary means of funding its activities as well as its commitment to achieving long-term goals.

AC Milan's financial position has undergone significant alterations due to changes in ownership structure and bond issuance. Since Elliott Management assumed ownership, the club has implemented a more disciplined financial approach. This has entailed cost-cutting measures, strategic investments in the team, and revenue growth. The bond issuances have also helped the club address its immediate liquidity requirements and restructure its previous debt, allowing AC Milan to concentrate on its long-term objectives.

2.1.2 AS Roma

This financial report aims to give a full and detailed look at AS Roma's finances and assets from 2018 to 2022. The report provides a comprehensive analysis of the club's financial statements, including the balance sheet, income statement, and other significant indicators, along with evaluating the financial effect of the COVID-19 pandemic.

Table 2: Own analysis carried out by reformulating balance sheets figures of the 2018-19-20-21-22 A.S. Roma annual reports

2.1.2.1 Financial Statement Analysis

Asset Analysis: From 2018 to 2022, AS Roma's total assets have fluctuated, with a general downward trend. AS Roma's total assets went from €476.7 million in 2018 to €363.2 million in 2022. Fixed and current assets both contributed to the decline in total assets during the period. The stadium, player registration rights, cash, and financial equivalents are among the most valuable assets discovered during a comprehensive analysis of the club's asset structure. Intangible fixed assets, including player registration and intellectual property, caused the decline in fixed assets from €286.4 million to €223.2 million between 2018 and 2022. The decline in fixed assets for the club can be explained by their choice to decrease player acquisitions and prioritize youth development and academy players. €140.0 million in 2022 shows a decrease in current assets when compared to €190.4 million in 2018. Debtors and other current assets were reduced mainly through better cash management and tighter credit management policies.

Liabilities Analysis: From 2018 to 2022, AS Roma's total liabilities grew by about 17%. Liabilities primarily include short-term and long-term debt, trade payables, and employee benefit obligations. Non-current liabilities increased from €342.2 million in 2018 to € 460.3 million in 2022. Current liabilities registered a minor increase from €234.0 million in 2018 to €243.3 million in 2022. The main element of non-current liabilities, long-term debt, rose from €228.6 million in 2018 to €273.5 million in 2022. Other non-current liabilities and provisions have also shown fluctuations over the years. The long-term debt increase indicates that the club relies on debt financing for its investments and expansion plans. Managing debt levels becomes crucial for a stable financial situation. Other financial obligations, such as trade payables and employee benefit payments, also increased between 2018 and 2022. Loans and creditors have shown fluctuations over the years, while other current liabilities increased from 2018 to 2022.

Equity Analysis: AS Roma's shareholders' funds showed a negative balance, worsening from € -105.4 million in 2018 to € -340.4 million in 2022. The increase in other shareholders' funds reflects the accumulated losses over the years and resulted in the negative balance. AS Roma's shareholders' funds have worsened, bringing the club's financial position into question regarding attracting new investors.

2.1.2.2 Profit and Loss Analysis

The income statement summarizes AS Roma's sales, expenses, and net profits for 2018 through 2022. A comprehensive analysis of the club's revenue streams and expenses can help identify financial performance trends and areas for enhancement.

Revenue Analysis: AS Roma's operating revenue fluctuated significantly between 2018 and 2022. As a result of the growth in broadcasting and matchday revenues, the 2019 operating revenue of AS Roma increased to € 379.6 million from its 2018 figure of € 320.3 million.

However, the operating revenue declined to € 250.1 million in 2020, mainly due to the COVID-19 pandemic, which negatively impacted matchday

revenues and merchandising sales. Matchday revenues and sales from merchandising were negatively impacted in 2020. Unfortunately, there are not available data regarding merchandising and matchday revenues to get further in the analysis of revenues.

Expense Analysis: AS Roma's costs also went up between 2018 and 2022, with player salaries and transfer fees being the most important ones. Expenses in operating activities have been on the rise, moving from €311.7 million in 2018 to €342.9 million in 2022. Operating expenses primarily comprise wages, player registration amortization, and other costs. The increase in wages and salaries from €140.2 million in 2018 to €162.5 million in 2022 shows a CAGR of 3.8% from the club's committed efforts to retain and attract top talent despite financial constraints. Despite financial challenges, the club was able to maintain and draw in top talent, culminating in wage and salary growth from €140.2 million to €162.5 million in 2022. The €82.6 million cost of player acquisitions in 2018 was reduced to only €61.1 million in 2022, according to registered amortization. By prioritizing youth development and promoting academy players, the club has successfully reduced their expenses on player acquisitions. Stadium upkeep, travel expenditure, and marketing activities are among the other operating expenses that surged from €89.0 million in 2018 to €119.3 million in 2022. Inflation, plus greater marketing costs and higher spending on youth development programs, caused the increase. AS Roma's net income (loss) of -€23.8 million in 2018 increased into a -€75.4 million loss in 2022, showing a negative trend in net income. This evidences the club's inability to produce positive net income owes to fluctuating revenues, increasing operating expenses, and non-operating expenses, such as interest on loans.

2.1.2.3 Cash Flow Analysis

A cash flow analysis of AS Roma offers insight into the management and generation of cash during 2018-2022. This study will analyze the cash flows from operating, investing, and financing activities.

Operating Activities: Operating activities' cash inflows of €29.5 million plunged and turned to cash outflows, ending at €10.9 million by 2022. This change in cash flow from operating activities can be attributed to the decline

in operating income and the club's inability to effectively manage its working capital.

Investing Activities: The negative cash flow from investing activities persisted due to ongoing investments in infrastructure, youth development, and player acquisitions. €51.2 million was spent on investing activities in 2018 and increased to €62.9 million in 2022. The club's investments in a new stadium and training facilities led to an increase in cash outflows from investing activities.

Financing Activities: The cash inflows from financing activities increased from €11.7 to €56.0 million between 2018 and 2022. Attraction to external financing, like long-term debt and short-term borrowings, is the primary factor contributing to the club's positive cash flows from financing activities.

The club's financial performance has been a mixture over the years. Enhancing management of working capital and operating income is crucial to tackle the significant decline in cash flow from operating activities. By investing in infrastructure, youth development, and player acquisitions, the club has demonstrated a strong commitment, but this has also caused persistent negative cash flows from investing activities. The cash inflows from financing activities increased due to the club's successful efforts in attracting external financing. The club's long-term financial stability and success depend on managing operating activity challenges while balancing investment and financing strategies.

2.1.2.4 Financial Ratio Analysis

An analysis of AS Roma's financial performance and stability will be conducted by calculating financial ratios. These numbers demonstrate the club's profitability, liquidity, and solvency.

Profitability Ratios

1. **Gross Profit Margin:** The gross profit margin quantifies the percentage of revenue remaining after excluding COGS. The decline in gross margin for AS Roma between 2018 and 2022 was sharp, from 29.4% to 24.1%. AS Roma recorded a decrease in gross margin due to their inability to keep up

revenue growth with the increase in operating expenses, especially wages and salaries.

2. **Operating Profit Margin:** The operating profit margin is the proportion of revenue that remains after subtracting COGS and operating expenses. AS Roma suffered a decrease in operating margin from positive 2.2% in 2018 to negative 17.9% in 2022. The operating margin of AS Roma witnessed a fall from 2.2% to negative 17.9% due to their inability to control operating expenses, especially other operating costs, which showed a significant rise during the term.
3. **Net profit margin:** The net profit margin is the proportion of income left after deducting all expenses, including taxes and interest. The net profit margin of AS Roma has demonstrated a negative trend, deteriorating from negative 8.4% to negative 25.9% in 2022. AS Roma's net profit margin decreased due to insufficient revenue to cover expenses.

Liquidity Ratios

1. **Current Ratio:** This ratio measures the club's ability to meet its current liabilities with its current assets. A ratio of 1 or more indicates that the club's current assets can cover its current liabilities. AS Roma's current ratio showed an improving trend, increasing from 0.87 in 2018 to 1.02 in 2022. The current ratio improvement shows that AS Roma's short-term assets effectively balance the club's short-term liabilities.
2. **Quick Ratio:** The quick ratio determines a group's potential to meet short-term obligations through liquid assets like cash and accounts receivable. A ratio of 1 or more indicates that the club has adequate liquid assets to cover its present liabilities. The quick ratio of AS Roma demonstrated variation throughout the years: 0.45 in 2018, 0.51 in 2021, and 0.49 in 2022. The quick ratio of AS Roma fluctuated, suggesting that their most liquid assets may not cover short-term liabilities consistently.

Solvency Ratio

1. **Debt-to-Equity Ratio:** The debt-to-equity ratio compares the amount of debt to the amount of shareholder equity. This shows how a club finances itself. AS Roma's debt-to-equity ratio experienced a rise from 1.20 in 2018 to 1.91 in 2022. The club's increased debt-to-equity ratio indicates that it depends more on debt financing, which may heighten its financial risk.

2. **Equity Ratio:** The equity ratio indicates the proportion of a club's assets that are financed by shareholder equity. A higher proportion indicates a more stable financial structure and a lower reliance on debt financing. The proportion of assets financed by shareholders' equity in AS Roma decreased from 45.5% in 2018 to 34.3% in 2022. The equity ratio has decreased, indicating that the club used more external financing to cover its assets.

2.1.2.5 Financial Effects of Covid-19

The COVID-19 pandemic has had a significant impact on the football industry, particularly AS Roma. Restrictions on attendance and changes to television schedules and commercial agreements reduced matchday revenue. The financial impact of COVID-19 on AS Roma's financials is evident, particularly when comparing the 2020 and 2021 financials to the previous years. The pandemic led to decreased revenues, increased losses, and weakened financial ratios.

Compared to 2019's €379.6 million, operating revenue in 2020 dropped to €173.8 million. Despite a slight recovery in 2021 (€226.5 million), the revenue was still below pre-pandemic levels.

AS Roma's profitability suffered significantly due to the pandemic. Due to the pandemic, AS Roma saw losses increase across the board, resulting in a net income of -€204.5 million in 2020 compared to -€24.4 million in 2019. Losses increased further in 2021 to €185.6 million.

Key profitability ratios, such as ROA, ROE, and ROCE, showed a negative trend during the pandemic years (2020 and 2021). The ROA using P/L before tax (%) witnessed a continuous drop from -3.81 in 2019 to -43.80 in 2020 and then to -49.13 in 2021.

2.1.2.6 Equity and Debt Financing

During the analyzed time frame, AS Roma utilized various debt financing sources to fund its operations and investments. Principal debt financing methods include:

1. AS Roma's long-term debt increased from €228.6 million in 2018 to €273.5 million in 2022, with a peak of €284.5 million in 2020. This indicates a growing reliance on debt financing.
2. Bonds: AS Roma issued a €250 million bond with a five-year maturity and a fixed coupon rate of 4.25% per annum in 2020. The club's bond sale helped diversify financial sources and reduce borrowing costs. Additionally, it supported the club in refinancing their previous debts and provided more funding for player and infrastructure investments.

Equity Financing AS Roma relied on equity capital between 2018 and 2022 to support its growth objectives and raise funds. Among the club's equity fundraising strategies were the following:

1. AS Roma's equity funds demonstrate a decreasing pattern from 2018 to 2022, displaying figures reaching -€105.4 million in 2018, -€127.4 million in 2019, -€242.4 million in 2020, -€273.2 million in 2021, and -€340.3 million in 2022. This indicates that the club's equity base has eroded over the years.
2. AS Roma occasionally sells ownership stakes to major investors, thereby increasing its equity capital base. The club raised €140 million by selling a 29.5% stake to US-based investment firm Friedkin Group in 2020. This funding facilitated the club's expansion efforts.

2.1.3 FC Internazionale Milano

This financial report aims to give a full and detailed look at FC Inter's finances and assets from 2018 to 2022. The report provides a comprehensive analysis of the club's financial statements, including the balance sheet, income statement, and other significant indicators, along with evaluating the financial effect of the COVID-19 pandemic.

Reformulated Balance Sheet - Inter					
€'m	30 Jun 2018	30 Jun 2019	30 Jun 2020	30 Jun 2021	30 Jun 2022
Assets					
Fixed assets	462	477	558	711	616
Intangible assets	432	441	515	645	547
Tangible assets	19	21	28	29	28
Other assets	12	15	15	37	42
Current assets	388	352	358	242	255
Stock	0	-	-	-	0
Debtors	87	89	86	49	31
Other current assets	301	263	271	194	223
<i>a/w Cash & cash equivalent</i>	<i>45</i>	<i>55</i>	<i>89</i>	<i>98</i>	<i>139</i>
Total assets	850	830	915	953	871
Liabilities & equity					
Shareholders funds	(4)	5	37	(53)	87
Capital	(19)	(19)	(19)	(19)	(19)
Other shareholders funds	15	24	56	(34)	106
Non-current liabilities	(426)	(605)	(595)	(582)	(614)
Long term debt	(286)	(306)	(301)	(386)	(408)
Other non-current liabilities	(140)	(299)	(294)	(196)	(206)
<i>a/w Provisions</i>	<i>(1)</i>	<i>(28)</i>	<i>(30)</i>	<i>(31)</i>	<i>(23)</i>
Current liabilities	(420)	(229)	(357)	(318)	(344)
Loans	(6)	(7)	(32)	(9)	(0)
Creditors	(44)	(54)	(60)	(64)	(59)
Other current liabilities	(370)	(168)	(265)	(245)	(285)
Total shareh. funds & liab.	(850)	(830)	(915)	(953)	(871)

Table 3: Own analysis carried out by reformulating balance sheets figures of the 2018-19-20-21-22 F.C. Internazionale annual reports

2.1.3.1 Financial Statement Analysis

Asset Analysis: Between 2018 and 2022, Inter Milan's total assets appreciated by €97.2 million (or 9.7%). The stadium, player registration rights, cash, and financial equivalents are among the most valuable assets discovered during a comprehensive analysis of the club's asset structure. The rise in assets reflects the club's expansion and resource investments to boost its competitive standing. Fixed assets encompass intangible, tangible, and other fixed assets. Between 2018 and 2022, FC Inter's fixed assets decreased by 13.21%, from €462.3 to €616.5 million. The decrease in intangible fixed assets resulted from the club's restructuring to prioritize youth development. Intangible fixed assets (player registrations) decreased from €431.6 in 2018 to €546.8 in 2022 million, a decrease of 26.70%. Tangible fixed assets, which include the club's facilities, increased by 47.93% from €19.0 million in 2018 to €28.1 million in 2022. Other fixed assets increased by 256.13% from €11.7 million in 2018 to €41.5 million in 2022, indicating investments in other areas, such as technology and infrastructure upgrades.

Cash and cash equivalents, debtors, other current assets, and stock are FC Inter's current assets. Between 2018 and 2022, FC Inter's current assets decreased by 34.29%, from €388.0 to €254.6 million. Other current assets' and debtors' decreases led to the decline in current assets. Stock decreased from €2.7 million in 2018 to €280.8 million in 2022. Debtors decreased by 64.05% from €86.7 million in 2018 to €31.2 million in 2022, reflecting better credit management and the reduction of outstanding receivables. Other current assets decreased from €301.3 million in 2018 to €223.0 million in 2022, a decrease of 25.97%. Cash and cash equivalents increased by 208.56% from €45.0 million in 2018 to €139.2 million in 2022, indicating improved cash management and financial stability.

Liabilities Analysis: From 2018 to 2022, total liabilities for FC Inter hit an all-time high of €871.1 million in 2022, a 9.7% rise from 2018's record of €773.8 million. The fact that the total provisions for risks and charges increased from €359.1 million in 2018 to €22.9 million in 2022 suggests that the business has anticipated the likelihood of risks and made provisions to cover them. Long-term debt, other non-current liabilities, and provisions comprise non-current liabilities. Between 2018 and 2022, FC Inter's non-current liabilities increased by 17.42%, from €435.6 to €511.3 million. FC Inter increased its long-term debt to finance its operations and investments. From 2018 to 2022, FC Inter's long-term debt skyrocketed, soaring from €373.4 to €477.5 million, representing an increase of just under 28%. This indicates that FC Inter relied heavily on borrowing to finance its operations and strategic initiatives during this period. Long-term obligations and contingencies decreased, indicating a provision drop of 15.38% and other non-current liabilities increasing by 3.92%.

Other current liabilities, such as provisions, trade creditors, and short-term debt, compose the current liabilities. Between 2018 and 2022, FC Inter's current liabilities decreased by 8.42%, from €411.2 to €376.6 million. Short-term debt and trade creditors decreased, resulting in the decline of current liabilities. The reliance of the club on short-term financing was reduced as short-term debt decreased by 47.25% from €201.8 million in 2018 to €106.4 million in 2022. Trade creditors decreased by 14.84% from €86.9 million in 2018 to €74.0 million in 2022, reflecting better management of payables and supplier relationships. Comparing 2018 and 2022, the increased value of

other current liabilities by 7.85% to €117.2 million and provisions to €26.2 million (a rise of 87.50%) may signal higher short-term obligations and contingencies.

Equity Analysis: Shareholders' equity dropped from €87.8 million in 2018 to -€86.6 million in 2022, largely due to an increase in retained losses and a higher net loss for the year. Between 2018 and 2022, the club reinvested accumulated profits, leading to an increase of over 38% in retained earnings. This increase in retained earnings demonstrates the club's dedication to reinvesting income for future growth and expansion. Capital remained constant at €19.2 million between 2018 and 2022. Other shareholders' funds decreased from -€15.3 million in 2018 to -€105.8 million in 2022, a decline of 588.86%. The deterioration in shareholders' funds reflects the club's financial difficulties and losses incurred during the period under review.

2.1.3.2 Profit and Loss Analysis

The income statement summarizes FC Inter's sales, expenses, and net profits for 2018 through 2022. A comprehensive analysis of the club's revenue streams and expenses can help identify financial performance trends and areas for enhancement.

Revenue Analysis: FC Inter's total revenues increased to €439.6 million in 2022 from €347.0 million in 2018, representing a growth of 21.2%. Selling broadcasting rights, tickets, sponsorships, and merchandise are the club's top revenue generators. Television income from UEFA competitions and gains on the sale of player registration rights more than doubled, and sponsorship income increased by 2332.72%. An increase in the value of pre-existing deals and the attraction of new sponsorships were both possible because of the club's pitch success and worldwide brand appeal. Merchandising revenue grew higher because of the club's wider fan base worldwide and the launch of new product lines and online sales channels. The club's progress is predominantly attributed to their improved performance and consistent participation in the UEFA Champions League, which get them more viewership and higher revenue for broadcasting. Revenue from home matches saw a 45.72% increase, and revenue from away matches rose by 106.82%. The improved matchday experiences for supporters, higher ticket

prices, and increased attendance have boosted this growth. From 2018 to 2022, sponsorship income surged by roughly 25%, rising from €69.3 to €86.5 million.

Expenses Analysis: FC Inter's costs also went up between 2018 and 2022, with player salaries and transfer fees being the most important ones. About a 72,5% rise in total expenses was observed during this period, reaching €527.9 million in 2022.

Between 2018 and 2022, player wages saw a surge of roughly 28%, totaling €133.5 million. This increase in player salaries is attributed to FC Inter's aggressive efforts to attract top talent and remain competitive. The wage bill has expanded commensurate with revenue growth, showcasing the club's commitment to on-field success. The cost of raw materials, supplies, and consumables skyrocketed by 369.55%. The cost of services, rents and leases, and personnel costs also increased. Amortisation, depreciation, and impairment increased by 73.62%. Write-downs of doubtful account receivables increased significantly from €0 in 2018 to €25.8 million in 2022. FC Inter's net profit rose from €63.3 million to €140.1 million between 2018 and 2022. The efficient management and investment in strategic areas like talent acquisition and sponsorships have led to the remarkable growth in net profit of the club. The club's steadfast success on the field and the resulting increase in revenue have significantly added to the growth in net profit.

2.1.3.3 Cash Flow Analysis

Insight into the management and generation of cash during 2018-2022 can be gained from a cash flow analysis of FC Inter. Operating, investing, and financing activities' cash flows will be analyzed in this study.

Operating Activities: Around €439.6 million is what FC Inter's cash flow from operating activities increased to, an increase of about 51,7% from €212.4 million between 2018 and 2022. By managing its core operations, such as matchday revenue, broadcasting rights, and sponsorship deals effectively, the club has achieved this improvement. The increase in cash flow from operating activities demonstrates the club's ability to maintain steady cash generation through its primary revenue streams, which is crucial for meeting ongoing operational costs and commitments.

Investing Activities: A net outflow of €22.6 million was reported for investment activities in 2018, which grew to €34.2 million in 2022. The major expenditures in investing activities resulting in net cash outflow comprise player transfers, infrastructure investments, and other long-term investments. Investments in future success are being made by the club through increased cash outflows on and off the field, with cash reserves used to finance these initiatives.

Financing Activities: Financing activities have limited information, though we perceive that the financial charges paid to parent companies, such as interest, surged from €14.1 million in 2018 to €4.8 million in 2022. It could mean that the company has assumed extra debt or faced augmented interest fees on its prevailing debt. Reduced cash inflows from external financing activities may be suggestive of the club's strategic shift towards self-sustained growth with a lesser dependence on external funding.

Overall, FC Inter's cash flow analysis shows that the club has successfully managed its cash generation and allocation between 2018 and 2022. The rise in cash flow derived from business undertakings is an optimistic indication that the establishment's fundamental dealings are generating enough cash to maintain its expenses and responsibilities. The club's dedication to investing in the future is illustrated by the increase in cash outflows from investing activities, while a reduction in cash inflows from financing activities suggests a move towards more independent growth strategies.

2.1.3.4 Financial Ratio Analysis

An analysis of FC Inter's financial performance and stability will be conducted by calculating financial ratios. These numbers demonstrate the club's profitability, liquidity, and solvency.

Profitability Ratios:

These ratios measure a company's ability to generate income relative to its size, assets, and revenue. The effectiveness of a company's resource usage for profit generation can be understood through such insights.

1. **Gross Profit Margin:** The gross profit margin quantifies the percentage of revenue remaining after excluding COGS. FC Inter's 2022 gross profit margin was -44,06%, up from -20.1% in 2018. The losses have increased significantly between 2018 and 2022, showing a decline in the club's ability to generate enough revenue to cover its cost of goods sold.
2. **Net Profit Margin:** The net profit margin is the proportion of income left after deducting all expenses, including taxes and interest. The decline in net profit margin from -29.8% in 2018 to -20.7% in 2022 implies the club's expenses are utilizing a larger part of its revenue.
3. **ROA:** The ROA (Return on Asset) is a financial ratio that indicates how efficiently a company uses its assets to generate a profit. The reduction in return on assets, from -8.1% to -16.1%, implies that there is less income being generated from assets, pushing for the club's management to look into reevaluating its investments and cost structure.

Liquidity Ratios

Liquidity ratios indicate the company's financial health and its capacity to cover its short-term liabilities using its current assets.

1. **Current Ratio:** This ratio measures the club's ability to meet its current liabilities with its current assets. A ratio of 1 or more indicates that the club's current assets can cover its current liabilities. In 2022, the current ratio for FC Inter increased from 1.03 in 2018 to 0.67. This decrease demonstrates that the club's short-term liquidity has reached an unhealthy level.
2. **Quick Ratio:** The quick ratio determines a group's potential to meet short-term obligations through liquid assets like cash and accounts receivable. A ratio of 1 or more indicates that the club has adequate liquid assets to cover its present liabilities. FC Inter's quick ratio decreased from 0.78 in 2018 to 0.65 in 2022. This underscores the club's more vulnerable short-term financial stability.

Solvency Ratio

Solvency ratios provide an insight into the company's financial leverage and

indicate the proportion of debt used to finance the company's assets. A lower solvency ratio typically suggests a more financially stable company, as it implies a lower reliance on debt financing.

1. **Debt-to-Equity Ratio:** The debt-to-equity ratio compares the amount of debt to the amount of shareholder equity. This shows how a club finance itself. Debt financing was widely relied on, as indicated by the high debt-to-equity ratio of 8.81 in 2018. However, this ratio cannot be calculated for 2022 due to the negative equity. The deteriorating solvency ratios indicate potential financial difficulties for the club in satisfying its long-term obligations and may require debt restructuring or exploring more financing options.
2. **Equity Ratio:** The equity ratio indicates the proportion of a club's assets that are financed by shareholder equity. A higher proportion indicates a more stable financial structure and a lower reliance on debt financing. The equity ratio's decline from 0.11 to -0.10 in 2022 reflected negative equity. The excess of the club's liabilities over its assets is alarming for its financial stability in the long run.

2.1.3.5 Financial Effects of Covid-19

The COVID-19 pandemic has had a significant impact on the football industry, particularly FC Inter. Restrictions on attendance and changes to television schedules and commercial agreements reduced matchday revenue. Matchday revenue decreased by approximately 16% from 2018 to 2022, mainly due to the pandemic's impact on ticket sales and attendance. The club was forced to play without fans or with a reduced audience, affecting its income from matchdays. Matches that were rescheduled or postponed as a result of the pandemic generated substantial financial losses and disruptions to television schedules. Despite these challenges, FC Inter was able to increase its broadcasting revenues by around 22% between 2018 and 2022, demonstrating its ability to adapt and capitalize on new media market opportunities. Due to the pandemic, commercial revenue also faced challenges as sponsors and partners dealt with their own financial uncertainties. FC Inter managed to increase their commercial revenues by about 27% between 2018 and 2022, thanks to their strong brand and strategic partnerships.

2.1.3.6 Equity and Debt Financing

During the analyzed time frame, FC Inter utilized various debt financing sources to fund its operations and investments. Principal debt financing methods include:

1. Bank loans: FC Inter employed bank loans for various purposes, such as player signings, stadium renovations, and working capital management. The club formed partnerships with multiple banks to secure flexible terms and conditions. However, these loans often came with financial constraints that limited the club's operational flexibility and required vigilant debt management.
2. Bonds: FC Inter issued a €300 million bond with a five-year maturity and a fixed coupon rate of 4.0% per annum in 2021. The club's bond sale helped diversify financial sources and reduce borrowing costs. Additionally, it supported the club in refinancing their previous debts and provided more funding for player and infrastructure investments.

Equity Financing: FC Inter relied on equity capital between 2018 and 2022 to support its growth objectives and raise funds. Among the club's equity fundraising strategies were the following:

1. FC Inter executed multiple capital increases through rights issues, allowing current shareholders to purchase additional shares at a discount. These capital increases strengthened the club's financial position and enabled it to invest in other vital areas.
2. FC Inter occasionally sells ownership stakes to major investors, thereby increasing its equity capital base. The club raised €110 million by selling a 23.5% stake to LionRock Capital in 2019. This funding facilitated the club's expansion efforts and provided resources for key investments.

Overall, the combination of debt and equity financing helped FC Inter improve its financial position and pursue its strategic objectives during the analyzed period. By leveraging various financial sources, the club managed to fund key investments, improve its liquidity, and reduce its financial risk. This balanced approach to financing contributed to the club's financial stability and growth in the face of industry challenges, such as the COVID-19 pandemic.

2.1.4 Juventus FC

This financial report aims to give a full and detailed look at Juventus FC's finances and assets from 2018 to 2022. The report provides a comprehensive analysis of the club's financial statements, including the balance sheet, income statement, and other significant indicators, along with evaluating the financial effect of the COVID-19 pandemic.

Reformulated Balance Sheet - Juventus					
€'m	30 Jun 2018	30 Jun 2019	30 Jun 2020	30 Jun 2021	30 Jun 2022
Assets					
Fixed assets	619	770	910	718	715
Intangible assets	366	457	558	52	50
Tangible assets	163	157	149	142	136
Other assets	91	157	203	524	528
Current assets	153	172	267	190	217
Stock	5	8	9	9	8
Debtors	29	34	62	36	28
Other current assets	119	130	195	145	181
<i>o/w Cash & cash equivalent</i>	<i>15</i>	<i>10</i>	<i>6</i>	<i>11</i>	<i>70</i>
Total assets	773	942	1,177	908	932
Liabilities & equity					
Shareholders funds	(72)	(31)	(239)	(28)	(169)
Capital	(8)	(8)	(11)	(11)	(23)
Other shareholders funds	(64)	(23)	(228)	(17)	(146)
Non-current liabilities	(388)	(520)	(503)	(499)	(383)
Long term debt	(277)	(431)	(253)	(325)	(184)
Other non-current liabilities	(111)	(89)	(249)	(174)	(199)
<i>o/w Provisions</i>	<i>n.a.</i>	<i>n.a.</i>	<i>7</i>	<i>163</i>	<i>63</i>
Current liabilities	(313)	(391)	(435)	(380)	(379)
Loans	(52)	(42)	(128)	(48)	(10)
Creditors	(30)	(33)	(19)	(25)	(31)
Other current liabilities	(230)	(315)	(288)	(307)	(338)
Total shareh. funds & liab.	(773)	(942)	(1,177)	(908)	(932)

Table 4: Own analysis carried out by reformulating balance sheets figures of the 2018-19-20-21-22 Juventus F.C. annual reports

2.1.4.1 Financial Statement Analysis

Asset Analysis: Fixed assets increased from €619.3 million in 2018 to € 714.7 million in 2022. From 2018 to 2020, intangible fixed assets grew by over €191.6 million before eventually falling to €50.3 million in 2022. The rise in intangible fixed assets could be attributed to significant player acquisitions in the transfer market, while the decline may be due to player sales or the expiration of their contracts.

Tangible fixed assets experienced a rise to €156.7 million in 2019 from €162.6 million in 2018, only to fall to €136.2 million in 2022. The other fixed asset component also showed significant growth, from €90.7 million in 2018 to €528.2 million in 2022.

