

Financial Performance Evaluation of General Insurance Firms in Malaysia Via Capital Adequacy Ratio (CAR) and Grey Relational Analysis (GRA)

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Increasing liberalization in the insurance industry has challenged insurance regulatory authorities to monitor the financial strength of Malaysian insurance companies. The incompetence faced by the insurance industry is a matter of particular concern and the identification of troubled insurers has become the main objective of regulatory research. Bank Negara Malaysia (BNM) has mandated the use of risk-based capital (RBC) for the insurance industry with the objective to provide an early warning system on potential deterioration in capital adequacy level and ensure continuous solvency and smooth running of an insurer's business operations. BNM has initiated a method for measuring RBC known as the capital adequacy ratio (CAR) and its adoption is compulsory for all insurance companies. CAR measures the adequacy of the capital available in the insurance and insurer shareholder funds to support the total capital required. Grey relational analysis (GRA) theory is useful to provide solutions in a system where information is incomplete and data is not normally distributed. GRA is suitable for the evaluation of a company's financial performance. This study evaluates the financial performance and capital adequacy ratio of Malaysian general insurance firms in the period 2011-2015. Results of this study show that a firm is categorized as solvent if the solvency margin results, using the CAR method, indicate that the financial position of the company is in a stable state. A firm that is categorized as solvent also demonstrates financially sound performance.

Key words: *Capital adequacy ratio, grey relational analysis, financial ratios, performance, risk-based capital, solvency.*

JEL Classification: G22, L50, C67

Introduction

In Malaysia, the insurance sector is under the purview of Bank Negara Malaysia (BNM). BNM has adopted a risk-based supervision approach with insurers to maintain the stability and financial soundness of the insurance industry and hence promote insurer financial strength and safeguard the interests of policyholders. The nature and level of supervisory activity are administered by risk profiling and risk management appraisal. Through a focus on risks, BNM can discover potential risks that may jeopardize the stability of the financial system. The solvency requirement enforced by the regulatory body protects the availability of the promised insurance protection to an acceptable degree of certainty. Solvency of an insurer is closely related to the condition of its balance sheet. Capital is the excess of assets over obligations, representing the equity of the company, or shareholders' stake. Under the Generally Accepted Accounting Principles (GAAP) capital is known as equity while under Statutory Accounting Principles (SAP) capital is called surplus.

Bodie et al. (2014) define risk as the potential for divergence between the actual outcome and what is expected. In insurance, risk is the uncertainty regarding loss. Management is always faced with a dilemma regarding what premiums to charge, how much to reserve and what investment return will be made. Both the variability and the uncertainty are important in understanding risk (Hooker et al. 1996). The risk-based capital (RBC) development process began in 2002 in Malaysia. The RBC framework was developed and concluded with the issuance of draft papers in 2004 and 2005 and the final RBC framework was released by BNM in April 2007 (Bank Negara Malaysia 2013). Since 2009, BNM has directed the RBC system to be applied in the insurance industry. The role of the RBC system is to test the solvency of the insurance company as solvency margin is a measure of the financial position of an insurance company. The Capital Adequacy Ratio (CAR) measures the adequacy of the insurer capital available in two respective funds, insurance and shareholders, to support the total capital required. BNM has set a supervisory target capital adequacy rate of 130% for an insurance company to be considered solvent in terms of financial position or BNM will intervene at the earliest stages of insurer financial difficulty.

Various performance measurement methods have been used to accurately evaluate company financial health and ensure sustainability and continued company growth. The most commonly used method is financial ratio analysis which focuses on financial statements and comprises four main categories: liquidity, activity, debt structure and profitability (Abhang and Hameedullah 2012). Studies that relate factors to performance commonly employ traditional statistical methods and such studies demand a huge amount of data with assumptions of normality which, in practice is not the norm. In cases where data is limited and problematic and where data does not fit, normal, grey relational analysis as developed by Deng (1982), is the method of choice. The aim of this study is to investigate the financial performance of non-

life insurance companies in Malaysia via the grey relational analysis method and determine solvency stability through the capital adequacy ratio measurement.

