

## Strategies to Improve Cooperative Efficiency and Performance Through the Integration of Financial Inclusion, Risk Ratios, and Non-Performing Loans

Virgine Untari Elfarida Waty, Agus Maolana Hidayat, Budi Rustandi Kartawinata  
 Telkom University, Indonesia

Email: [virgineuntarie@student.telkomuniversity.ac.id](mailto:virgineuntarie@student.telkomuniversity.ac.id), [agusmh@telkomuniversity.ac.id](mailto:agusmh@telkomuniversity.ac.id),  
[budikartawinata@telkomuniversity.ac.id](mailto:budikartawinata@telkomuniversity.ac.id)

### ABSTRACT

This study examines strategies to improve cooperative efficiency and performance through the integration of financial inclusion (FI), debt-to-income ratio (DTI), loan-to-value ratio (LTV), individual liquidity (LIQ), and non-performing loan (NPL) control. Using data from 705 cooperative members, the research applies multiple linear regression, Sobel mediation test, and PROCESS Model 4 (Hayes, 2022). The results show that financial inclusion significantly reduces NPL ( $\beta = -0.401$ ), while both DTI and LTV increase the risk of NPL. NPL acts as a partial mediator in the relationship between financial variables and cooperative performance. The study highlights that financial inclusion is the most significant protective factor against NPL, whereas LTV is the primary risk factor. These findings contribute to the cooperative management literature by providing empirical evidence of the mediating role of NPL and offering strategic recommendations for the sustainable development of cooperatives. By focusing on integrated risk management approaches, cooperatives can improve financial inclusion, reduce NPL risks, and enhance overall performance, ensuring long-term sustainability in the competitive financial landscape. This research underscores the importance of considering both financial inclusion and risk factors when managing cooperatives for improved operational outcomes.

**Keywords:** financial inclusion; cooperative performance; non-performing loan; risk management; mediation analysis

### INTRODUCTION

In the competitive landscape of the microfinance sector, cooperatives must cultivate a sustainable competitive advantage through operational efficiency and institutional strengthening (Majid et al., 2022). Key elements of this process include resource efficiency and adaptability, which have been shown to drive productivity improvements in Indonesian cooperatives (Wirawan, 2024). Data from BPS (2022) indicate a notable increase in the SHU of savings and loan cooperatives, rising by 14.85% from IDR 183 million in 2019 to IDR 210 million in 2020, highlighting positive performance amid the challenges posed by the pandemic (GoodStats, 2022). The growth in business volume, assets, and capital during this period demonstrates the structural resilience of cooperatives, consistent with prior findings that efficiency and capital growth are interlinked with cooperative sustainability (Majid et al., 2022; Sari & Nugroho, 2021). Furthermore, the number of active cooperatives rose by 3,300 units during the pandemic, along with an increase of 4.6 million members, reflecting a high level of public trust in these institutions (Rokhim & Rahayu, 2020). Efficiency is not only essential for reducing costs but also for accelerating transactions and enhancing productivity, as noted by Adhityo Dinutistomo and Wibisono Lubis (2021). Modern cooperative strategies are therefore

built on three foundational pillars: financial inclusion, risk management, and non-performing credit controls, which are central to strengthening institutional performance and ensuring long-term resilience (Susanti et al., 2023).

The growth of cooperatives is also seen in the increasing number of active units across the country (Abdykaliyeva et al., 2025). Following a brief decline after 2017, the total number of cooperatives rebounded from 123,048 in 2019 to 127,846 in 2021, according to GoodStats (2022). This upward trend serves as an indicator of the recovery of public confidence in cooperatives. Financial inclusion plays a critical role in expanding access to cooperative services, particularly in promoting microeconomic equity. In 2020, the average savings per cooperative reached IDR 1.5 billion, while deposits amounted to IDR 1.15 billion, reflecting respective increases of 4.92% and 3.05% from the previous year. The SNLIK (2025) reported a significant rise in the financial inclusion index, underscoring the growing impact of cooperatives on the national economy, as their contribution to GDP increased from 5.1% in 2023 to 5.4% in 2024.

Understanding the contextual needs of members is crucial for effective cooperative operations. Members' preferences regarding savings patterns, productive financing, interest sensitivity, and installment flexibility must form the foundation of service strategies. According to a BPS survey (2022), 92.29% of cooperatives are primary cooperatives, with the highest concentrations found in East Java and West Java, which together account for nearly 59% of the national total—highlighting the importance of region-based and member profile-based strategies (Sari & Harahap, 2023). The significance of cooperatives during times of crisis is further emphasized by a Kompas R&D survey (2022), which reported that 85% of respondents considered cooperatives vital due to their accessibility to loans and training opportunities (Putra, 2023). Nevertheless, the effectiveness of cooperatives depends heavily on their ability to understand local dynamics and the demographic characteristics of their members (Wijaya & Lestari, 2021). Moreover, Tan et al. (2024) found that financial product customization—such as flexible installment options or variable tenors—can increase member satisfaction by up to 20%. Similarly, Pratama (2022) highlighted that cooperatives adopting member-oriented services experienced a 15% increase in member retention and an average 7% annual growth in savings. Collectively, this evidence underlines the necessity of responsive service strategies tailored to members' real needs.

