



## THE EFFECTS OF FIRM SPECIFIC FACTORS AND MACROECONOMICS ON PROFITABILITY OF PROPERTY-LIABILITY INSURANCE INDUSTRY IN TAIWAN

Chen-Ying Lee

Assistant Professor, Department of Insurance and Finance, Chihlee Institute of Technology, Taiwan

### ABSTRACT

*This article investigates the relationship between firm specific factors and macroeconomics on profitability in Taiwanese property-liability insurance industry using the panel data over the 1999 through 2009 time period. Using operating ratio and return on assets (ROA) for the two kinds of profitability indicators to measure insurers' profitability. The results show that underwriting risk, reinsurance usage, input cost, return on investment (ROI) and financial holding group have significant influence on profitability in both operating ratio and ROA models. The insurance subsidiaries of financial holding group compared with other insurance companies, showing lower profitability. In addition, economic growth rate has significant influence on profitability in operating ratio model but insignificant influence on profitability in ROA model. The findings contribute to insurance operation in the property-liability insurance industry and should be of interest to regulators, investors and policyholders.*

**Keywords:** Property-liability insurance, Panel data, Firm specific factors, Macroeconomics, profitability

**JEL:** C23, G22

### 1. INTRODUCTION

The insurance sector plays important role in the financial services industry in almost developed and developing countries, contributing to economic growth, efficient resource allocation, reduction of transaction costs, creation of liquidity, facilitation of economics of scale in investment, and spread of financial losses (Haiss and Sümegi, 2008). At the end of 1980s amid the trends of financial liberalization and internationalization, the regulatory authorities in Taiwan gradually opened up the domestic financial market, allowing the establishment of new banks, securities firms and insurance companies. In the property-liability (P-L) insurance industry, the market was opened to new domestic insurance companies in 1992 and to foreign insurers in 1994. In 2009, Taiwan implemented the phase three rate deregulation in the P-L insurance market, which further

intensified the competition in an already challenging market. On the other hand, the combined market share of top five P-L insurers rose from 54.4% in 2006 to 59.83% in 2011 as a result of merger and acquisition among insurers, indicating a rising trend in market concentration. In the face of intense market competition, seeking business growth has become an important strategy for P-L insurers to survive and turn in impressive profitability.

In the face of a market environment heading towards accelerated horizontal consolidation among financial institutions and operating insurance business under a financial holdings group, and the gradual relaxation of financial regulations, many P-L insurers practice cash-flow underwriting to vie for more business and raise more premium income, and then invest the cash income in the hope to cover the underwriting loss with investment profit. This business strategy might be viable when the overall investment environment is stable. However when the investment environment becomes highly unpredictable, insurance companies may be trapped in the predicament of being squeezed from both underwriting profit and investment profit. When the profit model of a company no longer works, the interests of shareholders are adversely affected. In more serious scenarios, the company might have problem paying its debts. Therefore in a changing environment, it is necessary once again to reflect on the underlying mechanism of value creation to return to past levels of profitability and the rules of thumb, such as maximization of market share, frequently become inapplicable when conditions change (Hancock *et al.*, 2001).

Profit does not only improve upon insurer's solvency state but it also plays an essential role in persuading policyholders and shareholders to supply funds into insurance firms. Thus, one of the objectives of management of insurance companies is to attain profit as an underlying requirement for conducting any insurance business. Similarly, P-L insurer's key issue should focus on business profitability; it must take into consideration the effect of the firm specific factors and macroeconomic variables on profitability.

Much of the extensive empirical literature on the determinants of profitability is mostly focus on the banking industry (Williams, 2003; Vejzagic and Zarafat, 2014). However, very little studies are conducted on the P-L insurance industry. Different from previous studies, this study uses panel data of Taiwan's P-L insurance industry from 1999 to 2009 to examine the firm specific factors and macroeconomics on profitability of P-L insurers. The main contributions of this paper are the following. The first, a comprehensive research on profitability determinants using economic data has not been conducted in the P-L insurance industry. Therefore, this study can be used to fill the gap in the insurance literature. Secondly, using panel data to analyze the effect of the firm specific factors and macroeconomic variables on profitability for P-L insurers to give more information to dwell upon when they formulate their business strategies; Thirdly, using empirical econometric methodology to provide corporate managers with insight on major factors influencing profitability and provide them with reference information that they can use in policy formulation.

