REBUILD THE TRUST: PREDICTING THE FINANCIAL WELL-BEING OF INDONESIAN INSURERS

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ABSTRACT

Introduction/Main Objectives: The emerging markets' economic growth relies on stable insurance sectors, which mitigate risk, maintain liquidity, and manage profitability for sustainable growth. This paper aims to examine the financial well-being prediction model using logit regression for Indonesian life and general insurance companies one year and two years before a failure event. **Background Problems:** The rise of insurance failures erodes people's trust, especially in Indonesia where financial literacy is still an ongoing issue. **Novelty:** Numerous studies examine the methodology for predicting insurance failure, but some of these procedures have statistical limitations or do not address the unique issue in the emerging markets' setting. **Research Methods:** This study employs logistic regression as its methodology and focuses on the life and general insurers operating in Indonesia between 2012 and 2020, using publicly available data. **Finding/Results:** This study finds the financial well-being of general insurance companies is dependent on their investment performance, profitability, liquidity, change in asset mix, premiums, and surplus growth, leverage, the inflation rate, and change in money reserves. While firm size, the operating margin, premium growth, liquidity change in the asset mix, the combined ratio of loss and expense ratios, surplus growth, and leverage are the key leading indicators of life insurers' insolvency. **Conclusion:** Firms with poor investment performance, low premium growth, and extreme levels of leverage are more likely to be insolvent. This study suggests that local authorities should regulate insurance companies' investment strategies, moderate their asset mix changes, and implement sound risk management systems to mitigate performance fluctuations.

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INTRODUCTION

Economic growth in an emerging market hinges on a robust and financially sound insurance sector, which plays a critical role in mitigating risks for both businesses and individuals (Kessler, 2013; Outreville, 2013; Vadlamannati, 2008). To function effectively, insurers must maintain liquidity and solvency to fulfill policyholder obligations and ensure sustainable profitability. However, recent insolvency cases within Indonesia's insurance sector have undermined public confidence in the regulatory authorities, as evidenced by the stagnation in insurance density and penetration rates in recent years.

From 2017 to 2022, Indonesian insurance density barely grew 0.25% annually. In sharp contrast, another ASEAN country, i.e. Malaysia, grew 18.26% (EOCD, 2022). Moreover, the penetration rate in 2022 decreased by 11.2% from the prior year, mainly contributing to life insurance (Badan Pusat Statistik, 2023; Directorate General for National Export Development, 2023). These insurance issues highlight the urgent need to design a monitoring system to effectively identify insurers that might be in, or heading toward, a precarious financial condition.

Studies exploring prediction models of financial well-being are numerous, each employing different methodologies. Most explanatory models utilize financial ratios to shed light on corporate bankruptcy (Altman et al., 2017; Kliestik et al., 2020; Mselmi et al., 2017; Svabova et al., 2020). Predictors of business failure fall into two primary categories: Those related to a firm's profitability, and those concerning the firm's capacity to fulfill its financial obligations (Kamaludin et al., 2019; Lukason et al., 2019).

The insurance sector has unique financial characteristics that necessitate the development of tailored models to accurately capture them. In developed countries, insurers' financial strength is determined by lagged solvency ratios, investment decisions, and underwriting risks (Cheng & Weiss, 2012; Rausch & Wende, 2015). Due to the distinct nature of the investment opportunities, market dynamics, and operational challenges in emerging countries, research indicates that changes in the surplus ratio, premium growth, and claim ratio all play important roles in determining insurance financial stability in the context of a particular setting (Dewi et al., 2017; Joo, 2013).

While the study of financial well-being prediction models is intriguing, research specific to general and life insurers in Indonesia remains limited. Such a study is essential for evaluating the financial risks, as their effectiveness may vary when utilized in contexts different from their original development (Gregova et al., 2020). Employing traditional statistical methods, prior studies suggest that financial ratios and macroeconomic conditions determine financial distress in Indonesian life and non-life insurers, which have been examined separately (Dewi, 2017; Rubio-Misas, 2020; Septina, 2022). This study aims to identify the predictors of financial well-being for general and life insurers in Indonesia by analyzing the financial ratios and macroeconomic conditions. The goal is to enhance the clarity of distress predictions, and develop an early warning system for local regulators and industry stakeholders so they can intervene promptly during financial risks, ensuring the sector's stability and enhancing economic resilience.

This study employs both firm-specific and macroeconomic data to predict the likelihood of default among Indonesian insurance firms. The firm-specific data utilized encompasses numerous factors such as size, investment performance, the operating margin, premium growth,

liquidity, change in the asset mix, the combined ratio, surplus growth, and insurance leverage. Additionally, macroeconomic data, including the inflation rate and the change in the money reserve, are also considered in the analysis.

The objectives of this study are twofold. Firstly, to compare and contrast the findings of previous research on the variables that significantly influence the financial health of insurance companies. Secondly, to utilize a logistic regression to predict the likelihood of default among insurance companies, to provide regulators with a tool for enhancing their monitoring of insurers' solvency status, and to enable prompt action to be taken when necessary.