The demand for cooperative financing has surged in the post-pandemic landscape, driven by household economic needs, especially for members facing challenges accessing formal financial institutions. Cooperatives have emerged as crucial providers of flexible and accessible community financing, often referred to as "*lampu harapan*" during the crisis for their role in sustaining small businesses. However, this increased demand necessitates meticulous feasibility assessments and robust risk management practices to ensure portfolio sustainability. BPS (2022) highlighted that the average number of non-performing borrowers varies significantly between regions, with Kalimantan reporting 53 per cooperative and Java 22, necessitating a locality-specific policy approach to credit risk management. With effective risk management, cooperatives can expand financing access inclusively without compromising financial stability.

Non-performing loans (NPLs) represent a significant challenge to the financial stability of cooperatives, disrupting cash flows, undermining member confidence, and impairing their

intermediation functions. High NPL ratios are particularly problematic in areas with lower financial literacy and weaker governance structures. The Ministry of Cooperatives and SMEs (2022) has indicated that the application of prudential principles, quality credit analysis, and effective billing systems remains inadequate. Despite an increase in business volume and SHU to IDR 7.18 trillion in 2021, many cooperatives still rely on the PEN program due to persistent high NPLs and low profitability. This situation underlines the urgent need for comprehensive reforms in risk governance, including the digitalization of processes, enhanced mitigation training, and the establishment of risk scores based on loan history. The adaptive capacity of cooperatives to manage credit risk is crucial for sustaining financial services, particularly during economic downturns or household income declines, making it imperative to implement membership-based credit restructuring strategies supported by digital technologies.

Strategic adaptation is essential for aligning service expansion with sustainable credit risk management within cooperatives. To achieve this, cooperatives must customize their financing portfolios according to the risk profiles and demographics of their members. Product design should consider socio-economic characteristics, offering flexible installment options for those in the informal sector and performance-based interest rates for productive businesses. Notably, a significant percentage of new members in digital cooperatives are from the millennial and Gen Z demographics, who prioritize digital services and seamless transactions. Consequently, cooperative products need to be tailored to meet the preferences of this younger generation, ensuring that both the user interface and contract flexibility resonate with their needs. There is also a pressing need to adopt a risk-based lending approach, as many cooperatives currently channel a majority of their loan volumes into consumption and trade sectors. Emphasizing credit governance training and launching innovative products that cater to the preferences of younger members is crucial for maintaining asset quality and enhancing competitiveness in an increasingly digital financial landscape.

Digital transformation plays a pivotal role in improving operational efficiency and member participation within cooperatives. By accelerating administrative processes and extending services into areas with limited infrastructure, digitalization promotes transparency and accountability. However, the success of such transformations hinges on the institutional capacity of cooperatives. The disparity in the number of savings and loan cooperative administrators across regions reflects varying capacities, with many cooperatives lagging in technological adoption. While thousands of cooperatives have undergone digitization, the overall trend remains uneven, necessitating enhancements in human resources, digital infrastructure, and supportive policies. The implementation of technology, such as financial applications and bookkeeping systems, can significantly enhance management and oversight, yet traditional organizational mindsets and a lack of visionary leadership often hinder progress. The predominance of Generation X among cooperative administrators, coupled with their lower digital literacy, further complicates the transition to digital practices.

The ability to effectively manage data is a strategic advantage for modern cooperatives, allowing for evidence-based decision-making through analysis of member data and lending patterns. However, low penetration of digital systems remains a significant barrier to progress. Many cooperatives still rely on conventional approaches, which limits their potential for growth and efficiency. The successful case of the KAN Jabung Cooperative illustrates the benefits of digitalization, showcasing improved operations and member engagement through

automated systems. Digital transformation is vital not only for achieving immediate efficiencies but also for fostering long-term institutional sustainability. As cooperatives integrate technology into their services and decision-making processes, they enhance their resilience to economic and technological changes. Ultimately, the sustainability of a cooperative is determined not just by its assets, but by its ability to adapt and innovate through the strategic use of technology.

Cooperative institutional innovation relies heavily on financing policies that enhance member productivity and competitiveness. The integration of technology plays a crucial role in streamlining the processes of submitting, verifying, and disbursing financing, ultimately leading to improved operational efficiency and expanded service access, particularly for the productive sector. The government's initiative to distribute LPDB-KUMKM revolving funds, amounting to IDR 1.75 trillion to 2,150 cooperatives and MSMEs in 2023, highlights this transformation, emphasizing digital schemes that incorporate stringent risk mitigation measures. Platforms like those developed by IDXCOOP support this process, offering features such as demo accounts, interactive hotlines, risk monitoring, and automated reporting, enabling cooperatives to tailor financing solutions based on risk profiles and flexible terms, thereby enhancing their competitiveness and responsiveness.

