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再保險多還是少比較好？

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處 理 方 式 ：
1.公開資訊：本計畫可公開查詢
2.「本研究」是否已有嚴重損及公共利益之發現：否
3.「本報告」是否建議提供政府單位施政參考：否

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中 文 摘 要 ： 大家普遍以為：使用再保險與衍生性金融商品來避險的險人，會有較好的績效表現。我們利用英國產險公司 1994 至 2011 年的資料，研究保險公司的績效與其使用再保險與衍生性金融商品的關係；同時也探討這些關係，會不會隨著公司大小與期間而改變。我們發現：使用再保險比較多且有使用衍生性金融商品的小公司，比較難提高其市場佔有率，特別是在危機期間。然而，我們卻沒有發現大公司或在非危機期間，有上述這樣的情形發生。

中文關鍵詞： 再保險；衍生性商品；績效；小型產險公司

英 文 摘 要 ： It is the public’s perception that insurers which use reinsurance and derivative hedging have better performance. Using regulatory returns data on UK non-life insurers from 1994 to 2011, this paper empirically examines whether insurer performance is related to the use of reinsurance and derivatives and how this relation varies across different size classes and time periods. We find that small insurers that use more reinsurance and engage in derivative transactions are more difficult to improve their market share. This is particularly the case during crisis periods. However, we do not find any such evidence for large insurers or during non-crisis times. Our analysis sheds some light on the effect of reinsurance and derivative use by small insurers on their performance.

英文關鍵詞： Reinsurance； Derivatives； Performance； Small non-life insurers

How Does the Use of Reinsurance and Derivatives Affect Insurer Performance? Evidence from the United Kingdom Non-life Insurance Industry

ABSTRACT

It is the public's perception that insurers which use reinsurance and derivative hedging have better performance. Using regulatory returns data on UK non-life insurers from 1994 to 2011, this paper empirically examines whether insurer performance is related to the use of reinsurance and derivatives and how this relation varies across different size classes and time periods. We find that small insurers that use more reinsurance and engage in derivative transactions are more difficult to improve their market share. This is particularly the case during crisis periods. However, we do not find any such evidence for large insurers or during non-crisis times. Our analysis sheds some light on the effect of reinsurance and derivative use by small insurers on their performance.

Keywords: Reinsurance; Derivatives; Performance; Small non-life insurers

How Does the Use of Reinsurance and Derivatives Affect Insurer Performance?

INTRODUCTION

Recent studies on reinsurance determinants have fostered an improved understanding of why primary insurers may use reinsurance (e.g., Mayers and Smith, Jr., 1990; Hoerger, Sloan, and Hassan, 1990; Adams, 1996; Garven, and Lamm-Tennant, 2003; Cole and McCullough, 2006; Powell and Sommer, 2007; Kader, Adams, and Mouratidis, 2010; Shiu, 2011) and derivatives (e.g., Colquitt and Hoyt, 1997; Hardwick and Adams, 1999; Cummins, Phillips and Smith, 1999; Cummins, Phillips and Smith, 2001, Shiu, 2007). However, very little research has focused on whether reinsurance and derivative hedging affects insurer performance, except Lee and Lee (2012) and Shiu (2010), respectively. Lee and Lee (2012) document a negative effect of reinsurance purchase on insurer performance in terms of return on assets. Shiu (2010) finds that non-life insurers using derivative hedging have a lower level of solvency.

Reinsurance has traditionally been one of the major risk management tools for primary non-life insurers to transfer underwriting risk. It is the public's perception that reinsurance hedging is good for insurers. In reality, however, is reinsurance instrumental in improving insurer various aspects of performance? Primary insurers are motivated to use reinsurance to increase underwriting capacity,

stabilize underwriting results, provide protection against catastrophe losses, increase earning, reduce expected tax payments, and obtain real services from reinsurers. Reinsurance purchase thus reduces costs for capital.

However, there is a cost for reinsurance. As a matter of fact, it is very costly (Froot, 2001; Cummins, Dionne, Gagné and Nouira, 2008). It seems that insurer managers have to strike a balance between reducing insolvency risk and decreasing potential profitability when making reinsurance decisions (Shiu, 2004). While the use of reinsurance may strengthen insurers' financial position, we expect that reinsurance may damages their other aspects of performance. Under the signal hypothesis, however, Chen, Hamwi, and Hudson (2001) argue that an insurer that overly uses reinsurance may signal its excessively high risk and eventually high likelihood of insolvency.

According to Swiss Reinsurance Company (2012: 36-37), the UK non-life insurance industry generated annual premiums of £68.29 billion (US$ 109.49 billion) in 2011. This volume accounts for 5.56 percent of all worldwide non-life insurance premium income. Moreover, in terms of premium volume, the UK non-life sector was ranked second in Europe (after Germany) and fourth in the world (after the US, Japan and Germany).

