Collaborative Strategies and Relational Capital: Risk Mitigation for MSMEs in Weak Markets

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Abstract.
Micro, Small, and Medium Enterprises (MSMEs) face a high probability of bankruptcy when operating in weak economies. According to empirical data from Ecuador's National Institute of Statistics and Census, 75% of MSMEs exit the market after seven years of operation. This study seeks to demonstrate a strong, direct relationship between Relational Capital, Collaborative Strategies, and Value at Risk (VaR) for MSMEs. The principles and theoretical foundations of "process-based collaborative actions" are explored as sustainable value generators in weak markets. An empirical methodology involving structural equation models and regression was applied, using secondary data from 367 MSMEs in the commercial sector sourced from Ecuador's Superintendence of Companies and surveys conducted with entrepreneurs and academics. The findings confirm that a "Relational-Collaborative" management approach can overcome the weaknesses of specific markets, even when broader dynamics remain unchanged. By harnessing synergy, businesses efficiently manage key financial variables, thereby reducing enterprise risk.

Keywords: Weak Markets, Structural Equations, Business Value, Collaborative Management, Strategic Alliances, Operational Covariance.

Introduction

The research unfolds in Guayas province, situated in the southwestern coastal region of Ecuador. Guayas houses 4.5 million inhabitants (24.5%) and drives the country's commercial and entrepreneurial activities. The nation holds 846,265 enterprises, with MSMEs covering 99%, contributing 27% of total sales, and employing 36% of the national workforce. Over 42% of these enterprises operate in Guayas, turning it into Ecuador's largest industrial hub (Instituto Ecuatoriano de Estadísticas y Censos, 2022).

The composition of MSMEs in Ecuador divides as follows: a) microenterprises employing 1 to 9 workers and earning annual revenues of up to $100,000; b) small enterprises employing 10 to 49 workers and earning annual revenues between $100,001 and $1,000,000; and c) medium enterprises employing 50 to 199 workers and earning annual revenues ranging from $1,000,001 to $5,000,000 (INEC, 2022; Molina-Sánchez et al., 2022). This segment endures the most severe impact from national market crises.

Enterprises tend to shut down early, surviving for an average of five years. The count of active enterprises dropped by 40,335 (4.5%) between 2019 and 2020. In the microenterprise segment alone, 26,000 closures (3.2%) occurred, with the service subsector suffering the most, losing 20,000 enterprises. The service sector endured a net reduction of 5% based on 2019 figures and an average contraction in sales of 16% during 2020 (INEC, 2022).

Facing substantial challenges, MSMEs wrestle with managing Value at Risk (VaR). Effective VaR management determines the bankruptcy or sustainability of a company. VaR springs from the organization\u2019s key financial indicators, emphasizing the critical importance of efficient financial performance systematization (Pacheco-Ruiz et al., 2022). To examine this behavior, financial data from 367 MSMEs, spanning 2006 to 2020, underwent analysis, yielding the following averages.

VaR is derived from the organization's key financial indicators; Therefore, the transcendent importance of the efficient systematization of the financial performance of an organization (Pacheco-Ruiz et al, 2022). In the need to analyze the aforementioned behavior, the financial information of 367 MSMEs is taken, from 2006 to 2020, with which the following averages were obtained (table 1).

Table 1 provides information on the behavior of financial variables over 15 years, revealing very high specific risk values. For instance, in Net Profit Margin, the risk reaches 360%, and on average, across all financial accounts, it stands at 84%. A significant weakness in financial management emerges, as acceptable leverage typically fluctuates between 25% and 50%, yet this analysis shows it remaining between 6% and 15%. This inefficiency materializes in the results: the Return on Assets indicator in 2020 stands at -0.01, and Net Profit Margin at -0.06 over the 15 years. These outcomes illustrate the reason for bankruptcies.

Addressing this phenomenon involves the theory of relational capital, collaborative strategy, and risk mitigation, under the assumption that MSMEs activities operate in weak markets (G. Gómez et al., 2022). In this context, the analysis stems from the following questions: Is there a relationship between risk, collaborative strategies, and relational capital? Does a strategy linking relational capital and collaborative strategies shorten the tails of normal distribution for these MSMEs? Given this framework, the research aims to demonstrate a strong and direct relationship between Relational Capital, Collaborative Strategies, and Value at Risk, proposing a criterion to stabilize key financial indicators for MSMEs.

