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Abstract: *This study aimed to examine the evolution of the capital structure of 27 Brazilian agricultural cooperatives between 2018 and 2022, based on economic and financial reports and the static comparison method, which included 27 performance measures across three groups subdivided by net worth. The method used ANOVA and multiple regression to examine the relationship between capital structure and debt metrics. It was assumed that debt behaves differently across cooperatives of different sizes. ANOVA identified significant differences in financial indicators across cooperatives of different sizes. The regression results showed that cooperatives with lower net worth rely more on equity to finance their operations and investments. However, cooperatives with greater net worth exhibit higher leverage, indicating that dependence on third-party capital still predominates, even among larger cooperatives, reflecting strategic financing choices rather than purely financial constraints. The minWACC analysis showed that a balanced capital structure can optimize the cost of capital and maximize net profits, benefiting cooperative members in the long term and supporting more consistent valuation benchmarks for cooperatives. Future research on maximizing present value and lowering the cost of capital is recommended to improve the understanding of capital structure in agricultural cooperatives.*

Keywords: *Agricultural Cooperatives, Valuation, minWACC Analysis, Capital Structure.*

Resumo: Este estudo teve como objetivo examinar a evolução da estrutura de capital de 27 cooperativas agrícolas brasileiras entre 2018 e 2022, com base em relatórios econômico-financeiros e no método de comparação estática, que incluiu 27 medidas de desempenho em três grupos subdivididos por patrimônio líquido. O método utilizou ANOVA e regressão múltipla para examinar a relação entre a estrutura de capital e os indicadores de endividamento. Partiu-se do pressuposto de que a dívida se comporta de forma diferente entre cooperativas de tamanhos distintos. A ANOVA identificou diferenças significativas nos indicadores financeiros entre cooperativas de tamanhos distintos. Os resultados da regressão mostraram que as cooperativas com patrimônio líquido menor dependem mais do capital próprio para financiar suas operações e investimentos. Entretanto, as cooperativas com patrimônio líquido maior apresentam maior alavancagem, indicando que a dependência de capital de terceiros ainda predomina, mesmo entre as cooperativas maiores, o que reflete escolhas estratégicas de financiamento e não restrições de natureza financeira. A análise de minWACC mostrou que uma estrutura de capital equilibrada pode otimizar o custo de capital e maximizar os lucros líquidos, beneficiando os membros da cooperativa no longo prazo e apoiando avaliações mais consistentes das cooperativas. Recomendam-se pesquisas futuras sobre a maximização do valor presente e a redução do custo de capital a fim de aprimorar a compreensão da estrutura de capital nas cooperativas agropecuárias.

Palavras-chave: Cooperativas agropecuárias. Valuation. Análise minWACC. Estrutura de capital.

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Resumen: *El objetivo de este estudio fue examinar la evolución de la estructura de capital de 27 cooperativas agrícolas brasileñas entre 2018 y 2022, basándose en informes económicos y financieros y en el método de comparación estática, que incluyó 27 medidas de rendimiento en tres grupos subdivididos según el patrimonio neto. El método utilizó ANOVA y regresión múltiple para examinar la relación entre la estructura de capital y los indicadores de endeudamiento. Se partió del supuesto de que la deuda se comporta de manera diferente entre cooperativas de distintos tamaños. El ANOVA identificó diferencias significativas en los indicadores financieros entre cooperativas de distintos tamaños. Los resultados de la regresión mostraron que las cooperativas con menor patrimonio neto dependen más del capital propio para financiar sus operaciones e inversiones. Sin embargo, las cooperativas con mayor patrimonio neto presentan un mayor apalancamiento, lo que indica que la dependencia del capital de terceros sigue predominando, incluso entre las cooperativas más grandes, lo que refleja decisiones estratégicas de financiación y no restricciones de naturaleza financiera. El análisis del minWACC mostró que una estructura de capital equilibrada puede optimizar el coste de capital y maximizar los beneficios netos, lo que beneficia a los miembros de la cooperativa a largo plazo y respalda evaluaciones más coherentes de las cooperativas. Se recomienda realizar investigaciones futuras sobre la maximización del valor actual y la reducción del coste de capital con el fin de mejorar la comprensión de la estructura de capital en las cooperativas agrícolas.*

Palabras clave: *Cooperativas agrícolas. Valoración. Análisis minWACC. Estructura de capital.*

INTRODUCTION

Agricultural cooperatives contribute to Brazil's agribusiness by coordinating production, marketing, and financial activities while fostering regional development and member participation. However, they operate in a competitive environment in which technological innovations require economic, financial, and operational efficiency, including capital payments and surplus allocation. The capital structure of cooperatives is a key determinant of operational efficiency and resilience in the face of uncertainty. An adequate capital structure allows agricultural cooperatives to adopt more strategic corporate governance, not only in operational and marketing decisions but also in financial decision-making, including during crises such as the COVID-19 pandemic (Malański, 2021; Oliveira Junior; Wander, 2022; Santos; Schneider, 2023).

Given the expansion of agricultural frontiers and the growing institutional complexity surrounding land use and cooperative activity (Heck, 2021), this research assesses the capital structure of 27 Brazilian agricultural cooperatives, covering 27 economic and financial performance metrics, with emphasis on capital structuring and indebtedness. The analysis is divided into three groups based on net equity size from 2018 to 2022. Economic and financial reports (balance sheets and income statements) were collected, and metrics were used to assess the relationship between equity and debt leverage.

Studies show that efficient financial management and a balanced capital structure are essential for cooperative sustainability (Rodrigues *et al.*, 2018). Maintaining liquidity and appropriate debt management, considering the cost of equity and third-party capital, are guiding elements for the efficient allocation of committed capital (Bialoskorski Neto, 1998; Royer, 2018; Malański, 2021). From this perspective, financial governance practices must align cooperative principles with statutory purposes, ensuring transparency and democratic participation in capital allocation through funds and reserves (Cadbury, 1992; Lima; Rech; Queiroz, 2023).

The importance of a well-established capital structure is reflected in its impact on profitability and value generation for members. Cooperatives with a higher proportion of equity tend to exhibit better financial performance, as they depend less on third-party capital and face lower financial risk, indicating stronger solvency capacity (Siqueira; Bialoskorski Neto, 2014; Steklá; Gryčová; Homolka, 2015; Díaz Córdova; Coba Molina; Navarrete López, 2017).

