

科技部補助專題研究計畫成果報告 期末報告

資本在金融危機期間對績效的影響：以英國壽險業為例

計畫類別：個別型計畫
計畫編號：MOST 103-2410-H-004-133-
執行期間：103年08月01日至104年11月30日
執行單位：國立政治大學風險管理與保險學系

計畫主持人：許永明

計畫參與人員：碩士班研究生-兼任助理人員：羅慶棠
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博士班研究生-兼任助理人員：蕭景元
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報告附件：出席國際會議研究心得報告及發表論文

處理方式：

1. 公開資訊：本計畫涉及專利或其他智慧財產權，2年後可公開查詢
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

中華民國 105 年 02 月 27 日

中文摘要：本文研究壽險公司的資本對其績效的影響，我們以成長及獲利能力來代表公司的績效。利用英國壽險公司自1985年至2012年的資料，我們將樣本分成大小公司與2008金融危機前後。我們發現：資本對小公司的影響比較大，特別在金融危機發生以後。我們也發現：資本對小公司的成長有正向影響，但對獲利能力有負面影響。

中文關鍵詞：資本、危機、壽險公司、績效、成長、獲利能力

英文摘要：This study aims to examine the effects of capital on life insurer performance, proxied by growth and profitability. Using the UK statutory returns of life insurers from 1985 through 2012, we split our sample by insurer size: small and large insurers. We then examine how capital affects insurer performance before and after financial crisis which occurred in 2008. Ordinary least squares and random-effects regressions are employed. We find that capital is more important in determining performance for small than large insurers, especially during crisis periods. To be more specific, capital is positively related to growth and negatively associated with profitability for small insurers.

英文關鍵詞：Capital, crisis, life insurers, performance, growth, profitability

Effects of Capital on Growth and Profitability during Financial Crises:

Evidence from the UK Life Insurance Industry

ABSTRACT

This study aims to examine the effects of capital on life insurer performance, proxied by growth and profitability. Using the UK statutory returns of life insurers from 1985 through 2012, we split our sample by insurer size: small and large insurers. We then examine how capital affects insurer performance before and after financial crisis which occurred in 2008. Ordinary least squares and random-effects regressions are employed. We find that capital is more important in determining performance for small than large insurers, especially during crisis periods. To be more specific, capital is positively related to growth and negatively associated with profitability for small insurers.

Keywords: Capital, crisis, life insurers, performance, growth, profitability

INTRODUCTION

Insurers are highly regulated and required to have sufficient capital available to operate as a going concern. Capital provides an insurer a buffer that can absorb unanticipated losses. However, capital involves cost, which may adversely affect insurer performance. As a result, the effects of capital on firm performance could be an empirical question. It would then be an interesting question to ask whether capital affects insurer performance. If it does, how does capital affect performance? Does the relation between capital and performance vary across different size classes and time periods? The purpose of this study is to empirically address the above-mentioned research questions.

The UK statutory returns of life insurers from 1985 through 2012 are employed in this study. The sample period is divided into two sub-periods, before and after financial crisis occurring in 2008. We further divide our sample firms into small and large insurers. The purpose of doing this is to examine how capital affects small and large insurers' performance during crisis and before crisis. Using ordinary least squares and random-effects regressions, we find that capital is more important in determining performance for small than large insurers, especially during crisis periods. Specifically, capital is positively related to growth and negatively associated with profitability for small insurers.

The motivation for this study is twofold. First, as far as we understand, the effects of capital on insurer performance have not yet been extensively examined before and after the 2008 financial crisis. The study that is most closely related to ours is Berger and Bouwman (2013). However, there exist a number of major differences between their study and ours. First and most obviously, their research employs banking data while

our study uses insurance data. Although banks and insurers are both regarded as financial intermediaries, they actually are quite different in nature. For instance, insurers use reinsurance as a risk management tool that banks do not have. Since buying reinsurance is like renting capital from reinsurers, we also examine how reinsurance affects insurer performance during crisis times. The second motivation is that this research has empirical importance. Since insurance regulators are very much concerned with how pre-crisis capital affect insurer performance during financial crises, our findings should be of interest to them.