Table 1. Average Financial Indicators in MSMEs

Period	Equity Debt Ratio	Leverage	Current Equity Debt	Non-Current Equity Debt	Admin & Sales Expense Impact	Net Return on Assets	Net Profit Margin	Operational Return on Equity	Operating Income / Total Assets
2006	13.67	14.49	6.53	5.38	0.26	0.03	0.00	1.01	0.10
2007	10.19	11.09	4.82	3.77	0.25	0.04	0.01	1.05	0.12
2008	11.44	12.39	5.03	5.49	0.34	-0.06	-0.05	0.04	-0.01
2009	8.29	9.19	4.05	2.96	0.31	0.03	0.01	0.26	0.08
2010	15.20	16.17	7.29	5.83	0.30	0.07	0.04	0.82	0.09
2011	8.71	9.67	3.72	3.33	0.31	0.07	0.04	0.61	0.09
2012	9.50	10.48	4.30	2.63	0.27	0.04	0.02	0.45	0.09
2013	14.07	15.05	6.81	5.86	0.28	0.04	0.02	-0.18	0.10
2014	5.52	6.52	2.60	1.57	0.28	0.05	0.03	0.70	0.15
2015	5.57	6.57	2.07	1.99	0.31	0.03	0.02	0.70	0.12
2016	6.21	7.18	2.23	2.20	0.33	0.02	0.01	0.50	0.09
2017	8.90	9.88	4.11	2.12	0.32	0.03	0.02	1.06	0.10
2018	5.71	6.70	2.19	2.04	0.32	0.03	0.02	0.36	0.09
2019	4.92	5.90	1.91	1.65	0.34	0.01	-0.01	0.38	0.08
2020	8.74	9.66	3.14	3.80	0.39	-0.01	-0.06	0.09	0.04
Total	9.11	10.06	4.05	3.37	0.31	0.03	0.01	0.52	0.09
	3.31	3.29	1.78	1.57	0.04	0.03	0.03	0.38	0.04
Risk	36%	33%	44%	47%	12%	113%	360%	72%	41%

Risk Coverage in Weak Markets

The high bankruptcy rate of newly established MSMEs, or their very slow capital growth, reflects the symptomatic challenges of weak economies (Instituto Ecuatoriano de Estadísticas y Censos, 2022). Similarly, the distortion of the risk-return relationship also emerges as symptomatic, serving as the root of productive margin contraction, which spreads pandemically across business networks (Hull & Basu, 2022).

Value at Risk (VaR), influenced by price volatility (linked to sales turnover and value creation), remains largely unexamined in MSMEs (Matute-Petroche et al., 2023). This aspect often falls to chance or uncertainty, resulting in successive losses (Pineda Guerrero et al., 2021). Weak markets demand the continuous sacrifice of entrepreneurial capital, yet reversing this logic offers success potential through the coordinated interaction of processes.

In weak markets, reducing bankruptcy risks and improving business value becomes feasible through the efficient management of relational capital and the simultaneous execution of collaborative strategies (Matute-Petroche et al., 2023).

Weak markets are those that limit participation through asymmetric information and lack guarantees for contract enforcement, making them inherently riskier (Adan Gallo et al., 2022). In these markets, MSMEs accumulate disadvantages due to unfair competition from monopolistic companies. They are also affected by the informality of their economic activities, which accounts for 60% of the economy. This group operates without futures contracts, technical or fundamental market information, or a stable currency (or with a weak currency). The depth of such markets depletes more easily, ultimately turning them into a graveyard for small businesses.

The authors Matute-Petroche et al. (2023) define relational capital as *an intangible asset that acts as a multiplier of competitive opportunities, enabling complex business processes within strategic partnerships [addressing the instability of internal processes*. This intangible capital enhances business capacity by improving operational assets, including working capital (cash flow). The operational cycle undergoes optimization in terms of timing, but more importantly, its chaotic variation, driven by price behavior, gets corrected.

The relational concept encompasses collaboration as the method that enables strategic partnerships without altering the ownership structure of each company (Castillo-Nazareno et al., 2021). It allows one company to leverage the assets and capabilities of another to improve its own competitiveness, thereby amplifying the strength of micro and small enterprises in the market. Ultimately, this overcomes transactional biases. The more companies that adopt the strategy, the more efficiently the market transforms: market forces balance, and weaknesses tend to disappear. Collaboration emerges as an urgent concept for understanding business competitiveness more broadly; MSMEs operating in competitive isolation have no chance of surviving in these markets.

Relational capital supports the improvement of processes impacted by price disadvantages. Meanwhile, collaborative strategies facilitate linkages among companies through key processes that enable shared management (Matute-Petroche et al., 2022). The former seeks internal improvements through relationships, while the latter focuses on collaboration. Together, they create an efficient market channel alongside one or more aligned companies. This results in better, more stable pricing levels, making growth planning achievable.

The "relational-collaborative" strategy represents a process-based alliance, requiring the ability to support and promote shared management among companies. This organizational approach, when applied to MSMEs, delivers benefits to each participant; for this reason, it can be defined as *Collaborative Management*. It is a necessary concept to reduce VaR by addressing operational covariances generated when integrating processes from different companies (Saiz-Alvarez et al., 2020).

The condition of a *process-based alliance* demands an instrumental understanding of VaR for MSMEs. VaR serves as a mean-variance model aiming to maximize returns. It measures the maximum probable loss a company might experience within a given time frame and plays a crucial role in decision-making (Taylor, 2020). This linkage of companies through mutual process operations contributes to reducing variance outcomes and facilitates return predictions (Pineda Guerrero et al., 2021; Wang et al., 2019).

The assumptions about loss distributions involved in VaR require robust databases (unavailable in weak markets) and strong technical management. Performance must be calculated using the concept of expected value, which becomes more challenging when long and thick-tailed distributions are present (Scheller & Auer, 2018). Complexity increases in environments with operational covariance, as this must be neutralized for each process-based alliance, even when the market retains its generally weak characteristics (C. Gómez, 2020). Administrative efficiency parameters revolve around successfully addressing these complex requirements (Pomar et al., 2021).