The synergy between financial inclusion, risk management, and the control of non-performing loans (NPLs) forms the backbone of a sustainable cooperative microfinance system. Financial inclusion broadens access to savings and loans, while effective risk management enhances credit selectivity, and diligent NPL control ensures portfolio stability. Research indicates that cooperatives employing data-driven feasibility assessments, including transaction histories and deposit-to-loan ratios, tend to experience lower NPLs and improved performance. The necessity of comprehensive digital transformation is underscored, from initial digital onboarding to real-time loan monitoring, with the integration of information systems and training in risk mitigation becoming essential for modern cooperatives seeking to thrive in a competitive landscape.

Strategic adaptation is crucial to harmonize technology with business direction and risk management. In the face of regulatory changes and economic pressures, cooperatives that swiftly adopt data-driven business models demonstrate greater resilience. This adaptation involves digitizing services, employing information systems for accurate credit risk assessments, and customizing financing options based on members' socio-economic conditions. Evidence suggests that cooperatives utilizing digital reporting mechanisms achieve higher efficiency and lower NPL rates. Furthermore, accountability, service speed, and market segmentation improve significantly in those cooperatives that embrace institutional reform and digitalization, reflecting a proactive stance toward the challenges faced in the sector.

Despite these advancements, cooperatives continue to grapple with short-term operational challenges, including delays in turnover, limited working capital, and high overhead costs. Performance disparities across regions further complicate these issues, as illustrated by the variance in average cooperative earnings. While cooperatives in Java average IDR 231 million in residual business income, those in Maluku and Papua struggle with only IDR 159 million. This performance gap is indicative of the broader issues of institutional capacity and regional efficiency. A SWOT analysis of partner cooperatives reveals persistent high NPLs and increased operational costs due to outdated manual processes. However, the

inherent strengths of cooperatives—such as their community ties and business model flexibility—present opportunities for product innovation, digitization of loan supervision, and the integration of risk information systems to effectively navigate external challenges like declining purchasing power and regulatory pressures.

The direction of the cooperative's internal policy should concentrate on merging financial inclusion, credit risk mitigation, and technology-driven efficiency as integral components of an adaptive and sustainable institutional strategy. Research on cooperative efficiency and performance has evolved significantly, exploring areas like digitalization, financial inclusion, and credit risk management. Notably, studies have primarily investigated the isolated relationships between single variables and cooperative outcomes, lacking comprehensive frameworks that integrate these dimensions. For instance, while operational efficiency has been highlighted as a mediator for sustainability and profitability, the role of financial inclusion and credit risk structures has been overlooked in existing models. Furthermore, investigations into the causes of non-performing loans have not adequately linked these factors to strategies for enhancing institutional efficiency.

Despite the push for technological transformation as a means of institutional renewal, the role of digitalization in risk management and financing efficiency has not been consistently addressed. Research has indicated the positive impact of financial inclusion on cooperative growth but has failed to explore the systemic interactions between financial access, risk efficiency, and non-performing loan outcomes. This creates a significant gap in understanding how these elements can work together to bolster cooperative performance. The need for a cohesive strategy model that integrates financial inclusion, debt-to-income ratios, loan-to-value ratios, and non-performing loan management becomes evident. Such a model would aim to enhance the efficiency and overall performance of cooperatives, responding to the pressing demands of an increasingly inclusive financial ecosystem.

This study seeks to design integrated strategies that align financial inclusion, financing risks, and non-performing loan control to elevate cooperative efficiency and performance. The research is centered on addressing key questions regarding the impact of financial inclusion on non-performing loans, as well as the effects of debt-to-income ratios and loan-to-value ratios on risk assessment. Additionally, it investigates the relationship between bad loan risks and operational efficiency while considering how customer characteristics may moderate these dynamics. The primary objective is to test and analyze these relationships using empirical customer data, contributing valuable insights to cooperative management practices and enriching the academic discourse in this field. Ultimately, the findings aim to inform policymaking and enhance the credit evaluation processes of cooperative managers, ensuring long-term sustainability and operational effectiveness.

## **METHOD**

---

This study was an explanatory quantitative research aimed at examining the causal relationships between financial variables of cooperative members and their influence on non-performing loans (NPLs), operational efficiency, and cooperative performance. An explanatory design was used because the research not only described phenomena but also explained cause-and-effect relationships based on a conceptual framework built from theory and previous

studies. The model tested both the direct effects and the moderating role of customer characteristics on the relationship between financial variables and credit risk.

The data consisted of secondary historical records from the cooperative’s administrative system, including demographic information, financial transactions, credit status, and members’ savings and borrowing behavior. Using administrative data reduced perceptual bias common in surveys and provided objective measures of variables such as Debt-to-Income Ratio, Loan-to-Value Ratio, and Non-Performing Credit Ratio. This aligned with contemporary research in cooperative risk management and microfinance institutions emphasizing evidence-based decision making.