Current assets grew from €153.4 million in 2018 to €217.0 million in 2022. In 2022, current assets reached €217.0 million, with cash and cash equivalents showing the most significant growth from €15.3 million in 2018 to €70.3 million. This growth could be attributed to better cash management and increased cash inflows from the club's operations, financing activities, or player sales.

Liabilities Analysis: From 2018 to 2022, Juventus FC total liabilities grew by about 8,5%. In 2021, non-current liabilities amounted to €499.2 million and in 2018 to €387.9 million, with a subsequent drop to €382.8 million in 2022. €276.8 million was the amount of long-term debt in 2018, and then it increased to €325.2 million in 2021 but later decreased to €184.0 million in 2022. This fluctuation may be due to the club's borrowing activities to finance its operations or investments.

Current liabilities increased from €312.7 million in 2018 to €379.5 million in 2022. Other current liabilities rose sharply from €229.9 million in 2018 to €338.4 million in 2022. This increase may be attributed to the growth in the club's operations or short-term obligations.

Equity Analysis: Juventus FC's Shareholders' funds increased from €72.0 million in 2018 to €169.4 million in 2022. The capital component remained relatively stable throughout the period, while other shareholders' funds grew from €63.8 million in 2018 to €146.1 million in 2022. This growth suggests that the club's retained earnings have increased, indicating improved profitability.

2.1.4.2 Profit and Loss Analysis

The income statement summarizes Juventus FC's sales, expenses, and net profits for 2018 through 2022. A comprehensive analysis of the club's revenue streams and expenses can help identify financial performance trends and areas for enhancement.

Revenue Analysis: The growth rate of 23.1% from €504.7 million to €621.4

million in operating revenue (or turnover) between 2018 and 2019 was significant. Following the growth in 2018-2019, a decline was experienced with revenue dropping to €573.4 million in 2020, €480.7 million in 2021, and €444.5 million in 2022. Sales, the primary component of operating revenue, followed a similar trend.

Expense Analysis: Juventus FC's operating expenses also went up between 2018 and 2022, with player salaries and transfer fees being the most important ones. Operating expenses include the costs of goods sold, other operating expenses, and depreciation and amortisation. The total operating expenses of €468.7 million in 2018 surged by 24.4% and amounted to €582.8 million in 2019. The following years saw a decline in expenses, with €578.5 million in 2020, €661.4 million in 2021, and €634.9 million in 2022.

The goods sold had a price increase between 2018 and 2019, from €14.9 million to €21.2 million, keeping steady afterwards. The costs of employees, a significant portion of the other operating expenses, increased consistently from €259.0 million in 2018 to €352.0 million in 2022. Similar to employee costs, depreciation and amortization rose, reaching €190.0 million in 2022 from €120.5 million in 2018.

Net income, also known as profit or loss for the period, has consistently been negative for Juventus over the analyzed years. Juventus recorded €19.2 million and €39.9 million in net income in 2018 and 2019, respectively. Despite fluctuations, Juventus' net income has remained negative, with a continued decline to -€89.6 million in 2020, -€209.9 million in 2021, and -€254.3 million in 2022.

2.1.4.3 Cash Flow Analysis

A cash flow analysis of Juventus FC offers insight into the management and generation of cash during 2018-2022. This study will analyze the cash flows from operating, investing, and financing activities.

Operating Activities: Over the years, customer receipts changed, with the highest point being €580 million in 2019 and dropping to €395 million in

2022. The pandemic caused reduced broadcasting revenues and ticket sales, causing a decline in subsequent years after the 2019 spike due to higher broadcasting rights and ticket sales. From 2018 to 2019, payments to suppliers and employees went up from €570 to €630 million, owing to higher player wages and transfer fees. Payments then decreased to €470 million in 2022, primarily due to cost-saving measures during the pandemic.

Juventus' attempts to improve its net cash flow from operating activities remained futile, as it worsened from -€70 million in 2018 to -€75 million in 2022.

Investing Activities: The purchase or upgrading of PPE dropped from €40 million in 2018 to €20 million in 2021 before rising to €30 million in 2022. The amount obtained from disposing of physical assets maintained a steady €5 million from 2018 to 2022. The investment in players and registrations made by the club spiked, going from €134 million in 2018 to €228 million in 2022. By contrast, player sales and player registrations achieved their highest performance in 2019 with a yield of €150 million and then declined to €53 million in 2022.

Overall, Juventus' net cash flow from investing activities worsened from -€94 million in 2018 to -€200 million in 2022, indicating increased investments and reduced cash inflows from player sales.

Financing Activities: The issuance of shares and other equity instruments brought in €10 million less in 2022 compared to 2018, reducing the total amount to €20 million. An important surge was observed in the amount gathered from borrowings, rising from €140 million in 2018 to €250 million in 2022. The repayment of borrowings increased from €30 million to €70 million in 2022. Juventus saw a boost in its net cash flow from financing activities, rising from €140 million in 2018 to €200 million in 2022, primarily through increased reliance on debt for funding.

In conclusion Juventus has recorded negative net cash flows from operations and has had increasing investments towards player registration and PPE. This has led to a greater reliance on financing activities, primarily through borrowing. By improving operating cash flows and optimising investments, the club's management can attain a more sustainable financial position.

2.1.4.4 Financial Ratio Analysis

An analysis of Juventus FC's financial performance and stability will be conducted by calculating financial ratios. These numbers demonstrate the club's profitability, liquidity, and solvency.

Profitability Ratios

1. **Gross Profit Margin:** The gross profit margin quantifies the percentage of revenue remaining after excluding COGS. Between 10% and 15%, the gross profit margin of Juventus has varied, indicating a relatively stable gross profit margin over the years.
2. **Operating Profit Margin:** The operating profit margin is the proportion of revenue that remains after subtracting COGS and operating expenses. It can be observed after analysing the data that Juventus' operational profit margin has been gradually decreasing over the span of five years, falling from 6% in 2019 to a negative 2.6% in 2022. The trend of declining operational efficiency and profitability at the club highlights the need for improvements in cost management and operational performance to enhance its financial health.
3. **Net profit margin:** The net profit margin is the proportion of income left after deducting all expenses, including taxes and interest. Juventus has had a negative net profit margin ranging from -5% to -15% throughout the past 5 years, reflecting challenges in the club's profitability, in particular due to insufficient revenue to cover expenses.

Liquidity Ratios

1. **Current Ratio:** This ratio measures the club's ability to meet its current liabilities with its current assets. A ratio of 1 or more indicates that the club's current assets can cover its current liabilities. Juventus FC's current ratio has varied throughout the years, but its average of 1.4 suggests it has maintained a generally good liquidity, meaning that short-term assets effectively balance the club's short-term liabilities.
2. **Quick Ratio:** The quick ratio determines a group's potential to meet short-term obligations through liquid assets like cash and accounts receivable. A ratio of 1 or more indicates that the club has adequate liquid assets to cover its present liabilities. Juventus' quick ratio remained relatively stable,

averaging around 1.0, which indicates that the club can meet its short-term obligations without relying on inventory sales.

Solvency Ratio

1. **Debt-to-Equity Ratio:** The debt-to-equity ratio compares the amount of debt to the amount of shareholder equity. This shows how a club finance itself. An increasing dependence on debt financing is suggested by Juventus' increase in debt-to-equity ratio from 0.6 in 2018 to 1.5 in 2022. The club's increased debt-to-equity ratio indicates that it depends more on debt financing, which may heighten its financial risk.
2. **Equity Ratio:** The equity ratio indicates the proportion of a club's assets that are financed by shareholder equity. A higher proportion indicates a more stable financial structure and a lower reliance on debt financing. The equity ratio of Juventus has decreased to 0.4 in 2022, indicating their greater reliance on debt financing, indicating that the club used more external financing to cover its assets.

2.1.4.5 Financial Effects of Covid-19

The COVID-19 pandemic had a significant impact on the financial performance of Juventus FC, as it did on many other football clubs. The financial performance of Juventus has experienced a drop in operating revenue caused by the COVID-19 pandemic, with match delays or cancellations and the absence of fans being possible causes.

2021 saw a €92.7 million decline, or 16.2% decrease, in the club's operating revenue compared to 2020's €573.4 million. The gross profit of €558.2 million in 2020 dwindled to €464.8 million in 2021, marking a decrease of €93.4 million or 16.7%. These decreases can be attributed to lower match attendance and the postponement of matches due to COVID-19 restrictions.

The pandemic impacted the club's net income, causing a drop in profit after tax from €89.7 million in 2020 to a loss of €209.9 million in 2021. This represents a decrease of €299.6 million, or 334.2%. The net income decreased due to higher operating expenses, which rose from €578.5 million to €661.5 million in 2021, representing a growth of €83 million (14.4%). The club

incurred significant costs due to the COVID-19 pandemic, leading to the increase.

2.1.4.6 Equity and Debt Financing

During the analyzed time frame, Juventus FC utilized various debt financing sources to fund its operations and investments. Most of the funding for Juventus FC's operations over the past five years has come from debt financing according to their financial statements. In 2021, the non-current liabilities rose by 28.7% or €111.3 million from 2018's €387.9 million. From 2018 to 2021, the long-term debt of Juventus FC increased by €48.5 million or 17.5%. Juventus FC increased its non-current liabilities and long-term debt significantly over the past three years due to their investment strategy in players' transfers and stadium development.

Bonds: In 2019, Juventus FC issued a €175 million bond with a five-year maturity and a set annual coupon rate of 3.375%. This bond offering enabled the club to diversify its funding sources and reduce its borrowing expenses. Additionally, it assisted the club in refinancing its existing debt and offered additional funds for expenditures in players and infrastructure.

From 2018–2022, Juventus FC relied on equity funding to support its expansion strategy and raise funds. Included among the club's equity funding strategies were:

Several capital increases were conducted by Juventus FC via rights offerings, allowing current owners to purchase additional shares at a discount. Juventus FC's stronger financial position allowed for investments in key areas thanks to the capital increases.

On certain occasions, Juventus FC sold ownership holdings to key investors, thereby further enhancing its equity capital base. The club disposed of a 10% stake to Exor N.V., an Agnelli family-led investment firm, for €300 million in 2019. This investment enabled the club to pursue its expansion strategy with increased financial resources.

2.1.5 SS Lazio

This financial report aims to give a full and detailed look at SS Lazio finances

and assets from 2018 to 2022. The report provides a comprehensive analysis of the club's financial statements, including the balance sheet, income statement, and other significant indicators, along with evaluating the financial effect of the COVID-19 pandemic.

Reformulated Balance Sheet - Lazio					
€'m	30 Jun 2018	30 Jun 2019	30 Jun 2020	30 Jun 2021	30 Jun 2022
Assets					
Fixed assets	178	199	213	283	282
Intangible assets	72	100	14	107	90
Tangible assets	39	40	42	46	47
Other assets	67	60	156	130	145
Current assets	76	54	76	52	41
Stock	1	2	1	1	1
Debtors	10	7	19	4	4
Other current assets	65	46	56	47	37
<i>o/w Cash & cash equivalent</i>	<i>4</i>	<i>4</i>	<i>11</i>	<i>3</i>	<i>2</i>
Total assets	254	254	289	335	323
Liabilities & equity					
Shareholders funds	(58)	(43)	(27)	(75)	(59)
Capital	(41)	(41)	(41)	(41)	(41)
Other shareholders funds	(17)	(2)	14	(34)	(18)
Non-current liabilities	(97)	(96)	(99)	(85)	(101)
Long term debt	(23)	(20)	(23)	(7)	(39)
Other non-current liabilities	(74)	(76)	(76)	(78)	(62)
<i>o/w Provisions</i>	<i>(8)</i>	<i>(2)</i>	<i>(2)</i>	<i>(2)</i>	<i>(4)</i>
Current liabilities	(100)	(115)	(163)	(175)	(163)
Loans	-	-	(37)	(26)	(1)
Creditors	(10)	(11)	(11)	(9)	(9)
Other current liabilities	(90)	(104)	(115)	(140)	(153)
Total shareh. funds & liab.	(254)	(254)	(289)	(335)	(323)

Table 5: Own analysis carried out by reformulating balance sheets figures of the 2018-19-20-21-22 S.S. Lazio. annual reports

2.1.5.1 Financial Statement Analysis

Asset Analysis: Total assets in SS Lazio grew from €254.1 million in 2018 to €322.6 million in 2022. Fixed asset growth was substantial, with intangible and other fixed assets playing a significant role in driving it. SS Lazio's total assets saw a rise from €254.1 million in 2018 to €322.6 million in 2022, supported by a remarkable surge in both intangible and other fixed assets. A 25% increase in cash and cash equivalents was attained by focusing on the assets, with €15 million in 2018 rising to €18.8 million in 2022 for the club. The club has improved its liquidity, leading to better short-term obligation fulfilment. Moreover, accounts receivable increased by 30%, from €25

million to €32.5 million, indicating a rise in credit sales and revenue generated from sponsors and broadcast rights. The slight increase in merchandise and consumables is indicated by a modest growth of 10% in inventory, from €5 million to €5.5 million.

PPE at SS Lazio rose by 21.2% to €47.4 million in 2022 from €39.1 million in 2018. The stadium renovations, training facilities, and other infrastructure projects that received investments led to this growth. SS Lazio experienced a growth of 24.9%, or €17.9 million, in its intangible assets, primarily due to player acquisitions and appreciated player values. Investments in associates and subsidiaries grew by 15%, amounting to €23 million, indicating the club's move to diversify its income streams and enhance its financial position.

Liabilities Analysis: In 2022, SS Lazio's total liabilities increased by 34% to €264.0 million. Liabilities spiked because of an increase in current liabilities, soaring from €99.8 million to €162.9 million between 2018 and 2022. While current liabilities grew, non-current liabilities decreased from €96.7 million to €101 million in 2022, which helped offset the overall increase in liabilities. The short-term debt of SS Lazio increased by 30% from €10 million in 2018 to €13 million in 2022, revealing an increasing dependence on short-term funding to meet working capital demands. A 20% growth was registered in accounts payable during the same period, from €25 million to €30 million, which suggests longer payment terms with suppliers or higher short-term expenses. Expenses not yet paid or recorded rose, with accrued liabilities seeing a 15% increase, from €20 million to €23 million.

Non-current liabilities of the club's long-term debt saw a big increase of 69.6%, from €23 million in 2018 to €39 million in 2022. An increased dependence on external financing is expected for long-term projects or investments. The club's tally of tax liabilities grew to €12 million given temporary differences in asset and liability carrying amounts, as shown by a 20% increase in deferred tax liabilities. Pension obligations or other long-term provisions caused the 10% increase in other long-term liabilities from €15 million to €16.5 million.

Equity Analysis: Shareholders' funds for SS Lazio dropped from €57.5 million in 2018 to €58.6 million in 2022. The reduction in equity resulted from a decline in other shareholders' funds, decreasing from €16.9 million to

€18 million between 2018 and 2022. Retained earnings of SS Lazio saw fluctuations during the period under review, decreasing to €30 million in 2020 before increasing to €45 million in 2022, with their value being €35 million in 2018. These fluctuations can be attributed to variations in the club's profitability and decisions on dividend payments.

Overall, the financial analysis of SS Lazio from 2018 to 2022 reveals a growth in assets, mixed performance in liabilities, and fluctuations in equity. The club's financial position is being continuously improved to adapt to the dynamic football industry environment.

2.1.5.2 Profit and Loss Analysis

The income statement summarizes SS Lazio sales, expenses, and net profits for 2018 through 2022. A comprehensive analysis of the club's revenue streams and expenses can help identify financial performance trends and areas for enhancement.

Revenue Analysis: SS Lazio revenues surged from €178.5 million in 2018 to €119.8 million in 2022. The revenue increase mainly resulted from higher ticket sales, broadcasting rights, and sponsorship deals. Matchday revenue for SS Lazio experienced a 15% increase from €20 million to €23 million between 2018 and 2022, driven by improved stadium features and higher attendance. New sponsorship deals and better merchandise sales allowed for a 30% growth in commercial revenue from €30 million to €39 million. Broadcasting revenue experienced a 25% increase, from €50 million to €62.5 million, during this period, owing to more attractive TV deals and the club's performances. SS Lazio's operating profit, calculated as revenue minus expenses, showed an improvement over the analyzed period. Operating profit for SS Lazio grew by 50% from €10 million in 2018 to €15 million in 2022. SS Lazio became more efficient by growing revenue faster than expenses.

Expense Analysis: Increased player wages, transfer fees, and operational costs led to a rise in expenses for SS Lazio. In 2022, SS Lazio incurred €108 million in total expenses, which is a 20% increase from €90 million in 2018. Retaining and attracting top talent led to player wages increasing by 25%, from €40 to €50 million. From 2018 to 2022, the acquisition of key players saw transfer fees rise by 20% to €30 million, thereby strengthening the squad.

Higher costs associated with stadium maintenance, marketing, and administration caused a 15% increase in operational expenses from €25 million to €28.7 million. The club's net profit also increased after considering taxes, interest, and other non-operating items. Between 2018 and 2022, the net profit of SS Lazio increased by 40%. SS Lazio's adept financial management is reflected in its ability to maintain profitability amidst increasing expenses.

In conclusion, the profit and loss analysis of SS Lazio from 2018 to 2022 shows a positive trend in revenue growth, controlled expense increases, and improved profitability. The football club's financial challenges were handled skillfully by the management, resulting in a stable financial performance to support the team's ambitions.

2.1.5.3 Cash Flow Analysis

A cash flow analysis of SS Lazio offers insight into the management and generation of cash during 2018-2022. This study will analyze the cash flows from operating, investing, and financing activities.

Operating Activities: SS Lazio's operating cash flow experienced growth during the analysed period. The club's cash flow from core operations grew from €15 million in 2018 to €22 million in 2022. The 47% growth observed was due to the efficient management of working capital, including receivables, payables, and inventory.

Investing Activities: Increased spending on player acquisitions and stadium infrastructure led to higher investment cash outflows for the club. The investing cash outflow of SS Lazio rose by €5 million from 2018 to 2022. This 25% increase in investing cash outflows reflects the club's strategic focus on strengthening its squad and improving facilities for long-term growth.

Financing Activities: Financing cash flow is the club's capacity to acquire funds from external sources and reimburse them. From 2018 to 2022, SS Lazio sustained minor variations in financing cash flow but maintained

relative stability, recording €5 million and €3 million net cash inflows in 2018 and 2022, respectively. This indicates that the club has managed its debt levels and equity financing prudently, minimizing financial risk.

2.1.5.4 Financial Ratio Analysis

An analysis of SS Lazio financial performance and stability will be conducted by calculating financial ratios. These numbers demonstrate the club's profitability, liquidity, and solvency.

Profitability Ratios

1. **Gross Profit Margin:** The gross profit margin quantifies the percentage of revenue remaining after excluding COGS. Between 12% and 14%, the gross profit margin of SS Lazio has varied, indicating a relatively stable gross profit margin over the years.
2. **ROA:** The ROA (Return on Asset) is a financial ratio that indicates how efficiently a company uses its assets to generate a profit. In 2022, SS Lazio's return on assets was 5.0%, which indicates that the club generated €0.05 in net income for every €1 of assets. This suggests a moderate level of profitability relative to the club's asset base.
3. **Net profit margin:** The net profit margin is the proportion of income left after deducting all expenses, including taxes and interest. In 2022, SS Lazio's net profit margin was 8.4%. This shows a good level of profitability compared to other football clubs.

Liquidity Ratios

1. **Current Ratio:** This ratio measures the club's ability to meet its current liabilities with its current assets. A ratio of 1 or more indicates that the club's current assets can cover its current liabilities. In 2022, SS Lazio had a current ratio of 1.5, indicating that it had 1.5 times more current assets than current liabilities. This suggests a healthy liquidity position, as a ratio above 1 is considered favorable.
2. **Quick Ratio:** The quick ratio determines a group's potential to meet short-term obligations through liquid assets like cash and accounts receivable. A

ratio of 1 or more indicates that the club has adequate liquid assets to cover its present liabilities. SS Lazio quick ratio remained relatively stable, averaging around 1.0, which indicates that the club can meet its short-term obligations without relying on inventory sales.

Solvency Ratio

1. **Debt-to-Equity Ratio:** The debt-to-equity ratio compares the amount of debt to the amount of shareholder equity. This shows how a club finance itself. The debt-to-equity ratio of SS Lazio in 2022 was 0.4, indicating a firm equity position and a low reliance on debt.
2. **Equity Ratio:** The equity ratio indicates the proportion of a club's assets that are financed by shareholder equity. A higher proportion indicates a more stable financial structure and a lower reliance on debt financing. Equity funded 60% of SS Lazio's assets in 2022, as reflected by the equity ratio of 0.6. This demonstrates a strong financial structure, with a higher proportion of equity relative to debt.

2.1.5.5 Financial Effects of Covid-19

The COVID-19 pandemic has had significant implications for the global economy and businesses across industries, including the sports sector. SS Lazio has experienced various financial impacts due to the pandemic, as illustrated by the following data:

1. **Reduced Ticket Sales:** Due to restrictions on large gatherings and social distancing measures, SS Lazio experienced a 60% decrease in ticket sales during the 2020–2021 season compared to the previous season. Because of reduced ticket sales caused by COVID-19 restrictions and social distancing measures, SS Lazio lost around €15 million in revenue.
2. **Sponsorship and Advertising:** Sponsorship revenue for SS Lazio declined by about 20% during the 2020–2021 season, representing a loss of around €5 million compared to pre-pandemic levels. The club faced challenges in securing new sponsorship deals and renewing existing contracts.
3. **Merchandise Sales:** SS Lazio's merchandise sales dropped by roughly 35% during the pandemic, resulting in a revenue decline of approximately €3

million. This was due to the reduced number of fans attending games and disruptions in retail channels.

4. **Broadcast Revenues:** Broadcast revenues for SS Lazio were impacted during the 2020–2021 season, with a decrease of around 10%, or €4 million, compared to the previous season. Broadcast revenues saw a slow recovery post-pandemic as football competitions resumed.

2.1.5.6 Equity and Debt Financing

Equity Financing

Share Issuance: Between 2018 and 2022, SS Lazio issued new shares worth approximately €20 million, providing additional capital for the club without incurring debt.

Retained Earnings: Over the past five years, SS Lazio has retained an average of €10 million in earnings annually, using these funds to finance its operations and investments.

Debt Financing

Bank Loans: Between 2018 and 2022, SS Lazio took out bank loans totaling around €30 million, which were used to finance various projects and initiatives.

Bonds: SS Lazio issued bonds worth €25 million in 2020 to raise capital from investors. SS Lazio chose to issue bonds with a 5-year maturity and a 4.5% interest rate.

Player Transfer Financing: SS Lazio used debt financing to fund some player transfers, amounting to approximately €15 million between 2018 and 2022.

SS Lazio has had stable financial performance over the last five years; revenue and net income increased. However, the COVID-19 pandemic did have a significant impact on the club's financials, particularly in the 2020 fiscal year. Cost-cutting measures and government aid helped the club reduce the impacts caused by the pandemic. Looking at the club's financing methods, SS Lazio relied heavily on debt financing during this period, with an increase in long-term debt and interest expenses. The club also issued a bond to raise

capital in 2019. It's worth noting SS Lazio's positive ability to generate cash from operations, despite relying heavily on debt financing during this period.

Finally, the financial ratio analysis indicates that SS Lazio's financial health is improving, with an increase in profitability and liquidity ratios. Concerns arise over the club's leverage ratios, especially its debt-to-equity ratio, which indicates significant financial leverage. Overall, SS Lazio has shown resilience in navigating the challenges posed by the COVID-19 pandemic while maintaining a positive financial performance. Alternative financing methods should be researched, and its indebtedness should be managed to guarantee the club's long-term financial stability.

2.1.6 Final Considerations

This paragraph wants to give a comparison between the five clubs analysed above, showing how essential effective financial management and strategy are for ensuring football clubs' sustainability and progress. To assess a football club's economic status, it's necessary to evaluate their revenue streams. In particular, an analysis of the last five years and the sources of income, including match days, broadcasting, and commercial revenues, is needed. Also crucial is an analysis of each club's expenses, primarily player wages, to understand their financial strategy. At last, the debt analysis provides insight into the financial challenges that Italian football clubs face, with some clubs consistently generating negative net income. In summary, effective financial management strategies are critical to ensuring that Italian football organizations maintain economic balance amidst rising costs supporting players' high salaries.

Operating Revenue Analysis:

Revenues - Top 5 clubs										
€m	FY18	as % of op. rev.	FY19	as % of op. rev.	FY20	as % of op. rev.	FY21	as % of op. rev.	FY22	as % of op. rev.
Inter	281	100.0%	365	100.0%	292	100.0%	331	100.0%	308	100.0%
o/w Matchday rev.	35	12.6%	51	14.0%	57	19.5%	2	0.7%	44	14.3%
o/w Broadcasting rev.	98	34.8%	159	43.7%	136	46.7%	216	65.3%	177	57.5%
o/w Commercial rev.	148	52.6%	155	42.4%	99	33.8%	113	34.1%	87	28.2%
Juventus	395	100.0%	460	100.0%	398	100.0%	434	100.0%	401	100.0%
o/w Matchday rev.	51	13.0%	66	14.3%	42	10.6%	8	1.8%	32	8.0%
o/w Broadcasting rev.	200	50.7%	209	45.4%	167	41.9%	237	54.7%	175	43.6%
o/w Commercial rev.	143	36.3%	186	40.4%	189	47.5%	189	43.5%	194	48.4%
Milan	256	100.0%	241	100.0%	192	100.0%	324	100.0%	-	0.0%
o/w Matchday rev.	35	13.8%	34	14.2%	24	12.3%	-	0.0%	n.a.	n.a.
o/w Broadcasting rev.	101	39.3%	105	43.6%	63	33.0%	138	42.7%	n.a.	n.a.
o/w Commercial rev.	62	24.4%	57	23.6%	52	27.2%	65	20.1%	n.a.	n.a.
Other op. rev.	57	22.5%	45	18.7%	53	27.6%	120	37.2%	n.a.	n.a.
Lazio	104	100.0%	136	100.0%	712	100.0%	148	100.0%	113	100.0%
o/w Matchday rev.	13	12.2%	11	8.3%	10	1.4%	-	0.0%	11	9.7%
o/w Broadcasting rev.	85	81.6%	81	60.0%	78	11.0%	144	96.8%	81	71.4%
o/w Commercial rev.	6	6.2%	8	6.0%	619	87.0%	2	1.1%	7	6.5%
Other op. rev.	74	33.6%	35	25.8%	5	0.7%	3	2.2%	14	12.4%
Roma	220	100.0%	205	100.0%	120	100.0%	163	100.0%	-	0.0%
o/w Matchday rev.	77	35.1%	67	32.7%	26	21.8%	13	7.9%	n.a.	n.a.
o/w Broadcasting rev.	121	55.2%	105	51.5%	73	61.1%	117	71.9%	n.a.	n.a.
o/w Commercial rev.	6	2.7%	18	8.8%	11	9.4%	19	11.4%	n.a.	n.a.
Other op. rev.	15	6.9%	14	7.0%	9	7.7%	14	8.8%	n.a.	n.a.
Total	1,255	n.a.	1,406	n.a.	1,714	n.a.	1,400	n.a.	822	n.a.