The most studied models for VaR analysis, according to Willumsen et al. (2019), include: a) historical simulation, b) MonteCarlo simulation, c) parametric models, d) Generalized Tukey-lambda distribution (GTLD), and e) GARCH (Pineda Guerrero et al., 2021). When applied

within "relational-collaborative" strategies, these complex methods, though still valid, become absorbed into strategically articulated processes designed to stabilize the most critical financial variables. In other words, resolving operational covariance coverage automatically simplifies the complexity of VaR calculations.

In conclusion, the deficiencies of countries lacking strong markets can be addressed through *Collaborative Management* among MSMEs (Bundy et al., 2018). Achieving this requires sharing costs, marketing production, scaling volume, organizing purchases, and distributing the market. This approach entails building strategic networks to stabilize returns based on equivalence in the value chain, decision-making mechanisms, and adjusted expectations. Networks of micro and small enterprises, under administrative convergence, enable efficient capital accumulation while ensuring equitable and fair distribution of generated wealth (Castillo-Nazareno et al., 2024). Collaborative operations have become essential to the structure of modern businesses (Pineda, Rojas, and Agudelo, 2021).

Despite the theoretical framework of economics and finance schools being focused on risk hedging in strong markets, a rigorous interpretation of the concepts of "relational–collaborative" dynamics concludes that it is feasible to operate successfully in weak markets (Castillo-Nazareno et al., 2023). Key aspects can be achieved, such as neutralizing information asymmetries, agreeing on hedging tools (e.g., maximum and minimum clauses in contracts), and arranging compensations through balance settlement, among other elements that positively impact significant financial variables (Pineda Guerrero et al., 2021).

Applied Methodology

The selected methodology is empirical in nature, based on structural equation models and regression analysis. For this study, the independent variables are the dimensions within *relational capital (RC) and collaborative strategies (CS)*, while the dependent variable is *enterprise value at risk (VaR)*. Each variable constitutes an equation that facilitates the construction of a structural equation model (Mubushar et al., 2020; Chumpitaz & Paparoidamis, 2020; AlQershi et al., 2020). The research hypotheses are as follows:

- H. The VaR of MSMEs in weak markets can be reduced and its distribution improved as a result of strengthening relational capital and enhancing the efficiency of collaborative strategies.

This main hypothesis provides a foundation for a model that encompasses a set of specific hypotheses outlined below.

- H.1. Relational capital positively influences the generation of collaborative strategies.
- H.2. Strategies developed within a collaborative framework are positively related to a reduction in enterprise VaR.
- H.3. The reduction of VaR in MSMEs contributes to improving their financial performance.

For this purpose, the following constructs are defined: a) Independent Variable 1 (IV1): relational capital; b) Independent Variable 2 (IV2): collaborative strategies; c) Dependent Variable (DV): enterprise value at risk (VaR). The study builds upon the findings of Fernández (2018) regarding competencies for microentrepreneurs. To evaluate hypothesis H.3, information is gathered from the Superintendence of Companies, drawing on the 30

key financial indicators from the past 15 years for 85 firms that responded affirmatively to the first three questions in the survey form. A multiple regression model based on the ordinary least squares (OLS) methodology is employed.

Population and Sample for the Main Model

Según datos obtenidos del Instituto Ecuatoriano de Estadísticas y Censos (2022), únicamente el 9% del total 846.265 empresas registran actividad de ventas, plazas de empleo, masa salarial en el IESS y declaran los resultados financieros en la Superintendencia de Compañías. La población a considerar corresponde a las MIPYMES de la provincia del Guayas que abarca el 42%.

According to data from the Ecuadorian Institute of Statistics and Census (2022), only 9% of the 846,265 registered companies report sales activity, employment levels, payroll data with the Ecuadorian Social Security Institute (IESS), and financial results to the Superintendence of Companies. The population considered corresponds to MSMEs in Guayas Province, which accounts for 42% of the total.

Within this framework, the total number of active companies registered with the Superintendence of Companies is 75,404, with 25% engaged in commercial activity (code G under the International Standard Industrial Classification - ISIC) out of the 21 registered activities. This results in 7,944 commercial MSMEs in Guayas Province. The resulting sample consists of 367 commercial SMEs from this province.

The systematization of the database is based on research conducted by Matute-Petroche (2024) in their doctoral thesis, where indicators were designed and assessed through in-depth interviews. Cronbach's alpha will be used to evaluate the correlation of items. The survey results will be analyzed using a multivariate statistical technique.

In-Depth Interviews and Questionnaire Development

The process involved three groups as units of analysis and support for developing the questionnaires. The first group consisted of eight experts who also assisted in refining the questions. The second group included nine participants (authorities and executives), selected based on the following criteria: experience, willingness, and communication skills. The third group comprised seven individuals (suppliers and customers), chosen according to criteria such as availability, willingness, and communication skills. In total, 24 participants contributed to this stage of the research.

