Influence of Capital Structure and Operational Risk on Profitability of Life Insurance Industry in Taiwan

Jian-Shen Chen
Professor
Department of Insurance
Chaoyang University of Technology, Taiwan, ROC
No. 168, Jifong E. Rd., Wufong Township, Taichung County 41349, Taiwan, ROC.

Mei-Ching Chen
Associate Professor
Department of Business Administration
Chaoyang University of Technology, Taiwan, ROC
No. 168, Jifong E. Rd., Wufong Township, Taichung County 41349, Taiwan, ROC.
Tel: 886-4-23323000 ext. 4202
Fax: 886-4-23742331
E-mail: mcchen@mail.cyut.edu.tw.

Wen-Ju Liao
Graduate Student for Ph.D Program
International Business Studies, National Chi Nan University
No. 1, University Road, Puli Nantou 545, Taiwan, R.O.C.

Tsung-Hsien Chen
Instructor
Department of Insurance
Chaoyang University of Technology, Taiwan, ROC
No. 168, Jifong E. Rd., Wufong Township, Taichung County 41349, Taiwan, ROC.
Influence of Capital Structure and Operational Risk on Profitability of Life Insurance Industry in Taiwan

Abstract

Purpose- The solvency of insurance companies is closely related to the policyholders, and consequently regulators in Taiwan pay considerable attention to this area. Several studies have demonstrated a close correlation among capital structure, operational risk and profitability. This study provides evidence regarding the influence of capital structure and operational risk on profitability of life insurance industry in Taiwan.

Design/methodology/approach- Structural equation modeling, which involves factor-analysis and path-analysis, is used to justify the relationship among capital structure, operational risk and profitability. Additionally, adding the macroeconomic latent variable to the model as a control variable demonstrates that the macroeconomic latent variable positively influences capital structure, operational risk and profitability.

Findings- This study leads to four key findings. First, according to the empirical result, the research model has excellent goodness-of-fit. That is to say, using multiple financial indexes suitably measures the specific financial factors. Second, the capital structure exerts a negative and significant effect on operational risk. Third, there is no reciprocal relationship but a one-way effect between capital structure and operational risk. Fourth, the operational risk exerts a negative and significant effect on profitability.

Practical implications- The empirical result shows the profitability decreased with the higher equity ratio. Hence, the regulatory organizations must urge insurance companies to effectively diversify their investments and employ risk avoidance strategies. Effective use of hedging and diversifying will help to divide risk and create financial revenue.

Original / value- This study proposes that the government loosen investment restrictions and develop other instruments to assist RBC in checking the financial condition of insurance companies.

Keywords: capital structure, operational risk, profitability, structure equation model.
1. Introduction

The depressed economic situation and declining market interest rates significantly affect the operations of financial services, particularly the insurance industry. Insurance companies face financial crises when the underwriting capacity is reduced and the interest risk increases. The solvency of insurance companies is closely related to policyholders, and consequently policyholders have become the focus of considerable attention by regulators in Taiwan.

Modigliani and Miller (1958, 1963) indicated that firm value is unrelated to capital structure and stimulated considerable discussion of this subject. Several studies found a close correlation among capital structure, operational risk and profitability. In Taiwan, Changchieh (2000) and Lin (2003) considered that operational risk influences capital structure. Several experts noted that the interrelationships between capital structure and operational risk exist in the operations of the insurance industry (see Cummins and Sommer, 1996; Chen and Tsai, 2002; Chen, Chen and Lin., 2004). Furthermore, the recent research found that there were both positive and negative effects of capital structure on the profitability of the insurance companies.

Chen, Chen and Lin (2004) provided evidence that the impact of capital structure and risk on profitability for property-liability industry using by structural equation model. In general, the operational risk of property-liability industry focuses on the underwriting risk and the level of hedge. There is a significant difference between property-liability industry and life insurance industry. Hence, this study examines the influence of capital structure and operational risk on profitability of life insurance industry in Taiwan using a structural equation model (SEM) that involves factor-analysis and path-analysis statistical techniques. The model includes the macroeconomic latent variable in the model as a control variable, and then justifies the relationship among capital structure, operational risk and profitability. Based on the empirical results, this study provides some suggestions for the regulation of insurance industry in Taiwan. The remainder of this paper is organized as follows. Section 2 develops a framework for testing and verifying the relationship among capital structure, operational risk and profitability for life insurance industry in Taiwan. Section 3 then describes the data and empirical methodology. Next, section 4 presents the empirical results. Finally, section 5 details the conclusions.