According to regulations, UK insurers are not permitted to engage in derivative transactions for speculative purposes. However, they can use derivatives to reduce investment risks or efficiently

manage portfolios (Campbell, Goldberg and Rai, 2003; Shiu, 2007; Philpott, 2012). Like reinsurance, the cost for setting up platform and hiring professionals for derivative transactions generally is huge. On balance, we expect that reinsurance and derivative hedging has a negative impact on insurer performance. In this paper, we attempt to explore empirically whether our expectation is supported by the data within the analysis period.

The motivation for this study is twofold. First, the effects of reinsurance and derivatives on insurer performance have not been extensively examined. Most prior insurance literature except Lee and Lee (2012) does not directly and specifically examine the relation between reinsurance hedging and performance, but just control for reinsurance in their studies. Shiu (2010) is the only research that examines the influence of derivative use in the context of insurance. The current study simultaneously examines the effects of these two types of hedging on insurer performance and hence can be used to fill the gap in the literature. The second motivation is that prior studies have mixed results regarding the relation between hedging and performance. In our research, we argue that this could be because the relation may vary among insurer size classes and between crisis and non-crisis times.

We find that the use of reinsurance and derivatives exerts a negative influence on the percentage change in market share of total admissible assets for small insurers, especially during crisis times. However, this is not the case either for the whole sample, for large insurers or during non-crisis

times. Our study improves our understanding of reinsurance and derivative use by insurers.

The remainder of this paper is organized as follows. The next section reviews related theories and develops hypotheses. We then describe the research methodology and framework used in this study. The empirical results are presented in the penultimate section, whereas the last section concludes.

RELATED THEORIES AND HYPOTHESIS DEVELOPMENT

According to Modigliani and Miller's propositions, risk management including reinsurance and derivative hedging should be irrelevant in a frictionless world. In reality, however, imperfections exist in capital markets and Modigliani and Miller's propositions do not completely hold. Insurers are therefore motivated to use reinsurance and derivatives to reduce the expected bankruptcy costs, agency costs, underinvestment problem.[1] Ma and Elango (2008) report that reinsurance as a risk management mechanism can help primary insurers smooth the variations in their revenues, which will then increase risk-adjusted returns.

However, reinsurance hedging involves huge cost, which may adversely affect insurer performance. Froot (2001) finds that insurers pay a much higher reinsurance premium than the actuarial price of the risk transferred. Cummins, *et al*., (2008) also point out that although reinsurance reduces the volatility of insurers' loss ratio, buying reinsurance increases significantly their cost. Using data on

[1] Insurers may obtain real services (e.g., claims handling and pricing) from reinsurers.

UK non-life insurance firms, Shiu (2004) finds evidence supporting the notion that reinsurance negatively affects the insurer's investment yield and percentage change in shareholders' funds. He further argues that higher reinsurance dependence increases operational stability but reduces the potential profitability. Shiu (2009) also documents a negative relation between UK life insurers' reinsurance use and their investment yield. Choi and Elyasiani (2011) find that the use of reinsurance by US non-life insurers reduces their revenue efficiency. Lee and Lee (2012) argue that non-life insurers that rely more on reinsurance have worse return on assets. Moreover, under the signal hypothesis Chen, Hamwi, and Hudson (2001) argue that it is difficult for a nearly insolvent insurer to raise required capital in the financial markets at a low cost. The insurer would therefore purchase reinsurance to rent capital from reinsurers in order to increase its underwriting capacity. An insurer that overly uses reinsurance may signal its excessively high risk and eventually high likelihood of insolvency. Further, insurers that are heavily dependent on reinsurance are highly subject to reinsurer default risk. In addition, some prior studies (e.g., Choi and Weiss, 2005) do not find a relation between reinsurance and insurer performance. Taken together, the empirical evidence is inconclusive. However,

Finance literature has examined the effects of derivatives on risk (e.g. Hirtle, 1997; Guay, 1999; Hentschel and Kothari, 2001) and firm value (e.g., Carter, Rogers and Simkins, 2006; Jin and Jorion, 2006). The empirical results are also mixed. For instance, Hirtle (1997) finds a positive relation between derivative use and corporate risk, while Guay (1999) documents a negative one. Hentschel

and Kothari (2001) find no significant relation. As regards the relation between derivative use and firm value, Carter, Rogers and Simkins (2006) find that derivative hedging add value to the firm, while Jin and Jorion (2006) find that hedging does not seem to affect firm value.

As far as the authors understand, there is little research investigating the effects of derivatives in the context of insurance, except Shiu (2010). He finds that non-life insurers that use derivative hedging can maintain a lower level of solvency. Like reinsurance hedging, however, derivative hedging is also costly. The high hedging cost arises from not only derivative products themselves but also setting a platform for derivative transactions purposes.

