



NON-LIFE INSURANCE PERFORMANCE IN INDONESIA AMID THE COVID-19 ENVIRONMENTAL CRISIS

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ABSTRACT

This study examines the key factors influencing financial performance among 62 Indonesian non-life insurance companies during the COVID-19 pandemic, a multifaceted crisis encompassing social, economic, and environmental dimensions. Data from the period 2020 to 2021 were analysed using multiple regression models, supported by diagnostic tests and a robustness test. The results demonstrate that Solvency (Sol) and Underwriting Risk (UR) consistently and significantly influenced financial performance, underscoring their central role in sustaining organisational resilience under systemic stress. Additionally, Premium Growth (PG), Loss Ratio (LR), and Expense Ratio (ER) had varying effects, particularly during the early phase of the pandemic. These findings underscore the importance of solvency management and prudent underwriting for boards and managers and suggest that regulators and policymakers adopt adaptive supervisory frameworks. Furthermore, the study emphasises that resilience strategies in financial services should integrate environmental considerations into sustainable crisis preparedness.

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Introduction

The COVID-19 outbreak escalated from a health emergency into a global economic crisis that disrupted livelihoods, business continuity, and financial systems. Comparative evidence documents interruptions to production and distribution, contractions in investment income, and heavier claims burdens that weakened outcomes across economies (Chemkha *et al.*, 2021; Rai *et al.*, 2021). Large-scale humanitarian shocks can intensify macroeconomic fragility by significantly depressing demand, affecting business performance and increasing market uncertainty (Rodríguez-Antón & Alonso-Almeida, 2020). These mechanisms generated persistent volatility in financial intermediation, requiring policy responses (Shahzad *et al.*, 2021). Moreover, understanding how major risk-bearing institutions navigate these conditions is

crucial for evaluating resilience and for designing measures that cushion future disturbances. This paper builds on that premise and investigates how context shapes the performance of non-life insurers under extreme uncertainty.

Within this global setting, the insurance industry encountered intensified operational disruption and pressure on profitability. As economic activity slowed, premium collection weakened, some lines experienced higher claims, and investment returns became more volatile, straining capital buffers and constraining underwriting capacity (Babuna *et al.*, 2020). Additionally, the insurance sector is central to global economic stability. It enables efficient risk management, transfers potential losses away from households and firms, and fosters capital formation by channelling

savings into productive investment, thereby contributing to economic growth (Senol *et al.*, 2020). In developing economies, insurance also serves as a financial intermediary, mobilising domestic capital for long-term investment while mitigating the adverse effects of disasters and macroeconomic shocks (Asongu *et al.*, 2020). The episode underscores the sector's dual role as a private risk distributor and as a stabilising mechanism that complements banking and capital markets.

Indonesia's insurance market expanded under the close supervision of the Financial Services Authority, as reflected in rising gross premium income and total invested assets (Otoritas Jasa Keuangan, 2024). The pandemic placed the non-life segment under significant pressure, with sector data showing a 15.95% decline in net income from 2019 to 2020 (Asosiasi Asuransi Umum Indonesia, 2020). The operating environment also deteriorated as the economy contended with pandemic disruptions (Thorbecke, 2023). In parallel, comparative evidence documents a broad deterioration in insurers' performance during COVID-19. Profitability and efficiency weakened as Underwriting Risk (UR) increased and investment income became more volatile, a pattern observed across markets and particularly salient in emerging economies (Paminto *et al.*, 2023). Collectively, these macro and sectoral conditions provide a coherent backdrop for a firm-level assessment of the financial determinants of non-life insurance performance in Indonesia during the crisis period.

Furthermore, performance assessment in insurance research and practice commonly relies on Return on Assets (ROA) and Return on Equity (ROE). ROA captures the efficiency with which assets generate earnings, while ROE measures profitability relative to shareholders' capital (Pointer & Khoi, 2019; Sachin & Rajesh, 2022). Both indicators are widely used to evaluate efficiency, profitability, and resilience across firms and over time, providing a consistent basis for cross-company comparisons in empirical work (Činčalová, 2021; Tackie *et*

al., 2022). Prior studies highlight the importance of solvency strength, underwriting discipline, premium dynamics, and cost structures. Nevertheless, much of the evidence originates in developed markets with regulatory and market architectures that differ from Indonesia's context.

Indonesia's non-life insurance sector is regulated similarly to the financial industry (Amanda & Pradipta, 2024; Astuti *et al.*, 2025; Susyanto *et al.*, 2025). Research on this sector, particularly during crises, remains limited. Previous studies have primarily focused on the broader financial industry and have not extensively examined the unique challenges faced by non-life insurers during periods of systemic disruption (Balcilar *et al.*, 2020; Terdpaopong & Rickards, 2021; Carvalho & Guimarães, 2024). This study addresses this gap by focusing on Indonesia's non-life insurance sector, which remains largely under-researched, particularly in the context of crises such as the COVID-19 pandemic. Unlike research that focuses on the broader financial industry, this study investigates how non-life insurers in Indonesia, operating under regulatory frameworks similar to those in the financial sector, face distinct operational models and risk profiles. These companies face different risks and claims management issues, setting them apart from financial institutions (Torri *et al.*, 2022; Upreti *et al.*, 2022). Consequently, this study contributes to filling a significant gap in the literature by providing insights into how non-life insurers navigate systemic disruption and how their financial performance and resilience are influenced during crises.

Notably, the pandemic exposed environmental dynamics with direct relevance for non-life insurance portfolios (Ranger *et al.*, 2021). Temporary mobility restrictions reduced emissions in many urban areas, whereas medical and plastic waste increased due to shifts in consumption and the widespread use of protective equipment, creating externalities and cleanup liabilities (Klemeš *et al.*, 2020; Rume & Islam, 2020). Environmental conditions shape

catastrophe exposure, industrial-accident risk, and pollution-related claims, with implications for pricing, underwriting capacity, and capital planning. Recent studies underscore the expanding role of Environmental, Social and Governance (ESG) metrics in evaluating business sustainability and in aligning investment and underwriting policies with risk-based objectives (Brogi *et al.*, 2022). In emerging markets, these factors intersect with regulatory priorities, reinsurance availability, and data quality, influencing accumulation-risk management and capital allocation (Nobanee *et al.*, 2022; Gupta & Venkataraman, 2024). Overall, these links motivate an integrated perspective that connects financial determinants of performance with environmental risk management and supervisory practices.

This study examines the financial determinants of non-life insurance performance in Indonesia during the COVID-19 environmental crisis. In particular, it analyses ten internal indicators and their short-run associations with profitability during 2020 to 2021, a period spanning the initial shock and the early recovery. ROA and ROE serve as the primary outcome measures. The contribution is twofold. First, the study provides a comprehensive firm-level assessment of 10 determinants under systemic stress, including Insurance Size (IS), Liquidity (Liq), Premium Growth (PG), Leverage (Lev), Solvency (Sol), Underwriting Risk (UR), Reinsurance (Rei), Loss Ratio (LR), Expense Ratio (ER), and Investment Income Ratio (INR). Second, it interprets these determinants within Indonesia's regulatory and market setting, generating practical implications for boards, risk managers, and policymakers seeking to strengthen crisis preparedness and sustainable financial resilience.

