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Digital Transformation Dynamics: A Comprehensive Analysis of Financial Climate Risk and Leverage on Digital Asset Performance in the Fintech Ecosystem

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ABSTRAK

Studi ini menyelidiki dampak risiko iklim keuangan dan leverage keuangan terhadap kinerja aset digital dalam ekosistem fintech Indonesia. Menggunakan pendekatan kuantitatif penjelasan dengan desain cross-sectional, penelitian ini menganalisis 18 lembaga keuangan digital, termasuk bank digital, platform fintech, platform cryptocurrency, startup digital, dan bank konvensional yang bertransformasi secara digital. Data dikumpulkan dari sumber sekunder periode 2021-2024, dengan memanfaatkan Climate Vulnerability Index (CVI), Debt to Equity Ratio (DER), dan Digital Asset Performance Index (DAPI). Analisis regresi linier berganda dilakukan dengan menggunakan SPSS untuk memeriksa hubungan antar variabel. Temuan ini mengungkapkan korelasi yang signifikan antara risiko iklim keuangan, leverage keuangan, dan kinerja aset digital. Indeks Kerentanan Iklim menunjukkan hubungan negatif, sedangkan Debt to Equity Ratio menunjukkan hubungan positif dengan kinerja aset digital. Penelitian ini berkontribusi untuk memahami dinamika kompleks ekosistem keuangan digital, menawarkan wawasan untuk investasi strategis dan manajemen risiko dalam lanskap keuangan digital yang berkembang.

ABSTRACT

This study investigates the impact of financial climate risk and financial leverage on digital asset performance within the Indonesian fintech ecosystem. Employing an explanatory quantitative approach with a cross-sectional design, the research analyzed 18 digital financial institutions, including digital banks, fintech platforms, cryptocurrency platforms, digital startups, and digitally transforming conventional banks. Data was collected from secondary sources covering the period 2021-2024, utilizing the Climate Vulnerability Index (CVI), Debt to Equity Ratio (DER), and Digital Asset Performance Index (DAPI). Multiple linear regression analysis was conducted using SPSS to examine the relationships between variables. The findings reveal significant correlations between financial climate risk, financial leverage, and digital asset performance. Climate Vulnerability Index demonstrated a negative relationship, while Debt to Equity Ratio showed a positive relationship with digital asset performance. The research contributes to understanding the complex dynamics of digital financial ecosystems, offering insights for strategic investment and risk management in the evolving digital financial landscape.

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1. INTRODUCTION

Digital transformation represents a complex paradigmatic phenomenon that epitomizes the evolutionary architecture of contemporary civilization, where technology transcends mere instrumental change to become a fundamental infrastructure redefining the epistemological mechanisms of socio-economic interactions (Hanelt et al., 2021). In an increasingly interconnected global context, this phenomenon generates a dialectical interplay between technological innovation and structural reconfiguration of systems, dismantling conventional methodological boundaries and generating a dynamic ecosystem capable of adapting at unprecedented transformation velocities (Baker et al., 2023). This emergent paradigm not only metamorphoses operational mechanisms but fundamentally redesigns the epistemological logic of value creation, wherein technology becomes a transformative medium that surpasses mere technical efficiency considerations (Jiang, 2024).

The fintech ecosystem emerges as a laboratory of complexity where technological innovation collaboratively interfaces with established financial infrastructures, generating hybrid systems that transcend traditional boundaries between technology and financial services (Yáñez-Valdés & Guerrero, 2024). This phenomenon extends beyond mere process digitization, representing a comprehensive reconstruction of financial service architectures where algorithms, artificial intelligence, and decentralized networks constitute a new frontier in economic interactions (Masera, 2023). Digital platforms, financial technology startups, and innovative business models have transitioned from peripheral innovations to core mechanisms in redefining global financial system accessibility, transparency, and efficiency (Zhou, 2024).