One of the possible reasons why empirical results vary is because the relation between hedging and performance may change. Although our theoretical framework should hold for insurers for all times, the negative relation between hedging and performance could vary across firms and periods of time. Warner (1977) argues that financial distress costs do not increase proportionately with firm size, indicating that smaller insurers are subject to higher bankruptcy costs than larger ones. Moreover, smaller insurers generally have less cash flows and higher borrowing costs. They also have less tolerance for risk and are more likely to encounter insolvency problems. Conversely, large insurers are less likely to fail due to a tacit “too big to fail” policy that was operated in most jurisdictions and hence insurers knew that they would be rescued if they became financially distressed. Therefore, smaller insurers are more likely, though probably unwillingly, to but have to pay higher hedging

costs, which will then have an adverse effect on their performance. This case is particularly pronounced for small insurers during crises. When the market is in turmoil, the supply of hedging tools generally is limited. As a result, hedging costs would be particularly high. We therefore expect that the use of reinsurance and derivatives negatively affect performance, in particular for small insurers and during crisis times.

THE METHODOLOGY AND EMPIRICAL FRAMEWORK

Data

We use data from SynThesys Non-life provided by Standard and Poor's. This data set contains regulatory returns for UK non-life insurers from 1985 through 2011. Given that UK non-life insurers only started using derivatives from 1994 onwards, the data used in this study covers only the period from 1994 to 2011, with several data exclusion criteria, as used in prior research, being applied. First, we exclude firms whose reinsurance assumed account for more than 75 percent of total premium written (Cole and McCullough, 2006; Powell and Sommer, 2007; Shiu, 2011) because these firms are more like reinsurers rather than primary insurers. We then exclude insurers with non-positive total admissible assets and negative premiums in any of the six lines of business, including accident and health, marine, aviation and transport, property, liability, financial loss and motor. Since our paper is only focused on the UK non-life insurance industry, insurers which submit global returns are excluded from this study. The resulting sample includes 94 insurers and 670 insurer-year observations. It is worthwhile to note that our study is less likely to be subject to

survivorship bias because all insurers that existed during the 1994-2011 period and filed complete regulatory returns are included in the sample, even if they failed to survive until the end of the analysis period.

Model

We perform the following regression to examine the marginal effect of reinsurance and derivatives on insurer performance:

$$\text{Performance}_{i,t} = \alpha + \beta\text{Reinsurance}_{i,t-1} + \gamma\text{Derivatives}_{i,t-1} + \sum \sigma\text{CV}_{i,t-1} + \varepsilon_{i,t}$$

where the subscripts i and t denote insurer and year, respectively. We estimate the model using ordinary least squares and random-effect regressions.[2] The LM test statistics across all regression specifications suggest that ordinary least squares regression is more appropriate than random-effect regression. Thus, we only report the ordinary least squares regression results in the empirical results section. Since observations come from a large number of cross-section insurers, heteroscedasticiy might exist. We therefore report White's heteroscedasticiy-consistent estimators (White, 1980).

Following Berger and Bouwman (2013), the performance measure is proxied by the percentage change in the insurer's market share of total admissible assets. Market share is an important performance benchmark for financial institutions including banks and insurers (Aghion and Stein, 2008; Berger and Bouwman, 2013). Reinsurance denotes the purchase of reinsurance, proxied by

[2] Since organization form, one of the control variables included in our model, is time-invariant, the model cannot be estimated using a fixed-effect regression.

the ratio of reinsurance premiums ceded to direct business written plus reinsurance assumed. Unlike the reinsurance variable, the derivatives variable is a dummy variable, with a value of 1 for users and 0 for non-users. We do not employ an extent proxy for the derivatives variable due to the low level of derivative use in the non-life insurance industry.

Our variables of interest, including reinsurance and derivatives, are lagged relative to the dependent variable, which is performance in our study. This approach alleviates the endogeneity problem because lagged use of reinsurance/derivatives and current performance are less likely to be jointed determined. All the control variables are also lagged.

We first run a regression using the whole sample. We then equally divide the whole sample into two groups: small and large firms. We also divide our sample into two periods: crisis and non-crisis periods. Following Berger and Bouwman (2013), the crisis period include two sub-periods. The first covers from 2000 to 2002, during which the bursting of the dot.com bubble and the terrorist attacks of September 11 occurred. The second sub-period is related to the subprime lending crisis, covering from 2007 to 2009. The remainder of the whole period is the non-crisis period.

Control variables

Based on previous research (e.g, McNamara and Rhee, 1992; Lai and Limpaphayom, 2003; Elango, Ma and Pope, 2008; Shiu, 2010; He, Sommer and Xie, 2011), we control for several factors that

may affect insurer performance in order to avoid omitted variables bias. They include leverage, business mix, business concentration, marginal tax rates, tax convexity, liquidity, underwriting risk, and organization form. The definitions for the variables used in our study are described in Table 1.

(Insert Table 1 around here)

Although insurers with higher level of leverage have higher probability of insolvency, high leverage may make firm performance better or worse depending upon the operating situation of the firm (Zou, 2010). In our study, leverage is proxied by the ratio of direct premiums written to surplus. We expect that insurers with higher leverage have more premium income and thus are more capable of increasing their market share.

