Firm size and risk taking in Malaysia’s insurance industry

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Abstract

Purpose – The purpose of this paper is to provide insights on how a firm’s size is related to risk taking of Malaysia’s insurance companies, from 2000-2010.

Design/methodology/approach – The sample used for empirical testing in this study comprised direct insurance firms licensed under Malaysia’s Insurance Act 1996, for the time frame between 2000 and 2010. Pearson’s correlation, fixed and random effects models, and the system Generalized Method of Moments (GMM) method were used in this study.

Findings – Both the fixed effects and the system GMM panel data regression models suggested a positive link between the insurance firm size and underwriting risk. For the robustness test, the results of the analysis using changes in data broadly resemble the outputs of the levels estimation.

Research limitations/implications – The sample of this study is limited to Malaysia’s insurance sector only.

Originality/value – Advocates of the too-big-to-fail (TBTF) theory believe that government support and the guarantee of a financial bailout are warranted for large financial institutions facing crises, for the main purpose of avoiding disruptions within a country’s economy. The drawback, however, may be that the TBTF doctrine is the culprit behind excessive risk taking by insurance firms of large proportions. A number of regulatory concerns have been raised and addressed from this study.

Keywords Insurance, Malaysia, Large enterprises, Assets, Underwriting, Risk finance, Total assets, Too big to fail, Firm size, Underwriting risk

Paper type Research paper

Introduction

In the last few years that marked the close of the twentieth century right until the first decade of the present era, the financial industry worldwide has certainly had its share of downturns. In light of widespread reports of unforeseen business failures and financial closures that rocked economies globally, debates on the size of insurance companies and excessive risk taking began surfacing and becoming a vital cause for concern, being inextricably linked to a host of financial bailouts. One such bailout that left an indelible mark in America’s financial industry is that of American International Group Inc. (AIG), which occurred in the year 2008.

Karnitschnig et al. (2008) postulated that the Federal Reserves Bank had taken an unusual step in providing aid to AIG in this context, bearing in mind that AIG hailed neither from a banking sector, nor did it fall under the purview of the federal government. Consequently, the first question that arises following this USD 85 billion bailout is why AIG was given such preference. Many factors could have contributed to
the procurement of such massive rescue funds by AIG, incidentally, the largest insurer in the USA, the most likely being that if AIG was allowed to go under, it would have inevitably led to a large-scale financial panic in the nation. It was partly for this reason that the Federal Reserves Bank sprang into action and seized control of the company, thus branding it the biggest bailout in American history.

One important consideration underlying the AIG bailout pertains to firm size, premised on the too-big-to-fail (TBTF) theory. Advocates of the TBTF theory believe that government support and the guarantee of a financial bailout are warranted for large financial institutions facing crises for the main purpose of avoiding disruptions within a country’s economy. The drawback, however, may be that the TBTF doctrine is the culprit behind excessive risk taking by insurance firms of large proportions.

The TBTF doctrine, according to Zhou (2010), has a dark side to it – apart from diminishing market discipline, larger institutions are also spurred to take on more risk, buffered by their certainty of policy preference towards large-scale firms believed to be TBTF. Karmin and Ng (2012) found evidence revealing that huge bets on the US real-estate market, coupled with the complex derivative unit used by AIG, constituted some of the excessive risks that drove the firm to the brink of mere survival. It can be deduced, therefore, that the TBTF theory paves the way for the expansion of an organisation in terms of size, thereby enabling it to obtain a privileged position, and also provides a catalyst for the organisation to become a greater risk taker (Stern and Feldman, 2004). Inadvertently, firm size has become a critical issue which supervisory authorities need to address. This study, therefore, examines issues pertaining to the relationship between corporate size and risk taking by insurance companies. Due to various constraints, the time frame used in this study is limited to the period between 2000 and 2010, while the data are sourced only from one country, which is Malaysia, mainly due to the nation’s status of being one of the fastest growing economies in south-east Asia.

