CFO's Intellectual Capital and its Relationship with Financial Performance, An Analysis of Companies Listed on the Stock Exchange (BOVESPA)

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Article

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Summary: In a business environment that is constantly changing, intellectual capital stands out as the most valuable asset for companies. Those who invest in developing their employees, especially their Chief Financial Officers (CFOs), tend to outperform their competitors. This study explores the relationship between the intellectual Capital of CFOs and the financial performance of companies listed on B3. The 100 companies with the largest capitalization listed on B3 in 2022 were analyzed, with available data on the CFO. A statistical model was applied in a *cross-section analysis*, considering two of the three subdivisions of Intellectual Capital: **Human Capital (**experience, education, and certifications) and **Relational/Social Capital (**network and reputation of the CFO). The results indicated a statistically significant relationship between CFOs' Human Capital level and the performance of the companies they manage, measured by EPS, ROA, and ROE. However, no statistical significance was found for Relational/Social Capital. This study contributes to the literature on intellectual capital and corporate finance in the Brazilian context, providing new evidence on the importance of CFOs' intellectual capital for company performance. It was observed that there are few equivalent studies in Brazil on the topic, especially about the Intellectual Capital of CFOs of companies listed on the stock exchange (BOVESPA).

Keywords: Financial director; Intellectual Capital; Financial Performance; Share Capital; CFO

1. Introduction

In a world in constant transformation, companies face an increasingly uncertain and competitive scenario. To stand out in this challenging environment, human and intellectual capital becomes the main differentiator for organizations' success.

Pimentel (2020) argues that, through actions such as aligning the interests of employees and employers, creating more welcoming and collaborative environments, and offering training, the company achieves better performance through a team committed to organizational objectives and engaged. The author states that human and intellectual capital, made up of employees' skills, knowledge, and experiences, is a crucial differentiator for companies to stand out in the market. Developing this capital through strategic actions is essential to achieving superior performance.

In contemporary companies' dynamic scenario, the chief financial officer (CFO) plays a fundamental role as a pillar of strategic and sustainable management. Its *expertise* encompasses supervising all financial operations, from meticulous cash flow management to preparing accurate and transparent financial reports. His functions go beyond mere accounting; he formulates financial strategies that boost the company's growth and competitiveness, building long-term plans, controlling the budget, optimizing resources, and ensuring the company's financial health.

The CFO often serves as a financial advisor to the CEO and other executives, providing valuable information for strategic decision-making. They are fundamental to the financial stability of companies, especially in periods of economic adversity, such as during the COVID-19 pandemic. The CFO is a "maestro" of financial management, leading the company to a scenario with lower risks and better returns.

Coleman (1990) refers to the social resources accessible to individuals through their relationship networks. In the context of companies, social capital can be defined as the sum of intangible resources that derive from the quality of relationships between stakeholders (shareholders, employees, customers, suppliers, community) and the organization itself.

In an increasingly competitive business environment, CFOs' intellectual and social capital emerges as a strategic differentiator for companies' success. This study examines the relationship

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between CFOs' intellectual and social capital and the financial performance of the organizations in which they work. The study also involves analyzing financial data from the top 100 companies listed on B3 in the year 2023, correlating them with CFOs' CV information obtained through LinkedIn and on the companies' own websites.

This work is organized into the following chapters: theoretical review and formulation of hypotheses, methodological approach, analysis of results, conclusions, and, finally, the list of references.

2. Theoretical Foundation

2.1. Intellectual Capital

Sousa (2021) defines intellectual capital as an individual asset resulting from the combination of genetic factors, education, life experience, and professional experience. The author recognizes that other authors associate intellectual capital with the individual's knowledge and social capacity.

In 1969, in his book "The New Industrial State," John Kenneth Galbraith was the first to coin the term "intellectual capital." More than just "pure intellect," Galbraith introduced the notion of "intellectual action" as a fundamental component of the concept. This innovative perspective highlights the dynamic nature of intellectual capital. This suggests that intellectual capital is likely a dynamic, not a static, form of Capital (Sucena et al., 2021).

Intellectual capital, often described as the knowledge incorporated into the organization, is a recognized asset that generates results when applied based on stored data, information, and methods. It symbolizes the value of the brand, the company's collective intelligence, and a collection of experiences, knowledge, information, and intellectual property (Novaes, 2021).

In the constantly evolving business world, intellectual capital emerges as a crucial strategic asset for companies' success and sustainability. Wuitschik et al. (2022) define intellectual capital as a set of intangible resources that, when managed effectively, generate a competitive advantage in the market.