Materials and Methods

Theoretical Literature Review

This study adopted an integrated theoretical approach, drawing on Resource-based View (RBV), Contingency Theory, Agency Theory,

and Stakeholder Theory, to explain how insurer-specific characteristics influence ROA and ROE during systemic disruption. The RBV posits that firms achieve sustained advantage when they control resources and capabilities that are valuable, rare, difficult to imitate, and non-substitutable (Barney, 1991). Empirical evidence demonstrates that information integration and visibility, developed through internal and external resources, enhance operational effectiveness and resilience, which are prerequisites for sustained profitability (Brandon-Jones *et al.*, 2014; Huo *et al.*, 2016; Chahal *et al.*, 2020). In the insurance industry, attributes such as strong solvency, disciplined underwriting practices, prudent use of reinsurance, and effective investment management function as practical expressions of these underlying capabilities. Moreover, adequate capital buffers, careful risk selection and efficient cost structures help insurers absorb shocks, maintain service to policyholders, and sustain competitive positioning in a volatile environment (Richter & Wilson, 2020; Upreti *et al.*, 2022; Horvey & Odei-Mensah, 2025a). This study considered solvency, UR, LR, ER, INR, and IS as observable indicators of the insurer's internal resource strength. Consistent with RBV, insurers with stronger capital positions, higher underwriting quality, tighter cost control, and more favourable investment outcomes are expected to achieve superior ROA and ROE during the COVID-19 period, when deficiencies in internal capabilities tend to become more apparent.

Contingency Theory adds that performance depends on the fit between internal systems and external environmental conditions (Donaldson, 2001). Recent evidence indicates that context-specific adaptations to shocks, including the COVID-19 pandemic, are crucial for maintaining operations and financial outcomes (Hongpukdee & Saraphat, 2024; Jiménez & Quispe, 2024; Tiwari *et al.*, 2024). Within non-life insurance firms, factors such as size, liquidity, reinsurance intensity, premium dynamics, the structure of claims, and operating costs function as contingencies that shape how internal capabilities translate into ROA and ROE

(Pointer & Khoi, 2019; Msomi & Nzama, 2023; Upadhyaya *et al.*, 2023; Horvey & Odei-Mensah, 2025b). However, the financial impact of these factors is not fixed. Liquidity, reinsurance, or premium expansion may strengthen or weaken performance depending on market volatility and underwriting conditions (Shiu, 2020; Upreti *et al.*, 2022; Hsiao & Shiu, 2023). Cross-country evidence further demonstrates that the effects of operational and financial ratios vary across regulatory regimes and macroeconomic environments (Eling & Jia, 2018; Klietnik *et al.*, 2020; Vojinović *et al.*, 2022). In this study, IS, liquidity, reinsurance, PG, LR, and ER are therefore viewed as context-conditioning variables that determine the effectiveness of underlying capabilities during the COVID-19 crisis. Collectively, the RBV explains which internal resources matter for performance, whereas Contingency Theory clarifies when and under what conditions these resources translate into ROE and ROA during systemic disruption.

On the other hand, Agency Theory explains how the separation between ownership and control can create conflicts of interest that shape financial outcomes. Early works by Berle and Means (2017) highlighted that managers who control corporate resources may not always act in the best interests of dispersed shareholders. Jensen and Meckling (1976) formalised this insight by modelling the firm as a nexus of contracts between principals and agents, in which divergent risk preferences and information asymmetries generate agency costs. Subsequent contributions emphasise the role of capital structure and monitoring mechanisms in constraining managerial discretion and aligning incentives with shareholder value (Lartey *et al.*, 2021; Ozdemir & Kilincarslan, 2021; Ugur *et al.*, 2022). In this study, leverage, liquidity, and ER are interpreted as agency-related financial policy variables that influence the efficiency of asset deployment and return generation, with direct implications for ROA and ROE during the COVID-19 period.

Moreover, Stakeholder Theory emerged as a critique of the narrow shareholder-primacy view

of the firm. Freeman (1984) reconceptualised the corporation as a web of relationships involving multiple stakeholder groups whose interests should inform strategic and operational decisions. Subsequent contributions argue that long-term success depends on the firm's ability to create and distribute value in ways that these groups regard as fair and legitimate. They increasingly emphasise that credible attention to ESG impacts is integral to such legitimacy, whereas systematic neglect of key stakeholders and ESG concerns may generate short-term financial gains at the expense of trust, reputation and sustainable performance (Zumente & Bistрова, 2021; Bridoux & Stoelhorst, 2022; Yan *et al.*, 2022). Within the insurance sector, policyholders, regulators, and reinsurers are particularly salient stakeholders because they rely on insurance's claims-paying capacity and prudent risk management. Notably, financial indicators such as solvency ratio, UR, LR, and liquidity position convey direct signals about claim-paying ability and overall financial soundness to these parties (Huggenberger & Albrecht, 2022; Kebede *et al.*, 2024; Tsai & Lo, 2024). Accordingly, solvency, UR, LR, liquidity, and reinsurance are treated as stakeholder-relevant variables whose prudent management supports sustainable ROA and ROE during the COVID-19 pandemic.

Sample and Data Collection

The sample for this study comprised all 77 non-life insurance companies registered with Indonesia's Financial Services Authority (OJK) as of 2022, covering both listed and non-listed firms. This study examined the annual financial impact of the COVID-19 pandemic on the sector, using financial data from 62 insurers for 2020 and 2021. These 62 firms were selected because comprehensive yearly financial statements were available for both years, enabling a thorough assessment of their financial performance during the pandemic. Data were systematically collected from each company's official website to ensure accuracy, consistency, and comparability across all companies.

Furthermore, the primary inclusion criterion required that firms provide sufficiently detailed information to compute all study variables, including 10 internal financial ratios and the dependent performance measures (ROE and ROA). Companies that did not meet these criteria were excluded from the sample, and the sample selection process is summarised in Table 1. Initially, 124 firm-year observations were used for the descriptive analysis. However, for the regression analysis, diagnostic tests for normality, homoscedasticity, and multicollinearity were conducted. During the normality test, two outliers were identified that significantly deviated from the overall data pattern. These outliers were removed to ensure the robustness of the regression models, resulting in a final sample of 122 observations.

Table 1 outlines the detailed sample selection process and the reasons for exclusion, ensuring transparency in the selection procedure. This rigorous process yielded a high-quality, balanced panel dataset, enabling a comprehensive empirical investigation of the factors influencing the financial performance of Indonesian non-life insurers during the pandemic.

Variables and Hypotheses

A large body of empirical research has examined the determinants of insurance performance using ROE and ROA as key indicators. For ROE,

Saleh and Derbali (2020) demonstrated that both internal factors, such as liquidity and firm size, and macroeconomic conditions, including Gross Domestic Product (GDP) growth, inflation, and interest rates, significantly affect United Kingdom insurers. Morara and Sibindi (2021) reported that ROE is positively associated with firm size but negatively associated with firm age among Kenyan insurers, and that more highly leveraged companies can outperform less leveraged peers. By contrast, Siddik *et al.* (2022) documented that firm size, technical provisions, leverage, and inflation reduce ROE for Bangladeshi insurers, highlighting differences across institutional settings. Focusing on ROA and net profit margin, Ahmeti and Iseni (2022) found that internal company characteristics, such as size, leverage, and firm age, significantly affect the profitability of Kosovan insurers. Overall, this evidence indicates that internal financial characteristics matter for performance, but their effects vary substantially across markets and institutional environments.

Conversely, regarding ROA, Worku *et al.* (2024) reported that asset tangibility, firm size, managerial efficiency, and leverage have positive effects on Ethiopian insurers, while GDP is not statistically significant. Tsvetkova *et al.* (2021) identified that ROA in Russian insurers is positively associated with firm size, claim ratio, liquidity, and ROE, with PG and inflation also exerting favourable impacts. Evidence from

Table 1: Sample selection of Indonesian non-life insurance companies

Sample Selection Step	Number of Firms
Non-life insurance companies registered with OJK	77
Less:	
Firms with incomplete or unavailable financial statements	9
Firms with financial or reporting irregularities	2
Firms with missing key financial data	1
Firms that are newly established	1
Firms that underwent an acquisition or name change	1
Firms with a revoked licence	1
Final sample of non-life insurers for 2020 to 2021	62

Nepal similarly demonstrates that the retention ratio, gross premium, and ER are essential predictors of ROA (Upadhyaya *et al.*, 2023). Collectively, these studies demonstrate that internal financial characteristics are a necessary segment of the determinants that shape insurers' profitability and that their strength and direction are susceptible to institutional settings and macroeconomic conditions. Against this background, the present study re-examines the role of internal financial characteristics in Indonesia's non-life insurance market during the severe disruption associated with the COVID-19 pandemic.