Validation and Administration of the Survey. A survey was designed and validated with 42 participants. The purpose of the survey was to assess the importance that business leaders assign to relational capital and collaborative strategies. The validation group included experts, executives, collaborators, customers, and suppliers from MSMEs in Guayaquil. The calculation of *Cronbach's alpha* yielded a value of 0.93. Given its proximity to 1, this result confirms that the survey exhibits excellent consistency.

Results Analysis

Based on the survey results regarding the measurement of relational capital and the application of collaborative strategies, 85 MSMEs responded affirmatively to employing collaborative strategy practices, representing 23% of the sample. Of this group, 7% have

been in operation for less than 15 years, while 93% have been active for over 16 years. Additionally, 49% are medium-sized enterprises, 45% are small enterprises, and 5% are micro-enterprises.

Regarding forms of grouping, 52% belong to an association or chamber, 16% are part of a network, 14% have formed alliances, 12% have engaged in cooperative efforts, and 6% fall under other types of groupings. Furthermore, 58% of the companies do not rely on public policies to implement collaborative strategies. Among the objectives for participating in networks, 32% aim to expand markets, 26% seek to improve competitiveness, 18% focus on business growth and development, 12% strive to enhance quality, 8% aim to foster innovation, and 4% pursue other objectives. Financial data from the Superintendence of Companies was used to conduct a value-at-risk (VaR) analysis for this group of companies.

Structural Equation Model

The structural equation model (SEM) is a multivariate statistical analysis technique used to examine relationships between variables. In this study, SEM provides a statistical and mathematical framework to analyze complex causal relationships among the variables. The analysis was conducted using the AMOS software for SPSS V25. This approach enables the examination of direct and indirect relationships among variables, as well as the evaluation of their strength and significance. For this research, the resulting model equation is divided into three components: a) Relational capital, b) Collaborative strategy, and c) Enterprise value at risk.

Construct Structure: Relational Capital Dimension

This construct includes all variables (I1 to I11) and mechanisms (M1 to M11) that comprise this dimension. Each factor is analyzed to determine whether the variables align exclusively with this dimension.

Table 2. Variables and Mechanisms of Relational Capital

Variable	Mechanism
I1. Negotiation	**M1.** Promotion of negotiation that fosters external links or connections.
I2. Entrepreneurship	**M2.** Effectively and efficiently drives entrepreneurship opportunities.
I3. Technical and Conceptual Skills	**M3.** Understands and applies technical and conceptual knowledge to establish and manage costs and prices.
I4. Innovation	**M4.** Identifies opportunities for improvement to reduce risks.
I5. Adaptability	**M5.** Adapts to the market with collaborative strategies.
I6. Initiative	**M6.** Promotes new ideas that generate collaborative strategies.
I7. Collective Achievements	**M7.** Focuses on meeting business objectives.
I8. Proactivity	**M8.** Encourages participation in collective actions to solve problems.
I9. Teamwork	**M9.** Promotes flexible work structures.
I10. Openness to Dialogue	**M10.** Builds relationships and expands networks of contacts.
I11. Communication and Collaborative Actions	**M11.** Establishes and maintains communication and collaborative actions.

In this model, error correlations are low (ranging between 0.21 and 0.35), as their strength and intensity decrease as values increase. The CFI value is 0.938, and the TLI value is 0.923; since both are greater than 0.9, it can be concluded that the model fits the observed data well. The value of 0.118, which exceeds the 0.10 threshold, is considered acceptable for interpretation as a good fit.

Construct Structure: Collaborative Strategy. The collaborative strategy construct encompasses the variables (I12 to I14) and mechanisms (M12 to M15) that make up this dimension.

Table 3. Variables and Mechanisms of Collaborative Strategies

Variable	Mechanism
I12. Linkage/Coordination	**M12.** Develops skills to establish connections with strategic stakeholders.
I13. Trust	**M13.** Manages indicators to measure business trust.
I14.1 Strategy Systematization	**M14.** Provides support through information for strategy formulation.
I14.2 Managerial Information Systematization	**M15.** Manages information on solvency levels, risk exposure, and internal control mechanisms.

When executing the model, the correlations are very strong, but the error values decrease (3.99, 3.71, 3.90, 3.81). The p-value is 0.00, indicating no dependence. This situation arises when the dataset is very large. Since NPAR does not exceed 30, there is no statistical error. The CFI value of 0.970 and the TLI value of 0.909 confirm the theory, validating the dimension.

Construct Structure: Value at Risk. The value at risk construct includes the variables (I15 to I17) and mechanisms (M16 to M19) that make up this dimension.

Table 4. Variables and Mechanisms of Value at Risk

Variable	Mechanism
I15. Financial Results	**M16.** Outcomes achieved through the application of collaborative strategies (collective guarantee).
I16.1 Credit Risk	**M17.** Access to internal resources for implementing strategies and addressing risks.
I16.2 Compliance Risk	**M18.** Solvency and leverage to fulfill acquired collaborative commitments.
I17. Business Support (Positive)	**M19.** Improved outcomes driven by the company's positioning at both national and international levels (future contracts).