2. Framework

Capital structure describes the ratio of debt to equity in a company. This study examines the influence of capital structure and operational risk on the profitability of life insurance industry in Taiwan. This study attempts to build a research model by examining the problems arising from previous studies.
2.1 Hypotheses and Variables

Modigliani and Miller (1958) argued that the capital structure of a firm is irrelevant to the firm's value, assuming perfect markets and zero transaction costs. Modigliani and Miller (1963) showed the impact of corporate income taxes on the capital structure of a firm and found that firms will increase their use of debt to exploit the tax deductibility of interest. However, higher debt financing increases the probability of bankruptcy. Market equilibrium must exist in which the benefit of using debt-financing equals increased risk of bankruptcy owing to the high leverage of firms. Additionally, Staking and Babbel (1995) supported the hypothesis found by Modigliani and Miller. Jou (1999) found the value of a firm initially increasing with financial leverage and then falling with financial leverage. Chen, Chen and Lin (2004) have used SEM to test and verify the relationship among capital structure, risk and profitability of property-liability insurance industry in Taiwan. They found that there were both positive and negative influences of capital structure on profitability. Furthermore, finance theory maintains that firm value is determined by the discounted present value of cash flow. Therefore, the following hypothesis is developed:

H1: Capital structure positively influences the profitability of the life insurance industry in Taiwan.

Two important influences on insurance company solvency are capital structure and operational risk. Chen and Tsai (2002) collected information from all of the life insurance companies operating in the United States in 1997, and then used the two stage least squares method to estimate the relationship between capital structure and risk. Their analytical results are the same as the study of Cummins and Sommer (1996). In Taiwan, Changchien (2000) found a positive relationship between the insurance disclosure and the liability ratio. Lin (2003) found that there was a simultaneous and causal influence of risk and premium on firm capital strategies in the property-liability insurance industry in Taiwan. In addition, Lin used the vector autoregression method to demonstrate the negative relationship between liability ratio and risk. Therefore, this study develops the second hypothesis:

H2: A negative relationship exists between capital structure and operational risk in the life insurance industry in Taiwan.

Cummins and Harrington (1988) used the CAPM model to examine the property-liability insurance industry, and subsequently found a significant relationship between the expected return and systematic risk and unsystematic risk. When insurance companies encounter increasing operational risk, it becomes necessary for policyholders to pay increased risk premiums due to the increased probability of financial crisis. Jensen and Meckling (1976) also indicated that the
agency cost would reduce a firm’s value. Lai, Lu and Wu (1999) demonstrated the financial index of the property-liability insurance industry from 1992 to 1996 in Taiwan and found that the company had long-term strong solvency with higher operational performance. Lin and Huang (2002) used the option-based valuation model to develop a surplus valuation model for property-liability insurance industry in Taiwan and further demonstrated that a much lower surplus is achieved if the associated catastrophe risk comprises systematic components. Additionally, Liu (2003) used the SEM to test and verify the relationships among industry structure, business strategy and profitability. The evidence suggests that larger life insurance companies may adopt a conservative strategy of pursuing gradual growth in Taiwan. However, the conservative strategy generally has problems dealing with dynamic markets. Consequently, if a major change occurs in the investment environment, the larger scale insurers will suffer major losses. Therefore, this study develops the third hypothesis:

H3: Operational risk negatively influences the profitability of the life insurance industry in Taiwan.