The structure of this paper is as follows: The introduction provides an overview of the research background, purpose, and data collection. The literature review presents a review of previous studies into insurer insolvency. The methodology outlines the data and methods used for testing the hypotheses developed. The results and analysis discuss the findings of the research. This is followed by the conclusion, which provides a summary of the research, and lastly, the references cite the sources used in the article.

LITERATURE REVIEW

Predicting failure in the insurance sector holds significant importance in preventing substantial losses for both customers and shareholders. Previous research has attempted to investigate the occurrence of failures in the insurance sector. For instance, Hsiao and Whang (2009) conducted a study on the probability of failure of life insurance firms, and provided a concise overview of the existing literature. Rausch and Wende (2014) utilized regression analysis to assess the financial stability of general insurance firms. On the other hand, Isayas (2021)

presented a summary of the factors for evaluating the financial health of insurance companies, without differentiating between general and life insurance. In this study, the insurance industry is categorized into general and life insurance, considering the differences in operational characteristics, investment activities, the duration of liabilities, and the vulnerabilities (Bandt & Overton, 2022).

This study assumes that firm size, investment performance, profitability, premium growth, liquidity, the change in the asset mix, the combined ratio, surplus growth, and insurance leverage are all factors that impact the financial health of insurers at the firm-specific level. Extensive research has highlighted the significance of those variables.

1. Financial well-being determinants

1.1. Firm size

Firm size is inversely correlated with the financial instability of insurers, as smaller insurers tend to be more susceptible to insolvency (Eling & Jia, 2018; Isayas, 2021; Rausch & Wende, 2014). Small firms often lack resources, have limited market expertise, and have fewer connections compared to large firms, making them more prone to bankruptcy (Honjo, 2000; Isayas, 2021; Simeone et al., 2020).

1.2. Investment Performance

Insurance companies gather funds from policyholders and invest them to generate income. However, their overall risk level is influenced by the quality of the individual investments. The performance of these investments, proxied by the ratio of investment income to net premiums written, is crucial as it directly influences the financial strength of the insurer (Kiptoo et al., 2021). Despite the limited scope of research on this matter, studies indicate that strong investment performance directly

influences financial stability (Kiptoo et al., 2021; Chen and Wong, 2004; Zelie, 2019).

1.3. Profitability

Profitability, commonly assessed by the operating margin, has been found to have a positive relationship with the financial stability of insurers (Kabede et al., 2024; Zelie, 2019). However, high profitability alone does not guarantee financial health. If the internal rate of return surpasses the profitability growth rate, the company still risks facing bankruptcy (Isayas, 2021).

1.4. Premium Growth

Premium growth measures the rate of market penetration. Excessive growth in premiums can lead to insurer insolvency (Rausch & Wende, 2014). If an insurer uses under-pricing to boost its market share, it will struggle with financial setbacks due to inadequate reserves, despite the potential long-term gains (Chen and Wong, 2004; Isayas, 2021). This increased risk could lead to a higher probability of financial instability.

1.5. Liquidity

Liquidity, which measures an insurer's ability to meet its liabilities, has been identified as a significant indicator of solvency (Abdu, 2021; Gyarteng, 2021). For an insurer, its financial strength hinges on two primary sources of liquidity, which are its cash flow, primarily from premiums and investment income, and its ability to liquidate assets (Jawad & Ayyash, 2019; Joo, 2013).

1.6. Change in Asset Mix

Change in the asset mix has been empirically linked to the insolvency of life insurers (Chen and Wong, 2004). Carson and Hoyt (2003) suggest increasing investments in stable assets, such as bonds, enhances stability but may limit

returns. Conversely, higher allocations to equities can offer greater returns but expose the insurer to market volatility. Balancing these considerations is essential for maintaining solvency and meeting financial obligations over the long term.

1.7. Combined Ratio

The combined ratio measures the ratio of losses and claims to the premiums collected. This reflects the cost of delivering insurance coverage. A higher combined ratio indicates a reduced ability to make expense payments, which can be indicative of financial distress (Kebede et al., 2024; Rausch & Wende, 2014; Yonas, 2001).

1.8. Surplus Growth

The surplus signifies the financial cushion beyond liabilities, demonstrating the firm's ability to absorb unexpected losses. An increase in the surplus can stem from higher revenue, reduced expenses, or both. However, aggressive growth in the surplus may not only indicate strong profitability but also pose risks to an insurer's financial health, due to increased operational risk-taking (Chen & Wong, 2004).

1.9. Insurance Leverage

Insurance leverage is calculated as the ratio of reserves to surplus. Insurers that are deficient in reserves, relative to their surplus, may encounter difficulties in fulfilling their obligations during adverse events, such as significant claims or economic downturns. This imbalance can precipitate financial distress, compromising the insurer's solvency and its capacity to meet policyholders' claims (Abdu, 2022; Chen & Wong, 2004).

1.10. Macroeconomic control variables

Prior research has predominantly focused on firm-specific factors, while largely neglecting

the influence of economic and market conditions on the number and size of insurance insolvencies, although insurers' assets and income are partly derived from investments. Exogenous conditions, such as government policies, inflation, and exchange rate problems, are associated with the likelihood of life insurers experiencing insolvency (Chen & Wong, 2004; Isayas, 2021).

