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(計畫名稱)

保險公司管理策略對經營效率之影響分析

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## I. 中文摘要

### 中文摘要

本研究蒐集美國產險公司之實證資料，利用資料包絡分析法 (data envelopment analysis) 探討相互保險公司在改變成股票型態後，也就是進行非相互化 (demutualization)，是否真能提升其經營績效。就保險公司之組織型態而言，究竟是股票公司還是相互公司比較有效率，一直是保險研究文獻中的重要問題，而且過去文獻也有許多討論，但是針對進行非相互化的保險公司是否能提升其經營績效，文獻中卻僅有壽險業之實證分析，並未針對產險業進行探討。本研究蒐集美國產險公司之實證資料，利用資料包絡分析法 (data envelopment analysis)，探討進行非相互化之產險公司是否真能提升其經營績效，並採用 Malmquist 指數來衡量進行非相互化期間其總生產力變動的狀況。本研究的附加價值法 (value-added approach) 與 財務中介法 (the financial intermediary approach) 之結果支持窗飾效果假說 (window dressing hypothesis)，也就是進行非相互化的產險公司在其非相互化前會提升其效率；以及效率假說 (efficiency hypothesis)，也就是進行非相互化的產險公司在其非相互化後會提升效率。

關鍵詞：非相互化，經營績效，資料包絡分析法，Malmquist 指數，產險公司

### I. Abstract

This study investigates whether the conversion of U.S. property-liability insurers improves their efficiency performance before and after conversion. The evidence shows that converting insurers experience larger gains in cost efficiency and total productivity change than mutual control insurers before conversion using the value-added approach. The empirical evidences of the value-added approach and the financial intermediary approach indicate converting insurers experience improvement in their efficiency relative to mutual control insurers after the conversion. The results are robust with respect to cost efficiency scores and total factor productivity change. The overall results support the efficiency hypothesis.

Keyword: demutualization, efficiency, DEA, property-liability insurers.

## II. Introduction

Mutual-to-stock conversion, a process known as demutualization, has been occurring in the U.S. insurance markets for many decades. These conversions have raised much attention from insurance regulators, policyholders, and academics and have become an important issue in the insurance literature. To understand why insurers demutualize, we need to ask: Which form of organizational structure, mutual or stock, is more efficient? A number of studies have explored this issue and provide many meaningful insights. Spiller (1972), Frech (1980), Cummins, Weiss and Zi (1999), Brockett et al. (2004, 2005) among others examine the efficiency issue of stock versus mutual insurers. Mayers and Smith (1986), McNamara and Rhee (1992), and Cagle et al. (1996) further examine the performance issue for insurers who go through the conversion process.

Mayers and Smith (1986) suggest two competing hypotheses to explain why mutual insurers convert: the expropriation hypothesis and the efficiency hypothesis. The expropriation hypothesis alleges that conversions may be used as a mechanism to transfer wealth from policyholders to officers and directors of converting insurers and policyholders may be harmed through the conversion process. The efficiency hypothesis, on the other hand, suggests that the purpose of conversion is to improve financial and operational performance of the converting insurer. Based on agency theory, there are many disadvantages of mutual insurers. Mutual insurers are less effective in monitoring and controlling management than stock insurers. In other words, the conflict between the policyholder and the managers is much higher for mutual insurers. Moreover, mutual insurers are less effective in operation because of their restricted access to capital and inability to diversify. Thus, the efficiency hypothesis states that mutual insurers convert to stock insurers in an effort to improve efficiency.

A few studies have examined the performance changes during conversion period. For example, McNamara and Rhee (1992) examine the performance of converting life insurance companies by examining the product variables, financial variables, and management welfare variables. Their empirical evidence suggests that converting life insurers did improve their performance after conversion. Cagle et al. (1996) further investigate the results of conversion for property-liability insurers by examining financial status, business mix, and management welfare variables. Their evidence shows that the converting insurers experience no change in accounting profitability.

McNamara and Rhee (1992) and Cagle et al. (1996) shed insight on the efficiency issue, but they use conventional financial ratios and operational ratios as proxies for “performance” and do not examine efficiency from the input/output efficiency perspective. More recently, Jeng, Lai, and McNamara (2006) utilize input/output efficiency to examine the efficiency performance changes of converting life insurers but not property-liability insurers. In fact, there is no study investigating the input/output efficiency performance change of converting property-liability insurers. This paper helps to fill this gap in the literature.

The main purposes of this paper are to evaluate the pre- versus post-conversion efficiency performance of property-liability insurers and to test the efficiency hypothesis proposed by Mayers and Smith (1986). We utilize the data envelopment analysis (DEA) approach to

evaluate the efficiency changes of converting insurers. Both the value-added approach and the financial intermediary approach of the DEA method are used. Malmquist index analyses are employed to examine the productivity changes of converting insurers over the sample period.