Despite this evidence, the literature provides a limited understanding of how indebtedness dynamics in agricultural cooperatives can be evaluated through analytical metrics that support capital structure decisions (Rodrigues *et al.*, 2018). While prior studies suggest that higher equity proportions reduce dependence on external financing and financial risk, there remains a lack of empirical evidence that considers cooperative size as a differentiating factor, a research gap this study addresses.

Given the challenges agricultural cooperatives face in balancing debt and equity to ensure economic, financial, and operational efficiency, the following research question is proposed: How does the capital structure of Brazilian agricultural cooperatives reflect financial efficiency and indicate capital costs by cooperative size?

This proposition is investigated using analysis of variance (ANOVA) and multiple regression, considering asset size (net worth) and economic-financial metrics to identify relationships and patterns in cooperative financial management. Subsequently, these results are integrated into the minimum weighted-average cost of capital (minWACC) framework, accounting for debt and equity financing sources.

Thus, this study aims to analyze the capital structure of agricultural cooperatives using the static comparison method, performance metrics, and asset size.

By examining capital structure, including capital payments, allocation, and debt composition, this research contributes to the literature on agricultural cooperatives. It provides an analytical basis for future research on fair value, surplus allocation, and cost of capital minimization, contributing to discussions on capital structure in cooperatives.

2 – THEORETICAL REFERENCE

2.1 – Financial Governance and Capital Structure

Agricultural cooperatives share governance features with publicly traded companies, such as general meetings and executive boards representing members. However, they differ fundamentally in their restricted access to capital markets, which directly affects their capital structure (Oliveira Júnior; Wander, 2022). As a result, cooperative financing relies primarily on paid-in member capital, complemented by bank financing and, occasionally, public subsidies or donations to support operations and investment projects (Bialoskorski Neto, 1998; Gimenes; Sousa, 2006; Pokharel; Archer; Featherstone, 2020).

The concept of governance has evolved across the management literature but remains anchored in the coordination of organizational structures, taking into account transaction costs and asset specificity (Williamson, 1979). In the cooperative context, financial governance encompasses the monitoring, management, and control of financial activities, while capital structure refers to how cooperatives finance their operations and projects through equity and third-party capital (Lazzarini; Bialoskorski Neto; Chaddad, 1999; Limnios *et al.*, 2016; Malański, 2021). Studies highlight that effective financial governance ensures efficient resource allocation while aligning financial decisions with members' interests (Jansen; Maehler; Wegner, 2018; Büttenbender *et al.*, 2021).

Good financial governance is widely recognized as a prerequisite for the long-term sustainability of cooperatives, grounded in clearly defined statutory purposes, ethical policies, internal control systems, performance monitoring, and transparency toward stakeholders (Liszbinski *et al.*, 2016; Lima; Rech; Queiroz, 2023). Beyond these institutional aspects, empirical evidence suggests that capital structure outcomes are a direct consequence of governance decisions related to liquidity management and indebtedness (Bressan *et al.*, 2009; Rosa; Zamberlan; Brum, 2016; Marques *et al.*, 2023).

From a theoretical perspective, capital structure is traditionally defined by the relationship between the cost of equity (K_e) and the cost of debt (K_i). Seminal contributions by Durand (1952) argue for the existence of an optimal capital structure that maximizes firm value, whereas Modigliani and Miller (1958, 1963) propose capital structure irrelevance under restrictive assumptions. Subsequent theories, notably the Trade-Off Theory and the Pecking Order Theory (Myers, 1984; Myers; Majluf, 1984; Rodrigues *et al.*, 2018; Royer, 2018), introduced more pragmatic approaches by considering bankruptcy costs, tax benefits, and financing hierarchies.

Although cooperatives share specific financial characteristics with investor-owned firms, their capital structure is shaped by institutional constraints and

cooperative principles (Rodrigues *et al.*, 2018; International Cooperative Alliance, 2024). Cooperatives typically prioritize equity financing, as excessive leverage increases financial risk and vulnerability to adverse shocks (Murray, 1983; Bialoskorski Neto, 1998; Gentzoglanis, 2007; Meira, 2023). Empirical studies indicate that more balanced capital structures, with lower dependence on third-party capital, tend to reduce the weighted average cost of capital (WACC) and improve financial efficiency (Gimenes *et al.*, 2009; Steklá; Gryčová; Homolka, 2015; Limnios *et al.*, 2016).

These financial decisions are embedded in cooperative principles of democratic governance, member economic participation, and the preservation of indivisible reserves (Fairbairn, 1994; Ramos *et al.*, 2022). The indivisibility of certain funds and reserves plays a central role in ensuring financial stability and long-term sustainability, limiting speculative behavior and protecting collective assets (Brasil, 1971, 2021; Avsec, 2023).

Brazilian cooperative law (Law 5.764/1971) further shapes capital structure decisions by restricting bankruptcy procedures and emphasizing out-of-court liquidation, thereby affecting creditors' risk perceptions and financing costs, while the system of compulsory reserves strengthens internal capitalization by retaining surpluses. Consequently, cooperatives tend to adopt conservative leverage strategies, reinforcing the role of member contributions and retained surpluses in capital formation.

Equity capital in cooperatives comprises paid-in shares, mandatory and voluntary reserves, and indivisible funds, collectively forming the cooperative's net worth. These resources are primarily intended to sustain operations, finance investments, and protect against unexpected shocks, rather than to generate speculative returns for members (Gentzoglanis, 2007; Bazzana; Catturani, 2021). To summarize the main sources and components of cooperative financing, Table 1 presents the core elements that constitute the capital structure of agricultural cooperatives.

Table 1 - Relevant components of the capital structure in agricultural cooperatives

Components		Description	Purposes / Examples
Equity Capital	Social Capital	Amount of resources invested by cooperative members: membership shares.	Financial contributions made by member farmers.
	Reserves	The surplus will be retained by the cooperative for future use. It may constitute mandatory or voluntary funds.	Part of the profits are reinvested in the cooperative, such as expansion, training, investments, storage, credits, logistics, diversification, innovation, etc.
	Donations	Resources obtained through donations.	Donation of agricultural equipment by a company.
	Sponsorships	Resources obtained through sponsorships.	Sponsorship of events organized by the cooperative.
Third-Party Capital	Loans	Resources obtained through loans.	Bank loans to finance the cooperative's expansion.
	Investment Funds	Resources obtained from specific investment funds.	Investments from funds specialized in agricultural cooperatives.
	Credit Lines	Credit is provided by financial institutions.	Bank credit line for purchasing agricultural inputs.
	Grants	Resources granted by the government or public agencies.	Government grants to encourage sustainable production.
	Third-Party Capital	Participation of non-members in the cooperative.	Investment from an external partner in the cooperative.