This paper unfolds as follows. Section II reviews the related literature. Section III details the data and methods. Section IV presents the performance measurement results and finally, Section V sets forth conclusions.

Related Literature

The insurance industry in Malaysia can be classified into life insurance, general insurance and takaful. There are two categories of general insurance products and more products in the commercial lines are offered to businesses which include liability insurance, marine, aviation, engineering, burglary and fidelity guarantee insurance. The personal category, designed specifically for the public, includes medical and health insurance, personal accident, travel and motor insurance. By international standards, the insurance industry in Malaysia is relatively small however, the general insurance industry has registered a slow growth rate and achieved 1.5% in 2018 (PIAM 2019).

The solvency regulation composes restrictions on investments and capital and also requirements related to reserves and other financial issues. Among these, capital requirement receives significant attention as solvency is about maintaining the minimum capital requirement. Risk Based Capital is a method developed by the National Association of Insurance Commissioners (NAIC) in 1992 to measure the minimum amount of capital that an insurance firm needs to support its overall business operations. RBC requirements help regulators to identify weak insurers and encourage prompt action through intervention when reported capital falls below specified risk-based capital levels. The risk-based capital model has been shown to be the most well received method in identifying insolvency cases by using the risk-based capital ratio (Cummins et al., 1995; Cheng & Weiss, 2012).

In Malaysia, the Risk-Based Capital framework was adopted in 2009 for conventional insurers. Traditionally, the capital adequacy requirement, formerly known as the margin of solvency, came into effect in 2006. Margin of solvency is a fixed minimum amount of capital better known as a “one-size-fits-all” approach. Initially the RBC framework adopted by BNM concentrated on financial risks: credit, market, under writing and concentration risk. In 2011, BNM introduced the modified RBC framework with broad risks to be managed and the revised RBC focuses on four risk classifications: credit risks deal with assets default and failure of counter-party, market risks are about the reduction in assets market value and are nonparallel in asset-liability, liability risk are concerned with insurance liabilities underestimation and adverse claims experience and operational risk involve failed system and human capital processes (BNM 2013).

Studies on insurer insolvency in Malaysia are sparse. Jaaman et al. (2007) and Lazam et al. (2012) discuss the elements of Total Capital Available (TCA) where TCA is the excess of assets and liabilities and assets represent the size of a firm, and concluded that measurement of solvency targeted large insurance firms. Chiet et al. (2009), created an early warning system for solvency prediction by applying Artificial Neural Network and found that the model could be used to predict insolvency. Using Risk-Based Capital, margin of solvency and claim paying ability of Rating Agency Malaysia, Yakob et al. (2012) estimated the soundness of conventional and Takaful operators and concluded that insolvency was not a major problem for life insurers. According to Ismail (2013), solvency margin has a significant negative effect on the performance of general insurers and Takaful operators. Aida et al. (2016) analyzed the Malaysian RBC framework against seven objectives set by Cummins, Harrington and Niehaus (1993) and four additional objectives developed by Holzmüller (2009). They concluded that Malaysian RBC fully fulfil four objectives and partially fulfil three objectives. All study findings indicate that the Risk-Based Capital framework is effective at preventing Malaysian insurers from becoming insolvent.

Traditional statistical methods applied to measure firm performance often require a large number of data with normal distribution assumptions (Kung et al., 2006; Yan & Kung, 2011). In reality, data is scarce and hard to acquire and typically does not fulfil the assumptions of normality. According to Kung and Cheng (2004), Wen (2004) and Kung et al. (2006) in cases where limited amount of data that data is not normally distributed, the grey system theory initiated by Deng (1982) can be a preferred alternative. In the grey system theory, the “grey” level of knowledge represents the information that is partially known and partially unknown (Liu & Lin, 2006). This information may be poor, incomplete or uncertain. GRA is useful in determining the significant factors in a system with a limited amount of data, GRA is thus suitable for the evaluation of firm financial performance (Kung & Wen, 2007).