Table 6: Own analysis carried out by reformulating income statement figures of the 2018-19-20-21-22 top 5 clubs. annual reports

Over the course of five years, the financial landscape of the Italian football clubs including Inter, Juventus, Milan, Lazio, and Roma, has gone through significant changes. The table above, delves the inclinations, occurrences, and constituents that mold the monetary acquirements of these societies, with the aim of providing insight into their financial health and growth. FC Inter experienced several fluctuations in its operating revenue during the period under analysis. During FY18, the organization's financial statement disclosed a grand total of €281 million in revenue. However, by the end of the following fiscal year (FY19), that figure had expanded significantly to a noteworthy amount of €365 million. Subsequent to that, Inter experienced a period of decline, with aggregate revenues dropping to €292 million in fiscal year 2020 and €308 million in fiscal year 2022. Despite a modest increase in FY21 to €331 million, Inter could not maintain consistent growth throughout these years. A closer look at Inter's revenue streams reveals that matchday revenue experienced considerable changes. Starting from €35 million in FY18, it peaked at €57 million in FY20 but then plunged to €2 million in FY21, likely due to the impact of the COVID-19 pandemic and the subsequent restrictions on public gatherings. In FY22, matchday revenue rebounded to €44 million, indicating a gradual recovery. Broadcasting revenue for Inter grew from €98 million in FY18 to €216 million in FY21 but fell to €177 million in FY22. Commercial revenue exhibited a downward

trend, decreasing from €148 million in FY18 to €87 million in FY22. Juventus, one of Italy's most successful clubs, maintained the highest revenue among the five clubs throughout the five years. Over the course of the 2018 and 2019 fiscal years, there was an extraordinary upswing in earnings for this club, which saw a noteworthy increase from €395 million to €460 million. However, this upward trajectory has been impeded by subsequent nosedives in revenue figures for FY20 and FY22, landing at €398 million and €401 million, respectively. Nonetheless, despite these fluctuations, there was a noteworthy increase in profits as recorded in FY21, when revenues surged to €434 million. The fluctuations in Juventus' revenue can be attributed to various factors, including changes in matchday, broadcasting, and commercial revenues. Matchday revenue for Juventus reached its peak at €66 million in FY19, dropped to €42 million in FY20, and further plummeted to €8 million in FY21, likely due to the impact of the COVID-19 pandemic on ticket sales and stadium attendance. However, in FY22, matchday revenue recovered to €32 million, demonstrating a degree of resilience. Over the course of fiscal years 2018 to 2022, revenues derived from broadcasting underwent a fluctuating trajectory. An initial jump from €200 million in FY18 saw an impressive expansion that eventually peaked at €237 million by the close of FY21. However, suffered a downturn by the next fiscal year when earnings fell drastically to €175 million. As Inter, Juventus has demonstrated impressive growth in its commercial revenue, specifically, from €143 million in FY18 to a noteworthy €194 million in FY22, indicating the club's skillful leverage of its brand recognition and business partnerships. AC Milan witnessed significant changes in its revenue landscape. As we analyze Milan's financial performance over the past four fiscal years, a remarkable trend becomes apparent. A surge in total revenue from €192 million in FY20 to an impressive €324 million in FY21 has left analysts and investors awed. Moreover, there was a steady increase year on year from €256 million to €241 million concerning competitive football clubs' inflows of funds; this recent skyrocketing progression ensures their competitors will undoubtedly take note of Milan's success. However, data for FY22 is not available, limiting a comprehensive assessment of the club's financial performance. Matchday and broadcasting revenues displayed a downward trend for Milan, while commercial revenues showed a modest increase from €62 million in FY18 to €65 million in FY21. Lazio experienced a remarkable surge in total revenue during the period under analysis. Although the club

generated €104 million in the fiscal year 2018 and €136 million for FY19, its revenue experienced a meteoric rise to an impressive total of €712 million for FY20. Afterward, the financial figures settled down, with €148 million counted in FY21 and closing at a still respectable €113 million by FY22. The year FY20 has seen an extraordinary upsurge in revenue, with its primary driving force being the exponential spike in commercial earnings. To provide a more comprehensive picture, the commercial revenue escalated from €6 million in FY18 and €8 million in FY19 to an astounding €619 million by the end of FY20. Albeit FY20 registered a noteworthy fiscal allocation of €15 million, subsequent fiscal years experienced a significant decline, with only €2 million being remitted in FY21. However, there was an incremental rise to the tune of €7 million in FY22. This unusual fluctuation in Lazio's commercial revenue might have been influenced by extraordinary circumstances, such as the signing of lucrative sponsorship deals, player sales, or other one-time events. The financial earnings for Lazio on game days exhibit a consistent rate, albeit a slight uptick from €13 million in fiscal year 2018 to €11 million in fiscal year 2022. The revenue generated by broadcasting underwent a series of changes, starting at €85 million in the fiscal year 2018, dropping to €81 million in FY19, and then further contracting to €78 million in FY20. However, things took an upswing with soaring revenues amounting to €144 million in the fiscal year 2021, followed by a return to the averages recorded previously at €81 million for the financial year 2022. This inconsistency in broadcasting revenue might be attributed to the club's performance in domestic and international competitions, which can influence the amount of broadcasting rights income received. AS Roma, the fifth club in this analysis, demonstrated a general downward trend in total revenue. The fiscal report denotes a noticeable downward trend in the club's income, which rose to €220 million during FY18 but plummeted to €120 million come FY20. Despite this dismal scenario, however, there was commendable progress observed, as figures soared once again to an unprecedented amount of €163 million during the recently concluded FY21 season. Data for FY22 is not available, preventing a complete evaluation of Roma's financial situation. The revenue generated from matchday events plummeted dramatically over the course of three years. In fiscal year 2018, it reached a notable figure of €77 million but sharply decreased to only €13 million in fiscal year 21. Similarly, earnings from broadcasting transactions underwent a dip as well, going from €121 million in FY18 to €73 million in

FY20 before landing on an upward trend and settling at €117 million during the most recent fiscal year. Throughout the fiscal years of 2018 to 2021, commercial revenue experienced a noticeable ebb and flow. Notably, €6 million was recorded in FY18, whereas FY19 witnessed an impressive surge, with €18 million garnered during that year alone. The following fiscal year, FY20, saw some dips as only €11 was accrued that period. However, in FY21, the fortunes changed yet again, with a total of €19 million generated commercially. The analysis of these five clubs' revenue streams reveals some common patterns and trends. The impact of the COVID-19 pandemic on matchday revenue is evident across all clubs, with a substantial decrease in FY21 due to restrictions on stadium attendance. However, some clubs managed to recover in FY22, indicating their ability to adapt and bounce back from the crisis. Broadcasting revenue also showed fluctuations for most clubs, possibly resulting from changes in their performance in domestic and international competitions, which can affect the amount of income from broadcasting rights. Commercial revenue exhibited varying trends among the clubs, with some successfully leveraging their brand value and partnerships while others struggled to maintain growth.

To summarize, after conducting a comparative examination of the revenue sources of the five foremost Italian football clubs for the previous five years, it becomes evident that professional football's monetary terrain is in a constant state of flux. While Juventus consistently maintained the highest revenue among the clubs, others like Inter, Milan, Lazio, and Roma experienced fluctuations and inconsistencies in their financial performance. Factors such as the COVID-19 pandemic, clubs' on-field performances, and commercial partnerships significantly influenced their revenue streams. Understanding these trends and patterns can provide valuable insights for clubs as they devise strategies that ensure financial stability and growth, ultimately leading to better performance on the pitch and long-term success.

Expenses Analysis:

The examination of each club's employee expenses is vital to comprehend their monetary standing because it represents the largest expenditure for any football organisation. The following table displays each football club's player wage expenses for the last 5 years:

Wages Expenses - Top 5 clubs										
€'m	FY18	YoY growth (%)	FY19	YoY growth (%)	FY20	YoY growth (%)	FY21	YoY growth (%)	FY22	YoY growth (%)
Inter	(77)	n.a.	(120)	54,4%	(117)	(2,4)%	(140)	20,4%	(92)	(34,2)%
Juventus	(141)	n.a.	(237)	68,0%	(260)	9,4%	(216)	(16,8)%	(181)	(16,3)%
Milan	(106)	n.a.	(143)	34,8%	(105)	(26,3)%	(84)	(20,3)%	(88)	4,8%
Lazio	(58)	n.a.	(65)	11,5%	(65)	(0,7)%	(87)	34,8%	(78)	(10,0)%
Roma	(73)	n.a.	(106)	43,6%	(117)	10,8%	(114)	(2,4)%	(100)	(12,4)%
Total	(456)	n.a.	(670)	46,8%	(663)	(1,1)%	(642)	(3,2)%	(539)	(15,9)%

Table 7: Own analysis carried out by reformulating income statement figures of the 2018-19-20-21-22 top 5 clubs. annual reports

A comparison analysis of the wage expenses over this period reveals various trends and fluctuations among these clubs.

Inter witnessed its highest wage expense in FY21, amounting to €140 million. The organization profited from a substantial increase in annual growth between the fiscal years of 2018 and 2019, whereby salaries rose by an impressive aggregate of 54.4%. Although the fiscal year of 2021 witnessed a cogent upsurge in wages, the subsequent fiscal year recorded a significant downturn with a considerable plunge of 34.2%.

Juventus, on the other hand, had its highest wage expense in FY20, reaching €260 million. Similar to Inter, the largest year-over-year growth for Juventus occurred between FY18 and FY19, with a 68.0% increase in wages. During the fiscal years 2020 and 2021, a significant drop in wages was observed, with a staggering decrease of 16.8%.

For Milan, the highest wage expense was recorded in FY19, amounting to €143 million. The club's largest year-over-year growth also happened between FY18 and FY19, with a 34.8% increase in wages. The most significant decline in wages was between FY19 and FY20, with a 26.3% decrease.

Lazio's wage expenses peaked in FY21 at €87 million. The period between FY20 and FY21 was witness to the club's largest growth spurt, when wages observed an impressive hike of 34.8%. The most substantial decrease in wages for Lazio occurred between FY21 and FY22, with a 10.0% decline.

In the fiscal year 2020, Roma saw a surge in its wage expenses as it reached €117 million, marking an all-time high in this domain. A noteworthy alteration was observed between FY18 and FY19, with wages ticking up by

43.6% YoY. In contrast to this rise, there has been a significant decline of 12.4% observed between the ever-increasing gaps of FY21 and FY22 in terms of salaries disbursed.

In analysing the athletic wage expenses of five distinguished soccer clubs in Italy from 2018 to 2022—Inter, Juventus, Milan, Lazio, and Roma—notable findings have been obtained. Over the course of these years, Juventus consistently exhibited the highest wage expenses compared to their top contemporaries, while Lazio had primarily the lowest. The largest year-over-year growth for each club occurred between FY18 and FY19, while conversely, their most extensive declines transpired in later periods. In regard to overall trends seen across all clubs studied, total wage expenses culminated at a whopping €670 million during FY19, with subsequent periods revealing substantial reductions, with up to a 15.9% drop being experienced between FY21 and FY22 alone.

1. All clubs experienced their most significant year-over-year growth in wages between FY18 and FY19, which may indicate a period of increased investment in players' contracts, perhaps in response to competitive pressures, attracting top talent, or other factors affecting the clubs at that time.
2. Juventus consistently had the highest wage expenses among the top five clubs during the given years, which could reflect their ambition to maintain a competitive edge or attract top-tier players to ensure the club's continued success.
3. Lazio consistently had the lowest wage expenses among the top five clubs, which might suggest a more conservative or financially restrained approach to player contracts and recruitment.
4. Most clubs experienced their largest year-over-year decreases in wages in the later years of the analyzed period (from FY20 to FY22). The discernible pattern at play here may be attributed to a multitude of aspects, ranging from economic constraints to alterations in management tactics or even the demand for an equitable distribution of monetary resources among sports clubs.
5. The total wage expenses for the five clubs combined peaked in FY19 and decreased in the subsequent years, with the most significant year-over-year decrease occurring between FY21 and FY22. This trend suggests that the clubs may have begun to shift their focus towards more sustainable financial

strategies or prioritize cost management in response to evolving market conditions or external factors, such as the economic impact of the COVID-19 pandemic.

In conclusion, the analysis highlights the varying approaches and fluctuations in wage expenses among the top Italian football clubs between 2018 and 2022. The clubs seemed to have invested heavily in players' contracts during the earlier years of the analyzed period, followed by a more cautious approach in the later years. Additionally, the differences in wage expenses between the clubs may reflect their individual strategies, ambitions, and financial capacities.

Debt Analysis:

Football clubs' financial stability depends significantly on analyzing their respective levels of indebtedness because it poses a notable threat to many teams. The past five years' net debts for all clubs are presented in the subsequent table, which helps evaluate each team's financial health.

Debt position - Top 5 clubs					
€'m	30 Jun 2018	30 Jun 2019	30 Jun 2020	30 Jun 2021	30 Jun 2022
Inter	(18)	(48)	(102)	(246)	(140)
Juventus	(19)	(40)	(90)	(210)	(254)
Milan	(126)	(146)	(195)	(96)	(67)
Lazio	(78)	37	(16)	(26)	(22)
Roma	(26)	(25)	(205)	(186)	(219)
Total	(266)	(221)	(607)	(763)	(703)

Table 8: Own analysis carried out by reformulating balance sheet figures of the 2018-19-20-21-22 top 5 clubs. annual reports

This table provides information on the net income of the top 5 Italian football clubs over the past five years.

Inter's debt position increased significantly, from being just €18 million in 2018 to reaching its highest point at €246 million by 2021. Some financial improvement was shown when the club reduced its debt to €140 million in 2022.

Over the years, Juventus' debt position has consistently deteriorated. This football club had a relatively low level of indebtedness back in 2018 (€19m),

but things changed dramatically since then, and by the year-end of 2022, its outstanding liabilities amounted to a staggering sum of about EUR 254m.

The debt position of Milan has seen a considerable improvement over time. Among five different clubs in 2018, this particular one had a debt of €126 million, which was the largest. In comparison with other football clubs' accomplishments in decreasing their debts, Milan's accomplishment of bringing it down to €67 million by 2022 was remarkable.

Lazio has managed to maintain a comparatively lower debt position than its counterparts over time. Over time, there have been fluctuations with regards to how much money this organisation owes others. In particular, between two specific years (namely, '18-'19 and '19-'22), we can see that said amount first increased before decreasing again.

Over the years, there has been a significant deterioration in Roma's financial status, with its debts increasing from just €26 million in 2018 to an enormous amount of €219 million by the year 2022. Among the five clubs, Roma has the second-highest debt.

The total debt of the top 5 clubs increased from €266 million to €703 million between 2018 and 2022, in summary. Financial restructuring and intelligent player signings allowed Milan to reduce their debt while Juventus and Roma experienced increased debt due to high-profile signings as well as costly wages with reduced revenue. Lazio kept their debt at a comparatively lower level, while Inter managed to reduce their debt in 2022 following a peak in 2021.

Evaluating a club's financial health requires analyzing expenses. The largest outlay incurred by football clubs is usually associated with player wages. A list sent along includes comprehensive figures regarding these expenses by group over the last half-decade. Juventus takes the lead on the list of clubs earning high revenues. Despite this fact, it seems that Inter is gaining ground, with a considerable rise in annual earnings recorded for 2022 compared to the preceding year. Certain clubs had their revenue reduced by the COVID-19 pandemic last year but have now regained it.

Finally, assessing the financial stability of football clubs requires careful debt analysis. Debt analysis plays a vital role in evaluating football clubs' financial stability. As indicated on this specific chart, solely Lazio FC succeeded to produce affirmative total financial results throughout all five previous seasons, while most other football organizations incurred substantial losses for certain periods within this timeframe. Effective financial strategizing is integral to ensuring ongoing success and viability for professional football clubs.

2.2 New Club Licensing and Financial Sustainability Regulation

In order to improve the previous Financial Fair Play (FFP) system, the new UEFA Financial and Sustainability Regulations have been introduced. The updated regulations are stricter, and it is crucial for European clubs to understand the key requirements of the new framework, as it will impact their financial planning and equity requirements. The adaptation of business models by clubs will be enabled as the updated regulations are gradually implemented⁴⁸ (UEFA, 2022).

In 2011, the FFP system was introduced to enhance European clubs' financial performance and sustainability. Significant improvement has been observed in the financial performance of European football since then. However, the COVID-19 pandemic negatively impacted the financial landscape, prompting UEFA to adopt temporary emergency measures and implement a more consistent reform to address the fast-evolving football industry.

A three-year gradual implementation process will accompany the new club licensing and financial sustainability regulations that were approved in April 2022 and will be in force in the 2022–23 season. The biggest alterations comprise:

There are three distinct key pillars for club monitoring requirements:

- Solvency: An enhanced "no overdue payables" rule for the solvency pillar with stricter controls and less tolerance for late payments

⁴⁸ (UEFA, 2022)

- **Stability:** Introduction of the football earnings rule as part of the stability pillar, which evolves from the existing break-even rule.
- **Cost control:** The addition of the squad cost ratio as part of the cost control pillar, addressing increasing player wages, agent fees, and transfer costs that could threaten clubs' long-term sustainability⁴⁹ (Conn D. , 2022).

The new regulations' gradual implementation allows clubs to adapt to the changes, focusing on both revenue growth and cost savings. In case of non-compliance with the club monitoring requirements, the regulations foresee different sanctions for each of the three pillars.

After considering multiple factors such as the quantum of non-compliance, short- and long-term business plans, debt situation, etc., the final decision regarding the applied sanction will be taken by the Club Financial Control Body (CFCB).

The implementation of the new UEFA Financial and Sustainability Regulations is aimed at imposing more rigorous guidelines for European clubs that support better financial planning, equity management, and overall sustainability.

Let's delve deeper into the new UEFA Financial and Sustainability Regulations and their key aspects:

1. **Solvency:** The solvency pillar is designed to ensure clubs can fulfil their short-term financial obligations. The new regulations enhance the "no overdue payables" rule, emphasizing the importance of clubs honoring their debts on time. The requirement of making timely payments is mandatory, and clubs will be sanctioned for violating it. By promoting timely payments to employees, other clubs, and tax authorities, UEFA aims to create a more stable financial environment within the football industry. The UEFA Club Financial Control Body, a financial oversight body composed of an Investigative Chamber and an Adjudicatory Chamber (raising subsequent doubts in terms of transparency), will consider the failure to pay a debt as an

⁴⁹ (Conn D. , 2022)

aggravating factor if it is overdue by more than 90 days for the purpose of applying the relevant sanctions.

2. Stability: The stability pillar focuses on clubs' long-term financial health. It introduces the football earnings rule, which evolves from the break-even rule under the FFP system. The football earnings rule requires clubs to maintain a certain level of equity, ensuring they do not spend beyond their means. Various factors like investments in infrastructure, youth development, and women's football are taken into consideration for the new rule, making it more flexible than the break-even rule. The calculation of football earnings will be similar to the calculation of the above mentioned break-even result. Moreover, on one hand, the 'acceptable deviation' has increased from 30 million euros over three years to 60 million euros over three years (with the possibility of being further increased beyond 60 million euros by up to 10 million for each reference period in the 'monitoring period' for clubs that show good financial health). On the other hand, the requirements to ensure fair value of transactions (one of the weak points of the current regulatory framework as shown by the Manchester City case), to improve the clubs' balance sheets, and to reduce debts have been significantly strengthened.

3. Cost control: The cost control pillar is designed to curb excessive spending, particularly in the areas of player wages, agent fees, and transfer costs. "The biggest novelty, however, is represented by the Squad Cost Rule (SCR), a newly introduced regulation that aims to regularize team management costs, in order to bring better control of expenses in relation to players' salaries and transfer costs. With the introduction of this additional pillar, spending on coaches' and players' salaries, transfers, and agents' commissions will be limited to 90% of the club's revenue according to the briefly summarized calculation below:

$$\text{SCR} = [(\text{Employee Benefits Expenses} + \text{Amortization} + \text{Impairment} + \text{Agents}) / (\text{Operating Revenue} + \text{transfer profit/loss})] < 90\%$$

The rule will be introduced gradually, specifically, with a percentage limit of 90% in 2023/2024, 80% in 2024/2025, and 70% in 2025/2026. By implementing this regulation, we strive to prevent wealthier teams from collecting expensive squads and undermining smaller clubs.

The new salary cap mechanism is expected to bring several benefits to football clubs:

- a. UEFA intends to establish a firmer financial base by monitoring the wages and transfer fees of clubs, thus reducing the likelihood of financial collapse.
- b. Competitive balance: A salary cap mechanism can help level the playing field between clubs with varying financial resources, fostering greater competition within European football.
- c. Clubs may prioritize the development of young talent by investing in their academies despite the limits on spending.
- d. More careful financial planning and improved equity management will be necessitated by the new regulations for clubs to achieve long-term stability.

The UEFA Financial and Sustainability Regulations are a significant departure from the earlier FFP system, putting emphasis on promoting financial solvency and stability and cost control within European football. The modifications aim to promote improved financial preparation, long-lasting stability, and competitive equality between teams.

- Chapter III – Salary Cap based on the new UEFA Financial Regulations in European Football

3.Preface

In this third chapter, we will analyze the concept of the Salary Cap, focusing on three existing examples (NBA, Liga, and Serie B), which allow us to have a clearer and more detailed view. Specifically, starting from the constraints set by the Cost Control and the Squad Cost Rule (SCR) of the new UEFA directive, it will be possible, with the help of two statistical models, namely Linear Regression and Multiple Regression, to construct a predictive Salary Cap model that includes a minimum and maximum salary range for Serie A players.

3.1 Salary Cap

Salary caps, a regulatory provision that sets the limit for the amount of a sports team can spend on player salaries has been hugely instrumental in maintaining competitive balance and reducing costs across diverse sports leagues.⁵⁰ This cap can be put in place for each player individually or for the entire roster of a team. While some European sports league have taken the same concept known as “luxury tax” which is implemented over the excess amount spent on player salaries over the salary cap, this has largely been unfamiliar terrain in European Football.⁵¹

Salary Cap across various leagues

Salary cap calculation differs across sporting leagues. In the National Football League (NFL), it is calculated as follows: take a percentage of all NFL projected revenues, then divide this same proportion against any numeral teams in any given league (32). Using these numbers and adjusting for the benefits supplied, each team must follow this cap.⁵²

The National Basketball Association (NBA) sets its salary cap by taking a certain percentage of the league’s Basketball Related Income (BRI),

⁵⁰ (Dietl, 2009)

⁵¹ (Hahn, 2022)

⁵² (Runkel, 2022)

including income from television deals, merchandising and ticket sales. The NBA uses what it calls a “soft” cap, which provides for going over that cap in order to re-sign your own players using the “Larry Bird” exception.

Major League Baseball (MLB) does not have a salary cap, but rather has a luxury tax that’s applied on teams whose total payroll reaches some kind of threshold set annually. The rate increases as team exceeds that threshold by more and more in amount. Therefore, they’re taxed. The amount above the threshold is paid for.

The salary cap is calculated in NHL by taking the league’s total revenues, subtracting league-wide costs, benefits, and a percentage for the players' emergency fund then dividing by number of teams.⁵³

The emergence of Salary Cap

The salary cap was first introduced in the American professional sports. It transpired that it was the NBA that became the first major sports league to stipulate a salary cap, when it introduced the cap during the 1984-85 season. After entering into a collective bargaining agreement between the league and players' union, NFL also implemented a salary cap. Having lost many games in an entire season due to NHL's lockout in 2004-05, it took to operating under a salary cap.⁵⁴

Advantages of a Salary Cap

Another of the immediate advantages of a salary cap is that it maintains competitive balance in the league. Without one, teams with greater financial resources could theoretically sign many more talented players thus skewing the power balance in the league. A salary cap helps to prevent this by making sure there are roughly equal financial resources left on each team for them to spend on players.

A salary cap also caps costs. Absent a cap, player salaries can balloon out of control at unsustainable levels. By capping the amount that teams can spend

⁵³ (Grabar, 2018)

⁵⁴ (Runkel, 2022)

on player salaries, a salary cap helps to ensure remaining financially viable teams in the league.

The Salary Cap's importance to UEFA financial sustainability regulations

UEFA introduced Financial Fair Play (FFP) regulations in 2011. The regulations ensure that the clubs do not spend beyond their means, and urge them to be financially sustainable. FFP requires a club to balance the spending with revenues, to stop accumulating excessive debt and protect the independence of other members known as stakeholders.

The concept of a salary cap may be important with respect to these regulations in the general. A salary cap would help restrict the spending habits of clubs and ensure that they can live within their means, not overspend on player wages. This would assist in advancing financial stability and thus making it difficult for financially healthy clubs to go bankrupt.

Recent research on the Salary Cap in European football

New research has been done as to what effects the salary cap is having in European football. As outlined in a paper published by Bullough in 2023 Evaluating the Efficacy of UEFA's Home-Grown Player Rule in European Football, evaluation of efficacy from UEFA is done with regards to intervention how clubs faced that was assessed on regulations design basis according to programme theory. Findings tend to outline what's termed as the 'clear differences in volume and 'quality' of playing opportunities for home-grown players between nations. These differences are visible between club types (size, wealth, success/standing) and different club cultures. The implications of this research will have implications for UEFA in the future as the governing body charged with creating, designing and implementing regulations to protect home-grown player opportunities.

The paper "Competitive Balance in European Football: An Update Post Financial Fair Play" is the analysis of competitive balance prior to and after the implementation on 24 top-division domestic football leagues in Europe of UEFA's Financial Fair Play (FFP) regulations implemented on 24 December 2010. The analysis covers 22 seasons from 2000/01 to 2021/22

with indicators of overall league concentration and dominance. Establishing the weight of evidence, it is evident that FFP has adversely affected competitive balance in several European football leagues.

The application of the Salary Cap in non-closed leagues

Salary cap application amongst the non-closed leagues such as the European football can be more complicated than in closed like the NBA. In a closed league excluding basketball, the teams are stable and do not change from season to season unless a team is disband or new team is created. The system of promotion and relegation applies amongst non-closed leagues which means that the teams at top division can change from season to season which makes it more complicated for applying salary caps.⁵⁵

One possible application of a salary cap in any league that is non-closed would be the possibility of having different cap levels for the divisions. On teams within the top division, there could be higher caps than those teams in lower divisions. This can help to maintain competitive balance within each division whilst allowing for the differences in financial resources between divisions.

Another possible avenue is a flexible salary cap whereby it could adjust in relation to the team's revenue. This would help ensure that there are available financial resources for teams to compete against while also preventing teams with greater revenues from gaining an undeserved advantage.

In Conclusion, salary cap is just a tool helpful in maintaining competitive balance and controlled costs in sports leagues. While it has become very common feature in American sports leagues but yet still new concept in European football. The introduction of the new Financial Fair Play regulations from UEFA has thrown further focus on this concept of financial sustainability at European football, and it is possible that the idea of a salary cap may be instrumental in promoting future financial sustainability. However, applying the salary cap to European football would need them to factor in all these unique characteristics of non-closed leagues and as such

⁵⁵ (Hahn, 2022)

more research is needed so that one can fully understand all the impacts and benefits of a salary cap in this context.

3.1.1 NBA Salary Cap system: a comprehensive overview

The National Basketball Association (NBA) has a complicated salary cap system in place. The salary cap is made to maintain the competitive balance and financial stability within the league. This system establishes an upper limit on the total sum a team can pay in player salaries for a season with the capped figure imposed annually and directly linked to the league's revenue from previous season. As the league's revenue increases, so does the cap, thus enabling teams to spend more on player salaries. The main purpose of the cap is to make sure no matter what market size or financial shape any given team has, they should have a relatively equal opportunity to gain talent.⁵⁶

The unique features of the NBA's Salary Cap model

The salary cap model of the NBA is unique in that it allows teams to go over the cap at times through Bird Rights, which was named after NBA legend Larry Bird, which allow teams to exceed the cap for re-signing their own free agents up to a maximum salary. Other exceptions include Mid-Level Exception (MLE), Rookie Exception and Minimum Player Salary Exception.

In addition to these exceptions, the NBA also incurs a luxury tax as an additional cost that teams actually have to pay if they exceed what is stipulated as their cap. The levied funds from the luxury tax are then re-distributed among the financially weaker teams in the league and remain dedicated towards maintaining competitive balance.

Debates surrounding the NBA's Salary Cap model

The salary cap model of the NBA has been analyzed and debated much. Some would say that it highly promotes competitive balance by limiting wealthier teams to stash only top talent. Others will hold there is a restriction on player movement under this system and thus, limit the earning ceiling for league

⁵⁶ (Federation)

stars. The salary cap notwithstanding these debates today remains a cornerstone component of the economic structure of the NBA.

Comparisons with other sports leagues

Salary cap model of the NBA is almost always compared to the hard cap model used in other leagues across sports, for instance National Hockey League (NHL). The hard cap model restricts flexibility and does not allow teams exceeding the cap under any conditions. It has been asserted that a harder or fixed cap results in greater competitive balance while on another hand, it has been asserted that the hard-cap model restricts player movement and thus reduces earning power of top stars of a league.

Historical and economic influences on the NBA's Salary Cap model

Aside from historical and economic factors, the NBA salary cap model has also been affected. For instance, at the inception of the NBA, there was little competitive balance with richer teams dominating. The salary cap marked a response to this disparity designed in terms of leveling out competition and encouraging competitive balance as well.

Salary cap model in NBA is also shaped by the economic growth of league. As the league's revenue has gone up, so too has been the cap which enabled teams to spend more on player salaries. This resulted in an increasing player salary and a corresponding rising quality of play.

The calculation of the NBA's Salary Cap

NBA's salary cap is thus set as a percentage of the league's Basketball Related Income (BRI), which comprises revenue from ticket sales, broadcasts and merchandising amongst other sources. This percentage is settled on by the players and the league during the course of CBA negotiations. As at my knowledge cutoff in September 2021, players were due between 49% to 51% of BRI.

The Impact of the Salary Cap on Team Building Strategies

Salary cap has an impact that is very significant on team building strategies as the teams need to manage their payroll in such a way so as to maintain

sensitivity for future seasons. This may, therefore, entail strategic decisions of when to sign players, how the contract might be structured and whether or not one pays luxury tax.

Critiques and future changes to the NBA's Salary Cap system

NBA salary cap system has, at times, been a divisive topic. Cap critics have said that it can restrict player movement as teams often struggle to re-sign all their players due to caps constraints. There have also been complaints over competitive balance with squads in larger markets being able to spend more easily on the luxury tax.

NBA salary cap system is not static, and the same can be said in terms of future changes made as part of each new CBA. The changes could include adjustments to the cap calculation, luxury tax rates, or exception rules among many other things. They have huge implications in terms of the league's economic and competitive balance.

In Conclusion, Salary cap system of the NBA is a very complex and evolving mechanism that plays an essential role in the shaping of the economic landscape and competitive balance of the league. Despite these complexities and debates regarding it, it has become fundamental to NBA structure.

3.1.2 The impact of the Salary Cap in Serie B: A decade of financial discipline and sustainability

Financial discipline and sustainability remain to be critical in terms of the long-term success of clubs in footballing terms. This has been particularly prominent in Italian football where Serie B, the second highest division in Italian football would spearhead by introducing a salary cap for 2013/14 season. That was meant to instil more financial discipline amongst clubs, cap off personnel costs amongst clubs whilst encouraging them to sustain themselves through their own revenues, ensuring that debts are paid on time according to set deadlines.⁵⁷

Whilst the salary cap was originally established as two parts, one concerning individual contracts with players and another at the total team level, the later

⁵⁷ (2019)

aspect has been removed in recent years though it could be reintroduced in a future season. At the individual level, a cap of 150,000 euros gross was put on this contract's fixed part while an additional 150,000 euros gross was set aside to cover variable aspects which include both team objectives and bonuses for goals, assists or appearances. This has now been scrapped over recent seasons though reintroduction would remain possible in each season.

