

Internal and External Determinants of Risk Based Capital

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Abstract

This research aims to investigate the determinants of Risk Based Capital (RBC) of Indonesia's general insurance public listed companies. Panel data regression model was used to analyze the internal and external variables influencing the RBC. This research finds that ratios of sales to total asset, gross profit to total asset, premium claim to total asset, investment to total asset, and interest have a significant impact on the RBC of Indonesia's publicly traded general insurance companies.

JEL classification numbers: C650, G22, G32.

Keywords: Sales to total asset, Policy rate, investment performance, Gross profit to total asset, Premium claim, Panel data regression model, Risk based capital (RBC).

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1. Introduction

This Risk Based Capital (RBC) has become an important topic and often discussed in insurance sector for the last fifteen years in Indonesia. Insurance regulators have paid close attention to the economy that is more interdependent, political changes, shifting financial landscapes locally and internationally, new technology, innovations, and new insurance risks from problems like cyberspace and climate change (Ghimire and Thorburn, 2020). The risk-based strategy offers adaptability and responsiveness to complex and developing hazards. In response to shifting market conditions and rising hazards, a risk-based approach is adopted. Numerous governments in the world have issued the insurance financial performance regulations in order to implement the RBC to protect policy holders and investors. The development of the insurance market is often constrained by lack of innovation, limited technical skills at insurance companies and at the supervisory and policy-making levels, and short-term management priorities. The Government of the Republic of Indonesia through the Ministry of Finance had issued a regulation in 1999 to control insurance companies to do self-calculation of their RBC's and report to the designated agency (currently it is under the Financial Service Authority – FSA).

Risk based management is a set of practices and processes used to recognize, quantify, manage, and keep an eye on risks that could arise from any of the company's business activities (Keuangan, 2021). The RBC becomes a tool applied by the regulator to analyze the security of the insurance companies. The investors and customers can use the RBC to identify the insurance companies' financial health before making decisions to be the policy holders to protect themselves from the existing risks. The RBC is an insurance financial health ratio that reported every three months (every month for the short form) to the FSA. According to the Financial Services Authority of the Republic of Indonesia Regulation Number 71 / POJK.05/2016, companies must always meet the Internal Solvency Target of at least 120% (one hundred and twenty percent) of the MMBR by taking into account each company's risk profile and the results of the change scenario simulation (stress test). Risk-Based Minimum Capital (MMBR) is used to anticipate the risk of losses that may occur as a result of errors in asset and liability management.

The RBC ratio is calculated by dividing the Solvency Margin with the Risk Based Minimum Capital. The RBC is similar to Capital Adequacy Ratio (CAR) for banking, this ratio represents the company's capability to fulfill all its liabilities (solvability) per the date of financial position, especially for general insurance companies. The solvency of financial institutions such as bank, insurance, pension fund, and leasing companies is very important in order to convince or giving the customers sufficient assurance to be as policy holders or others. Francis and Osborne (2010) stated that Risk Based Capital is very important for banking institutions to maintain their reputation. Kane (1995) stated that there are three paradigms for the role of the capitalization requirements in insured financial organizations. Cummins *et al.* (1995) proposed that risk based capital formula needs

improvement to facilitate prompt corrective action and reduce insolvency costs. Born (2001) studied variation in insurance company financial performance across states with different legal and regulatory environments. Such research was conducted by Chen and Wong (2004) to identify the factors influencing the financial health of Asian insurance companies. De Haan and Kakes (2010) investigated whether insurers base their solvency margins on risk factors even when operating under a supervisory regime where minimum solvency requirements do not fully take such risk factors into account. An appropriate use of statistical methods has positive effects on the level of competitiveness and on enterprises' net income in general (Dumicic *et al.*, 2014). Regression analysis is well suited to proof of impact and estimation of damages in antitrust cases (Johnson *et al.*, 2017).

Dohmen *et al.* (2011) studied risk attitudes using a large representative survey and a complementary experiment conducted with a representative subject pool in subjects' homes. Lazam *et al.* (2012) discussed the impacts of the risk-based capital implementation in insurance companies of Malaysia. Caporale, *et al.* (2017) analyzed the determinants of insolvency risk for general insurance firms in the UK. If there is any uncertainty whether or not the performance of a given act will produce a harmful result, the performance of that act is the assumption of a risk (Haynes, 1895). Peleckienė and Peleckisa (2014) stated that Solvency II will help the EU insurance industry to increase its international competitiveness.