The inflation rate affects the real value of costs and income, as increased prices can erode purchasing power. Inflation poses challenges to insurers through heightened claim costs, reduced investment returns, and complexities in their pricing strategies. These factors collectively elevate the financial risks, potentially leading to financial distress or bankruptcy if not effectively managed by insurers (Isayas, 2021; Zhang et al., 2015). On the other hand, a change in the money reserve reflects the ease of borrowing, which can have a significant impact on economic growth, and subsequently affect insurance companies' financial stability (Jobst, 2014).

The framework for this study integrates the previously outlined hypotheses, focusing on the role of financial ratios as traditional indicators of corporate performance (Rahman et al., 2017). Corporate distress typically unfolds gradually rather than abruptly, progressing through a sequential phase. By measuring and assessing the financial ratios related to profitability, liquidity, and leverage, one can identify the specific phase a company is experiencing. The general sequence leading to corporate insolvency often includes a decrease in revenue, a decline in profitability, an increase in the need for working capital, a deterioration of the capital structure, and ultimately insolvency (Kliestik et al., 2020). Identifying crucial predictors and understanding their impact on financial stability is essential for

monitoring financial risks and managing their effects (Valaskova et al., 2018). In Table 1, the variables that have a positive expected effect on instability, such as premium growth, surplus growth, the combined ratio, the change in the asset mix, and the inflation rate, tend to increase the chance of financial instability. This statement is logical since increasing the values of these variables could deteriorate profitability and the capital structure. Conversely, variables that reduce the chance of instability, such as firm size, investment performance, the operating margin, the liquidity ratio, and the change in the money reserve, tend to enhance the performance of companies and make them more resilient against financial instability.

Based on the development of the above hypotheses, Table 1 presents the 14 hypotheses to be tested in this study. These hypotheses examine the effect of firm-specific financial ratios and macroeconomic factors as predictor variables on the financial stability of general insurers and life insurers.

Table 1. Hypotheses of the Effects of Firm-Specific and Macroeconomic Variables on Insurers

Hypothesis	Variables	Expected Effect
Firm-Specific Factors on General and Life Insurers		
H1	Firm size	-
H2	Investment performance	-
H3	Operating margin	-
H4	Premium growth	+
H5	Surplus growth	+
H6	Combined ratio	+
H7	Liquidity ratio	-
H8	Change in asset mix	+
H9	Insurance leverage	+
H10	Inflation rate	+
H11	Change in money reserve	-

METHOD, DATA, AND ANALYSIS

The research used datasets comprising annual data spanning from 2012 to 2022, obtained from the financial report summaries of 40 life insurers and 41 general insurers in Indonesia. Table 2 shows the number of insurers used in this study each year. The methodology employed in this study involved utilizing a random-effects logit model with binary outcomes as the dependent variables. The firm-specific factors for predicting the insurers' financial instability were size (LNSIZ), investment performance (IP), operating margin (OM), change in the asset mix (CAM), insurance leverage (IL), premium growth (PG), liquidity (LQ), the combined ratio (CR), and surplus growth (SG). In addition to firm-specific data, this study also employed inflation (INF) and the change in the money reserve (CMR), obtained from Bank Indonesia's reports, to identify the potential effect of macroeconomic factors on the performance of the insurance sector.

To determine the probability of an insurer's financial failure, this study used a logistic regression estimation model with robust standard error (Ambrose and Carroll, 1994; BarNiv, 1990; BarNiv and Hershbarger, 1990; Carson and Hoyt, 1995; Chen and Wong, 2004; Lee and Urrutia, 1996; Tumbelaka, et al., 2021). When predicting financial distress in firms in an emerging country, comparative studies examining the prediction method of financial failure show logit regression has better

prediction accuracy compared to other methods, i.e. multivariate discriminant analysis (Hassan, Zainuddin, Nordin; 2017) or a neural network (Zizi, et al., 2021). This study constructed two estimation models to account for one-year and two-year prior data. The estimation models were as follows:

$$ln\left(\frac{\pi_{t+1}}{1-\pi_{t+1}}\right) = \beta_{0t} + \beta_1 LNSIZ_t + \beta_2 IP_t +$$
$$\beta_3 OM_t + \beta_4 PG_t + \beta_5 SG_t +$$
$$\beta_6 CR_t + \beta_7 LQ_t + \beta_8 CAM_t +$$
$$\beta_9 IL_t + \beta_{10} INF_t + \beta_{11} CMR_t +$$
$$e_t$$

$$ln\left(\frac{\pi_{t+2}}{1-\pi_{t+2}}\right) = \beta_{0t} + \beta_1 LNSIZ_t + \beta_2 IP_t +$$
$$\beta_3 OM_t + \beta_4 PG_t + \beta_5 SG_t +$$
$$\beta_6 CR_t + \beta_7 LQ_t + \beta_8 CAM_t +$$
$$\beta_9 IL_t + \beta_{10} INF_t + \beta_{11} CMR_t +$$
$$e_t$$

Where $ln\left(\frac{\pi_{t+1}}{1-\pi_{t+1}}\right)$ was the dependent variable that took the value 1 or 0, with probabilities π_i and $1 - \pi_i$, respectively. The logit was assigned 1 if the insurer had a risk-based capital (RBC) that was equal to or less than 120% (RBC $\leq$ 120%), and 0 otherwise, following the minimum threshold of 120% set by OJK to categorize an insurer as being unstable (Tumbelaka, et al., 2021). Table 3 lists the description of firm-specific variables that are used in equations 1 and 2.