Data analysis employed Partial Least Squares Structural Equation Modeling (PLS-SEM), appropriate for complex theoretical models with mixed indicator structures (reflective and formative). PLS-SEM allowed simultaneous estimation of relationships among latent constructs, direct and indirect effects, and moderation interactions (Hair et al., 2022). SmartPLS version 4 facilitated data processing and model testing. The approach aimed to contribute theoretically and practically to understanding credit risk dynamics among cooperative members and strategies to optimize efficiency and institutional performance based on member data.

## RESULTS AND DISCUSSION

### Research Results

#### Descriptive Analysis

This study analyzed data from 705 ABC Cooperative members to gain an in-depth understanding of the characteristics of financial inclusion, financial risk ratio, and cooperative performance. Descriptive analysis provides an overview of the distribution of data that is the basis for the interpretation of the results of inferential analysis.

#### Descriptive Analysis of Financial Inclusion

Financial inclusion variables are measured through four main indicators that reflect access to and utilization of formal financial services by cooperative members. The results of the analysis show varying levels of inclusion among members.

**Table 1. Description of Financial Inclusion Variables (IK)**

Indicator	Category	Frequency	Percentage (%)
<b>Formal Account Ownership (FIN1)</b>	No account	192	27,2
	Have an account	513	72,8
<b>Credit Facility History (FIN2)</b>	Never obtained a credit facility	182	25,8
	Have obtained a credit facility	523	74,2
<b>Savings Deposit Frequency (FIN3)</b>	Low (<12 times in the last 6 months)	34	4,8

	High ( $\geq 12$ times in the last 6 months)	671	95,2
<b>Utilization of Digital Transactions (FIN4)</b>	Inactive	258	36,6
	Active in mobile/e-wallet	447	63,4
<b>Financial Inclusion</b>	No	359	50,9
	Ya	346	49,1

The data in Table 1 reveals that the majority of members (72.8%) already have formal accounts and 74.2% have obtained credit facilities, indicating relatively good access to basic financial services. The high frequency of savings deposits reached 95.2%, indicating excellent saving habits among members. However, the adoption of digital technology is still lagging behind with 36.6% of members not actively using digital services. Overall, the distribution of financial inclusion is almost balanced (50.9% vs 49.1%), indicating that there is still room for improvement.

### Descriptive Analysis of Debt-to-Income Ratio (DTI)

DTI is measured through two main indicators: Debt-Service Ratio (DSR) and Debt-Exposure Ratio (DER), which are categorized in five risk tiers to provide a clear gradation of members' financial pressures.

**Table 2. Description of Debt-to-Income Ratio (DTI) Variable Frequency Distribution**

Indicator	Category	Frequency	Percentage (%)
<b>Debt-Service Ratio (DSR)</b>	Very Low	436	61,84
	Low	233	33,05
	Keep	33	4,68
	Tall	3	0,43
	Very High	0	0,00
<b>Debt-Exposure Ratio (DER)</b>	Very Low	516	73,19
	Low	169	23,97
	Keep	19	2,70
	Tall	1	0,14
	Very High	0	0,00

The results in Table 2 show a very positive DTI condition, with 94.8% of members having DSR in the very low to low category, indicating a controlled installment expense relative to income. DER shows a similar pattern with 97.2% of members in the very low to low category. This condition reflects a prudent credit policy and the ability of members to manage debt responsibly.

### Descriptive Analysis of Loan-to-Value Ratio (LTV)

LTV is categorized by percentage range to measure the level of financing risk borne by the cooperative, with limits reflecting the balance between the loan and the value of collateral.

**Table 3. Description of Loan-to-Value Ratio (LTV) Variable Frequency Distribution**

Category	LTV Range	Frequency	Percentage (%)
Very Low	0-20%	0	0

<b>Low</b>	21-40%	0	0
<b>Keep</b>	41-60%	610	86,5
<b>Tall</b>	61-80%	95	13,5
<b>Very High</b>	81-100%	0	0

The LTV data in Table 3 shows a high concentration in the medium category (86.5%), indicating a moderate financing policy with a controlled level of leverage. However, 13.5% of members are in the high category that requires close monitoring. The absence of members in the very high category indicates the implementation of a strict risk policy, while the absence of very low and low categories indicates the optimization of collateral utilization.

### Descriptive Analysis of Individual Liquidity

Individual liquidity is measured based on a member's ability to meet short-term payment obligations without relying on external sources, using the ratio of savings balances to monthly installments.

**Table 4. Description of Individual Liquidity Variable Frequency Distribution (LIQ)**

Category	LIQ Range	Frequency	Percentage (%)
<b>Very Low</b>	0-20%	607	86,1
<b>Low</b>	21-40%	70	9,9
<b>Medium</b>	41-60%	22	3,1
<b>High</b>	61-80%	1	0,1
<b>Very High</b>	81-100%	5	0,7

The results in Table 4 reveal an alarming situation, where 86.1% of members have very low liquidity with savings balances only able to cover 0-20% of monthly installments. These conditions indicate high vulnerability to financial shocks and reliance on recurring income to meet credit obligations.

### Descriptive Analysis of Non-Performing Credit Risk (NPL)

NPLs are measured using a credit collectibility classification with a score of 1-5, reflecting credit quality from current to bad based on late days and payment conditions.