Building on the theoretical framework comprising the RBV, Contingency Theory, Agency Theory, and Stakeholder Theory, the empirical analysis focuses on 10 internal financial indicators introduced earlier. These indicators capture insurers' scale, capital structure, liquidity position, premium dynamics, solvency, UR, use of reinsurance, and the principal ratios, namely LR, ER, and INR. Overall, they describe each firm's financial profile and summarise its risk-bearing capacity, operating efficiency, and investment performance. The central premise is that an insurer's internal financial profile systematically shapes its financial performance, as reflected in ROE and ROA, during the COVID-19 period. The hypotheses that follow specify the expected direction of the relationship between each indicator and the two performance measures.

IS is frequently associated with higher operational efficiency, broader market reach, and improved access to capital (Vu *et al.*, 2019; Vojinović *et al.*, 2020; Aldboush *et al.*, 2023; Basdekis *et al.*, 2023). Alsharari and Alhmoud (2019) found that a larger size was associated with higher ROA among Sharia-compliant insurers. In contrast, Sasidharan *et al.* (2023) reported an adverse effect for Indian non-life insurers, indicating potential diseconomies of scale. By comparison, Al-Harbi (2019) observed no significant size effect among insurers in developing Organisation of Islamic Cooperation (OIC) countries, and evidence from Indonesia

points to an inverse association between firm size and firm value (Ayu *et al.*, 2022). Taken together, these results suggest that, despite heterogeneous outcomes across markets, larger insurers are generally expected to exploit economies of scale and stronger market positions to support financial performance during periods of crisis.

H1: The insurance size positively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Specifically, liquidity is critical for meeting short-term obligations and sustaining operations when claims increase or cash flow becomes volatile. Prior studies have shown that higher liquidity is associated with improved profitability because liquid reserves can cushion unexpected shocks. Nonetheless, they also emphasise the opportunity costs and inefficiencies that arise when excess funds remain idle rather than being deployed into productive assets (Sasidharan *et al.*, 2023; Qubbaja, 2025). Evidence from periods of financial turbulence further indicates that liquidity effects are strongly context-dependent. Katusiime (2021) revealed that liquidity can exert a negative short-term impact during global shocks. Rohman *et al.* (2022) reported no significant influence in the Indonesian banking sector. Collectively, these findings posit that liquidity does not exert a uniformly positive effect on performance and may even depress returns when maintained at excessively high levels. In the specific context of the COVID-19 crisis, elevated liquidity in non-life insurers may therefore reflect precautionary hoarding and underutilised resources rather than efficient balance-sheet management.

H2: Liquidity negatively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

PG is widely regarded as an engine of profitability, since expansion in business volume tends to increase earned premiums and strengthen competitive positioning in insurance markets (Akotey *et al.*, 2013; Öner Kaya, 2015).

Empirical findings, however, are not uniform. Horvey *et al.* (2024) and Sasidharan *et al.* (2023) reported weak or statistically insignificant effects. In contrast, Tsvetkova *et al.* (2021) demonstrated that rapid premium expansion can deteriorate performance by raising UR and future claims. These divergent results suggest that the impact of PG on profitability depends on pricing discipline, risk selection, and prevailing market conditions. During the COVID-19 period, moderate and appropriately priced PG is likely to have contributed to revenue stabilisation. Concurrently, overly aggressive expansion may have intensified loss experience under heightened uncertainty. On balance, PG is expected to support insurers' financial performance when managed prudently during crisis conditions.

H3: Premium growth positively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Furthermore, leverage is operationalised as the ratio of total debt to total equity. In line with traditional capital structure theory, leverage can enhance profitability by providing tax shields and facilitating more efficient capital use (Lee & Lee, 2012; Morara & Sibindi, 2021; Worku *et al.*, 2024). However, higher leverage simultaneously increases the probability of financial distress and the severity of insolvency risk, particularly when earnings become volatile. Empirical evidence on this relationship is mixed. Siddik *et al.* (2022) reported a substantial adverse effect of leverage on ROA for Bangladeshi non-life insurers, whereas other studies document neutral or even positive associations, contingent on institutional and market conditions (Isayas, 2021; Abdeljawad *et al.*, 2022). Thus, these contrasting findings indicate that the impact of leverage on insurer performance is susceptible to the broader economic environment and the robustness of risk management practices. In the context of the COVID-19 crisis, the increased risk of financial distress may offset any benefits associated with leverage.

H4: Leverage negatively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Solvency is widely regarded as a core determinant of insurer stability and policyholder protection. Conceptual and regulatory analyses emphasise that adequate capital and earnings buffers are essential for absorbing underwriting, market, and credit risks and for safeguarding claims-paying capacity in modern risk-based regimes (Sandström, 2016). Empirical evidence indicates that solvency materially influences underwriting outcomes and overall profitability, and recent work suggests that these effects may be non-linear, with performance improving once solvency exceeds certain threshold levels (Horvey & Odei-Mensah, 2025b). Studies from other markets similarly report that better-capitalised and more solvent insurers tend to exhibit stronger financial performance, thereby enhancing confidence among policyholders, investors, and regulators (Öner Kaya, 2015; Morara & Sibindi, 2021). Overall, these findings underscore the role of solvency as a key channel through which risk-bearing capacity and financial outcomes are shaped. Accordingly, the present study adopts an earnings-based solvency ratio aligned with prior empirical applications. Higher solvency is expected to enhance insurers' balance sheet resilience and the sustainability of returns during systemic shocks, such as the COVID-19 pandemic.

H5: Solvency positively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Additionally, UR arises when realised claims consume a substantial proportion of earned premiums or exceed them, thereby compressing underwriting margins and constraining insurers' ability to generate sustainable profits (Zainudin *et al.*, 2018; Olarewaju & Msomi, 2021). In line with prior empirical research on insurance performance, the present study operationalises UR as the ratio

of total claims to earned premiums (Horvey *et al.*, 2024). An extensive body of empirical literature generally reports that higher UR is associated with weaker financial performance, underscoring the importance of effective claims management (Burca & Batrinca, 2014; Öner Kaya, 2015; Siopi & Poufinas, 2023). However, evidence across countries, product lines, and periods is not entirely consistent, indicating that the effect of UR on profitability depends on institutional conditions and the strength of insurers' risk management frameworks. In the context of the COVID-19 pandemic, characterised by heightened uncertainty in claim frequencies and severities, UR in the Indonesian non-life market is therefore expected to exert a particularly adverse influence on insurers' earning capacity.

H6: Underwriting risk negatively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Reinsurance is a fundamental component of insurers' risk management strategies, enabling them to transfer a portion of their risk exposure to third-party reinsurers. This transfer helps maintain solvency, smooths loss experience, and mitigates the impact of significant or catastrophic claims (Constantinescu *et al.*, 2022; Dias *et al.*, 2025). Some empirical evidence suggests that reinsurance enhances risk capacity and stabilises earnings (Morara & Sibindi, 2021). Conversely, other research indicates that excessive reliance on reinsurance may reduce profitability due to high ceded premium costs and inefficiencies in risk sharing (Lee & Lee, 2012; Cao *et al.*, 2020). These divergent findings imply that the effect of reinsurance on financial performance is context-dependent, shaped by factors such as the pricing and structure of reinsurance arrangements and the underlying risk environment. Amid the COVID-19 pandemic, marked by heightened uncertainty and potential severe losses, reinsurance is anticipated to play a stabilising role for Indonesian non-life insurers and help maintain profitability.