Table 2. Number of Insurers' Data Used In This Study, By Year

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
General Insurers	8	14	19	21	25	32	35	37	40	40	30	301
Life/Health Insurers	11	15	18	19	22	31	35	39	41	41	39	311

Source: Data processed, 2023.

Table 3. List of Variables Employed for Predicting General and Life/Health Insurers' Instability

Variables	Formula
Size	$\ln (Total\ Admitted\ Assets)$
Investment performance	$\dfrac{Investment\ Income}{Net\ Premiums\ Written}$
Operating margin	$\dfrac{Operating\ Income}{Revenue}$
Premium growth	$\dfrac{Net\ Premiums\ Written\ in\ Current\ Year - Net\ Premiums\ Written\ in\ Previous\ Year}{Net\ Premiums\ Written\ in\ Previous\ Year}$
Liquidity ratio	$\dfrac{Current\ Assets}{Current\ Liabilities}$
Change in asset mix	$\dfrac{Asset\ Mix\ in\ Current\ Year - Asset\ Mix\ in\ Previous\ Year}{Asset\ Mix\ in\ Previous\ Year}$
Combined ratio	$Loss\ Ratio + Expense\ Ratio$
Surplus growth	$\dfrac{Surplus\ in\ Current\ Year - Surplus\ in\ Previous\ Year}{Surplus\ in\ Previous\ Year}$
Insurance leverage	$\dfrac{Reserves}{Surplus}$

RESULT AND DISCUSSION

1. Descriptive Statistics

Table 4 presents the summary of RBC, firm characteristics, and macro characteristics. It shows the total number of observations, and the mean, median, maximum, and minimum values for each indicator used in this study. Panel A shows statistics regarding general insurance companies, Panel B shows life insurance companies' data, and Panel C presents a summary of the macroeconomic data.

Panels A and B show that the RBC of most general and life insurers was above the Indonesian authority's threshold (120%). However, during the observation period, the RBC of some insurance companies fell below the standard. This study investigated the characteristics of such insurers, to shed light on the leading indicator of financial instability of Indonesian insurers. Within our dataset, there were 158 samples classified as non-default (0) for general insurers and seven samples classified as default (1). The default samples were distributed across the years 2015, 2016, 2020, 2021 (three samples), and 2022. For life insurers in the same dataset, there were 210 samples classified as non-default (0) and an unspecified number of samples classified as default (1), with default instances occurring in 2015, 2016, 2021, and 2022.

From Table 4, we find the size of general insurers to be significantly smaller than life insurers, resulting in a lower RBC. Moreover, due to the distinct investment styles between general and life insurers, we see that the investment performance of life insurers was better than general insurers. Premium growth, liquidity, and asset mix growth were also more prominent in life insurance companies. However, the operating margin and surplus growth were higher in general insurers.

Table 4. Summary of Statistics

Variables	Obs	Mean	Median	Stdev	Min	Max
Panel A. General insurance companies						
Risk-based capital (RBC)	165	3.111 x	2.817 x	1.733 x	-1.65 x	10.63 x
Firm size (SIZ) *(million IDR)*	165	2,200,355	1,132,263	2,874,493	111,542	13,300,000
Investment performance (IP)	165	0.121	0.107	0.077	0.001	0.530
Operating margin (OM)	165	0.116	0.129	0.189	-0.890	0.552
Premium growth (PG)	165	0.190	0.063	1.048	-0.874	12.704
Liquidity (LQ)	165	1.738	1.640	0.550	0.760	4.466
Change in asset mix (CAM)	165	0.195	-0.004	0.733	-1.000	5.192
Combined ratio (CR)	165	1.507	1.459	0.624	0.420	7.646
Surplus growth (SG)	165	0.083	0.076	0.518	-2.531	4.814
Insurance leverage (IL)	165	1.600	1.244	2.017	-9.609	17.483
Panel B: Life insurance companies						
Risk-based capital (RBC)	214	8.253 x	5.240 x	9.923 x	-3.26 x	66.36 x
Firm size (SIZ) *(million IDR)*	214	4,999,394	1,758,521	7,082,785	53,956	37,600,000
Investment performance (IP)	214	0.578	0.169	2.316	-1.065	26.970
Operating margin (OM)	214	0.014	0.045	0.313	-1.960	0.868
Premium growth (PG)	214	0.453	0.118	2.425	-13.051	25.450
Liquidity (LQ)	214	3.386	2.463	3.443	-0.350	33.580
Change in asset mix (CAM)	214	0.269	0.033	0.977	-0.785	9.061
Combined ratio (CR)	214	2.239	1.666	4.292	-0.533	50.821
Surplus growth (SG)	214	0.182	0.049	0.605	-1.789	5.419
Insurance leverage (IL)	214	4.747	3.288	6.080	-2.589	37.625
Panel C. Macroeconomics						
Inflation rate (INF)	214	0.031	0.027	0.017	0.017	0.084
Change in money reserve (CMR)	214	0.068	0.044	0.067	-0.026	0.178

Source: Data processed, 2023.