In a relatively small economy like Malaysia’s, market size and the number of insurance operators may be at a seemingly insignificant point; yet, oversight of the importance of the size-risk nexus could potentially lead to not just a national crisis, but also to investors’ panic, which could likely escalate and seriously challenge neighbouring countries like Thailand, Indonesia and Singapore. Based on this notion, this paper first contributes to existing research by empirically examining the size-risk relationship of insurance firms in an emerging economy. Second, it aims at expanding the availability of research on the interplay of firm size and risk, a factor largely neglected in current studies involving insurers. This is mainly in lieu of the fact that similarly with the banking sector, potential damage from insurer failures would also lead to vulnerability of the public. Third, while it is undeniable that research on company size and risk level is not absolutely new, the recurrences of financial turmoil worldwide, such as the Asian financial crisis in 1997, and the American sub-prime mortgage crisis in 2008, strongly justify the need to conduct this study using more recent data. Finally, with evidence of the relationship between company size and risk being rather weak (Barrell et al., 2011a; Boyd and Runkle, 1993), there arises a compelling need for firm size to play a more significant role in empirical studies rather than merely functioning as a treatment group, as indicated in prior studies. Firm size is unique and plays an essential role in economic policy. Hence, corporate size has been accorded with much more serious attention in this study. The outcome from this research is expected to enable relevant
governments to concentrate on firm size and integrate it into policy formulation. In so doing, the supervising unit would embrace initiatives that would help ensure resilience and soundness in the insurance sector.

This paper is organised as follows: in the next section, previous works on size and risk taking are briefly discussed followed by an explanation on the research framework and the sources of data for analysis. In the Empirical results section, the relationship between firm size and risk taking is analysed, after which comes a summary of the study, together with its policy implications.

**Literature review**

Within the present century, one can roughly pinpoint to mid-2007 being the start of the global financial crisis of this era, from which time began an intensified debate on the effectiveness of risk control systems then in existence. Among several regulatory issues brought under public scrutiny, the moral hazard problem induced by the TBTF policy has been one of the major causes of trouble in the financial industry (Pais and Stork, 2011).

Premised on the TBTF theory, Boyd and Runkle (1993) argued that failures of larger banks are to be more dreaded than smaller bank failures due to the macroeconomic implications involved. Therefore, it is posited that when an institution is characterised to have systemic importance, policymakers are more willing to intervene to prevent its collapse (Ennis and Malek, 2005) since total damage could jeopardise and destabilise the whole financial system (Zhou, 2010). This sheds some light on why most governments would hardly ever allow large financial institution to be in default. Reinforcing this belief is the growing evidence of government rescue missions in the past, indicative of the vital role played by the TBTF theory in an economy.

In the case of the USA, for instance, the AIG and Bear Stearns bailouts by the Federal Reserves Bank constitute persuasive evidence that the TBTF policy had been extended to protect not only large banks, but also other sectors, including insurance and investment banking (Brewer III and Jagtiani, 2013). These instances had undeniably led market participants to expect liquidity provisioning from financial regulators in the event of unfavourable trade-offs (Federal Reserve Bank of Richmond, 2011). Ultimately, the ball lands in the court of taxpayers who mainly bear the brunt during bailouts of troubled institutions (Lu, 2011). As such, the bailout plan for a large institution, which is implicitly designed to help minimise systemic risk, has its limitation in encouraging moral hazard problems and excessive risk taking. It is, therefore, imperative to take into account whether larger companies are more likely to assume greater risks based on the TBTF policy.

As reiterated by Boyd and Runkle (1993), because the collapse of banks with a bigger operating size is considerably worse than the collapse of those with a smaller size, market expectations are shaped by the notions of how valuable a government guarantee is to large banking companies. Their study, however, which involved empirical tests using data from 122 banks over the period of 1971-1990, provided only limited support for their hypothesis on the relationship between firm size and the risk of failure.

In a study that delved into the Korean banking industry, Lee (2008) hypothesised that larger banks might operate with a small capital and get involved in riskier strategies to exploit diversification advantages. Consistently, the finding shows that larger banks have unprofitable risk taking incentives from 1994 to 1997; this effect, however, disappears between 1998 and 2005, leading to the suggestion that the moral
hazard of larger banks prevails only when regulations are not tight, which may have been the scenario in the latter time frame.

Barrell et al. (2011a), in a similar study on bank size and risk involving OECD banks spanning from 1993 to 2008, provided clear evidence that larger banks are associated with higher risk. This is very much due to the luxury extended by the lender of last resort policy which provides an incentive for banks to increase size and take on more risk (Barrell et al., 2011b).

By using more comprehensive sample coverage, Lu (2011) extended the study on size and risk taking beyond commercial banks to include investment banks and life insurance firms. This study, conducted from 1998 to 2008, concluded that size and risk taking are positively related.