Studies of Taiwanese insurer performance, where performance was measured using financial ratios and utilizing GRA method (Kung et al., 2006; Yan and Kung, 2011), are referenced in the current research. Kaya (2016) studied the financial performance of six non-life insurers in Turkey using four types of financial ratio categories and employed GRA method while Özdağoğlu et al. (2017) evaluated manufacturing performance of firms listed on the Istanbul exchange. All studies indicate that GRA can be a powerful method to measure firm performance based on financial statements data.

Data and Methods

Data

Generally, the coverage period for general insurance policies and plans is one year when premiums are paid on a one-time basis. There were twenty-one licensed general insurance companies in Malaysia in 2015. For this study, data from nine general insurance companies that had not been taken over or merged and were operational through the years 2011 to 2015, were collected. General insurance company data is collected from the Annual Financial Report. Table 1 below presents the general insurers and the code given to each insurer for the purpose of this study.

Table 1: List of General Insurance Companies

Firm Name	Code
AIG Malaysia Insurance Bhd	Firm1
Allianz General Insurance Bhd	Firm2
Liberty Insurance Bhd	Firm3
Lonpac Insurance Bhd	Firm4
QBE Insurance (Malaysia) Bhd	Firm5
Pacific Insurance Bhd	Firm6
Progressive Insurance Bhd	Firm7
Tokio Marine Insurans Bhd	Firm8
Tune Insurance Malaysia Bhd	Firm9

The financial performance of general insurance companies is reviewed based on four financial ratio groups: capital adequacy ratio, liquidity ratio, operating ratio and profitability ratio. Table 2 below lists the financial ratio analyzed in this study.

Table 2: Financial Ratios

Ratios		Code	Target
Capital adequacy ratios	Gross Written Premiums/Equity Capital	Car1	Smaller the better
	Net Written Premiums/Equity Capital	Car2	Smaller the better
	Equity Capital/Total Assets	Car3	Larger the better
Liquidity ratios	Current Ratio	Lr1	Larger the better
	Liquidity Ratio	Lr2	Larger the better
	Liquid Assets/Total Assets	Lr3	Larger the better
Operating Ratios	Net Written Premiums/Gross Written Premiums	Or1	Larger the better

Profitability Ratios	Claims Incurred/Net Written Premiums	Pr1	Smaller the better
	Return on Assets	Pr2	Larger the better
	Return on Equity	Pr3	Larger the better

The capital adequacy ratios indicate the financial strength of the insurance companies to fulfil their obligations to policyholders which is a very important element for insurance companies. The amount of equity capital is an important indicator to measure the financial strength of an insurance firm. Liquidity ratios show the relationship of a firm's cash and other current assets to its current liabilities (Brigham & Houston, 2001). Operating ratios measure the efficiency of firm management in keeping costs low to generate larger revenue. Profitability ratios evaluate the ability of a firm to generate income. The two most common measures of profitability are the ROA and ROE and an insurer naturally prefers a high ROA and a high ROE.

Capital Adequacy Ratio (CAR)

The Risk-Based Capital (RBC) Framework applied by Bank Negara Malaysia (2013) aims to ensure that each insurer maintains a capital adequacy level that is commensurate with its risk profile at all times. The RBC system in Malaysia employs the capital adequacy ratio (CAR) to measure the adequacy of capital available in the insurance and insurer shareholder funds to support the total capital required. The CAR is expressed as:

$$CAR = \frac{\text{Total Capital Available (TCA)}}{\text{Total Capital Required (TCR)}} \times 100\% \quad (1)$$

The CAR is used to assess the financial strength of the insurer with BNM imposing a minimum supervisory target capital level of 130%. The risk-based capital adequacy ratio consists of Total Capital Available (TCA) and Total Capital Required (TCR). The TCA consists of total equity while the TCR is the sum of credit risk capital charges, market risk capital charges, insurance liability risk capital charges and operational risk capital charges. The total capital required is the aggregate of the total capital charges for each insurance fund and the aggregate capital charges for all assets in the shareholders' fund. Requirements pertinent to each insurer determine the adequacy of the capital available in its insurance and shareholders' funds to support the total capital required. TCR serves as a key indicator of the insurer's financial resilience and is used as input to determine supervisory interventions by BNM.