Many experts have discussed the influence of macroeconomic factors on the operations of insurance industry in Taiwan using economic models. Chan (1997) and Wang (1999) demonstrated that macroeconomic factors lead the policy lapse rate to rise in the life insurance industry. Chen (1999) employed the vector autoregression model to examine the interrelationship among the effective premium, national income, consumer price index, the economic growth rate and expenditure on medical treatment and health protection. Chen (2002), Chu (2002) and Chen (2001) confirmed that a relationship exists among macroeconomic factors and premium receipts in the life insurance industry. The above results show that the macroeconomic variables truly influence the operations of insurance industry in Taiwan. Bykerk and Thompson (1979) analyzed the effect of policy loans on policyholders and companies and found a positive relationship between the rates of commercial paper and policy loans. Additionally, Mark, James and Robert (1999) applied Poisson regression to identify the influence of exogenous factors, including interest, real estate and stock return, rate of unemployment and the number of insurance companies facing probable bankruptcy in the industry.

This study chooses the observed variables for each latent variable based on the studies mentioned above. Table 1 lists the formulas of each variable. However, market conditions clearly are continually changing (see Figure 1). To avoid obtaining incorrect results in this research model, this study adds the macroeconomics latent variable into the model as a control variable.
Table 1: Variables Definitions

<table>
<thead>
<tr>
<th>Latent Variables</th>
<th>Observed Variables</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomics($\xi_0$)</td>
<td>Economic growth rate ($\xi_1$)</td>
<td>$(GDP_t - GDP_{t-1})/GDP_{t-1}$, where $GDP$ respects Real Gross Domestic Product</td>
</tr>
<tr>
<td></td>
<td>Inflation rate ($\xi_2$)</td>
<td>$(CPI_t - CPI_{t-1})/CPI_{t-1}$, where $CPI$ respects Consumer Price Index.</td>
</tr>
<tr>
<td></td>
<td>Unemployment rate ($\xi_3$)</td>
<td>The number of unemployed population is divided by the number of employed population.</td>
</tr>
<tr>
<td>Capital Structure ($\eta_0$)</td>
<td>Liability ratio ($\eta_1$)</td>
<td>Total liabilities is divided by total assets</td>
</tr>
<tr>
<td></td>
<td>Equity ratio ($\eta_2$)</td>
<td>Shareholders’ equity is divided by total assets</td>
</tr>
<tr>
<td></td>
<td>Reserve-to-liability ratio ($\eta_3$)</td>
<td>The reserve is divided by total liabilities</td>
</tr>
<tr>
<td>Operational Risk ($\eta_0$)</td>
<td>Portfolio concentration ($\eta_4$)</td>
<td>$\sum (\text{The investment of } k/\text{total investments})^2$</td>
</tr>
<tr>
<td></td>
<td>Insurance leverage ($\eta_5$)</td>
<td>The reserve is divided by shareholders’ equity.</td>
</tr>
<tr>
<td>Profitability ($\eta_0$)</td>
<td>Profit margin ($\eta_6$)</td>
<td>The profit before tax is divided by total revenue.</td>
</tr>
<tr>
<td></td>
<td>Return on assets ($\eta_7$)</td>
<td>The net income is divided by total assets.</td>
</tr>
</tbody>
</table>

Note: ER indicates the economic growth rate; IR indicates the inflation rate; UR indicates the unemployment rate.

Figure 1: Macroeconomic variables observed during the period 1993 to 2003.
2.2 Theoretical Model

The theoretical model (original model) includes an exogenous latent variable and three endogenous latent variables. The exogenous latent variable is a macroeconomic variable reflected by three observed variables. The macroeconomic latent variable includes the economic growth rate \( (x_1) \), the inflation rate \( (x_2) \) and the unemployment rate \( (x_3) \). The model employs three endogenous latent variables, including capital structure \( (\eta_1) \), operational risk \( (\eta_2) \) and profitability \( (\eta_3) \). Capital structure is reflected by liability ratio \( (y_1) \), equity ratio \( (y_2) \) and reserve-to-debt ratio \( (y_3) \); meanwhile, operational risk is reflected by portfolio concentration \( (y_4) \) and insurance leverage \( (y_5) \); finally, profitability is reflected by profit margin \( (y_6) \) and return on assets \( (y_7) \). Therefore, the theoretical model is shown in Fig.2.