HYPOTHESIS DEVELOPMENT AND MODEL CONSTRUCTION

Insurer performance can be measured through several perspectives. Of which, growth and profitability are two important measures that concern life insurer managers. Life insurers as a risk pooler are exposed to several main risks (such as market, insurance, credit and operational risks), which if not properly controlled may cause insurers to go bankrupt. An insurer's capital can be used as a buffer to absorb unexpected losses (arising from the insurer's liability and asset portfolios) and therefore a well-capitalized insurer has a relatively small probability of insolvency. However, it does not necessarily mean that higher capital is better for a firm because capital bears cost. On the contrary, an insurer with a high capital-assets ratio reflects that it is operating too conservatively. This kind of operational philosophy might result in an insurer's missing profitable but risky investment and business opportunities, which in turn have adverse effects on overall firm performance.

A firm's performance is frequently evaluated from its growth and profitability. However, the effects of capital on these two performance measures could be different. Due to regulatory solvency requirements, insurers

have to hold sufficient capital in order to purchase more assets. We therefore expect a positive relation between capital and growth. Nevertheless, since capital is costly, high capital would reduce an insurer's profitability.

Prior studies such as Goddard, Molyneux and Wilson (2004) have also argued that growth and profit are interdependent and closely related. In practice, a firm's current after-tax profits minus dividends will be added to its retained earnings, which are recorded under shareholders' equity on the balance sheet. Retained profits are then a source of capital (Goddard, et al., 2004). Under a risk-sensitive solvency regime of insurance that requires insurers to meet various capital adequacy standards, an insurer with higher levels of capital is then permitted to increase its investment in assets or underwriting in insurance because increases in both investment and underwriting activities expose an insurer to higher levels of risk. We therefore expect that a more profitable insurer tends to grow faster.

The reverse causality from growth to profitability is also straightforward. An insurer that takes risk by expanding its asset and business portfolios is more likely to be profitable. We thus also expect that a growing insurer is more likely to be profitable. Taken together, we expect a two-way relation between growth and profitability and thus the model is constructed accordingly as follows.

$$\text{Growth}_{i,t} = \alpha_{1,i} + \beta_1 \text{Capital}_{i,t-1} + \gamma_1 \text{Profitability}_{i,t-1} + \delta_1 \text{Growth}_{i,t-1} + \boldsymbol{\theta}'_1 \mathbf{X}_{i,t-1} + \varepsilon_{1,i,t} \quad (1)$$

$$\text{Profitability}_{i,t} = \alpha_{2,i} + \beta_2 \text{Capital}_{i,t-1} + \gamma_2 \text{Growth}_{i,t-1} + \delta_2 \text{Profitability}_{i,t-1} + \boldsymbol{\theta}'_2 \mathbf{X}_{i,t-1} + \varepsilon_{2,i,t} \quad (2)$$

It is worthwhile to note that we include previous year growth and profitability in Equations (1) and (2) respectively to take into account the possible persistence of growth and profit. Growth $_{i,t}$ is measured by logarithmic growth in assets and premiums of insurer i in year t . To be more specific, they are $\log_e \frac{\text{Assets}_{i,t}}{\text{Assets}_{i,t-1}}$ and $\log_e \frac{\text{Premiums}_{i,t}}{\text{Premiums}_{i,t-1}}$, respectively. Profitability $_{i,t}$ is measured by return on equity (ROE) and return on assets (ROA) of insurer i in year t . The main variable of interest is Capital $_{i,t-1}$ is proxied by capital-assets ratio of insurer i in year $t-1$. $\mathbf{X}_{i,t-1}$ is a vector of control variables. All explanatory variables including control variables are lagged by one year to address possible endogeneity concerns. All variables including explanatory and dependent variables are normalized by subtracting their cross-sectional means in each year. $\varepsilon_{1,i,t}$ and $\varepsilon_{2,i,t}$ are structural errors and may be correlated with each other.