Source: Prepared by the authors.

Significantly, surplus distribution in cooperatives is based on members' economic transactions rather than capital ownership, reinforcing the distinction between cooperative equity and corporate shareholding (Bressan *et al.*, 2010; Mendes *et al.*, 2023). This characteristic underscores why traditional opportunity-cost assumptions applied to equity capital in investor-owned firms do not fully translate into cooperatives (Lambert, 1975).

Overall, financial governance, capital structure decisions, and cooperative principles are deeply interconnected. Understanding how equity composition, leverage choices, and institutional constraints interact is essential for evaluating capital structure configuration and its implications for capital cost behavior. This integrated perspective provides the theoretical foundation for the empirical analysis developed in this study, encompassing performance metrics, asset size, and the application of the minWACC framework.

3 – METHODOLOGY

The research is descriptive and quantitative. The methodological design follows Canassa and Costa (2019) and Royer and McKee (2020). To support statistical inference, the descriptive analysis was preceded by a one-way analysis of variance (ANOVA) to identify differences across agricultural cooperatives by size.

This study analyzes 27 agricultural cooperatives that disclosed financial statements between 2018 and 2022, selected from the list of the 500 largest cooperatives by revenue (Econodata, 2024). The sample size reflects the restricted availability of publicly disclosed financial statements, resulting in a non-probabilistic sample. The dataset comprises balance sheets and income statements for the entire period. Cooperatives were classified according to average net equity (PL), expressed

in R$ thousands: Group 1 (G1): R$ 20,000–205,999; Group 2 (G2): R$ 206,000–1,400,000; and Group 3 (G3): R$ 1,400,001–6,699,000. Grouping by equity allows assessment of the relationship between own and third-party capital, focusing on how capital costs behave across different financial scales. Net equity is defined as the residual value available to the cooperative after obligations and statutory allocations. Box 1 presents the distribution of cooperatives across groups.

Box 1 - Sample groups of agricultural cooperatives

G1			**G2**			**G3**		
Cooperagudo	Comiva	Primato	Capul	Camda	Copersucar	Castrolanda	Copacol	Larcooperativa
Coapa	Cagro	Coagril	Camnpal	Coasul	Frisia	Cooxupe	Cooperalfa	C.Vale
Cooperoque	Cocafe	Coplana	Copagril	Integrada	Coopercitrus	Cocamar	Comigo	Coamo

Source: Research data.

The analysis comprises 27 financial and operational variables (Table 2). Equity (PL) was treated as the core component of capital structure, guiding the comparative analysis across groups. Initially, one-way ANOVA was applied, with group means and standard deviations examined. Normality and homoscedasticity assumptions were tested using the Shapiro–Wilk and Levene tests, respectively. When variance homogeneity was violated, Welch's ANOVA was applied.

Once group consistency was validated, the analysis proceeded with the variables listed in Table 2. PL, total assets (AT), and operational performance (PO) reflect financial position, while leverage (GE, GAF) and financial commitments (CJ, IF) capture indebtedness and external financing autonomy. All metrics were calculated following standard financial formulations and aligned with the period under analysis.

Table 2 - Variables used to analyze the capital structure of agricultural cooperatives

Code	Description	Equation
PL [1]	Equity	Group 1: R$ 205.999 ≤ $\overline{PL}$ ≥ R$ 20.000 Group 2: R$ 1.400.000 ≤ $\overline{PL}$ ≥ R$ 206.000 Group 3: R$ 1.400.001 ≤ $\overline{PL}$ ≥ R$ 6.699.000
AT	Total Assets	$\overline{AT} = \sum_{t=2018}^{2022} Total\ Assets$
MO	Operating Margin	$\overline{MO} = \sum_{t=2018}^{2022} \frac{Operating\ Surplus}{Net\ Revenues}$
PO	Interest-Bearing Debt	$\overline{PO} = \sum_{t=2018}^{2022} Passivo\ Onero$
GE	Debt Ratio	$\overline{GE} = \sum_{t=2018}^{2022} \frac{Total\ Debt}{Total\ Assets}$
GAF	Degree of Financial Leverage	$\overline{GAF} = \sum_{t=2018}^{2022} \frac{\frac{Surplus\ Available\ to\ the\ AGM}{Equity}}{\frac{Surplus\ Available\ to\ the\ AGM\ +\ Financial\ Expenses}{Total\ Assets}}$
Ki_AT	Liabilities / Total Assets	$\overline{Ki_AT} = \sum_{t=2018}^{2022} \frac{Third\ Party\ Capital}{Total\ Assets}$
Ki_Ke	Debt / Equity	$\overline{Kie} = \sum_{t=2018}^{2022} \frac{Third\ Party\ Capital}{Equity}$
CJ	Interest Coverage Ratio	$\overline{CJ} = \sum_{t=2018}^{2022} \frac{Earnings\ Before\ Interest\ and\ Taxes}{Interest\ Paid}$

Code	Description	Equation
CS_PL	Paid-in Capital / Equity	$\overline{CS_PL} = \sum_{t=2018}^{2022} \frac{Paid\text{-}in\ Social\ Capital}{Equity}$
IF	Financial Independence	$\overline{IF} = \sum_{t=2018}^{2022} \frac{Equity}{Total\ Assets}$
S	Surplus Available for AGM	$\overline{S} = \sum_{t=2018}^{2022} Surplus\ Available\ for\ AGM$
AT_S	Total Assets / Surplus Available for AGM	$\overline{AT_S} = \sum_{t=2018}^{2022} \frac{Total\ Assets}{Surplus\ Available\ for\ AGM}$
S_Ass	Surplus Available for AGM / Cooperative Members	$\overline{S_Ass} = \sum_{t=2018}^{2022} \frac{Surplus\ Available\ for\ AGM}{Cooperative\ Members}$
Ev_Ass	Evolution of the Number of Cooperative Members	$Ev_Ass = \frac{Cooperative\ Members\ ^{2022}}{Cooperative\ Members\ ^{2018}}$
Ev_PL	Evolution of Equity	$Ev_PL = \frac{Equity\ ^{2022}}{Equity\ ^{2018}}$
Ev_CS	Evolution of Paid-in Capital	$Ev_CS = \frac{Paid\text{-}in\ Social\ Capital^{2022}}{Paid\text{-}in\ Social\ Capital^{2018}}$
AT_Ass	Total Assets / Cooperative Members	$\overline{AT_Ass} = \sum_{t=2018}^{2022} \frac{Total\ Assets}{Cooperative\ Members}$