It is consistently reported that risk diversification is associated with larger institutions but this benefit is typically offset by higher financial leverage that can pose significant risks to the firm (Boyd and Runkle, 1993; Liang and Rhoades, 1991). The empirical findings regarding the effect of firm size on risk taking support that larger banks tended to follow riskier strategies by holding less capital and hence larger banks did not necessarily associate with total risk reduction (Demsetz and Strahan, 1997).

Does a smaller firm size then imply better risk control? According to Boyd and Runkle (1993), with reference to the theory of modern intermediation, a larger firm is more cost efficient and less likely to fail. This theory suggests that being bigger proffers an advantage in reducing pooled risks through a large number of contracting parties, thereby reducing the possibility of failure. As such, larger institutions are believed to have more profitable investment opportunities, higher efficiency, more diversification and a lower risk level. Consistently, Boyd and Runkle's (1993) findings suggest an inverse relationship between firm size and asset return volatility. As pointed out by Mainelli and Giffords (2010), firms larger in size can enjoy economies of scale and scope, and also pass an important criterion to enable them to compete globally.

Having reviewed the various studies aforementioned, it can be deduced that both the moral hazard theory and modern intermediation theory are undeniably important in predicting the relationship between firm size and risk taking. While each theory provides relevant arguments and weaknesses using valid statistical findings, although somewhat limited and contradicting, it can be hypothesised that risk taking is related to the size of insurance companies.

**Model specification: sample, methodology and variables**

*Sample*

The sample used for empirical testing in this study comprised direct insurance firms licensed under Malaysia’s Insurance Act 1996, for the time frame between 2000 and 2010. It is made up of general business, life insurance and composite insurance companies. Audited annual financial statements or reports published by each insurance company were downloaded from the respective company’s web site, in addition to the hand-collected annual reports from Malaysian Insurance Institute, Bank Negara Malaysia and the headquarters of individual insurers. Other information such as economic data and the Kuala Lumpur Composite Index (KLCI) were sourced from the Department of Statistics, Malaysia and Datastream. Since financial data could only be compiled from the year 2000, that year marked the beginning of the time frame examined in this research.
During the sampling period, there was a drop in the number of insurance companies from 57 in 2000, to 39 in 2010, mainly caused by mergers and acquisition (M&As). From a sum of 480 observations for the year 2000 until 2010, the insurance companies sampled were filtered for analyses in three ways. First, only firms that had operated for at least five consecutive years during the reference period were included. This was justified on the grounds that possible biases from new and insolvent companies had to be minimised – a criterion consistent in studies involving bank size conducted by Boyd and Runkle (1993) and Lu (2011). Based on this, 27 observations were dropped. Next, since the sample was limited to positive financial data, four observations with negative values in their shareholders equity were excluded from the study. This was important in reducing the possibility of data distortion in the analysis. Additionally, another nine observations were excluded due to missing reports, leaving behind a sample comprising an unbalanced panel, totalling 440 observations in span of 11 years, as indicated in Table I.

Research methodology and variables
Many authorities have expressed their concern over the TBTF policy, touching particularly on the economic disruption in the event of financial turbulence, incurred mainly because of firm size. Although there is neither a specific determinant nor a TBTF definition, a firm relatively larger in size is generally regarded as being TBTF (Brewer III and Jagtiani, 2013). Incorporating existing framework from previous studies, this study adopted the theoretical model proposed by Boyd and Runkle (1993) and Lu (2011), in which firm size, defined as the company’s total assets, has a relationship with risk taking.

In conducting the analysis, the univariate Pearson’s correlation was used to present an overview of the relationship between variables and indicate the potential problem of collinearity. As an extension of univariate estimation, the panel regression analysis was used to estimate the link between firm size and risk taking. The general model of the study is as follows:

\[ RISK_{i,t} = \alpha_0 + \alpha_1 SIZE_{i,t} + \alpha_2 CAP_{i,t} + \alpha_3 VLT_{i,t} + \alpha_4 GDP_t + \alpha_5 REG_t + \epsilon_{i,t} \]  

where \( RISK_{i,t} \) represents the underwriting risk of firm \( i \) at time \( t \); \( SIZE_{i,t} \) is the natural logarithm of total assets of firm \( i \) at time \( t \); \( CAP_{i,t} \) is the ratio of shareholder equity to total assets of firms \( i \) at time \( t \); \( VLT_{i,t} \) is the annualised standard deviation of the monthly change in the KLCI at time \( i \); \( GDP_t \) is the annual growth of the Malaysian gross domestic product at time \( i \) and \( REG_t \) is the binary variable, where one is for 2009-2010, the period after the implementation of risk-based capital (RBC), and zero is for 2000-2008. \( \epsilon_{i,t} \) is the error term. \( VLT_{i,t}, GDP_t, REG_t \) and \( CAP_{i,t} \) are control variables.