Drawn from prior studies (Goddard, et al., 2004; Shiu, 2009), the control variables included in the above two-way dynamic panel regression model are as follows. First, liquidity of an insurer can play a role similar to capital in absorbing unforeseen losses. However, liquid assets cannot generate high financial returns. We thus expect that this variable, proxied by liquid ratio, is negatively related to an insurer's growth and profitability.

The second control variable is reinsurance dependence. Reinsurance has traditionally been a risk management tool that insurers use. According to the renting-capital hypothesis, reinsurance purchase reduces the strain on the insurer's capital (Shiu, 2011). Buying reinsurance is just like renting capital from the reinsurer. Therefore, reinsurance effectively serves as a substitute to some degree for equity capital (Adiel, 1996). Although life insurers need less reinsurance than their non-life counterparts, reinsurance is still

indispensable in their insurance operations in order to stabilize earnings and mitigate catastrophic losses. In spite of these benefits, reinsurance comes with a cost that has to be paid. Reinsurance cost could be very high (Froot, 2001; Cummins, Dionne, Gagné and Nouira, 2008), especially when catastrophic events occur and high losses are caused. We therefore expect a negative relation between reinsurance dependence and our two dependent variables.

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 lines of business. We do not provide an *ex ante* prediction regarding the effect business mix on performance.

Life insurers' performance may be relatively unstable when they have an undiversified business portfolio. If this is the case, highly concentrated insurers probably 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 perform 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 could be influenced by taxes, we include two tax-related variables. They include marginal tax rates and tax convexity. The marginal tax rate is set to be 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 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 \div annual taxable income).

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.

THE METHODOLOGY AND EMPIRICAL FRAMEWORK

Data

The data for our analysis will be obtained from SynThesys Life provided by Standard and Poor's. This data set contains regulatory returns for UK life insurers from 1985 through 2012. Several data exclusion criteria that are used in prior research are applied. First, we exclude insurers with non-positive total admissible assets and negative premiums in any of the identified lines of business. Since our paper is only focused on the UK life insurance industry, insurers which submit global returns are excluded from this study. It is worthwhile to note that our study is less likely to be subject to survivorship bias because all insurers that existed during the 1985-2012 period and filed complete regulatory returns are included in the sample, even if they failed to survive until the end of the analysis period.

Methodology

We first examine the effects of capital on performance using the whole sample. We then equally divide the whole sample into two groups: small and large firms. The aim of doing so is to investigate whether the effects would be different for small and large insurers. For robustness check, we also use the median of total admissible as a cut-point to divide our sample into small and large groups.

In order to examine the effects of capital on insurer performance before and after the crisis, we then also divide our whole sample period into two types of periods: before and after crisis periods, using the year of 2008 as a cut point.

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. We estimate the model using ordinary least squares and random-effect regressions. The LM test statistics is used to determine whether the ordinary least squares regression or the random-effect regression is appropriate for our data. Since observations come from a large number of cross-section insurers, heteroscedasticity might exist. We therefore report White's heteroscedasticity-consistent estimators (White, 1980).

PRELIMINARY RESULTS

We have found that capital is important in determining life insurer performance. To be more specific, capital is positively related to growth and negatively associated with profitability for small insurers. The effect is more influential for small insurers than for large insurers. We also found that this effect would be more pronounced after crisis. We winsorized our sample and found that results are robust.

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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：105 年 2 月 14 日

計畫編號	MOST 103-2410-H-004 -133 -		
計畫名稱	資本在金融危機期間對績效的影響：以英國壽險業為例		
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	104 年 8 月 2 日至 104 年 8 月 6 日	會議地點	德國慕尼黑
會議名稱	(中文) 世界風險與保險經濟論壇 (英文) 2015 World Risk and Insurance Economics Congress (WRIEC)		
發表題目	(中文) 互補或替代假說：以英國壽險公司所使用的風險管理工具為例 (英文) Complementary versus Substitution Hypothesis: Evidence from the Use of Risk Management Instruments by United Kingdom Life Insurers		

一、參加會議經過

I started my journey for attending the World Risk and Insurance Economics Congress on 1 August 2015. On the morning of the next day, I arrived in Frankfurt, Germany. I soon took ICE train to Munich, where the conference took place from 2-6 August 2015.