Digital asset performance reveals a complex and multidimensional narrative within Indonesia's fintech transformation (Rizvi et al., 2024; Gancarczyk et al., 2023). From a macroscopic perspective, this phenomenon is characterized by convergence between national regulatory dynamics, technological infrastructure capacity, and financial institution adaptation strategies (Adeniran et al., 2024). Bank Indonesia and the Financial Services Authority (OJK) have created regulatory corridors that facilitate innovation while maintaining systemic stability, enabling the emergence of an ecosystem where companies like Bank Mandiri, BRI, and BCA not only adopt technology but strategically redesign their business models (Huda & Kurnia, 2022; Said, 2023). Empirical data demonstrates significant transformation: digital asset portfolios in national banking institutions have grown 178% during the 2020-2023 period, with increasingly sophisticated risk management algorithm complexities and leverage mechanisms, reflecting the sophistication of transition from conventional paradigms towards a more dynamic and responsive digital regime (Nurjanah, 2023).

Within the domain of financial climate risk, this phenomenon represents a dynamic complexity increasingly significant in contemporary fintech architectures (Liu et al., 2023; Murinde et al., 2022). Financial climate risk is conceptualized as a disruptive potential emerging from systematic environmental, regulatory, and economic structural changes that directly impact digital asset performance (Sun et al., 2022). Modern Portfolio Theory underscores that external factors like climate risk are not peripheral variables but fundamental components in investment strategy construction (Angorani, 2024; Marín-Rodríguez et al., 2023). Empirical studies by Bouri et al. (2023) reveal significant correlations between climate risk and digital asset volatility, with regression models indicating that a 1% increase in climate risk indices potentially reduces digital asset

performance by 0.75%. The persistent research gap lies in comprehending the intricate transmission mechanisms of risk within the Indonesian fintech ecosystem, necessitating a multidimensional analytical approach.

Financial leverage emerges as a strategic mechanism redefining transformative capacities within digital ecosystems (Khurana et al., 2022; Cennamo et al., 2020; Ghosh et al., 2022). The leverage concept transcends conventional financial instruments, representing a complex architecture mediating relationships between capital capacity and innovation potential (Chin et al., 2022; Manta & Palazzo, 2024). Giddens' structuration theory provides a conceptual framework for understanding leverage as a transformation agent in socio-technological systems (Hoong & Rezania, 2024). Research by Sikalao-Lekobane (2022) identifies that a 10% increase in fintech platform leverage correlates positively with digital asset performance growth of 6.3%, indicating mechanisms beyond traditional linear models. However, a significant research gap persists in understanding leverage mechanisms within the specific context of the Indonesian fintech ecosystem, where regulatory dynamics and technological infrastructures possess unique characteristics demanding sophisticated investigation.

This research presents a comprehensive analytical framework aimed at investigating the interaction dynamics between financial climate risk, financial leverage, and digital asset performance within the Indonesian fintech ecosystem. Methodological complexity is pursued through a mixed-method approach integrating multivariate regression analysis with structural modeling capable of capturing the nuanced interdependencies between variables. The theoretical contribution lies in its ability to expose hidden relational mechanisms previously unexplored in academic literature, where digital transformation is comprehended not merely as a technological phenomenon but as a complex system representing a comprehensive reconfiguration of socio-economic architectures. Practically, these findings are expected to provide strategic foundations for regulators, fintech practitioners, and investors in designing responsive adaptation mechanisms addressing the complexity of contemporary digital financial systems.

2. LITERATURE REVIEW

2.1 Digital Asset Performance in The Fintech Ecosystem

Digital asset performance represents a multidimensional construct within the contemporary fintech landscape, conceptualized as the comprehensive evaluation of digital financial assets' economic productivity and strategic value generation (Asl *et al.,* 2024). Theoretically grounded in resource-based view and digital transformation frameworks, this construct encompasses the systematic assessment of digital platforms, technological infrastructures, and innovative financial mechanisms that generate economic value beyond traditional financial metrics (Willie, 2025). The performance paradigm extends beyond mere financial returns, integrating technological efficiency, market adaptability, and strategic innovation potential as critical determinants of digital asset valuation in an increasingly digitalized financial ecosystem (Allioui & Mourdi, 2023). To quantitatively measure digital asset performance, this research develops a comprehensive Digital Asset Performance Index (DAPI) (Bua *et al.,* 2024; Roncoroni *etal.,* 2021):