The CFI value is recorded at 0.989, and the TLI value is 0.967, both close to 0.90, confirming that the model fits the observed data well. The RMSEA value is 0.109, indicating that the model has an acceptable fit. The AIC value is 34.751, compared to 333.687 for relational capital and 54.05 for collaborative strategies, showing that the constructs are entirely structural. Table 5 presents the results of executing the structural equation model for each construct.

The data reveals that error correlations are quite low; as they increase, their strength and intensity decrease. Furthermore, enterprise value at risk is not a strongly defined construct due to its relationship with the other study variables. Based on this analysis, the structural equation process is carried out for the three constructs.

Table 5. Comparison Model Matrix

	CMIN	**P**	0	**CMIN/DF**	6.084
Relational Capital	Baseline Comparison	**TLI - rho2**	0.923	**CFI**	0.938
	Root Mean Square Error of Approximation	**RMSEA**	0.118		
	Structural Comparison Indicator	**AIC**	333.687		
	CMIN	**P**	0	**CMIN/DF**	15.027
Collaborative Strategies	Baseline Comparison	**TLI - rho2**	0.909	**CFI**	0.97
	Root Mean Square Error of Approximation	**RMSEA**	0.196		
	Structural Comparison Indicator	**AIC**	54.054		
	CMIN	**P**	0,005	**CMIN/DF**	5.376
Enterprise Value at Risk	Baseline Comparison	**TLI - rho2**	0.967	**CFI**	0.989
	Root Mean Square Error of Approximation	**RMSEA**	0.109		
	Structural Comparison Indicator	**AIC**	34.751		

Resulting Model.

The structural equation modeling (SEM) system has an advantage over other systems and multivariate techniques, as it allows for the analysis of relationships within each subset of variables while also enabling interrelations between variables from different groups.

Correlations.

The correlations for the dimensions—relational capital, collaborative strategy, and enterprise value at risk—are interpreted as normal correlations. In this model, the error correlations for the three dimensions approach zero, resulting in a reliable model.

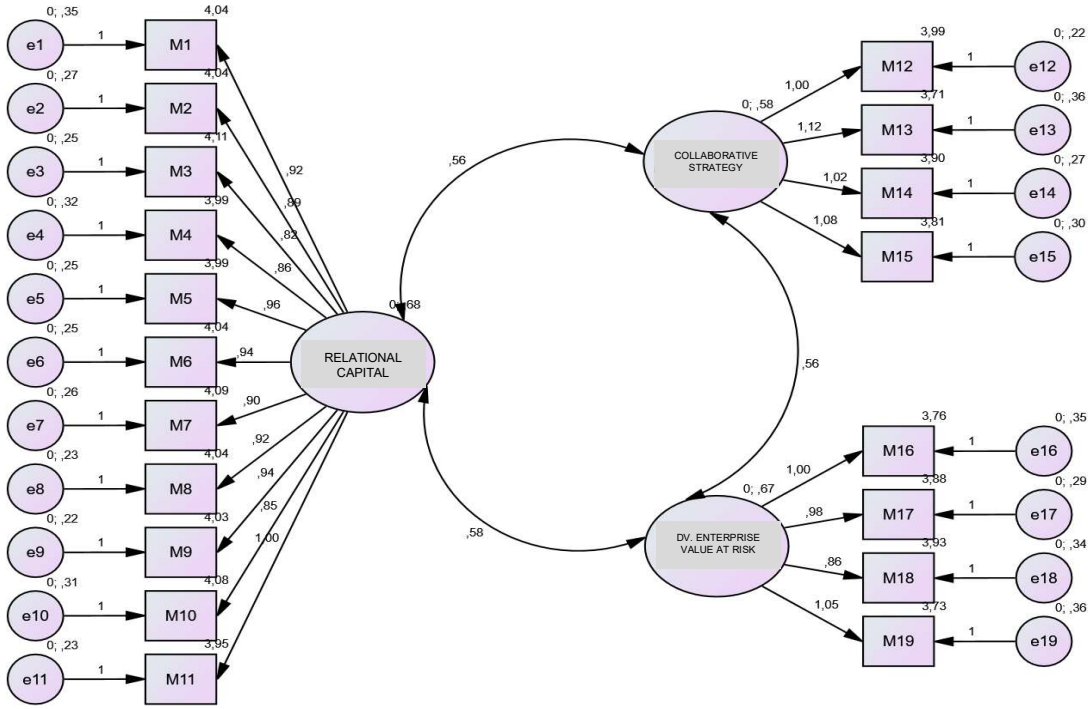

Figure 1. Resulting Model for RC, CS, and VaR

The model shows that the direct correlations are very strong (ranging from 0.82 to 1.12), while the error correlations are lower (ranging from 0.22 to 0.36), making the model robust.

Summary of the Resulting Model.

The summary of the model for the constructs: relational capital (RC), collaborative strategies (CS), and enterprise value at risk (VaR), is presented through the following metrics: CMIN - Minimum Structure, Baseline Comparison - Model of Comparisons, RMSEA - Adjusted Value of Errors, AIC (Akaike Information Criterion)- Structural Comparison Indicator.

CMIN - Minimum Structure.