2. Correlation Matrix

Given the nature of the data, the pair-wise correlation and the variance inflation factors were assessed to ensure the strength of the correlation among the predictors did not violate the regression result. Table 5 reports the correlation matrix. Despite the high correlation between investment performance and the combined ratio (expense ratio and loss ratio), the variance inflation factors did not suggest multicollinearity.

Table 5. Correlation Matrix

	Investment Performance	Operating Margin	Change in Asset Mix	Insurance Leverage	Inflation	Change in Money Reserve	Premium Growth	Liquidity	Combined Ratio	Surplus Growth	Size
Investment performance	1										
Operating margin	-0.0252	1									
Change in asset mix	0.1587***	-0.0163	1								
Insurance leverage	0.302***	0.0359	0.0355	1							
Inflation	-0.0488	0.1243**	-0.0142	-0.0676	1						
Change in money reserve	0.0246	-0.0279	-0.011	-0.0061	0.2143***	1					
Premium growth	0.0027	-0.0397	0.0123	0.0424	0.0371	-0.037	1				
Liquidity	0.0887*	-0.1225**	-0.0501	-0.0295	0.1165**	0.0297	0.0626	1			
Combined ratio	0.9426***	-0.1657***	0.1424***	0.1645***	-0.0654	0.0479	-0.0184	0.1019**	1		
Surplus growth	0.0104	0.0836*	-0.0043	0.0061	0.1965***	0.078	0	0.0124	0.0108	1	
Size	-0.0158	0.1504***	-0.0996**	0.2343***	-0.0577	0.0315	-0.0715	0.1045**	-0.0282	0.0026	1

Notes: *** variables significant at 1%, ** variables significant at 5%, and * variables significant at 10%.

Source: Data processed by Stata/BE 17.0

Table 6. Logit Regression Results of Insurance Financial Instability Estimation Models

Financial Instability	General Insurance		Life Insurance	
	1-year prior	2-year prior	1-year prior	2-year prior
Firm size (SIZ)	0.0102	1.1296	**-1.4289***	**-0.9371***
	(0.02)	(0.87)	(-1.68)	(-1.94)
Investment performance (IP)	**-146.1465***	**-41.2171***	0.3558	0.1034
	(-2.76)	(-2.66)	(1.38)	(0.62)
Operating margin (OM)	**-11.9095***	-12.2744	**1.3269***	**0.9929***
	(-1.97)	(-1.5)	(2.09)	(3.32)
Premium growth (PG)	**-27.5202***	-0.3051	**-6.8776***	**-3.1613***
	(-3.33)	(-0.2)	(-2.76)	(-2.92)
Liquidity (LQ)	-0.4137	-0.3018	**1.4431***	**1.169***
	(-0.16)	(-0.68)	(1.79)	(1.74)
Change in asset mix (CAM)	**2.263***	2.091	**-0.2833***	-0.1028
	(2.82)	(1.09)	(-1.69)	(-0.61)
Combined ratio (CR)	3.843	-0.1696	-1.4908	**-0.5326***
	(1.2)	(-0.39)	(-1.05)	(-1.88)
Surplus growth (SG)	**4.4483***	37.3036	**-1.2391***	0.2432
	(3.22)	(0.51)	(-1.05)	(0.66)
Insurance leverage (IL)	**1.0357***	-12.1801	**0.3484***	**0.1978***
	(2.33)	(0.19)	(-2.56)	(2.64)
Inflation rate (INF)	**327.4717***	1.9103	28.3153	15.3696
	(3.63)	(0.28)	(2.45)	(0.43)
Change in money reserve (CMR)	**-16.9739***	-2.3247	11.7961	1.1764
	(-1.72)	(0.44)	(1.1)	(0.28)
Constant	-10.8363	-30.6106	28.8711	18.8059
	(-0.56)	(0.37)	(1.26)	(1.64)
N	165	132	214	175
Prob>chi2	0.0004	0.0002	0.0078	0.0000
Pseudo R2	68.86%	41.28%	43.15%	18.19%

Notes: ***, **, * denotes significance at 1%, 5%, and 10% respectively.
Source: Data processed by Stata/BE 17.0

Given the binary dependent variable employed in this research, we used logit regression with a robust standard error to estimate financial instability's leading indicators. Table 6 reports the estimation results for both general and life insurance companies. The one-year prior prediction model did a reasonable job within the sample in predicting financial instability, with a pseudo-R2 of 69% to 43%. However, the prediction model for two years before the failure of life insurance companies indicated the predictors were not explaining the variation in financial instability.