According to most economists, intellectual capital, a set of intangible resources that reside in an organization, plays a crucial role in economic activity. Puzynya et al. (2022) corroborate this view, highlighting how intellectual capital improves the organization's operational efficiency and competitiveness in the market. In recent decades, researchers from different areas have contributed to developing intellectual capital categorization models. The most widespread approach in the literature divides intellectual capital into two or three elements (Dzenopoljac et al., 2017). The most cited elements of intellectual capital are three: Human Capital, Structural Capital, and Relational Capital (Feil, 2020; Ficco, 2020; de Castro; Correia, 2022; Sousa, 2021).

The study conducted by Carvalho et al. (2017)revealed that employee investments are associated with a positive slope in a company's market value. This finding suggests that developing and improving human resources within a company can significantly impact its financial position and investors' perception of it. Therefore, strategies that promote employee growth and empowerment can benefit organizations' long-term success.

The study by Pew Tan et al. (2007) entitled " *Intellectual Capital and Firm Performance* " is a landmark in the literature on the subject. The research provides robust empirical evidence demonstrating the positive relationship between intellectual capital and companies' financial performance. However, according to the study, the contribution of intellectual capital to company performance varies from industry to industry.

Research by Salehi et al. (2023)determines that increasing the quality of intellectual and social capital improves the use of human resources, the control system, innovation, and company performance. Their study indicates that intellectual and social capital growth will mitigate internal control vulnerabilities in the long term.

2.2. Human Capital

capital Faria et al. (2023)refers to the accumulation of knowledge, skills, and competencies that individuals obtain through education and training. These attributes are vital to economic and social progress as they enable individuals to reach their full potential and contribute to society.

Bertolami et al. (2018) say that human capital is the set of individual skills and competencies that influence the ability to run a business successfully. These skills and competencies are acquired throughout life through education, training, experience, and other factors, reflected in a high capacity

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to adapt to environmental changes. He states that individuals who have a high level of education have a more remarkable ability to solve and manage problems, in addition to being able to visualize solutions and resources more quickly and identify new business opportunities.

Over the last decade, human capital has gained increasing importance for organizations. In some instances, it may even exceed the value of tangible resources, such as physical infrastructure, financial assets, and existing technologies. This is because human capital is a problematic resource to replicate or codify. It encompasses an individual's set of skills, competencies, innovation, and knowledge, allowing professionals to perform more complex tasks with greater efficiency and quality (Bortoluzzi et al., 2018).

Regarding the importance of intellectual capital within organizations, Beyer e Diaz de Vivar Soler (2019) provides an in-depth analysis of the importance of human capital as a foundation for the success of organizations. The centrality of human capital lies in its direct impact on the company's financial performance and value, boosting the organization's competitiveness and reputation in the market. Thus, the company can achieve more productive and innovative results, thanks to each employee's performance and skills; this issue influences the company's competitiveness in the market and its relationship with *stakeholders*.

Second, according to Silva et al. (2021), the desired professional profile involves employees who, in addition to the skills necessary to perform their duties, can manage their time effectively and are prepared to solve daily problems. This may require investments in training, which are only sometimes carried out. For him, it is essential to remember that although a machine can sometimes perform a better function than a human being, it is limited to what has been programmed and cannot think or renew its processes.

2.3. Structural Capital

Feil (2020)describes structural capital as knowledge encompassing databases, patents, manuals, systems, experiences, management, and organizational culture. It is linked to organizational capacity and the systems and *software* used to store, organize, and present intellectual capital, among other aspects. This entire infrastructure serves as support for the process to be carried out by human capital.

Gimenes et al. (2019)states that structural capital manages the company's processes and can help employees adequately develop their intellectual performance, consequently improving the company's overall performance. An organization's structural capital can be quantified and, therefore, integrated into the company's assets and sold, which is not possible with human capital.

Nicoletti et al. (2023), based on Edvinsson and Malone, classify structural capital into three main categories. Organizational capital encompasses investments in tools, systems, and operational culture, resulting in systematized competence. Innovation capital highlights the ability to innovate and obtain results, including intellectual property and other intangible assets. Finally, process capital covers training that guides employees to improve efficiency and performance. Structural capital, exclusively owned by the company, is easily monitored by managers, and its primary function is to accumulate reserves of knowledge that support the work valued by customers and facilitate the exchange of information and knowledge within the company.

Thus, Nicoletti et al. (2023) state that the firm's structural capital can be its backbone, as it encompasses all the elements that help organizations create value. This includes administrative Planning, organizational capacity, control systems, processes, culture, and functional networks. These resources are significant for companies, who must ensure that these assets continue to add value and not stagnate or decline.