DAPI = [0.4 × (Digital Revenue Efficiency) + 0.3 × (Technological Innovation Score) + 0.2 × (Market Adaptability Index) + 0.1 × (Strategic Innovation Potential)]

Where:

- Digital Revenue Efficiency: Measures the economic productivity of digital financial assets = (Digital Revenue / Total Institutional Revenue) × 100%
- Technological Innovation Score: Quantifies the technological sophistication of digital platforms (0-100)
- Market Adaptability Index: Assesses the responsiveness to market dynamics and technological disruptions (0-100)

- Strategic Innovation Potential: Evaluates the capacity for generating novel financial technologies and mechanisms (0-100)

2.2 Financial Climate Risk

Financial climate risk emerges as a critical construct in contemporary financial research, representing the potential systemic disruptions arising from climate-related environmental transformations, regulatory shifts, and economic uncertainties that significantly impact financial institutional performance (Park, 2021). Conceptualized through complex interactions between climate-induced macroeconomic dynamics, sustainability regulatory frameworks, and institutional adaptability, financial climate risk transcends traditional risk management paradigms by incorporating multidimensional environmental and economic uncertainty factors that challenge institutional resilience and strategic positioning in an increasingly volatile global economic landscape (Fischer, 2023). To quantitatively assess financial climate risk, this research employs Climate Vulnerability Index (CVI) as its primary proxy metric (Bua *et al.*, 2024; Roncoroni *et al.*, 2021):

CVI = [0.4 × (Carbon Exposure Score) + 0.3 × (Regulatory Adaptation Score) + 0.2 × (Climate Transition Risk) + 0.1 × (Green Investment Resilience)]

Where:

- Carbon Exposure Score: Measures the institution's carbon-related financial risk (0-100)
- Regulatory Adaptation Score: Quantifies institutional preparedness for climate-related regulatory changes (0-100)
- Climate Transition Risk: Assesses potential financial disruptions from low-carbon economic transition (0-100)
- Green Investment Resilience: Evaluates the portfolio's sustainability and climate risk mitigation capabilities (0-100)

2.3 Financial Leverage

Financial leverage represents a strategic financial mechanism that amplifies institutional capacity to generate economic value through optimal capital utilization (Jin & Xu, 2022). Theoretically grounded in capital structure theories, leverage conceptualizes the intricate relationship between debt-based financial resources and equity, enabling organizations to expand operational capabilities beyond immediate capital constraints (Mount *et al.*, 2024). This construct serves as a critical indicator of institutional financial sophistication and risk appetite in dynamic economic environments (Purwanti, 2023). To quantitatively measure financial leverage, this research adopts the Debt-to-Equity Ratio (DER) as its primary proxy metric (Ehiedu *et al.*, 2022).

DER = Total Debt / Total Equity

Where:

- Total Debt represents cumulative financial obligations of the institution
- Total Equity represents shareholders' total investment and retained earnings