Firm-specific and macroeconomic determinants for general insurers' financial instability

Firm Size. The findings presented in Table 6 do not support the alternative hypothesis, suggesting that the impact of firm size is not significant for general insurers. This result is in contrast to the findings of Cummins, Harrington, and Klein (1995), who observed that the addition of firm size to the logit model could improve the prediction accuracy of large general insurers' insolvency. However, it aligns with Chen and Wong (2004), who used a similar model for

general insurance in Singapore, Malaysia, and Taiwan, and found little evidence that firm size is linked to the likelihood of financial instability. The findings of this study imply that the failure of firm size to explain the financial well-being of insurers might be attributable to poor governance of the large insurers that mediates the positive effect of firm size on financial health.

Investment Performance. The investment performance coefficient is negative and significant for general insurers' financial instability, leading to the rejection of the null hypothesis. This result is supported by numerous studies, such as by Chen and Wong (2004), who suggest investment performance positively impacts the financial well-being of general insurers in Taiwan, and Zelie (2019), who finds the variable has a statistically positive effect on the financial health of insurers in Ethiopia. Since investment income is a major source of income for insurers, higher investment performance makes it easier for insurers to fulfill their obligations to policyholders, and increases the capital reserve needed to cushion against losses.

Operating Margin. The operating margin significantly enhances financial stability, thereby rejecting the null hypothesis. Similar to investment performance, an increase in the operating margin boosts insurers' profitability, thereby strengthening their financial health. This finding aligns with previous studies that identify the operating margin as a key predictor of insurers' financial well-being (Chen and Wong, 2004; Kramer, 1996; Wong, 2004). However, this study finds no supporting evidence in the two-year prior estimation model, suggesting that the operating margin is more substantial in the short term.

Premium Growth. This study finds that rapid premium growth negatively impacts insurers' financial instability, thus failing to reject the null hypothesis for the one-year prediction model.

Although this finding contrasts with Kim et al. (1995), it aligns with the evidence from Harris and Raviv (1990), Mackie-Mason (1990), and Yosha (1995). This suggests that rapid premium growth is not always detrimental to the financial health of insurers, particularly if they can still maintain profitability during an aggressive growth period.

Liquidity. The effect of the liquidity ratio is not significant according to the result of this study. This contrasts with the findings from previous research (Chen and Wong, 2004; Lee and Urrutia, 1996). This result suggests that liquidity is not as influential as profitability in determining the financial health of insurers, as liquidity could be artificially boosted through corporate actions, such as issuing shares, which helps prevent bankruptcy.

Change in Asset Mix. Change in the asset mix significantly predicts financial instability one year before the event, leading to the rejection of the null hypothesis. This finding is consistent with the empirical results of Ambrose and Carroll (1994), BarNiv and Herschbarger (1990), and Chen and Wong (2004), who all found that insurers who increase the proportion of bonds in their portfolios face a higher likelihood of financial distress. This implies that insurers bear a greater risk in shifting to a higher bond proportion in their portfolio, since this could heighten their exposure to both macro-economic and idiosyncratic risks. However, this study finds no significant effect in the two-year prior estimation model, suggesting that the change in the asset mix is more substantial in the short term.

Combined Ratio. This study found that the combined ratio has no significant effect on financial instability, thus failing to reject the null hypothesis. This result aligns with Chen and Wong (2004), who found no evidence of such an effect in Taiwan, and contrasts with Browne and

Hoyt (1995) and Leadbetter and Dibra (2008), who reported a positive influence of the combined ratio on general insurers' insolvency. The combined ratio is a crucial measure of insurers' performance, as it indicates the efficiency of the underwriting process. The contrasting outcome of this study suggests that other measures of profitability, such as strong investment performance, could mitigate the adverse effects of a high combined ratio for general insurers.

Surplus Growth. Surplus growth has a positive and significant effect on general insurers' financial instability for the one-year prior data, thereby rejecting the null hypothesis. This result confirms the empirical results of Lee and Urrutia (1996), and Chen and Wong (2004), for general insurers in Singapore. High surplus growth indicates an increased operation risk, which negatively impacts financial well-being.

Insurance Leverage. This study finds a positive and significant impact of insurance leverage on insolvency, rejecting the null hypothesis in the one-year prior prediction model. This contrasts with Carson & Hoyt (1995) and Chen & Wong (2004), who reported a negative effect of insurance leverage on the financial health of life insurers. Higher insurance leverage could weaken a firm's capital structure, therefore increasing the risk of insolvency.

Inflation Rate. The inflation rate has a positive and significant impact on the financial instability of general insurers in the one-year prediction model, thereby rejecting the null hypothesis. This empirical result aligns with Browne and Hoyt (1995). A high inflation rate could erode the value of the investment portfolio, therefore contributing negatively to the insurers' financial health.

Change in Money Reserve. The change in the money reserve has a negative and significant effect on the general insurers' financial instabi-

lity for the one-year period data, thereby rejecting the null hypothesis. In theory, the money reserve is linked to the supply of liquidity in the economic system, meaning that the increase in the money reserve could facilitate better access to external financing for companies, including insurers, hence reducing the risk of insolvency. The result of this study supports this argument in the context of general insurers (Tsvetkova et al., 2019).