![Diagram](image)

Figure 2: Theoretical Model

3. Empirical Methodology

3.1 Data

Data for the empirical analysis is obtained from the “Annual report on the life insurance industry, Republic of China” published by the Life Insurance Association of the Republic of China,
and the statistical database of the Department of Statistics, Ministry of Economic Affairs. This study observes the local life insurance industry in Taiwan from 1993 to 2003. To minimize the possibility of biased results, only firms for which data is available throughout the sample period are included. After deleting missing values and incomplete data, the sample includes a total of 13 insurance companies.

3.2 Structural equation modeling

The structural equation model minimizes the difference between the sample covariance and the predicted covariance, which is capable of defining the relationship between the observed and latent variables, and also the interaction among the latent variables. Therefore, this study uses SEM with the SPSS AMOS 4.0 statistics software. Additionally, SEM comprises measurement and structural equations, with the former being used to describe the relationship between the observed and latent variables, and the latter being used to analyze the causality among the latent variables. The measurement equation comprises two parts, and the corresponding mathematical model can be specified as follows (Huang, 2003):

\[
y = \Lambda_y \eta + \epsilon
\]
\[
x = \Lambda_x \xi + \delta
\]

where, \( y_{(px1)} \): vector of endogenous observed variables, 
\( x_{(qx1)} \): vector of exogenous observed variables, 
\( \eta_{(mx1)} \): vector of endogenous latent variables, 
\( \xi_{(nx1)} \): vector of exogenous latent variables, 
\( \Lambda_{y(pxm)} \): coefficient matrix relating \( y_{(px1)} \) to \( \eta_{(mx1)} \), 
\( \Lambda_{x(qnx)} \): coefficient matrix relating \( x_{(qx1)} \) to \( \xi_{(nx1)} \), 
\( \epsilon_{(px1)} \): measurement error vector for \( y_{(px1)} \), 
\( \delta_{(qx1)} \): measurement error vector for \( x_{(qx1)} \).

As for the structure equation, the corresponding:

\[
\eta = B \eta + \Gamma \xi + \zeta
\]

where, \( B_{(mxx)} \): coefficient matrix for \( \eta_{(mx1)} \),
\( \Gamma_{(mxx)} \): coefficient matrix for \( \xi_{(nx1)} \),
\( \zeta_{(mxx)} \): latent error vector in equations.
With the following assumptions:

(1) \( E(\varepsilon) = E(\delta) = E(\zeta) = 0 \).

(2) \( \eta \) is uncorrelated with \( \varepsilon \).

(3) \( \xi \) is uncorrelated with \( \delta \).

(4) \( \eta \) is uncorrelated with \( \zeta \).

(5) \( \varepsilon, \delta \) and \( \zeta \) are mutually uncorrelated.

(6) \((I - B)\) is nonsingular.

The two methods most often used for estimating SEM are generalized least square (GLS) and maximum likelihood (ML). Both of these methods should satisfy the normality assumption. If data size is small, GLS outperforms ML. This study uses the GLS method because the data size is 143. Seven criteria exist for measuring the goodness of fit of the specified model: (1) \( \chi^2 \) value: Goodness of fit increases with decreasing score, but is affected by sample size. (2) GFI (Goodness of Fit Index) value: a value between 0 and 1, with the nearness of the value to one indicating increased goodness of fit. GFI resembles the \( R^2 \) value used in multi-regression. (3) AGFI (Adjusted Goodness of Fit Index) value: Similar to the \( \overline{R}^2 \) value used in multi-regression, AGFI can be used to compare with each different degree of freedom model. (4) RMSEA (Root-Mean-Square Error of approximation) value: This variable has a value between 0 and 1, and a numerical value below 0.5 reflects a better goodness of fit. (5) CFI (Comparative of Fit Index) value: This variable has a value between 0 and 1, with a value closer to 1 reflecting a better goodness of fit. (6) AIC (Akaike Information Criterion) value: This variable can be used to compare models, and an AIC value closer to 0 reflects a better goodness of fit. (7) Stability value: This variable is used to judge the stability of a non-recursive model. A stability value closer to 0 indicates a stable model. Accordingly, there are seven exogenous observed variables. The measurement and structure equations are shown below:

\[
\begin{bmatrix}
    y_1 \\
    y_2 \\
    y_3 \\
    y_4 \\
    y_5 \\
    y_6 \\
    y_7 \\
    x_1 \\
    x_2 \\
    x_3
\end{bmatrix} = \begin{bmatrix}
    \lambda_{y_1} & 0 & 0 & 0 \\
    0 & \lambda_{y_2} & 0 & 0 \\
    0 & 0 & \lambda_{y_3} & 0 \\
    0 & \lambda_{y_4} & 0 & 0 \\
    0 & \lambda_{y_5} & 0 & 0 \\
    0 & 0 & \lambda_{y_6} & 0 \\
    0 & 0 & 0 & \lambda_{y_7} \\
    0 & 0 & 0 & \lambda_{x_1} \\
    0 & 0 & 0 & \lambda_{x_2} \\
    0 & 0 & 0 & \lambda_{x_3}
\end{bmatrix} \begin{bmatrix}
    \eta_1 \\
    \eta_2 \\
    \eta_3 \\
    \eta_4 \\
    \eta_5 \\
    \eta_6 \\
    \eta_7 \\
    \xi_1 \\
    \xi_2 \\
    \xi_3
\end{bmatrix} + \begin{bmatrix}
    \varepsilon_1 \\
    \varepsilon_2 \\
    \varepsilon_3 \\
    \varepsilon_4 \\
    \varepsilon_5 \\
    \varepsilon_6 \\
    \varepsilon_7 \\
    \sigma_1 \\
    \sigma_2 \\
    \sigma_3
\end{bmatrix}
\]
4. Empirical Results

4.1 Goodness-of-fit measures

This study uses seven criteria to assess the goodness of fit of the specified model (see Table 3). The model estimates are listed in Tables 4 and 5. As mentioned earlier, the goodness of fit increases with the closeness of GFI, AGFI and CFI relative to 1. Each research method used must satisfy several assumptions, and thus the results are believable. The basic assumptions of SEM include: (1) sufficient sample size, (2) multivariate normality, (3) correct model specification, (4) simple random sampling and (5) non-systematic missing value. First, SEM has no sample size criteria with the sample size depending on the characteristics of the sample data. Second, this study uses GLS, which must satisfy the assumption of multivariate normality. If the absolute value of skew were greater than 3 and the absolute value of kurtosis were greater than 10, the model would be against multivariate normality.

\[
\begin{bmatrix}
\eta_1 \\
\eta_2 \\
\eta_3
\end{bmatrix} =
\begin{bmatrix}
0 & \beta_{12} & 0 \\
\beta_{21} & 0 & 0 \\
\beta_{31} & \beta_{32} & 0
\end{bmatrix}
\begin{bmatrix}
\eta_1 \\
\eta_2 \\
\eta_3
\end{bmatrix}
+ 
\begin{bmatrix}
\gamma_{11} \\
\gamma_{21} \\
\gamma_{31}
\end{bmatrix} + 
\begin{bmatrix}
\zeta_1 \\
\zeta_2 \\
\zeta_3
\end{bmatrix}
\]

Table 2: Summary Statistics

<table>
<thead>
<tr>
<th>variable</th>
<th>mean</th>
<th>Standard deviation</th>
<th>skew</th>
<th>kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x_1$</td>
<td>0.0489</td>
<td>0.0257</td>
<td>-1.7943</td>
<td>2.5729</td>
</tr>
<tr>
<td>$x_2$</td>
<td>0.0142</td>
<td>0.0178</td>
<td>-0.0451</td>
<td>-1.1309</td>
</tr>
<tr>
<td>$x_3$</td>
<td>0.0304</td>
<td>0.0126</td>
<td>0.5190</td>
<td>-1.0248</td>
</tr>
<tr>
<td>$y_1$</td>
<td>0.7981</td>
<td>0.2646</td>
<td>-1.8922</td>
<td>2.3926</td>
</tr>
<tr>
<td>$y_2$</td>
<td>0.2014</td>
<td>0.2651</td>
<td>1.8828</td>
<td>2.3758</td>
</tr>
<tr>
<td>$y_3$</td>
<td>0.8577</td>
<td>0.2059</td>
<td>-2.5425</td>
<td>6.2069</td>
</tr>
<tr>
<td>$y_4$</td>
<td>0.0597</td>
<td>0.0437</td>
<td>1.0463</td>
<td>1.5909</td>
</tr>
<tr>
<td>$y_5$</td>
<td>17.9655</td>
<td>92.3823</td>
<td>11.4402</td>
<td>134.6596</td>
</tr>
<tr>
<td>$y_6$</td>
<td>-0.0606</td>
<td>0.1919</td>
<td>-2.2766</td>
<td>7.5266</td>
</tr>
<tr>
<td>$y_7$</td>
<td>-0.0365</td>
<td>0.0961</td>
<td>-2.5527</td>
<td>7.2983</td>
</tr>
</tbody>
</table>