The remainder of the paper is organized as follows. Section 2 reviews previous studies relating to the effects of firm specific and macroeconomics on profitability of P-L insurers. Section 3

provides details of the methodology and variable development. Section 4 summarizes the empirical results and Section 5 is the conclusion.

## 2. LITURATURE REVIEW

Insurers' profitability is influenced by both internal and external factors. Whereas internal factors focus on an insurer's specific characteristic, the external factors concern both industry features and macroeconomic variables. The relevant literature may be categorized as: the effects of firm specific factors on profitability and the effects of macroeconomics variables on profitability.

### 2.1. The Effects of Firm Specific Factors on Profitability

Several variables have been found to share significant relationships with insurance companies' profitability. An insurer's size has been found to share a relationship with insurer profitability. [Cummins and Nini \(2002\)](#) found that larger firms are more cost and revenue efficient, and which implies that larger firms may experience greater premium growth. [Adams and Buckle \(2003\)](#) provided evidence that insurance companies with high leverage have better operational performance than insurance companies with low leverage. Insurers that undertake risky business and the diversification of underwriting risks help to mitigate exposure to underwriting losses ex-ante and improve operational profits. Lower anticipated losses may lead to better performance because the monitoring and claims handling costs are low. [Choi and Weiss \(2005\)](#) analyzed the relationship among market structure, efficiency and performance in the U.S. property-liability insurance industry from 1992 to 1998. They found the concentration is positively related to profit, whereas market share and group is related negatively rather than positively. [Liebenberg and Sommer \(2008\)](#) also have found that financial-holding groups there are a negative correlation with firm performance. In addition, [Gatzlaff \(2009\)](#) tested the predictive insolvency indicators and relationship of performance, the results indicated operational performance was negatively related to loss ratios, underwriting expense ratios, premium growth and premium to surplus ratios, whereas positively correlated with return on investment and realized capital gains. [Pervan and Pavić \(2010\)](#) indicated that an inverse and significant influence of ownership, expense ratio and inflation on profitability. Specifically, [Malik \(2011\)](#) found that whereas size and capital have positive association with insurer's profitability, loss ratio and leverage have strong inverse relationship with profitability. [Lee and Lee \(2012\)](#) argued that firm size, financial leverage, reinsurance, underwriting risks, liquidity ratio and return on investment have significant influence on firm performance. However, [Sambasivam and Ayele \(2013\)](#) stated that growth, leverage, volume of capital, size, and liquidity are identified as most important determinant factors of profitability hence growth, size, and volume of capital are positively related. In contrast, liquidity ratio and leverage ratio are negatively but significantly related with profitability.

## 2.2. The Effects of Macroeconomics variables on Profitability

Grace and Hotchkiss (1995) documented a link between insurance industry performance and long-run general economic conditions using co-integration technique. They also show that real GDP is negatively related to premium and interest rates have reverse effects on the underwriting profits. Browne *et al.* (2001) identified important economics and market factors and insurer-specific characteristics related to life insurer performance. In their paper, firm performance was positively related to firm size, liquidity, bond portfolio returns, whereas negatively related to unanticipated inflation. Chen and Huang (2001) confirmed that a relationship exists among macroeconomic factors and premium receipt in the life insurance industry. Doumpos and Gaganis (2012) estimated the performance of non-life insurers and found that macroeconomic indicators such as gross domestic product (GDP) growth, inflation and income inequality influence the over performance of firms.

## 3. DATA SOURCES AND METHODOLOGY

### 3.1. Data Sources

This study investigates the firm specific factors and macroeconomics on profitability of P-L insurance companies in Taiwan and samples 15 P-L insurers each year over a period of eleven years between 1999 and 2009, totaling 163 samples. Relevant financial and business data for the study are obtained from Overview of P-L Insurance Statistics and Insurance Yearbook published by Taiwan Insurance Institute (TII) and from the websites of respective sampled insurers. Those data include cross-sectional data and time series data broken down by year for statistical analysis to explore the relationships between firm specific factors and macroeconomics on profitability of P-L insurers over the study period.