H7: Reinsurance positively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Moreover, the LR, defined as the ratio of net claims incurred to net premiums, is a critical measure of underwriting performance, with higher values indicating greater strain on underwriting results. Empirical literature consistently finds a negative relationship between LR and profitability, reinforcing the importance of effective claims management and prudent underwriting (Fernández *et al.*, 2024). Some studies suggest that well-managed companies can maintain profitability even with higher LRs, while others imply that excessive LRs reflect inefficiencies in risk management and underwriting processes (Andoh & Yamoah, 2021; Dhiab, 2021). During periods of crisis such as the COVID-19 pandemic, the adverse effects of high LRs are likely magnified by increased claim frequencies and severities. Considering these findings, this study posits that the LR will negatively impact the financial performance of Indonesian non-life insurance companies during the pandemic.

H8: The loss ratio negatively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

The ER, defined as operating expenses relative to net earned premiums, is a central indicator of cost efficiency in non-life insurance operations (Mazviona *et al.*, 2017; Horvey & Odei-Mensah, 2025b). Empirical studies generally document that higher ERs are associated with weaker financial performance, as they reflect less efficient use of administrative and acquisition resources (Mazviona *et al.*, 2017; Upadhyaya *et al.*, 2023). In particular, recent evidence from the South African non-life insurance market posits that, after controlling for other firm-specific and macroeconomic factors, the direct effect of the ER on profitability may be minimal or statistically insignificant, indicating some contextual variation in its impact (Horvey

& Odei-Mensah, 2025b). Evidence from the COVID-19 period confirms that tight expense control remains a critical driver of profitability under heightened stress and operational disruption (Salman *et al.*, 2024). On this basis, the present study treats the ER as an inverse proxy for operating efficiency. It is expected that a higher ER will be associated with lower profitability for Indonesian non-life insurers during the pandemic period.

H9: Expense ratio negatively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

The INR, defined as net investment income relative to net earned premiums, captures the extent to which insurers generate returns from their asset portfolios in addition to underwriting activities. Evidence from Indonesian insurers reports that weak, volatile investment income is associated with greater financial vulnerability, underscoring its central role in maintaining solvency and overall financial health (Astuti *et al.*, 2025). Studies from other markets similarly demonstrate that investment income is an essential contributor to profitability and performance, as it is identified as a key secondary revenue source for Indian non-life insurers and as a significant determinant of performance within a risk-based capital framework in Kenya (Muthulakshmi, 2018; Chache *et al.*, 2020). By contrast, research on cooperative Islamic insurers reports a weaker or model-contingent relationship between investment income and profitability, reflecting Shariah-compliant investment constraints and the prominence of fee-based income (Savai *et al.*, 2025). At a broader regional level, investment performance has also been indicated to be a significant predictor of the financial health and solvency of Asian non-life insurers (Chen & Wong, 2004). Overall, these findings suggest that, despite heterogeneity across institutional settings, more substantial investment income generally enhances insurers' profitability and resilience by cushioning adverse underwriting and

macro-financial shocks. Amid the COVID-19 pandemic, the INR of Indonesian non-life insurers is expected to positively affect ROE and ROA.

H10: Investment income ratio positively affects the financial performance (ROE and ROA) of Indonesian non-life insurance companies during the COVID-19 pandemic.

Collectively, these 10 hypotheses posit that financial characteristics of Indonesian non-life insurers significantly shape ROE and ROA during a systemic shock such as the COVID-19 pandemic.

Empirical Model

Building on these hypotheses, the study specifies an empirical framework in which financial performance is measured by two dependent variables, ROE and ROA, explained by 10 internal financial indicators. IS, liquidity, PG, leverage, solvency, UR, reinsurance, LR, ER, and the INR are included as regressors in both specifications, so that each hypothesis H1 to H10 is evaluated with respect to both ROE and ROA. The baseline models are specified as follows.

Model 1:

$$ROE_{it} = \alpha + \beta_1 IS_{it} + \beta_2 Liq_{it} + \beta_3 PG_{it} + \beta_4 Lev_{it} + \beta_5 Sol_{it} + \beta_6 UR_{it} + \beta_7 Rei_{it} + \beta_8 LR_{it} + \beta_9 ER_{it} + \beta_{10} INR_{it} + \varepsilon_{it} \quad (1)$$

Model 2:

$$ROA_{it} = \alpha + \beta_1 IS_{it} + \beta_2 Liq_{it} + \beta_3 PG_{it} + \beta_4 Lev_{it} + \beta_5 Sol_{it} + \beta_6 UR_{it} + \beta_7 Rei_{it} + \beta_8 LR_{it} + \beta_9 ER_{it} + \beta_{10} INR_{it} + \varepsilon_{it} \quad (2)$$

where i denotes insurers and t represents the year. The two equations are identical in their explanatory structure and differ only in the dependent variable, allowing a direct comparison of how the same set of internal financial characteristics influences ROE and ROA. In this way, Models (1) and (2) jointly operationalise the overall proposition that

financial characteristics of Indonesian non-life insurers significantly affect their financial performance during the COVID-19 pandemic, as articulated in hypotheses H1 to H10.

Table 2 provides a summary of the variables used in this study, along with their abbreviations, measurement approaches, and relevant references.

Statistical Analysis

To address its research goals, this study employed regression analysis, a statistical method for estimating models and assessing both the significance and nature of the

association between independent and dependent variables. In particular, the technique captures how variations in explanatory factors influence outcomes, enabling predictions of financial performance based on selected indicators. The analysis examined 10 financial indicators against two widely used financial measures, ROE and ROA. This framework assessed predictive accuracy and identified which indicators had the greatest impact on firm performance.

Before interpreting the regression outputs, diagnostic tests were applied to confirm the validity and reliability of the model estimates. These included assessments for normality,

Table 2: Variables, abbreviations, measurements, and references

Variable	Abbreviation	Measurement	References
Return on Equity	ROE	Net income/total equity	Alsharari and Alhmoud (2019), Saleh and Derbali (2020), Aldboush <i>et al.</i> (2023)
Return on Assets	ROA	Net income/total assets	Isayas (2021), Aldboush <i>et al.</i> (2023), Sasidharan <i>et al.</i> (2023)
Insurance Size	IS	The natural logarithm of total assets	Rahman and Sharma (2020), Sasidharan <i>et al.</i> (2023), Horvey and Odei-Mensah (2025a)
Liquidity	Liq	Current assets/current liabilities	Öner Kaya (2015), Isayas (2021), Sasidharan <i>et al.</i> (2023)
Premium Growth	PG	$(GWP_{(t)} - GWP_{(t-1)}) / GWP_{(t-1)}$ where GWP denotes gross written premium.	Öner Kaya (2015), González-Fernández <i>et al.</i> (2023), Horvey and Odei-Mensah (2025a)
Leverage	Lev	Total debt/total equity	Devi <i>et al.</i> (2020), Horvey and Ankamah (2020), Ahmeti and Iseni (2022)
Solvency	Sol	Net income/total liability	Öner Kaya (2015), Morara and Sibindi (2021), Horvey and Odei-Mensah (2025a, 2025b)
Underwriting Risk	UR	Total claim/earned premium	Öner Kaya (2015), Kamau, 2023, Horvey <i>et al.</i> (2024), Zinyoro and Aziakpono (2024)
Reinsurance	Rei	Ceded reinsurance premium/total premium	Morara and Sibindi (2021), Upreti <i>et al.</i> (2022), Horvey and Odei-Mensah (2025a)
Loss Ratio	LR	Net claims incurred/net premiums earned	Opoku <i>et al.</i> (2024), Andoh and Yamoah (2021), Fernández <i>et al.</i> (2024)
Expense Ratio	ER	Operating expenses/net premiums earned	Muthulakshmi (2018), Horvey and Odei-Mensah (2025b), Naidu and Rao (2025), Olaiya (2025)
Investment Income Ratio	INR	Investment income/net premiums earned	Chen and Wong (2004), Astuti <i>et al.</i> (2025), Savai <i>et al.</i> (2025)

homoscedasticity, and multicollinearity. Additionally, the Durbin–Wu–Hausman (DWH) test, a widely recognised diagnostic tool for detecting endogeneity and omitted-variable bias, was applied to enhance the robustness of the model specification. To further account for potential temporal variations, the dataset was divided by year (2020 and 2021) and analysed separately. This approach reflects the contrasting economic conditions at the onset of the pandemic in 2020, which was marked by heightened uncertainty and financial disruption, and the subsequent recovery phase in 2021, characterised by gradual policy adjustments.