The nature of an insurer's product portfolio determines its investment portfolio and both portfolios determine insurer performance. Prior studies on insurer performance (e.g., Elango, Ma and Pope, 2008) consider the effects of lines of business on performance to reflect risk and return differences across lines. We measure the proportions of net earned premiums written in each of the following six lines: accident and health, marine, aviation and transport, property, liability, financial loss and motor. We do not provide an *ex ante* prediction regarding the effect business mix on performance.

One of the prominent features that distinguish non-life insurance business from life business is that

non-life lines generally have so-called underwriting cycles. The performance of insurers with high business concentration will mostly depends on the underwriting cycles of the very few lines on which they concentrate. As a result, their performance would be relatively unstable compared with those insurers which have a diversified business portfolio. If this is the case, highly concentrated insurers would not be in a position to increase their market share. Another line of argument can be also proposed from the perspective of comparative advantage. Insurers would performance well if they concentrate on the business that they know well and have edge over their competitors. In this case, insurers with higher business concentration would be more capable of increasing market share. The net effect of business concentration on performance is therefore an empirical question. We calculate the Herfindahl index of net premiums written to reflect the concentration of lines of business.

Since the accounting performance of insurers is influenced by taxes to a great extent, we include two tax-related variables, including marginal tax rates and tax convexity. We set the marginal tax rate equal to top rate if the net operating loss in the previous year is 0 and taxable income in the current year is greater than 0, and 0 otherwise (Adams, Hardwick and Zou, 2008; Shiu, 2011). Although Insurers which are subject to top rate will pay higher taxes than those which are not, they are considered to operate well and hence are more likely to improve their market share. We also include tax convexity in our regressions. This variable is to account for the fact that non-life insurers may attempt to reduce their tax liability by lowering their pretax income volatility when

facing convex tax schedule. By so doing, their accounting performance will be smoothed and their ability to increase market share may be adversely affected. Following Adams, Hardwick and Zou (2008) and Shiu (2011), we measure tax convexity by the excess of the marginal tax rate (defined above) over the annual effective tax rate (total tax expenses ÷ annual taxable income).

Since their losses are more variable, non-life insurers need more liquidity than their life counterparts. High liquidity can reduce liquidity risk for insurers and could help them increase their market share when they want to. We therefore predict a positive relation between insurer performance and liquidity. This variable is proxied by the ratio of liquid assets (sum of cash, bonds and shares) to total admissible assets.

Underwriting risk is one of the major risks faced by non-life insurers. It is expected that insurers with higher underwriting risk could be less likely to increase their market share. The underwriting risk variable is proxied by the ratio of claims to earned premiums.

Prior studies (e.g., McNamara and Rhee, 1992; Lai and Limpaphayom, 2003; Elango, Ma and Pope, 2008) on insurer performance consider the effects of organizational form on performance. Mutual insurers are considered to be efficient than stock insurers in controlling agency costs. However, stock insurers have easier access to market capital and lower costs of raising new capital than mutual insurers. We therefore expect that stock insurers are more likely to increase their market

share. We include a dummy variable that equals one if the insurer is a stock firm, and 0 otherwise.

EMPIRICAL RESULTS

Univariate analysis

Table 2 presents summary statistics on all variables used in our analysis of the full sample. The performance variable, measured by the percentage change in market share of total admissible assets, ranges from -0.966469 to 99.1511 and has a standard deviation of 3.84325. This indicates that the performance of the non-life insurers in our sample varies to a great extent. The sample firms approximately reinsure an average of 17.72% of their annual direct business written and reinsurance assumed. Approximately 6.42% of the firms participate in the derivative market. We also find that some non-life insurers do not use either reinsurance or derivatives. The values for the business mix variables, except accident & health, range from 0 to 1. This indicates that we have specialist insurers as well as multiline insurance firms in our sample.

(Insert Table 2 around here)

In unreported results of the simple correlation coefficients, we find that in the full sample reinsurance is positively, though insignificant at the 0.1 level, correlated with the performance with a correlation coefficient of 0.034. However, the derivatives dummy is negatively correlated with the performance with a correlation coefficient of -0.015, statistically insignificant at conventional

levels. In the sample of small insurers, however, we find that reinsurance is significantly negatively related with performance at the 0.05 level, with a correlation coefficient of -0.148. The derivatives dummy has an insignificant correlation coefficient of -0.061. In the sample of small insurers during crisis times, the reinsurance variable has a significant correlation coefficient of -0.237 at the 0.01 level, while the derivatives dummy has an insignificant correlation coefficient of -0.137. Taken together, it appears that the effects of reinsurance and derivatives are stronger for smaller insurers, especially during crisis times.

Multivariate analysis

Table 3 presents the regression results for the full sample. The *F*-value for the overall goodness of fit test is 1.90, statistically significant at the 0.05 level, confirming that the fitted model is better than a null model without explanatory variables. The adjusted R^2 is 0.01968. We report the White's heteroskedasticity-consistent standard errors. We do not find any significant explanatory variables, including reinsurance and derivatives.