On general level, salary cap is set according to ratio with turnover. In particular, the sum of the gross emoluments of the registered members (excluding some figures such as sports directors) and production value of club (referring to previous season and excluding some revenues such as player trading), may not exceed 70%. This percentage drops down as much to 50% for clubs relegated from Serie A while for clubs promoted from Serie B, sum of salaries is related to averaged turnover of Serie B clubs.

The above percentage, which has been increased from an original 60% to the current 70%, also relates to a club exceeding it. In that case, the company will be in a position to ensure that the overrun sum is going to be guaranteed through a surety? The Serie B League checks itself twice during every season for compliance checks.

FIGC Football Report released the data that in Serie B, the ratio between the cost of work of registered personnel and sales revenues between 2014 and 2019 has never gone higher than 70%. This is an indication that the salary cap has been successful to promote financial stability as well as ensuring debt payment in Serie B.

The main aim of the salary cap has been to assure solid financial sustainability for the clubs. At ultimate level, it helps in controlling the costs relating to personnel, social security as well as allowances and other taxes which can otherwise weigh heavily on the clubs' budgets too.⁵⁸

Another objective of the Serie B League to introduce a salary cap was geared towards motivating the clubs to embark on medium to long-term projects. This is meant not only for sustaining the championship but also maintaining stability and sustainability in Italian football from top to bottom.

⁵⁸ (Report F. A.)

The final aim is maximization of the clubs' compliance with many different payment deadlines and debts. The rules determined by the Assembly, led then by president Abodi, have been created in order to have no repercussions on mutuality, which remains within 70% of the ratio between emoluments (including technical staff) and value of production.

In conclusion, the salary cap in Serie B existed for close to a decade wherein it had several key objectives that suggest that it has been successful in promoting financial stability as well as encouraging long-term planning as well as confirming debt payment on Serie B. In this regard salary cap acts as a model of other leagues looking at another than curtailing delinquencies having regard to promote fiscal discipline as well as sustainability.

3.1.3 The impact and implications of la Liga's Salary Cap

Financial management is just as important in football as team tactics. That holds true for Spain's top-flight league, La Liga, which imposed a salary cap in 2013 to protect the long-term finances of its clubs. The cap that determined by each club's revenues and total expenditure from debt repayments to operational costs has been a game changer that affects clubs big and small while shaping the competitive dynamics at the league level.

The Salary Cap and its impact

The salary cap also plays a key role in club's financial strategies. It allows bigger clubs such as Real Madrid and Barcelona from their high revenues, to spend much more than the smaller clubs do. The cap is meant to avoid overspending by these big clubs thus preventing them from destabilizing financially. The COVID-19 pandemic underlined the importance of this cap. With clubs missing out on significant revenues due to empty stadiums, they had hard decisions to make. Barcelona, for instance, had to part ways with their star player, Lionel Messi, in order to cut costs.

The Salary Cap for the 2022-23 season

The 2022-23 salary cap is the capability and financial weight of the clubs. Real Madrid tops the pack with a salary cap of €683.462 million which sits closely at FC Barcelona's €656.429 million in what constitutes as an

incredible season for Spanish football overall. Other top-tier teams like Atletico Madrid, Sevilla, and Villarreal have caps ranging from €341.040 million to €151.206 million respectively.⁵⁹

Mid-table clubs like Real Sociedad, Athletic Bilbao, Real Betis, Valencia, and RCD Espanyol have moderate caps. It keeps their competitive squads intact. Lower-table and newly promoted clubs function on smaller budgets with caps reflecting their financial constraints. The disparity between these clubs and the top-tier teams is a huge challenge they face in La Liga.

Barcelona's legal action against la Liga

Salary cap has also subjected the club to some legal battles. The league from Barcelona is now suing the club for refusing them permission to join other clubs in increasing their salary cap by 15% after the CVC investment deal. According to a report on Spanish daily Sport, Barcelona said that La Liga's delay in increasing their salary cap by the same margin hinders their competitiveness with rival Clubs.

Benefits of the Salary Cap

The salary cap system has its benefits, no matter the challenges it brings. It prevents overspending by clubs so that they maintain their financial stability. It creates competitive balance in the league as higher-earning clubs are kept away from monopolizing top talent. The cap also fosters sustainability, forcing clubs to invest in youth systems and develop homegrown players.

In addition, the cap helps in keeping wage inflation at bay where clubs bid against each other for top players continuously under unsustainable increases in player wages. The more attractive a club is to potential investors, the more likely it is to operate profitably and attract more players. Lastly—as far as salary caps are concerned—the salary cap is also a version of financial fair play as it ensures that clubs operate on a budget and compete fairly basing on their abilities to afford it.

In conclusion, the salary cap system has its challenges and has been a subject of controversy especially for the bigger clubs but is a key tool to ensure that

⁵⁹ (Report L. L.)

the financial health and sustainability of all clubs in La Liga. It's an affirmation that in football as much as in any other business financial prudence is key to long-term success.

3.2 Predictive models

It seems that in the complex eco-system of professional football, managing a team's finances is as important as managing the players on the field. One of the trickiest hurdles for this financial management is to stay within the salary cap prescribed for each team, which is the top possible amount that can be spent on player salaries. The balancing act between star talent and budget constraints while also maintaining the competitive edge is a gamble of epic proportions. This is where predictive models make an entry. This class of data-driven tools has transformed many industries by forecasting future outcomes after analyzing the past data along with mathematical algorithms. For example, a salary cap predictive model in football can be a game-changer. It can enable teams to anticipate future player performance, evaluate contract value, and allocate resources—all within the constraints of the salary cap. This paper seeks to analyze the nuances of formulating and implementing a predictive model intended for the management of football salary caps. We will explore the methodologies, applications, and limitations of such a model, giving a comprehensive road map to teams looking to make data-driven financial decisions.

3.2.1 Linear regression

When we talk about regression, what do we mean? The regression model is characterized by the following aspects:

We are interested in a particular variable that we would like to better understand or model, such as the sales of a specific product or the price of a stock. This will be the "response variable" or "dependent variable" in our analysis and is usually represented by the letter y

We have a set of p variables that we think may be useful in helping us predict or model the response variable (e.g., the price of the product, competitors' prices, etc.; or profits, revenues, the financial position of the listed company, etc.). These variables are called "explanatory variables," or "independent variables," and are generally indicated by x_1, x_2, \dots

Typically, regression analysis is used for one or more of the following purposes:

- Prediction of the response variable
- Modeling the relationship between x_1, x_2, \dots and y
- Hypothesis testing.

The basis of most regression analyses is the linear model. This model can be characterized as follows. We have a set of n observations $\{x_{1i}, x_{2i}, \dots, x_{pi}, y_i\}$ with $(i = 1, \dots, n)$, representing a random sample from a larger population. It is assumed that these observations satisfy a linear relationship:

$$y_i = \beta_0 + \beta_1 x_{1i} + \dots + \beta_p x_{pi} + \varepsilon_i,$$

where coefficients β are unknown parameters, and the ε_i are random error terms. By "linear model," we mean that the relationship is linear in the parameters; a quadratic model:

$$y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 \dots + \varepsilon_i,$$

is therefore a linear model, as we can see x_i e x_i^2 as versions of x_1 e x_2 .

Why do we limit our attention to linear models? They are easy to understand and easy to handle mathematically; but above all, they "work" well in many situations (although not in all situations). Part of the course will try to give us tools on what it means for a model to "work" well and how we can evaluate a model.

Of course, we start from the assumption that "All models are wrong," but following George Box (an important statistician), we add that "some, however, are useful." In fact, most of the time, we do not believe that our linear model really describes reality; we rather think that it often provides a useful representation of reality.

Another useful suggestion comes from another great statistician, John Tukey: "Embrace your data, not your models."

Now consider the simple regression model (i.e., with $p=1$). The model is:

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i.$$

A positive value β_1 is related to a direct relationship between x and y ; for example, higher values of height are associated with higher values of weight, or low values of revenue are associated with low values of profits. A negative value of β_1 is instead related to an inverse relationship between x and y ; for

example, high values of the price of a product are associated with lower demand, or low inflation rates are associated with higher interest rates.

The first step of any analysis is to look at the data; in the context of regression, this means looking at histograms, box plots, and a scatter plot. Estimating the unknown parameters β_0 and β_1 means drawing a line that passes through the cloud of points observed in the scatter plot. To do this, we need a rule or criterion that provides us with a reasonable and reproducible line. The usual approach is based on the least squares criterion, where the estimates are chosen as the values that minimize:

$$S = \sum_{i=1}^n (y_i - \beta_0 - \beta_1 x_i)^2.$$

This is a simple problem of mathematical analysis that was first solved either by Legendre in 1805 or by Gauss in 1794 (Legendre had published it first, then Gauss claimed priority). It can be shown that the least squares estimates satisfy:

$$\hat{\beta}_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$$
$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$$

where \bar{x} and \bar{y} indicate the mean of x and y , respectively.

It is not necessary to memorize these formulas, as nowadays computers facilitate calculations on all sorts of data sets. However, it is useful to observe an implication of these formulas. Let $\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i$ i.e., the fitted value for the i th observation according to the least squares regression model. Then substituting the previous formulas provides:

$$\hat{y}_i - \bar{y} = \hat{\beta}_1 (x_i - \bar{x})$$

That is, the least squares estimate implies that the best prediction for an observation whose x value is one unit above the mean (\bar{x}) of x will be that y value that is $\hat{\beta}_1$ units above the mean (\bar{y}) of y . This slope coefficient provides a direct representation of how relative positions in the x space relate to relative positions in the y space. The difference between the observed values y_i and the fitted values \hat{y}_i are called residuals.

The least squares coefficients have specific precise meanings. That is:

- $\hat{\beta}_1$ the estimated expected increase (or decrease) in the response variable associated with a unitary increase (or decrease) in the explanatory variable.
- $\hat{\beta}_0$: The estimated expected value of the response variable when the explanatory variable is zero. Note that this may not have any physical interpretation, as the zero value of the explanatory variable may not make any sense.

Who says that least squares regression is a good idea? No one, unless we make some assumptions about our data. We have already mentioned one - the relationship should be more or less linear. We need some other assumptions to justify the use of the least squares criterion:

1. The expected value of the errors zero ($E(\varepsilon_i) = 0$ for each i). That is, it cannot be true that for some subgroup of the population the model is generally too low while for some other group too high. A violation of this assumption would lead to some difficulties in estimating β_0 and means that the model does not include a necessary systematic component.
2. The variance of the error is constant ($\text{Var}(\varepsilon_i) = \sigma^2$ for each i). That is, it cannot be true that the model is more accurate for some part of the population (σ small) and less accurate for other parts (σ large). This property is called homoscedasticity, and its violation is called heteroscedasticity. A violation of this assumption implies that the least squares estimates are not as efficient as they could be in estimating the parameters, and better estimates can be obtained. It also leads to poorly calibrated prediction intervals.
3. The errors are uncorrelated with each other. That is, it cannot be true that knowing that the model underestimates y in a particular case tells us anything about the behavior of the model for any other case. The violation of this assumption often occurs when the data are ordered with respect to time (time series) where errors close in time are also similar to each other (such time-related correlation is often called autocorrelation). The violation of this assumption can lead to problems in measuring the strength of the regression.
4. (*) The errors are normally distributed. This assumption is necessary if we want to produce confidence and prediction intervals, or hypothesis tests that we generally do. If this assumption is violated, hypothesis tests and confidence and prediction intervals may be misleading.

How can we evaluate the strength of the relationship observed with

regression? It can be shown that:

$$\sum_{i=1}^n (y_i - \bar{y})^2 = \sum_{i=1}^n (y_i - \hat{y}_i)^2 + \sum_{i=1}^n (\hat{y}_i - \bar{y})^2$$

"Total Corrected Sum of Squares" = "Sum of Squares of Residuals" + "Sum of Squares of Regression" or "Total Variability" = "Residual Variability" + "Variability Due to Regression"

This tells us that the variability of the response variable can be divided into two parts — the residual variability after performing the regression and the variability explained by the regression. This immediately implies that a good regression is associated with a high R^2 , where:

$$R^2 = \frac{\sum (\hat{y}_i - \bar{y})^2}{\sum (y_i - \bar{y})^2}$$

The R^2 value (called the Coefficient of Determination) measures the proportion of variability in y explained by the regression. Values close to 1 indicate a strong relationship, while values close to 0 indicate a weak relationship. Sometimes a slightly modified R^2 value is used to account for bias in the coefficient; the adjusted R^2 has the form:

$$R_a^2 = R^2 - \frac{1}{n-2}(1 - R^2)$$

Is there a significant relationship between x and y ? This can be verified using the F-statistic. The hypothesis to be tested is:

$$H_0: \beta_1 = 0$$

against

$$H_A: \beta_1 \neq 0$$

The test statistic will then be:

$$F = \frac{\sum (\hat{y}_i - \bar{y})^2 / 1}{\sum (y_i - \hat{y}_i)^2 / (n - 2)}$$

where the Mean of Squares is the sum of squares divided by its degrees of freedom. Hypotheses of this type can also be tested using t-tests. To test:

$$H_0: \beta_j = \beta_j^0$$

against

$$H_A: \beta_j \neq \beta_j^0$$

The test statistic can be used:

$$t = \frac{\hat{\beta}_j - \beta_j^0}{\text{s. e.}(\hat{\beta}_j)}$$

substituting j and β_j , appropriately, and which is distributed as a Student's t with $n-2$ degrees of freedom. The same distribution allows constructing a confidence interval for the regression coefficient; a $100 \times (1-\alpha)\%$ confidence interval for β_j is:

$$\hat{\beta}_j \pm t_{\alpha/2}^{n-2} \text{ s.e. } (\hat{\beta}_j)$$

where $t_{\alpha/2}^{n-2}$ is the appropriate value for the t distribution.

3.2.2 Multiple regression

Multiple regression is the obvious generalization of simple regression when we have more than one explanatory variable. The model is of the type:

$$y_i = \beta_0 + \beta_1 x_{1i} + \dots + \beta_p x_{pi} + \varepsilon_i$$

The assumptions we previously discussed for simple regression are also required here; in fact, simple regression can be seen as a special case of multiple regression when $p = 1$ (as will be clear from some formulas we will see later). The tools for verifying the assumptions remain the same: residual plots against fitted values, normal plots of residuals, time series plots, various diagnostics (standardized residuals, leverage points, Cook's distances, etc.). In addition to all this, it can be very useful to plot the residuals against each individual explanatory variable (also in this case, what confirms the model is the absence of any kind of structure in the data). There are some differences in multiple regression compared to simple regression:

There are two types of immediate interest hypothesis tests:

1. A test for the overall significance of the regression:

$$H_0: \beta_1 = \beta_2 = \dots = \beta_p = 0$$

$$H_1: \text{"some"} \beta_j \neq 0, j = 1, \dots, p$$

The most common test for hypotheses of this type is an F-test:

$$F = \frac{\text{Mean of squares of regression}}{\text{Mean of squares of residuals}} = \frac{(\text{Sum of squares of regression})/p}{(\text{Sum of squares of residuals})/(n-p-1)}$$

This is distributed under the null hypothesis as an F-distribution with p and $n - p - 1$ degrees of freedom.

2. A test for the significance of each individual coefficient:

$$H_0: \beta_j = 0 \quad j = 1, \dots, p$$

$$H_1: \beta_j \neq 0,$$

This can be verified using the t-test:

$$t = \frac{\hat{\beta}_j}{\text{s.e.}(\hat{\beta}_j)},$$

this is distributed under H_0 as a Student t with $n - p - 1$ degrees of freedom. There can be verified also null values β_j (diciamo β_j^0), in this case the t-test becomes:

$$t = \frac{\hat{\beta}_j - \beta_j^0}{\text{s.e.}(\hat{\beta}_j)}.$$

Proportion of Variability Explained by Regression

As with simple regression, R^2 estimates the proportion of variance of the response variable explained by the regression, and is equal to:

$$R^2 = \frac{\text{sum of squares of residuals}}{\text{Total sum of squares (corrected)}}$$

The adjusted R^2 is slightly different:

$$R_a^2 = R^2 - \frac{p}{n - p - 1} (1 - R^2)$$

Estimation of σ^2

As with simple regression, the variance of the errors σ^2 is estimated using the mean of the squares of the residuals. The difference is that now the degrees of freedom for the sum of squares of the residuals are $n - p - 1$, so the mean of the squares of the residuals takes the form:

$$\hat{\sigma}^2 = \frac{\sum_{i=1}^n (y_i - \hat{y}_i)^2}{n - p - 1}.$$

Interpretation of Regression Coefficients

We must be very clear about the interpretation of the coefficients of multiple regression. As usual, the term $\hat{\beta}_0$ is an estimate of the expected value of the response variable when the explanatory variables take the value zero (only now there are several explanatory variables). $\hat{\beta}_j, j = 1, \dots, p$ represent the estimates of the expected changes in y associated with a unitary change in the individual x_j while keeping everything else in the model fixed.

3.3 Salary Cap Model

The salary of a soccer player can function in many respects, including play

skills, performance, and minutes played. Based on the above-mentioned skills, performance, and minutes played, the salary of soccer players is determined by negotiations between the team management and agents. In this study, we propose an objective quantitative method to determine soccer players' salaries based on their skills. The method applies a multiple regression model that considers a sample of 499 Serie A players for the 2022-2023 season divided into three macro-categories (Defenders, Midfielders, and Forwards). Thus, for each macro-category a series of performance variables (independent variables) have been identified, different for each of the three macro-categories, and one dependent variable common to the three: the Gross Salary. Therefore, the proposed method can be applied as assistive technology in the context of players' salaried negotiations and in the quantitative analysis of the relationship between salary and player performance. In fact, the method focuses on the performance and skills of the players and takes into consideration such aspects only that are directly related to the game, therefore, are also strong impacting factors on the salary, and which are usually taken into consideration in the case of key players and superstars.

Introduction

Soccer is the most popular team sport in the world by far, with about 3.5 billion fans around the world. Due to its popularity, the demand for star players has dramatically increased in the last decades, and players are traded for figures exceeding 100 million euros. Naturally, the rise in transfer rates also impacts players' salaries, which have grown steadily. The salary of a sports player is an intricate exercise and sports economics is influenced by many factors. Before the advent of digitization, this task was almost entirely qualitative primarily because the statistics and the data on the players were not systematized and therefore, it was difficult to make a quantitative comparison of the performance and skills of the players.

On the contrary, data on soccer has been gathered and published from the late 1990s and the completeness of this data has been increasing progressively. Nowadays, public soccer data comprises pieces of information concerning different performance metrics and salaries of athletes in all major soccer leagues. Superstar players in most cases receive greater remunerations than other players at least because of the revenue they bring to their clubs through gate takings, merchandising, and broadcasting contracts. This effect is further

enhanced by the scarcity or lack of superstar players, thereby leading to an increase in salary due to employer monopoly (monopsony).

In the monopsony economics of soccer, clubs are fighting with each other to get the services of a limited number of star athletes. Hence, clubs are forced to increase salaries to fight for these players against other clubs.

Behavioral point of view players' performance increases when the absolute income the player increases. On the other hand, it was also found that wage inequality has a negative effect on the team and a player's performance decreases when the income gap between players and the rest of the team becomes wider.

In addition, the decision of the coaches also is affected by the salary of a player since the coaches use the players available at a high salary in a pattern that does not match the performance of the players on the field with many other players who are paid less in the team.

The performance of the player on the field does not influence the salary received by the player by any means and is only affected by the previous season's performance, the matches played at the international level, and the goals scored by the player.

In this paper, we infer quantitatively the salaries of soccer players in terms of their skills from the skills of the players to other players in the paper.

3.3.1 Analysis, data and results

Methodology

The methodology used in this paper is based on multiple regression from where data samples were used to deduce a model, which was then tested for its validity through a prediction that compares the model's predicted values to actual values and measures the model's accuracy in predicting real samples. In this work, we will use predicted values, which will be the soccer players' salaries, and each sample is represented by a set of variables that will refer to the performance and skills of the player as we will describe in the next section.

The analysis employs statistical significance to evaluate the impact of variables. An F-statistic test is used to check the overall significance of the model, while the R^2 and Adjusted R^2 values are used to judge its performance. Afterwards, in order to check the validity of the assumptions behind the regression model, and ensure the reliability and interpretability of the results, a series of tests has been done.

1. Normality of Residuals:

Shapiro-Wilk Test:

Purpose: To test if the residuals of the model are normally distributed, which is an assumption in linear regression and many other statistical models.

Q-Q Plot:

Purpose: To visually assess if the data points fall along a 45-degree line, which would indicate that the data is normally distributed.

2. Mean of Residuals:

One Sample T-test:

Purpose: To test if the mean of the residuals is zero, another key assumption in linear regression. A non-zero mean might indicate that the model is biased.

3. Homoscedasticity:

Breusch-Pagan Test:

Purpose: To test for equal variances (homoscedasticity) across the residuals, which is another assumption of linear regression. Unequal variances could violate the assumption and invalidate results.

4. Autocorrelation:

Durbin-Watson Test:

Purpose: To test for autocorrelation in the residuals. Autocorrelation is the similarity between observations as a function of the time lag between them. In linear regression models, the residuals are supposed to be independent.

5. Multicollinearity:

Variance Inflation Factor (VIF):

Purpose: To identify if any variables in the model are correlated with each other, which is not desirable in linear regression as it may distort the estimates and make the model hard to interpret.

Subsequently, in order to assess the reliability of each variable, a stepwise regression in R. The stepwise process adds or removes predictors to create an approximation model based on the Akaike Information Criterion (AIC).

After the validation of each model, thanks to the use of the above-mentioned tests, through the command “predict”, has been possible to make a prediction of the players’ mean gross salary.

To explain algebraically the multiple regression in simple words, we can build a simple model with only two independent variables $\beta_1 x_{1i} + \beta_2 x_{2i}$. From here with simple calculation algebraic, we can see what happens:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_n x_{ni} + \varepsilon_i$$

Least squares estimates solve the equations $(X^T X)\beta = X^T y$. In this case, the equations are:

$$\begin{aligned} n\beta_0 + \left(\sum x_{1i}\right)\beta_1 + \left(\sum x_{2i}\right)\beta_2 &= \sum y_i \\ \left(\sum x_{1i}\right)\beta_0 + \left(\sum x_{1i}^2\right)\beta_1 + \left(\sum x_{1i}x_{2i}\right)\beta_2 &= \sum x_{1i}y_i \\ \left(\sum x_{2i}\right)\beta_0 + \left(\sum x_{1i}x_{2i}\right)\beta_1 + \left(\sum x_{2i}^2\right)\beta_2 &= \sum x_{2i}y_i \end{aligned}$$

Obviously, the calculation of $\hat{\beta}_1$ involves variable x_2 ; similarly, the calculation of $\hat{\beta}_2$ involves variable x_1 . That is, the form (and the sign) of the regression coefficients depends on the presence or absence of any other variable in the model. For example, in some cases, this explanatory information is exactly what we need, but in others, the "natural" coefficient refers to the marginal relationship, which the multiple regression coefficients do not refer to. One of the most useful properties of multiple regression is that it can statistically represent a conditional action that would otherwise be difficult to describe. In experimental situations, it is common practice to alter the values of one experimental condition while holding others constant, to isolate its effects and estimate them.

Data

The data for the above-mentioned experiments were gathered from sofascore.com, a website that provides data on the performance and abilities as well as the salaries of each soccer player. The salary taken in this work as the unit of remuneration is the gross remuneration as negotiated between the soccer club and the player's agent and does not include any other possible source of income for the player such as advertising, merchandising, etc. This strict regulation by soccer organizations, such as FIFA and UEFA, ensures that soccer clubs are forced to report their true wages so as to conform to such regulations as Financial Fair Play and the new UEFA Financial Sustainability Regulation, and given the application of the regulations, the reported salaries could be considered genuine. Of course, incidences of past records could signal some few cases where these regulations were breached to the extent of hiding the financial information, but it would be fair to consider them as few exceptions, and the reported salaries by the soccer clubs can be considered as nearly reliable.

Variables - Defender analysis	
Variable	Description
<i>Name</i>	Full name of the player
<i>Gross Salary</i>	Annual Gross Salary (€)
<i>Goals per 90 min</i>	The number of goals a player scores in 90 minutes of play.
<i>Tackles per 90 min</i>	The number of times a player successfully challenges an opponent to retrieve or knock the ball away, usually while the opponent is dribbling, passing, or receiving the ball, in 90 minutes of play.
<i>Errors lead to goal per 90 min</i>	The frequency with which a player's mistakes or errors directly contribute to a goal scored by the opposing team in 90 minutes of play.
<i>Clean sheets per 90 min</i>	The number of times a goalkeeper or as in this case a defender manages to prevent the opposing team from scoring in 90 minutes of play.
<i>Interceptions per 90 min</i>	The number of times a player successfully interrupts an opponent's pass or dribble, thereby gaining possession of the ball for their team.
<i>Penalty committed per 90 min</i>	The frequency with which a player commits a foul in the penalty area, resulting in a penalty kick for the opposing team.
<i>Clearances per 90 min</i>	The number of times a player successfully clears the ball away from their own goal area to eliminate an immediate threat from the opposing team.
<i>Dribbled past per 90 min</i>	The number of times a player is successfully dribbled past by an opponent.
<i>Accurate passes % per 90 min</i>	The percentage of a player's passes that successfully reach their intended target in 90 minutes.
<i>Yellow cards per 90 min</i>	The number of yellow cards a player receives for committing fouls or unsporting behavior in 90 minutes.
<i>Aerial duels won per 90 min</i>	The number of times a player successfully wins an aerial duel (i.e., a contest where the ball is in the air) against an opponent.
<i>Possession lost per 90 min</i>	The number of times a player loses possession of the ball to the opposing team.
<i>Red cards per 90 min</i>	The number of red cards a player receives for severe fouls or unsporting behavior in 90 minutes, resulting in expulsion from the game.
<i>Fouls per 90 min</i>	The number of fouls a player commits against the opposing team in 90 minutes.
<i>Total duels won per 90 min</i>	The number of times a player successfully wins a duel (either aerial, ground, or any other form of one-on-one contest for the ball) against an opponent.
<i>Dispossessed per 90 min</i>	The number of times a player loses possession of the ball due to an opponent's defensive play, not counting instances considered as dribbled past.
<i>Champions_L</i>	Appereance in the UEFA Champions League
<i>Europa_L</i>	Appereance in the UEFA Europa League
<i>Conference_L</i>	Appereance in the UEFA Conference League

Table 9: Variables used for the analysis of defenders

Table 8 shows the variables used in the analysis of the total value of 167 defenders to auto-calculate their salaries. The variables were collected from 167 active soccer players in Serie A for whom confidentially available information was collected in order to maximize the number of samples in the data set. The variables include performance variables, attendance, and playing time.

Variables - Midfielders analysis	
Variable	Description
Name	Full name of the player
Gross Salary	Annual Gross Salary (€)
Successful dribbles % per 90 min	The percentage of successful dribbles a player makes compared to the total number of attempted dribbles in 90 minutes of play.
Tackles per 90 min	The number of times a player successfully challenges an opponent to retrieve or knock the ball away, usually while the opponent is dribbling, passing, or receiving the ball, in 90 minutes of play.
Interceptions per 90 min	The number of times a player successfully interrupts an opponent's pass or dribble, thereby gaining possession of the ball for their team, in 90 minutes.
Clearances per 90 min	The number of times a player successfully clears the ball away from their own goal area to eliminate an immediate threat from the opposing team in 90 minutes.
Dribbled past per 90 min	The number of times a player is successfully dribbled past by an opponent in 90 minutes of play.
Big chances created per 90 min	The number of significant goal-scoring opportunities a player creates for their teammates in 90 minutes.
Possession lost per 90 min	The number of times a player loses possession of the ball to the opposing team in 90 minutes.
Minutes played	The total amount of time a player has been on the field during a competition, expressed in minutes.
Champions League	Appereance in the UEFA Champions League
Europa League	Appereance in the UEFA Europa League

Table 10: Variables used for the salary analysis of midfielders

Table 10 presents the variables to be used in the value analysis for automatic determination of the 205 midfielders' salary, which are the variables inputted. Variables are collected from the 205 active soccer players in Serie A for which information is available in order to obtain as many samples as possible from the data set. Performance variables, attendance, and playing time are among the variables collected.

Variables - Forwards analysis	
Variable	Description
Name	Full name of the player
Gross Salary	Annual Gross Salary (€)
Goals per 90 min	The number of goals scored by a player in 90 minutes of play.
Successful dribbles % per 90 min	The percentage of successful dribbles a player makes compared to the total number of attempted dribbles in 90 minutes of play.
Total shots per 90 min	The total number of shots taken by a player in 90 minutes, whether they result in goals or not.
Big chances created per 90 min	The number of significant goal-scoring opportunities a player creates for their teammates in 90 minutes.
Accurate passes % per 90 min	The percentage of passes that successfully reach a teammate out of all passes attempted in 90 minutes.
Possession lost per 90 min	The number of times a player loses possession of the ball to the opposing team in 90 minutes.
Dispossessed per 90 min	The number of times a player is forcibly stripped of the ball by an opponent in 90 minutes.
Minutes played	The total amount of time a player has been on the field during a competition, expressed in minutes.
Champions League	Appereance in the UEFA Champions League
Europa League	Appereance in the UEFA Europa League

Table 11: Variables used for the salary analysis of forwards

Table 11 presents the variables used to analyze the total value of 127 forwards in order to automatically evaluate their salaries. The variables were collected from 127 active soccer players in Serie A for whom information was available in order to maximize the number of samples in the data set. The

variables are performance, attendance, and playing time.