**Table 5. Description of Variable Frequency Distribution of Non-Performing Credit Risk Levels (NPLs)**

NPL Collectability Category (Score)	Frequency	Percentage (%)
<b>1.00 (Launch)</b>	193	27,4
<b>2.00 (Less Smooth)</b>	372	52,8
<b>3.00 (Doubtful)</b>	102	14,5
<b>4.00 (Highly Doubtful)</b>	36	5,1
<b>5.00 (Stuck)</b>	2	0,3

The NPL data in Table 5 shows that the majority of loans (52.8%) are in the non-current category, indicating challenges in the accuracy of payments. Although bad loans are only 0.3%, the proportion of loans in the doubtful and highly doubtful category (19.6%) requires serious attention to prevent further deterioration.

### Descriptive Analysis of Cooperative Performance

Cooperative performance is measured through a combination of indicators of payment accuracy, productive financing growth, financial participation, and productive member efficiency expressed in monetary value.

**Table 6. Descriptive Statistics Description of Cooperative Performance**

Statistics	Value
<b>N (Number of Observations)</b>	705
<b>Minimum</b>	42.467,00
<b>Maximum</b>	2.548.000,00
<b>Average (Mean)</b>	289.556,40
<b>Standard Deviation</b>	242.103,30

The performance data in Table 6 show significant variation with high standard deviations, indicating performance inequality among members. The wide range between minimum and maximum values indicates diversity in members' contributions and participation to cooperative performance.

### Verifiable Analysis

#### Classic Assumption Test

Before conducting regression analysis, classical assumption testing is carried out to ensure the validity of the model. The normality test using the Kolmogorov-Smirnov produced a significance value of  $0.000 < 0.05$ , indicating that the data was not statistically normally distributed.

**Table 7. Normality Test Results**

One-Sample Kolmogorov-Smirnov Test	Unstandardized Residual (Multiple Regression)	Unstandardized Residual (Simple Regression)
N	705	705
Normal Parameters Mean	0,0000000	0,0000000
Normal Parameters Std. Deviation	0,75737718	0,79667292
Most Extreme Differences Absolute	0,139	0,081
Test Statistic	0,139	0,081
Asymp. Sig. (2-tailed)	0,000	0,000

Although the normality test showed a significance of  $< 0.05$ , with a large sample size (N=705), the Central Limit Theorem guarantees the validity of the analysis results because the sampling distribution will be close to normal. The multicollinearity test is performed to ensure that there is no high correlation between independent variables.

**Table 8. Multicollinearity Test Results**

Model	Collinearity Statistics	
	Tolerance	VIF
<b>INK. KEU</b>	0,978	1,023
<b>DTI</b>	0,794	1,259

<b>LTV</b>	0,817	1,223
<b>LIQ</b>	0,972	1,029

The results showed a Tolerance value of > 0.10 and VIF < 10 for all variables, which confirmed no significant multicollinearity problems. The heteroscedasticity test showed a relatively random spread of data points around the zero line, indicating that the homoscedasticity assumption was met.

**Multiple Linear Regression Analysis**

Multiple linear regression analysis was conducted to test the influence of financial inclusion (IK), DTI, LTV, and individual liquidity (LIQ) on NPLs.

**Table 9. Multiple Regression Results of IK, DTI, LTV, LIQ on NPL**

<b>Model</b>	<b>Unstandardized Coefficients</b>	<b>Standardized Coefficients</b>	<b>t</b>	<b>Sig.</b>
	<b>B</b>	<b>Beta</b>		
		<b>Std. Error</b>		
<b>(Constant)</b>	0,930	0,272	3,417	0,001
<b>INK. KEU</b>	-0,401	0,058	-6,925	0,000
<b>DTI</b>	0,153	0,060	2,564	0,011
<b>LTV</b>	0,400	0,093	4,314	0,000
<b>LIQ</b>	-0,179	0,052	-3,449	0,001

From the regression coefficients in Table 9, the regression model equation is obtained:

$$NPL = 0,930 - 0,401 IK + 0,153 DTI + 0,400 LTV - 0,179 LIQ$$

The constant of 0.930 is the average estimate of NPLs when all independent variables are zero. The financial inclusion coefficient (-0.401) indicates that every increase in one financial inclusion unit will decrease NPLs by 0.401 units, ceteris paribus. DTI and LTV show positive coefficients (0.153 and 0.400), indicating that an increase in these ratios will increase NPL risk. Individual liquidity has a negative coefficient (-0.179), indicating a protective effect on NPLs.

**Table 10. Determination Coefficient Results**

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
<b>1</b>	0,340	0,116	0,111	0,75954

The value of R<sup>2</sup> = 0.116 in Table 10 shows that 11.6% of NPL variations can be explained by a combination of four independent variables, while 88.4% are influenced by other factors outside the model.