Code	Description	Equation
R_Ass	Net Revenue / Cooperative Members"	$\overline{R_Ass} = \sum_{t=2018}^{2022} \frac{Net\ Revenue}{Cooperative\ Members}$
PL_Ass	Equity / Cooperative Members	$\overline{PL_Ass} = \sum_{t=2018}^{2022} \frac{Equity}{Cooperative\ Members}$
LG	Current Ratio	$\overline{LG} = \sum_{t=2018}^{2022} \frac{Current\ Assets + Long\text{-}term\ Receivables}{Total\ Liabilities}$
LI	Quick Ratio	$\overline{LI} = \sum_{t=2018}^{2022} \frac{Cash\ and\ Cash\ Equivalents}{Current\ Liabilities}$
EBITDA [2]	Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	$\overline{EBITDA} = \sum_{t=2018}^{2022} Operating\ Profit + Depreciation + Amortization$
NOPAT [3]	Net Operating Profit After Tax (NOPAT)	$\overline{NOPAT} = \sum_{t=2018}^{2022} EBIT * (1 - tax\ rate)$
EVA [4]	Economic Value Added (EVA)	$\overline{EVA} = \sum_{t=2018}^{2022} NOPAT - Cost\ of\ Capital * Invested\ Capital$
PO_PL	Debt-to-Equity Ratio	$\overline{I_PL} = \sum_{t=2018}^{2022} \frac{Onerous\ Liability}{Equity}$
I_PL	Asset Utilization of Equity	$\overline{I_PL} = \sum_{t=2018}^{2022} \frac{Fixed\ Assets}{Equity}$

Source: Adapted from Assaf (2023); Bento *et al.* (2017); Bressan *et al.* (2010); Iudícubs (2017); Russo *et al.* (2000); Souza *et al.* (2023).

1- To analyze cooperative performance from 2018 to 2022, agricultural cooperatives were classified according to their average net worth over the period, which served as the basis for group formation and comparative analysis.

2- EBITDA and NOPAT were analyzed considering that Brazilian agricultural cooperatives may adopt either the Real Profit or Presumed Profit tax regimes, which affect operating performance measurement. While both indicators capture operational results, NOPAT incorporates tax effects. To ensure comparability, non-recurring and non-cash items were excluded, including adjustments related to provisions, asset impairments, fair value remeasurements (biological assets, inventories, commodities), financial subsidies, exchange variations, derivatives, extraordinary gains and losses, depreciation and amortization, and other non-operating effects.

3- The effective corporate tax burden for agricultural cooperatives in Brazil was assumed to be 24%, comprising 15% corporate income tax (IRPJ) and 9% social contribution on net profit (CSLL), applicable to non-cooperative acts.

4- The cost of invested capital was estimated using a simplified approach based on the ratio between average surpluses available at the General Assembly and average shareholders' equity

ANOVA was applied to test the relationship between equity and each metric. A *t-test* was subsequently used to verify differences in mean equity across groups. The analysis assumes: (i) independence of observations; (ii) approximate normality (Shapiro–Wilk, $p > 0.05$); and (iii) homogeneity of variances. ANOVA enabled the identification of metrics with statistically significant associations with equity, capturing their relative contribution to variance.

To further examine relationships between third-party capital (K_i) and equity (K_e), multiple linear regression was applied. Variables were selected based on Pearson correlation coefficients, adopting significance thresholds of $p < 0.05$, p < 0.01, and $p < 0.001$. From the initial set of 27 variables, eight were retained for the regression model (Table 3).

Table 3 - Correlation Matrix

		PL	AT	PO	GE	Ki_AT	Ki_Ke	
PL	R de Pearson	—						
	p-valor	—						
AT	R de Pearson	0.8075242439992824 ***	—					
	p-valor	< .001	—					
PO	R de Pearson	0.2182434911100051	0.4865903469952435 *	—				
	p-valor	0.274	0.010	—				
GE	R de Pearson	-0.2476163142481334	0.0008117352766348	0.2139494664219850	—			
	p-valor	0.213	0.997	0.284	—			
Ki_AT	R de Pearson	-0.2841221404304498	-0.0141765109412551	0.2183808240901365	0.9949891718322154 ***	—		
	p-valor	0.151	0.944	0.274	< .001	—		
Ki_Ke	R de Pearson	-0.3010646266418379	0.1293043341889793	0.3949966891322253 *	0.6188219570745925 ***	0.6613974185471537 ***	—	
	p-valor	0.127	0.520	0.041	< .001	< .001	—	
IF	R de Pearson	0.4309768265593479 *	0.0201947373318789	-0.3186568501632518	-0.5431437311647970 **	-0.6176702790875110 ***	-0.8309680318103062 ***	
	p-valor	0.025	0.920	0.105	0.003	< .001	< .001	
LG	R de Pearson	0.3734046667563780	0.0513991412073687	-0.2202982528066244	-0.9200351334903013 ***	-0.9488331740248177 ***	-0.6661912716379254 ***	0.7664
	p-valor	0.055	0.799	0.270	< .001	< .001	< .001	
I_PL	R de Pearson	-0.3779222812927277	-0.1989005729863229	0.2241100268747047	0.1107644325934555	0.1424258527318234	0.3968744396841654 *	-0.3021
	p-valor	0.052	0.320	0.261	0.582	0.479	0.040	

Source: Research data.
Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

After analysis, only those with a correlation coefficient and significance to K_i _K_e (Table 3) were considered from a list of 27 variables described in Table 2, giving a total of 8 variables for the regression model, as expressed in Equation 1:

$$K_i_K_e = \alpha + \beta_1 IF + \beta_2 LG + \beta_3 GE + \beta_4 K_i_AT + \beta_5 PO + \beta_6 I_{PL} + \beta_7 PL + \beta_8 AT + \varepsilon \quad (1)$$

Table 2 describes the variables included in the model. The parameter α represents the intercept, corresponding to the expected value of $K_i_K_e$ when all independent variables equal zero, and ε: denotes the unexplained error term.

In the context of the capital structure of agricultural cooperatives, the regression model in Equation (1) examines how financial and operational metrics influence the cost components of capital (K_i and K_e), with model fit assessed using the coefficient of determination (R^2). Although this specification identifies statistically significant associations and the relative contribution of the selected

variables, its scope is essentially explanatory and does not indicate an optimal capital structure. Therefore, to advance the analysis toward a normative assessment of capital structure efficiency, a second analytical stage is introduced, focusing on value maximization and cost of capital minimization.