2.4. Relational Capital and Social Capital

In his study on the influence of intellectual capital in technology parks, Luiz et al. (2022) wrote that relational capital is the set of relationships that the company has with other organizations and people, such as customers, suppliers, and partners. It is essential to the company's success, allowing it to access resources and information, reduce costs and risks, and increase customer satisfaction.

Social Capital and relational Capital are two concepts that are closely related but have some important differences. Social capital is a broader concept that refers to all social relationships between individuals and organizations. It can be divided into three dimensions: reputation, collaboration, and

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sharing. Relational capital, on the other hand, is a more specific concept that refers to the social relationships between individuals and organizations (Claridge, 2018).

Relational capital is considered an organization's most valuable intangible asset, as it refers to the sequence of relationships with individuals and companies to whom the organization sells its products and services. It is associated with the organization's ability to interact with the market, covering all relationships established with customers, consumers, intermediaries, suppliers, partners, owners, and creditors. It is the entire period in which employees dedicate themselves to working for customers, time potentially focused on maintaining, creating, and developing relationships(Scantamburlo et al., 2018)

In their study on the determining factors in the *disclosure* of the intellectual Capital of Brazilian companies, Santos et al. (2022) state that relational capital includes relationships with the external environment, encompassing all intangible assets that guide and direct relationships with customers, suppliers, and other interested parties. It is the flow of knowledge between different stakeholders through the transfer of learning, group interaction, and information that circulates through networks. In other words, it is an intangible asset based on creating and maintaining relationships with individuals, groups, and organizations that impact the business.

Fernández et al. (2021) propose a division of relational capital into three dimensions: individual, objective, and collective. The individual dimension refers to the knowledge that members of the organization have about their external interlocutors, such as customers, suppliers, competitors, partners, etc. The objective dimension concerns the organization's knowledge of its target audience, such as its products, patents, brand, reputation, etc. The collective dimension encompasses the knowledge that the organization develops internally, differentiating it from others, such as its processes, methods, values, culture, etc. According to the authors, each dimension of relational capital influences and is influenced by the others, creating a positive feedback cycle.

Santos (2022)considers that relational capital is a source of competitive advantage that goes beyond the limits of business boundaries and is based on relationships. In other words, relational capital focuses on long-term, partnership-based relationships that develop trust, respect, and reciprocity over time, facilitating cooperative behavior and reducing transaction costs.

The study by Leis and Cavalcante (2019) offers a comprehensive analysis of the concept of social capital, highlighting two main currents: economic and sociological (headed by Bourdieu).

Santos et al. (2021) state that social capital is the ability of individuals and groups to amplify their individual and collective gains through networks and lasting social connections in social structures. These gains are distinct from those arising from economic or cultural capital.

The sociological current defines social capital as a resource that can generate social benefits. Bourdieu (1986) defines social capital as "the set of durable resources obtained through membership in a network of social relationships." Social capital can be used to obtain advantages, such as access to opportunities, protection against risks, and promotion of social identity.

Leis and Cavalcante (2019) state that two schools of thought on social capital have different focuses and emphasize different aspects of the concept. The economic current emphasizes the role of social capital in promoting economic development, while the sociological current emphasizes the role of social capital in promoting social cohesion.

Bourdieu (1986) sees social capital as a product of history, which materializes in relationship networks, allowing social actors access to cultural and economic capital. In this context, social capital can be seen as a resource intended to achieve specific objectives, which may be economic. However, Bourdieu (1986) considers social capital in its relationship with other forms of capital, mainly economic capital, without reducing social capital to economic capital.

Social capital results from the interaction between organizations and their partners, which generates mutual benefits based on trust and cooperation. Relationship networks are a key element of Social Capital, which managers can build through social skills. Social capital can provide various resources for organizations, such as information, knowledge, technology, financial capital, insertion in networks, and partnerships with strategic actors (Tondolo et al.,2023).

In the age of knowledge, company survival becomes increasingly complex. This new context in which knowledge is a preponderant factor requires companies to have greater skills in creating and maintaining competitive advantages. While advantages related to access to capital can be easily

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copied by competitors, the competitive advantage based on knowledge is the most difficult to overcome(Carvalho et al.,2017).

2.5. CFO within Organizations

According to Camacho (2019), the role of the modern financial leader goes beyond the realm of conventional financial practices. He became an active strategist, directly involved in formulating and implementing corporate strategy. He is the catalyst for change, whether technological or not, and an effective communicator, often representing the company before shareholders and investors. Furthermore, he is a general manager who can deal with multidisciplinary issues and manage the company's resources and profits.