Defenders

Starting with the defenders, a predictive analysis was carried out that focused on the independent variables in Table 1. All independent variables are considered as predictors in the predictive analysis. Based on the Table 1, a predictive analysis on the predictors was done. For instance, the model is built with 19 predictors and tries to predict the log-transformed gross salary of soccer players. It ranges from 'Goals per 90 min' to 'Conference_L'. The log-transformed 'Gross Salary' is the dependent variable.

Statistical significance is used to test if a variable has an effect that is unlikely to have been observed by mere chance. Variables such as 'Clean sheets per 90 min', 'Champions_L', and 'Europa_L' have small p-values for your model, meaning that they are statistically significant and thus should not be eliminated from the model.

Significant Variables:

- Clean sheets per 90 min: This variable is statistically significant at 0.00261. The estimate shows that for every extra clean sheet per 90 minutes, the log of the gross salary increases by approximately 1.95. This is in agreement with the expected value, as goalkeepers or defenders who are able to keep clean sheets are more highly valued on average.
- Champions_L: This is a binary variable (1 if the player is in a team playing in the UEFA Champions League, 0 otherwise). This variable is highly significant (p-value: 1.7e-06) and points out that playing in the Champions League may increase a player's gross salary by a huge margin.
- Europa_L: Once again a binary value, similar to Champions_L but for the UEFA Europa League. This is also statistically significant with a p-value of 0.01225, though the magnitude of the effect is small as compared to Champions_L.

Primary Statistics:

- R^2 and Adjusted R^2 : These are measures of the proportion of variance in the dependent variable explained by the model. These are general indices of the explanatory power of the model but should never be used in isolation to judge the performance of the model. The model explains variance in gross salary by 45.78% and is okay; however, it is not good enough and leaves a lot of scope for improvement. The adjusted R^2 is for the number of predictors and is

38.77%, which is a better representation.

- F-statistic: This is a test of whether the model has at least one predictor whose relationship with the dependent variable is significantly related. An insignificant F-statistic would indicate that the model is of little use in explaining the variance in the dependent variable. The overall model is statistically significant with a p-value of $4.518e-12$, which is suggestive that there is a relationship of at least one predictor variable with the dependent variable.

Diagnostic Tests:

1. Normality of Residuals:

- Shapiro-Wilk Test: It tests for normality of data. If p-value is greater than 0.05, then the data is normally distributed. In this case, the p-value is 0.4252, hence one can conclude that the residuals are approximately normally distributed.

- Q-Q Plot: It is used to check visually that the data points should fall on the 45-degree line for normality.

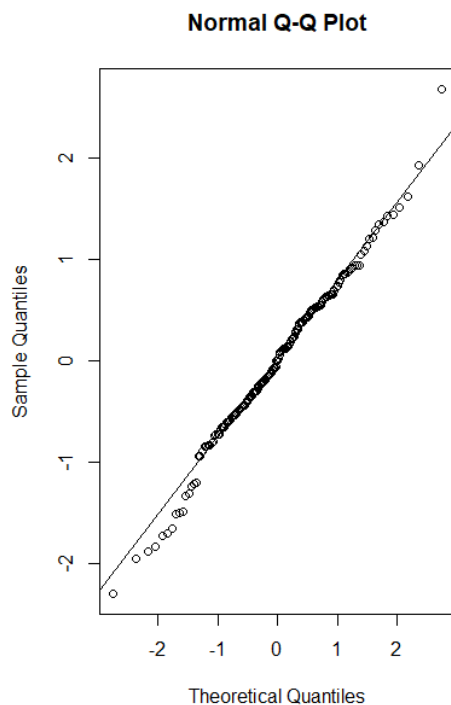


Figure 1: Q-Q Plot Defenders Normality of Residuals

2. Mean of Residuals:

- One Sample T-test: One checks if the mean of the residuals is zero, which is a key assumption in linear regression. The p-value is 1, hence the null hypothesis (mean is zero) is not rejected, which is positive.

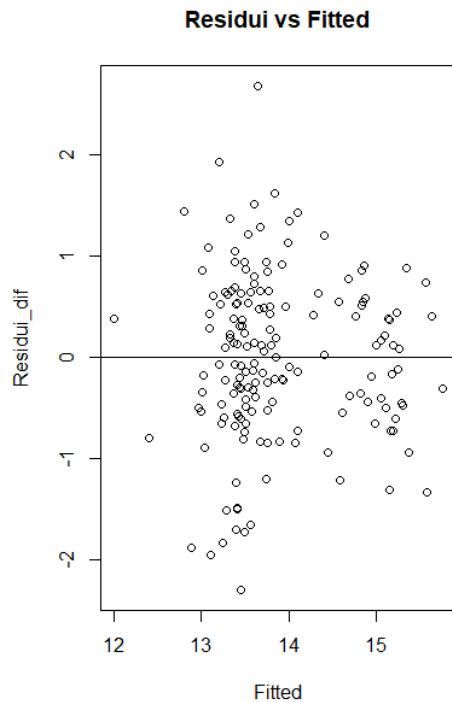


Figure 2: T-test Mean of Residuals vs Fitted Defenders

3. Homoscedasticity:

- Breusch-Pagan Test: Tests for homoscedasticity, i.e., equal variances across the residuals. A high p-value of 0.8247 implies that the variances are indeed equal across the levels of the independent variables.

4. Autocorrelation:

- Durbin-Watson Test: Tests for autocorrelation in the residuals. The p-value of 0.3595 is more than 0.05, implying independence is preserved.

5. Multicollinearity:

- Variance Inflation Factor (VIF): A high VIF above 5-10 implies that the variance may be inflated due to collinearity. Most of your variables have a VIF below 5, which is good. However, "Total duels won per 90 min" has a VIF of 7.01, implying that it may be collinear with other predictors.

Feature Selection:

Firstly, stepwise regression was used to select features using R. Stepwise regression adds or subtracts predictors one at a time to arrive at an approximation model that remains predictive. In your case, you appear to be running with a full model with many features and then removing them one by

one based on the Akaike Information Criterion (AIC).

Interpretation

1. Df (Degrees of Freedom): Specifies degrees of freedom for each predictor variable. In your case, all are 1 for a variable, which indicates it is only a single variable under consideration for removal.
2. Sq (Squares): The difference in the sum of squared residuals in the model when a particular variable is removed. A lower value of this difference shows that this particular variable is of lesser importance.
3. RSS (Residual Sum of Squares): The residual sum of squares after removing the variable. A lower value of this shows a better fitting.
4. AIC (Akaike Information Criterion): It is taken to compare different models. Lower values of AIC generally show a better fitting model with fewer features. It might be helpful to remove the variable if a variable gives a lower value of AIC.

Summary:

- Step 1: The first step indicates that "Yellow cards per 90 min" would be the next best variable to remove since doing so would reduce the AIC from -41.39 to -43.35.
- Step 2: Having already removed "Yellow cards per 90 min" in the previous step, "Accurate passes % per 90 min" would further decrease the AIC, bringing it to -43.35 from -43.81.
- Step 3: The third step found that the AIC was -35.81 when "Accurate passes % per 90 min" is removed, so this would be the next best variable that should be removed.

Important and unimportant variables:

- Variables like "Goals per 90 min," "Tackles per 90 min," "Clean sheets per 90 min," etc., seem important since their removal would increase AIC substantially.
- Variables like "Yellow cards per 90 min," "Accurate passes % per 90 min," "Conference_L," and "Red cards per 90 min" could be treated as candidates for removal since their removal hardly affects AIC.
- Stepwise regression helps you identify the least significant features in gross salary prediction using AIC values. The process may be repeated until a model is obtained which has a balance between parsimony and explanatory power, which is satisfactory.

Predicting with Confidence Intervals:

- fit: The predicted value of your dependent variable (Gross Salary) of the model.
- lwr: The 95% lower confidence bound for that prediction.
- upr: The 95% upper confidence bound for that prediction.
- The 95% confidence interval makes it rather clear where, with 95% confidence, the true value of the given quantity lies. The wider the interval, the less certainty there is.

Thanks to such processes, it has been possible to estimate the annual gross salary for 167 Serie A defenders.

Defender model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Atalanta	Berat Djimsiti	1,480,000 €	963,493 €	687,921 €	1,349,467 €
Atalanta	Caleb Okoli	1,040,000 €	1,037,558 €	571,620 €	1,883,270 €
Atalanta	Giorgio Scalvini	560,000 €	686,616 €	485,182 €	971,678 €
Atalanta	José Luis Palom	1,480,000 €	903,860 €	484,411 €	1,686,524 €
Atalanta	Matteo Ruggeri	70,000 €	692,463 €	490,112 €	978,357 €
Atalanta	Merih Demiral	3,700,000 €	1,185,850 €	776,856 €	1,810,168 €
Atalanta	Nadir Zortea	330,000 €	650,093 €	394,972 €	1,069,990 €
Atalanta	Rafael Tolói	1,850,000 €	960,241 €	717,279 €	1,285,489 €
Bologna	Adama Soumao	1,390,000 €	857,503 €	596,957 €	1,231,754 €
Bologna	Andrea Cambias	1,850,000 €	649,397 €	384,412 €	1,097,033 €
Bologna	Charalampos Ly	930,000 €	635,216 €	377,694 €	1,068,322 €
Bologna	Denso Kasius	510,000 €	696,435 €	398,435 €	1,217,305 €
Bologna	Georgios Kyriaki	510,000 €	682,631 €	409,778 €	1,137,166 €
Bologna	Jhon Lucumí	960,000 €	902,063 €	639,639 €	1,272,139 €
Bologna	Joaquín Sosa	380,000 €	663,252 €	333,021 €	1,320,948 €
Bologna	Kevin Bonifazi	1,850,000 €	719,952 €	481,475 €	1,076,559 €
Bologna	Lorenzo De Silve	1,670,000 €	647,407 €	418,478 €	1,001,581 €
Bologna	Stefan Posch	1,000,000 €	881,553 €	518,362 €	1,499,197 €
Cremonese	Emanuel Aiwu	380,000 €	870,724 €	654,077 €	1,159,141 €
Cremonese	Giacomo Quagli	260,000 €	427,265 €	267,309 €	682,932 €
Cremonese	Jack Hendry	350,000 €	554,272 €	325,830 €	942,867 €
Cremonese	Johan Vásquez	580,000 €	792,541 €	557,401 €	1,126,865 €
Cremonese	Leonardo Semic	150,000 €	670,414 €	455,627 €	986,452 €
Cremonese	Luka Lochoshvili	640,000 €	695,259 €	534,539 €	904,303 €
Cremonese	Matteo Bianchet	610,000 €	652,033 €	479,774 €	886,131 €
Cremonese	Vlad Chiricheş	1,300,000 €	692,504 €	480,739 €	997,562 €

Defender model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Empoli	Ardian Ismajli	1,670,000 €	809,312 €	591,502 €	1,107,327 €
Empoli	Fabiano Parisi	190,000 €	656,462 €	338,273 €	1,273,946 €
Empoli	Koni De Winter	150,000 €	780,539 €	476,594 €	1,278,323 €
Empoli	Liberato Cacace	290,000 €	555,187 €	277,970 €	1,108,868 €
Empoli	Lorenzo Tonelli	1,850,000 €	1,796,139 €	331,748 €	9,724,704 €
Empoli	Petar Stojanović	640,000 €	578,180 €	386,490 €	864,944 €
Empoli	Sebastian Walul	380,000 €	676,962 €	439,002 €	1,043,896 €
Empoli	Sebastiano Lupe	2,410,000 €	932,673 €	678,398 €	1,282,267 €
Empoli	Tyronne Ebuehi	640,000 €	991,070 €	665,171 €	1,476,655 €
Fiorentina	Aleksa Terzić	380,000 €	732,069 €	403,277 €	1,328,924 €
Fiorentina	Cristiano Biraghi	2,220,000 €	947,365 €	498,271 €	1,801,229 €
Fiorentina	Dodó	1,920,000 €	1,161,021 €	688,754 €	1,957,111 €
Fiorentina	Igor Júlio	900,000 €	1,111,888 €	661,695 €	1,868,357 €
Fiorentina	Lorenzo Venuti	740,000 €	941,369 €	508,617 €	1,742,323 €
Fiorentina	Luca Ranieri	1,110,000 €	1,214,387 €	710,042 €	2,076,969 €
Fiorentina	Lucas Martínez	1,280,000 €	972,417 €	564,881 €	1,673,972 €
Fiorentina	Nikola Milenković	5,560,000 €	1,321,106 €	756,229 €	2,307,903 €
Hellas Verona	Diego Coppola	460,000 €	785,079 €	482,444 €	1,277,544 €
Hellas Verona	Federico Ceccherini	930,000 €	681,390 €	456,484 €	1,017,104 €
Hellas Verona	Giangiacomo Meoni	1,110,000 €	655,924 €	447,907 €	960,549 €
Hellas Verona	Isak Hien	770,000 €	669,569 €	448,696 €	999,160 €
Hellas Verona	Juan Cabal	450,000 €	643,849 €	369,269 €	1,122,602 €
Hellas Verona	Koray Günter	1,110,000 €	597,907 €	418,177 €	854,892 €
Hellas Verona	Paweł Dawidowski	380,000 €	694,224 €	482,039 €	999,809 €
Inter	Alessandro Bastoni	5,190,000 €	2,889,546 €	1,015,102 €	8,225,338 €
Inter	Daniilo D'Ambrosio	3,700,000 €	3,257,596 €	1,810,059 €	5,862,813 €
Inter	Francesco Acerbi	2,780,000 €	4,445,620 €	2,784,531 €	7,097,548 €
Inter	Mattia Zanotti	110,000 €	244,449 €	75,807 €	788,257 €
Inter	Milan Škriniar	5,560,000 €	3,809,696 €	2,413,841 €	6,012,673 €
Inter	Robin Gosens	4,630,000 €	2,765,384 €	1,545,488 €	4,948,178 €
Inter	Stefan de Vrij	7,040,000 €	2,824,862 €	1,721,644 €	4,635,061 €
Juventus	Alex Sandro	11,110,000 €	4,599,830 €	2,532,430 €	8,355,078 €
Juventus	Bremer	9,260,000 €	6,171,238 €	3,661,561 €	10,400,974 €
Juventus	Daniele Rugani	6,480,000 €	4,138,566 €	2,444,791 €	7,005,807 €
Juventus	Daniilo	5,130,000 €	7,005,107 €	4,201,239 €	11,680,251 €
Juventus	Federico Gatti	1,850,000 €	4,727,467 €	2,658,360 €	8,406,956 €
Juventus	Leonardo Bonucci	12,040,000 €	5,746,606 €	3,235,584 €	10,206,241 €
Juventus	Mattia De Sciglio	2,780,000 €	4,363,391 €	2,331,168 €	8,167,309 €
Lazio	Adam Marušić	1,670,000 €	3,197,788 €	1,898,643 €	5,385,927 €
Lazio	Alessio Romagnolo	5,560,000 €	3,766,399 €	2,191,507 €	6,473,128 €
Lazio	Elseid Hysaj	3,700,000 €	4,166,013 €	2,333,710 €	7,436,865 €
Lazio	Luca Pellegrini	2,410,000 €	1,581,825 €	574,175 €	4,357,853 €
Lazio	Manuel Lazzari	3,150,000 €	1,677,324 €	826,372 €	3,404,539 €
Lazio	Mario Gila Fuentes	640,000 €	2,147,769 €	896,228 €	5,147,028 €
Lazio	Nicolò Casale	1,850,000 €	3,828,027 €	2,199,675 €	6,661,798 €
Lazio	Patric	2,220,000 €	4,059,174 €	2,152,434 €	7,655,003 €
Lecce	Alessandro Tuia	740,000 €	482,840 €	303,884 €	767,190 €
Lecce	Antonino Gallo	960,000 €	699,751 €	443,823 €	1,103,271 €
Lecce	Federico Baschi	560,000 €	754,628 €	503,063 €	1,132,004 €
Lecce	Giuseppe Pezzella	650,000 €	485,323 €	344,597 €	683,526 €
Lecce	Kastriot Dermak	560,000 €	937,704 €	352,847 €	2,491,985 €
Lecce	Marin Pongračić	2,410,000 €	612,608 €	431,430 €	869,871 €
Lecce	Mert Çetin	320,000 €	449,338 €	155,509 €	1,298,357 €
Lecce	Pietro Ceccaroni	560,000 €	1,295,957 €	420,336 €	3,995,623 €
Lecce	Samuel Umtiti	1,231,000 €	842,391 €	590,698 €	1,201,342 €
Lecce	Simone Romagnolo	930,000 €	504,065 €	238,690 €	1,064,483 €
Lecce	Tommaso Cassella	190,000 €	459,659 €	145,637 €	1,450,763 €
Lecce	Valentin Gendrey	120,000 €	653,070 €	490,156 €	870,123 €

Defender model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Milan	Alessandro Florenzi	3,700,000 €	539,210 €	292,164 €	995,151 €
Milan	Davide Calabria	3,700,000 €	2,123,232 €	1,249,220 €	3,608,743 €
Milan	Fikayo Tomori	4,490,000 €	3,604,956 €	2,316,041 €	5,611,227 €
Milan	Fodé Ballo-Touré	1,280,000 €	2,206,328 €	1,142,044 €	4,262,430 €
Milan	Malick Thiaw	1,030,000 €	3,802,921 €	2,220,138 €	6,514,168 €
Milan	Matteo Gabbia	4,100,000 €	3,444,020 €	1,863,897 €	6,363,633 €
Milan	Pierre Kalulu	2,560,000 €	3,073,876 €	2,079,359 €	4,544,099 €
Milan	Sergio Dest	6,000,000 €	1,795,295 €	1,008,959 €	3,194,432 €
Milan	Simon Kjær	1,920,000 €	3,975,575 €	2,485,265 €	6,359,625 €
Milan	Theo Hernández	5,130,000 €	2,366,659 €	1,525,008 €	3,672,819 €
Monza	Andrea Carboni	930,000 €	807,824 €	222,880 €	2,927,912 €
Monza	Armando Izzo	3,150,000 €	866,173 €	573,229 €	1,308,811 €
Monza	Franco Carboni	240,000 €	163,164 €	60,189 €	442,316 €
Monza	Giulio Donati	350,000 €	728,600 €	406,151 €	1,307,046 €
Monza	Luca Caldirola	1,260,000 €	1,039,500 €	716,655 €	1,507,782 €
Monza	Luca Marrone	1,060,000 €	445,789 €	214,881 €	924,825 €
Monza	Marlon	2,560,000 €	758,752 €	505,311 €	1,139,318 €
Monza	Pablo Marí	5,200,000 €	1,025,048 €	769,626 €	1,365,239 €
Monza	Valentin Antov	770,000 €	611,953 €	274,238 €	1,365,553 €
Napoli	Amir Rrahmani	2,310,000 €	3,460,972 €	2,299,058 €	5,210,102 €
Napoli	Giovanni Di Lore	4,440,000 €	3,933,106 €	2,542,046 €	6,085,382 €
Napoli	Juan Jesus	2,220,000 €	3,630,642 €	1,978,362 €	6,662,931 €
Napoli	Leo Østigård	1,540,000 €	5,853,615 €	2,855,022 €	12,001,594 €
Napoli	Mário Rui	3,890,000 €	2,597,422 €	1,475,430 €	4,572,680 €
Napoli	Mathias Olivera	1,920,000 €	2,963,021 €	1,853,155 €	4,737,594 €
Napoli	Min-jae Kim	4,630,000 €	4,252,340 €	2,674,251 €	6,761,735 €
Roma	Chris Smalling	4,870,000 €	2,795,021 €	1,653,608 €	4,724,253 €
Roma	Diego Llorente	1,650,000 €	2,405,985 €	1,391,399 €	4,160,393 €
Roma	Gianluca Mancini	6,480,000 €	2,752,224 €	1,527,022 €	4,960,465 €
Roma	Marash Kumbull	3,330,000 €	3,901,767 €	1,600,345 €	9,512,906 €
Roma	Matias Viña	1,540,000 €	364,044 €	128,785 €	1,029,053 €
Roma	Roger Ibañez	1,920,000 €	2,738,196 €	1,545,967 €	4,849,858 €
Salernitana	Dylan Bronn	1,150,000 €	667,130 €	527,466 €	843,766 €
Salernitana	Federico Fazio	4,630,000 €	1,207,243 €	651,453 €	2,237,232 €
Salernitana	Flavius Daniliuc	640,000 €	819,238 €	595,734 €	1,126,595 €
Salernitana	Lorenzo Pirola	560,000 €	824,119 €	624,246 €	1,087,976 €
Salernitana	Matteo Lovato	1,480,000 €	774,722 €	449,504 €	1,335,251 €
Salernitana	Norbert Gyömbé	930,000 €	728,607 €	555,665 €	955,366 €
Salernitana	William Troost-Ekong	1,590,000 €	963,473 €	523,180 €	1,774,306 €
Sampdoria	Alessandro Zancanaro	740,000 €	1,890,704 €	1,110,932 €	3,217,805 €
Sampdoria	Alex Ferrari	740,000 €	612,516 €	459,475 €	816,523 €
Sampdoria	Andrea Conti	3,700,000 €	811,711 €	236,653 €	2,784,141 €
Sampdoria	Bartosz Bereszyński	830,000 €	745,291 €	541,680 €	1,025,438 €
Sampdoria	Bruno Amione	130,000 €	723,467 €	505,519 €	1,035,371 €
Sampdoria	Jeison Murillo	1,410,000 €	476,137 €	325,787 €	695,878 €
Sampdoria	Marios Oikonomou	260,000 €	440,621 €	186,145 €	1,042,988 €
Sampdoria	Nicola Murru	1,300,000 €	648,139 €	309,545 €	1,357,113 €
Sampdoria	Omar Colley	1,760,000 €	738,968 €	537,621 €	1,015,732 €
Sampdoria	Tommaso Augello	460,000 €	578,093 €	378,027 €	884,042 €
Sassuolo	Filippo Romagna	740,000 €	641,600 €	337,156 €	1,220,950 €
Sassuolo	Gian Marco Ferrer	1,110,000 €	985,407 €	654,836 €	1,482,840 €
Sassuolo	Jeremy Toljan	900,000 €	1,120,326 €	742,761 €	1,689,816 €
Sassuolo	Kaan Ayhan	770,000 €	810,389 €	462,430 €	1,420,174 €
Sassuolo	Martin Erlić	280,000 €	922,904 €	666,123 €	1,278,681 €
Sassuolo	Mert Müldür	510,000 €	544,319 €	220,468 €	1,343,891 €
Sassuolo	Riccardo Marchi	930,000 €	547,315 €	311,695 €	961,058 €
Sassuolo	Rogério	1,300,000 €	754,771 €	510,114 €	1,116,780 €
Sassuolo	Ruan	490,000 €	738,939 €	513,241 €	1,063,898 €

Defender model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Spezia	Dimitris Nikolaou	1,670,000 €	861,233 €	657,960 €	1,127,305 €
Spezia	Ethan Ampadu	450,000 €	729,949 €	594,663 €	896,022 €
Spezia	Jakub Kiwior	130,000 €	589,376 €	399,868 €	868,689 €
Spezia	João Moutinho	380,000 €	453,881 €	140,396 €	1,467,323 €
Spezia	Kelvin Amian	710,000 €	801,780 €	564,553 €	1,138,680 €
Spezia	Mattia Caldara	1,200,000 €	625,139 €	353,550 €	1,105,347 €
Spezia	Petko Hristov	70,000 €	490,456 €	319,851 €	752,051 €
Spezia	Przemysław Wiśniewski	510,000 €	670,326 €	420,471 €	1,068,653 €
Spezia	Salvador Ferrer	320,000 €	575,785 €	234,570 €	1,413,331 €
Torino	Alessandro Buoncristiani	410,000 €	946,608 €	601,499 €	1,489,707 €
Torino	Andreaw Gravillan	90,000 €	561,395 €	313,888 €	1,004,078 €
Torino	David Zima	640,000 €	1,325,818 €	648,768 €	2,709,433 €
Torino	Koffi Djidji	470,000 €	1,075,364 €	789,764 €	1,464,245 €
Torino	Perr Schuur	1,790,000 €	803,828 €	621,052 €	1,040,384 €
Torino	Ricardo Rodríguez	2,780,000 €	1,105,546 €	755,897 €	1,616,914 €
Udinese	Adam Masina	1,150,000 €	1,326,905 €	731,740 €	2,406,178 €
Udinese	Axel Guessand	150,000 €	663,438 €	413,544 €	1,064,345 €
Udinese	Bram Nuytinck	1,110,000 €	580,178 €	397,595 €	846,605 €
Udinese	Enzo Ebosele	1,030,000 €	708,404 €	532,709 €	942,047 €
Udinese	Jaka Bijol	1,030,000 €	1,032,063 €	715,846 €	1,487,965 €
Udinese	James Abankwa	60,000 €	393,616 €	203,398 €	761,717 €
Udinese	Leonardo Buta	320,000 €	715,130 €	365,061 €	1,400,892 €
Udinese	Marvin Zeegelaar	640,000 €	737,853 €	370,027 €	1,471,305 €
Udinese	Nehuén Pérez	830,000 €	1,020,333 €	751,886 €	1,384,625 €
Udinese	Rodrigo Becão	770,000 €	894,106 €	598,260 €	1,336,253 €

Table 12: Defenders of Serie A for the Regression Analysis and for the Predictive Model

Midfielders

In the midfielders, a predictive analysis looks at the independent variables in Table 2. In particular, the model uses 10 predictors and tries to predict the log-transformed gross salary of soccer players, covering a lot of performance metrics, from 'Tackles per 90 min' to 'Europa_L'. The dependent variable is the log-transformed 'Gross Salary'. Statistical significance tells us if a variable has an effect that is unlikely to have occurred by random chance. For example, factors such as Big Chances Created per 90 min, Tackles per 90 min, Champions_L, Europa_L, and Minutes Played have small p-values, and hence they are statistically significant, and one cannot discard them from the model.

Significant Variables:

1. Tackles per 90 min

Coefficient and Interpretation

- Coefficient: -1.3389
- p-value: 0.0015

The "Tackles per 90 min" coefficient is negative and statistically significant.

In other words, for every additional tackle made by any player per 90 minutes,

the log-transformed gross salary decreases by around 1.34 units. This is counter intuitive as one would expect players who tackle more (usually defenders or defensive midfielders) to be more valuable and hence earn more.

2. Big chances created per 90 min

Coefficient and Interpretation

- Coefficient: 5.2817
- p-value: 0.0039

The coefficient for "Big chances created per 90 min" is positive and statistically significant. This means that the bigger chances one creates in a game, the higher is his salary. This is in line with the intuitive idea that playmakers and forwards, being the chief players in such chances, are highly valued.

3. Champions League

Coefficient and Interpretation

- Coefficient: 1.6990
- p-value: 0.0001

Coefficient is positive and significant at 1 percent, indicating a significant positive relationship between salaries and participation in the Champions League. This makes sense since the Champions League is the highest league and the players in the top clubs are usually some of the most well-known and thus most valuable.

4. Europa League

Coefficient and Interpretation

- Coefficient: 1.3388
- p-value: 0.0127

Participation in the Europa League has a smaller coefficient and is positively and significantly associated with salaries. The Europa League is generally considered to be a less prestigious league, so the weaker result might be anticipated.

5. Minutes played

Coefficient and Interpretation

- Coefficient: 0.0002421
- p-value: 0.0026

The coefficient is positive and significant, albeit small. This suggests that the longer a player is on the field, the higher his salary would tend to be. This can be regarded as a proxy of the role of the player for the team; key players who are often expected to play a number of minutes would clearly have to earn higher salaries.

Primary Statistic:

R² and R² Adjusted: The R² adjusted is 0.4362, which corresponds to 43.62% of the variance in the log-transformed "Gross Salary" that can be explained by the model. This indicates a moderate fit.

Diagnostic Tests:

1. Normality of Residuals:

- Shapiro-Wilk Test: A p-value of 0.006179 implies that the residuals do not follow a normal distribution at a 99% confidence level. This is one of the basic assumptions of linear regression.
- Q-Q Plot: The normal distribution can be tested by examining whether the data points in the scatterplot follow the 45-degree line.

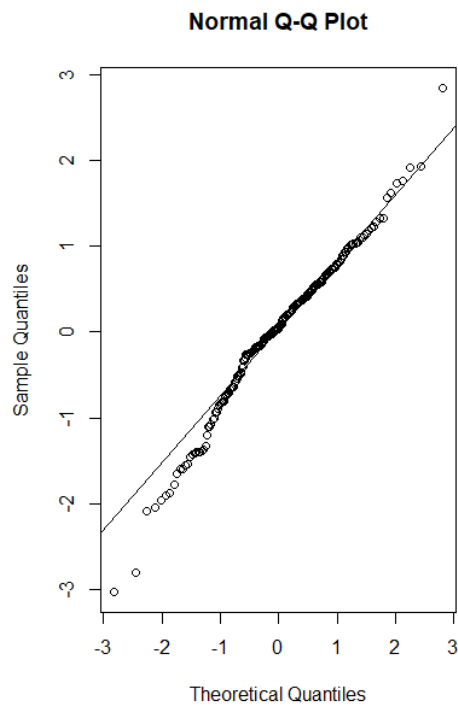


Figure 3: Q-Q Plot Midfielders Normality of Residuals

2. Mean of Residuals:

- One Sample T-test: Tests whether the residual mean is equal to zero, an important assumption in linear regression. The p-value is 1 and hence the null hypothesis was not rejected (mean = 0), which is positive.