Building on these explanatory results, the analysis proceeds to a second methodological stage to assess capital structure efficiency. At this stage, the focus shifts from identifying statistical associations to evaluating the implications of financing choices for minimizing capital costs. To this end, a methodological adaptation based on Wang (2016), Royer and McKee (2020), and Canassa and Costa (2019) is applied.

After identifying the group with the strongest associations through ANOVA and confirming the consistency of the selected variables, this framework simplifies the capital structure in terms of equity and debt components (K_e and K_i), as expressed in Equation (2):

$$\max PV_{\pi} = \left(\frac{\sum_{i=0}^{n}[i_c CS + sPR_i - PR_i]}{(1+d)^i}\right) + \left(\frac{\sum_{i=0}^{\infty-m}(1-s)PR_i}{(1+d)^{m+i}}\right) \quad (2)$$

To operationalize the proposed framework and focus on capital cost minimization, the cost components of equity and debt were estimated with cooperative-specific adaptations. The cost of equity (K_e) was approximated using a return-based measure (Equation 3), acknowledging the heterogeneous expectations of cooperative members, who simultaneously act as owners and users, making individualized estimation impractical (Canassa; Costa, 2019; Royer, 2018). The cost of debt (K_i) was calculated as the ratio of financial expenses to interest-bearing liabilities, as defined in Equation (4).

$$k_e = \left[\frac{Sob_{dis} + Dev_{quo}}{PL_{med}}\right] + \left(\frac{Sob_{Liqt}}{PL_{med}}\right) x \left[1 - \left(\frac{Sob_{dis}}{Sob_{ad}}\right)\right] \quad (3)$$

$$K_i = \frac{Desp_t}{TE + Fin_{dp} + R_{fi} + K_{inc}} \quad (4)$$

To integrate equity, debt, and retained surpluses, the WACC minimization model was applied:

$$\min WACC_{\pi} = \left[\left(\frac{CS}{(CS+Dj)}\right).Ke + \left(\frac{Dj}{(CS+Dj)}\right).Ki\right] + (1-s)_j \quad (5)$$

Where CS represents share capital, D_j long-term debt, and $(1–s)$ the proportion of retained surpluses. Box 2 summarizes the variables and expressions used.

Box 2 - Descriptions of capital structure and cost models

Expression	Description	Expression	Description
$\max PV_{\pi}$	maximizing the present value of the surpluses (income) distributed to the cooperative members.	K_e	cost of equity.
i_e	leftover distribution rate.	K_i	cost of third-party capital.
CS	the cooperative's share capital (equity).	$Sobdis$	distributed surpluses.
PR	profit sharing.	$Sobad$	surpluses before allocations.
$1+d$	discount rate.	$Sobliqt$	net surpluses.
1-s	is the percentage of PR that is not distributed and is therefore allocated to the cooperative's capital as revolving funds or reserves.	$Devquo$	return of dues.
s	is the reimbursement rate (leftovers): proportion distributed to cooperative members.	$PLmed$	average net worth.
i	specific period over time.	$Despt$	financial expenses for the period.
m	is the term of the revolving fund. For example, m = four means that the revolving fund in period 0 must be returned to the cooperative members at the beginning of period 4, the revolving fund in period one must be returned at the beginning of period 5, and so on.	TE	total loans.
d	weighted average cost of capital is assumed to be a discount rate composed of K_e + K_i.	$Finclp$	total financing (short and long term).
K_{inc}	Non-cooperative third-party capital.	Rfi	investment fund resources.

Source: Adapted from Canassa and Costa (2019), Royer and McKee (2020) and Wang (2016).

Where *CS* represents share capital, D_j long-term debt, and $(1-s)$ the proportion of retained surpluses. Box 2 summarizes the variables and expressions used. Based on this specification, Equation (5) is applied to cooperatives with the highest and lowest representativeness within each equity group, allowing a structured comparison of capital structure configurations and surplus retention practices in terms of their implications for WACC and financial efficiency.

4 –ANALYSIS OF RESULTS

Once the net worth was accepted as an analysis parameter for grouping and understanding part of the capital structure of agricultural cooperatives, the descriptive analysis of the net worth was progressively segregated as one moved from one group to another, with averages of R$ 82,017.89 for G1, R$ 698,273.56 for G2 and R$ 2,487,803.00 for G3 (both in units of R$ thousands). The results also showed that G3 had the highest standard deviation, indicating greater dispersion of equity values in this group. This may imply significant heterogeneity in the financial and structural characteristics of the cooperatives in this group, underscoring the importance of complementing their evaluation with the proposed financial and operational metrics. To assess the different PL strata among the groups, the Shapiro-Wilk test confirmed the data's normality. It revealed that, for all groups, the *p-value* was greater than 0.05, indicating insufficient evidence to assume the data are not normally distributed.

Another aspect is that, although insignificant, the *p-values* were lower for G3, indicating a possible asymmetry in the data for this group. The mean values, standard deviations, and Shapiro-Wilk correlation coefficients are presented in Table 4 for each analyzed group.

Table 4 - ANOVA: Tests of Normality and Homogeneity of Variances of the PL

Descriptive analysis of the PL:		
	Grouping	**PL**
Average	1	82.018
	2	698.274
	3	2.487.803
Standard deviation	1	56.401
	2	456.768
	3	1.624.113
W for Shapiro-Wilk	1	0,882900728
	2	0,873240065
	3	0,626006344
p Shapiro-Wilk	1	0
	2	0
	3	< 0,001

One-way ANOVA (Welch):				
	W	***gl1***	***gl2***	***p***
PL	16,820175890	2	10,83947620	< 0,001

Test for normality (Shapiro-Wilk):		
	W	***p***
PL	0,613191258	< 0,001

Note: A small *p-value* suggests a violation of the normality assumption.

Test for homogeneity of variance (Levene):

	F	***gl1***	***gl2***	***p***
PL	3,28515903	2	24	0,055

Source: Research data.