In his dissertation on the personality of the CFO (Financial Director), Shimada (2020) highlights a professional profile made up of skills and characteristics that are common to professionals in the field; he would be someone who has strategic thinking, with a clear vision of needs and an action plan that avoids distractions. This professional is adaptable and capable of learning and reacting to new scenarios. He thinks innovatively and creatively, with a holistic view of the business. Furthermore, he can communicate complex concepts interestingly, build influential and empathetic relationships, and lead effectively. This CFO is always looking for gains, with a clear vision to take advantage of constantly changing situations.

The study by Alves (2023) offers an in-depth analysis of the role of the CFO (*Chief Financial Officer*) as a strategic leader and fundamental management team member. The CFO is not limited to financial management but instead acts as a visionary who monitors the organization, aligning its decisions with the company's long-term expectations.

The role of the CFO in startups is fundamental to the success and sustainability of the company. In contrast to already established companies, the CFO of a startup takes on a more strategic role, going beyond traditional financial management (Röhm et al., 2018).

Qiao et al. (2022) offer an intriguing analysis of the influence of CFOs' confidence on the risk of stock declines. Research shows that overconfident CFOs tend to increase the likelihood of falling stock prices through two main routes: excessive risk-taking by underestimating the risks inherent in strategic decisions and investments, and overconfident CFOs may be less likely to release negative news about the company.

The following research hypotheses were defined based on the research presented on intellectual capital and the role of financial directors in the organization.

H1. *There is a positive correlation between the intellectual Capital of CFOs and the financial performance of companies.*

H1a. *There is a positive correlation between Human Capital and EPS*

H1b. *There is a positive correlation between Human Capital and ROE*

H1c. *There is a positive correlation between Human Capital and ROA*

3. Methodology

For the study, the first 100 companies with the largest capitalization listed on the stock exchange in 2022 were considered. To participate in the study, we followed the following criteria:

- Companies must have their CFO registered on their website or published on other platforms
- Companies must have a high market capitalization value

Financial information was collected by the Status Investing website (https://statusinvest.com.br/) and InfoMoney (https://www.infomoney.com.br/). Information on CFOs and the companies they work for will be taken from published financial reports, the LinkedIn website (https://br.linkedin.com/), and the organization's portals or websites.

The first explains the dependent variables used: ROA (return on assets), a key performance indicator that evaluates a company's profitability relative to the total available assets. In this way, it measures the effectiveness of using these assets to generate profit. The calculation considers all

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elements in which capital is invested or that have the potential to generate future profits. The higher, the better, as it indicates that resources are used efficiently to generate profit for the business.

ROE (Return on Equity) is a financial indicator that assesses a company's ability to create value from its initial resources. In other words, it demonstrates the profit generated from the capital invested.

EPS (Earnings per share) is a fundamental indicator that calculates a company's net profit divided by the total number of its shares. This indicator is important in the capital market because it indicates whether the company is profitable. If it is low, it means the company is making a loss.

The debt ratio is an indicator that shows the relationship between a company's debts and total resources, as well as how these resources are used. A high value for this index indicates that a large part of the company's resources was acquired through debt, which can leave the company excessively dependent on third-party capital.

Intellectual capital, an independent variable, can be measured within the two factors in the present research. Therefore, we will evaluate it using two components: human and relational.

Below is a table summarizing the variables and their description to facilitate understanding.

Table 1. Description of variables.

Nature	Variable	Description	Scale	Source
Dependent	Return on Assets (ROA)	Demonstrates how profitable a company is about its set of assets	Percentage (%)	Stock Exchange Data
Dependent	(ROE)	It determines how efficient a company is in generating profit from its resources.	Percentage (%)	Stock Exchange Data
Dependent	Earnings per Share (LPA)	Indicator that divides the company's net profit by the number of shares it owns	Numeric value	Stock Exchange Data
Explanatory	Debt (END)	Refers to the situation in which the company takes on debt to finance its activities or to acquire goods and services	Numeric value	Stock Exchange Data
Explanatory	Current Liquidity (LIQ)	A financial indicator measures a company's ability to meet its short-term financial responsibilities.	Numeric value	Stock Exchange Data
Independent	Share capital (CPSOC)	It refers to the connections that people make among themselves, amplifying their individual and collective gains through networks and social connections	Numeric value 1,2,3	Data from LinkedIn and the organization's websites

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Independent	Intellectual Capital (CAPINT)	It refers to two of its components: human and relational capital.	Numeric value 1,2,3	Data from LinkedIn and the organization's websites
Independent	Years of managerial experience (EXP)	Refers to years of experience in any area in management positions	Numeric value	Data from LinkedIn and the organization's websites
Independent	Graduated in finance (FORFIN)	Have any level of training in finance	Numeric value	Data from LinkedIn and the organization's websites
Independent	Teaching experience (PROF)	Experience in teaching any higher education course	Numeric value	Data from LinkedIn and the organization's websites
Independent	Board Size (TC)	Number of people on the board of directors	Numeric value	Data from LinkedIn and the organization's websites

4. Descriptive Statistics

Table 2 presents some descriptive statistics on the variables used in the empirical analysis. The data makes it possible to highlight some relevant aspects.