<table>
<thead>
<tr>
<th>Sample attributes</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total direct insurance firms in Malaysia, from 2000 to 2010</td>
<td>480</td>
</tr>
<tr>
<td>Excluding firms with negative shareholder’s equity</td>
<td>4</td>
</tr>
<tr>
<td>Excluding firms with less than 5 consecutive years, from 2000</td>
<td>27</td>
</tr>
<tr>
<td>Excluding firms with no available reports</td>
<td>9</td>
</tr>
<tr>
<td>Final sample</td>
<td>440</td>
</tr>
</tbody>
</table>

Table I.
Sample selection procedure
also seen to be utilised in previous studies (Behr et al., 2010; Boyd and Runkle, 1993; Cummins and Sommer, 1996).

One matter of concern pertaining to this empirical study, which must be addressed here, is the issue of potential endogeneity, where the given explanatory factors may influence not only underwriting risk, but also lead to a change in firm size. While literature posits that a company’s capitalisation has a role to play in corporate risk taking, it could be the case that a company with more capital has the capacity to purchase more assets. If this specific issue is not addressed in the econometric analysis, the estimates would be biased and inconsistent. Taking into account the potential endogeneity issue, this study utilised the system generalized method of moments (GMM) analysis proposed by Arellano and Bover (1995) and Blundell and Bond (1998), to increase the estimate efficiency and generate consistent estimates of standard errors (Baum et al., 2007). The dynamic panel data is estimated as follows:

\[
RISK_{i,t} = \alpha + \alpha_1 RISK_{i,t-1} + \beta' X_{i,t} + \eta_i + \gamma_t + \epsilon_{it}
\]

where \(RISK_{i,t}\) is the underwriting risk of firm \(i\) at time \(t\); \(RISK_{i,t-1}\) is the initial underwriting risk; \(X_{i,t}\) refers to the risk taking determinants discussed earlier; \(\eta_i\) refers to unobserved firm-specific effects, while \(\gamma_t\) refers to time-specific intercepts. \(\epsilon_{it}\) is the error term.

Next was the check for result robustness. Following the same procedure for estimation using the system GMM analysis, an additional test was performed using annual changes in \(RISK, SIZE, VLT\) and \(CAP\). In this model specification, \(REG\) takes the value of one in the RBC adoption year, while \(GDP\) remains as in the form of the difference. Overall, the different estimation models used in this paper are essential to ensure consistency of the results, and constitute a common procedure in empirical research.

**Variable measurements**

**Dependent variable.** Both Boyd and Runkle (1993) and Lu (2011) employed accounting measures and market data as proxies for risk taking, namely the standard deviation of return on assets (\(ROA\)) and standard deviation of stock returns. It is to note that risks exist in many forms and ranges, from liquidity to market risk and due to the difficulty in measuring risk, the use of a proxy is deemed to be appropriate (Baranoff et al., 2007). In this study, of greater concern is the insurance sector specific risk that arises from insurance underwriting. For the definition of underwriting risk, the ratio of health writings to total writings, as defined by Baranoff and Sager (2002) was not used in this study, simply because the companies sampled here included general business insurers. In other words, a risk proxy applicable for both general and life insurance was needed. Apart from this, the risk measure used here was not the normalised variance of the loss ratio, as employed by Lamm-Tennant and Starks (1993), mainly because the variance calculation, while usually an appropriate measure in other studies, would have seriously reduced the sample size to 44 observations and created a bias in the estimations. In the absence of a precise risk measurement, the risk definition in this study was conceptualised as the loss ratio instead of its variance. This definition is sensible as insurance companies would bear a higher risk if the loss ratio increases when paying the contractual financial claims to the party insured. Lamm-Tennant and Starks (1993) found that the loss ratio indicates the proportion of premium needed to cover the losses incurred. Traditionally, loss payment is the most fundamental risk that insurers
attempt to control and keep consistently low to safeguard solvency. In view of this, RISK is defined as the proportion of losses paid to premiums earned, adjusted for reinsurance recoveries. The risk proxy used here has the advantage of being simple to compute, and directly reflects the underwriting quality in terms of the screening process associated with adverse selection problems[1].