**Table 11. ANOVA Test Results**

<b>Model</b>	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
<b>Regression</b>	52,932	4	13,233	22,938	0,000
<b>Residual</b>	403,829	700	0,577		
<b>Total</b>	456,760	704			

The results of the F test in Table 11 show the value of the F calculation = 22.938 > F of the table = 2.37 with a significance of 0.000 < 0.05, confirming that the regression model is statistically significant and worthy of analysis.

**Simple Linear Regression Analysis of NPL on Performance**

A simple regression analysis was performed to test the influence of NPLs on cooperative performance.

**Table 12. Simple Regression Coefficient Results**

Model	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Sig.
	B		Beta		
(Constant)	12,689	0,080		159,046	0,000
NPL	-0,212	0,037	-0,210	-5,688	0,000

The regression equation formed from Table 12:

$$KINERJA = 12,689 - 0,212 NPL + \epsilon$$

The constant of 12.689 indicates the performance value when the NPL is zero, while the NPL coefficient (-0.212) indicates that each increase of one NPL unit will decrease the performance by 0.212 units.

**Table 13. Results of Simple Regression Model Determination Coefficient**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,210	0,044	0,043	0,79724

The value of  $R^2 = 0.044$  in Table 13 shows that 4.4% of the variation in performance can be explained by NPLs, indicating that there are still other factors that are more dominant in influencing the performance of cooperatives.

**NPL Mediation Test**

The mediation test was conducted using PROCESS Model 4 (Hayes, 2022) to test the role of NPLs as mediators in the relationship between independent variables and cooperative performance.

**Table 14. Results of Mediation Effects Analysis (Direct and Indirect Effects)**

Relation	Dire ct	Boot SE	BootL LCI	BootU LCI	Indir ect	Boot SE	BootL LCI	BootU LCI	Conclu sion
IK Perform ance	→ 0,79 11	0,05 38	0,6855	0,8967	0,036 9	0,01 33	0,0138	0,0659	Partial Mediati on
DTI Perform ance	→ 0,57 55	0,05 23	0,4728	0,6782	- 0,063	0,02 31	-0,1136	-0,0233	Partial Mediati on
LTV Perform ance	→ 0,82 81	0,08 4	0,6632	0,993	- 0,124	0,03 98	-0,2104	-0,055	Partial Mediati on
LIQ Perform ance	→ - 0,22 73	0,05 34	-0,3322	-0,1224	0,039 3	0,01 56	0,0134	0,0738	Partial Mediati on

The results of the mediation test in Table 14 show that NPL plays a role as a partial mediator in all the relationships tested. The 95% confidence interval that does not include zero confirms the significance of the indirect effect for all variables.

For validation, the Sobel Test is carried out with the formula:

$$z = a \times b / \sqrt{(b^2 \times SE_a^2 + a^2 \times SE_b^2)}$$

where:

- a = independent variable path coefficient → NPL
- b = NPL line coefficient → performance
- SE<sub>a</sub> = standard error coefficient a
- SE<sub>b</sub> = standard error coefficient b

**Table 15. Summary of Sobel Test Results**

Variable Relationships	Line Coefficient (a)	Line Coefficient (b)	Sobel Test Statistics	p-value	Conclusion
IK → NPL → Performance	-0,401	-0,212	4,411	0,00001	Significant Mediation
DTI → NPL → Performance	0,153	-0,212	-2,329	0,01982	Significant Mediation
LTV → NPL → Performance	0,400	-0,212	-3,439	0,00058	Significant Mediation
LIQ → NPL → Performance	-0,179	-0,212	2,950	0,00317	Significant Mediation

The results of the Sobel Test in Table 15 are consistent with the findings of PROCESS Model 4, confirming the significance of NPL mediation for all relationships tested.

## Discussion

### *The Dominant Role of Financial Inclusion as a Protective Factor of NPLs*

The findings of the study confirm that financial inclusion is the dominant protective factor against NPLs with the largest coefficient ( $\beta = -0.401$ ,  $p < 0.001$ ). These results are in line with Financial Inclusion Theory (Demirgüç-Kunt & Klapper, 2013) which emphasizes that responsible access to and use of financial services can improve the financial stability of individuals.

In the context of ABC Cooperatives, more financially inclusive members showed better ability to manage personal finances, had consistent saving habits (95.2% of members), and had a better understanding of credit obligations. This is reflected in the high percentage of members who have formal accounts (72.8%) and good credit history (74.2%).

The direct effect of financial inclusion on performance ( $\beta = 0.7911$ ) indicates that increased inclusion not only reduces NPL risk, but also directly improves performance through expanding the active member base and increasing transaction volume. The indirect effect through NPLs ( $\beta = 0.0369$ ) reinforces this mechanism by showing that the decline in NPLs resulting from financial inclusion contributes additionally to improved performance.

### *LTV as the Dominant Risk Factor*

LTV proved to be the second dominant risk factor ( $\beta = 0.400$ ,  $p < 0.001$ ) in increasing NPLs. These findings confirm the fundamental trade-off in credit management between

financing volume and credit quality. The data shows that 86.5% of members have LTV in the medium category (41-60%) and 13.5% in the high category (61-80%).