### 3.2. Methodology

In the measure of profitability, we use operating ratio and return on assets (ROA). Operating ratio indicates pretax operating income from underwriting and investment activities, which differs from the commonly used measure of combined ratio (Elango *et al.*, 2008), which only takes into account the underwriting profit of a P-L insurer while ignoring investment income. In this study, we define operating ratio as loss ratio plus expense ratio less investment income ratio. Thus an operating ratio below 100% means the company might be profitable in core business (BarNiv and McDonald, 1992; Jonghag, 2001). ROA refer to the proxy variables used to measure the profitability of insurers (Liebenberg and Sommer, 2008; Chen *et al.*, 2009). This study defines ROA as pre-tax income (losses) divided by average assets. ROA measures the profit earned per dollar of assets and reflect how well insurance management use the insurer's real investments resources to generate profits. The effects of these factors on the dependent variables are examined as follows and a list of variables and their definitions are described in Table 1.

**Table-1.** Description of variables

Variable	Variable Definition
Operating ratio (OR)	(Loss ratio + expense ratio) – (investment income ÷ net written premium)
Return of assets (ROA)	Profit before Tax/Average Assets
Firm growth (FG)	(Premium of current year – premium of prior year) ÷ (premium of prior year)
Input cost (IC)	Expense ÷ written premium
Firm size (FS)	Natural logarithm of total assets
Financial leverage (FL)	Total liabilities ÷ total assets
Diversification (PD)	1- Line-of-business Herfindahl index
Reinsurance (RE)	The ratio of reinsurance premium ceded to direct business written plus reinsurance assumed
Return on investment (ROI)	(Firm’s investment income of current year) ÷ (assets at the beginning of year + assets at the end of year- net investment income of current year)/2
Underwriting risk (UR)	Annual losses incurred (net of loss adjustment expenses) divided by annual premium earned
Market share (MS)	Each firm’s premium ÷ total market premium
Economic Growth Rates (EGR)	$(GDP_t - GDP_{t-1}) / GDP_{t-1}$ , where GDP respects real gross domestic product
Inflation rates (IR)	$(CPI_t - CPI_{t-1}) / CPI_{t-1}$ , where CPI respect consumer price index
A member of a Financial holdings group (FH)	1: a subsidiary of a Financial holdings group; 0: not a subsidiary of a Financial holdings group

We employ ordinary least square (OLS) regression model, fixed effect model (FEM) and random effect model (REM) for the analysis of panel data to examine the effects of firm specific factors and macroeconomics on profitability of the P-L insurers.

Through literature review, we construct an empirical regression model below:

$$\text{Operating ratio} = \alpha + \beta_1 FS_{it} + \beta_2 IL_{it} + \beta_3 UR_{it} + \beta_4 GP_{it} + \beta_5 RE_{it} + \beta_6 ROI_{it} + \beta_7 MS_{it} + \beta_8 PD_{it} + \beta_9 IC_{it} + \beta_{10} EGR_{it} + \beta_{11} IR_{it} + \beta_{12} FH_{it} + e_{it} \quad (1)$$

$$\text{ROA} = \alpha + \beta_1 FS_{it} + \beta_2 IL_{it} + \beta_3 UR_{it} + \beta_4 GP_{it} + \beta_5 RE_{it} + \beta_6 ROI_{it} + \beta_7 MS_{it} + \beta_8 PD_{it} + \beta_9 IC_{it} + \beta_{10} EGR_{it} + \beta_{11} IR_{it} + \beta_{12} FH_{it} + e_{it} \quad (2)$$

where subscript i

and t represents respectively firm i in year t;  $\alpha$  is the intercept;  $\beta_j$  is the estimated regression coefficient of independent variable;  $j=1,2,3..12$ ; and  $e_{it}$  represents error term, assuming it follows a normal distribution.