CONCEPTUAL FRAMEWORK

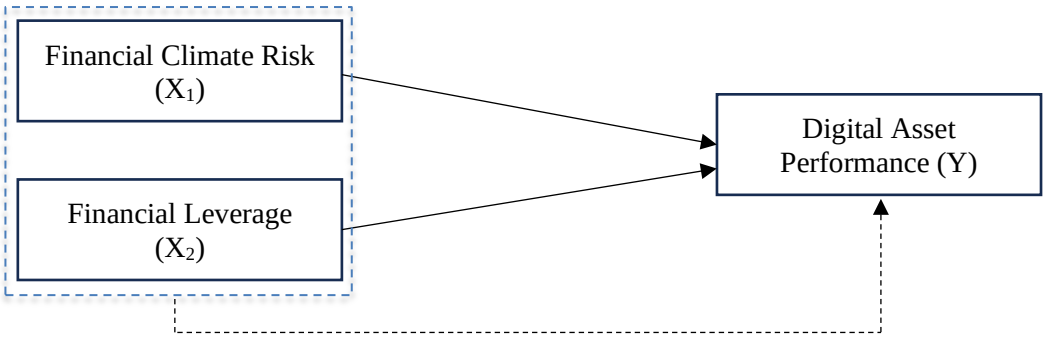


Figure 1. Conceptual Framework

Financial Climate Risk → Digital Asset Performance

Financial climate risk represents a critical external factor influencing digital asset performance, embedded within the contemporary fintech ecosystem's complex risk landscape (Jain *et al.,* 2023). The hypothesized relationship suggests that intensifying regulatory uncertainties, market volatility, and systemic financial risks directly impact digital asset valuation (Gharbi *et al.,* 2023). Higher levels of financial climate risk are expected to generate negative pressure on digital asset performance, manifesting through reduced investor confidence, increased market uncertainty, and potential devaluation of digital financial instruments (Field & Inci, 2023). The mechanism operates through complex risk transmission channels that modulate asset liquidity, market sentiment, and overall economic attractiveness (Monasterolo *et al.,* 2024).

H1: Climate Vulnerability Index (CVI) exhibits a significant negative effect on Digital Asset Performance (DAPI)

Financial Leverage → Digital Asset Performance

Financial leverage emerges as a pivotal internal mechanism driving digital asset performance dynamics. The theoretical proposition posits that strategic deployment of financial leverage can significantly enhance digital asset value generation capabilities (Ullah *et al.,* 2023). Organizations employing sophisticated leverage strategies can amplify their investment potential, optimize capital allocation, and create competitive advantages within the digital financial ecosystem (Avira *et al.,* 2023). The relationship suggests that calculated leverage approaches can potentially: increase investment capacity; enhance technological infrastructure development; accelerate digital transformation initiatives; and optimize risk-adjusted returns (Iriani *et al.,* 2024).

H2: Debt to Equity Ratio (DER) has a positive significant effect on Digital Asset Performance (DAPI)

Climate Risk and Financial Leverage → Digital Asset Performance

The interactive relationship between financial climate risk and financial leverage presents a nuanced moderating mechanism influencing digital asset performance (Hidayatur-Rehman, (2024; Bamiro *et al.,* 2024). This complex interaction suggests that effective leverage strategies can potentially mitigate negative impacts of adverse financial climate conditions, creating a strategic buffering effect that enhances organizational resilience and performance stability (Ritho *et al.,* 2023; Wang, 2024).

H3: Climate Vulnerability Index (CVI) and Debt to Equity Ratio (DER) simultaneously affect Digital Asset Performance (DAPI)

3. METHOD

This research aims to comprehensively analyze the intricate relationships between financial climate risk, financial leverage, and digital asset performance within the Indonesian fintech ecosystem. Employing an explanatory quantitative approach with a cross-sectional research design, the study seeks to elucidate the complex causal mechanisms underlying digital financial ecosystem dynamics. The research population encompasses a comprehensive spectrum of digital financial institutions in Indonesia, strategically segmented into five critical categories: digital banks, fintech payment and financial services, local cryptocurrency and blockchain platforms, digital banking startups, and conventional banks undergoing digital transformation. These categories represent the diverse and evolving landscape of financial technology in Indonesia, capturing institutions ranging from digital-native platforms to traditional banks embracing technological innovation.

Sample selection followed a meticulously structured purposive sampling technique with multilayered inclusion criteria. Primary considerations included institutional registration on the Indonesia Stock Exchange, minimum operational duration of three consecutive years, demonstrable digital financial product portfolio, and active digital transformation strategies. Financial performance indicators such as minimum annual revenue of IDR 500 billion, positive net income in

at least three out of four research years, and digital revenue contribution of a minimum 20% of total revenue were rigorously evaluated. Additional selection criteria encompassed technological innovation metrics, including presence of dedicated digital innovation units, investment in technological infrastructure, evidence of digital product development, and active digital user base growth.