Results and Discussion

Descriptive Statistics

The descriptive results for the financial performance of 62 Indonesian non-life insurance companies during the 2020 to 2021 period are presented in Table 3. The average ROE was 0.07, ranging from -0.31 to 0.67, indicating that while most companies achieved positive returns, several experienced losses, reflecting significant variability in profitability across the sample. Similarly, the average ROA was 0.03 with a range of -0.17 to 0.28, implying moderate profitability overall, though a few firms experienced substantial financial difficulties.

IS ranged from 12.10 to 16.57 on a logarithmic scale with an average of 13.99, suggesting considerable variation in company sizes, with larger firms likely benefiting from better access to resources. The liquidity ratio ranged from 0.76 to 8.06 with an average of 1.85, reflecting considerable differences in the companies' ability to meet short-term obligations amid the crisis. The leverage ratio had a mean of 0.56, ranging from 0.11 to 3.09, suggesting that most firms maintained moderate levels of debt relative to equity.

Table 3 also shows that PG ranged from -0.06 to 6.33, with a mean of 0.09, indicating that while some firms experienced substantial PG, others saw a decline. Solvency ranged from -0.40 to 0.63 with an average of 0.05, indicating that some companies struggled to meet their liabilities. UR had a mean of 0.47, with values ranging from 0.14 to 2.22, underscoring differences in risk management practices across firms. Moreover, the reinsurance ratio ranged from 0.00 to 0.97, with an average of 0.45, highlighting varying degrees of reliance on reinsurance to mitigate risk exposure. The LR had a mean of 0.49, ranging from 0.06 to 1.25, indicating considerable variation in net claims relative to net premiums earned. The ER averaged 0.48 (0.06–1.01), indicating that,

Table 3: Descriptive statistics of financial performance (2020 to 2021)

Variable	N	Mean	Minimum	Maximum	Std. Deviation
ROE	124	0.07	-0.31	0.67	0.11
ROA	124	0.03	-0.17	0.28	0.06
IS	124	13.99	12.10	16.57	1.15
Liq	124	1.85	0.76	8.06	0.86
PG	124	0.09	-0.06	6.33	0.63
Lev	124	0.56	0.11	3.09	0.44
Sol	124	0.05	-0.40	0.63	0.10
UR	124	0.47	0.14	2.22	0.27
Rei	124	0.45	0.00	0.97	0.25
LR	124	0.49	0.06	1.25	0.22
ER	124	0.48	0.06	1.01	0.19
INR	124	0.12	-0.10	0.46	0.09

on average, insurers allocated approximately 48% of their net premiums earned to operational costs. Lastly, the INR ranged from -0.10 to 0.46 with a mean of 0.12, reflecting substantial variability in investment returns across insurers.

Diagnostic Test for Regression Models

This section builds upon the preceding descriptive analysis by presenting the results of multiple regression analyses for two models: Model 1 (ROE) and Model 2 (ROA). However, while the descriptive findings highlighted variations in financial performance among non-life insurance firms during the COVID-19 crisis, the regression analysis aims to identify the underlying determinants of these outcomes. The section begins with classical diagnostic tests for normality, homoscedasticity, and multicollinearity to ensure the robustness of the model estimates. It subsequently provides an in-depth discussion of both statistically significant and non-significant predictors, interpreting them within the broader framework of organisational resilience in the Indonesian non-life insurance sector. Finally, the section concludes with a robustness test on disaggregated models for 2020 and 2021 to capture temporal variations.

Before interpreting the regression results, classical assumption tests were conducted to ensure the validity and reliability of the Ordinary Least Squares (OLS) estimators. During the diagnostic, two outliers were identified that significantly deviated from the data's general

pattern. Notably, outliers can distort the residual distribution, affect the estimation of regression coefficients, and violate the normality assumption, thereby compromising the model's accuracy. To improve model accuracy, these two outliers were removed, resulting in a final sample size of 122. As depicted in Table 4, the Kolmogorov–Smirnov (K–S) test yielded *p*-values of 0.787 for Model 1 (ROE) and 0.954 for Model 2 (ROA), both of which exceed the 0.05 significance level. Hence, this result confirms that the residuals are normally distributed and that the normality assumption holds for both models.

The assumption of homoscedasticity, defined as constant residual variance across independent variables, was assessed by visual inspection of the scatter plots. Figures 1 and 2 display the studentised residuals against the predicted values for Models 1 (ROE) and 2 (ROA). Both plots show random dispersion of points along the horizontal axis, with no discernible funnel shapes or clustering, indicating that the residual variance remains constant. Therefore, the assumption of homoscedasticity is satisfied for both models, supporting the reliability of the regression estimates.

Regression Results

The results of the multiple regression estimations for Model 1 (ROE) and Model 2 (ROA) are reported in Table 5. Unless otherwise stated, statistical significance is assessed at

Table 4: Kolmogorov–Smirnov test for normality in Model 1 (ROE) and Model 2 (ROA)

	Model 1 (ROE)	Model 2 (ROA)
N	122	122
Mean	0.000	0.000
Standard deviation	0.041	0.008
Most extreme differences–Absolute	0.058	0.045
Most extreme differences–Positive	0.049	0.044
Most extreme differences–Negative	-0.058	-0.045
Test statistic	0.058	0.045
Exact significance (2-tailed)	0.787	0.954

Note: Test distribution is normal. Calculated from data.

the 5% level based on two-tailed p -values. In line with the study's theoretical framework, solvency, UR, LR, ER, and PG are specified as the core explanatory variables, as they directly

capture firms' risk-taking, capital strength, and operational efficiency. By contrast, IS, liquidity, leverage, reinsurance, and the INR are introduced as control variables to account

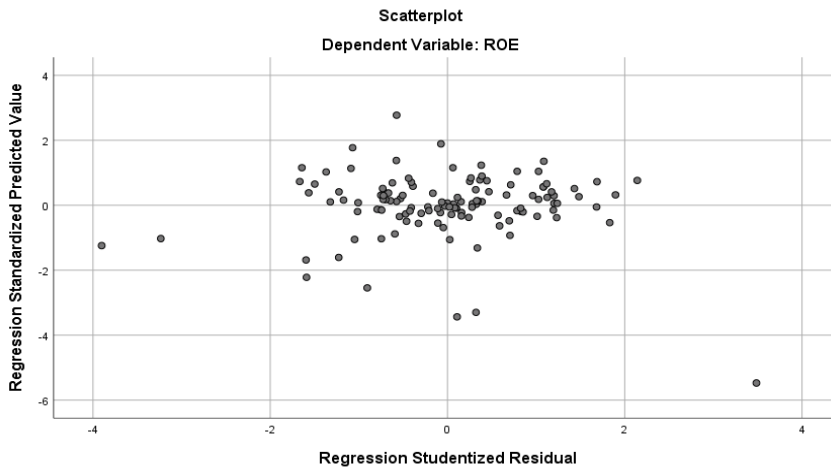


Figure 1: Scatterplot of studentised residuals and predicted values: Model 1 (ROE)

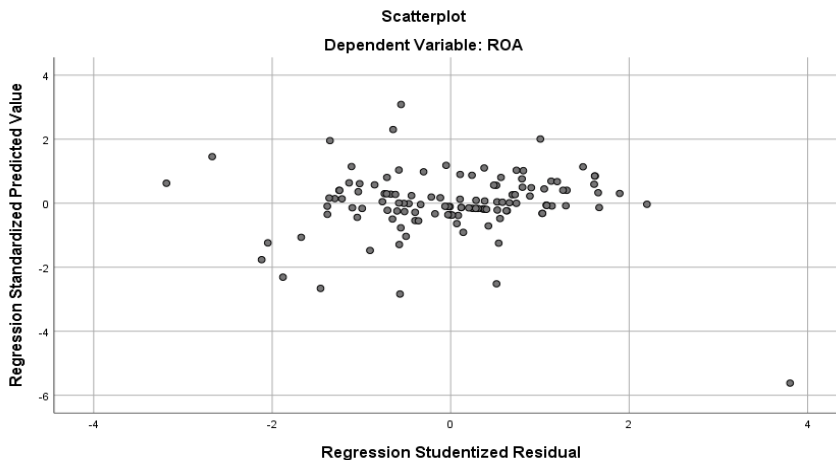


Figure 2: Scatterplot of studentised residuals and predicted values: Model 2 (ROA)

for broader differences in financial structure and balance sheet conditions. This modelling approach aligns with the RBV and Contingency Theory, which consider solvency and risk-related indicators as key internal capabilities and adaptive mechanisms. It is also consistent with Agency and Stakeholder Theory, which emphasise that cost efficiency and risk exposure

reflect managerial decisions with implications for shareholders, policyholders and regulators.