This conference is jointly co-organized by American Risk and Insurance Association, Asia-Pacific Risk and Insurance Association, European Group of Risk and Insurance Economists and The Geneva Association. This conference was held in Ludwig-Maximilians-Universität (LMU). At 6pm, 2 August I attended the conference's welcome reception. This warm reception took place at Lichthof and Speerträger at LMU main building. I met several colleagues from my Department and professors from other universities.

The conference's Opening and Welcome started at 8:45 am on 3 August. There were 8 concurrent sessions held in the following four days. Approximately 10 sessions in each concurrent sessions. My paper entitled "Complementary versus Substitution Hypothesis: Evidence from the Use of Risk Management Instruments by United Kingdom Life Insurers" was scheduled to present in the F session of 4 August, starting at 8:30 am. This session was moderated by Randy Dumm from Florida State University. In my session, 3 papers were presented and each paper was given 30 minutes to be presented and discussed. Dr. Anja Erlbeck from University of Cologne commented on my paper.

二、與會心得

The World Risk and Insurance Economics Congress is the largest annual meeting in the academic field of risk management and insurance professionals. It takes place every five years cohosted by the above-mentioned 4 organizations. This conference always attracts academic professionals in this field.

Attending this conference is instrumental in having a look at the latest and hottest topics on which risk and insurance professionals are working. Many excellent papers are presented in this conference and there are so much that can be learned. Another advantage of attending this conference is to have an opportunity to have a good look at my paper. It has been quite a while since this paper has been drafted. Several weaknesses of this paper have been identified and improved.

三、發表論文全文或摘要

Using a sample of U.K. affiliated life insurers, this paper examines two competing hypotheses, i.e., complementary and substitution hypotheses, regarding the relation between derivatives and reinsurance use. Unlike prior studies, we further divide reinsurance into internal and external reinsurance since there are some cost and structural differences between these two types of reinsurance. Consistent with complementary hypothesis, we find a positive relation between derivatives and reinsurance. Moreover, a stronger positive relation between derivatives and external reinsurance is found. This finding is consistent with our expectation that derivatives and external reinsurance use exhibit stronger effect on each other because external reinsurance could have broader risk management applications than internal reinsurance. We further find that risk management instruments use lead to reduction in insurer's overall risk. This result is in line with complementary hypothesis since it implies that insurers use derivatives and reinsurance to mitigate investment and underwriting risk jointly and thus lead to the reduction in overall risk.

四、建議

N/A

五、攜回資料名稱及內容

A copy of conference program.

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:2016/02/05

科技部補助計畫	計畫名稱: 資本在金融危機期間對績效的影響: 以英國壽險業為例
	計畫主持人: 許永明
	計畫編號: 103-2410-H-004-133- 學門領域: 財務
無研發成果推廣資料	

103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：103-2410-H-004-133-					
計畫名稱：資本在金融危機期間對績效的影響：以英國壽險業為例							
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	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（本國籍）	碩士生	1	1	100%	人次	
		博士生	2	2	100%		
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	1	1	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。）		在執行計畫期間，原先所得的研究成果不如預期，因此再透過廣泛閱讀文獻，發現必須將主題作一些必要的調整，資料亦得重新蒐集，以增加本研究的貢獻度。目前已得到初步的實證結果，並寫於結案報告中，後續將持續彙整相關資料，以寫成一篇完整的論文並投稿。					

	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）

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）

本計畫的主題在於探討資本在金融危機前後對於壽險公司的影響。由於資本對壽險公司的績效表現，影響很大，因此這樣的研究，在實務上有其重要性。在學術上，同時探討壽險公司資本、成長與獲利能力的文章，亦不多見。所獲得的結論應可填補文獻上的空缺，並提供給實務界及監理機關參考。