Owing to the insurance leverage ($y_3$) exceeding the normal range, the variable is eliminated and a new estimate is made. The model is continuously modified until it is considered acceptable. Deleting liability ratio ($y_1$) and insurance leverage ($y_5$) resulted in a modified model. For the modified model, $\chi^2(16)=20.059$, \textit{p-value} (0.218) is greater than 0.05, GFI=0.965, AGFI=0.921, CFI=0.975, RMSEA=0.042 and AIC=60.059, all index values indicate that the modified model is
acceptable. Therefore, the model used in this study has excellent goodness of fit (see Table 3).

Table 3: Goodness of Fit Measure

<table>
<thead>
<tr>
<th></th>
<th>original model</th>
<th>modified model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$ ($df$)</td>
<td>$\chi^2_{(29)} = 45.087$</td>
<td>$\chi^2_{(16)} = 20.059$</td>
</tr>
<tr>
<td>$p$-value</td>
<td>0.029</td>
<td>0.218</td>
</tr>
<tr>
<td>GFI</td>
<td>0.936</td>
<td>0.965</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.88</td>
<td>0.921</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.063</td>
<td>0.042</td>
</tr>
<tr>
<td>CFI</td>
<td>0.913</td>
<td>0.975</td>
</tr>
<tr>
<td>AIC</td>
<td>97.087</td>
<td>60.059</td>
</tr>
<tr>
<td>stability</td>
<td>0.098</td>
<td>0.01</td>
</tr>
</tbody>
</table>

![Figure 3: Modified Model](image)

Figure 3: Modified Model
4.2 Relationship between latent variables and observed variables

The identification problem in the model which the latent variable is measured by few observed variables is easy to have an under-identified result, i.e. the model has more parameters than data, and it cannot be uniquely estimated. It can solve this problem by setting the relationship between latent variables and one of observed variables to 1. Therefore, this study sets $\lambda_{x1}$, $\lambda_{y2}$, $\lambda_{y4}$ and $\lambda_{y6}$ equal to 1. The analytical results demonstrate that all of the observed variables significantly reflect the latent variable. The economic growth rate and inflation rate positively affect macroeconomics. However, the unemployment rate negatively affects macroeconomics. Additionally, the equity ratio positively affects capital structure. The reserve-to-liability ratio negatively affects capital structure. Operational risk increases with portfolio concentration. Furthermore, profitability increases with profit margin and return on assets.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda_{x1}$</td>
<td>0.829</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{x2}$</td>
<td>0.953</td>
<td>0.804</td>
<td>0.055</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{x3}$</td>
<td>-0.924</td>
<td>-0.550</td>
<td>0.041</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{y2}$</td>
<td>0.965</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{y3}$</td>
<td>-0.898</td>
<td>-0.716</td>
<td>0.054</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{y4}$</td>
<td>0.969</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{y6}$</td>
<td>0.986</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\lambda_{y7}$</td>
<td>0.867</td>
<td>0.441</td>
<td>0.023</td>
<td>0.000***</td>
</tr>
</tbody>
</table>

Notes: The symbol “***” indicates that the correlation coefficient is statistically significant at a significance level of 0.01. “**” indicates that the correlation coefficient is statistically significant at a significance level of 0.05. “*” indicates that the correlation coefficient is statistically significant at a significance level of 0.1.