In Model 1, where ROE is the dependent variable, four of the main explanatory variables are statistically significant. Solvency exhibits a large positive association with ROE ($\beta = 0.940$, $p < 0.001$), while UR ($\beta = -0.078$, $p < 0.001$), the LR ($\beta = -0.068$, $p = 0.008$), and the ER (β

Table 5: Regression results for ROE and ROA of Indonesian non-life insurance companies

Variable	ROE		ROA	
	Coefficient	<i>p</i> -value (Sig.)	Coefficient	<i>p</i> -value (Sig.)
(Constant)	0.120	0.062	0.028	0.020
IS	0.001	0.725	-0.0001	0.902
Liq	-0.001	0.790	-0.001	0.393
PG	-0.008	0.257	-0.003	0.009
Lev	0.005	0.583	0.001	0.583
Sol	0.940	< 0.001	0.471	< 0.001
UR	-0.078	< 0.001	-0.017	< 0.001
Rei	0.019	0.317	-0.002	0.671
LR	-0.068	0.008	-0.009	0.061
ER	-0.100	0.001	-0.017	0.002
INR	-0.054	0.326	-0.001	0.897

= -0.100, $p = 0.001$) all demonstrate significant adverse effects. These findings indicate that higher risk exposure and operating costs erode equity-based profitability. PG and all control variables are not statistically significant for ROE. Conversely, in Model 2, which explains ROA, four explanatory variables are statistically significant, with PG ($\beta = -0.003$, $p = 0.009$), solvency ($\beta = 0.471$, $p < 0.001$), UR ($\beta = -0.017$, $p < 0.001$), and the ER ($\beta = -0.017$, $p = 0.002$) all emerging as significant predictors. As in the ROE specification, all control variables, namely IS, liquidity, leverage, reinsurance, and the INR, remain statistically insignificant for ROA. This result suggests that core risk, capital, and cost indicators, rather than general balance sheet characteristics, primarily drive insurers' profitability during the pandemic period.

Table 6 presents the key diagnostic statistics for the regression models. The multiple correlation coefficient is high for the ROE specification ($R = 0.91$) and even higher for

the ROA specification ($R = 0.98$), indicating a robust association between the set of predictors and each profitability measure. In terms of explanatory power, the models account for 83% of the variation in ROE and 96% of the variation in ROA ($R^2 = 0.83$ and 0.96). Simultaneously, the corresponding adjusted R^2 values of 0.81 and 0.96 demonstrate that this fit remains robust after adjusting for the number of regressors. The standard errors of the estimates are relatively small (0.043 for ROE and 0.008 for ROA), implying that the predicted values lie close to the observed outcomes. Collectively, these diagnostics reveal that both models have strong explanatory capacity and are well-suited for subsequent hypothesis testing and theory-driven interpretation.

Summary of hypothesis testing

Table 7 summarises the 10 hypotheses, their expected signs and the empirical support from the ROE and ROA models.

Table 6: Model summary for Model 1 (ROE) and Model 2 (ROA)

Model	Dependent	R	R ²	Adj. R ²	SEE
1	ROE	0.91	0.83	0.81	0.043
2	ROA	0.98	0.96	0.96	0.008

Note: R = Multiple correlation coefficient; R² = Coefficient of determination; Adj. R² = Adjusted R²; SEE = Standard error of the estimate.

Overall, the hypothesis tests indicate that solvency (H5), UR (H6), and the ER (H9) are the only predictors that receive consistent support across both ROE and ROA. In contrast, the LR (H8) is only partially supported. Meanwhile, the hypotheses concerning IS (H1), liquidity (H2), PG (H3), leverage (H4), reinsurance (H7), and the INR (H10) are not supported. Therefore, these results underscore that capital strength, UR exposure, and cost efficiency, rather than general balance-sheet attributes, are the principal drivers of Indonesia's non-life insurers' performance during the COVID-19 pandemic.

Discussion of Key Findings

The regression results reported in Table 5 and summarised in Table 7 reveal a clear pattern in how internal financial characteristics shape the performance of Indonesian non-life companies during the COVID-19 pandemic. Only three variables, namely solvency, UR, and the ER, are consistently associated with both ROE and ROA. In contrast, the LR plays a secondary role, and PG is only adversely related to ROA.

Conversely, IS, liquidity, leverage, reinsurance, and the INR do not exhibit statistically significant effects once these core risk, capital, and cost indicators, together with premium dynamics, are considered.

Furthermore, in the context of this study, ROE and ROA provide distinct yet complementary perspectives on financial performance during crisis conditions. ROE reflects shareholder-oriented profitability by demonstrating how effectively equity generates net income, which is critical for evaluating insurers' capacity to create value during systemic shocks (Olaewaju & Msomi, 2021; Fariha *et al.*, 2022). In comparison, ROA measures overall operational efficiency by relating total assets to net income, offering insight into how well companies utilise their resources for sustained profitability (Abuamsha & Shumali, 2022; Tackie *et al.*, 2022). The relevance of this distinction is heightened in the context of the COVID-19 crisis, when insurers faced both capital volatility and operational challenges. By analysing both metrics simultaneously, the study captures a more comprehensive picture of

Table 7: Summary of hypotheses and empirical support

Hypothesis	Predictor	Expected Sign	ROE Result	ROA Result	Overall Conclusion
H1	Insurance size	+	Insignificant	Insignificant	Not supported
H2	Liquidity	-	Insignificant	Insignificant	Not supported
H3	Premium growth	+	Insignificant	Negative, significant	Not supported (opposite sign for ROA)
H4	Leverage	-	Insignificant	Insignificant	Not supported
H5	Solvency	+	Positive, significant	Positive, significant	Fully supported
H6	Underwriting risk	-	Negative, significant	Negative, significant	Fully supported
H7	Reinsurance	+	Insignificant	Insignificant	Not supported
H8	Loss ratio	-	Negative, significant	Negative, insignificant	Partially supported
H9	Expense ratio	-	Negative, significant	Negative, significant	Fully supported
H10	Investment income ratio	+	Insignificant	Insignificant	Not supported

firm resilience. ROE emphasises equity-driven returns, while ROA highlights the efficiency of asset deployment, thereby enabling a nuanced understanding of organisational performance under short-term stress.

The central role of solvency is entirely consistent with the RBV. Insurers with stronger solvency positions, as captured by higher net income relative to total liabilities, systematically achieve higher ROE and ROA. The ability to generate earnings exceeding obligations is a critical internal capability that allows firms to absorb shocks, maintain underwriting capacity, and continue serving policyholders during periods of disruption. Notably, this finding supports earlier evidence that solvency is a key determinant of non-life insurers' profitability and resilience (Morara & Sibindi, 2021; Horvey & Odei-Mensah, 2025a). From a Stakeholder Theory perspective, high solvency provides a credible signal of claims-paying ability and overall financial soundness to policyholders and regulators (Fadun, 2013; Garayeta *et al.*, 2022; Huggenberger & Albrecht, 2022; Sid *et al.*, 2025). Agency Theory also implies that robust earnings-based solvency, combined with prudential regulation, can limit excessive risk-taking by managers and align their behaviour more closely with the interests of shareholders and other stakeholders (Curi & Lozano-Vivas, 2020; Bertomeu *et al.*, 2023; Rendón *et al.*, 2023).