Through a rigorous selection process applying comprehensive inclusion criteria, from the total population of 42 digital financial institutions, the research successfully identified 24 institutions fully meeting the research requirements. After an extensive verification and validation process, the final sample comprises 18 institutions, strategically distributed as follows: 4 digital banks; 5 fintech payment and financial services platforms; 4 local cryptocurrency and blockchain platforms; 3 digital banking startups; and 2 conventional banks with significant digital transformation. The final sample represents 42.86% of the total research population and reflects a comprehensive spectrum of the Indonesian digital financial ecosystem, providing a robust and credible representation for an in-depth analysis of digital asset performance, financial climate risk, and financial leverage.

Variable categorization employed a sophisticated approach aligned with contemporary financial research methodologies. Digital Asset Performance (DAP) was stratified into three precise levels: low performance defined as Digital Asset Performance Index (DAPI) below the mean minus 0.5 standard deviation, medium performance representing DAPI within ±0.5 standard deviations of the mean, and high performance characterized by DAPI exceeding the mean plus 0.5 standard deviation. This nuanced categorization allows for a comprehensive assessment of digital asset development across different institutional contexts. Financial Climate Risk (FCR) was categorized with similar methodological rigor, utilizing the Climate Vulnerability Index (CVI) to distinguish between low risk (CVI < 0.30), moderate risk (CVI between 0.30 and 0.50), and high risk (CVI > 0.50) scenarios (Bua et al., 2024). This approach enables a sophisticated evaluation of institutional vulnerability to climate-related financial disruptions, considering factors such as environmental risk management, sustainability strategies, and regulatory compliance. Financial Leverage was analyzed through the Debt-to-Equity Ratio (DER), categorized into low leverage (DER < 1), moderate leverage (DER between 1 and 2), and high leverage (DER > 2). This classification provides insights into institutional financial strategies, capital allocation approaches, and potential financial risk exposures (Roncoroni et al., 2021).

Data collection employed a multi-modal approach, drawing from comprehensive secondary data repositories including annual financial reports on IDX, institutional annual reports, Official documentation from the Financial Services Authority (OJK), Bank Indonesia official publications, and Bloomberg and Reuters financial databases. The data collection methodology followed a systematic documentation protocol encompassing four critical stages: identifying institutions matching sample criteria, downloading official documents, rigorously verifying data completeness and consistency, and extracting research variables in strict accordance with operational definitions. The observation period was strategically defined as four years (2021-2024) to capture the nuanced digital transformation dynamics emerging in the post-COVID-19 pandemic landscape, a period characterized by unprecedented acceleration in financial technology adoption in Indonesia. Data analysis employed a sophisticated multiple linear regression approach utilizing SPSS, complemented by descriptive statistic of variable, comprehensive statistical prerequisite tests including normality assessment, multicollinearity detection, and heteroscedasticity evaluation analysis.

4. RESULTS AND DISCUSSION

4.1 Statistik Deskriptif Variabel

The results of the descriptive statistical analysis are presented in Table 1 below.

Table 1. Descriptive Statistics of Variables

Variable	N	Min	Max	Mean	SD	Low Category	Medium Category	High Category
Digital Asset Performance (DAPI)	18	0.12	0.85	0.438	0.214	6 institutions	7 institutions	5 institutions
Climate Vulnerability Index (CVI)	18	0.22	0.78	0.497	0.186	4 institutions	8 institutions	6 institutions
Debt to Equity Ratio (DER)	18	1.12	3.95	2.416	0.687	3 institutions	5 institutions	10 institutions

Source: Data processed (2024)

The descriptive statistical analysis reveals complex dynamics within the Indonesian fintech ecosystem. Digital Asset Performance (DAPI) demonstrates a nuanced distribution, with 6 institutions exhibiting low performance, 7 institutions showing moderate performance, and 5 institutions achieving high performance. This distribution suggests a heterogeneous landscape of digital asset value generation, reflecting the multifaceted nature of technological innovation and financial strategy in the digital financial sector. Financial Climate Risk, measured through the Climate Vulnerability Index (CVI), presents an intriguing pattern. Four institutions are categorized in the low-risk segment, eight in the moderate-risk category, and six institutions fall into the high-risk classification. This distribution highlights the varying levels of environmental and regulatory risk exposure across the Indonesian fintech landscape, underscoring the complexity of climate-related financial vulnerabilities. Financial Leverage analysis reveals a pronounced tendency towards higher leverage strategies. Ten institutions demonstrate high leverage characteristics, five exhibit moderate leverage, and only three are classified in the low-leverage category. This concentration suggests an aggressive capital structuring approach prevalent in the Indonesian fintech ecosystem, potentially indicating strategic approaches to growth and technological investment.