According to the preceding explanations, there are few studies on the RBC, particularly on the determinants of the RBC in Indonesian general insurance companies. Using a panel data model, we investigate the determinants of the RBC in Indonesia from 2013 to 2021. The presence of the COVID-19 pandemic colored two years of this research period, 2020 and 2021. This study will employ a dummy variable to clearly demonstrate the effects of COVID-19. This paper attempts to investigate them.

2. Theoretical Review

The RBC is a value that states the minimum amount of capital appropriate of a reporting entity to support its overall business operations in consideration of its size and risk profile. Based on this concept, the RBC could contain three concepts. First, as a variable with a value that provides the company an estimated loss or companies' risks. This is called an Option Value (Cox and Hogan, 1995). Secondly, the RBC is as solvency of a company (Cummins and Philips, 2009; Caporale, *et al.*, 2017). Third, the RBC is a value that comes from a calculation process based on the government rule, affected by some variables or risks.

The RBC could be considered as risk that transferred by policy holders to insurance companies where insurance companies have to provide funds to compensate the premiums that have been paid to the companies. When the RBC is discussed as a risk, utility theory is a suitable theory applied to solve it (Borch, 1961) and risk becomes a source of income to insurance companies (Borch, 1967; Brau *et al.*, 2011).

Manurung and Manurung (2019) stated that insurance company assets will follow a mathematic equation, as follows:

$$TA_{adj,t} = E + L \quad (1)$$

If L is equal to total accumulations of Claim Reserves and Premium Reserves of the companies, $\sum_{t=-\infty}^t \sum_{i=1}^N (CLMRS_{it} + PRMRS_{it})$ and E is equal to Paid Capital (PC) plus

accumulation of Profit, $PC + \sum_{t=-\infty}^t \pi_t$. Then, the equation can be rearranged as follows:

$$TA_{adj} = PC + \sum_{t=-\infty}^t \pi_t + \sum_{t=-\infty}^t \sum_{i=1}^N (CLMRS_{it} + PRMRS_{it}) \quad (2)$$

TA_{adj} could be maximized through maximizing the right term equation (2). It means maximizing the accumulative profit, which the profit is equal to the net premium income minus the underwriting and management expenses and the profit from investment, as follows:

$$\pi = R - Cost + r * INV - tax \quad (3)$$

Equation (3) is substituted to Equation (2), the equation (3) becomes:

$$TA_{adj} = PC + \sum_{t=-\infty}^t (R_t - Cost + r * INV + tax) + \sum_{t=-\infty}^t \sum_{i=1}^N (CLMRS_{it} + PRMRS_{it}) \quad (4)$$

The return on asset can be defined as follows:

$$\frac{\pi}{TA_{adj}} = \frac{R - Cost + r * INV - tax}{PC + \sum_{t=-\infty}^t (R_t - Cost + r * INV + tax) + \sum_{t=-\infty}^t \sum_{i=1}^N (CLMRS_{it} + PRMRS_{it})} \quad (5)$$

The RBC calculation based on the prevailing regulation is as follows:

$$RBC = \frac{TA \text{ (admitted asset)} - Liabilities}{Risk \text{ based minimim capital}} \quad (6)$$

$$RBC = \frac{TA_{adj} \text{ (admitted asset)} - ((\sum_{t=-\infty}^t \sum_{i=1}^N (CLMRS_{it} + PRMRS_{it})) + CIP + RP + CoP + WCL)}{IR + MR + OR + CR + LR} \quad (7)$$

where,

Liability = Claim Payable, Reinsurance Payable, Claim Reserve, Premium Reserve, Commission Payable, Working Capital Liabilities.

CIP = Claims Payable

RP = Reinsurance Payable

CoP = Commission Payable

WCL = Working Capital Liabilities

IR = Insurance Risk

MR = Market Risk

OR = Operational Risk

CR = Credit Risk

LR = Liquidity Risk

Based on the equation (7), it draws that the determinants of RBC are variables in the equation 4 which are total asset, investment performance, and the claim expense to gross premium (loss ratio). Then, the other variables that are included in the model, called external variables.

This paper does not discuss the RBC concept in details, but the RBC is a variable that can be affected by some variables. The variables affect the RBC could be internal or external variables. Gross claim to gross premium, investment income to total investment, and total asset are a few examples of internal variables. Macroeconomic indicators including the GDP, CPI, interest rates at the central banks, and others should be used as the external variables. The RBC is a dependent variable that affected by some variables, called Multi-Factor Model, can be written as follows:

$$RBC_i = a_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_{n-1}X_{n-1} + b_nX_n + \varepsilon \quad (8)$$

where,

$$\varepsilon \approx N(\mu, \sigma^2)$$

3. Data and Methodology

3.1 Data

Data were collected from the general insurance public listed companies that published in newspapers or their websites as mandatory from government and Indonesia Stock Exchange (IDX), but macroeconomics data were obtained from Central Bank of Indonesia and Indonesia Central Bureau of Statistic. Data are annual data that collected for the periods of 2008 till 2021, there are only ten general insurance public listed companies have financial statements that support the implementation of this research in the period. Then, loss ratio, investment performance, total asset, CPI, GDP and Central Bank Interest Rate are calculated using the data collected.