Table 2. Statistical description of variables.

Variable	Average	Median	Standard deviation	Minimum	Maximum
Market Value (VM)	42,812,841,745.98	16,908,938,621	73,782,670,405	812.276.553	504,580,171,560
Earnings per share (LPA)	2.58	1.23	4.83	-14.3	23.3
Debt (ENDV)	0.877	0.475	1.75	-1.71	13.2
Current Liquidity (LIQ)	1.97	1.47	2.66	0.105	24.9
Return on Equity (ROE)	19.5	15.9	26.1	-48.4	175,
Return on Assets (ROA)	5.90	4.86	8.24	-41.3	37.5
Board Size (TC)	18.9	17	12.8	3	116

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Intellectual Capital (CAPINT)	1.87	two	0.485	0	1
Social Capital (CAPSOC)	3667.03	2871	3917.52	0	22232
Years of management experience (EXP)	18.8	19	7.75	6	40
Graduated in Finance (FORFIN)	0.96	1	0.197	0	1
Teaching experience (PROF)	0.030	0	0.171	0	1

The average market value of the 100 companies studied is R$42,812,841,745.98, with a median of R$16,908,938,621 and a standard deviation of R$73,782,670,405. Petrobras has the highest capital value, totaling R$504,580,171,560, while Americanas has the lowest value, with R$812,276,553.

The dependent variable LPA (Earnings per share) of the 100 companies present on the Brazilian stock exchange for 2022 has an average value of 2.58. The median is 1.23 and has a standard deviation of 4.83. The company with the lowest Earnings per share value is America, with a value of –14.31, and the company with the highest value is Banco do Nordeste, with 23.33. With these numbers, we can infer that Banco do Nordeste has the highest profit per share. Therefore, it is the most profitable. The other companies with the best positions are Vale (20.07), Monteiro Aranha (18.84), Suzano SA (17.18), and Petrobras (14.44).

The dependent variable, Debt or Net Debt, has a mean of 0.877, a median of 0.475, and a standard deviation of 1.75. Sul América has the lowest debt rate, with a value of -1.71, which indicates that, among the 100 companies analyzed, it has the lowest amount of debt about its equity. Minerva has the highest net debt ratio, at 13.21. Other companies with high debt ratios include Simpar (9.40), Comgas (5.56), Braskem (2.84), and Klabin SA (2.20).

The Current Liquidity-dependent indicator is a tool used to assess a company's ability to meet its financial obligations in the short term. The average current liquidity among companies is 1.97, with a median of 1.47 and a standard deviation of 2.66. BR Advisory Partners Participações SA has the lowest current liquidity, with a value of 0.11. On the other hand, Banco do Brasil has the highest current liquidity among the one hundred companies, with a value of 24.89, which indicates its high capacity to pay its debts. Other companies with good ratings include Bradesco (8.86), Petronio (7.64), Grendene (7.28), Usiminas (3.78) and Tran Paulist (3.61).

ROE (Return on Net Equity) serves the company and its investors as a demonstration of efficiency in applying its resources. The average value of ROE among companies is 19.5%, the median 15.9%, and the standard deviation 26.1%. The company with the highest ROE index is Comgas with 175.40%, indicating that they know how to manage their net worth well above the average of other companies, right after Congas come the following companies: Minerva (128.75%), BBSeguridade (79.57%), Suzano (70.72%) and Unipar (57.22%). Companies with the lowest index: Americanas (-48.42%), BRF SA (-28.10%), Natura Group (-12.80%), Embraer (-7.12%)

ROA (Return on Assets) is an asset profitability index that demonstrates how profitable a company is about its assets. The average ROA is 5.90%, the median corresponds to 4.86%, and the standard deviation equals 8.24%. The company with the lowest return on assets is America, with –41.3%, and the largest, with 37.5%, is BBSeguridade. Right after it, the four companies with the

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highest rates are Caixa Seguridade (25.22%), OdontoPrev (22.39%), Unipar (22.12%), and Vale (21.16%).