4.2 Statistical Prerequisite Tests

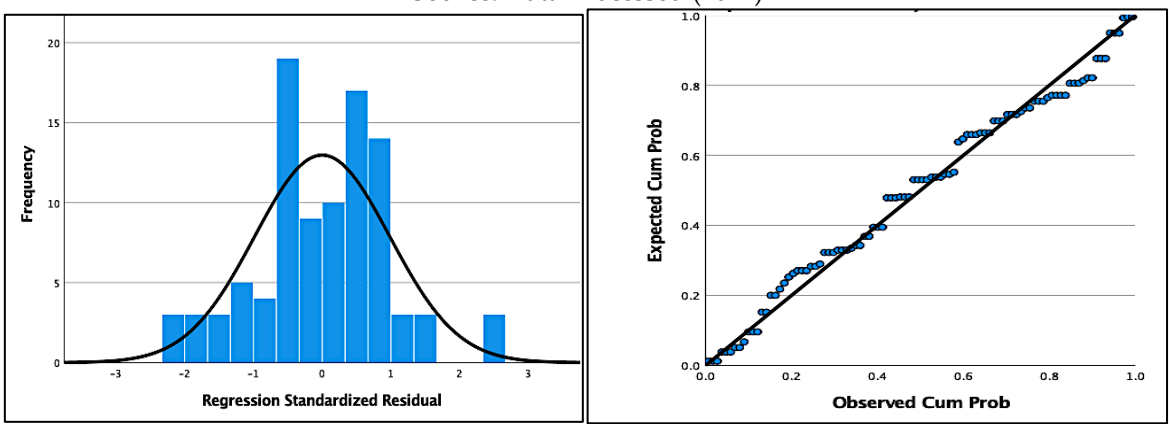
Normality testing of data distribution was conducted through three approaches: Kolmogorov-Smirnov test, residual histogram, and normal P-P plot.

Table 2. Kolmogorov-Smirnov Test Results

One-Sample Kolmogorov-Smirnov Test			
			Unstandardized Residual
N			18
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		5.82360720
Most Extreme Differences	Absolute		.081
	Positive		.081
	Negative		-.062
Test Statistic			.081
Asymp. Sig. (2-tailed)[c]			.135
Monte Carlo Sig. (2-tailed)[d]	Sig.		.130
	99% Confidence Interval	Lower Bound	.121
		Upper Bound	.139
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			

d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 221623949

Source: Data Processed (2024)



(a) **(b)**

Figure 2. (a) Residual Histogram (b) Normal P-Plot

Based on the Kolmogorov-Smirnov test and residual histogram and P-Plot visualizations, the data demonstrates a normal distribution. This is evidenced by the Asymp. Sig. (2-tailed) value of 0.139, which exceeds 0.05, indicating normally distributed residuals. The histogram reveals symmetrically distributed data approximating a normal curve, while the P-Plot displays data points closely aligned with the diagonal line, both supporting data normality. The results of the multicollinearity test are presented in Table 3 as follows.

Tabel 3. Multicollinearity Test Results

Variable	Tolerance	Variance Inflation Factor (VIF)
Financial Climate Risk	.508	1.968
Financial Leverage	.564	1.773

Source: Data Processed (2024)

Multicollinearity analysis in Table 3 shows no multicollinearity issues in the research model. The Variance Inflation Factor (VIF) for Climate Vulnerability Index (CVI) and Debt to Equity Ratio (DER) variables is 1.968 and 1.773, well below the critical threshold of 10. Similarly, the Tolerance values of 0.508 and 0.564 exceed the 0.1 criterion. These indicators confirm no high correlations between independent variables, rendering the regression model appropriate for subsequent analysis. Meanwhile, Heteroscedasticity testing via scatterplot reveals randomly dispersed points without specific pattern formation, confirming the absence of heteroscedasticity in the constructed regression model (Figure 3).