There are four capital charges under TCR as shown below.

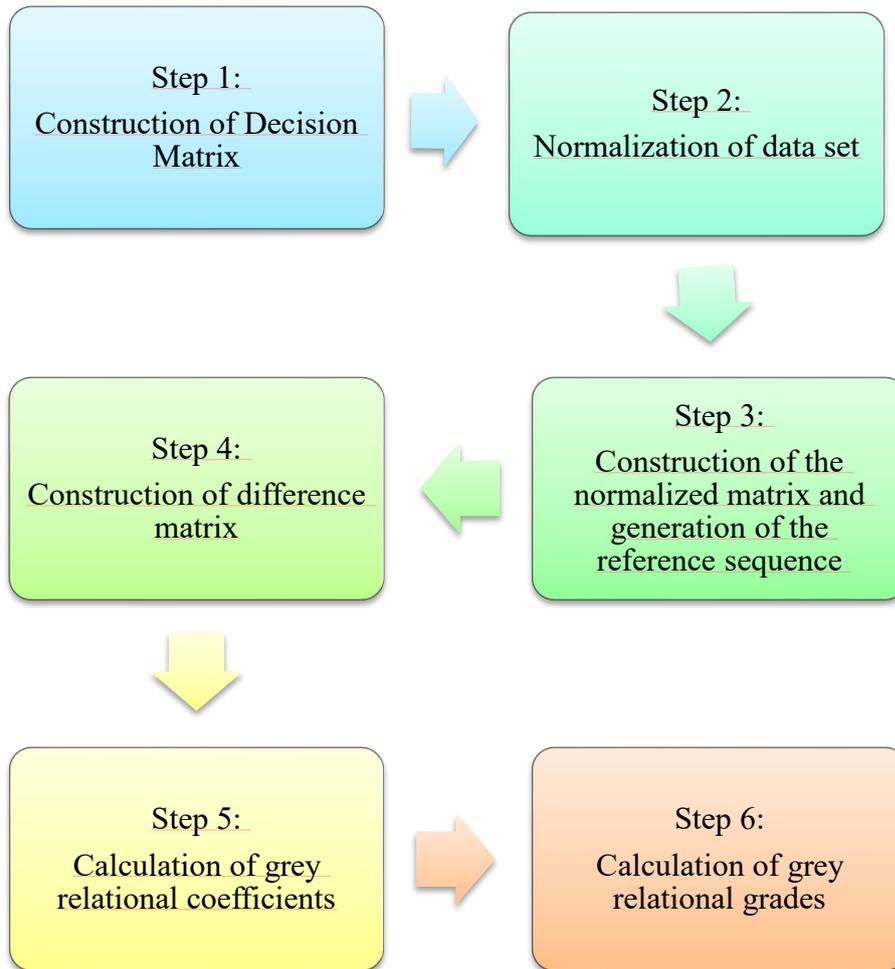
$$TCR = \sum \left[\begin{array}{l} \text{Credit risk capital charges} \\ + \text{Market risk capital charges} \\ + \text{Liability risk capital charges} \\ + \text{Operational risk capital charges} \end{array} \right] \quad (2)$$

Credit Risk Capital Charges (CRCC) focus to mitigate risk of loss resulting from assets default and related loss of income and the inability or unwillingness of a counter-party to fully meet its contractual financial obligations. Market Risk Capital Charges (MRCC) focus to mitigate risk of financial loss arising from the reduction of market value of assets and the non-parallel movement between the value of liabilities and the value of assets backing the liabilities due to interest rate movement. Liabilities Risk Capital Charges (LRCC) focus to address risks of under-estimation of insurance liabilities and adverse claims experience developing over and above the amount reserves already provided related to claims or unexpired risks. Currently the actuarial computation is set at the 75% level of confidence (BNM 2013). The Operational Risk Capital Charges (ORCC) focus to mitigate the risk of losses arising from inadequate or failed internal processes, people and systems (Aida et al. 2016).