The average size of companies' Boards of Directors is 18.9 members, the median is 17, and the standard deviation is 12.8. The companies with the smallest boards are Raizen, Smart Fit, and Mrs Logist, each with just three members. In contrast, Bradesco has the largest board, with 116 members, followed by Santander BR with 59 members and Banco do Brasil with 46.

The independent variables are the intellectual and social capital indices. Intellectual capital was classified as 1, 2, and 3, respectively, representing a postgraduate degree, master's degree, or MBA, and doctorate in any area. The average of these values is 1.87, with a median of 2 and a standard deviation of 0.485.

Social capital values were determined by the number of CFOs' followers on Linkedin. The average is 3673 followers, the median is 2871, and the standard deviation is 3917.03. The CFOs of the five companies with the largest number of followers are from JBS (22,232), Suzano SA (18,560), Weg (16,144), Klabin S/A (13,800) and Gerdau Met (11,816).

In terms of managerial experience, the Financial Directors of the companies Intelbras (40 years), Santander BR (39 years), Embraer (38 years), Copel (38 years), and M.Diasbranco (36 years) have the most extended experience in the job market. On the other hand, the directors of the companies Klabin S/A (6 years), CSN Mineracao (6 years), Hypera, Grupo Natura, and Vamos have seven years. The mean of the values equals 18.8, the median equals 19, and the standard deviation corresponds to 7.75.

The variable of training in finance was measured by assigning the value 1 to those who had some course, undergraduate or postgraduate degree in finance, and 0 to those who had no training in financial areas. The mean of this variable was 0.96, the median was 1, and the standard deviation was 0.197.

The mean of the variable of teacher experience is 0.30, the median is 0, and the standard deviation is 0.171. Notably, only one director, specifically from the company ItauUnibanco, has teaching experience mentioned on his resume.

Model and Estimation Method

If linearity assumptions and the correct specification of the model are met, the OLS (*Ordinary Least Squares) estimation approach (statistical regression),* known in Portuguese as ordinary least squares (OLS), can be used to estimate the model, as follows. Indicated. However, if hypothesis violations are detected, alternative estimation methods such as the GLS (*Generalized Least Squares*) estimator, known as generalized least squares or robust errors, must be applied, as they are more efficient in the occurrence of heteroscedasticity.

Gretl was used to carry out linear regression, a platform developed for analyzing and interpreting various data. It is widely used in econometric research to assist in statistical studies.

To present better results, a specification of the log-log model (which considers the logarithm in the dependent and explanatory variables) was assumed. In a log-log model, the estimated coefficients take on a special meaning known as elasticity. Elasticity represents the percentage change in the dependent variable in response to a 1% percentage change in the explanatory variable. This means that rather than an absolute change, elasticities provide us with a measure of the relative sensitivity of the dependent variable to the explanatory variable. Follow the model specifications (1).

Model (1):

$$\boldsymbol{lnLPA_i = \alpha_o + \alpha_1 lnCAPINT_i + \alpha_2 lnCAPSOC_i + \alpha_3 lnFORFIN_i + \alpha_4 ln\text{EXP} + \alpha_5 lnPROF_i + \alpha_6 lnENDV_i + \alpha_7 lnLIQ_i + \alpha_8 lnROA_i + \alpha_9 lnROE_i + \alpha_{10} lnTC_i + u_i \ (Eq.1)}$$

Model (2)

$$\boldsymbol{lnROA_i = \alpha_o + \alpha_1 lnCAPINT_i + \alpha_2 lnCAPSOC_i + \alpha_3 lnFORFIN_i + \alpha_4 ln\text{EXP} + \alpha_5 lnPROF_i + \alpha_6 lnENDV_i + \alpha_7 lnLIQ_i + \alpha_8 lnLPA_i + \alpha_9 lnROE_i + \alpha_{10} lnTC_i + u_i \ (Eq.2)}$$

Model (3)

$$\boldsymbol{lnROE_i = \alpha_o + \alpha_1 lnCAPINT_i + \alpha_2 lnCAPSOC_i + \alpha_3 lnFORFIN_i + \alpha_4 ln\text{EXP} + \alpha_5 lnPROF_i + \alpha_6 lnENDV_i + \alpha_7 lnLIQ_i + \alpha_8 lnROA_i + \alpha_9 lnLPA_i + \alpha_{10} lnTC_i + u_i \ (Eq.3)}$$

The dependent variable of the model (1), EPS (Earnings per Share) (Eq. 1), is an indicator that calculates a company's net profit divided by the total number of its shares. It indicates whether the company is profitable and is very important in the capital market. Estimating Equation (1), it is expected that the following factor has a positive correlation with EPS and the following variables:

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Intellectual Capital (CAPINT), Social Capital (CAPSOC), graduate in Finance (FORFIN), Years of experience (EXP), He was a Professor (PROF), Current Liquidity (LIQ). Debt (ENDV) negatively correlates with EPS (Earnings per Share).