CMIN represents the Chi-square value and is used to determine whether the observed variables and the expected outcomes are statistically significant. CMIN indicates whether the sample data and the hypothetical model fit acceptably. If the CMIN/DF value is ≤ 3, the fit is acceptable; if the value is ≤ 5, the fit is considered reasonable.

Table 6. CMIN - Minimum Structure for RC, CS, and VaR

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	60	737,134	149	,000	4,947
Saturated model	209	,000	0		
Independence model	38	6679,712	171	,000	39,063

It is observed that the resulting model values for the constructs: relational capital, collaborative strategies, and enterprise value at risk, yield a CMIN/DF of 4.947, which is ≤ 5, indicating that the model has a reasonable fit.

Baseline Comparisons - Model of Comparisons.

A CFI or NFI greater than 0.9 is commonly used as a threshold to determine a good model fit. When the CFI or NFI exceeds this value, it is interpreted that the model fits the observed data well.

Table 7. Baseline Comparisons – Model of Comparisons for RC, CS, and VaR

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,890	,873	,910	,896	,910
Saturated model	1,000		1,000		1,000
Independence model	,000	,000	,000	,000	,000

In the correlations of the resulting model for the dimensions: relational capital, collaborative strategy, and enterprise value at risk, a CFI value of 0.910 and a RHO2 value of 0.896 are recorded, both of which are close to 0.90. Therefore, it can be stated that validation exists, as shown in Table 7.

RMSEA (Root Mean Square Error of Aproximation) - Adjusted Value of Errors.

Regarding the ideal RMSEA value, it is generally considered that: a value ≤ 0.05 indicates excellent fit, a value between 0.05 and 0.08 indicates good fit, a value between 0.08 and 0.10 indicates acceptable fit.

Tabla 8. RMSEA (Root Mean Square Error of Aproximation) for RC, CS and VaR

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,104	,096	,111	,000
Independence model	,322	,316	,329	,000

In the correlations of the resulting model, a value of 0.104 is shown in Table 8, which is close to 0.10. Therefore, it can be concluded that the model has an acceptable fit. **AIC (Akaike Information Criterion) – Structural Comparison Indicator.** The AIC is a measure of the quality of fit of a statistical model. A lower AIC value indicates a better fit and a more parsimonious model.

Tabla 9. AIC (Akaike Information Criterion) for RC, CS and VaR

Model	AIC	BCC	BIC	CAIC
Default model	857,134	864,070		
Saturated model	418,000	442,162		
Independence model	6755,712	6760,105		

In Table 9, the AIC for the dimension of Relational Capital (RC) is 333.687, for Collaborative Strategies (CS) is 54.05, and for Enterprise Value at Risk (VaR) is 34.751. However, in the correlations of the resulting model, the AIC value is 857.13, indicating convergence among the three dimensions. This confirms the validity of the model. The correlations between variables reach one, and most error correlations are symmetrical.

Hypothesis Testing.

When working with structural equation models, all hypotheses can be tested simultaneously by analyzing the behavior of each variable against the others. Regarding the main hypothesis proposed in the research:

H. The value at risk can be reduced and its distribution improved as a result of strengthening relational capital through business collaborative efficiencies.

It can be stated that there is strong statistical evidence to validate that value at risk can be reduced and its distribution improved as a result of strengthening relational capital through business collaborative efficiencies. This conclusion is supported by the fact that the CFI value, corresponding to the fit of the resulting model, is 0.910, and the TLI value, the correlation indicator, is 0.896. Both are close to 0.9, which demonstrates the robustness and viability of the model. Additionally, the RMSEA (adjusted error value) is 0.104, which is considered very low and therefore acceptable. Finally, the AIC (structural comparison indicator) yields a result of 857.134, indicating convergence among the three dimensions.

Based on the results of the resulting model, it is evident that the hypothesis is not rejected. The same interpretation applies to hypotheses H1 and H2.

H.1. Relational capital positively influences the generation of collaborative strategies.

H.2. Strategies developed within the collaborative structure are positively related to the reduction of value at risk for the company.

Given the covariant relationship in the linear correlation among the three dimensions, there is strong statistical evidence to support the research hypothesis. Thus, relational capital does positively influence the generation of collaborative strategies, and the strategies developed within the collaborative structure are indeed positively related to the reduction of value at risk for the company.

For the analysis of data related to the value-at-risk variable, associated with H.3, historical regression models were conducted using RStudio. The hypothesis is as follows:

H.3. The reduction of value at risk in SMEs contributes to improving financial profitability.

Given that there is a covariant relationship in the linear interaction among the three dimensions, there is robust statistical evidence supporting the acceptance of the research hypothesis. This indicates that relational capital positively influences the generation of collaborative strategies, and the strategies developed within the collaborative structure are indeed positively related to the reduction of value at risk for the company.

The data analysis for the value-at-risk variable, associated with hypothesis

H.3, was conducted using the RStudio program through historical regression models. The hypothesis is as follows:

H.3. The reduction of value at risk in MSMEs contributes to improving financial profitability.