## 4. EMPIRICAL RESULTS

### 4.1. Model Specification and Descriptive Statistic

Table 2 depicts the statistics and variance inflation factors (VIF) of variables. As shown, the mean of operating ratio, ROA and firm growth rate of sampled firms between 1999 and 2009 are respectively 0.924, 0.018 and 0.0393, indicating fierce competition in the P-L insurance market, in

which high firm growth was difficult to achieve and profits were limited. It is apparent that the overall P-L insurance industry has fairly thin profit margin under intense market competition. In examining the effect of firm specific factors and macroeconomics on profitability for P-L insurance companies, first, OLS regression model, FEM and REM are run and then tested to determine the best fit model. I use LaGrange multiplier (LM) test to determine whether OLS model is better fit than FEM or REM. Subsequently, Hausman test is employed to determine whether FEM or REM is better fit for the study data. To test the relationships between variables, I perform correlation coefficient analysis and find relatively low correlation between explanatory variables. I also calculate the VIF values for each explanatory variable and find that none of the explanatory variables are no more than four, indicating a minor multicollinearity problem (Gujarati, 1995). Thus in subsequent regression modeling, multicollinearity is not expected to present a significant problem. In this study, profitability variable is tested with regression models based on both operating ratio and ROA. The results are checked by LM test and indicate that both the FEM and REM are better fit than OLS regression model. The results of Hausman test also show that REM is a better estimator than FEM in two models.

Table-2. Basic Statistics and VIF

Variable	Mean	SD	Min	Max	VIF
Operating ratio (OR)	0.924	0.150	0.536	1.599	-
Return of assets (ROA)	0.018	0.077	-0.280	0.230	
Firm size (FS)	16.031	1.438	11.153	20.465	3.11
Financial leverage (FL)	0.679	0.180	0.210	1.420	1.35
Underwriting risk (UR)	0.573	0.197	0.150	1.290	1.20
Firm growth (FG)	0.039	0.149	-0.500	0.900	1.22
Reinsurance (RE)	0.468	0.124	0.190	0.800	1.90
Return on investment (ROI)	0.027	0.025	-0.082	0.161	1.21
Market share (MS)	0.064	0.053	0.002	0.442	1.80
Diversification (PD)	0.664	0.129	0.079	0.842	1.51
Input cost (IC)	0.320	0.076	0.192	0.675	2.73
Economic Growth Rates (EGR)	0.037	0.029	-0.018	0.062	2.19
Inflation rates (IR)	0.119	0.046	0.004	0.308	1.38
Financial holdings (FH)	0.293	0.456	0.000	1.000	1.25

Notes: The definitions of the variables can be found in Table 1

#### 4.2. Firm Specific Factors and Macroeconomics on Profitability-Operating ratio

Table 3 shows estimations of the parameters from the REM on operating ratio. The empirical results show that underwriting risk, reinsurance, input cost, economic growth rate and financial holdings group are significantly and positively correlated with operating ratio. Higher underwriting