Moreover, the findings on UR and LR highlight the importance of disciplined risk-taking and effective claim management. In this study, UR is defined as total claims relative to earned premiums. It therefore captures the overall intensity of claim costs. In contrast, the LR is measured as net claims incurred over net premium earned and thus reflects underwriting performance on a net-of-reinsurance basis. Both indicators are negatively related to profitability, implying that higher claims relative to premiums, whether in gross or net terms, weaken equity-based and asset-based returns, in line with prior evidence on the adverse impact of heavy claims burdens on insurers' performance

(Burca & Batrîna, 2014; Öner Kaya, 2015; Fernández *et al.*, 2024). Within the Contingency Theory framework, these results suggest that the ability to adjust underwriting criteria, pricing, and product design to changing risk conditions is critical for sustaining margins (Eling & Jia, 2018; Siopi & Poufinas, 2023; Horvey & Odei-Mensah, 2025a). From an Agency Theory and RBV perspective, elevated underwriting and LR can be interpreted as outcomes of managerial preferences for volume over risk-adjusted returns. They also indicate weaker underwriting and claim-handling capabilities, which ultimately generate agency costs borne by shareholders and policyholders (Adams *et al.*, 2019; Tayeh *et al.*, 2023; Jansen *et al.*, 2025).

The consistently adverse effect of the ER on both ROE and ROA underscores the importance of cost efficiency in the Indonesian non-life insurance market during the pandemic. Higher operating expenses relative to net earned premiums reduce profitability, reflecting that insurers with leaner cost structures were better positioned to cope with revenue uncertainty and operational disruption. Consequently, this finding supports the view that efficient internal processes, such as streamlined distribution, digitalised operations and rigorous overhead control, constitute valuable capabilities in the RBV sense (Greene & Segal, 2004; Ige-Gbadeyan & Swanepoel, 2023; Köhne & Köhne, 2024). Agency Theory also links high operating costs to potential managerial inefficiencies or perquisite consumption, particularly when monitoring is weak (Andrews *et al.*, 2017; Singh & Davidson, 2003). For stakeholders, especially policyholders and regulators, persistent cost inefficiency raises concern about pricing, service quality, and capital adequacy (Cummins & Danzon, 1997; Greene & Segal, 2004).

Notably, the relationship between PG and profitability during COVID-19 is more complex than a straightforward growth-performance model suggests. Although PG is often regarded as a driver of profitability (Akotey *et al.*, 2013; Öner Kaya, 2015; Horvey & Odei-Mensah, 2025b), its negative association with ROA

indicates that rapid business expansion reduced operational efficiency. This finding aligns with prior research revealing that aggressive growth can weaken underwriting discipline and increase future claims, especially in volatile environments (Eling & Jia, 2018; Horvey & Odei-Mensah, 2025b). From a Contingency Theory perspective, this posits that growth strategies effective under stable conditions can become detrimental during systemic shocks if not supported by sound risk management. Agency Theory further posits that managerial incentives to prioritise premium volume or market share may increase risk exposure and strain resources, ultimately impacting profitability (Akotey *et al.*, 2013; Öner Kaya, 2015). Overall, these findings highlight that during the COVID-19 crisis, the quality and risk profile of growth were more important than the rate of expansion.

In contrast, IS, liquidity, leverage, reinsurance, and the INR were not statistically significant in either model. This outcome indicates that the associated hypotheses (H1, H2, H4, H7, and H10) are not supported. The absence of significant effects suggests that general balance-sheet attributes do not consistently distinguish high-performing from low-performing insurers after accounting for solvency, risk, and cost variables. Hence, this finding aligns with prior research, which demonstrates that the impact of size, capital structure, liquidity buffers, and reinsurance usage is highly context-dependent and varies across markets, regulatory regimes, and macroeconomic environments (Eling & Jia, 2018; Klietk *et al.*, 2020; Paminto *et al.*, 2023). From a Stakeholder Theory perspective, regulatory constraints and prudential norms may limit insurers' ability to leverage liquidity, reinsurance, or capital structure in ways that significantly impact profitability. Consequently, this shifts the focus to solvency, underwriting quality, and cost management as the primary indicators of financial soundness (Nguyen & Vo, 2020; Zhang & Cao, 2023; Horvey & Odei-Mensah, 2025b).

Beyond these conventional financial indicators, recent evidence highlights the growing importance of environmental

sustainability during the COVID-19 pandemic. Although this study emphasises short-term financial indicators such as solvency, UR, and ERs, prior research demonstrates that firms with stronger ESG performance, particularly in the environmental dimension, exhibited greater resilience to pandemic-related shocks (Broadstock *et al.*, 2021; Abedifar *et al.*, 2023; Xu *et al.*, 2023). Specifically, evidence from Ghana and China further suggests that environmental disclosure and performance enhancements improved firms' financial outcomes during the crisis (Kaakeh & Gokmenoglu, 2022; Opuni-Frimpong *et al.*, 2024). ESG performance, particularly in environmental factors, helped mitigate the adverse impacts on firm value by easing financing constraints and fostering green innovation. However, the strength of this effect varied across emerging markets (Al Amosh & Khatib, 2023; Gao & Geng, 2024).

In the insurance sector, the environmental dimension of ESG has emerged as a crucial factor given insurers' exposure to climate-related risks and the financial impact of environmental change. Empirical evidence from property and casualty firms reveals that stronger ecological performance is associated with greater financial resilience and reduced sensitivity to systemic shocks (Bressan, 2023). Moreover, additional studies on ESG pillar scores demonstrate that environmental indicators carry significant weight in shaping investor expectations with notable differences across regions, industries, and firm characteristics (Brasch & Eckert, 2025). Comprehensive reviews also highlight that environmental sustainability is increasingly emphasised in underwriting practices, investment decisions, and product development, reflecting insurers' evolving role in promoting climate adaptation (Sood & Özen, 2024). Collectively, these insights imply that integrating environmental considerations into insurance operations should be viewed as both compliance with regulatory and societal expectations and a strategic orientation towards sustainable business models. This perspective is highly relevant to ongoing debates on resilience, and sustainability in the financial services sector.

In summary, the findings underscore that capital strength, underwriting discipline, and cost efficiency were the primary financial drivers of ROE and ROA for Indonesian non-life insurers during the COVID-19 pandemic. These results are consistent with the theoretical framework adopted in this study, which emphasises solvency and operational efficiency. Contingency Theory highlights the need for adaptable risk and growth strategies, Agency Theory focuses on managerial incentives and cost control, and Stakeholder Theory stresses the importance of solvency in maintaining stakeholder confidence. Additionally, while traditional financial indicators remain essential, the growing importance of environmental sustainability, particularly through ESG

performance, suggests that insurers' resilience to systemic shocks is increasingly shaped by their environmental practices.

Robustness Test

As a robustness test, the regression analysis was re-estimated by disaggregating the pandemic years 2020 and 2021 to examine whether the effects of explanatory variables on financial performance differed between the initial and subsequent phases of the COVID-19 crisis. The findings presented in Table 8 indicate variations in the significance and orientation of certain variables, suggesting that the financial dynamics of insurance firms shifted as the pandemic progressed.