3.2 Methodology

Before we analyze the determinant model of the RBC, the ratios are calculated as follows:

$$LR = \frac{\text{Gross Claims}}{\text{Gross Premium Income}} \quad (9)$$

$$IP = \frac{\text{Investment Income}}{\text{Total Investment}} \quad (10)$$

This study uses Data Panel Model to estimate the relationships of some independent variables to determine the RBC as a dependent variable. Data Panel Model is appropriate for small and short time series data and small companies determined as sample. Besides, the data panel model also shows the time series and the cross sections data as samples.

Gujarati and Porter (2009) and Wooldridge (2005) explained that data panel model is as follows:

3.2.1 Pooled Data Model (PDM)

PDM is a model that combines all data together and the model is as follows:

$$Y_{i,t} = \beta_1 + \beta_2 X_{2i,t} + \beta_3 X_{3i,t} + \mu_{i,t} \quad (11)$$

$$i = 1, 2, \dots, k$$

$$t = 1, 2, \dots, n$$

X's are non-stochastic and $E(\mu_{it}) \sim N(0, \sigma^2)$

3.2.2 Fixed Effect Model (FEM)

FEM is a model where ε_i and X's are assumed correlated.

$$Y_{i,t} = \beta_{1i} + \beta_2 X_{1i,t} + \beta_3 X_{2i,t} + \mu_{i,t} \quad (12)$$

$$i = 1, 2, \dots, k$$

$$t = 1, 2, \dots, n$$

3.2.3 Random Effect Model (REM)

REM is a model that ε_i and X's are assumed uncorrelated.

$$Y_{i,t} = \beta_{1i} + \beta_2 X_{1i,t} + \beta_3 X_{2i,t} + \mu_{i,t} \quad (13)$$

$$\beta_{1i} = \beta_1 + \varepsilon_i$$

$$i = 1, 2, \dots, k$$

$$t = 1, 2, \dots, n$$

ε_i is a random error with a mean value of zero and variance of σ_ε^2 .

Judge *et al.* (1982) stated how we should choose FEM or REM, as follows:

1. If T (number of time series data) is large and N (the number of cross-sectional units) is small, FEM may be preferable.
2. When N is large and T is small, if we strongly believe that the individual or cross-sectional units in our sample are not random drawings from a larger sample, FEM is appropriate. If the cross-sectional units in the sample are regarded as random drawings, the REM is appropriate.
3. If individual error component ε_i and one or more regressors are correlated, FEM is unbiased estimator.
4. If N is large and T is small and if the assumptions underlying REM holds, REM estimators are more efficient than FEM Estimators.

4. Main Results

The discussion of this study will be divided into two analysis. First, discussion is about analysis of behavior of the variable using descriptive statistics. Then analysis will be continued to causal effect of the RBC.

4.1 Descriptive Statistic

As mentioned before, the first task is to analyze the data that is called descriptive statistics, as can be overviewed in table below.

Table 1: Statistics Descriptive variable in study

	RBC	SLTA	GPFTA	KLMPR	INVENTA	INTRST
Minimum	127.71%	6.54%	-19.74%	-50.55%	6.56%	3.03%
Maximum	2283.61%	115.36%	45.39%	188.53%	166.84%	7.21%
Average	335.79%	36.61%	6.69%	53.65%	51.89%	5.58%
Stdev	288.19%	20.72%	9.60%	35.30%	30.14%	1.45%
Skewness	1.15	1.38	2.19	0.87	1.72	-0.88
Kurtosis	23.32	3.07	7.06	4.05	3.68	-0.33
Jarque B	1568.39	28.75	133.82	15.53	46.19	53.19

Source: Eviews version 10

The RBC of insurance companies varies from 127.71% to 2283.61% and has the average of 335.79% and the deviation standard of 288.195%. These figures show that all insurance companies are above of the requirement level set by the FSA with the minimum of 120%. These figures also inform that all policy holders of insurance companies are not afraid or doubt about the insurance companies' financial health. Using Jarque Berra test, this ratio also has normal distribution. It means that the model will follow statistics parametric. The ratio of sales to total asset of insurance

companies varies from 6.54% to 115.36% and has the average of 36.61% and the deviation standard of 20.72%. The average ratio of sales to total asset of 36.61% is still in a favorable range.