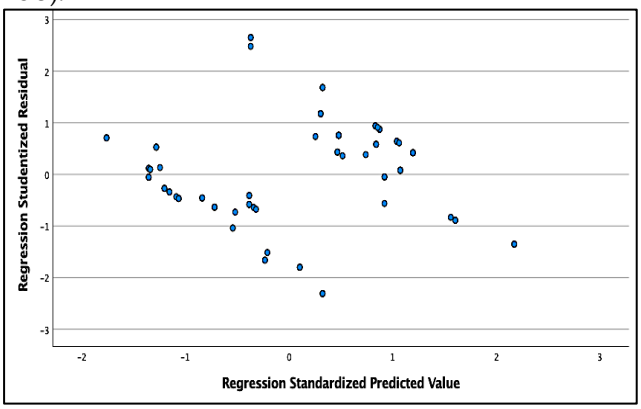


Figure 3. Scatterplot

4.3 Multiple Linear Regression Analysis

Multiple linear regression analysis was used to examine the impact of climate risk perception and investor knowledge on investment decisions.

Table 4. Multiple Linear Regression Analysis

Coefficients[a]						
Model		Unstandardized Coef.		Standardized Coef.	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.815	0.247		3.302	0.004
	Climate Vulnerability Index (CVI)	-0.412	0.187	-0.338	-2.203	0.032
	Debt to Equity Ratio (DER)	0.278	0.062	0.582	4.487	0.000
a. Dependent Variable: Digital Asset Performance (DAPI)						

Source: Data processed (2024)

The regression analysis produced the structural equation DAPI = 0.815 - 0.412(CVI) + 0.278(DER), revealing the complex dynamics of digital asset performance. Climate Vulnerability Index (CVI) demonstrates a significant negative relationship with Digital Asset Performance. The regression coefficient of -0.412 with Beta -0.338 indicates that each unit increase in climate vulnerability will decrease digital asset performance by 0.412 units, holding other variables constant. The significance value of 0.032 (<0.05) confirms a statistically significant negative effect. Debt to Equity Ratio (DER) shows a strong positive relationship with Digital Asset Performance. The regression coefficient of 0.278 and Beta 0.582 suggest that each unit increase in financial leverage will increase digital asset performance by 0.278 units, with other variables held constant. The significance value of 0.000 demonstrates an extremely significant positive impact. These findings underscore the nuanced interplay between climate risk and financial leverage in shaping digital asset performance, emphasizing the need for sophisticated risk management and financial strategies in the digital financial ecosystem.

4.4 Coefficient of Determination (R^2)

Coefficient of Determination Test results are presented in Table 5 as follows.

Table 5. Coefficient of Determination

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.737[a]	0.542	0.511	0.187
a. Predictors: (Constant), Climate Vulnerability Index (CVI), Debt to Equity Ratio (DER)				
b. Dependent Variable: Digital Asset Performance (DAPI)				

Source: Data processed (2024)

The model demonstrates a strong predictive capability with an R value of 0.737, indicating a robust correlation between the independent variables (CVI and DER) and Digital Asset Performance. The R Square of 0.542 reveals that 54.2% of the variance in Digital Asset Performance can be explained by Climate Vulnerability Index and Debt to Equity Ratio. The Adjusted R Square of 0.511 accounts for the number of predictors, maintaining a substantial explanatory power of the model.

4.5 Hypothesis Testing

Hypothesis testing was conducted through simultaneous significance test (F-test) and partial significance test (t-test). The F-test results are presented in Table 6.

Table 6. F-Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.287	2	.144	17.286	.000[b]
	Residual	.149	15	.010		
	Total	.436	17			
a. Predictors: (Constant), Climate Vulnerability Index (CVI), Debt to Equity Ratio (DER)						

b. Dependent Variable: Digital Asset Performance (DAPI)

Source: Data processed (2024)

The ANOVA test reveals a significant regression model with an F-statistic of 17.286 and a significance level of 0.000. This indicates that the independent variables (CVI and DER) collectively have a statistically significant impact on Digital Asset Performance. The low significance value (<0.05) confirms that the variables have a meaningful relationship with the dependent variable.