Table 8: Robustness test results for Model 1 (ROE) and Model 2 (ROA)

Model	Variable	2020		2021	
		Coefficient	<i>p</i> -value (Sig.)	Coefficient	<i>p</i> -value (Sig.)
ROE	Constant	0.176	0.107	0.028	0.719
	IS	-0.003	0.614	0.008	0.139
	Liq	0.006	0.549	-0.001	0.825
	PG	-0.015	0.067	0.006	0.737
	Lev	0.023	0.165	0.000	0.996
	Sol	1.137	< 0.001	0.840	< 0.001
	UR	-0.095	< 0.001	-0.089	0.003
	Rei	0.019	0.513	0.018	0.487
	LR	-0.088	0.022	-0.049	0.162
	ER	-0.117	0.027	-0.069	0.049
	INR	-0.037	0.698	-0.114	0.091
ROA	Constant	0.020	0.269	0.024	0.149
	IS	0.000	0.972	0.000	0.795
	Liq	0.002	0.143	-0.002	0.128
	PG	-0.004	0.001	-0.001	0.800
	Lev	0.005	0.051	-0.001	0.753
	Sol	0.508	< 0.001	0.460	< 0.001
	UR	-0.018	< 0.001	-0.021	0.001
	Rei	-0.003	0.469	0.001	0.867
	LR	-0.014	0.021	-0.001	0.879
	ER	-0.015	0.088	-0.013	0.063
	INR	0.004	0.780	-0.015	0.272

The robustness test, which separated the pandemic years 2020 and 2021, further validates the study's core findings. Model 1 (ROE), with four variables, namely solvency, UR, LR, and ER, remained statistically significant in both the pooled sample and the 2020 sub-period. Solvency had a significant positive effect on ROE in both years (2020: $\beta = 1.137, p < 0.001$; 2021: $\beta = 0.840, p < 0.001$), indicating that more solvent companies tend to be more profitable. UR also had a significant adverse effect on ROE in both years (2020: $\beta = -0.095, p < 0.001$; 2021: $\beta = -0.089, p = 0.003$), suggesting that higher UR is associated with lower profitability. Furthermore, the ER remained significant in both years (2020: $\beta = -0.117, p = 0.027$; 2021: $\beta = -0.069, p = 0.049$), underscoring the importance of cost control during a crisis. The LR, which was significant in 2020 ($\beta = -0.088, p = 0.022$), lost statistical significance in 2021 ($\beta = -0.049, p = 0.162$), signifying that claim pressures diminished as firms adapted to the ongoing pandemic.

On the other hand, in Model 2 (ROA), a combination of PG, solvency, UR, and the ER had a significant impact on ROA in the combined data. Solvency had a significant positive effect on ROA in both 2020 ($\beta = 0.508, p < 0.001$) and 2021 ($\beta = 0.460, p < 0.001$), affirming that more solvent companies tend to have better asset efficiency and maintain stable financial performance. UR had a significant adverse effect on ROA in both years (2020: $\beta = -0.018, p < 0.001$; 2021: $\beta = -0.021, p = 0.001$), implying that higher UR is associated with lower asset efficiency. Moreover, PG was significant in 2020 ($\beta = -0.004, p = 0.001$), but lost significance in 2021 ($\beta = -0.001, p = 0.800$), suggesting that aggressive premium expansion in the early stage of the crisis hindered asset efficiency, with the effect diminishing over time. The LR had a significant impact in 2020 ($\beta = -0.014, p = 0.021$). Nevertheless, it became insignificant in 2021 ($\beta = -0.001, p = 0.879$) and in the combined data ($\beta = -0.009, p = 0.061$), underscoring that claim pressures reduced in the second year of the crisis. The ER was significant in the combined data ($\beta = -0.017, p = 0.002$),

but lost significance in both 2020 ($\beta = -0.015, p = 0.088$) and 2021 ($\beta = -0.013, p = 0.063$). This finding demonstrates that while the ER had an overall significant impact, its influence was weaker when analysed separately by year.

The results indicate that insurance company performance during systemic stress is more reliant on adaptive internal capabilities than on static financial indicators. The consistent significance of solvency and UR highlights the importance of financial stability and effective risk management (Nguyen & Vo, 2020; Siopi & Poufinas, 2023; Horvey & Odei-Mensah, 2025b). According to Contingency Theory, a firm's ability to align its internal strategies with changing external conditions is crucial for maintaining resilience (Eling & Jia, 2018; Aigner, 2025). In the context of Agency Theory, managerial behaviour influenced by incentives can affect the effectiveness of these strategies (Milidonis & Stathopoulos, 2011; Coles & Li, 2020). Additionally, Stakeholder Theory emphasises that solvency and effective risk management maintain stakeholder confidence (Jones *et al.*, 2018; Nguyen & Vo, 2020; Garayeta *et al.*, 2022). From the RBV perspective, these findings suggest that strong solvency and underwriting discipline are key internal capabilities that enable insurance companies to withstand and adapt to changes in the external environment (Horvey & Odei-Mensah, 2025a). Overall, these results highlight that alignment between internal strategies and shifts in external conditions is vital to insurance companies' resilience.

Endogeneity Diagnostic and Study Limitations

In addition to the core findings, this study conducted supplementary diagnostic evaluations to address potential specification issues. The DWH test indicated endogeneity in several independent variables. Nonetheless, solvency and UR, as the two primary predictors, remained statistically significant and directionally consistent across both the pooled and disaggregated models for 2020 and 2021, reinforcing the robustness of the key

relationships. Although instrumental variable techniques such as Two-Stage Least Squares (2SLS) are theoretically appropriate for short panels, efforts to construct valid instruments, including the use of lagged variables, did not satisfy the necessary relevance and exogeneity conditions, resulting in implausible estimates. This outcome aligns with the observations of Bound *et al.* (1995), who cautioned that weak instruments can produce substantial inconsistencies and finite-sample biases. Thus, to avoid imposing potentially unreliable specifications, this study emphasises estimation rigour by retaining the most defensible model specification and transparently acknowledging residual endogeneity.

Likewise, dynamic panel estimators such as the Generalised Method of Moments (GMM) were deemed unsuitable due to the two-year timeframe, which does not fulfil the commonly recommended minimum of four periods. As emphasised by Arellano and Bond (1991) and further elaborated by Roodman (2009), applying GMM under such constraints risks instrument proliferation, biased coefficients, and weakened diagnostic reliability. These limitations reinforce the methodological soundness of the chosen approach. Consequently, while classical diagnostic tests confirmed the absence of multicollinearity and other major violations, some endogeneity remains a noteworthy consideration. Future research using extended panel datasets and more robust identification strategies would offer valuable opportunities to further validate and refine these findings.

Conclusions

This study examines the determinants of financial performance in Indonesia's non-life insurance sector during the COVID-19 pandemic, using ROE and ROA as the leading performance indicators, and finds that solvency and UR are the most influential factors. Solvency consistently supports profitability and operational resilience, while higher UR reduces

both. Other variables, such as PG, LR, and ER, have more nuanced effects: PG worsens ROA but does not significantly affect ROE. Overall, ROA, which reflects both profitability and asset efficiency, emerges as a more reliable indicator of financial health during a systemic shock than ROE, which is more sensitive to capital structure. These findings imply that boards and risk managers should strengthen solvency management and underwriting discipline as core elements of crisis preparedness. Simultaneously, regulators such as OJK should reinforce supervisory frameworks and design more adaptive macroprudential policies to enhance sectoral resilience. Notably, this study is limited by its two-year pandemic window and the omission of explicit macroeconomic and policy variables. Therefore, future research should employ longer panel data, a broader set of explanatory variables, and an alternative empirical approach to provide a stronger basis for refining regulation and improving crisis preparedness in Indonesia's insurance sector.

Author's Contribution

Dyah Puspitasari Sunaryo Putri: Data curation, methodology, and writing-original draft preparation. Azwadi Ali: Conceptualisation, supervision, writing, reviewing, and editing. Siti Nurain Muhammad: Supervision, writing, reviewing, and editing. Nanang Kusnandar: Formal analysis.

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Conflict of Interest Statement

The authors state that they have no conflicts of interest to disclose.

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