(Insert Table 3 around here)

We then equally divide the full sample into two-subsamples: small and large insurers. The results are presented in Table 4. *F*-tests for small and large insurers are both statistically significant and the adjusted R^2 are 0.07253 and 0.03189, respectively. An interesting finding is that both in the

subsample for small firms reinsurance and derivatives have significantly negative effects on performance at conventional levels, which supports the view that small insurers which use more reinsurance or participate in the derivative markets could find it harder to improve their market share. This negative relation is partly due to the fact of particularly high hedging costs for small insurers. However, we find that reinsurance and derivatives are positively, thought insignificantly, correlated with performance for large insurers.

(Insert Table 4 around here)

We also divide our whole sample period into two periods: crisis and non-crisis times. As shown in Table 5, we document weak evidence on the negative relation between the derivatives dummy and performance for the crisis period, suggesting that non-life insurers engaging in derivative transactions are less likely to increase market share. Nevertheless, we do not find such evidence for the non-crisis period.

(Insert Table 5 around here)

Next, we divide the full sample into four subgroups: small insurers during crisis times, small insurers during non-crisis times, large insurers during crisis times and large insurers during non-crisis times. The results are shown in Tables 6 and 7. In the subgroup of small insurers during

crisis times, the estimated coefficients of reinsurance and derivatives are both negative and significant at the 0.1 level. The two variables still have negative, though insignificant, coefficients in the subsample of small insurers during non-crisis period. For large insurers whether in crisis or non-crisis times, most of the coefficients on the reinsurance and derivatives variables are positive, though insignificant. It appears that risk hedging benefits large insurers more than small insurers especially during crisis times.

(Insert Tables 6 and 7 around here)

Our overall results have sensible economic interpretations. Reinsurance and derivatives are two risk management tools used by non-life insurers to hedge underwriting and investment risks, respectively. For smaller firms, bankruptcy and capital costs are higher. They are motivated to hedge their risk in order to reduce these costs and hence have a greater demand for hedging instruments, including reinsurance and derivatives. Other things being equal, they would be charged a higher price for hedging instruments. It is generally accepted that the hedging cost would be higher for smaller insurers, particularly during crisis times, because they are more likely to become insolvent or default on their obligations.

For saving space, we only discuss the results of the control variables in the sample for small insurers. As presented in Table 4, the organization form variable is positive and statistically

significant at the 0.01 level. This evidence supports the notion that stock insurers are more likely to increase their market share than mutual insurers. We also find that leverage is significantly positively correlated with insurer performance at the 0.05 level, suggesting that highly-leveraged insurers are in a better position to improve market share. The liquid variable is also positive and statistically significant. This finding is consistent with the view that highly liquid insurers are more likely to improve market share. We also find slight evidence indicating that business mix and marginal tax rates have an influence on insurer performance.

CONCLUSION

In this paper, we examine whether the use of reinsurance and derivatives is related to insurer performance. We further tests whether this relation may vary for small and large insurers and for crisis and non-crisis times. Using data from a sample of UK non-life insurance companies from 1994 through 2001, we document a negative relation between small insurers' use of reinsurance and derivative and their percentage change in market share of total admissible assets. This is also the case during the crisis times, including the years from 2000 to 2002 (the dot.com bubble and 911 attack) and from 2007 to 2009 (the subprime crisis). We, however, do not find such evidence for large insurers or during non-crisis times. We partly attribute this to the fact that small insurers have high hedging cost, especially in crisis times.

It is worthwhile to note that our results might be tampered by the data limitations inherent in the

current research. Therefore, our results need to be interpreted with some caution. For instance, the non-life insurance sector is a good research setting for testing the reinsurance-related argument since reinsurance has been a traditional hedging instrument used by non-life insurers. However, this setting potentially limits our ability to test the derivatives-related argument, given the generally lower level of derivative use in the non-life insurance industry, compared with the life insurance sector. Further research may thus seek to test further the relation between derivative use and insurer performance in the life insurance industry.

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Table 1 Variable descriptions

Variables	Description
Dependent Variable	
Performance	The percentage change in market share of total admissible assets.
Explanatory Variables	
Reinsurance	The ratio of reinsurance premiums ceded to direct business written plus reinsurance assumed.
Derivatives	Derivative user = 1; Derivative non-users = 0
Leverage	The ratio of direct premiums written to surplus
Business_Mix	The proportions of net earned premiums written in each of the six lines of business, comprising of accident and health, marine, aviation and transport, property, liability, financial loss and motor.
Business_Concentration	The Herfindahl index of the concentration of lines of business using net premiums written by the insurer in the line of business.
Marginal_Tax_Rate	Top rate if the net operating loss in the previous year = 0 and taxable income in the current year >0; otherwise 0.
Tax_Convexity	The excess of the marginal tax rate (top rate if the net operating loss in the previous year = 0 and taxable income in the current year >0; otherwise 0) over the annual effective tax rate (total tax expenses÷ annual taxable income)
Liquidity	The ratio of liquid assets (sum of cash, bonds and shares) to total admissible assets
Underwriting_Risk	The ratio of claims to earned premiums
Organizational_Form	Stock insurers = 1; Mutual insurers = 0