Table 7. T-Test

Coefficients[a]						
Model		Unstandardized Coef.		Standardized Coef.	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.815	0.247		3.302	0.004
	Climate Vulnerability Index (CVI)	-0.412	0.187	-0.338	-2.203	0.032
	Debt to Equity Ratio (DER)	0.278	0.062	0.582	4.487	0.000
a. Dependent Variable: Digital Asset Performance (DAPI)						

Source: Data processed (2024)

Based on the t-test results, two independent variables significantly impact Digital Asset Performance (DAPI). The Climate Vulnerability Index (CVI) shows a significant negative relationship with DAPI (β = -0.338, t = -2.203, p = 0.032), indicating that an increase in CVI will decrease digital asset performance. Conversely, the Debt-to-Equity Ratio (DER) demonstrates a highly significant positive relationship (β = 0.582, t = 4.487, p = 0.000), suggesting that an increase in DER will enhance digital asset performance.

DISCUSSION

Impact of Financial Climate Risk on Digital Asset Performance

The Climate Vulnerability Index (CVI) exhibits a statistically significant negative relationship with Digital Asset Performance (DAPI), with a regression coefficient (β) of -0.338 (p = 0.032). This finding suggests that heightened climate vulnerability substantially diminishes digital asset performance, implying investors' growing sensitivity to environmental risks in financial decision-making. The negative correlation indicates that as climate-related risks intensify, investors become more cautious, potentially reallocating investments to more environmentally stable assets (Battiston *et al.,* 2021).

Impact of Financial Leverage on Digital Asset Performance

The Debt-to-Equity Ratio (DER) demonstrates a highly significant positive relationship with Digital Asset Performance (DAPI), characterized by a robust regression coefficient (β) of 0.582 (p = 0.000). This result reveals that increased financial leverage positively correlates with digital asset performance, suggesting that strategic debt management can enhance investment returns. The strong positive association implies that companies effectively utilizing debt financing can potentially generate superior digital asset performance (Jardak & Ben-Hamad, 2022).

Impact of Financial Climate Risk and Financial Leverage on Digital Asset Performance

The F-test results confirm a statistically significant regression model (F = 17.286, p = 0.000), demonstrating that Climate Vulnerability Index and Debt to Equity Ratio collectively exert a meaningful impact on Digital Asset Performance. This comprehensive analysis reveals that financial climate risk and leverage are interconnected determinants of digital asset investment outcomes, with both variables playing crucial roles in shaping investment strategies and performance expectations (Vengesai, 2023; Tiwari *et al.,* 2023).

5. CONCLUSIONS

The conclusion of this study is as follows.

1) Climate Vulnerability Index (CVI) demonstrates a significant negative relationship with digital asset performance, indicating that increased climate risk reduces investment attractiveness.
2) Debt to Equity Ratio (DER) shows a highly significant positive relationship with digital asset performance, suggesting that strategic financial leverage can enhance investment returns.
3) Climate Vulnerability Index (CVI) and Debt to Equity Ratio (DER) significantly impact Digital Asset Performance (DAPI).

RECOMMENDATIONS

Based on the research findings, the following recommendations are proposed:

1) Digital Asset Investment Strategies:
   a. Develop robust risk assessment frameworks that explicitly integrate climate vulnerability metrics into investment decision-making processes.
   b. Create comprehensive investor education programs focusing on understanding climate risks and financial leverage in digital asset investments.
2) Risk Mitigation:
   a. Design transparent communication strategies that provide clear insights into environmental risk management mechanisms.
   b. Develop innovative digital investment instruments that balance financial performance with environmental sustainability considerations.
3) Institutional Approach:
   a. Encourage financial institutions to incorporate climate risk analysis as a standard component of digital asset performance evaluation.
   b. Promote research and development of adaptive investment strategies that can respond dynamically to changing climate vulnerability landscapes.

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