Grey Relational Analysis

The grey relational analysis has been developed to solve multi-criteria decision making problems where a decision maker needs to consider interrelationships among multiple variables and factors. The major role of GRA is to evaluate the performance of all alternatives by comparative categorization with respect to the factors or criteria (Kuo et al., 2008; Wang et al., 2016). GRA is a useful method to capture the correlations between the reference factor and other factors which can be compared within a system (Wu et al., 2010). In this study, grey relational analysis (GRA) method is employed to analyze the financial performance of general insurance firms. The application steps of the GRA method are shown in Figure 1 below.

Figure 1. Application Steps of Grey Relational Analysis



As shown in Figure 1 the first step is to form a matrix of data sequence characterized by the number of criteria. In this study there are nine general insurance firms (Firm1 to Firm9) and 10 financial ratios (Car1 to Pr3). To obtain comparable scales, according to Feng and Wang (2000) the data set needs to be normalized (step 2 & step 3). Normalization should be performed to construct comparable series. The data can be normalized by one of three regimes: larger the better, smaller the better and nominal the best. In step 4, the absolute differences between the normalized decision matrix values and the standard series values is constructed to obtain the concluding matrix. Calculation of grey relational coefficients (step 5) to obtain the value of coefficient of coherent relationships uses the formula below:

$$\gamma_{01}(j) = \frac{\min_i^n \min_j^m \Delta_{0i}(j) + \zeta x \max_i^n \max_j^m \Delta_{0i}(j)}{\Delta_{0i}(j) + \zeta x \max_i^n \max_j^m \Delta_{0i}(j)} \quad (3)$$

where $\gamma_{01}(j)$ is the grey relational coefficient of the j th financial ratio and ζ is the distinguishing coefficient. This coefficient is a value between 0 and 1.

ζ usually ranges between 0.1 and 0.5 and reduces the effect of extremely large $\max_i^n \max_j^m \Delta_{0i}(j)$ in cases where data variation is large (Chang and Lin 1999). Finally, in step 6 the grey relational grade is calculated as follows (4) where Γ_{0i} is the grey relational grade and $w(j)$ is the weight of the j th financial ratio. The performance of general insurance

firms can be ranked according to the grey relational grades, the higher the grade, the better financial performance.

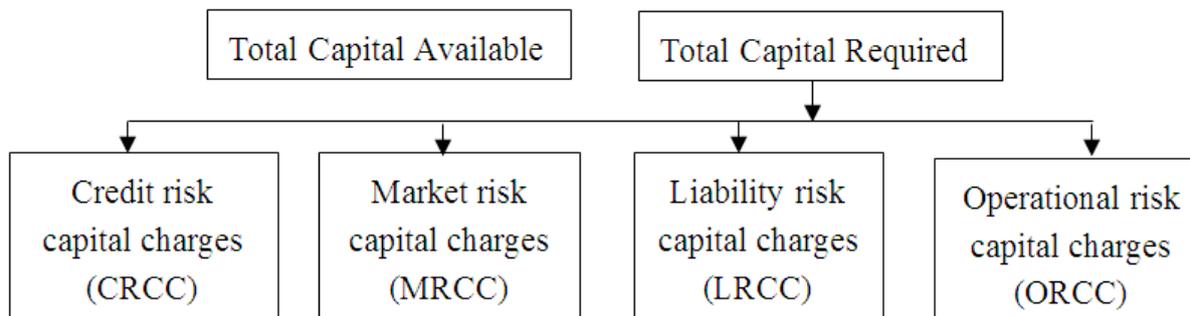
$$\Gamma_{0i} = \sum_{j=1}^m [w(j) \times \gamma_{01}(j)], \quad \sum_{j=1}^m w(j) = 1,$$

Performance Measurement Results

Capital Adequacy Ratio (CAR)

The four risk components which comprise the total risk required of the Risk Based Capital framework imposed by Bank Negara Malaysia are: credit risk, market risk, liability risk and operational risk as shown in Figure 2 below.