Table 4 also shows the following results for the one-way ANOVA (PL): degrees of freedom (gl_1 = 2 and $gl_2 \approx 10.839476$), and based on the critical value of F at *p-value* < 0.001, the result is assumed to be statistically significant, suggesting that at least one of the groups differs significantly from the others in terms of PL means. This indicates that there is variability in the groups' averages for PL. Complementing the results of the normality tests, the *p-value* for PL was less than 0.05 with the Shapiro-Wilk test, indicating that the data do not follow a normal distribution. Therefore, the data did not meet normality assumptions as assessed by the Shapiro-Wilk test (p = 0.001). When evaluating the descriptive data, it can be seen that group 3 had a p < 0.001. The assumption of homogeneity of variance was met, as indicated by Levene's test (p = 0.055). However, since one of the ANOVA assumptions (normality) was not met, the Kruskal-Wallis test was used, with a PL result of p < 0.001, and the Dwass-Steel-Critchlow-Fligner test for multiple comparisons between groups yielded p < 0.001. These tests indicate statistically significant differences in

the medians of the groups, as shown in Table 5.

Table 5 - Tests of significance and comparability between the PL groups

Test: Kruskal-Wallis:

	X^2	*gl*	*p*
PL	23,14285714	2	< 0,001

Test Comparisons: Dwass-Steel-Critchlow-Fligner:

	W	*p*
1 : 2	5,05756338	0,001
1 : 3	5,05756338	0,001
2 : 3	5,05756338	0,001

Source: Research data.

Since the abnormality identified was limited only to G3, new tests were carried out (Table 5), confirming the groups' significance and the homogeneity of variance (Table 4). The tests indicate that it is plausible to assume the one-way ANOVA (PL) assumptions were met. Thus, the differences observed in average equity are consistent, allowing the ANOVA analysis to proceed by assigning other complementary variations to metrics contiguous to the capital structure to examine their relationship with equity size within their respective groups. Once the significant conditions for analyzing the equity factor were met, the ANOVA for equity continued, treating the other financial and operating metrics as residual variables, as shown in Table 6.

Table 6 - ANOVA of PL and comparability of Groups with residual analysis metrics

ANOVA - PL x Groups:

	Sum of Squares	***gl***	**Mean square**	***F***	***p***
Groups	28109966040228,9	2	14054983020114,5	14,79700357	< 0,001
Waste	22796479762957,1	24	949853323456,5		

Post Hoc Test - PL x Group Comparisons:

Comparison		**Average Difference**	**Standard error**	***gl***	***t***	***pTukey***
Groups	**Groups**					
1	2	-616255,67	459432,820250879	24,0	-1,341340104	0,387
	3	-2405785,11	459432,820250879	24,0	-5,236424141	< 0,001
2	3	-1789529,44	459432,820250879	24,0	-3,895084037	0,002

Source: Research data.

Table 6 shows significant differences between the groups in equity size (F = 14.797; p < 0.001; gl = 2), indicating that equity size affects the proposed financial and operational metrics. When the metrics were submitted to the post hoc test for comparability between the groups to observe the differences in average equity, it was found:

a) mean difference between groups 1 and 2 of -616,255.67, with a standard error of 459,432.82. However, the Tukey test found no significant differences

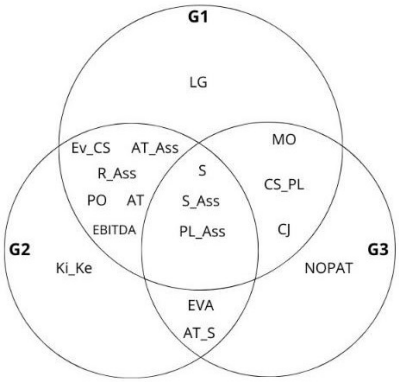
between these groups (p = 0.387).

b) mean difference between groups 1 and 3 of -2,405,785.11, with a standard error of 459,432.82. This difference is highly significant (p < 0.001), indicating that G3 has a significantly lower PL than.

c) the mean difference between groups 2 and 3 was -1,789,529.44, with a standard error 459,432.82. This difference was also significant (p = 0.002), indicating that G3 differs significantly from G2 regarding PL.

These results reinforce the importance of understanding the nature of net worth, which is largely derived from the shares and allocations added to the cooperative with surpluses, as these are its primary sources of composition. In an analysis of low-net-worth cooperatives (G1), they face different financial challenges than those in G3, whose net worth is higher. Delving deeper into the complementary analysis of the residuals, it can be seen that the Shapiro-Wilk *p-values* configure the following most significant metrics for their respective groups, as can be seen in Figure 1:

Figure 1 - Grouping of financial and operational metrics in ANOVA PL



Source: Research data.

Figure 1 shows the individual metrics standard to both groups that were significant when considering the capital structure under ANOVA PL analysis. It should be noted that, for both groups, the metrics S; S_Ass and PL_Ass show that the surpluses calculated at the cooperatives' Ordinary General Meetings (AGM) are relevant for the constitution of new contributions to distributed equity capital via allocations, since other metrics in terms of number of members and PL are also common elements. These are determinants in the constitution of Ke in the capital structure. Another notable aspect of Figure 1 is that each group has a single metric that allows for a more detailed analysis of the capital structure under the ANOVA PL relationship, capable of conceiving analytical digressions inherent to the size of the cooperative. However, the analysis of the residuals must provide a consistent result since the comparability was accepted between the PL groups. On the other hand, the metrics used were only analytical components to highlight groups with higher coefficients of determination. It is necessary to complement these metrics' analysis, considered residuals in the PL ANOVA, using multiple regression, as shown in Table 7.

Table 7 - Significant financial and operational metrics for the PL groups

Measures of Model Fit:

Model	*R*	R^2	R^2 Adjusted	Testing the Global Model			
				F	*gl1*	*gl2*	*p*
1	0,96879	0,93856	0,91125	34,37135	8	18	< 0,001

Model coefficients: K_i_K_e:

Predictor	Estimates	Standard error	*t*	*p*
Intercept	-15,4235928	6,08717131	-2,53378656	0,021
IF	-20,1458444	3,60594155	-5,58684720	< 0,001
GE	34,8852687	22,02630280	1,52319922	0,145
AT	0,0000001	0,00000008	1,87485827	0,077
PL	-0,0000002	0,00000022	-0,96030806	0,35
PO	-20,0612146	0,00000006	-1,31551744	0,205
K_i _AT	8,8644394	26,91663515	-0,74530916	0,466
LG	1,3944156	1,63685118	5,41554390	< 0,001
I_PL		0,44936274	3,10309565	0,006

Collinearity:

	VIF	Tolerance
IF	17,63777830	0,05669648
GE	1008,33698554	0,00099173
AT	6,09392419	0,16409787
PL	7,22890831	0,13833347
PO	2,02169478	0,49463451
K_i_AT	1246,96488784	0,00080195
LG	25,16919237	0,03973111
I_PL	1,49591616	0,66848667

Durbin-Watson autocorrelation test:

Autocorrelation	*DW* Statistics	*p*
0,18575755	1,50925989	0,122

Source: Research data.

