The Relationship among Reinsurance, Capital Structure and Catastrophes: The Dynamic Approach Evidence on Property-Liability Insurers in Asian Countries

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Abstract

Reinsurance and capital structure are important factors in insurer's operations. In recent years, catastrophes happened frequently in Asian countries; however, the property-liability insurers in Asia seldom use catastrophe bonds or derivatives to transfer their risk to capital market. Thus, this study aims to investigate the relationship among reinsurance, capital structure and catastrophes in the context of the young but fast-growing Asian insurance market. Using data that consists of property-liability insurers in China and Taiwan from 2007 to 2012, we adopt the simultaneous equation model to examine the relationship among reinsurance, capital structure and catastrophes. Previous studies had found that there exists an interactive relationship between reinsurance and capital structure. Therefore, we predict the property-liability insurers with higher level of reinsurance tend to have higher debt ratio, and the property-liability insurers with high debt ratio may purchase more reinsurance. If catastrophic events happened in the previous year, we predict that reinsurance and capital structure of insurers may change in the following year.

Key Words: Reinsurance, Capital Structure, Catastrophe, Property-Liability Insurers, Asian Insurance Industry

1. Introduction

The reinsurance and capital structure are both important factors in insurer's operations. Since Modigliani and Miller (1958) provided capital structure theory, what is the optimal leverage to maximize the firm value has drawn a lot of concerns for both in practice and academia. According to the bankruptcy cost theory, the insurers with high financial leverage are exposed to have higher insolvency probability. Thus, literature had reported that insurers with higher financial leverage tend to purchase more reinsurance to supplement capital deficiency (Cole and McCullough, 2006; Powell and Sommer, 2007; Shiu, 2011). Furthermore, there are numerous empirical studies attempt to examine why property-liability insurers purchase reinsurance (Hoerger et al., 1990; Adams, 1996; Chen etal., 2001; Garven and Tennant, 2003; Powell and Sommer, 2007; Adams et el., 2008; Bartram et al., 2009; Shiu, 2011)[1]. Reinsurance cab be regarded as one forms of off-balance-sheet capital. Some papers argued reinsurance or insurance can expand a firm's financial leverage capacity (Zou and Adams, 2008; Bartram et al., 2009).

Most studies examined the relationship between reinsurance and capital structure was conducted under the framework of a single equation. However, a few previous studies documented that reinsurance and capital structure might be jointly determined (MacMinn, 1987; Plantin, 2006; Shiu, 2011). Therefore, the purpose of this study is to examine the relationship among reinsurance, capital structure and catastrophes simultaneously for property-liability insurers in Asian countries. In recent years, many catastrophic events happened all over the world, especially in Asian countries. Although reinsurance contract provides the most practical and low transaction costs method to deal with risk; however, when catastrophes happened, insurers might not have purchased enough reinsurance coverage it (Froot, 1999). Furthermore, after extreme disasters, the rising demand and decreasing supply of reinsurance will increase the reinsurance price in the following year. Although instruments such as catastrophic bonds and derivatives which are developed in capital market can help insurers and reinsurers alleviate the catastrophic loss (Cummins, 2005, 2008; Cummins and Weiss, 2009; Albertini and Barrieu, 2009), the property-liability insurers in Asian countries seldom use catastrophe bonds or derivatives to transfer their catastrophe risk to capital market.

In general, our study is motivated in two further aspects compared to that of the previous studies. Firstly, previous studies are usually focused on the linkage between reinsurance and capital structure in the United Stated and other developed economies. As the growing economy in Asia, the insurance market in Asian countries has

[1] Some previous studies documented that liability-property insurers use reinsurance in order to reduce bankruptcy cost, underwriting risk and tax cost (Chen etal., 2001; Zou and Adam, 2008; Bartram et al., 2009; Shiu, 2011).

gradually attracted more attention (Goenka and Mony, 1997; Chen and Wong, 2004). However, the insurance operations could vary in different countries with distinct regulatory and economics settings[2]. Thus, analyzing the linkage between reinsurance and capital structure of insurance industry in Asian countries is crucial. Second, to the best of our knowledge, there is no paper attempts to investigate the relationship among reinsurance, capital structure and catastrophes. When the catastrophes happened in the previous year, the reinsurance price may increase in the next year. Thus, property-liability insurers may change their reinsurance usage and capital structure after catastrophes. Moreover, unlike insurers in developed countries, the property-liability insurers in Asia seldom use catastrophe bonds to transfer their catastrophe risk to capital market. Therefore, the relationship among reinsurance, capital structure and catastrophes should be further investigated especially in Asian countries.