The dependent variable of the model (2), ROA (Return on Assets) (Eq. 2), Return on Assets (ROA) is an essential financial indicator that reflects a company's ability to generate profit from its assets. A higher ROA rate suggests a company with greater profitability. Estimating Equation (2), it is expected that the following factor has a positive correlation with ROA and the following variables: Intellectual Capital (CAPINT), Social Capital (CAPSOC), Graduate in Finance (FORFIN), Years of experience (EXP), He was a Professor (PROF), Current Liquidity (LIQ). Debt (ENDV) negatively correlates with ROA (Return on Assets).

The dependent variable of the model (3) (Eq. 3) is also represented by the ROE (Return on Net Equity), which indicates how profitable an asset is for your business, and the net margin variable, which measures the profitability of the organization. Estimating Equation (3), it is expected that the following factor has a positive correlation with ROE and the following variables: Intellectual Capital (CAPINT), Social Capital (CAPSOC), graduate in Finance (FORFIN), Years of experience (EXP), He was a Professor (PROF), Current Liquidity (LIQ). Debt (ENDV) negatively correlates with ROE (Return on Equity).

5. Empirical Analysis and Discussions

Table 3 presents regression results considering LPA, ROA, and ROE as dependent variables. In general terms, the results are satisfactory from the point of view of the quality of fit and the statistical significance of the coefficients, with more than 42% (R-square) for model 1 and 51% for model 2. The R-square for model 3 run in OLS (ordinary least squares method) is 75%, and for GLS, it is 82%.

Table 3. Estimation results, Equation (1), (2) and (3).

Variables	Model (1) (OLS - LPA)	Model (2) (OLS - ROE)	Model (3) (OLS - ROA)	Model (4) (GLS-ROA)
Const	−3.69486 (***) <0.0001	2.68066(***) <0.0001	−0.620467 0.1887	−1.05561(***) 0.0085
lnCAPINTEL	1.11083 (**) 0.0191	-	0.599161 (*) 0.0767	0.609101 (**) 0.0148
lnROE	0.805715 (***) <0.0001	-	0.881323 (***) <0.0001	0.940182(***) <0.0001
lnEXP	0.413526(*) 0.0573	-	-	-
lnLPA	-	0.418192(***) <0.0001	0.115593 (*) 0.0826	0.07663 0.1944
lnENDV	-	0.283271(***) <0.0001	−0.341547 (***) <0.0001	−0.324713 (***) <0.0001
lnTC	-	-	−0.357389 (***) 0.0021	−0.213518 (**) 0.0326
R-squared (R^2)	0.426481	0.517798	0.752927	0.8241
F-Stat	F(3.84) = 20.82139	F(2, 70) = 37.58363	F(5, 66) = 40.22545	F(5, 66) = 61.84285

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Joint significance	P-value (F) 3.54e-10	P-value(F) 8.19e-12	P-value(F) 9.18e-19	P-value(F) 1.41e-23
Heteroscedasticity	LM = 13.1392	LM = 5.9173	LM = 46.707	-
(White's test)	p-value = 0.15641	p-value = 0.314349	p-value = 0.000644078	-
(Ramsey reset)	p-value = 0.491938	p-value = 0.649094	p-value = 0.585465	-
Specification	F (2.82) = 0.715576	F(2, 68) = 0.434936	F(2, 64) = 0.539853	-
Comments (#)	88	73	72	72

Additionally, RESET tests do not reject the null hypothesis that the models have a correct specification. The estimates are efficient (with the lowest variance), as the disturbances are homoscedastic, as indicated by the White test (the null hypothesis of constant error variance is not rejected), except model 3, in which it was necessary to estimate a GLS model (Generalized Least Squares Method) to correct heteroscedasticity.

When evaluating the marginal impacts of the explanatory variables in Model 1, it is possible to predict that, on average, a 1% increase in CFOs' intellectual capital results in a corresponding 1.11% increase in EPS. This finding confirms hypothesis H1a, indicating a positive correlation between CFOs' Intellectual Capital and companies' financial performance. When considering the ROE index, it is estimated that a 1% increase in this index causes an increase of 0.80% in EPS. Finally, an increase of 1% in the variable years of management experience results in an increase of 0.41% in EPS. We did not find statistical significance for the variables Social Capital, Graduated in Finance, Teaching experience, Earnings per Share, Net Debt, Current Liquidity, Board Size, and Return on Assets; we infer that these variables have no impact on the increase or decrease in the variable ROE.