Table 7 presents the results of Equation 1 based on the metrics with the highest correlation coefficients and significance (Table 3). The model showed statistical significance ($p < 0.001$) with an *F* value of 34.3713. The variance explained by the eight metrics, as measured by adjusted R^2, was 91.13%. Therefore, the variable of interest, PL, shows statistical significance in ANOVA, indicating that variations in PL are associated with the evaluated metrics. The high explained variance indicates that the model can explain most of the variation observed in the financial metrics examined. However, there is multicollinearity between some of the independent variables. The high value of the variance inflation factor (VIF) shows that PO and I_PL have relatively low correlation with other independent variables, making them robust to the model. However, the other metrics indicated considerable multicollinearity, which can affect the accuracy of the associated estimates. With the Durbin-Watson autocorrelation test, the *p-value* was 0.122, which supported the model's reliability, indicating no significant autocorrelation in the residuals. Thus, when considering the *VIF* parameter 10 (Hair *et al.*, 2005; Johnson; Wichern, 1988; Vining; Peck; Montgomery, 2021), the variables AT, PL, PO, and I_PL are the most

robust predictors of the model. In these respects, the decision was made to maintain the current model. Thus, based on Equation 1 of the regression model and considering the proposed factors and their respective intercept values and estimated β coefficients, its application is expressed in Equation 6:

$$K_i_K_e = -15{,}4236 - 20{,}1458 * IF + 8{,}8644 * LG + 34{,}8853 * GE - 20{,}0612 * K_i_AT - 0{,}00000007813 * PO + 1{,}3944 * I_PL - 0{,}0000002175 * PL + 0{,}0000001435 * AT$$

The metric $K_i_K_e$ represents the volume of capital financed by third parties relative to the cooperative's capital, providing insight into the cooperative's financing structure and financial leverage. Considering Equation 6 and averaging the survey data from the cooperatives with the lowest and highest PL in each group, we can see the model's applied results, as expressed in Table 8.

Table 8 - Average debt-to-equity ratio

	G1	**G2**	**G3**
Minor (PL)	Cooperagudo	Capul	Castrolanda
	0,67	0,30	0,78
Largest (PL)	Coplana	Coopercitrus	Coamo
	3,68	3,61	0,21

Source: Research data.

Table 8 shows that a value below 1 represents less dependence on third-party debt. In other words, the cooperative depends more on its capital to finance its operations and investments, as found in Díaz Córdova, Coba Molina and Navarrete López (2017) and Russo *et al.* (2000). Conversely, if the value is above 1, there is considerable financial leverage since operations and investments are more anchored to third-party capital debts. The results show that, in G1 (represented by Cooperagudo with the lowest net worth and Coplana with the highest net worth), Cooperagudo has $K_i_K_e$ below 1, i.e., it depends more on its capital to finance its operations and investments. On the other hand, Coplana, with the highest net worth, has $K_i_K_e$ above 1, showing that its operations and investments are leveraged and depend more on third-party capital. The G2 (Capul and Coopercitrus) has the same analysis as G1. For these two groups, it is clear that, despite their relatively high net worth, dependence on third-party capital still predominates. In G3 (Castrolanda and Coamo), the $K_i_K_e$ values are below 1. Castrolanda has a relatively high value (0.78), with moderate dependence on third-party capital. Finally, Coamo (with high equity) has a low value (0.21), even compared to the other cooperatives analyzed, indicating low dependence on third-party capital.

After carrying out the correlation analysis based on the average data for the period analyzed for some of the cooperatives in the groups, which showed discrepancies in equity, the application of the model adapted to minimize the cost of capital and aimed at analyzing the capital structure produced the following result, as shown in Table 9.

Table 9 - Minimizing the cost of capital and the leftovers earmarked for the AGM

		Cooperagudo	Coplana	Capul	Coopercitrus	Castrolanda	Coamo
R$ million	*CS*	3.623	20.141	47.527	534.904	582.004	384.966
	D_j	3.711	135.657	62.791	1.234.337	509.193	1.944.675
	1-s	36.629	184.023	116.877	658.882	790.377	6.277.460
	Surplus before allocations	2.946	25.853	33653.33	156.612	145.950	1.359.054
	Surpluses available at AGM	572	25.853	7.101	156.612	113.547	523.625
	K_e	0,1242	0,1242	0,1242	0,1242	0,1242	0,1242
	Ki	0,0178	0,1296	0,0410	0,1486	0,0346	0,0266
	%1-s	0,0804	0,1405	0,2879	1,0000	0,1847	0,2165
minWACC		**0,15**	**0,27**	**0,36**	**1,14**	**0,27**	**0,26**
Ratio: Surplus Available for AGM to Net Surplus		19,41%	100%	21,10%	100%	77,80%	38,53%

Source: Research data.

Table 9 presents the results of Equation 5 for the same cooperatives as in Table 8. For D_j (long-term debt), it was assumed that the capital structure is not limited to financing and loans on the balance sheet, but involves all financial instruments and commitments that impact the cooperative's long-term financial position, such as capital to be repaid to members, judicial deposits, provisions for judicial deposits, provisions for labor/tax contingencies, and lease obligations, among others.

About the cooperatives' retained surpluses (*1-s*), the average for the period under analysis was also taken as the amount of reserves and funds incorporated into the cooperatives' equity. For K_e, the average for the period under analysis was used for the shareholder risk premium in the farming and agriculture sector, which was 5.89% (Instituto Assaf, 2024), i.e., below 12%, considering Law 5.764/71, Art. 24, § 3. This was also added to the average for the period for SELIC (Special Settlement and Custody System), which was 6.53%, thus: K_e = 12.42%. For K_i, a simplified approach was also adopted for its calculation, as there is no access to specific data or contracts that reveal interest rates or any financial charges associated with sources of financing, such as loans and leases. It, therefore, assumes the proportion of debt (onerous liabilities) to equity, using the SELIC average for the period as the analytical basis for the debts incurred. For this simplified approach to K_i, it was possible to estimate the cost for each cooperative under analysis. For (*1-s*), the proportion of the average surpluses retained in the cooperatives compared to the average surpluses before allocations were considered.