Figure 2. Malaysian Risk Based Capital



Credit risk relates to losses resulting from asset defaults and loss of income due to the inability of the other party to fulfil its contractual financial obligations (BNM 2013). The market risk is such that insurance firms will need to deal with its investment. In CAR measurement, market risk capital charges aim to mitigate risks of financial loss that arise from reduction of market value of assets, mismatch of interest rate and exposure in certain asset classes. Liability risks refer to the risk of bodily injury or third-party property damage. The general insurance risk capital charges aim to address risks of adverse claims experience and under-estimation of insurance liabilities over and above the amount of reserves already provided for at the 75% level of confidence (BNM 2013). Finally, the operational risk is the risk of losses due to failure or weakness of the infrastructure, people and systems.

The capital adequacy ratio (CAR) of nine general insurers observed in this study is measured using equation (3) above and Table 3 below provides the CAR result.

Table 3: Capital Adequacy Ratio (CAR) of General Insurance Firms

General Insurance Firms	Code	Year					
		2011	2012	2013	2014	2015	Average
Progressive	Firm5	169.24	173.63	154.19	173.8	169.03	167.978
Lonpac	Firm4	170.92	159.41	151.85	146.43	147.69	155.26
Liberty	Firm3	131.2	136.55	165.13	156.82	167.88	151.516
AIG	Firm1	153.06	143.04	148.92	136.23	154.96	147.242
Tokio Marine	Firm8	140.33	109.99	124.12	132.71	104.28	122.286
Pacific	Firm7	94.15	97.15	119.9	113.04	116.39	108.126
QBE	Firm6	114.95	111.63	101.13	96.35	90.99	103.01
Tune	Firm9	79.55	92.27	102.92	99.71	94.91	93.872
Alliaz	Firm2	118.38	77.7	73.14	81.24	85.13	87.118

To facilitate interpretation, firms that recorded a CAR result above BNM's supervisory target level of 130% are highlighted in bold. Of nine firms observed during the period 2011 to 2015, four firms consistently registered CAR above 130%: Progressive Insurance Bhd, Lonpac Insurance Bhd, Liberty Insurance Bhd and AIG Malaysia Insurance Bhd. These firms managed to maintain the adequacy of the capital available in the insurance and shareholders' funds in order to support the total capital required which is the sum of credit risk capital charges, market risk capital charges, insurance liability risk capital charges and operational risk capital charges. The capital adequacy ratio of five general insurers: Allianz General Insurance Bhd, Tune Insurance Malaysia Bhd, QBE Insurance Bhd, and Tokio Marine Insurance Bhd, violate BNM's supervisory target level and thus may face stricter supervisory action, which could include business restriction and a requirement to restructure.

Grey Relational Analysis Results

This study evaluates the financial performance of nine general insurers in Malaysia by applying the GRA with ten financial ratios. The financial ratios were calculated for each of the nine general insurance firms for the period from 2011 to 2015. Then, 5-year averages of the financial ratios for each firm were taken. Table 4 below presents the grey relational coefficients, the weight value used is based on Chang and Lin (1999).

Table 4: Grey Relational Analysis Grade Coefficient Value

	Car1	Car2	Car3	Lr1	Lr2	Lr3	Or1	Pr1	Pr2	Pr3
Weight	0.072	0.072	0.096	0.096	0.096	0.096	0.096	0.155	0.096	0.124
Firm1	0.85	0.71	1.00	1.00	0.37	0.85	0.53	0.80	0.53	0.36
Firm2	0.36	0.33	0.35	0.34	0.33	0.36	0.55	0.60	0.53	0.66
Firm3	0.37	0.38	0.35	0.35	0.54	0.37	0.44	0.55	0.54	0.61
Firm4	0.33	0.40	0.38	0.41	1.00	0.33	0.37	1.00	1.00	1.00
Firm5	1.00	1.00	0.63	0.36	0.57	1.00	0.34	0.47	0.40	0.34
Firm6	0.86	0.70	0.81	0.35	0.78	0.86	0.61	0.85	0.48	0.35
Firm7	0.81	0.77	0.63	0.35	0.61	0.81	0.41	0.56	0.39	0.33
Firm8	0.67	0.56	0.49	0.36	0.55	0.67	0.63	0.61	0.57	0.42
Firm9	0.55	0.67	0.41	0.35	0.62	0.55	0.33	0.53	0.43	0.39

The final stage of the analysis was to calculate the grey relational grades for each general insurance firm. The grey relational grade of each firm was calculated by multiplying the grey relational coefficient by the weight of each financial ratio and by adding the result. After the calculation of these grades, the general insurance firms were ranked according to their grey relational grades. The grey relational grades for the firms and its ranking are presented in Table 5 below.