risk increases the operating ratio, indicating adverse effect on the firm's profitability. This result suggests that as P-L insurers undertake underwriting risk (e.g. the risk of catastrophe), they need to maintain good management guidelines to reduce their risk exposure before underwriting while maximizing their return on investment after underwriting. This finding is consistent with the studies of Gatzlaff (2009) and Malik (2011). Reinsurance utilization shows a positive correlation with operating ratio ( $p < 0.05$ ). This finding is consistent with Lee and Lee (2012) of view that insurers with higher reinsurance dependence tend to have a lower level of firm profitability. It is possible that an insurer that cedes more business to reinsurer and keeps lower retention more or less operates like a reinsurance broker who only transfers risk without underwriting risk and is likely to report less profit for a relatively high percentage of the premium received is ceded to reinsurers. Input cost and operating ratios are also found to exhibit significant and positive correlation, suggesting higher input cost increases a firm's operating ratio and reduces the firm's profit. This result coincides with the finding of Choi (2010) that efficient firms would be able to earn higher returns than competitors. With respect to economic growth rate is significantly and positively related to operating ratio. It is possible that economic growth increases a firm's premium growth so that the growth source could be attributed to cash-flow underwriting but the firm used the infusion of premium income on high-risk investment, which in the end produced negative effect on profitability. The positive correlation between the financial holding group and operating ratio suggests that a P-L insurance firm operating as a subsidiary of a financial holding group might not have advantage over an independent P-L insurance firm in terms of profitability, a finding consistent with the studies of Liebenberg and Sommer (2008). ROI and market share are significantly and negatively related to operating ratio. The negative correlation between ROI and operating ratio supports the finding of Elango *et al.* (2008), suggesting an insurance firm with better ROI enjoys some competitive advantage, which could result in better profit. This study finds that bigger market share is positively related to lower operating ratio, which coincides with the proposal of (Gale, 1972) that high market share might result in high profit, mainly because high market share boosts a firm's market advantage and its ability to set prices, which helps the firm to boost profit and achieve economies of scale. Other variables such as firm size, firm growth, diversification and inflation rates are found to be positively correlated with operating ratio, whereas financial leverage exhibits negative correlation with operating ratio, but are not significantly different from zero. Table 3 summarizes the empirical results.

**Table- 3.** Firm-Specific, Macroeconomic factors on Profitability Empirical Results –Analysis of Operating Ratio (REM Model)

Variable	Coefficient	t- statistic	p value
Intercept	0.1104	0.59	0.558
Firm size (FS)	0.0143	1.46	0.143
Financial leverage (FL)	-0.0292	-0.57	0.571
Underwriting risk (UR)	0.5746	11.12	0.000***
Firm growth (FG)	0.0214	0.36	0.718
Reinsurance (RE)	0.2038	2.30	0.022**

Return on investment (ROI)	-1.1193	-3.18	0.001***
Market share (MS)	-0.4082	-2.03	0.043*
Diversification (PD)	0.0149	0.18	0.854
Input cost (IC)	0.6124	3.92	0.000***
Economic Growth Rates (EGR)	0.7301	2.42	0.016**
Inflation rates(IR)	0.4175	0.63	0.526
Financial holdings (FH)	0.0376	1.73	0.084*
Observations		163	
Adjusted R <sup>2</sup>		0.5584	

**Note 1:** \* , \*\* , \*\*\* level of significance at 10%, 5%, 1%.

**Note 2:** The F test value in H<sub>0</sub>:OLS vs. H<sub>1</sub>:FEM is 14.55\*\*\*.

**Note 3:** The LM test value in H<sub>0</sub>:OLS vs. H<sub>1</sub>:REM is 189.70\*\*\*.

**Note 4:** The Hausman test value in H<sub>0</sub>:REM vs. H<sub>1</sub>: FEM is 11.44, insignificant, supporting REM as the best fit model.

### 4.3. Firm Specific Factors and Macroeconomics on Profitability- ROA

Table 4 shows estimations of the parameters from the REM on ROA. Apart from financial leverage is significantly and negatively correlated with ROA, the empirical results of other variables, including underwriting risk, reinsurance, input cost, financial holdings group and ROI are consistent with the results of operating ratio, indicating consistency in the results of both tests. The negative correlation between financial leverage and ROA is consistent with the finding of [Elango et al. \(2008\)](#), indicating that the use of financial leverage might lower the capital required for an insurer to operate business, but high financial leverage could be reflected in lower market value, thereby reducing the firm's profit and leading to solvency problem. Other variables such as firm size, market share are positively correlated with ROA, whereas firm growth, diversification, economic growth ratio and inflation rates exhibit negative correlation with ROA, but are not significantly different from zero. Table 4 summarizes the empirical results.