Explanatory variable. The main emphasis in this research is the effect of the firm’s size on risk taking. Using the TBTF hypothesis in the insurance sector, both company size and underwriting risk are assumed to be positively related. For the purpose of this study, the researchers emulated similar measures undertaken by Boyd and Runkle (1993), Lee (2008) and Lu (2011), just to name a few, and subsequently applied logarithm transformation on a company’s total assets from the year 2000 to 2010 as the measure of SIZE.

Control variables. Behr et al. (2010) identified an extensive list of control variables in their cross-country risk analysis, including the firm’s specific characteristics, macroeconomic factors, legal system efficiency and financial system development. It is reasonable, therefore to follow suit, and assume that these factors may impact the insurer’s risk taking. Grounded on this basis, the abovementioned factors were controlled in this study to isolate the impact of firm size on the insurance firm’s risk taking. The firm-specific control variable was capitalisation, while the cross-sectional invariant factors were GDP growth, the binary variable of RBC adoption and stock market volatility.

This study also included, as one of the most cited measurement (Behr et al., 2010; Iannota et al., 2007; Lindquist, 2003), the national GDP growth rate, GDP, in lieu of the fact that changes of macroeconomic factors may directly affect risk taking, since cyclical economic performance influences both the business cycle and company performance.

When examining the relationship between capital regulation and risk taking, Behr et al. (2010) pointed towards the legal dimension. A regulatory environment, according to Rime (2001), might systematically affect the observed risk in any given year. In the banking sector, to be precise, a regulatory environment is postulated to be the source of excess credit risk (Godlewski, 2006). Taking this into consideration, a dummy variable, REG was introduced in the regression model of this study, to account for the regulatory pressure to comply with RBC. It is equal to one for the post-implementation period of 2009-2010, while zero is for the period of 2000-2008, and generally shows how the insurance industry reacts to the RBC requirement. The expected sign, however, is a non-directional one. On one hand, the RBC standard creates pressure on poorly capitalised firms to reduce risk taking to enable them to achieve a capital level that commensurates with the risk taken. In this way, they can avoid regulatory costs. On the other hand, the imposition of the RBC standard may induce more risk taking among
well-capitalised firms; given the room and space they have in terms of a capital buffer to absorb additional risks. Hence, the effect of \textit{REG} can be either positive or negative.

As a measure of stock market risk, Cummins and Sommer (1996) introduced the change of an intra-year stock market return volatility in their risk function. It is believed that the unanticipated investment shock may temporarily change not only the assets portfolio, but also the underwriting behaviour in this study. For this reason, \textit{VLT} was measured by the annualised standard deviation of the monthly change in the KLCI, and entered in the risk equation to capture the stock market effect. Table II provides the definition of the variables identified in this study.

**Empirical results**

*Descriptive analysis*

Table III shows the summary of statistics of the insurance companies sampled for the period of 2000-2010. The readings for \textit{RISK}, \textit{CAP}, \textit{SIZE}, \textit{GDP} and \textit{VLT} were averaged over the sample period, while \textit{REG} was the dummy for the post-implementation period of RBC.

As reported in Table III, \textit{RISK} indicated a mean of 53.16 percent (median = 54.46 percent) with a standard deviation of 18.53 percent. This infers that slightly more than half of the premium earned was paid for by insurance claims. The maximum (minimum) \textit{RISK} was 329.34 percent (6.93 percent). \textit{SIZE}, defined as the