2. Data and Methodology

2.1 Data Descriptions

The purpose of this study is to investigate the relationship among reinsurance, capital structure and catastrophes simultaneously for property-liability insurers in Asian countries. We will use the panel regression analysis to examine the relationship among reinsurance, capital structure and catastrophes after controlling numerous possible explanatory variables. For China data, the property-liability insurers' data will be drawn from Chinese Insurance Yearbook. Because new accounting standards were enacted in 2007 in China, some of these new accounting regulations are applied specifically to insurance industries. Thus, the empirical data comprised from financial reports, including the balance sheets and income statements are conducted during the sample period from 2008 to 2012. Furthermore, for Taiwan data, we will collect data of 23 Taiwanese property-liability insurers from the Taiwan Insurance Institute (TII) during the same sample period.

2.2 Empirical Model

Our two-equation simultaneous model can be described as follows:

$$REINS_{i,t} = \alpha_0 + \alpha_1 LEV_{i,t-1} + \phi_1^{'} X_{i,t}^{REINS} + \lambda_1 Catastrophe_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

[2] The difference characteristics of property-liability industry environment in developed and developing countries are show as follows. Firstly, the number of property-liability insurers in developing countries is significantly less than in developed countries. Secondly, mutual form insurers play an important role in the United States and other European countries. However, the organizational forms of most insurers in Asian countries are stock companies. Finally, because of booming economies in Asian countries, the insurance demand has been attracted the entry of many foreign insurers. As a result, foreign non-life insurance firms now have a substantial portion business of the property-liability insurance industry in Asia.

$$LEV_{i,t} = \beta_0 + \beta_1 REINS_{i,t-1} + \lambda_2 Catastrophe_{i,t-1} + \phi_2^{'} X_{i,t}^{LEV} + \eta_{i,t} \quad (2)$$

where $REINS_{i,t}$ and $REINS_{i,t-1}$ respectively denote as the ratio of premiums ceded to reinsurer to direct premium written for the firm i in year t and t-1; $LEV_{i,t}$ and $LEV_{i,t-1}$ respectively denote as the ratio of the property-liability insurer's total liabilities to total assets for the firm i in year t. $Catastrophe_{i,t}$ means catastrophic event happened in year t, and had financial impact on firm i[3]. Then, $X^{REINS}_{i,t}$ and $X^{LEV}_{i,t}$ are the controlling variable matrices.

As for the controlling variables, we choose the following variables. $Size_{i,t}$ is defined as the natural log of total asset; $Proit_{i,t}$ is defined as the pre-tax profit divided by surplus; $ROA_{i,t}$ is defined as the ratio of net profit to total admissible asset; $Exp_{i,t}$ is defined as the total expenses divided by total written premiums; $Growth_{i,t}$ is defined as the change in the natural log of total asset of the insurers; $Age_{i,t}$ and $Ages_{i,t}$ are respectively the insurer's age and the square of insurer's age. $Group_{i,t}$ is a dummy variable that equals 1 if the insurer belongs to the affiliated group and 0 otherwise; $Pubic_{i,t}$ is a dummy variable that equals if the insurer's stock is public trading and 0 otherwise; $Foreign_{i,t}$ is dummy variable equaling 1 if the insurer is belonging to a foreign firm and 0 otherwise. We will utilize the General Moment Method (GMM) to estimate a simultaneous equation model

3. Expected Results and Conclusion

The linkage between reinsurance and capital structure has been an important topic for both in practice and academia. Most of the previous studies usually investigate this issue in developed countries and without considering about the occurrence of catastrophes. As insurance industries in China and Taiwan have grown significantly in the past two decades, we will use data that consists of property-liability insurers in China and Taiwan from 2007 to 2012 to examine the relationship among reinsurance, capital structure and catastrophes by the simultaneous equation. The expected results of this study are described as follows.

(1) The property-liability insurers with higher level of reinsurance tend to have higher debt ratio. Furthermore, the property-liability insurers with higher debt ratio may purchase more reinsurance.

(2) If catastrophic events happened in the previous year, the property-liability insurers may purchase more reinsurance in the next year. Moreover, if catastrophic events happened in the previous year, the property-liability insurers may increase debt ratio in the next year.

[3] We need to further think how to define the occurrence of catastrophe and evaluate the impact of catastrophe. Maybe we can use the ratio of premiums to exposure the specific catastrophic event for the firm i in year t as a proxy for variable, $Catastrophe_{i,t}$.