The analysis is based on information from the Superintendence of Companies, encompassing the 30 main financial indicators over the last 15 years for the 85 firms that provided affirmative responses to the first three questions of the survey form. In this analysis, the variables exhibit an acceptable correlation, which allows the regression analysis to proceed. The regression enables verification that financial profitability improves according to specific variables that are interrelated, thereby contributing to the reduction of financial value at risk for the analyzed firms.

A regression model, specifically an adjusted model, was implemented, with the resulting regression equation as follows: $y=a+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\beta8X8+\beta9X9+e$. Where: Y = Profitability; X1 = equity debt, X2 = Leverage, X3 = Liquidity, X4 = Asset debt, X5 = Impact of administrative and sales expenses, X6 = Impact of financial burden, X7 = Gross margin, X8 = Operational return on equity, X9 = ROE, and e, Statistical error at a 95% confidence level

```
Call:
lm(formula = `RENTABLIDAD NETA` ~ ., data = FinlEntrenamiento,
    ])

Residuals:
      Min        1Q    Median        3Q       Max
-4.397e-06 -5.620e-08  1.610e-08  7.440e-08  1.024e-05

Coefficients:
                                        Estimate Std. Error    t value Pr(>|t|)
(Intercept)                           -1.569e-07  4.523e-08 -3.468e+00 0.000531 ***
`LIQUIDEZ CORRIENTE`                  -3.260e-09  1.823e-09 -1.788e+00 0.043944 *
`ENDEUDAMIENTO DEL ACTIVO`            -1.146e-07  3.482e-08 -3.292e+00 0.001005 **
`ENDEUDAMIENTO PATRIMONIAL`           -1.482e-07  2.646e-08 -5.600e+00 2.32e-08 ***
APALANCAMIENTO                         1.504e-07  2.645e-08  5.684e+00 1.43e-08 ***
`IMPACTO GASTOS ADMINISTRACION Y VENTAS` 1.227e-06  2.813e-08  4.360e+01  < 2e-16 ***
`IMPACTO DE LA CARGA FINANCIERA`      -1.317e-06  2.211e-07 -5.958e+00 2.82e-09 ***
`MARGEN BRUTO`                        -6.845e-07  3.303e-08 -2.072e+01  < 2e-16 ***
`RENTABILIDAD OPERACIONAL DEL PATRIMONIO` 4.265e-10  2.197e-09  1.940e-01 0.046076 *
ROE                                    1.000e+00  2.340e-09  4.274e+08  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.337e-07 on 3319 degrees of freedom
Multiple R-squared: 0.8945   Adjusted R-squared: 0.8657
F-statistic: 1.029e+17 on 9 and 3319 DF,  p-value: < 2.2e-16
```

Figure 2. Analysis of the Adjusted Regression Model

In the results presented in Figure 2, it can be observed that the intercept is significant, as are the variables included in the analysis of the adjusted model. Furthermore, in the optimized model, the squared error remains at 0.99. Once the correlation has been verified, an analysis of the assumptions derived from the optimized model is conducted, known as residual plots.

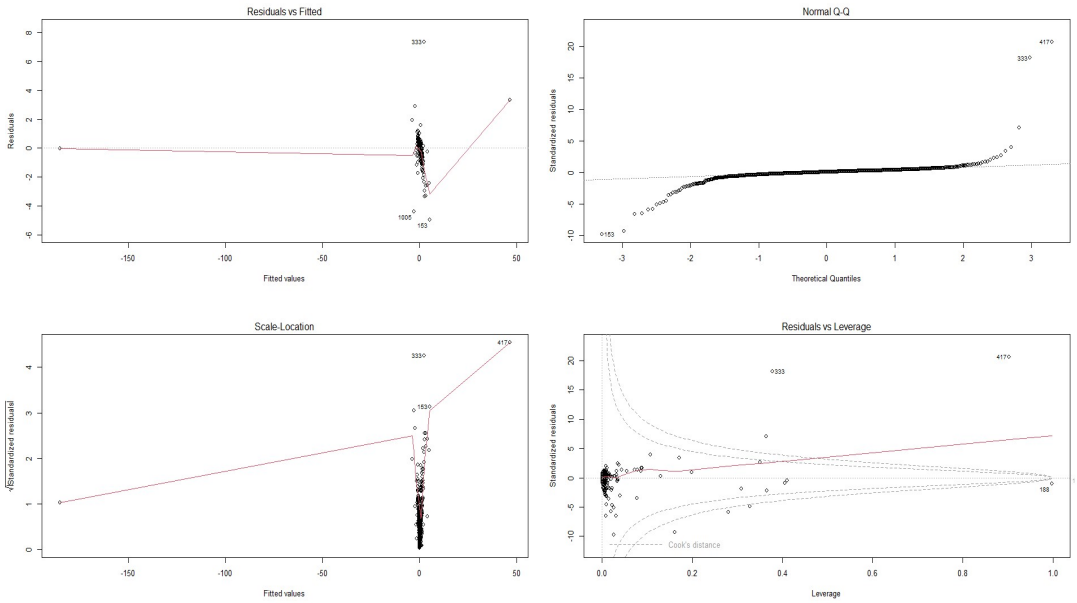

Figure 3. Analysis of Residual Plots

The figures correspond to the optimized model and provide insights into whether the data fall within the normality range. In the residuals vs. fitted plot, the results are consistent with those in the scale-location plot, showing an acceptable correlation. In the Normal Q-Q plot (quantile-quantile), the data points form a pattern resembling a snake that closely aligns with the regression line, supporting the conclusion that the data are significant.