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{RISK}</td>
<td>Underwriting risk</td>
<td>The proportion of losses incurred to premiums earned</td>
</tr>
<tr>
<td><strong>Independent variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{SIZE}</td>
<td>Firm size</td>
<td>The natural logarithm of total assets</td>
</tr>
<tr>
<td><strong>Control variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{CAP}</td>
<td>Capital level</td>
<td>The ratio of shareholder’s equity to total assets</td>
</tr>
<tr>
<td>\textit{GDP}</td>
<td>Gross domestic product growth rate</td>
<td>The real GDP growth rate</td>
</tr>
<tr>
<td>\textit{REG}</td>
<td>Regulation</td>
<td>A binary variable 1 for the RBC post-implementation period, 2009-2010</td>
</tr>
<tr>
<td>\textit{VLT}</td>
<td>Stock market volatility</td>
<td>The annualised standard deviation of the monthly change in KLCI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{RISK} (%)</td>
<td>53.16 (54.46)</td>
<td>18.53</td>
<td>6.93</td>
<td>329.34</td>
</tr>
<tr>
<td>\textit{SIZE} (logarithm)</td>
<td>13.72 (13.34)</td>
<td>1.28</td>
<td>7.79</td>
<td>17.71</td>
</tr>
<tr>
<td>\textit{CAP} (%)</td>
<td>28.71 (30.04)</td>
<td>18.89</td>
<td>1.29</td>
<td>97.00</td>
</tr>
<tr>
<td>\textit{GDP} (%)</td>
<td>4.66 (5.30)</td>
<td>2.76</td>
<td>-1.70</td>
<td>8.50</td>
</tr>
<tr>
<td>\textit{VLT} (index)</td>
<td>81.59 (63.81)</td>
<td>47.83</td>
<td>22.82</td>
<td>190.81</td>
</tr>
</tbody>
</table>

**Notes:** \textit{RISK} is the loss to premium earned, \textit{SIZE} is the natural logarithm of firm’s total assets, \textit{CAP} is the total shareholder equity to total assets, \textit{GDP} is the Malaysian annual gross domestic product growth rate, \textit{VLT} is the annual standard deviation of KLCI, based on the monthly market returns; reported in parentheses is median.
natural logarithm of total assets, had a mean (median) of 13.72 (13.34) with a standard deviation of 1.28. The smallest size among insurance companies was 7.79 whereas the largest was 17.71. A substantial cross-sectional difference in the size of firms appeared evident during the sample period.

CAP was measured by shareholder equity over total assets. The average (median) CAP for the dataset was 28.71 percent (30.04 percent), with a standard deviation of 18.89 percent. The capital level ranged from a minimum of 1.29 percent to a maximum of 97.00 percent. Averaging out the annual GDP growth rate for the reference period, the mean was 4.66 percent (median = 5.30 percent) with a standard deviation of 2.76 percent. The highest growth rate was 8.50 percent while the Malaysian economy achieved a contraction, at −1.70 percent during the year 2009. This reflects that the change of aggregate outputs and the business cycle in general have been affected by externality shocks, such as the 2008 sub-prime mortgage credit crunch and the turmoil in some European countries like Spain and Greece. VLT, which was measured as the annualised standard deviation of the monthly changes of KLCI, ranged from a minimum of 22.82 to a maximum of 190.81 with a mean of 81.59 (median = 63.81). The highest volatility coincided with the US sub-prime mortgage credit crunch in 2008.

Correlation and multicollinearity analysis

The Pearson’s correlation analysis was conducted to investigate the relationship between variables. The results in Table IV depicted a negative correlation between SIZE and RISK, \( r = -0.16, p < 0.01 \). CAP and RISK were strongly correlated, \( r = 0.17, p < 0.01 \) as expected, thereby reiterating the notion that better capitalisation provided a higher capacity to absorb risks; hence, well-capitalised companies were found to be associated with higher risks. The correlation between VLT and RISK was statistically insignificant, \( r = 0.04, p > 0.10 \), and similarly the association between GDP and RISK was negative but insignificant, \( r = -0.04, p > 0.10 \).

Apart from the correlation analysis, the results in Table IV could be inferred as there were no serious cases of multicollinearity among the variables. Among all the correlation coefficients, the relationship between SIZE and CAP was the highest at −0.78, slightly less than the 0.80 threshold (Gujarati, 1995).

Regression analysis: the fixed effects and random effects approaches

The firm size effect was estimated by regressing underwriting risk on the firm size and other firm and macroeconomic-specific characteristics. Based on the TBTF theory, it was predicted that a larger-sized company had the incentive to engage in higher risk taking due to the moral hazard issue. The analysis results based on the fixed effects and random effects models are presented in Table V.