Firm-specific and macroeconomic determinants of life insurers' financial instability

Firm Size. Contrary to the result for general insurers, the firm size effect on life insurers is statistically significant, leading to the rejection of the null hypothesis. This finding holds across both the one-year and two-year prior prediction models, and aligns with the conclusion from Chen and Wong (2004), Morara and Sibindi (2021), and Kulustayeva et al. (2020), who all found that smaller firms are more susceptible to insolvency. The rationale behind the positive relationship between size and financial stability is that regulators are less inclined to liquidate larger insurers in the event of default (BarNiv and Hershbarger, 1990).

Investment Performance. Investment performance has no significant influence on the financial instability of life insurers in the one-year and two-year periods, thereby failing to reject the null hypothesis. This contrasts with the impact observed for general insurance, where investment performance strongly affects financial instability. Due to the need to maintain conservativeness in investment policies, to fulfill the long-term liability to the policyholders, life insurers typically hold a higher proportion of bonds and deposits in their investment portfolios. As a result, the role of investment performance in determining the solvency of life

insurers is less pronounced, compared to general insurers, who often adopt a more aggressive investment approach. However, this finding aligns with the conclusions of Chen and Wong (2004) for life insurers in Singapore, Malaysia, and Taiwan, which also found no significant evidence of this association.

Operating Margin. The operating margin has a significant positive relationship with financial instability, thereby failing to reject the null hypothesis. This finding aligns with the conclusions of Chen and Wong (2004), but contradicts BarNiv and Hershbarger (1990), who assert that the operating margin is the strongest variable that positively correlates with the financial health of life insurers. Due to the conservative investment strategies of life insurers, which result in lower investment income, our datasets include numerous samples with negative operating margins. This suggests that the operating margin might be less critical for the stability of life insurers.

Premium Growth. Premium growth shows a negative relationship with the financial instability of life insurers, although this result is only significant for the one-year prediction. This finding supports the conclusions of Isayas (2021). Similar to the findings for general insurance firms, companies with high premium growth tend to be more financially solvent. This suggests that rapid premium growth could be beneficial, as it could give additional revenue to life insurers.

Liquidity. This study finds that the liquidity ratio has a positive and significant relationship with the financial instability of life insurers, thus failing to reject the null hypothesis. This finding suggests that life insurers might experience financial distress despite having higher liquidity. Remarkably, this finding corresponds with Kristanti et al. (2016), who found a positive association between liquidity and financial

instability in the Indonesian sample, and with Santoso et al. (2020), who discovered that the liquidity ratio does not affect the financial performance of Islamic insurers in Indonesia. This could be explained by the notion that liquidity indicates a company's preference to prudently hold current assets in cash and equivalents, potentially limiting the opportunities to generate future profits.

Insurance Leverage. Insurance leverage has a positive and significant relationship with life insurers' financial instability, leading to the rejection of the null hypothesis. This relationship holds for the one-year period data. The rationale behind this finding parallels that observed for general insurers, as higher insurance leverage might undermine the firms' capital structures, thereby increasing the risk of insolvency. This finding diverges from the result of Chen and Wong (2004), who did not find a significant relationship between insurance leverage and financial instability for life insurers.

Change in Asset Mix, Combined Ratio, and Surplus Growth. In life insurance prediction models, the change in the asset mix shows a negative association with the financial instability of life insurers. This result is statistically significant only for the one-year prior data, thus failing to reject the null hypothesis. The change in the asset mix alters the risk exposure of life insurance firms, potentially exerting a significant impact on their financial stability. This finding contrasts with the research conducted by Ambrose and Carroll (1994), which suggested a positive impact of changes in the asset mix on the insolvency of life insurers. Similarly, the result for surplus growth also fails to reject the null hypothesis, exposing a negative correlation with financial instability. This finding contradicts Kristanti et al. (2021), who observed that higher surplus growth increases the likelihood of distress among Indonesian life

insurers, although Chen and Wong (2004) found no evidence for this relationship. Furthermore, the result for the combined ratio shows a negative relationship with financial instability in the two-year period data. Intuitively, a higher combined ratio could lead to a lower underwriting profit, indicating increased losses and expenses during the underwriting process, potentially increasing the probability of default. The conflicting outcome of this study suggests that the larger size and higher RBC of the sample of life insurers might mitigate the negative impact of a high combined ratio on their financial health.

Inflation Rate and Change in Money Reserve. Neither of these macroeconomic variables show significant effects on the financial stability of life insurers, thus failing to reject the null hypothesis. This finding shows a contrasting result with general insurers, which indicated a positive influence of inflation and the change in the money reserve on financial stability in the one-year period samples. From this finding, we could infer that macroeconomic conditions exert a stronger influence on general insurers. This aligns with the hypothesis that general insurers focus on the sector closer to business and risk-taking activities, making them more susceptible to fluctuations in macroeconomic conditions.