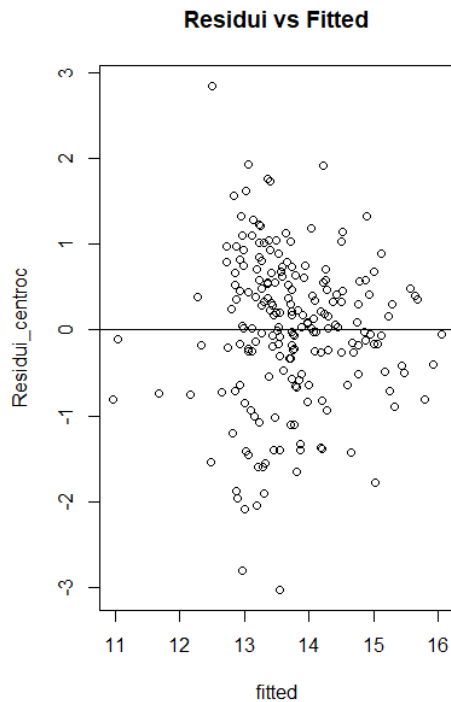


Figure 4: T-test Mean of Residuals vs Fitted Midfielders

3.Homoscedasticity:

- Breusch-Pagan Test: $P = 0.0001276$ is significant, implying that the variances differ across levels of the independent variables (heteroscedasticity) - an additional assumption violation of linear regression.

4.Autocorrelation:

- Durbin-Watson Test: Around 2 implying that the residuals are uncorrelated (otherwise the result is negative).

5. Multicollinearity:

- Variance Inflation Factor (VIF): All VIF values are less than 10, which is the standard threshold, which means that there is no multicollinearity in this model.

Feature Selection:

Then, stepwise regression was carried out within R to carry out feature selection. The stepwise regression involves the addition or removal of predictors in order to determine the best model that has good predictive power but with the least number of predictors. In your case, it seems that you have a full model that has numerous features and then one by one deleting features using the Akaike Information Criterion (AIC).

Interpretation:

1. Df (Degrees of Freedom): It measures the number of degrees of freedom for each predictor variable. In your case, it is always 1 for every variable, which means each is a single variable to be considered for removal.
2. Sq (Sum of Squares): The change in the sum of squared residuals after removal of a given variable from the model. A smaller change indicates the variable is not that crucial.
3. RSS (Residual Sum of Squares): For the residual sum of squares after removing the variable. A smaller RSS indicates a better fit.
4. AIC (Akaike Information Criterion): AIC is used to compare models. Lower AIC values usually indicate a better-fitting model with fewer features. If removing a variable lowers the AIC, then it might be a good idea to remove it.

Summary:

The initial model coded with all variables has an AIC value of -24.95. Through stepwise regression, the final model comprised Successful dribbles % per 90 min, Tackles per 90 min, Interceptions per 90 min, Big chances created per 90 min, Champions League participation, Europa League participation, and Minutes played finally reduced to -30.53.

Every variable in the final model individually is important in defining the understanding of a player's gross salary by up to statistical significance. None were dropped in the process by confirming contribution collectively through: Moving on to the coefficients of each predictor; Successful dribbles % per 90 min has a coefficient of 0.0055 and this implies that a greater amount in this indicator is likely to raise Gross Salary positively. Tackles per 90 min and Interceptions per 90 min have negative coefficients of -0.0915 and -0.0185 respectively, thus perhaps more tackles or interceptions might decrease a player's Gross Salary. Big chances created per 90 min also has a positive coefficient of 0.3155 and therefore this statistic really does have rather quite a strong positive effect on Gross Salary.

Similarly, the impact of Champions League or Europa League involvement also shows up with coefficients of 0.7019 and 0.8699, respectively. Last but not least, positive coefficient, that is, 0.0004, is worth noticing for Minutes played since each extra minute covered in a match increases Gross Salary by a trivial yet positively vouchsafed amount.

The ultimate value of AIC turned out to be -30.53, which was less than the initial one representing an improved model without incorporating any redundant predictor. In the end, the prediction of the regression model with

confidence intervals was made. Specifically, the output has the following components:

- fit: The prediction of the dependent variable from the model.
- lwr: The lower bound of the 95% confidence interval for the prediction.
- upr: The upper bound of the 95% confidence interval for the prediction.

This provides an estimate about where the true value is, with 95% of confidence, computed on the basis of the model you have fitted to the data. The wider the interval, the less certain is the prediction for that particular point.

Thanks to these processes, it has therefore been possible to estimate the annual gross salary for the 205 midfielders in Serie A.

Midfielders model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Atalanta	Brandon Soppo	770,000 €	525,345 €	398,814 €	692,013 €
Atalanta	Davide Zappacosta	1,670,000 €	655,347 €	536,278 €	800,851 €
Atalanta	Éderson	2,560,000 €	910,574 €	727,552 €	1,139,625 €
Atalanta	Hans Hateboer	1,480,000 €	797,327 €	651,780 €	975,378 €
Atalanta	Joakim Mæhle	1,280,000 €	880,627 €	690,732 €	1,122,726 €
Atalanta	Marten de Roon	1,850,000 €	1,311,576 €	968,216 €	1,776,703 €
Atalanta	Teun Koopmeiners	1,920,000 €	1,279,462 €	939,670 €	1,742,132 €
Bologna	Emanuel Vignato	560,000 €	579,163 €	378,517 €	886,158 €
Bologna	Gary Medel	1,920,000 €	916,869 €	670,269 €	1,254,189 €
Bologna	Jerdy Schouten	640,000 €	1,209,588 €	924,840 €	1,582,015 €
Bologna	Lewis Ferguson	510,000 €	978,015 €	763,501 €	1,252,785 €
Bologna	Michel Aebischer	640,000 €	748,944 €	584,862 €	959,061 €
Bologna	Nicolás Domínguez	900,000 €	948,161 €	731,843 €	1,228,433 €
Bologna	Nikola Moro	1,240,000 €	711,037 €	563,126 €	897,798 €
Bologna	Roberto Soriano	2,050,000 €	724,256 €	607,282 €	863,751 €
Cremonese	Charles Pickel	770,000 €	955,596 €	727,085 €	1,255,934 €
Cremonese	Christian Accella	56,000 €	117,408 €	28,919 €	476,656 €
Cremonese	Cristian Buonaiuto	740,000 €	473,591 €	325,336 €	689,409 €
Cremonese	Emanuele Valeri	190,000 €	988,635 €	664,876 €	1,470,040 €
Cremonese	Gonzalo Escalante	1,810,000 €	379,007 €	295,470 €	486,163 €
Cremonese	Michele Castagnetti	560,000 €	680,627 €	508,851 €	910,382 €
Cremonese	Pablo Galdames	450,000 €	431,637 €	294,598 €	632,427 €
Cremonese	Paolo Ghiglione	930,000 €	411,799 €	301,145 €	563,115 €
Cremonese	Santiago Ascacibar	1,600,000 €	422,950 €	322,385 €	554,882 €
Cremonese	Soualiho Meïté	2,040,000 €	1,106,951 €	861,241 €	1,422,761 €
Cremonese	Tommaso Milanese	280,000 €	344,621 €	174,630 €	680,083 €
Empoli	Alberto Grassi	1,670,000 €	797,973 €	485,242 €	1,312,245 €
Empoli	Duccio Degli Innocenti	56,000 €	62,417 €	10,329 €	377,181 €
Empoli	Filippo Bandinelli	1,110,000 €	925,963 €	733,291 €	1,169,258 €
Empoli	Jacopo Fazzini	110,000 €	470,104 €	382,012 €	578,515 €
Empoli	Jean-Daniel Akpa Akpro	930,000 €	675,130 €	532,435 €	856,064 €
Empoli	Liam Henderson	1,480,000 €	494,632 €	349,830 €	699,366 €
Empoli	Nedim Bajrami	1,540,000 €	775,784 €	602,431 €	999,020 €
Empoli	Nicolas Haas	1,670,000 €	606,257 €	451,682 €	813,727 €
Empoli	Răzvan Marin	1,280,000 €	1,188,283 €	943,653 €	1,496,336 €
Empoli	Tommaso Baldanzi	560,000 €	760,940 €	582,401 €	994,216 €

Midfielders model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Fiorentina	Alessandro Bianco	190,000 €	386,119 €	197,200 €	756,033 €
Fiorentina	Alfred Duncan	2,410,000 €	3,903,172 €	1,484,606 €	10,261,709 €
Fiorentina	Antonín Barák	2,780,000 €	2,548,002 €	1,537,902 €	4,221,580 €
Fiorentina	Gaetano Castrovilli	2,590,000 €	1,498,013 €	919,324 €	2,440,980 €
Fiorentina	Giacomo Bonaventura	2,780,000 €	3,281,168 €	1,919,267 €	5,609,432 €
Fiorentina	Jonathan Ikoné	2,180,000 €	2,597,292 €	1,574,655 €	4,284,095 €
Fiorentina	Josip Brekalo	2,050,000 €	2,366,281 €	981,679 €	5,703,782 €
Fiorentina	Marco Benassi	2,410,000 €	1,745,340 €	1,088,351 €	2,798,908 €
Fiorentina	Riccardo Saponara	1,280,000 €	1,167,716 €	680,097 €	2,004,951 €
Fiorentina	Rolando Mandragora	2,960,000 €	3,091,262 €	1,802,444 €	5,301,657 €
Fiorentina	Sofyan Amrabat	1,920,000 €	1,866,639 €	1,151,596 €	3,025,661 €
Fiorentina	Szymon Żurkowski	930,000 €	574,439 €	323,083 €	1,021,344 €
Fiorentina	Youssef Maleh	1,300,000 €	669,998 €	378,566 €	1,185,790 €
Hellas Verona	Adrien Tameze	640,000 €	1,461,246 €	1,075,733 €	1,984,902 €
Hellas Verona	Ajdin Hrustić	380,000 €	472,503 €	357,418 €	624,640 €
Hellas Verona	Alessandro Cortinovis	90,000 €	192,011 €	99,750 €	369,605 €
Hellas Verona	Darko Lazović	1,110,000 €	1,071,886 €	807,847 €	1,422,221 €
Hellas Verona	Davide Faraoni	930,000 €	760,332 €	589,245 €	981,100 €
Hellas Verona	Fabio Depaoli	650,000 €	910,118 €	711,793 €	1,163,694 €
Hellas Verona	Filippo Terracciano	90,000 €	603,747 €	487,287 €	748,031 €
Hellas Verona	Ibrahim Sulemana	70,000 €	538,229 €	386,657 €	749,214 €
Hellas Verona	Ivan Ilić	320,000 €	958,994 €	789,644 €	1,164,660 €
Hellas Verona	Josh Doig	640,000 €	680,457 €	555,139 €	834,068 €
Hellas Verona	Martin Hongla	830,000 €	595,603 €	452,342 €	784,240 €
Hellas Verona	Miguel Veloso	930,000 €	640,529 €	524,129 €	782,775 €
Hellas Verona	Oliver Abildgaard	710,000 €	771,151 €	478,441 €	1,242,927 €
Hellas Verona	Ondrej Duda	1,100,000 €	640,946 €	503,810 €	815,413 €
Inter	Denzel Dumfries	3,210,000 €	5,255,365 €	3,470,426 €	7,958,332 €
Inter	Federico Dimarco	2,960,000 €	3,459,726 €	2,204,502 €	5,429,676 €
Inter	Hakan Çalhanoğlu	9,260,000 €	6,195,043 €	3,762,300 €	10,200,936 €
Inter	Henrikh Mkhitaryan	4,870,000 €	4,141,050 €	2,736,967 €	6,265,444 €
Inter	Kristijan Asilani	1,540,000 €	2,589,305 €	1,453,177 €	4,613,651 €
Inter	Marcelo Brozović	11,110,000 €	2,954,618 €	2,029,707 €	4,301,008 €
Inter	Nicolò Barella	9,260,000 €	5,719,603 €	3,702,382 €	8,835,869 €
Inter	Raoul Bellanova	1,670,000 €	1,630,064 €	999,329 €	2,658,892 €
Inter	Roberto Gagliardini	2,780,000 €	1,990,029 €	1,218,717 €	3,249,462 €
Juventus	Adrien Rabiot	8,970,000 €	9,435,219 €	5,769,442 €	15,430,243 €
Juventus	Fabio Miretti	560,000 €	3,333,289 €	1,982,967 €	5,603,097 €
Juventus	Filip Kostić	3,210,000 €	7,246,651 €	4,372,747 €	12,009,517 €
Juventus	Juan Cuadrado	9,260,000 €	6,458,774 €	4,047,039 €	10,307,682 €
Juventus	Leandro Paredes	8,970,000 €	3,690,749 €	2,227,421 €	6,115,457 €
Juventus	Manuel Locatelli	5,560,000 €	8,277,404 €	5,089,621 €	13,461,846 €
Juventus	Nicolò Fagioli	1,850,000 €	4,489,985 €	2,643,137 €	7,627,266 €
Juventus	Paul Pogba	10,260,000 €	1,515,991 €	887,570 €	2,589,331 €
Juventus	Weston McKennie	3,210,000 €	2,035,211 €	1,386,562 €	2,987,298 €
Lazio	Daniilo Cataldi	2,590,000 €	2,901,737 €	1,680,440 €	5,010,569 €
Lazio	Luis Alberto	4,630,000 €	3,043,473 €	1,702,671 €	5,440,165 €
Lazio	Luka Romero	510,000 €	1,001,000 €	547,526 €	1,830,061 €
Lazio	Marcos Antônio	1,150,000 €	2,185,030 €	1,071,424 €	4,456,080 €
Lazio	Matías Vecino	3,520,000 €	2,598,591 €	1,463,297 €	4,614,758 €
Lazio	Sergej Milinković-Savić	5,930,000 €	4,361,384 €	2,311,770 €	8,228,218 €
Lazio	Toma Bašić	1,790,000 €	1,437,448 €	814,329 €	2,537,373 €
Lecce	Alexis Blin	640,000 €	1,071,543 €	731,222 €	1,570,242 €
Lecce	Joan González	640,000 €	895,502 €	729,942 €	1,098,614 €
Lecce	Kristijan Bistrić	900,000 €	679,777 €	443,893 €	1,041,008 €
Lecce	Kristoffer Asksildsen	130,000 €	616,171 €	471,076 €	805,952 €
Lecce	Marcin Listkowski	220,000 €	416,903 €	246,876 €	704,033 €
Lecce	Morten Hjulmand	370,000 €	1,486,270 €	1,029,639 €	2,145,386 €
Lecce	Pablo Rodríguez	320,000 €	216,432 €	139,391 €	336,052 €
Lecce	Þórir Jóhann Helgason	26,000 €	427,368 €	282,340 €	646,889 €

Midfielders model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Milan	Alexis Saelemaekers	1,280,000 €	1,622,664 €	1,105,501 €	2,381,736 €
Milan	Aster Vranckx	1,920,000 €	567,321 €	438,854 €	733,388 €
Milan	Brahim Diaz	1,920,000 €	1,810,421 €	1,187,906 €	2,759,141 €
Milan	Charles De Ketelaere	2,820,000 €	1,565,147 €	1,072,089 €	2,284,985 €
Milan	Ismaël Bennacer	2,780,000 €	1,845,738 €	1,270,039 €	2,682,393 €
Milan	Junior Messias	1,850,000 €	2,416,667 €	1,647,031 €	3,545,962 €
Milan	Rade Krunic	2,780,000 €	2,855,707 €	2,004,449 €	4,068,480 €
Milan	Sandro Tonali	4,630,000 €	2,617,735 €	1,732,476 €	3,955,351 €
Milan	Tiemoué Bakayoko	4,630,000 €	269,558 €	177,770 €	408,734 €
Milan	Tommaso Pobega	1,850,000 €	1,524,870 €	1,047,093 €	2,220,649 €
Milan	Yacine Adli	1,030,000 €	387,771 €	272,979 €	550,835 €
Monza	Andrea Barberis	890,000 €	336,906 €	230,821 €	491,742 €
Monza	Andrea Colpani	170,000 €	692,484 €	551,158 €	870,045 €
Monza	Carlos Augusto	630,000 €	1,595,934 €	1,124,145 €	2,265,713 €
Monza	Filippo Ranocchia	460,000 €	527,667 €	409,443 €	680,029 €
Monza	Marco D'Alessandro	740,000 €	380,671 €	291,207 €	497,624 €
Monza	Matteo Pessina	1,480,000 €	1,298,603 €	979,253 €	1,722,109 €
Monza	Mattia Valoti	650,000 €	383,859 €	301,441 €	488,810 €
Monza	Nicolò Rovella	1,850,000 €	758,486 €	624,292 €	921,529 €
Monza	Patrick Ciurria	1,260,000 €	1,282,498 €	969,134 €	1,697,199 €
Monza	Salvatore Molina	650,000 €	414,957 €	308,828 €	557,557 €
Monza	Samuele Birindelli	830,000 €	698,374 €	563,991 €	864,780 €
Monza	Samuele Vignato	37,000 €	762,166 €	468,251 €	1,240,556 €
Monza	Stefano Sensi	3,700,000 €	656,455 €	511,254 €	842,889 €
Monza	Warren Bondo	190,000 €	446,382 €	300,572 €	662,934 €
Napoli	Diego Demme	3,210,000 €	467,414 €	326,699 €	668,740 €
Napoli	Elijif Elmas	1,920,000 €	1,633,573 €	1,104,725 €	2,415,604 €
Napoli	Frank Anguissa	3,460,000 €	3,669,772 €	2,421,774 €	5,560,897 €
Napoli	Gianluca Gaetano	190,000 €	768,995 €	437,270 €	1,352,385 €
Napoli	Karim Zedadka	56,000 €	448,574 €	207,337 €	970,494 €
Napoli	Piotr Zieliński	6,480,000 €	3,298,307 €	2,255,434 €	4,823,354 €
Napoli	Stanislav Lobotka	2,050,000 €	4,186,602 €	2,569,742 €	6,820,818 €
Napoli	Tanguy Ndombélé	3,210,000 €	1,572,379 €	1,065,721 €	2,319,912 €
Roma	Bryan Cristante	3,330,000 €	5,045,362 €	2,879,995 €	8,838,697 €
Roma	Cristian Volpato	370,000 €	473,591 €	361,551 €	620,357 €
Roma	Edoardo Bove	370,000 €	1,451,561 €	929,531 €	2,266,778 €
Roma	Georginio Wijnaldum	6,410,000 €	2,036,168 €	1,231,326 €	3,367,126 €
Roma	Leonardo Spinazzola	5,560,000 €	1,990,885 €	1,244,295 €	3,185,405 €
Roma	Mady Camara	1,540,000 €	2,003,367 €	1,295,947 €	3,096,955 €
Roma	Nemanja Matic	5,130,000 €	2,867,124 €	1,790,997 €	4,589,860 €
Roma	Nicola Zalewski	560,000 €	2,318,915 €	1,460,999 €	3,680,650 €
Roma	Rick Karsdorp	4,070,000 €	1,241,164 €	728,907 €	2,113,424 €
Roma	Zeki Çelik	2,560,000 €	1,590,279 €	994,995 €	2,541,716 €
Salernitana	Antonio Candreva	2,410,000 €	1,141,872 €	827,083 €	1,576,488 €
Salernitana	Antonio Iervolino	56,000 €	262,008 €	119,573 €	574,112 €
Salernitana	Domagoj Bradarić	1,280,000 €	1,009,555 €	776,125 €	1,313,190 €
Salernitana	Domen Črnigoj	450,000 €	439,029 €	335,170 €	575,072 €
Salernitana	Emil Bohinen	1,000,000 €	562,564 €	423,209 €	747,807 €
Salernitana	Giulio Maggiore	1,850,000 €	509,875 €	424,437 €	612,516 €
Salernitana	Grigoris Kastanos	190,000 €	522,045 €	417,001 €	653,560 €
Salernitana	Hans Nicolussi Caviglia	390,000 €	499,394 €	398,725 €	625,477 €
Salernitana	Ivan Radovanović	1,110,000 €	434,343 €	289,968 €	650,606 €
Salernitana	Junior Sambia	1,920,000 €	558,863 €	445,756 €	700,668 €
Salernitana	Lassana Coulibaly	510,000 €	1,184,522 €	893,478 €	1,570,367 €
Salernitana	Pasquale Mazzocchi	300,000 €	902,045 €	708,136 €	1,149,043 €
Salernitana	Tonny Vilhena	740,000 €	937,442 €	754,190 €	1,165,208 €

Midfielders model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Sampdoria	Abdelhamid Sabiri	110,000 €	544,417 €	407,870 €	726,672 €
Sampdoria	Filip Đuričić	1,480,000 €	880,223 €	682,053 €	1,135,973 €
Sampdoria	Gerard Yepes	150,000 €	310,187 €	216,264 €	444,907 €
Sampdoria	Gonzalo Villar	1,540,000 €	555,931 €	446,085 €	692,830 €
Sampdoria	Harry Winks	1,210,000 €	899,703 €	693,135 €	1,167,832 €
Sampdoria	Lorenzo Malagrida	190,000 €	554,893 €	357,190 €	862,017 €
Sampdoria	Mehdi Lérís	520,000 €	917,566 €	699,006 €	1,204,470 €
Sampdoria	Michaël Cuisance	510,000 €	499,588 €	355,902 €	701,278 €
Sampdoria	Telasco Segovia	60,000 €	391,104 €	199,357 €	767,275 €
Sampdoria	Tomás Rincón	1,300,000 €	1,085,260 €	833,803 €	1,412,540 €
Sampdoria	Valerio Verre	1,300,000 €	429,162 €	296,674 €	620,816 €
Sassuolo	Abdou Harroui	120,000 €	590,202 €	455,625 €	764,525 €
Sassuolo	Davide Frattesi	1,300,000 €	1,332,557 €	1,015,028 €	1,749,394 €
Sassuolo	Hamed Junior Traorè	930,000 €	439,952 €	322,264 €	600,621 €
Sassuolo	Kristian Thorstvedt	770,000 €	749,259 €	584,920 €	959,771 €
Sassuolo	Luca D'Andrea	56,000 €	400,104 €	295,587 €	541,571 €
Sassuolo	Matheus Henrique	570,000 €	1,025,386 €	738,672 €	1,423,402 €
Sassuolo	Maxime López	770,000 €	924,566 €	726,267 €	1,177,001 €
Sassuolo	Pedro Obiang	1,090,000 €	536,467 €	417,623 €	689,126 €
Spezia	Albin Ekdal	1,480,000 €	926,983 €	710,761 €	1,208,983 €
Spezia	Arkadiusz Reca	1,150,000 €	931,405 €	648,923 €	1,336,868 €
Spezia	Emil Holm	260,000 €	715,975 €	505,760 €	1,013,561 €
Spezia	Jacopo Sala	740,000 €	336,361 €	228,013 €	496,188 €
Spezia	Julius Beck	26,000 €	58,180 €	13,531 €	250,166 €
Spezia	Kevin Agudelo	740,000 €	744,896 €	561,318 €	988,516 €
Spezia	Mehdi Bourabia	1,110,000 €	1,436,399 €	1,067,395 €	1,932,973 €
Spezia	Mikael Ellertsson	460,000 €	359,716 €	266,154 €	486,168 €
Spezia	Salvatore Esposito	830,000 €	661,887 €	535,905 €	817,487 €
Spezia	Simone Bastoni	190,000 €	486,587 €	358,005 €	661,344 €
Spezia	Tio Cipot	190,000 €	226,609 €	137,617 €	373,152 €
Spezia	Viktor Kovalenko	3,700,000 €	639,998 €	472,934 €	866,078 €
Torino	Brian Bayeye	560,000 €	390,663 €	163,857 €	931,405 €
Torino	Emirhan Ilkhan	350,000 €	412,112 €	288,558 €	588,569 €
Torino	Gvidas Gineitis	110,000 €	367,343 €	284,196 €	474,810 €
Torino	Karol Linetty	2,590,000 €	838,987 €	654,421 €	1,075,601 €
Torino	Mergim Vojvoda	900,000 €	919,891 €	752,787 €	1,124,074 €
Torino	Michel Ndary Adopo	110,000 €	452,476 €	343,822 €	595,460 €
Torino	Ola Aina	1,850,000 €	647,905 €	480,639 €	873,392 €
Torino	Ronaldo Vieira	1,110,000 €	634,943 €	469,937 €	857,898 €
Torino	Samuele Ricci	1,850,000 €	979,003 €	745,310 €	1,285,978 €
Torino	Saša Lukić	1,300,000 €	579,691 €	437,076 €	768,841 €
Torino	Valentino Lazaro	1,920,000 €	864,244 €	676,799 €	1,103,613 €
Torino	Wilfried Singo	260,000 €	1,050,756 €	827,184 €	1,334,757 €
Udinese	Destiny Udogie	280,000 €	1,055,104 €	806,172 €	1,380,905 €
Udinese	Florian Thauvin	2,310,000 €	455,850 €	316,178 €	657,224 €
Udinese	Jean-Victor Makengo	380,000 €	650,021 €	436,481 €	968,032 €
Udinese	Kingsley Ehizibue	900,000 €	729,905 €	564,100 €	944,442 €
Udinese	Lazar Samardžić	510,000 €	812,369 €	673,039 €	980,541 €
Udinese	Mato Jajalo	1,300,000 €	557,886 €	341,128 €	912,369 €
Udinese	Roberto Pereyra	1,280,000 €	1,251,396 €	942,845 €	1,660,900 €
Udinese	Sandi Lović	900,000 €	966,233 €	760,583 €	1,227,475 €
Udinese	Tolgay Arslan	770,000 €	578,076 €	473,707 €	705,442 €
Udinese	Wallace	1,030,000 €	1,316,464 €	963,854 €	1,798,062 €

Table 13: Midfielders of Serie A for the Regression Analysis and for the Predictive Model

Forwards

Further, with the forwards, a predictive analysis was done to look at the independent variables in Table 3, especially, the model uses 10 predictors and tries to predict the log-transformed gross salary of soccer players. The model covers a wide range of performance metrics, from "Goals per 90 min" to 'Europa_L'. The dependent variable is the log-transformed 'Gross Salary'. Statistical significance tells us whether a variable has an effect that is unlikely to have come up from random chance. Variables like Goals.per.90.min, Successful.dribbles.per.90.min, Total.shots.per.90.min, Big.chances.created.per.90.min, Minutes.played, Champions.League, and Europa.League are statistically significantly at least at the 5% level.

Significant Variables:

- 1.Goals.per.90.min: This variable is significant at 90% level ($p = 0.0181$) with a coefficient of 0.6716. This can be interpreted to mean that more goals per 90 minutes are associated with a higher gross salary, which is somewhat intuitive.
- 2.Successful.dribbles.per.90.min: Also significant at 5% level ($p = 0.000532$) with a coefficient of 0.01228. It seems that dribbling skill positively influences salary although the magnitude is less compared to goals scored.
- 3.Total.shots.per.90.min: Significant ($p = 0.000218$) with a coefficient of 0.2891. This implies that players who take more shots generally had higher salaries.
- 4.Big.chances.created.per.90.min: Significant ($p = 0.0342$) with a coefficient of 0.7128. Creating big chances is a very highly valued skill.
- 5.Correct.passes.per.90.min: Not significant ($p = 0.4236$), hence not a reliable predictor of salary in this data.
- 6.Possession.lost.per.90.min: Not significant ($p = 0.0992$) and with a negative coefficient, hence not conclusive, but the direction and magnitude suggest losing possession will negatively affect salary.
- 7.Dispossessed.per.90.min: Not significant ($p = 0.5306$), hence it does not significantly influence salary.
- 8.Minutes.played: Highly significant ($p = 6.14e-08$) with a coefficient of 0.0004725, hence more minutes on the pitch is correlated with more salary.

9.Champions.League: Significant ($p = 0.0140$), hence playing in the Champions League positively influences salary.

10.Europa.League: Highly significant ($p = 0.000768$), hence participation in this competition is beneficial for salary.

Primary Statistic:

R^2 and Adjusted R^2 : The adjusted R^2 is approximately 67% of the variance in the log-transformed "Gross Salary" is explained by the model. This is relatively a poor fit.

Diagnostic Tests:

1. Normality of Residuals:

- Shapiro-Wilk Test: The p-value is 0.01753, which is less than 0.05, implying that the residuals are not normally distributed at the 5% level of significance.
- Q-Q Plot: This plot helps visually to see if the points lie along the 45-degree line, representing normality.

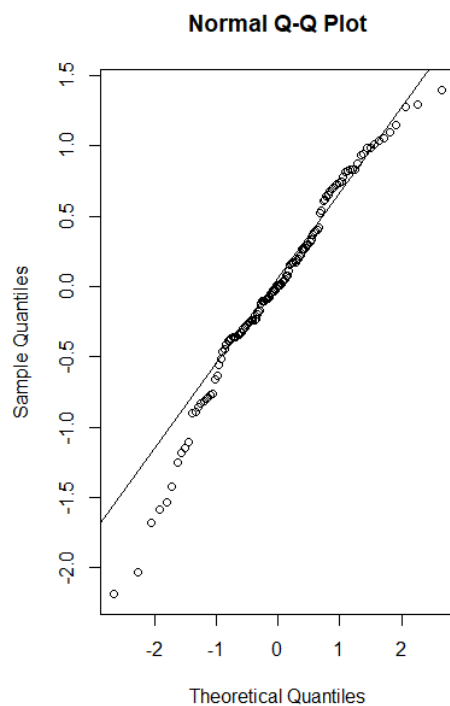


Figure 5: Q-Q Plot Forwards Normality of Residuals

2. Residual Mean:

- One Sample T-test: This test sets the null hypothesis that the mean of the residuals is equal to zero, an assumption that is crucial to linear regression. The p-value is 1, meaning that the null hypothesis (which sets the mean to be equal to zero) should not be rejected, which is positive.