Table 2 Summary statistics

Variables	Mean	S.D.	Min	Max
Performance	0.25384	3.84325	-0.966469	99.1511
Reinsurance	0.17722	0.17930	0	0.73162
Derivatives	0.06418	0.24526	0	1
Leverage	1.25843	1.20529	0	19.20000
Accident & Health	0.09224	0.26529	0	1
Marine, Aviation & Transport	0.02852	0.10167	0	0.78291
Property	0.24556	0.35619	0	1
Liability	0.16987	0.33160	0	1
Financial_Loss	0.26938	0.40304	0	1
Motor	0.08575	0.23066	0	1
Business_Concentration	0.71079	0.33860	0	1
Marginal_Tax_Rate	0.22658	0.13326	0	0.33
Tax_Convexity	0.00722	0.56410	–0.99387	0.88424
Liquidity	0.98234	0.05076	0.49870	1
Underwriting_Risk	1.20973	0.18972	-4.48333	1
Organizational_Form	0.84776	0.35952	0	1

Table 3 Regression results for all sample

Independent Variables	Expected Sign	Coeff.	S.E.
Constant		0.63626	0.88095
Reinsurance	–	1.89064	1.98341
Derivatives	–	0.18076	0.26245
Leverage	+	0.04128	0.02715
Accident&Health	+/–	-0.87112	0.89583
Marine, Aviation & Transport	+/–	-1.55519	1.57339
Property	+/–	-1.16171	1.07995
Liability	+/–	-1.47808	1.46234
Financial_Loss	+/–	-0.99651	0.92181
Motor	+/–	1.93886	1.96307
Business_Concentration	+/–	1.05744	1.07409
Marginal_Tax_Rate	+	0.00039	0.00067
Tax_Convexity	–	-0.00090	0.00107
Liquidity	+	0.21590	0.53182
Underwriting_Risk	–	-0.00339	0.00328
Organizational_Form	+	-1.15176	1.14065
Year Dummies		Yes	Yes
Adjusted *R*-squared		0.01968	
F-value		1.90**	

Notes:

[a] The heteroskedasticity-consistent estimates are derived by using a heteroskedasticity corrected covariance matrix (White, 1980).

[b] *** indicates statistical significance at the 1 per cent level; ** indicates statistical significance at the 5 per cent level; and * indicates statistical significance at the 10 per cent level.

Table 4 Regression results for small and large insurers

Independent Variables	Expected Sign	Small insurers		Large insurers	
		Coeff.	S.E.	Coeff.	S.E.
Constant		–0.28257	0.22576	0.88494	1.64537
Reinsurance	–	–0.25731**	0.11458	5.31326	4.93524
Derivatives	–	–0.23828*	0.12359	0.75881	0.80336
Leverage	+	0.04213**	0.01899	0.12609	0.17062
Accident&Health	+/–	–0.30759	0.23078	–1.18605	1.69436
Marine, Aviation & Transport	+/–	–0.09763	0.22872	–3.13968	2.90275
Property	+/–	–0.24565	0.21847	–1.20248	1.21128
Liability	+/–	–0.11783	0.21288	–2.24679	2.16008
Financial_Loss	+/–	–0.24709	0.22089	–1.55209	1.47787
Motor	+/–	–0.43468*	0.22214	3.83330	3.59045
Business_Concentration	+/–	0.04791	0.10692	1.28733	1.35920
Marginal_Tax_Rate	+	0.00008*	0.00005	0.00061	0.00149
Tax_Convexity	–	–0.04368	0.03086	–0.00156	0.00198
Liquidity	+	0.42149**	0.18097	–0.01247	1.24212
Underwriting_Risk	–	–0.00328	0.00434	–0.00702	0.00638
Organizational_Form	+	0.14464***	0.05285	–2.21732	2.12473
Year Dummies		Yes		Yes	
Adjusted *R*-squared		0.07253		0.03189	
F-value		2.74***		1.73**	

Notes:

[a] The heteroskedasticity-consistent estimates are derived by using a heteroskedasticity corrected covariance matrix (White, 1980).

[b] *** indicates statistical significance at the 1 per cent level; ** indicates statistical significance at the 5 per cent level; and * indicates statistical significance at the 10 per cent level.