When analyzing the implications in Model 2, we deduce that a 1% increase in Earnings per Share (LPA) results in a 0.41% increase in Return on Equity (ROE). Similarly, a 1% increase in the Net Debt ratio causes a 0.28% increase in ROE. Based on the results, we can infer that these variables, Intellectual Capital, Social Capital, Finance Degree, Teaching Experience, Years of Managerial Experience, Net Debt, Current Liquidity, Board Size, and Return on Assets, do not have a direct impact on the increase or decrease in the ROE variable since there were no statistical results. In other words, there is not enough evidence to conclude that they significantly influence the Return on Equity of the companies analyzed, contrary to what hypothesis H1b says.

When analyzing data from Model 4, since Model 3 presents heteroscedasticity and it was necessary to correct in Model 4, we observed that an average increase of 1% in Intellectual Capital leads to a 0.69% increase in Return on Assets (ROA), validating hypothesis H1c. Similarly, a 1% increase in Return on Equity (ROE) results in a 0.94% increase in ROA. Furthermore, a 1% increase in Earnings per Share (LPA) causes a 0.07% increase in ROA. On the other hand, a 1% increase in the company's Net Debt causes an average reduction of 0.32% in ROA. Regarding Board Size, a 1% increase leads to a 0.21% drop in ROA. The variables Social Capital, Education in Finance, Teaching Experience, Years of Managerial Experience, and Current Liquidity did not directly impact the variation in ROA, as indicated by the results. No statistical evidence was found to confirm the hypothesis that these variables influence the increase or decrease in ROA.

When examining the results in Table 3 in relation to the three models presented, the data confirms that the level of intellectual Capital of company CFOs has a positive impact on the financial performance of the companies they manage. Furthermore, social capital does not influence the company's financial results.

Intellectual capital plays a fundamental role in the success of companies listed on the Brazilian stock exchange, directly impacting financial performance and generating shareholder value. The

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CFO, in turn, plays a strategic role in modern business management. In addition to mastering the financial area, the CFO's intellectual capital encompasses several skills that directly impact the organization's success.

The results of this study are in line with the findings of Carvalho et al. (2017), Pew Tan et al. (2007), and Salehi et al. (2023). They identified that intellectual capital exerts a positive influence or correlation with market value, financial return, and the appropriate use of human resources and risk management.

The CFO's intellectual capital is a valuable resource for the company, as it allows him to have a broad and strategic view of finances, analyzing scenarios, risks, and opportunities. With this knowledge, the CFO can make assertive financial decisions that directly impact the company's profitability, profitability, and value and implement sustainable financial strategies aligned with the organization's long-term objectives. The CFO's intellectual capital also builds a positive company image before investors and the financial market, demonstrating credibility, transparency, and solidity. Finally, the CFO's intellectual capital favors the implementation of an organizational culture based on data and knowledge management, stimulating innovation, learning, and continuous improvement of processes and financial results

6. Conclusions

The study presented a research problem: "The intellectual capital of CFOs has a positive influence on the financial performance of companies." It analyzed the financial indicators and their relationship with intellectual capital, applying quantitative methodology through tests with the Gretl *software*.

The study's results cooperate with other works on the topic of Intellectual Capital, contributing information on how investments focused on this topic have presented a positive response about the financial return of companies in the capital market. As for the estimation methods, the Ordinary Least Squares (OLS) method was used, and for model 3, the Generalized Least Squares (GLS) Method was used, in which it was possible to identify, through data from the 100 largest companies on the Stock Exchange, B3 values the correlation between financial performance and the intellectual Capital of CFO'S.

The research revealed that CFOs' intellectual capital significantly impacts companies' financial performance. It was possible to statistically determine how intellectual capital influences Earnings per Share (LPA), Return on Equity (ROE), and Return on Assets (ROA). However, it was impossible to identify a positive or negative correlation between the influence of CFOs' social capital and the financial performance of the companies they manage.

Regarding study restrictions, the database, which includes the dependent and independent variables of organizations listed on B3, still needs to be more accessible and easier to access. This is because reliability would be increased if all information were obtained directly from companies' communication channels.

Future research should consider a larger sample of companies operating in the capital market and incorporate more variables, such as structural capital, to improve the accuracy of results on financial performance and intellectual capital (IC). There is a vast field to be explored regarding the influence of IC in different business sectors and how it behaves when compared between them. Furthermore, different methods for calculating intellectual capital open up space for new research opportunities.

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