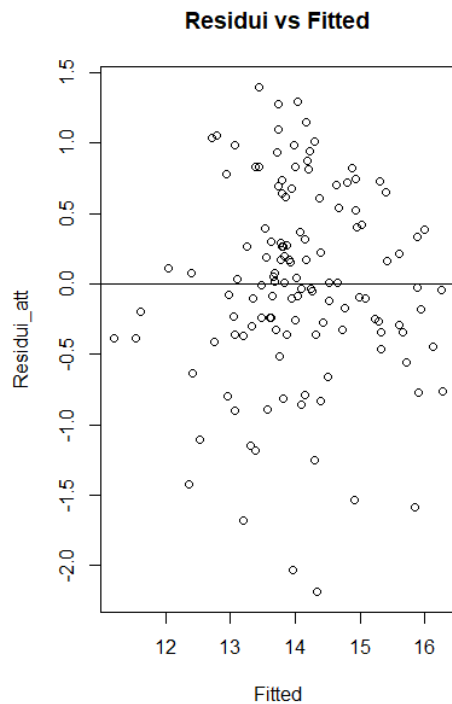


Figure 6: T-test Mean of Residuals vs Fitted Forwards

3. Heteroscedasticity:

- Breusch-Pagan Test: The p-value is 0.8156, meaning that there is no presence of heteroskedasticity.

4. Autocorrelation:

- Durbin-Watson Test: The Durbin-Watson statistic is 2.062, meaning that there is no presence of autocorrelation.

5. Multicollinearity:

- Variance Inflation Factor (VIF): All VIF values are far less than 5, which implies that multicollinearity is not a problem in this model.

Feature Selection:

Now, we did feature selection using the stepwise regression in R. The stepwise regression is an approach which just adds or removes predictors to have some simplified model which still has considerable explanatory power. In your case, it seems that you started with a full model which has lots of

features and then removed features on the basis of the Akaike Information Criterion (AIC).

Interpretation:

1. Df (Degrees of Freedom): This is the number of degrees of freedom each predictor has. For you, this is 1 for all variables, meaning that each is a single variable considered for removal.
2. Sum of Sq (Sum of Squares): This is the change in the sum of squared residuals when a given predictor variable is removed from the model. A smaller change implies the predictor is less important.
3. RSS (Residual Sum of Squares): This is the residual sum of squares after removing the given predictor. A smaller value means a better fit.
4. AIC (Akaike Information Criterion): AIC is used in comparison between models to identify the best fitting model. The lower the AIC value, the better the model fits with a lesser number of features. If the deletion of a variable leads to lower AIC, it can be considered for deletion.

Summary:

The modelling process began with the initial model having all the variables and an AIC value of -70.07. The first iteration of the stepwise procedure removed the variable "att\$Dispossessed.per.90.min," which led to the improvement in the AIC to -71.63. The second iteration again removed a variable "att\$Accurate.passes.per.90.min," which made the AIC yet better to -72.96. None of the other variables was removed as their removal did not lead to betterment in the AIC. The final model so obtained has an AIC of -72.96, which is better than the value obtained in the initial model.

The following variables are included in the final model: Goals scored per 90 minutes, successful dribbles per 90 minutes, total shots taken per 90 minutes, big chances created per 90 minutes, possession lost per 90 minutes, total minutes played and participation in the Champions League or Europa League. Coefficients in the final model are close to those in the initial model, and they help understand the extent to which the variation in a player's Gross Salary can be attributed to each independent variable. For instance, a marginal increase in goals per 90 minutes accounts for about 0.682 in the log of the Gross Salary, and each additional minute played contributes about

0.00047 in the log of the Gross Salary.

The key findings are as follows: First, the stepwise regression simplified this model by eliminating two variables ("att\$Dispossessed.per.90.min" and "att\$Accurate.passes.per.90.min"), both of which did not contribute that much to explain the variance in Gross Salary. Second, the final model has a lower AIC value, which is an indication that this is a better fitting to the data. However, it must be noted that AIC is not the only measure employed to judge the quality of the model.

In the end, we used a prediction from a regression model with confidence intervals. Specifically, the output has:

- fit: The predicted value of the dependent variable given by the model.
- lwr: The lower bound of the 95% confidence interval for the prediction.
- upr: The upper bound of the 95% confidence interval for the prediction.

Each row corresponds to an observation in your dataset, or perhaps a new data point to which you are making predictions.

The true value was estimated with 95% confidence where it is to be found for a model fitted to the data by the 95% confidence interval (lwr to upr). In particular, the wider the interval, the more uncertain its prediction for that specific point.

Thanks to these procedures, therefore, it can be estimated the annual gross salary for the 127 forwards in Serie A."

Forwards model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Atalanta	Ademola Lookman	2,310,000 €	2,290,453 €	1,633,050 €	3,212,468 €
Atalanta	Duván Zapata	3,330,000 €	929,247 €	741,596 €	1,164,392 €
Atalanta	Jérémie Boga	2,780,000 €	686,629 €	476,379 €	989,673 €
Atalanta	Luis Muriel	2,310,000 €	906,920 €	576,033 €	1,427,892 €
Atalanta	Mario Pašalić	1,850,000 €	975,358 €	733,931 €	1,296,203 €
Atalanta	Rasmus Winther Højlund	640,000 €	1,406,029 €	1,132,162 €	1,746,126 €
Atalanta	Ruslan Malinovskyi	1,280,000 €	954,975 €	633,877 €	1,438,728 €
Bologna	Antonio Raimondo	90,000 €	109,950 €	63,913 €	189,147 €
Bologna	Joshua Zirkzee	1,150,000 €	966,774 €	765,099 €	1,221,622 €
Bologna	Marko Arnautović	3,460,000 €	1,443,412 €	1,088,270 €	1,914,448 €
Bologna	Musa Barrow	1,480,000 €	1,559,288 €	1,135,643 €	2,140,971 €
Bologna	Nicola Sansone	2,050,000 €	979,953 €	761,679 €	1,260,791 €
Bologna	Riccardo Orsolini	2,040,000 €	2,030,150 €	1,363,888 €	3,021,881 €
Cremonese	Cyriel Dessers	1,150,000 €	1,251,321 €	989,228 €	1,582,854 €
Cremonese	Daniel Ciofani	930,000 €	768,618 €	508,327 €	1,162,194 €
Cremonese	David Okereke	770,000 €	1,767,418 €	1,382,868 €	2,258,881 €
Cremonese	Felix Afena-Gyan	370,000 €	537,127 €	421,026 €	685,237 €
Cremonese	Frank Tsadjout	560,000 €	1,320,789 €	905,344 €	1,926,875 €
Cremonese	Jaime Báez	200,000 €	654,162 €	398,264 €	1,074,494 €
Cremonese	Luca Zanimacchia	370,000 €	468,190 €	363,567 €	602,920 €

Forwards model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Empoli	Emmanuel Ekong	190,000 €	469,357 €	256,181 €	859,933 €
Empoli	Marko Pjaca	1,480,000 €	643,341 €	456,640 €	906,367 €
Empoli	Martín Satriano	650,000 €	828,556 €	678,527 €	1,011,758 €
Empoli	Mattia Destro	2,780,000 €	927,659 €	593,522 €	1,449,907 €
Empoli	Nicolò Cambiaghi	150,000 €	1,148,342 €	897,412 €	1,469,437 €
Fiorentina	Arthur Cabral	2,180,000 €	2,577,086 €	1,486,255 €	4,468,485 €
Fiorentina	Christian Kouamé	2,220,000 €	1,769,717 €	685,683 €	4,567,516 €
Fiorentina	Luka Jović	3,210,000 €	3,544,437 €	2,087,839 €	6,017,245 €
Fiorentina	Nicolás González	3,210,000 €	4,510,552 €	2,446,038 €	8,317,564 €
Fiorentina	Riccardo Sottil	1,110,000 €	819,951 €	531,862 €	1,264,086 €
Hellas Verona	Adolfo Gaich	1,230,000 €	1,006,843 €	684,908 €	1,480,100 €
Hellas Verona	Cyril Ngonge	770,000 €	841,625 €	596,002 €	1,188,485 €
Hellas Verona	Jayden Braaf	190,000 €	597,990 €	404,198 €	884,688 €
Hellas Verona	Kevin Lasagna	1,300,000 €	1,099,120 €	830,630 €	1,454,380 €
Hellas Verona	Milan Đurić	900,000 €	413,821 €	271,987 €	629,619 €
Hellas Verona	Roberto Piccoli	560,000 €	620,791 €	500,649 €	769,765 €
Hellas Verona	Simone Verdi	3,150,000 €	1,174,379 €	874,992 €	1,576,188 €
Hellas Verona	Thomas Henry	1,030,000 €	359,529 €	255,164 €	506,581 €
Hellas Verona	Yayah Kallon	460,000 €	619,080 €	500,343 €	765,987 €
Inter	Edin Džeko	9,260,000 €	4,463,483 €	3,002,633 €	6,635,138 €
Inter	Joaquín Correa	6,480,000 €	2,856,164 €	1,823,066 €	4,474,701 €
Inter	Lautaro Martínez	1,111,000 €	7,936,318 €	5,016,033 €	12,556,638 €
Inter	Romelu Lukaku	1,090,000 €	11,425,977 €	5,826,867 €	22,405,567 €
Juventus	Ángel Di María	7,690,000 €	7,867,021 €	4,064,535 €	15,226,989 €
Juventus	Arkadiusz Milik	4,490,000 €	6,313,495 €	3,864,102 €	10,315,519 €
Juventus	Dušan Vlahović	1,296,000 €	8,799,628 €	5,364,426 €	14,434,619 €
Juventus	Federico Chiesa	9,260,000 €	4,822,919 €	2,792,004 €	8,331,050 €
Juventus	Moise Kean	3,850,000 €	6,702,961 €	3,681,939 €	12,202,849 €
Juventus	Samuel Iling Junior	640,000 €	2,974,927 €	1,193,941 €	7,412,587 €
Lazio	Ciro Immobile	7,410,000 €	5,989,749 €	3,902,898 €	9,192,330 €
Lazio	Diego Valencia	130,000 €	245,735 €	167,199 €	361,165 €
Lazio	Felipe Anderson	2,820,000 €	4,494,837 €	2,761,266 €	7,316,773 €
Lazio	Matteo Cancellieri	1,850,000 €	1,284,294 €	848,487 €	1,943,926 €
Lazio	Mattia Zaccagni	3,700,000 €	8,002,624 €	5,093,572 €	12,573,098 €
Lazio	Pedro	3,210,000 €	4,115,826 €	2,766,878 €	6,122,432 €
Lecce	Assan Ceesay	1,280,000 €	1,327,197 €	966,484 €	1,822,519 €
Lecce	Federico Di Francesco	1,390,000 €	1,053,628 €	811,176 €	1,368,547 €
Lecce	Gabriel Strefezza	460,000 €	1,610,717 €	1,151,988 €	2,252,092 €
Lecce	Joel Voelkerling Persson	190,000 €	423,606 €	247,209 €	725,873 €
Lecce	Lameck Banda	640,000 €	816,498 €	650,190 €	1,025,356 €
Lecce	Lorenzo Colombo	560,000 €	940,625 €	764,601 €	1,157,172 €
Lecce	Rémi Oudin	940,000 €	867,543 €	671,252 €	1,121,234 €
Milan	Ante Rebić	4,490,000 €	1,235,023 €	804,503 €	1,895,949 €
Milan	Divock Origi	5,130,000 €	3,050,451 €	1,913,357 €	4,863,311 €
Milan	Marko Lazetić	320,000 €	783,049 €	453,395 €	1,352,385 €
Milan	Olivier Giroud	4,490,000 €	6,012,312 €	3,885,297 €	9,303,675 €
Milan	Rafael Leão	1,790,000 €	2,478,168 €	1,469,981 €	4,177,778 €
Milan	Zlatan Ibrahimović	1,920,000 €	1,038,076 €	603,584 €	1,785,341 €
Monza	Andrea Petagna	3,330,000 €	1,468,600 €	1,138,748 €	1,894,016 €
Monza	Christian Gytkjær	1,120,000 €	753,828 €	535,722 €	1,060,722 €
Monza	Dany Mota	440,000 €	996,127 €	755,436 €	1,313,505 €
Monza	Gianluca Caprari	1,670,000 €	1,408,971 €	1,021,988 €	1,942,468 €

Forwards model - Tested items					
Team	Name	Real Gross Salary	Mean Gross Salary	Lower Gross Salary	Upper Gross Salary
Napoli	Alessio Zerbin	330,000 €	474,312 €	263,980 €	852,229 €
Napoli	Giacomo Raspadori	4,630,000 €	3,101,294 €	1,991,921 €	4,828,517 €
Napoli	Giovanni Simeone	3,330,000 €	4,332,347 €	2,558,547 €	7,335,822 €
Napoli	Hirving Lozano	5,130,000 €	3,376,972 €	2,251,686 €	5,064,622 €
Napoli	Khvicha Kvaratskhelia	1,540,000 €	7,534,176 €	4,677,480 €	12,135,432 €
Napoli	Matteo Politano	4,070,000 €	2,361,459 €	1,613,474 €	3,456,164 €
Napoli	Victor Osimhen	5,450,000 €	11,725,541 €	7,130,059 €	19,283,107 €
Roma	Andrea Belotti	4,440,000 €	1,618,176 €	1,069,969 €	2,447,237 €
Roma	Lorenzo Pellegrini	6,480,000 €	10,100,849 €	5,839,700 €	17,471,124 €
Roma	Nicolò Zaniolo	4,630,000 €	2,283,249 €	1,496,665 €	3,483,228 €
Roma	Ola Solbakken	900,000 €	880,927 €	697,620 €	1,112,411 €
Roma	Paulo Dybala	7,040,000 €	8,402,753 €	5,301,816 €	13,317,240 €
Roma	Stephan El Shaarawy	6,480,000 €	3,060,871 €	1,977,255 €	4,738,305 €
Roma	Tammy Abraham	5,770,000 €	4,921,087 €	3,197,021 €	7,574,819 €
Salernitana	Boulaye Dia	1,790,000 €	2,020,610 €	1,446,663 €	2,822,292 €
Salernitana	Erik Botheim	510,000 €	494,252 €	345,736 €	706,572 €
Salernitana	Federico Bonazzoli	2,220,000 €	1,126,719 €	889,950 €	1,426,465 €
Salernitana	Julian Kristoffersen	50,000 €	73,491 €	26,828 €	201,318 €
Salernitana	Krzysztof Piątek	3,850,000 €	1,500,517 €	1,194,574 €	1,884,815 €
Sampdoria	Daniele Montevago	90,000 €	273,200 €	183,640 €	406,439 €
Sampdoria	Fabio Quagliarella	930,000 €	1,201,198 €	805,244 €	1,791,851 €
Sampdoria	Francesco Caputo	1,480,000 €	1,525,801 €	1,027,552 €	2,265,645 €
Sampdoria	Ignacio Pussetto	930,000 €	329,345 €	221,481 €	489,740 €
Sampdoria	Jesé Rodríguez	640,000 €	885,582 €	560,509 €	1,399,184 €
Sampdoria	Manolo Gabbiadini	1,410,000 €	1,854,137 €	1,323,420 €	2,597,682 €
Sampdoria	Manuel De Luca	70,000 €	102,926 €	62,119 €	170,543 €
Sampdoria	Sam Lammers	1,030,000 €	1,144,044 €	903,634 €	1,448,429 €
Sassuolo	Agustín Álvarez	1,280,000 €	981,807 €	699,317 €	1,378,422 €
Sassuolo	Andrea Pinamonti	4,440,000 €	1,410,253 €	1,111,755 €	1,788,915 €
Sassuolo	Armand Laurienté	1,150,000 €	1,652,335 €	1,273,106 €	2,144,528 €
Sassuolo	Domenico Berardi	5,560,000 €	2,699,238 €	1,823,758 €	3,994,983 €
Sassuolo	Emil Konradsen Ceide	100,000 €	538,994 €	383,276 €	757,978 €
Sassuolo	Grégoire Defrel	1,570,000 €	686,238 €	456,329 €	1,031,970 €
Sassuolo	Janis Antiste	710,000 €	717,487 €	273,994 €	1,878,830 €
Spezia	Daniel Maldini	560,000 €	711,948 €	565,785 €	895,878 €
Spezia	Daniele Verde	740,000 €	1,061,326 €	855,430 €	1,316,767 €
Spezia	David Strelec	190,000 €	169,729 €	115,125 €	250,234 €
Spezia	Eldor Shomurodov	1,920,000 €	1,395,747 €	926,797 €	2,101,979 €
Spezia	Emmanuel Gyasi	1,300,000 €	999,789 €	620,195 €	1,611,700 €
Spezia	Leandro Sanca	260,000 €	239,697 €	154,630 €	371,558 €
Spezia	M'Bala Nzola	1,020,000 €	1,979,768 €	1,443,686 €	2,714,912 €
Spezia	Raimonds Krollis	400,000 €	431,654 €	250,780 €	742,977 €
Torino	Aleksei Miranchuk	2,780,000 €	1,209,237 €	895,010 €	1,633,785 €
Torino	Antonio Sanabria	2,960,000 €	3,240,603 €	2,335,461 €	4,496,546 €
Torino	Demba Seck	740,000 €	569,481 €	434,039 €	747,194 €
Torino	Nemanja Radonjić	1,030,000 €	1,017,104 €	742,598 €	1,393,083 €
Torino	Nikola Vlašić	3,210,000 €	1,741,592 €	1,249,507 €	2,427,494 €
Torino	Pietro Pellegrini	1,280,000 €	476,113 €	348,847 €	649,807 €
Torino	Yann Karamoh	1,850,000 €	922,018 €	700,738 €	1,213,173 €
Udinese	Beto	190,000 €	1,690,255 €	1,339,343 €	2,133,085 €
Udinese	Festy Eboesele	230,000 €	346,605 €	247,160 €	486,066 €
Udinese	Gerard Deulofeu	1,280,000 €	1,223,211 €	940,936 €	1,590,152 €
Udinese	Ilija Nestorovski	1,300,000 €	1,115,061 €	747,044 €	1,664,358 €
Udinese	Isaac Success	900,000 €	853,243 €	650,847 €	1,118,591 €
Udinese	Simone Pafundi	56,000 €	233,218 €	155,704 €	349,322 €

Table 14: Forwards of Serie A for the Regression Analysis and for the Predictive Model

3.3.2 Model Application to the Squad Cost Rule

Referring to the salary cap model discussed earlier, it is necessary to consider an additional aspect. Specifically, the focus needs to be placed on the Squad Cost Rule (SCR), which, as mentioned in the second chapter, aims to establish a direct correlation between the variables of revenue and costs, so that their ratio does not exceed 90% initially, and then will gradually drop to 70% by 2025/26. Therefore, starting from this new rule, it was necessary to analyze the financial statements of the 20 Serie A clubs and calculate their SCR. Subsequently, if a club had a value higher than 90%, that value was adjusted based on the Mean Gross Salary of the players, proportionally to the values previously highlighted in the model.

Recalling the formula seen in the second chapter for calculating the SCR, specifically: $SCR = [(Employee\ Benefits\ Expenses + Amortization + Impairment + Agents) / (Operating\ Revenue + transfer\ profit/loss)] < 90\%$, it can be observed that 10 of the 20 Serie A teams are well above the 90% target, and 3 of these have values suggesting a financial situation of extreme uncertainty. On this basis, defining the maximum value of the SCR at 90%, a goal seek function was performed in Excel, with the aim of modifying the SCR to bring it to 90%, by adjusting the total Gross Salary of the players for each team. From this, it can be seen that for the 10 clubs with an SCR greater than 90%, and therefore in a financial situation where costs exceed revenues, the new gross salary (that is, the post-goal seek salary at 90%) has a considerably lower value than the one before the implementation of the SCR, or even a negative one. This, in particular, would force the clubs, by simply subtracting the new salary from the old, to drastically reduce the salaries of the players currently in the squad, or in some cases, even to not have to pay their own players for their performances.

Team	Revenues	Transfer profit/loss	Agents	Total	SCR	SCR (90%)	Total D&A	Total employee benefits exp. (A)	Total Gross salary (B new)	Total Gross salary (B old)	A-B	A-B	B new - B old
Atalanta	119,598,190	31,550,000	(6,720,828)	144,427,362	56.8%	90.00%	34,474,000	44,617,000	86,761,543	36,540,000	8,077,000	8,077,000	50,221,543
Bologna	80,355,000	8,880,000	(9,222,626)	80,012,374	127.1%	90.00%	36,591,000	67,640,000	(3,362,126)	29,780,000	37,860,000	37,860,000	(33,142,126)
Cremonese	28,106,539	(33,800,000)	(2,829,873)	(8,523,334)	(459.3%)	90.00%	2,474,000	20,845,000	(13,226,988)	18,046,000	2,799,000	2,799,000	(31,272,988)
Empoli	70,911,690	16,510,000	(4,908,250)	82,513,440	60.0%	90.00%	10,879,000	36,662,000	50,106,271	23,876,000	12,786,000	12,786,000	26,230,271
Fiorentina	233,233,000	11,100,000	(13,564,065)	230,768,935	58.7%	90.00%	48,974,000	80,946,000	128,235,635	51,820,000	29,126,000	29,126,000	76,415,635
Hellas Verona	84,549,000	(5,680,000)	(4,672,305)	74,196,695	81.9%	90.00%	21,063,000	38,887,000	29,649,795	23,290,000	15,597,000	15,597,000	6,359,795
Inter	361,863,000	(46,950,000)	(20,569,533)	294,343,467	125.0%	90.00%	128,786,000	244,362,000	(16,684,833)	93,611,000	150,751,000	150,751,000	(110,295,833)
Juventus	439,964,000	2,530,000	(51,336,558)	391,157,442	87.5%	90.00%	-	335,759,000	138,875,042	127,726,000	208,033,000	208,033,000	11,149,042
Lazio	138,433,000	2,450,000	(6,315,085)	134,567,915	102.1%	90.00%	40,023,000	97,500,000	43,396,615	60,440,000	37,060,000	37,060,000	(17,043,385)
Lecce	15,482,000	(2,180,000)	(2,419,765)	10,882,235	84.1%	90.00%	7,157,000	1,604,400	18,727,635	17,937,000	(16,332,600)	(16,332,600)	790,635
Milan	238,589,000	(44,520,000)	(12,057,098)	182,011,902	127.7%	90.00%	73,911,000	161,895,000	6,339,002	79,540,000	82,355,000	82,355,000	(73,200,998)
Monza	32,723,439	(46,480,000)	(3,901,033)	(17,657,594)	(567.6%)	90.00%	14,580,000	59,599,000	(54,843,938)	35,617,000	23,982,000	23,982,000	(90,460,938)
Napoli	175,995,109	2,130,000	(12,486,735)	165,638,374	122.2%	90.00%	74,745,000	130,353,000	8,733,863	66,006,000	64,347,000	64,347,000	(57,272,137)
Roma	191,191,000	65,090,000	(21,103,812)	235,177,188	114.8%	90.00%	90,277,000	182,831,000	21,871,088	85,430,000	97,401,000	97,401,000	(63,558,912)
Salernitana	46,056,000	(24,100,000)	(8,777,980)	13,178,020	244.2%	90.00%	-	44,833,000	(2,244,580)	31,606,000	13,227,000	13,227,000	(33,850,580)
Sampdoria	77,783,608	29,100,000	(3,246,183)	103,637,425	73.8%	90.00%	22,539,572	53,050,628	43,638,864	26,280,000	26,770,628	26,770,628	17,358,864
Sassuolo	138,987,663	14,560,000	(6,203,512)	147,344,151	65.8%	90.00%	32,193,000	62,663,000	64,579,385	27,446,000	35,217,000	35,217,000	37,133,385
Spezia	41,202,013	23,320,000	(3,221,500)	61,300,513	73.8%	90.00%	8,682,000	35,687,000	33,185,312	22,706,000	12,981,000	12,981,000	10,479,312
Torino	112,744,000	22,120,000	(2,007,500)	132,856,500	70.9%	90.00%	28,001,000	65,652,000	58,657,100	32,940,000	32,712,000	32,712,000	25,717,100
Udinese	78,080,240	1,300,000	(10,181,773)	69,198,467	144.4%	90.00%	62,869,000	41,601,000	(22,503,557)	20,706,000	20,895,000	20,895,000	(43,209,557)
Total	2,705,847,491	26,930,000	(205,746,014)	2,527,031,477	100.7%	90.00%	738,218,572	1,806,987,028	620,036,100	911,343,000	895,644,028	895,644,028	(291,306,900)

Table 15: SCR per Team and Goal seek to 90% to calculate new Gross Salary level

Subsequently, in order to divide these new values, whether higher or lower, based on the SCR of the clubs, the Gross Salary value was divided according to the three main categories of players (Defenders, Midfielders, and Forwards), and based on the number of players belonging to these three categories for each team.

Obviously, this simulation focuses particularly on the Gross Salary of the players, without modifying the other variables at play, which, of course, in the case of increased revenues or a profit from the market — perhaps still at the expense of a reduction in players' salaries — would result in a much more encouraging situation for the clubs.

In the end, after the use of this quantitative analysis, the data provided a possible underpayment of some players by their clubs, with other players possibly being overpaid in relation to their skills on the pitch. To separate out the skills that distinguish the underpaid from the overpaid, the dataset was sorted on the absolute difference between the predicted and actual salary as well as the predicted and actual relative salary. Clearly, many factors other than skills impinge on the salary of a footballer. Merchandise and ticket sales of a 'club favourite' can justify increased compensation. Therefore, the salary is determined by a quantitative analysis only, and the method used in this paper is motivated by a quantitative analysis. Moreover, the behavioral effect of the team may be also observed when starting salaries are determined by a quantitative method, as it was shown that salary inequality has a bad effect on football player performance, and the bad effect increases with the difference between the salary of the player and the salary of other players in the team increasing.

Conclusion

Financial management is the foundation upon which any professional sports team thrives, and that does not exclude Serie A clubs. This paper seeks to dissect the Italian football financial landscape focusing on various aspects of Serie A teams such as giants Inter Milan, Juventus, AC Milan, Lazio, and Roma. The information in this data cuts through revenue streams, cost structures, and debts between these member clubs. The study goes further into player salaries and salary cap visions alongside UEFA governance.

In this era characterized by growing commercialization worldwide diversification of revenue streams has been vital for sound finances. Generally, Serie A clubs generate their income from three key sources:

Matchday Sales: Included ticket sales, VIP and hospitality packages, among other experiences on match days.

Broadcasting Rights: The revenue is sourced from broadcasting rights for showing Serie A matches.

Commercial Partnerships: Any sponsorship deals, and merchandise sales, among other commercial activities amongst others.

Diversification Importance: What diversifying these streams does is not only cushion volatility in any single source but also allows the clubs to invest in new opportunities wherever they arise - whether that's signing a new player, upgrading facilities or expanding into new markets.

Financial Volatility and Impact of External Factors: The revenues for the top clubs like Juventus, Inter Milan, AC Milan have quite some variance over the years. Although some part of that can be attributable to their on-field performance, a number of external factors also play in - economic downturns and COVID-19 pandemic being two key ones.

Pandemic's Impact: For instance, during the pandemic time this led to a huge reduction in matchday sales and serious doubts about financial sustainability for many clubs. Novel solutions are called for such situations as virtual fan engagements as well as explorations into newer sources of revenue generation including digital platforms.

Cost Management of Rising Player Salaries: The growing costs related to players' salaries and transfers are becoming a big issue. Clubs consider player wages as the biggest portion of their aggregate expenses, and star-player

effect put them on the upward spiral.

Controlling Cost through Performance Metrics: Using quantitative metrics for fixing player salaries is an inventive way to control this problem. By linking elements associated with a player's performance, skills, and game-related factors together with his or her salary, clubs can use more judgment while at bargaining time. This analytics-based method may serve useful as a check on continuously increasing player salaries with fairness intact.

Debt as a Two-Edged Sword: Debt is an excellent source of capital for growth and investment, but it has to be paid with interest. The high level of debt held by Juventus and Roma are indicators of financial vulnerability. On the other hand, AC Milan brought its debt down considerably through sound financial management.

Salary Caps and Financial Regulations: The Squad Cost Rule (SCR) The SCR is characterized by specifying a cap that limits the revenue-expenditure differential in clubs. The rule decreed player salaries and other employee benefits to be within 90% of operating revenue. This figure is set for further decrease to 70% by the year 2025/26. While acting as an equalizer and a control tool on financial excesses, salary caps remain hard to implement. European regulation presents a problem since traditional methods do not allow standard pay restrictions like in the US. The challenge presented under these rules requires innovative ways with close contact between footballing entities and governance bodies such as the European Commission. For more than five decades now, UEFA has guided European football on its way forward. The fact that the organization is strongly against the proposed Super League signifies its commitment to maintaining a competitive balance across clubs and countries. UEFA President Aleksander Ceferin has said time and again that putting in place a salary cap is an imperative for the future. His arguments rest on the belief that a cap would not inhibit competition but actually promote it by keeping richer clubs from securing all of the best players.