Table 5: Ranking of General Insurers Based on Grey Relational Analysis Grade

Code	General Insurance Firms	Grey Relational Grade	Position
Firm1	AIG Malaysia Insurance Bhd	0.693	1
Firm4	Lonpac Insurance Bhd	0.667	2
Firm6	QBE Insurance Bhd	0.661	3
Firm5	Progressive Insurance Bhd	0.574	4
Firm8	Tokio Marine Insurance Bhd	0.551	5
Firm7	Pacific Insurance Bhd	0.549	6
Firm9	Tune Insurance Malaysia Bhd	0.477	7
Firm3	Liberty Insurance Bhd	0.463	8
Firm2	Allianz General Insurance Bhd	0.461	9

Higher grey relational grade shows better financial performance. The GRA financial performance results of the general insurance firms observed in this study are based on ten financial ratios and show that AIG Malaysia Insurance Bhd has the highest relational grade followed by Lonpac Insurance Bhd, QBE Insurance Bhd in the third position and Progressive Insurance Bhd in the fourth position. Results show that Allianz General Insurance Bhd, Liberty Insurance Bhd and Tune Insurance Malaysia Bhd are low in terms of financial performance.

Table 6 below compares the results of the rankings provided by the capital adequacy ratio and grey relational analysis measurement. The Capital Adequacy Ratio (CAR) measures the adequacy of the available insurer capital to support the total capital required. CAR indicates the financial strength of the insurance firms to fulfil their obligations to policyholders. BNM has set a supervisory target CAR of 130% for an insurance firm to be considered solvent. The most commonly used tool to measure financial performance is the financial ratio analysis. Strong overall financial performance indicates firm financial health and this ensures the sustainability and continued growth of the firm.

Table 6: General Insurance Firms' Ranking Based on CAR and GRA

Code	General Insurance Firms	CAR Position	GRA Position
Firm1	AIG Malaysia Insurance Bhd	4	1
Firm2	Allianz General Insurance Bhd	9	9
Firm3	Liberty Insurance Bhd	3	8
Firm4	Lonpac Insurance Bhd	2	2
Firm5	Progressive Insurance Bhd	1	4
Firm6	QBE Insurance Bhd	7	3
Firm7	Pacific Insurance Bhd	6	6
Firm8	Tokio Marine Insurans Bhd	5	5
Firm9	Tune Insurance Malaysia Bhd	8	7

As shown in Table 6, firms that exceed BNM's CAR supervisory target level are also considered to be financially sound. Progressive Insurance Berhad which has highest average CAR value, is ranked fourth in terms of financial performance while Lonpac Insurance Bhd are placed in second position for both CAR and GRA measurements. AIG Malaysia Insurance Bhd which has the highest financial performance is ranked fourth in fulfilling the BNM solvency requirement. Allianz General Insurance Bhd appears to be the lowest based on both capital adequacy ratio and grey relational analysis. This confirms that the firm is not producing good results in its financial statements nor is it able to satisfy BNM's capital requirement. This indicates the inability of the firm to fulfill its contractual financial obligations.

Conclusion

As a reflection of general national industry performance, the financial performance of the general insurers can be considered as an indicator. Financial health of these firms is frequently subject to analysis by regulators, policy holders, financial institutions, investors and managers. Policyholders can make more precise choices in choosing a potentially efficient general insurer by evaluating firm solvency requirements based on CAR measure and financial performance



ranking based on GRA method. An insurer is considered to be solvent and financially stable if it presents good performance for both CAR and GRA measurements.

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