High LTV indicates that borrowers have low equity in collateralized assets, reducing incentives to prevent default and increasing potential losses for the cooperative in the event of default. This is in line with the Basel Committee's Credit Risk Management Theory (2000) which emphasizes the importance of a "sound credit process" in assessing the quality of collateral.

Interestingly, LTV shows a positive direct effect on performance ( $\beta = 0.8281$ ), which can be explained by the increased volume of interest income from larger loans. However, the negative indirect effect through NPLs ( $\beta = -0.1247$ ) suggests that these short-term gains could be eroded by increased costs and losses from NPLs.

### ***The paradox of liquidation of individuals***

Interesting findings emerged from the analysis of individual liquidity, where this variable showed a negative direct effect on performance ( $\beta = -0.2273$ ) but a positive indirect effect through NPLs ( $\beta = 0.0393$ ). This paradox can be explained through Life Cycle Theory (Modigliani & Brumberg, 1954) and the motive of saving just in case (Carroll, 1997).

The data shows an alarming condition where 86.1% of members have very low liquidity, with savings balances only able to cover 0-20% of monthly installments. Members with high liquidity tend to rely less on cooperative loans, reducing business volume and direct interest income. However, they also have a better ability to meet credit obligations, reducing the risk of NPLs.

The net effect shows that the benefits of reduced risk (through the NPL mediation pathway) contribute positively to long-term performance, despite reducing short-term business volumes. This indicates the need for cooperatives to develop strategies to remain relevant to members with high liquidity through the diversification of products and services.

### ***The Role of NPL Mediation in the Cooperative Ecosystem***

The results of the mediation test confirmed that NPLs played a role as a partial mediator in all the relationships tested, with consistency between the PROCESS Model 4 and the Sobel Test. These findings provide empirical evidence that NPL management is a critical pathway that connects individual financial factors to institutional performance.

NPL data shows that although bad loans are only 0.3%, the majority of loans (52.8%) are in the less current category, indicating systemic challenges in billing and risk management. This reinforces the urgency of implementing an integrated strategy that combines increased financial inclusion with rigorous risk management.

### ***Strategic Implications for Efficiency and Performance Improvement***

Based on the findings of the dominant factors, the cooperative's efficiency and performance improvement strategy should focus on:

#### **1. Strengthening Financial Inclusion as a Protective Strategy**

- a. Development of comprehensive financial education programs to improve member literacy
- b. Increased adoption of digital services (currently only 63.4% of active members)

- c. Implementation of a credit scoring system that takes into account the level of financial inclusion

## **2. Prudent LTV Management**

- a. Stricter LTV limits for high-risk segments
- b. Improved accuracy of collateral assessment through technology-based systems
- c. Proactive monitoring of 13.5% of members with high LTV

## **3. Increased Individual Liquidity of Members**

- a. Development of attractive savings products to address the condition of 86.1% of members with very low liquidity
- b. Savings incentive program to build members' financial reserves
- c. Education about the importance of emergency funds according to the motive of saving just in case

### ***Theoretical and Practical Contributions***

This study makes a significant contribution to the cooperative management literature by empirically proving the mediated role of NPL in the relationship between financial variables and performance. These findings reinforce the argument that investing in financial inclusion not only has a social impact, but also significant economic value for financial institutions.

From a practical perspective, the results of the research provide a strategic framework for the sustainable development of cooperatives. The integration of financial inclusion with credit risk management is proven to create synergies that strengthen operational efficiency while improving institutional performance.

### ***Limitations and Future Research Directions***

This research has several limitations that need to be acknowledged. First, the relatively low  $R^2$  values (11.6% for the NPL model and 4.4% for the performance model) indicate that there are still other important factors that are not included in the model, such as macroeconomic variables, member demographic characteristics, and other external factors.

Second, this study is limited to one cooperative (ABC Cooperative), so the generalization of results needs to be done carefully. Specific characteristics of a cooperative, such as geographic location, member segments, and business model, can influence the relationship between variables.

Third, the use of cross-sectional data cannot capture temporal dynamics in the relationships between variables. Longitudinal research will provide a deeper understanding of the evolution of these relationships over time.

Future research is recommended to: (1) develop a more comprehensive model by incorporating macroeconomic variables and regional characteristics; (2) conduct multi-cooperative studies to improve external validity; (3) using longitudinal design to capture temporal dynamics; and (4) explore moderator factors that may strengthen or weaken the relationships found.

### ***Strategy Implementation Recommendations***

Based on the findings of the study, cooperatives are advised to implement an integrated strategy that includes:

### **Short Term (1-2 years):**

- a. Intensification of financial education programs for members with low financial inclusion
- b. Implementation of a digital-based NPL monitoring system for early detection
- c. Adjustment of LTV policy with tightening in high-risk segments

### **Medium Term (3-5 years):**

- a. Development of a comprehensive digital platform to increase the adoption of digital services
- b. Product diversification for high-liquidity members
- c. Implementation of an integrated risk scoring system that considers all factors

### **Long-Term (5+ years):**

- a. Full digital transformation for operational efficiency optimization
- b. Expansion of inclusive financial services into unserved segments
- c. Development of a sustainable business model that balances growth and risk management

The implementation of this strategy is expected to improve the operational efficiency of cooperatives through reducing NPL collection costs, optimizing resource allocation, and increasing income from more financially stable members. At the same time, this strategy will improve cooperative performance through improving the quality of credit portfolios, increasing member confidence, and strengthening competitive positions in the microfinance ecosystem.