The results in Table 9 show that the values for minimizing the cost of capital (minWACC) between the cooperatives analyzed differed significantly. The Cooperagudo cooperative has the lowest minWACC (0.15) from the perspective of the discount rate used to value the cooperative at fair value, which is the one that will provide the best value for the assets, since its cost of capital has been lower. This indicates relative efficiency in capital management and in minimizing financing costs. Thus, the minWACC of the Cooperagudo and Coamo cooperatives is relatively low (0.15 and 0.26, respectively), indicating efficient capital management and low

financial costs and leverage. Coopercitrus indicates a discrepancy, but this is due to a series of conditions in the allocation of surpluses, such as: Realization of the Technical, Educational and Social Assistance Reserve (RATES); Transfer of non-cooperative acts to RATES; Surpluses after RATES adjustments; Allocations from Statutory Reserves to Reserves of: Capital, Surplus and Legal Reserves; Social Investment Fund; Surplus after allocations: Working Capital Fund - 40% and Social Capital - 60%. Among these aspects inherent to the cooperative, it can also be seen that the surpluses were 100%, with the Surplus Reserves account being cumulative and already included in the PL. Comparing the relative financing cost analysis (K_e and K_i) presented in Table 8, it can be seen that both Coplana and Coopercitrus leverage their activities and depend more on third-party capital, as also evident in Table 9.

It should be noted that operational performance, investments, cost management efficiency, and the policy for distributing results adopted by each cooperative are variables that can cause these analytical discrepancies. For example, in the case of Coopercitrus, it is impossible to determine the minWACC index effectively. This could also be the case for Coplana, which has a 100% ratio. In the case of Coplana, the level of detail in the economic and financial reports does not, for example, detail the allocation of reserves, funds, and capital. This leads, at first, to dubious claims that all net surpluses are available for the AGM, compromising better analysis of the minWACC and, in turn, the capital structure.

The application of the minWACC model, as adapted in this study, represents a methodological innovation in the analysis of the capital structure of the agricultural cooperatives. The minWACC used here is adjusted to reflect the peculiarity of the cooperative environment, where the objective is not speculative profit but the generation of value and benefits for cooperative members. The formulation of Equation 5, by integrating the *CS* of the cooperative members, D_j, and $(1\text{-}s)_j$, allows for a more accurate assessment of the cost of capital from a cooperative perspective.

From this standpoint, the approach is innovative because it incorporates the opportunity cost inherent in cooperative membership. This differs from conventional approaches, in which the opportunity cost of equity capital is the return that shareholders could obtain from alternative investments of similar risk. In cooperatives, although the capital paid in by members is not intended to generate direct profit through share appreciation, it represents a resource that could be used in their own productive activities or in other financial investments. Therefore, minimizing WACC in this context not only optimizes the cooperative's financing costs but also reflects efficient management that maximizes the collective benefit of cooperative members by freeing up resources that high capital costs would otherwise consume. By reducing WACC, the cooperative can offer better pricing for products and inputs, invest in infrastructure and services that directly benefit members, or even increase the distribution of surpluses, which ultimately represents the return on capital invested by cooperative members from a differentiated opportunity-cost perspective.

Building on this reasoning, the methodological perspective adopted here links capital structure choices to the effective cost borne by cooperative members, reframing leverage as a governance and allocation problem rather than solely a financial ratio. By integrating equity, debt, and retained surpluses into the minWACC framework, the analysis translates statistical associations identified through ANOVA and regression into a decision-oriented evaluation of financing efficiency. The results indicate that variations in surplus retention policies and debt composition materially affect the cooperative's cost of capital, influencing its capacity to invest, distribute benefits, and

withstand market volatility. Consequently, the approach provides a structured basis for assessing how governance arrangements and allocation rules shape the capital structure.

FINAL CONSIDERATIONS

This study evaluated the capital structures of 27 Brazilian agricultural cooperatives from 2018 to 2022 by combining economic and financial performance metrics with equity-based groupings. The results indicate that cooperatives with higher net worth tend to exhibit greater financial resilience and lower dependence on third-party capital. Conversely, smaller cooperatives display more fragile capital structures and higher leverage.

The evidence indicates that larger cooperatives rely less on external financing, whereas organizations with lower equity bases require intensified capitalization efforts to sustain operations and investments. These findings position equity composition not merely as a structural financing component but as a strategic determinant of leverage dynamics within cooperative governance frameworks, particularly in contexts where capital accumulation directly affects the weighted-average cost of capital.

In addition to existing theory, the results indicate structurally heterogeneous leverage behavior across equity strata, consistent with empirical evidence reported by Santos and Schneider (2023). The evidence shows that higher equity levels do not necessarily translate into lower leverage, as some large cooperatives continue to rely heavily on third-party capital. This pattern suggests that leverage decisions cannot be fully explained by capitalization capacity alone, casting doubt on the linear application of traditional capital structure theories in the cooperative context.

This evidence reinforces the interpretation that leverage patterns in agricultural cooperatives are shaped by organizational and institutional conditions rather than equity size alone. Consistent with the clustering perspective proposed by Rodrigues *et al.* (2018), the observed differences reflect strategic financing choices associated with organizational scale, governance arrangements, and differential access to financial markets.

The application of the adapted minWACC model represents a methodological contribution by incorporating the cooperative member's opportunity cost into the analysis of capital structure efficiency. Minimizing WACC in this context is not merely a financial optimization exercise, but a mechanism for enhancing collective value by reducing financing costs, improving surplus allocation policies, and strengthening long-term sustainability. Such an approach is consistent with the argument that the cost of capital in cooperatives must account for the implicit cost of retained surpluses, the redeemable nature of member quotas, and the time horizon for restitution (Royer, 2018).

From a governance perspective, the findings emphasize the strategic role of surplus retention and allocation policies in shaping capital structure outcomes. Funds and reserves are not only accounting instruments but also governance mechanisms that affect capitalization, member participation, and financial stability. Transparent and well-aligned allocation rules, as defined in cooperative bylaws, are therefore critical to ensuring consistency between capital structure decisions and cooperative principles.

From a broader perspective, this research advances understanding of capital structure dynamics in Brazilian agricultural cooperatives by integrating financial metrics, equity stratification, and cost-of-capital analysis within a cooperative-specific framework. It underscores the need for financial management models that recognize the distinct nature of cooperativism rather than relying exclusively on conventional corporate finance assumptions.

Finally, future research should explore valuation approaches tailored to cooperatives that combine present value maximization with cost-of-capital minimization. Investigating how different configurations of equity, debt, and surplus retention affect fair value and member welfare over time remains a promising avenue for advancing both theory and practice in cooperative finance.

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