The above-mentioned estimation results show firm characteristics and macroeconomic conditions can be applied as predictors of Indonesian insurers' financial well-being. From here, all the stakeholders, including local authorities, can utilize our prediction model as an early warning system for insurance companies' financial well-being. We recommend using the one-year prior model for general insurers since the model satisfies two requirements for an acceptable model in empirical modeling: 1) high R2, and 2) most

predictors are statistically significant (Ozili, 2023). Given that the pseudo-R2 above 50% was merely on the one-year prior estimation model, therefore we suggest that the stakeholders employ this model, along with estimator values, to predict general insurers' insolvency as follows:

$$Y_{t+1} = -146.15\, IP_t - 11.91\, OM_t - 27.52\, PG_t + 2.26\, CAM_t + 4.45\, SG_t + 1.04\, IL_t + 327.47\, INF_t - 16.97\, CMR_t \quad (3)$$

To calculate the probability of RBC < 120% in the next year, use this equation:

$$P = \frac{1}{1 + e^{-Y_{t+1}}} \quad (4)$$

The output from the above equations is the probability of firms being insolvent in the following year. We expect that this study can assist local authorities and insurers to evaluate the financial well-being of general insurance companies in Indonesia.

Compared to other research conducted in advanced markets, the findings of this study largely align with those conducted in emerging markets, particularly with the work of Chen and Wong (2004). This alignment reflects the unique characteristics of the insurance industry within the emerging market context. The capital market in emerging economies is often featured as underdeveloped, illiquid, and lacking financial innovation. These factors significantly impact the operation of insurance firms, as one of the primary sources of cash flow for insurers comes from the investment income they derive from stocks and bonds. Unfortunately, the unfavorable characteristics of emerging markets mentioned earlier could exacerbate the financial losses of insurers during economic downturns. For instance, the lack of liquidity might impede the liquidation of assets to meet the financial liabilities.

Furthermore, the lower participation rate in derivatives usage in emerging markets, as noted by Lantara (2010), limits the tools available for financial institutions to mitigate earnings volatility and manage investment risk, as highlighted by Oktavia et al. (2019). Unsurprisingly, the failure of insurers in Indonesia tends to be concentrated around periods of severe market contraction, such as during the COVID-19 crisis, in contrast to advanced markets where the failures are almost non-existent during such a period. Additionally, inadequacies in the government's effectiveness, the quality of the regulations, and law enforcement, commonly poor in emerging markets, can adversely impact the risk exposure and stability of financial firms, as observed by Muizzuddin et al. (2021). Instances of financial fraud, like those involving KSP Indosurya and Kresna Life in Indonesia, further complicate insurance failures in emerging markets. In conclusion, failures in the insurance sector in emerging markets are often multifaceted, involving the interplay of economic conditions, financial performance, and corporate governance.

CONCLUSION AND SUGGESTION

This study uses the logit regression method to construct an insurance financial well-being prediction model, using Indonesian general and life insurers' annual data from 2012 to 2022. This study finds firm characteristics and macroeconomic conditions determine financial well-being in the following year. Firms with poor investment performance, low premium growth, and extreme levels of leverage are more likely to be insolvent. Changes in economic conditions, such as an increase in the inflation rate and low money reserve growth, enhance the exposure of insurance companies to financial instability.

A notable finding of this study is the sound empirical result of the general insurers' financial well-being prediction model that can predict insolvency for the following year. The one-year prior model for general insurers serves as an early warning system to enhance regulatory monitoring, by enabling pre-emptive action when the model predicts potential insolvency in the following year. The model for the one-year period for general insurers is recommended, having the highest pseudo R-squared (0.6886) value. In contrast, the model for life insurers performs poorly despite having a larger sample size. This discrepancy could be attributed to data imbalance for failed insurers, leading the model to exhibit bias toward the characteristics of healthy firms. The dataset for life insurers comprises only three instances of insolvency, compared to seven in the case of general insurers. Historically, insolvency has been a rare occurrence among life insurers, as noted by Kim et al. (1995), posing challenges in the acquisition of data. Consequently, the variables that truly affect the solvency of life insurers might not be fully uncovered, since the relevant observations are scarce.

This study could benefit society in various ways. For general readers, it provides insights into the mechanics of the insurance industry, empowering them to make informed decisions before buying insurance products. In a growing economy, insurers often aggressively promote high-risk products while sacrificing profitability. This study suggests that this approach could increase the insurers' risk of default. Moreover, this study shows that macroeconomic factors, such as inflation and a change in the money reserves, can significantly impact the performance of general insurers. This information could help the government to formulate economic policies that support the insurers' financial well-being. Furthermore, the regulators

in the financial industry stand to gain the most from this research, as they can use the general insurers' model, developed in this study, to establish an early warning system as part of their regulatory framework. By periodically assessing the probability of insurance bankruptcies using this model, regulators could take proactive action to intervene if the default condition is predicted.

Although this study reports the development of a robust financial well-being prediction model, and provides valuable insight to the literature and practitioners, this study has several limitations that could guide the direction of future research. First, obtaining data for troubled insurers is challenging, as these companies tend to have less transparency in their information disclosures. More comprehensive data could result in more balanced data, and potentially lead to different conclusions than those obtained in this study. Second, our financial instability prediction model for life insurers shows a relatively low goodness of fit. Therefore, we recommend that future research could explore additional variables not considered in this study that might better explain variations in the dependent variables, or employ alternative models capable of capturing potential non-linear relationships between the dependent and independent variables.

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