**Table- 4.** Firm-Specific, Macroeconomic factors on Profitability Empirical Results –Analysis of ROA (REM Model)

Variable	Coefficient	t- statistic	p value
Intercept	0.1859	2.20	0.028**
Firm size (FS)	0.0053	1.22	0.222
Financial leverage (FL)	-0.1247	-5.32	0.000***
Underwriting risk (UR)	-0.0640	-2.83	0.005**
Firm growth (FG)	-0.0077	-0.30	0.764
Reinsurance (RE)	-0.0929	-2.35	0.019**
Return on investment (ROI)	0.3633	2.35	0.019**
Market share (MS)	0.0015	0.02	0.980
Diversification (PD)	-0.0030	-0.08	0.933
Input cost (IC)	-0.2733	-3.97	0.000***
Economic Growth Rates (EGR)	-0.1172	-0.89	0.375
Inflation rates(IR)	-0.0436	-0.13	0.893
Financial holdings (FH)	-0.0164	-1.69	0.091*
Observations		163	
Adjusted R <sup>2</sup>		0.3747	

Note 1: \* , \*\* , \*\*\* level of significance at 10%, 5%, 1%.

Note 2: F test value in H<sub>0</sub>:OLS vs. H<sub>1</sub>:FEM is 3.74\*\*\*

Note 3: LM test in H<sub>0</sub>:OLS vs. H<sub>1</sub>:REM is 85.13\*\*\*.

Note 4: Hausman test value in H<sub>0</sub>:REM vs. H<sub>1</sub>: FEM is Hausman test 2.85, insignificant, supporting REM as the best fit model.



#### 4.4. Robustness Test

As further check for the robustness of my results, I performed alternative analyses. I repeat the above analyses using a different measure of the sensitivity of firm specific factors and macroeconomics on profitability for P-L insurers. Following [Hardwick and Adams \(2002\)](#) in their calculation of profitability of insurers. I use the ratio of pre-tax profit to written premium to proxy the profitability variable. The findings using profit ratio as the sensitivity measure are consistent with the results based on the major variables of operating ratio and ROA models.

### 5. CONCLUSION AND MANAGEMENT IMPLICATIONS

This article investigates the effects of firm specific factors and macroeconomics on profitability using data drawn from Taiwan P-L insurance market over the 1999 through 2009 time period. The results find that underwriting risk, reinsurance usage, input cost, ROI and financial holding group have significant influence on profitability in both operating ratio and ROA models, but macroeconomics variables only economic growth rate has significant influence on profitability in operating model. The results indicate that low underwriting risk, low input cost and low reinsurance usage produce positive effect on profitability. P-L insurance companies operating under a financial holding group are not necessarily more profitable. It might have to do with the discretionary cost incurred within the group and other group related expenses. In addition, the significantly positive coefficients on the ROI variable in model support that insurers with higher investment returns have better profitability. Thus in seeking greater profit and competitiveness, P-L insurer should conduct careful assessment and take into consideration firm specific factors and macroeconomics variables influence the profitability of the company before making major business decision.

Based on the empirical findings discussed above, this study likes to point out some important management implications for both the P-L insurance industry and the regulatory authorities. First, P-L insurers if the underwriting risks rise, it will be necessary to purchase more reinsurance to diversify risk and avoid insolvency. Hence, managers have to strike a balance between decreasing insolvency risk and reducing potential profitability. Second, previous research ([Hardwick, 1997](#)) suggests in fact that many firms with unexploited economies of scale have operated for many years in life insurance and other financial services markets. The results suggesting higher input cost reduce the firm's profit, so that manager can use efficient firms would be able to earn higher returns than competitors. Third, the study shows that P-L insurers operating under a financial holding group turns in poorer profitability in comparison with independent P-L insurers. A financial holding subsidiary has advantages over non-financial holding insurance companies in sales. However, improper cost control within the financial holding group as a whole will offset such benefit and adversely affect the profit of the insurer ([Regan, 1999; Colquitt and Sommer, 2003](#)). Thus a financial holding company should examine the economies of scale to seek the best-fit economic scale and maximize the synergistic effect so as to boost profit. Finally, both firm specific factors and macroeconomics are associated with firm's profitability. The explanatory power of economic

growth rate has significant influence on profitability in operating ratio model but insignificant influence on profitability in ROA model. Therefore, managers can further explore the impact of macroeconomic factors on firm's profitability in the future.

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