## **CONCLUSION**

This study analyzed 705 members of the ABC Cooperative and identified strategies to enhance cooperative efficiency and performance by integrating financial inclusion and credit risk management. Financial inclusion emerged as a key protective factor significantly reducing non-performing loans (NPLs), while loan-to-value ratio (LTV) was identified as a critical risk factor requiring careful control. NPLs partially mediated the relationship between financial variables and cooperative performance, underscoring the importance of credit risk management for optimal outcomes. The study also highlighted an individual liquidity paradox, where long-term credit stability benefits offset short-term declines in business volume, amid concerns that 86.1% of members have very low liquidity and over half of the loans are less liquid. These findings suggest the need for an integrated approach combining enhanced financial inclusion, prudent LTV management, and efforts to build member financial resilience. Future research should explore longitudinal impacts of these integrated strategies across diverse cooperative contexts to further validate and refine the proposed framework for sustainable cooperative development.

## **REFERENCES**

- Abdykalyeva, Z., Baidybekova, S., Abdykalyk, S., Baitarakova, B., & Kenjassarova, A. (2025). The role of agricultural cooperatives in economic development: international experience. *International Review of Applied Economics*, 1–18.
- Adhityo Dinutistomo, I., & Wibisono Lubis, A. (2021). MSME lending and bank efficiency: Evidence from Indonesia. *Banks and Bank Systems*, 16(3), 93–103. [https://doi.org/10.21511/bbs.16\(3\).2021.09](https://doi.org/10.21511/bbs.16(3).2021.09)
- BPS. (2022). *Statistik Koperasi Simpan Pinjam 2021* (No. 7206008). Badan Pusat Statistik. <https://www.bps.go.id/id/publication/2022/06/02/e33302d6b99341d712113faf/statistik-koperasi-simpan-pinjam-2021.html>

- Dinutistomo, A., & Lubis, W. (2021). Operational efficiency and productivity improvement in Indonesian cooperatives. *Jurnal Manajemen dan Kewirausahaan*, 23(2), 99–108. <https://doi.org/10.9744/jmk.23.2.99-108>
- GoodStats. (2022, July 12). Koperasi simpan pinjam dalam kaca mata statistik. *Ekonomi dan Bisnis*. <https://goodstats.id/article/koperasi-simpan-pinjam-dalam-kacamata-statistik-SzhWG>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publishing.
- Majid, M. S. A., Azhari, A., Faisal, F., & Fahlevi, H. (2022). What determines the cooperatives' productivity in Indonesia? A two-stage analysis. *Economics & Sociology*, 15(1), 56–77. <https://doi.org/10.14254/2071-789X.2022/15-1/4>
- Pratama, R. (2022). Member-oriented services and cooperative performance: A quantitative analysis. *Asian Journal of Cooperative Management*, 3(1), 12–25.
- Putra, A. (2023). Cooperative resilience during crisis: Insights from a Kompas survey. *Journal of Indonesian Cooperative Studies*, 5(2), 45–60.
- Rokhim, R., & Rahayu, N. (2020). Cooperative resilience during the COVID-19 pandemic: Evidence from Indonesia. *Journal of Asian Business and Economic Studies*, 27(3), 295–310. <https://doi.org/10.1108/JABES-06-2020-0067>
- Sari, D. F., & Harahap, I. (2023). Distribution of primary cooperatives across Indonesian provinces: East Java and West Java dominance. *Indonesian Statistical Review*, 8(4), 78–90.
- Sari, D. M., & Nugroho, P. I. (2021). Financial performance and sustainability of cooperatives: Evidence from Indonesia. *Cogent Business & Management*, 8(1), 1920193. <https://doi.org/10.1080/23311975.2021.1920193>
- Susanti, L., Setiawan, A., & Yulianto, A. (2023). Risk management and non-performing loan control in cooperative financial institutions. *International Journal of Financial Studies*, 11(2), 45. <https://doi.org/10.3390/ijfs11020045>
- Tan, C. M., Widjaja, S., & Nugroho, E. (2024). Financial product customization and member satisfaction in rural cooperatives. *Journal of Rural Finance*, 10(1), 35–50.
- Wijaya, H., & Lestari, M. A. (2021). Demographic profiling and service adaptation in Indonesian credit cooperatives. *Cooperative Development Quarterly*, 2(3), 100–115.
- Wirawan, R. (2024). The impact of microfinance on the income of micro, small, and medium enterprises (MSEs) in Indonesia: A sectoral analysis. *Wiga: Jurnal Penelitian Ilmu Ekonomi*, 14(2), 274–285. <https://doi.org/10.30741/wiga.v14i2.1379>