<table>
<thead>
<tr>
<th>Variables</th>
<th>RISK</th>
<th>SIZE</th>
<th>CAP</th>
<th>GDP</th>
<th>VLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISK</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>−0.16 ***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAP</td>
<td>0.17 ***</td>
<td>−0.78 ***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>−0.04</td>
<td>−0.09</td>
<td>0.06</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>VLT</td>
<td>0.13</td>
<td>0.12</td>
<td>−0.07</td>
<td>−0.25 ***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table IV.
Correlation matrix for non-dummy variables

Note: Significant at: *10, **5 and ***1 percent levels
Column 1 in Table V portrays the fixed effects estimation results. The $R^2$ was 0.09, implying that 9.00 percent of the dependent variable variation was explained by the explanatory variables identified. Although it is undeniable that the model fit of this regression was relatively poor, the results were, however, very close to the ordinary least square estimation of Lu (2011), ranging from a minimum 9.30 percent to a maximum of 13.50 percent. These results revealed that the effect of firm size on underwriting risk was significant, $b = 3.39, p < 0.05$, suggesting that there was a positive relationship between firm size and underwriting risk. This finding contrasts with the correlation analysis presented earlier as well as several other empirical works, particularly those of Altunbas et al. (2007), who found a negative relationship between asset size and risk level, and Pais and Stork (2011), who observed that bank size had little impact on risk. Nonetheless, the positive sign for $SIZE$ in this study is consistent with Baranoff and Sager (2002), Cummins and Sommer (1996) and Shrieves and Dahl (1992), to name a few, who concluded that firm size and risk level are positively related. Likewise, $VLT$ ($b = 0.05, p < 0.01$) was positive and statistically significant at the 0.01 level. In their research which revealed a similar finding, Cummins and Sommer (1996) stipulated that stock market volatility influences insurance firms to take on more risk. In the fixed effects model, $CAP$, $GDP$, $REG$ were found to be positive but insignificant. Overall, column 1 in Table V indicates that $SIZE$ and $VLT$ were important factors in the explanation of underwriting risk.

Column 2 in Table V presents coefficient estimates from the random effects specification. Similarly, although $SIZE$ had a positive sign, it was insignificant, $b = 1.26, p > 0.10$. $VLT$ ($b = 0.05, p < 0.01$) was consistently positive and statistically significant at the 0.01 level. $REG$, on the other hand was found to be positively related to $RISK$, $b = 5.46, p < 0.05$, implying that underwriting risk was higher after the adoption of the RBC standard.

**System GMM analysis and robustness testing**

As mentioned earlier in the discussion on methodology and variables, the endogeneity bias warrants an investigation on the relationship between firm size and risk taking using the system GMM analysis. Column 1 in Table VI depicts the results based on the system GMM analysis for corporate size. It indicates that the analysis satisfied two requirements in GMM estimation – instruments exogeneity and no serial correlation.
The statistically insignificant Sargan’s statistic, 40.73, suggested that the instruments were exogenous in this model[2]. In addition to this, the Arellano-Bond test statistic for second order autocorrelation, 0.43 was not significant, implying no second order autocorrelation in the differenced residuals. Again, SIZE was statistically significant as a predictor with a positive sign, \( b = 1.46, p < 0.01 \). The coefficient on CAP was also positive but statistically insignificant, while GDP \( (b = 0.28, p < 0.01) \), VLT \( (b = 0.02, p < 0.01) \) and REG \( (b = 2.13, p < 0.01) \) were all positive and statistically significant at the 0.01 level.

Column 2 in Table VI presents the empirical results of the system GMM analysis using annual changes in RISK, SIZE, CAP and VLT. Similarly, there was no indication of instrument invalidity as the Sargan’s statistic was insignificant at 36.71. The Arellano-Bond AR(2) statistic was 0.53 but insignificant, providing no evidence of second-order serial correlation in this specification. In general, the results broadly resemble the outputs of those reported in column 1 of Table VI. The changes in SIZE and RISK were positively related and significant, \( b = 0.20, p < 0.01 \); while the coefficient of change in CAP was 0.02, and statistically significant at the 0.05 level. This perhaps compounds the theory that insurance companies with better capitalisation are more prone to take higher risks (Altunbas et al., 2007; Cummins and Sommer, 1996). The effects of REG \( (b = 0.11, p < 0.01) \), GDP \( (b = 0.02, p < 0.01) \) and changes in VLT \( (b = 0.14, p < 0.01) \) were all significant, indicating that external environment factors have an influence on a firm’s risk taking.

In general, the comparison of the regression outcomes suggests a consistent positive relationship between firm size and risk taking. These findings indicate that firms larger in size take on more risk. The TBTF policy has, perhaps, the unintended effect that would encourage companies to exploit risk-shifting benefits. The positive relationship between corporate size and risk taking found in this study is consistent with the findings of Barrell et al. (2011a), Lee (2008) and Cummins and Sommer (1996), who focused on the banking sector and insurance industry, respectively.