4.3 Relationship among latent variables

This study takes the macroeconomic latent variable as the control variable. The relationship between macroeconomics and operational risk is fixed in this study. The results demonstrate that macroeconomics significantly and positively influence capital structure and operational risk (see Table 5). Based on the results, the capital structure exerts a negative and significant effect on
operational risk and profitability. Additionally, operational risk exerts a significant and negative effect on profitability.

### Table 5: Estimated Parameters of the Structure Equation

<table>
<thead>
<tr>
<th>parameter</th>
<th>standardized estimator</th>
<th>estimator</th>
<th>standard error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_{11}$</td>
<td>0.558</td>
<td>6.753</td>
<td>1.380</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\gamma_{21}$</td>
<td>0.529</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\gamma_{31}$</td>
<td>0.081</td>
<td>0.723</td>
<td>1.061</td>
<td>0.496</td>
</tr>
<tr>
<td>$\beta_{21}$</td>
<td>-0.379</td>
<td>-0.059</td>
<td>0.027</td>
<td>0.026**</td>
</tr>
<tr>
<td>$\beta_{31}$</td>
<td>-0.442</td>
<td>-0.324</td>
<td>0.085</td>
<td>0.000***</td>
</tr>
<tr>
<td>$\beta_{12}$</td>
<td>-0.026</td>
<td>-0.167</td>
<td>1.131</td>
<td>0.882</td>
</tr>
<tr>
<td>$\beta_{32}$</td>
<td>-0.175</td>
<td>-0.825</td>
<td>0.466</td>
<td>0.076*</td>
</tr>
</tbody>
</table>

Notes: The symbol “***” indicates that the correlation coefficient is statistically significant at a significance level of 0.01. “**” indicates that the correlation coefficient is statistically significant at a significance level of 0.05. “*” indicates that the correlation coefficient is statistically significant at a significance level of 0.1.

### 5. Conclusion

This study uses SEM to test and verify the relationships among capital structure, operational risk and profitability of life insurance industry in Taiwan. SEM not only reduces the problem of unsatisfactory results, but uses multiple financial indexes to measure latent variables. SEM can increase the explanatory power of the model and clarify the causal relationships among latent variables. There are four important findings. First, there are excellent empirical results in this study. The observed variables adequately measure the latent variables and the modified model has goodness-of-fit. That is to say, using multiple financial indexes suitably measures the specific financial factors. Furthermore, the modified model is close to the real financial state.

Second, capital structure exerts a significantly negative effect on profitability. It implies that a company has higher profitability when the equity ratio increases or reserve-to-liability ratio decreases. This result supports the first hypothesis and indicates that the more conservative operational strategy does not lead to higher profitability. The result is consistent with the results of Staking and Babbel (1995).

Third, the capital structure exerts a significantly negative effect on operational risk. There is no reciprocal relationship but a one-way effect between capital structure and operational risk. This
finding indicates that the more conservative operational strategy effectively reduces the operational risk. This result is consistent with the results of some scholars (Changchien, 2000; Liu, 2003). But it does not support the second hypothesis.

Fourth, the operational risk exerts a significantly negative effect on profitability. The higher portfolio concentration reflects the higher operational risk, and causes the lower profitability. This finding supports the third hypothesis. This result is consistent with the results of some scholars (Lai, Lu and Wu, 1999; Lin and Huang, 2002; Liu, 2003). Additionally, the administrators must decrease or diversify their investment to protect profits and prevent losses.

In conclusion, the purpose of the government establishing the risk-based capital (RBC) is to calculate the base capital requirement for each company. Although the government regulates each company reaching the base capital requirement, the government cannot ensure that companies avoid insolvency. Insurance premiums are the main revenue source for life insurance companies; financial revenue is the secondary source. A higher premium represents the higher reserve and liability. The empirical result in this study shows the profitability decreased with the higher equity ratio. Hence, the regulatory organizations must urge insurance companies to effectively diversify their investments and employ risk avoidance strategies. Effective use of hedging and diversifying will help to divide risk and create financial revenue. This study proposes that the government loosen investment restrictions and develop other instruments to assist RBC in checking the financial condition of insurance companies.

References