Table 5 Regression results for crisis and non-crisis periods

Independent Variables	Expected Sign	Crisis		Non-crisis	
		Coeff.	S.E.	Coeff.	S.E.
Constant		0.18009	0.63893	0.40894	1.17700
Reinsurance	–	–0.17212	0.18550	3.14696	3.09147
Derivatives	–	–0.13791*	0.07417	0.44615	0.47843
Leverage	+	0.01659	0.01427	0.05502	0.07111
Accident&Health	+/–	0.21338	0.29068	–1.47158	1.34835
Marine, Aviation & Transport	+/–	–0.11273	0.22017	–2.41759	2.40494
Property	+/–	–0.07709	0.15206	–1.66188	1.55371
Liability	+/–	0.05325	0.15612	–2.47802	2.33997
Financial_Loss	+/–	–0.06060	0.16755	–1.49728	1.38951
Motor	+/–	0.06438	0.22699	3.36843	3.35211
Business_Concentration	+/–	–0.06767	0.14681	1.65906	1.60740
Marginal_Tax_Rate	+	-0.00003	0.00008	0.00250	0.00231
Tax_Convexity	–	–0.00883	0.01752	–0.00331	0.00311
Liquidity	+	–0.04152	0.62808	1.02123	0.99765
Underwriting_Risk	–	0.00290	0.00482	–0.00601	0.00564
Organizational_Form	+	0.05073	0.05444	–2.07942	1.95182
Year Dummies		Yes		Yes	
Adjusted *R*-squared		0.03594		-0.00390	
F-value		2.02**		0.93	

Notes:

[a] The heteroskedasticity-consistent estimates are derived by using a heteroskedasticity corrected covariance matrix (White, 1980).

[b] *** indicates statistical significance at the 1 per cent level; ** indicates statistical significance at the 5 per cent level; and * indicates statistical significance at the 10 per cent level.

Table 6 Regression results for small insurers during crisis and non-crisis periods

Independent Variables	Expected Sign	Crisis		Non-crisis	
		Coeff.	S.E.	Coeff.	S.E.
Constant		–0.06379	0.42538	–0.40572	0.25556
Reinsurance	–	–0.26760*	0.14910	–0.24232	0.16120
Derivatives	–	–0.15509*	0.08497	–0.15034	0.16279
Leverage	+	0.03405*	0.01956	0.05570**	0.02775
Accident&Health	+/–	–0.64042*	0.35812	–0.12053	0.30232
Marine, Aviation & Transport	+/–	–0.30255	0.34654	0.01127	0.28448
Property	+/–	–0.58523	0.36803	–0.05953	0.28094
Liability	+/–	–0.41370	0.35264	0.02984	0.26982
Financial_Loss	+/–	–0.55900	0.35314	–0.08374	0.28638
Motor	+/–	–0.76346**	0.34755	–0.28883	0.29454
Business_Concentration	+/–	0.22936	0.15755	–0.02438	0.14955
Marginal_Tax_Rate	+	0.00007	0.00006	0.10704	0.13411
Tax_Convexity	–	0.00361	0.01607	–0.10220***	0.02367
Liquidity	+	0.29059	0.34085	0.41714*	0.22689
Underwriting_Risk	–	–0.00508	0.00362	0.01707	0.02175
Organizational_Form	+	0.20322**	0.09047	0.12407*	0.06725
Year Dummies		Yes		Yes	
Adjusted *R*-squared		0.12126		0.02789	
F-value		2.13**		1.40	

Notes:

[a] The heteroskedasticity-consistent estimates are derived by using a heteroskedasticity corrected covariance matrix (White, 1980).

[b] *** indicates statistical significance at the 1 per cent level; ** indicates statistical significance at the 5 per cent level; and * indicates statistical significance at the 10 per cent level.

Table 7 Regression results for large insurers during crisis and non-crisis periods

Independent Variables	Expected Sign	Crisis		Non-Crisis	
		Coeff.	S.E.	Coeff.	S.E.
Constant		–0.91609	1.44794	–0.28322	1.68131
Reinsurance	–	0.09462	0.29725	9.31842	8.06103
Derivatives	–	–0.14635	0.09356	1.73254	1.55175
Leverage	+	–0.05760	0.05980	0.56348	0.53050
Accident&Health	+/–	1.00753	0.67629	–3.97708	3.59033
Marine, Aviation & Transport	+/–	–0.48062	0.37010	–4.17692	3.83793
Property	+/–	0.10271	0.20981	–1.69110	1.73354
Liability	+/–	0.08506	0.22940	–4.45426	3.94135
Financial_Loss	+/–	–0.02264	0.26252	–2.97813	2.71263
Motor	+/–	0.20678	0.33875	6.81309	6.08133
Business_Concentration	+/–	–0.14244	0.27575	2.63448	2.54510
Marginal_Tax_Rate	+	–0.00011	0.00008	0.00358	0.00303
Tax_Convexity	–	–0.02068	0.03133	–0.00520	0.00447
Liquidity	+	1.05043	1.46551	1.63315	1.77643
Underwriting_Risk	–	0.00849	0.04404	–0.01127	0.00964
Organizational_Form	+	0.10259	0.14430	–4.73693	4.07257
Year Dummies		Yes		Yes	
Adjusted *R*-squared		0.06726		0.06716	
F-value		1.65*		1.95**	

Notes:

[a] The heteroskedasticity-consistent estimates are derived by using a heteroskedasticity corrected covariance matrix (White, 1980).