Our results are based on the overall sample period (from 1989 to 2001). This study investigates whether the converting U.S. property-liability insurers improve their efficiency performance before and after the conversion. The evidence shows that converting insurers experience larger gains in cost efficiency scores and total factor productivity change than mutual control insurers before conversion when the value-added approach is used. On the other hand, converting insurers experience deterioration in cost efficiency scores and total factor productivity change relative to mutual control insurers before conversion when the financial intermediary approach is used. These two seemingly contradictory results may be complementary because the outputs and inputs of the two approaches are different. The empirical evidences of the value-added approach and the financial intermediary approach indicate converting insurers experience improvement in their efficiency relative to mutual control insurers after conversion. The results are robust with respect to cost efficiency scores and total factor productivity change. These overall results support the efficiency hypothesis. The regression evidence also shows that converting insurers outperform their mutual control insurers in cost efficiency after conversion using the both approaches.

This paper makes several contributions. First, this study is the first to utilize the data envelopment analysis (DEA) methodology to examine the efficiency performance change resulting from conversions in the U.S. property-liability insurance industry. Prior studies do not consider this type of efficiency analysis. The DEA method measures the efficiency performance from both input and output perspectives. Second, we analyze efficiency performance change by using the Malmquist index method, which further separates total productivity change into technical change and technical efficiency change. The additional two measures can provide more insights into the efficiency performance change. Another advantage of the DEA method and Malmquist method is that they produce a uniform efficiency score so that comparisons among insurers are possible. Finally, this study provides evidence supporting the efficiency hypothesis developed by Mayers and Smith (1986).

Our first research question is whether converting insurers improve their efficiency performance and productivity before conversion. Please note that it is not the intention of this paper to investigate the motivations for demutualization. Viswanathan and Cummins (2003) examined the motivations for conversion in the insurance industry. But they have not looked into the issue of efficiency changes using the DEA method. Our second research question is whether converting insurers improve their efficiency performance and productivity after conversion. The answer to this question will shed new light on the efficiency hypothesis proposed by Mayers and Smith (1986).

## **II. Data and Methodology**

We examine recent property-liability conversions that occurred during the 1993-1998 period. See Appendix A for a list of the sample insurers. Only insurers that have complete data during the sample period are included in this paper. There are two reasons for the short sample period. First, we can evaluate the efficiency performance change of converting insurers based on homogeneous economic conditions (see Viswanathan and Cummins (2003)). Second, for each converting insurer we identify 30 mutual/stock control insurers by matching their asset size and thus need to rely on NAIC (National Association of Insurance Commissioners) data tapes rather than hand-collected data. The overall sample period is from 1989 to 2001.

There are two major classes of efficiency estimation methods: the econometric (parametric) approach and the mathematical programming (non-parametric) approach. The main disadvantages of the parametric approach are the possibility of specification error and the difficulty of separating efficiency into different components. In this paper, we utilize the data envelopment analysis (DEA), a non-parametric approach, to avoid above disadvantages.

Two different DEA methods are used in this paper: the value-added approach and the financial intermediary approach. In addition, we use Malmquist Index analysis to track the efficiency changes and productivity growth during the sample period. Malmquist Index evaluation can also provide more detailed estimates of technical efficiency change, technical change and total factor productivity change over a given period. Cummins and Weiss (2000) provide an excellent review of the DEA methodology and Malmquist Index analysis, and discuss several major efficiency studies in the insurance industry.

We chose to employ the DEA approach for the following four reasons. First, the DEA approach has been used extensively in estimating efficiency in the banking and insurance literature. Second, this non-parametric approach allows us to avoid an inappropriate assumption about the distribution of error terms used in the parametric approach. Third, the DEA approach separately evaluates the efficiency of every decision making unit (DMU) relative to its reference set, thus providing a more meaningful measurement of efficiency. Finally, the use of the DEA approach enables us to provide consistent analysis since the Malmquist index is also DEA-based. We next discuss the input/output variables used in this study for the DEA approach and efficiency measurement. Both the value-added approach and the financial intermediary approach are used.

## **III. Research Results and Conclusion**

This study investigates the pre versus post-conversion efficiency and productivity changes of U.S. property-liability insurers. For robustness, we provide various DEA scores (cost efficiency, technical efficiency, and allocative efficiency scores), Malmquist indices (total factor productivity change, technical efficiency change and technical change), and regression results of the value-added approach and the financial intermediary approach before and after conversion. The empirical results are discussed below.

First, we find converting insurers improve their performance before conversion using the

value-added approach. On the other hand, converting insurers experience deterioration in efficiency before conversion using the financial intermediary approach. As we mentioned above, the two seemingly contradictory results from the two approaches may be complementary. The converting insurers improve performance before conversion to maximize their policyholders' (stockholders after conversion) wealth. At the same time, the evidence shows the converting insurers suffer deterioration in financial condition and need to seek a capital infusion through the conversion.