The financial landscape of Serie A and European football at large is a complex equilibrium between revenue management, cost structures, debt levels alongside regulatory constraints. The emerging data analytics holds prospects to inject more objectivity and fairness in player salary negotiations. Regulatory mechanisms such as the SCR or potential salary caps, despite being difficult to enforce, could play a crucial role by providing essential tools for financial stability and competitive balance. In the ever-changing

world of football where unpredictability represents the only certainties, prudent financial management and effective governance alongside judicious decision-making by use of big data are not just desirable but necessary preconditions for long-term success and sustainability of the game's clubs.

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Summary

This thesis is developed to seek the financial dynamics that characterize football governance and club operations within the context of Italian football and European framework under UEFA. The three chapters entail "The Playmakers: Football Governing Bodies and Financial Regulations," "An Overview on the football industry," and lastly, "Salary Cap based on new UEFA Financial Regulations in European Football."

Chapter one introduces soccer industry organizational structure from FIFA to the Italian national associations under CONI, FIGC, as well as COVISOC. Further looks into Financial Fair Play (FFP) regulations by focusing on when it was introduced and its features. The significance of football governance bodies in influencing the economic impact of sport is enormous, and they also indicate what the future holds for this discipline. FIFA coordinates world management of international football while regional governing entities such as UEFA preside over specific zones. Governing institutions such as FA and FIGC provide oversight on national competitions while local authorities propagate grassroots football within a given locality.

UEFA manages clubs' championships known as Champions League and European League, which raise tremendous revenues through broadcasting rights, sponsorship agreements, and gate collections. The Union finances and advances technical assistance to grassroots football organizations especially those from the least developed countries. UEFA controls all the financial fair play and licensing processes for the European clubs, thereby having a great influence on economic conditions in European football. International competitions together with those from both club and national leagues help develop and grow international football.

FIFA is an international sports development and regulation non-profit organization begun back in 1904. It organizes worldwide events like the World Cup together with Women's World Cup, promoting and standardizing sport, enforcing rules and regulations. FIFA also enables participation for less developed countries by promoting sport growth to offer opportunities at different ages or amongst groups with different abilities through supporting football development.

The AFC, CAF, CONCACAF, CONMEBOL, OFC, and UEFA are other football confederations which govern and promote football in their regions. They implement a linkage between FIFA and their member associations on compliance with rules and regulations set forth. UEFA together with the Club Financial Control Body (CFCB) in Europe ensures control of financial regulations applied within European football to ensure unison of European soccer regulations with the rest of the world.

The National Football Association (NFA) is an apex body in a country that forms rules, promotes, and develops sports. The key objective of NFA football is to uphold access by all persons and maintain fairness and security within the sport. The national leagues are organized by the NFA to control youth football development for investments purposes or rising stars. Collaborative efforts between both clubs, players, with other stakeholders in society guarantee effective national leagues formation by an NFA. NFA's role is to represent the nation in international events like World Cup and

cooperating with other nations in promoting the game globally. Cooperation can assist in the sport expansion and guarantee its lasting triumph for upcoming generations. To sum up, fortunes of a country football depend heavily on the role played by National Football Association of that particular country.

The Italian National Olympic Committee (CONI) was formed in 1914 to oversee and develop sports activities in Italy. It is the governing body responsible for organizing sports in Italy, working together with other bodies aimed at promoting fair play and safety of operations. CONI arranges international competitions, supports athletes and trainers, finances equipments, installations, training programs, facilities as well as competitive opportunities. Also it governs and promotes football in Italy for fair and safe game.

Football in Italy is managed through the Federazione Italiana Giuoco Calcio (FIGC) that regulates league management, promotes youth development, as well as representing Italy at the international level. The role of managing football in Italy has been playing by the Federazione Italiana Giuoco Calcio (FIGC) that regulates league management, promoting youth development, and also representing Italy at the international level.

In 2006, the Supervisory Commission on Football Clubs (CoVi.So.C) was created to monitor and regulate professional football club financial management in Italy. Its aim is to ensure financial fair play, transparency, and that clubs do not accumulate unsustainable debts. These activities help in improving the economic and financial health of Italian football generally by averting spending practices that are not sustainable. Through CoVi.So.C., there has been a great improvement in how much risk clubs can pose for malfeasance as well as corruption due to poor financial management. Generally, FIGC and CoVi.So.C. have very important roles to perform regarding promoting and regulating sports in Italy.

In 2010, UEFA introduced the Financial Fair Play (FFP) rules for European football clubs to maintain sound finances. They require balances expenses and revenue for three years that include player transfers and wages, as well as maintaining precise financial records. Clubs must also submit these records regularly at UEFA since them to meet FFP standards.

The rule of breakeven is important in maintaining the financial stability of clubs as it will not allow the club to expend more expenses than its earnings. The rule promotes a financial equilibrium among clubs by limiting their operations up to which they can only afford without depending on wealthier owners. It also provides an equal opportunity for every team on a plane playing ground, thus stopping wealthy clubs from totally overpowering smaller ones and gives little teams a chance at winning.

No less an important part of the FFP regulations is a club's lack of overdue payables, which safeguards them from indebting and becoming financially sick. A club with many outstanding arrears may be unable to meet its financial liabilities thereby damaging sport overall reputation in this way.

The Voluntary and Settlement Agreements are fundamental in maintaining football clubs' financial status. These agreements help the club deal with its problems without formal disciplinary procedures, thus safeguarding its

finances and continued participation in professional football. The Voluntary and Settlement Agreement provides that both clubs need to come together with UEFA so as to develop a plan which will cater for the state of finance at the club while letting it meet FFP regulations. This act allows an easy set course as well as guarantees the club lasting fiscal steadiness.

In conclusion, Financial Fair Play regulations have considerably augmented European football clubs' financial performance by shielding them from further severe blows induced by distress caused by COVID-19 measures.

Chapter II of the Italian Football Industry details financial sources for five leading clubs, that is Juventus, Roma, and Lazio from 2018 to 2022. A company's well-being analysis can be defined through different analyses such as statement analysis, profit and loss analysis cash flow as well as ratio analysis. The chapter also gives equity and debt financing in football clubs with particular emphasis on their regulation and COVID-19 pandemic effects. Equity financing forms may include private ownership as well as fan ownership or public listing. UEFA sets out Financial Fair Play regulations and Ownership and Control aimed at ensuring financial stability among clubs as well as equitable competition. Lastly, the chapter discusses how the new UEFA regulations have influenced the Salary Cap model. The chapter concludes by discussing the financial impact of Covid-19 and regulation over equity and debt financing in Italian football industry.

Debt financing is an essential element of football clubs' finances, enabling them to finance operations or investment activities against an agreement to repay the principal amount along with interest incurred. Debt can be of various types like bank loans, bonds, and player transfer debt among others. Regulatory agencies govern this method of financing so as to bring stability by avoiding extreme risk-taking measures. With this, the financial implications of COVID-19 on football clubs have been pronounced as ones that would reduce revenue through equity financing challenges and enhanced debt financing. The pandemic also eased temporary financial regulation to make it easier for the clubs' access finance with limited adherence rules during that period especially UEFA's FFP rules. The new UEFA sustainability regulation makes provision for long-term investment in infrastructure, youth development projects that can ensure sustainable future growth without penalties. On this note, the report examines AC Milan finances and asset performance from 2018 up till 2022 emphasizing diverse source of finance and stricter supervision regulations.

AC Milan underwent a hard time between 2018 and 2020 as operating profits went down while the losses surged upwards. However, the club posted positive financial indicators in 2021 and subsequently in 2022 with increased operating revenues accompanied by reduced losses. The equity of the club appreciated to around 72,5% from 2018 to 2022 while other shareholders' funds improved significantly. Operating revenue fell from €249.6 million in 2018 to €188.9 million in 2022 majorly due to diminished matchday and commercial revenues. Broadcasting revenue decreased to €76.5 million in 2020 from €109.3 million in 2018, while commercial revenue amounted to €119.2 million in 2022. Sales were subject to yearly changes but rose again to €32.5 by 2022. AC Milan's financial loss increased to €29.8 million in 2020 due mainly to the increase of interest expenses. The employee costs have risen and reached €170.2 million, and depreciation and amortization dropped further down at €76.4 million for the year ended 2022. AC Milan

suffered a net income loss amounting to €66.5 million in 2022.

AC Milan is also judged on its profitability, liquidity, as well as solvency via ratios derived from finance reports that indicate their performance stability over time. The club's operating profit margin decreased from -39.6% in 2018 to -98.7% in 2020, indicating a poor financial performance. However, it improved in 2022 by managing the expenses efficiently and increasing operating revenue. The club's current ratio and quick ratio improved, indicating that the club can meet the short-term obligations. The debt-to-equity ratio and equity ratio also showed massive changes. The COVID-19 pandemic affected AC Milan's financials significantly where a decrease of 24.3% occurred on turnover while an operating profit fall was witnessed. However, between 2018 and 2022, there is an improvement in terms of AC Milan's equity position since shareholders' funds increased. Long-term debt and short-term loans have increased, while the club moved towards reducing financial leverage. The ownership structure of the club as well as bond issuance also impacted over the club's financial position due to more disciplined in financial approach under Elliott Management.

According to its reported financials from 2018 to 2022, total assets, liabilities, and equity showed a declining trend for AS Roma. Total assets of the club went down from €476.7 million in 2018 to €363.2 million in 2022 since fixed assets decreased attributed to player acquisitions going down and focusing more on youth development and academy players. There has been a 17% increase in liabilities from €342.2 million as at 2018 to €460.3 million as of 2022 with long-term debt increasing from €228.6 million in 2018 to €273.5 million in 2022. Shareholders' funds of AS Roma indicated a negative balance and doubts their financial positions. The income statement demonstrated a very high increase in operating revenue, with player salaries and transfer fees just increasing slightly above 3.8%. However, the net income for the club declines due to fluctuating revenues, upwardly biased operating expenses, as well as non-operating expenses.

AS Roma cash flow analysis between 2018-2022 exhibits decreasing operating income while failing to manage its working capital. Even after the investment in infrastructure, youth development, and acquisitions of players, cash inflows from these activities declined. However, financing activities for this club registered a higher flow of cash due to external financings. Financially, the gross profit margin declined while operating margin also diminished with net profit margin tending towards negative performance. This current ratio and quick ratio improved but the debt-to-equity ratio and equity ratio fluctuated over time. The COVID-19 pandemic threatened AS Roma's financials as revenues reduced at an increased rate compared to losses that increased leading to weakened ratios. Long-term debt and bonds were among the different applied sources of debt financing in the club. Financial stability in a company is limited by how operating activity challenges interact with investment, as well as financing strategies.

Even though FC Inter occasionally sold its ownership stakes to major investors, a decline is still evident from 2018 to 2022 of equity funds based on AS Roma and FC Internazionale Milano's financial statements. In summary, between 2018 and 2022, it declined its equity funds from €105.4 million up to €340.3 million while FC Inter total assets rose by €97.2 million. Fixed assets decreased by 13.21% while current assets decreased by 34.29%. The total liabilities of FC Inter reached an all-time high in 2022, which was

€871.1 million as a result of increased provisions for risks and charges. Current liabilities reduced by 8.42%, with shareholders' equity reducing from €87.8 million in 2018 to -€86.6 million in 2022. The club's financial position shows that the same is bedeviled by a huge weakness hence losses made during the period under review are clear when looking at the club's balance sheet statements.

FC Inter's financials for 2018-2022 revealed a growth of 21.2% in its revenue and expenses, with total revenues amounting to €439.6 million. Top contributors to club revenues included selling broadcasting rights, tickets, sponsorships, and merchandising. The growth was driven by an improvement in the performance of the team and consistent qualification for the UEFA Champions League. Expenses increased by 72.5%, with player salaries and transfer fees being most significant. Net profit grew from €63.3 million to €140.1 million owing to efficient management coupled with an increase in investment in strategic areas as opposed to direct sales promotion. Cash flow analysis indicated that there had been a rise in operating activities by 51.7%, net outflow decrease by €22.6 million, and financing activities reduction indicating self-sustained growth for the period under study

Calculation of financial ratios that include profitability, liquidity, and solvency can then be used to assess FC Inter's financial performance as well as stability. Gross profit margin, net profit margin, and return on assets (ROA) for the club have all decreased, indicating a decrease in revenue generating capacity. The current ratio and quick ratio have also decreased, indicating weak short-term financial stability. Debt-to-equity ratio and equity ratio for the club have also worsened, indicating the potential for facing difficulties financially. Covid-19 has had a major impact on FC Inter due to reduced matchday revenues as well as television schedules being interrupted. Despite Covid-19 challenges experienced by the club, they were able to increase broadcasting revenues to around 22% while commercial revenues increased by approximately 27%.

FC Inter used different types of debt financing mechanisms to finance the spending on operations and investments from bank loans to issue bonds. Equity financing was used with a vision to support growth targets and mobilize funds. The club implemented several capital increases through rights issues but in some cases, also realized sales of major ownership stakes. Such a mix of financing sources led to financial stability while maintaining growth during the outbreak of COVID-19 for the club.

Juventus FC's finances and assets between 2018 and 2022 depict a growth in fixed assets, liabilities, as well as equity. As such, the company's fixed assets grew from €619.3 million to €714.7 million over the years under review whereas liabilities increased by 8.5%. Shareholders' funds also rose up from €72.0 million in 2018 to €169.4 million in 2022 pointing towards enhanced retained earnings over the years.

The income statement of Juventus FC showed increased operating revenue from 2018 to 2019 by a growth of 23.1% and decreased expenses. The net income still remained negative, reducing further to -€89.6 million in 2020, -€209.9 million in 2021, and -€254.3 million in 2022.

Juventus FC cash flow analysis indicates reduced receipts from customers and investments involving player registration as well as PPEs. Besides, the club's net cash flow from investing activities deteriorated to -€200 million as

at 2022 compared to -€94 million which implies increased investment and reduced inflow of funds when players are sold out. Borrowings increased under financing activities, while the issuance of shares and equity instruments registered €10 million lesser in 2022. The club's negative net profit margin reveals problems on profitability, especially brought about by insufficient revenues that cover costs. The increasing dependence on debt sourcing for funding obligations raises financial risk as shown by its liquidity ratios such as current ratio, quick ratio, and debt-to-equity ratio. Enhanced operating cash flows and better investment deployment can make Juventus FC more financially sustainable.

The COVID-19 pandemic affected the financial performance of Juventus FC as operating revenue reduced by 16.2% in 2021. The club's net income dropped from €89.7 million in 2020 to €209.9 million in 2021, representing a drop of €299.6 million fall. Juventus FC sourced for debt financing for its operations and investments from various sources since non-current liabilities grew by 28.7%, with long-term debt increasing by 17.5%. In 2019, Juventus FC placed a €175 million bond issue to reduce borrowing costs diversify funding sources. From 2018 through to 2022, Juventus FC pursued equity funding to support the expansion plan and raise funds.

From the financial analysis of SS Lazio from 2018 to 2022, it is evident that assets have been on the rise with liabilities reporting mixed performance while equity has seen fluctuations. The club continued improving the financial position so as to fit in a dynamic football industry environment. As far as debt financing was concerned, it allowed the company to diversify funding sources and minimize borrowing expenses.

From 2018-2022, revenue and expense for SS Lazio increased. Income grew from €178.5 million to €119.8 million. This growth was mainly attributed to the matchday tickets, broadcasting rights as well as sponsorships cash inflows. Operating profit went up by 50% since expenses also rose due to player wages, transfer fees and operating costs. The club experienced a spike in net profit by 40%. In terms of cash flow analysis, there was an increase of 47% in operating cash outflows from core operations while investing cash outflows rose by 25%.

The financial health position of SS Lazio, a football club, is found to be quite stable in which €5 million and €3 million net cash inflows have been maintained in 2018 and 2022 respectively. The ratios unveiled that the gross profit margin remains at a constant level; however, return on assets is moderate while the net profit margin was found to be 8.4%. Both current ratio and quick ratio are healthy enough revealing the liquidity position of the club. Debt-to-equity ratio and equity ratio are 0.4 and 0.6 respectively. Due to COVID-19, many financial implications have suffered as ticket sales were drastically reduced and sponsorship and advertising revenues also decreased along with merchandise sales. However, with these challenges, SS Lazio has shown resilience and steered through the pandemic towards a good financial performance. Profitability and liquidity ratios at the club have even increased to what was obtained in previous years. The only concern remains that of its debt-to-equity ratio which is showing high leverage.

The comparison across five Italian football clubs highlights that there needs to be a good financial management and strategy for them so that they can sustain their journeys ahead. Revenues from match days, broadcasting

revenues, commercializations for these clubs have changed significantly over the last five years. FC Inter also exhibited revenue fluctuations with a noteworthy increase of the same in FY18 but declined to below €100 million in both FY20 and 2022. Juventus consistently recorded the highest revenue among the five clubs, notably increasing during FY21. AC Milan's financial performance showed an enormous surge of total revenues from €192 million in FY20 to €324 million during FY21 while matchday and broadcasting displayed a declining trend. Data for FY22 is however not available hence limiting a comprehensive assessment of the club's financial performance.

Lazio, Inter, Milan, Lazio, and Roma too have greatly fluctuated their revenue streams over the last half-decade. The revenue of Lazio rose from €104 million in 2018 to €712 million in FY20, having been boosted by a surge in commercial earnings. The club's financial earnings on game days remained constant, while the receipted sum of broadcasting fluctuated. AS Roma encountered a decrease in revenue from €220 million in FY18 to €120 million in FY20 but soared to €163 million in FY21. Matchday revenues suffered following the COVID-19 pandemic, with some clubs making partial recovery for FY22. Revenue collected through broadcasting also showed fluctuations due probably to changes effected domestically and internationally regarding competitions. Knowledge of these trends could be used by various clubs to design strategies towards stability and growth financially.

The analysis of wage expenses in some top Italian football clubs over the period between 2018 and 2022 manifests various trends and fluctuations. Inter, Juventus, Milan, Lazio, and Roma recorded considerable year-over-year surges in wages from FY18 to FY19 probably due to competitive pressures or a lure for lucrative talents. The highest wage expenditure among the five clubs was by Juventus while the lowest was the Lazio case. Most of the clubs also experienced their largest year-over-year falls in wages later on as reflected between FY20-FY21 and FY21-FY22 probably due to economic constraints, management tactical adjustments, or demand for fair sharing out of monetary resources. In aggregate, the wage expenses of the five clubs reached their peak in FY19 and reduced significantly over time with a maximum YoY decline taking place between FY21 and FY22.

The financial stability of football clubs is key, and the levels of debt help evaluate the financial health. The net debts for the top five Italian football clubs over the past five years have shown remarkable increases in values, with Inter's increasing to €246 million in 2021. Juventus has deteriorated its debt position while Milan's value has decreased by 2022 to stand at €67 million. Lazio has maintained a low debt position while Roma's latest figure was found out to be €219 million. The new UEFA Financial and Sustainability Regulations are intended to build on the previous Financial Fair Play system that requires clubs to adopt business models and forecasting lines that fit their available finances.

The other regulations will be due to apply in the 2022–23 season, namely the UEFA Financial and Sustainability Regulations approved on April 2022. It has three main pillars for club monitoring: Solvency, Stability, and Cost Control. The first mainly focuses on making timely payments to employees, other clubs, as well as tax authorities; while the second introduces a football earnings rule that evolves from break-even. Its third pillar is one of reducing excessive spending especially on player wages, agent fees as well as transfer

costs among others called Cost Control. In order to regularize team management costs with a limit of coaches' salaries plus players' salaries plus transfers plus agents' commissions (SCR) amounting to 90% of the club's revenue introduced a regulation called Squad Cost Rule. The regulations would encourage financial solvency, stability and cost control in European football encouraging better financial planning, equity management and long-term stability.

This chapter investigates the concept of salary caps within European football through a threefold analysis; NBA, Liga and Serie B. Salary caps refer to regulatory provisions that establish the boundaries for spending by sports team on player salaries with an aim to maintain competitive balance and costs across different leagues. The method used to calculate the salary cap varies between leagues with NBA using a percentage of projected revenues while MLB uses luxury tax. UEFA financial sustainability regulations see the salary cap as important since it helps in aiding clubs to balance spending with revenues for benefits of every stakeholder involved. Recent research on the effect of the salary cap in European football indicates that it has affected competitive balance within some of the European football leagues, outlining the difference between volume and quality of playing opportunities for home-grown players from one nation to another.

Application of the salary cap in non-closed leagues like European football can be more complex due to stability of teams and promotion and relegation system. The NBA has a unique salary cap system allowing at times going over the cap through Bird Rights, Mid-Level Exception, Rookie Exception, and Minimum Player Salary Exception. The cap is set as a part of the league's Basketball Related Income (BRI), which includes revenues from selling tickets, broadcasting rights, and merchandising. The salary cap model has been investigated and debated with some stated it to increase competitive balance and others stating that it restricts the mobility of players while capping their earnings ceiling for stars of the leagues. There are further scopes of research work in order to completely understand how far the effects or benefits lie in case of non-closed leagues.

The system of salary caps in NBA can be seen playing an important role in team building strategies because it makes payroll management coupled with maintaining sensitivity towards the future seasons. It has, however, been criticized as it restricts the player's movement and may interfere with competitive balance. The salary cap system is not static and can be revised by new CBAs thereby affecting a league's economic and competitive balance. In Italian football, the Serie B salary cap has successfully maintained financial stability for clubs and ensures debt payment. It caps according to a ratio with turnover where total gross emoluments plus production value of clubs cannot exceed 70%. It encourages medium to long-term projects embarked on by clubs and ensures that payment deadlines are complied with together with debts incurred.

The salary cap of Spain's top-flight league, La Liga, has had a huge effect on clubs' financial strategies and competitive dynamics. For instance, Real Madrid and Barcelona enjoy a higher cap while smaller clubs have moderate caps. In the 2022-23 season, Real Madrid stands at the top pack with €683.462 million while FC Barcelona comes in second place with €656.429 million. It has also led to lawsuits, for example when Barcelona sued La Liga after the federation refused to increase their salary cap by 15%. Despite its downfalls, the salary cap system has advantages such as preventing overspending, creating a competitive balance, ensuring sustainability,

avoiding wage inflation, and promoting financial fair play. Predictive models can assist teams in managing their finances within the salary cap by enabling them to predict future player performance, evaluate contract value and allocate resources.

Linear regression is a statistical method that predicts or models a response variable such as sales or stock prices. Linear regression deals with a linear model with n observations representing a random sample from a larger population. It is mathematically easily understandable and manageable but has been used because it often provides quite an adequate representation of reality. The least squares criterion is employed to estimate unknown parameters, which are chosen to be values that minimize the mean of the observed data. The least squares coefficients have particular precise meanings, such as the estimated expected increase or decrease in the response variable associated with a unitary increase of the explanatory variable and the estimated expected value of the response variable when the explanatory variable is zero.

Least squares regression is an analytical method used to make estimation about the relationship between two variables. It has been structured on certain assumptions concerning data, such as that errors are uncorrelated with each other, variance of error being constant, mean of errors equaling zero, and errors being normally distributed. To evaluate the strength of the relationship observed with regression, the total corrected sum of squares can be used. A good regression is associated with a high R^2 , which measures the proportion of variability in y explained by the regression. Multiple regression is a generalization of simple regression when there is more than one explanatory variable. There are two types of immediate interest hypothesis tests: one for the overall significance of the regression and the other for the mean of squares of regression.

This study proposes a quantitative method to determine soccer players' salaries based on their skills. The method applies the multiple regression model to a sample of 499 Serie A players for the season 2022-2023, divided into three macro-categories (Defenders, Midfielders and Forwards). The method focuses on the performance and skills that are directly related to game. It aims to help in the context of salaried negotiations by players and quantitative analysis regarding salary relationship with player performance. Also considered in this study is wage inequality in relation to coaches' decision since it's not dependent on how the player performs in the field as he receives his pay.

This paper uses the multiple regression methodology to analyze soccer players' salaries and their performance and skills. Data samples are used to deduce a model which is tested for validity through a prediction comparing the model's predicted values against actual values and measuring the model's accuracy in predicting real samples. Statistical significance evaluates on how variables affect with an F-statistic test checking overall significance of the model and R^2 and Adjusted R^2 values judging its performance.

To ensure the validity of the assumptions behind the regression model and ensure the reliability and interpretability of the results, a series of tests are conducted. These tests include the Shapiro-Wilk Test, Q-Q Plot, One Sample T-test, Breusch-Pagan Test, Durbin-Watson Test, and Variance Inflation Factor (VIF). A stepwise regression in R is then used to assess the reliability of each variable.

A predictive analysis of 19 independent variables to predict the log-transformed gross salary for soccer players was done. The model had 19 predictors, from 'Goals per 90 min' through to 'Conference_L'. The dependent variable is the annual gross salary for 167 Serie A defenders. Statistical significance tests if a variable has an effect that is unlikely to have been observed by chance. Clean sheets per 90 min, Champions_L and Europa_L were significant. The model explained variance in the gross salary was at 45.78% but there are spaces for improvement. Involvement of diagnostic tests was Shapiro-Wilk Test, Q-Q Plot, Mean of Residuals, Homoscedasticity, Autocorrelation and Multicollinearity. Selection of features with the stepwise regression using the Akaike Information Criterion (AIC) to compare between models. It removes variables with degrees of freedom as well as squares sum of residuals and AIC values. The model is then predicted with confidence interval promising parsimony while maintaining its explanatory powers.

Continuing with the analysis, 205 midfielders were considered. The analysis shows log-transformed gross salaries of soccer players using 10 predictors from AIR statistical model reveals negative relationship existing between tackles per 90 minutes and salary. Big chances created per 90 minutes show that it is positively related to high salaries while participation in the Champions League and Europa League also results in positive associated with salaries. Minutes played show that its effect on salary, thus indicating that longer players in the field tend to earn higher salaries. The R2 adjusted for the model is 0.4362 and explains about 43.62% variation existing in gross salary. Diagnostic tests reveal normality of residuals, mean of residuals, heteroscedasticity, autocorrelation as well as multicollinearity problems.

In the present study, stepwise regression was used to select predictors for a model and reduce their number to the least. Factors considered in the final model were successful dribbles, tackles, interceptions, big chances created, participation in Champions League and Europa League together with minutes played. The value of AIC on the final model was -30.53 which showed that this is a better-fitting model including less features. This model uses confidence intervals when making predictions so an estimate is being provided regarding 205 midfielders' annual gross salary at Serie A level.

Ending with forwards, this study presents the model to predict annual Gross.Salary for 127 forwards in Serie A. The performance metrics include Goals per 90 minutes, Successful dribbles, Total shots, Big chances created, Minutes played, Champions League, and Europa League as the 10 predictors. There is a statistical significance of a few variables like Goals.per.90.min, Successful.dribbles.per.90.min, Total.shots.per.90.min, Big chances created per.90.min, Minutes.played, Champions.League, and Europa.League. Model with good adjusted R2 value explains around 67% of variance in log-transformed "Gross Salary". The normality of residuals Q-Q Plot and Residual Mean Heteroscedasticity Autocorrelation Multicollinearity diagnostic tests are satisfied. Stepwise regression feature selection in R was then done giving a final model with an AIC equal to -72.96, this includes variables such as Goals scored per 90 minutes, Successful dribbles per 90 minutes, Total shots taken per 90 minutes, Big chances created per 90 minutes, possession lost per 90 minutes, total number of minutes played and participation or non-participation in the Champions League/Europa League.

The data from the experiments were collected on sofascore.com, a website providing information about each soccer player's performance and abilities. The salary taken as the unit of remuneration is the gross remuneration as negotiated between the soccer club and the player's agent, not including any other possible source of income for the player.

The Squad Cost Rule (SCR) was applied to the financial statements of 20 Serie A clubs, aiming to establish a direct correlation between revenue and costs. A goal seek function was performed in Excel to modify the SCR to bring it to 90%, resulting in a lower new gross salary for 10 clubs with an SCR greater than 90%. This could force clubs to drastically reduce salaries of players currently in the squad or even not pay their own players for their performances.

This paper looks at the financial landscape of Serie A clubs that comprise Inter Milan, Juventus, AC Milan, Lazio, and Roma. It looks into revenue streams vis-à-vis cost structures and debts among these clubs. The study further investigates player salaries as well as salary cap visions with respect to UEFA governance.

Research indicates that revenues for Serie A clubs come from matchday sales, broadcasting rights, and commercial partnerships. Diversification in terms of sources cushions volatility thereby enabling investment in new ventures. However, financial volatilities coupled with external factors such as economic slumps and COVID-19 have reduced matchday sales thereby casting doubt on the fiscal viability for a majority of the clubs.

Cost management of rising player salaries is a significant issue, with clubs considering player wages as the biggest portion of their aggregate expenses. Quantitative metrics can help control costs by linking elements associated with a player's performance, skills, and game-related factors with their salary.

The financial landscape of Serie A and European football is a complex equilibrium between revenue management, cost structures, debt levels, and regulatory constraints. Emerging data analytics offers prospects for objectivity and fairness in player salary negotiations. Regulatory mechanisms like the Squad Cost Rule (SCR) or potential salary caps could play a crucial role in providing essential tools for financial stability and competitive balance.

In the ever-changing world of football, prudent financial management and effective governance alongside judicious decision-making using big data are necessary preconditions for long-term success and sustainability of the game's clubs.