Lastly, in the residuals vs. leverage plot, measured using Cook's distance, the trend line correlation falls within the confidence interval area, affirming the validity of the regression model. Subsequently, a series of tests were conducted. The first was the Shapiro-Wilk test, which yielded a p-value of < 2.2e-16, indicating a highly significant result. The second test was the Root Mean Squared Error (RMSE), with a result of 0.02, confirming an excellent fit. Finally, a trend graph was generated to conclude the analysis.

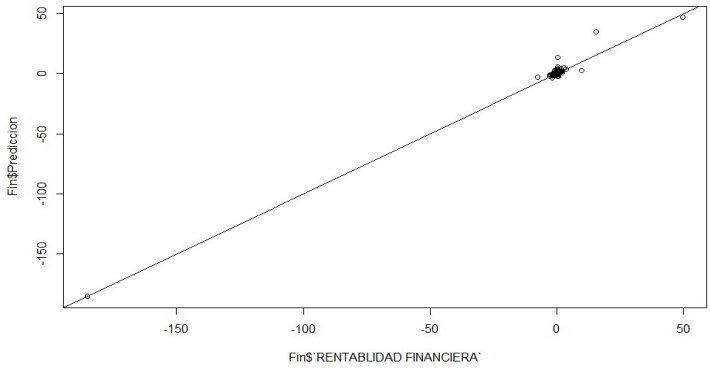

Figure 4. Trend Analysis

The trend analysis results, shown in Figure 4, examine risk management as a key factor, assuming that other management variables are well-administered. The evaluation of a 15-year sample of companies in the commercial subsector reveals the relationship between financial profitability and equity financing. This relationship pertains strictly to equity financing and not to leverage; that is, it involves using various means to fund business operations with internal resources (retained earnings, provisions) such that their proportion exceeds that of external financing. This occurs due to the higher cost of equity financing compared to external leverage. The condition arises when the financial sector of the economy is inefficient in credit allocation, thereby limiting access to banking for businesses. Consequently, when leverage has a positive effect, it effectively reduces equity financing.

Under this framework, it is crucial for business owners to identify the factors that have generated or impacted profitability. These include turnover, margins, financial leverage, and the fiscal effect, which measures the impact of taxation on net profit. By analyzing these relationships, managers can design policies to strengthen, adjust, or replace those currently implemented by the company.

Based on the results obtained, there is sufficient statistical evidence to accept the research hypothesis: the reduction of Value at Risk (VaR) in SMEs contributes to improving their financial profitability through the increased significance of financial indicators in the adjusted model.

Conclusions

The questions, "Is there a relationship between risk, collaborative strategies, and relational capital?" and "Do relational capital and collaborative strategies shorten the tails of the normal distribution?". In the structural equation model, the p-value derived from the chi-square method is significant, which leads to the non-rejection of the main null hypothesis, affirming the questions positively.

It was found that, given the interdependence among the variables constituting the relational capital dimension, there is sufficient statistical evidence to not reject H1, as relational capital positively influences the generation of collaborative strategies. Furthermore, the statistical evidence supports the non-rejection of H2, as collaborative structure strategies are positively related to the reduction of value at risk. By not rejecting the first two hypotheses, it is concluded that strengthening relational capital and collaborative strategies contributes to the structural reduction of business risk.

Additionally, the submodel containing the variables explaining profitability behavior was evaluated, represented by the equation: $y=a+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\beta8X8+\beta9X9+e$. Where: Y = Profitability; X1 = Equity debt, X2 = Leverage, X3 = Liquidity, X4 = Asset debt, X5 = Impact of administrative and sales expenses, X6 = Impact of financial burden, X7 = Gross margin, X8 = Operational return on equity, X9 = ROE, and e Statistical error at 95% confidence level.

The optimized multiple regression model demonstrates stability, as the root mean squared error (an indicator of model reliability) is notably low, with a value of 0.024. This provides robust statistical evidence to not reject H3. Having verified and not rejected the three research hypotheses, the general hypothesis is also not rejected: The value at risk (VaR) of MSMEs can be reduced and its distribution improved as a result of strengthening relational capital and enhancing the efficiency of collaborative business strategies.

Regarding forms of group association, 52% of SMEs belong to an Association or Chamber, 16% to a Network, 14% have formed Alliances, 12% have engaged in Cooperation, and 6% fall into other forms of grouping. Regarding the objectives for participating in networks, 32% aim to expand markets, 26% to improve competitiveness, 18% for business growth and development, 12% to increase quality, 8% to foster innovation, and 4% cite other objectives.

These findings allow the conclusion that the advantages of relational capital and collaborative strategies for MSMEs contribute to: Scaling up business activities, Greater bargaining power with suppliers and financial institutions, Enhanced capacity for business internationalization, Increased potential for innovation, Easier integration into public support and promotion policies. These elements collectively reduce risks and enhance profitability

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