Second, the evidence based on the pooled frontier of mutual insurers and converting insurers shows that converting insurers improve their performance after the conversion using the two approaches. These results strongly support the efficiency hypothesis developed by Mayers and Smith (1986). The evidence, based on the pooled frontier of converting insurers and stock insurers, indicates that converting insurers improve their performance using the value-added approach. On the other hand, the evidence indicates that performance of converting insurers deteriorates using the financial intermediary approaches. It should be noted that the mixed results do not necessarily invalidate the efficiency hypothesis. We believe that the results based on the mutual control insurers should be weighed more heavily than those for stock control insurers. The reason is that even though converting insurers change their organizational structure from mutual to stock, they may not behave as stock insurers within three years after conversion because it takes time to adjust the changes.

It should be noted that the regression results examine whether the converting insurers outperform mutual or stock control insurers, while the DEA scores and Malmquist indices examine whether converting insurers improve their performance. Thus, we should give more weight to the DEA scores and Malmquist indices when we examine the efficiency hypothesis. The efficiency and productivity changes before the conversion are summarized first. We cannot conclude converting insurers perform better or worse than mutual control insurers before the conversion. However, the empirical evidences of the value-added approach and the financial intermediary approach indicate converting insurers experience improvement in their efficiency relative to mutual control insurers after the conversion. The results are robust with respect to both the value-added approach and the financial intermediary approach.

The regression results of the efficiency and productivity changes after the conversion are summarized next. The evidence shows that the converting insurers experience larger gains in cost efficiency than mutual control insurers. The results are robust with respect to both the value added approach and the financial intermediary approach. Using the financial intermediary approach, we also find that converting insurers outperform mutual control insurers in terms of total factor productivity change and outperform stock control insurers in terms of cost efficiency. We believe the empirical results shed light on the efficiency hypothesis.

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## Evaluation of this paper (計劃成果自評)

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## 國科會出國開會報告(全美風險管理與保險年會, 2007)

報告人： 王儷玲, Jennifer L. Wang  
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本人於八月五日至八月八,日在加拿大的Quebec City參加美國風險管理與保險年會 (ARIA Annual Conference)。 ARIA Annual Conference是美國風險管理與保險學術界最重要的學術年會，也是國際風險管理與保險學術界極富盛名的學術年會。今年會議主題包括：巨災風險管理與預測模型、保險公司盈餘管理與市場訊號(Earnings Management and Market Signals)、再保險市場目前發展等，約有三百多位來自世界各國的學者參與此盛會。

本人於八月六日於此研討會中發表兩篇近期完成有關汽車保險資訊不對稱及產險公司之非專業化與專業化生產策略的研究著作：

1. " Provider-Induced Asymmetric Information in the Insurance Market " –10:15 AM -11:45 AM, August 6.
2. " Nonspecialized Strategy versus Specialized Strategy" –1:45 PM - 3:15 PM , August 6.

透過這次的發表，我得到了許多寶貴的修改意見，同時也增加此篇論文投稿於國際期刊被接受的可能性，並且藉由他人發表瞭解目前保險人效率與生產力相關重要議題的發展方向與程度，真是受益非淺。另外更重要的是，我有機會與世界各國頂尖的保險學者在年會中認識，並交換彼此的研究心得，因此也創造了將來可能可以彼此共同合作的機會。

在美國風險管理與保險年會除了有研究論文發表外，另外也安排幾場重要專題研討 (Plenary Section)」，邀請國際保險實務界經驗豐富的高階主管與學術界資深的重要學者共同討論目前美國及國際保險界的最新的發展趨勢，今年的討論主題包括Catastrophe Management in a Changing World、Institutional Evolution and Financing Catastrophe Risk等，會中邀請的keynote speaker與討論內容如下：

第一個主題 是有關Catastrophe Management in a Changing World的部分，今年邀請三位專家來參與座談：Jay Fishman, Chairman and CEO, Travelers；Joan Schmit, University of Wisconsin；Marty Grace, Georgia State University，指出目前巨災的風險管理方法，藉此討論出更好的解決方案。

另一相關的主題為Institutional Evolution and Financing Catastrophe Risk的部分，今

年邀請兩位專家來參與座談，Kenneth A. Froot、André R. Jakurski (Professor of Business Administration, Harvard University's Graduate School of Business Administration) 指出目前為巨大災害風險融資與財務風險管理的內容與衍生問題，藉此可以設法提出理論上更好的解決方案。

另外，這次在此研討會中發表的論文包括Predictive Modeling: The Case of Hurricanes、Earnings Management and Market Signals、Investment and Longevity Risk、The Financial Relevance of Industry Commissions等不同專題的優秀著作，不但增加了我對保險學術研究上許多寶貴的知識，更可以提供給像我這樣的年輕學者們不少的學習經驗與研究創作靈感。尤其目前國內的保險學術界仍無法定期舉辦如此大型的國際學術研討會，我建議應該鼓勵更多的國內學者們參與這樣的研討會。