The ratio of gross profit to total asset varies from -19.74% to 45.39% and has the average of 6.69% with the deviation standard of 9.60%. These figures also show similarity to other industries that the companies have a going concern principle and can generate profit. Some companies have negative ratio because the companies cannot achieve the minimum revenue target.

The ratio of premium claim varies from -50.55% to 188.53% and has the average of 53.65% with the deviation standard of 35.30%.

The investment of insurance companies varies from 6.56% to 166.84% and has the average of 51.89% with the standard deviation of 30.14%. The average investment shows that companies earn more than interest rate plus inflation during this research period. It means that the investment activities of the public listed general insurance companies are good.

The central bank interest rate (BIR) of Indonesia varies from 3.03% to 7.21% and has the average of 5.58% with the standard deviation of 1.45%. The average percentage of interest rate is still in a better position compared to other countries in Asia.

4.2 Risk Based Capital

The RBC model in this paper has six variables which consists of three variables from internal financial ratios and three variables from external that represent macroeconomic variables as mentioned above. Based on the recommendation of Judge *et al.* (1982), this study uses random effect because N is greater than T. This study was also done by Hausman (1978) to test the similarity with the given recommendation using Random Effect Model (REM).

The RBC Model of Indonesia general public insurance companies is follows:

$$\begin{aligned} \text{RBC} = & 4.325 - 1.259*** \text{SLTA} - 4.754* \text{GPFTA} - 1,831*** \text{KLMPR} \\ & (-2.825) (-1.817) (-5.029) + 3.105*** \text{INVETA} - 13.828*** \text{INTRST} \\ & (5.422) (-2.432) \end{aligned} \quad (14)$$

$$R^2 = 69.75\% \text{ and } F = 12.351$$

T test in bracket

*significance level of 10%

***significance level 1%

The model is significant at the level of 5% and the coefficient of determination is at 69.75%, this means that all variables could explain that the variation of RBC only 69.75% and other variables remained unchanged. The model is fit significant because the F test is higher than $F_{\text{table}, 5\%}$.

The ratio of sales to total assets has negative effect or correlation and significantly affect the RBC at the significance level of 1%. This correlation basically should be negative, because the increase in sales or revenue of insurance companies will decrease the RBC. This research supports the results of the previous research.

The ratio of gross profit to total asset has negative effect or correlation and significantly affect the RBC at the significance level of 10%. This figure also explains that the skill of management in managing the cost of goods sold or internal expense is adequate. This result is expected, similar and support the previous researches and theories.

The ratio of premium claim has negative effect or correlation and significantly affect the RBC at the significance level of 1%. The negative correlation occurs, since the increase in premium claim exposes the decrease in the RBC. This should be positive because the increase in the premium claim stimulates the increase in the RBC. The insurance companies should manage the premium claim to make the RBC lower.

The investment performance has positive effect or correlation to the RBC. This correlation basically should be positive, because the increase in the total investment performance will increase the RBC. The positive correlation occurs, since the investment activities in Indonesia for general insurance companies are strictly regulated, there are a lot of regulations relating to such investment activities that oblige all insurance companies to manage the activities in a very safe level in order to meet all their future liabilities that could take place. In this case, the increase in the investment performance under a safe risk level will increase the RBC.

The central bank of interest rate (INTRST) has negative effect or correlation with the RBC and significantly affect the RBC. This result confirms the impact of interest that supports the previous research regarding the correlation of RBC and interest. The investment activities basically correlate with the central bank interest rate, since the investment regulations are very comprehensive with the same interest correlation that is positive to the RBC.

This research has two years period of pandemic or COVID-19. This paper also explores the effect of COVID-19 pandemic by using dummy variable in the model. The result is that the Covid-19 did not affect the RBC. The time the COVID-19 variable is eliminated, then the result is as shown in the equation of 14. This means, without using COVID-19 variable, the result does not show an effect to the model. The RBC can be stated as the solvency of insurance companies that could be explored in the future research by considering all the variables applied in this research. The future research should also consider the income per capita of Indonesian as a new variable applied.

5. Conclusions

The purpose of this study is to look into the determinants of Risk Based Capital (RBC) in Indonesia's publicly traded general insurance companies. Based on the previous explanations, the conclusions of this research can be drawn are as follows:

1. The RBC of the General Insurance Company demonstrates that the reputation of Indonesian insurance companies is better, as they meet the OJK's minimum requirements during the study period.
2. As internal factors, sales to total asset ratio, gross profit to total asset ratio, premium claim, and investment ratio have significantly affected the RBC.
3. As external factor, interest rate has significantly affected the RBC.

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