[b] *** indicates statistical significance at the 1 per cent level; ** indicates statistical significance at the 5 per cent level; and * indicates statistical significance at the 10 per cent level.

科技部補助專題研究計畫出席國際學術會議心得報告

日期：104 年 1 月 16 日

計畫編號	MOST 102-2410-H-004-029		
計畫名稱	再保險多還是少比較好？		
出國人員姓名	許永明	服務機構及職稱	政治大學風險管理與保險學系教授
會議時間	103 年 7 月 27 日至 103 年 7 月 30 日	會議地點	俄羅斯莫斯科
會議名稱	(中文) 亞太風險與保險學會 2014 年會 (英文) Asia-Pacific Risk and Insurance Association 2014 Annual Meeting		
發表題目	(中文) 使用再保險與衍生性商品對績效的影響 (英文) How Does the Use of Reinsurance and Derivatives Affect Insurer Performance?		

一、參加會議經過

On 26 July 2014 I started my journal from Taipei and arrived at Moscow, Russia on the 27th. The purpose of this journal is to attend Asia-Pacific Risk and Insurance Association 2012 Annual Meeting. This meeting began from 27 to 30 July, 2014.

The conference was held at the Moscow State University (MSU). The first day of the conference started with a welcome reception at Atrium of the MSU Faculty of Economics. From the 28the onwards to the last day of the conference, there were seven concurrent sessions in total, including Sessions A to G.

I presented my paper entitled "How Does the Use of Reinsurance and Derivatives Affect Insurer Performance?" on 28 August. My paper is scheduled under the session of "Reinsurance", chaired by Professor Tim Jeffrey Query from New Mexico State University. We had four papers in this session. The conference did not assign a discussant for each paper. However, conference attendants offered a number of suggestions for further improving and enriching my paper.

二、與會心得

The Asia-Pacific Risk and Insurance Association Annual Meeting is one of the largest academic conferences in the field of risk management and insurance in the world. To my knowledge, many risk and insurance professionals including scholars and researchers in this field attend this conference every year. This conference provides a chance for attendants to know and converse with each other.

In my view, participating in the conference may not necessarily obtain very useful comments on the

paper presented. However, the presenter can know his or her paper better by simply preparing for the presentation. This would be one of the benefits of attending conferences. Besides, attending conferences also provides an opportunity to know the latest research topics in the relevant field. Maybe good research ideas can be generated from listening to other conference attendants' presentations.

三、發表論文全文或摘要

It is the public's perception that insurers which use reinsurance and derivative hedging have better performance. Using regulatory returns data on UK non-life insurers from 1994 to 2011, this paper empirically examines whether insurer performance is related to the use of reinsurance and derivatives and how this relation varies across different size classes and time periods. We find that small insurers that use more reinsurance and engage in derivative transactions are more difficult to improve their market share. This is particularly the case during crisis periods. However, we do not find any such evidence for large insurers or during non-crisis times. Our analysis sheds some light on the effect of reinsurance and derivative use by small insurers on their performance.

四、建議

N/A

五、攜回資料名稱及內容

A copy of conference brochure.

六、其他

N/A

科技部補助計畫衍生研發成果推廣資料表

日期:2015/01/16

科技部補助計畫	計畫名稱: 再保險多還是少比較好？
	計畫主持人: 許永明
	計畫編號: 102-2410-H-004-029- 學門領域: 財務

無研發成果推廣資料

102 年度專題研究計畫研究成果彙整表

計畫主持人：許永明	計畫編號：102-2410-H-004-029-
計畫名稱：再保險多還是少比較好？	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	1	1	100%		已經以’’’’ How Does Reinsurance and Derivative Hedging Affect Insurer Performance?’’’’ 投稿 Geneva Papers on Risk and Insurance: Issues and Practice, 也已經得到主編回覆，目前正在依據評審委員意見進行第一次修改。
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	2	2	100%		另有大專生兩名兼任助理協助計畫行政相關事宜。
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		

		專任助理	0	0	100%		
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)		無					

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

科技部補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 □未發表之文稿 ■撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：(以 100 字為限)

已經以’’’’ How Does Reinsurance and Derivative Hedging Affect Insurer Performance?’’’’ 投稿 Geneva Papers on Risk and Insurance: Issues and Practice, 也已經得到主編回覆,目前正在依據評審委員意見進行第一次修改。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）(以 500 字為限)

It is the public’s perception that insurers which use reinsurance and derivative hedging have better performance. Using regulatory returns data on UK non-life insurers from 1994 to 2011, this paper empirically examines whether insurer performance is related to the use of reinsurance and derivatives and how this relation varies across different size classes and time periods. We find that small insurers that use more reinsurance and engage in derivative transactions are more difficult to improve their market share. This is particularly the case during crisis periods. However, we do not find any such evidence for large insurers or during non-crisis times. Our analysis sheds some light on the effect of reinsurance and derivative use by small insurers on their performance.