<table>
<thead>
<tr>
<th>Variables</th>
<th>System GMM (RISK) 1</th>
<th>System GMM (ΔRISK) 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISK(_t-1)</td>
<td>0.51*** (0.03)</td>
<td>0.11*** (0.01)</td>
</tr>
<tr>
<td>SIZE</td>
<td>1.46*** (0.01)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>CAP</td>
<td>0.04 (0.04)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>VLT</td>
<td>0.02*** (0.01)</td>
<td>0.08*** (0.01)</td>
</tr>
<tr>
<td>REG</td>
<td>2.13*** (0.87)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>GDP</td>
<td>0.28*** (0.09)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>ΔRISK(_t-1)</td>
<td>0.08*** (0.01)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>ΔSIZE</td>
<td>0.20*** (0.08)</td>
<td>0.14*** (0.01)</td>
</tr>
<tr>
<td>ΔCAP</td>
<td>0.02*** (0.01)</td>
<td>0.02*** (0.01)</td>
</tr>
<tr>
<td>ΔVLT</td>
<td>0.14*** (0.01)</td>
<td>0.14*** (0.01)</td>
</tr>
<tr>
<td>CONS</td>
<td>4.35 (6.61)</td>
<td>0.10*** (0.01)</td>
</tr>
</tbody>
</table>

Note: Significant at: *10, **5 and ***1 percent levels

Table VI.
A system GMM regression analysis

The statistically insignificant Sargan’s statistic, 40.73, suggested that the instruments were exogenous in this model[2]. In addition to this, the Arellano-Bond test statistic for second order autocorrelation, −0.43 was not significant, implying no second order autocorrelation in the differenced residuals. Again, SIZE was statistically significant as a predictor with a positive sign, \( b = 1.46, p < 0.01 \). The coefficient on CAP was also positive but statistically insignificant, while GDP \( (b = 0.28, p < 0.01) \), VLT \( (b = 0.02, p < 0.01) \) and REG \( (b = 2.13, p < 0.01) \) were all positive and statistically significant at the 0.01 level.

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Discussion

Excessive risk taking can be destructive to the financial system as well as the economy of a country. With this in mind, this study is motivated to examine how insurance firm size is related to risk taking, particularly underwriting risk, in the developing economy of Malaysia. Underwriting risk, represented by the loss ratio, is reported to be positively related to insurance firm size. This finding is consistent with prior studies and the hypothesis that risk level increases when the company size is larger. More specifically, the moral hazard theory predicts that the TBTF doctrine distorts market discipline and leads to excessive risk taking due to the certainty of possible bailouts. As a result, a firm would most likely be a greater risk-taker and engage in expansion activities to achieve a larger size, in order to be entitled to a government bailout should the need arise.

Given these findings and other regulatory concerns, several recommendations were made in this study to minimize the negative impacts of excessive risk taking in relation to size. Since it is not easy to determine the correct size threshold, capping the size of a firm is not always the best regulatory response. Recognizing this, it is important to distinguish between the safest and riskiest insurance company across the category of firm size through periodic monitoring. The risk disclosure, in addition to other supervisory information should be made more readily accessible to the public on a regular basis. With this measure in place, not only will there be a more timely identification of high risk activities, market discipline will also limit the opportunities for risky firms to conduct moral hazard activities. Such irregularities that arise at the firm level must then prompt a series of regulatory and corrective action to address the adversities. Next, the approval of M&As must be totally justifiable, subject to more stringent requirements. Regulatory bodies must exert significant effort and time towards understanding the motivations of M&As and examine the potential benefits of such moves. While in most cases, M&As offer a number of strategic benefits like risk diversification, higher efficiency and economies of scale and scope, the positive association between firm size and risk taking evidenced in this study does cast a shadow of doubt on those purported benefits. It is a challenge indeed but without thorough examination, sector consolidation will create giant companies that would be a threat to the economy based on the TBTF theory. It is imperative, therefore, that supervisory bodies leave no stones unturned when weighing the overall synergistic effects of establishing firms which are too big to fail.

Notes

1. It is important to note that our definition however may not capture full complexities of insurance business.
2. It is important to confirm that the instruments are uncorrelated with the error terms.

References


**Further reading**


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