

Empirical Analysis of Surrender in the Taiwan Life Insurance Companies

Yawen Hwang, Associate Professor
Dept. of Risk Management and Insurance,
Feng Chia University, Taiwan
Email: ywhwang@fcu.edu.tw

Peiying Lu, Master Student
Dept. of Risk Management and Insurance,
Feng Chia University, Taiwan

Abstracts

In this paper, we analyze the main determinants of surrender dynamics in the Taiwan life insurance companies. The sample period is between 1999 and 2009. We consider macroeconomic variables and company-specific variables and apply OLS regression models to test the vital determinants of surrender rate. The numerical results show that the business line and homeownership ratio variables are the most significant variables. However, the numerical results are in contradiction with the emergency fund hypothesis. The company-specific variables show that the higher reputation and bigger companies have lower surrender rates. It suggests the life insurers should maintain their reputation to increase the confidence of policyholders.

Keywords: Surrender Rate; Macroeconomic Variables; Company-Specific Variables

1. Introduction

The quality and characteristics of insurance companies are vital factors when the customers decide to purchase insurance policies. For example, the ROA (Return of Asset) and the company age of the life insurer are main factors when householders are looking for insurance policies. Similarly, we are also considering whether or not the quality and characteristics of insurance companies affect the surrender decision of policyholders. Kiesenbauer (2012) mentioned the importance for understanding the vital determinants of surrender dynamics. For insurance managers, the surrender cash flows will influence the financial stability of the insurers. For regulators, surrender rate is an important parameter to determinate the requirement capital under Solvency II.

Past literature about surrender activity focuses on discussing the emergency fund and interest rate hypotheses. Most of these papers support the emergency fund and interest rate hypotheses, such as Hogan (1970), Schott (1971), Pesando (1974), Cummins (1975), Dar and Dodds (1989), Outreville (1990), Kuo et al. (2003) and Kim (2005). The references above make use of macroeconomics variables to test the emergency fund and interest rate hypotheses. However, according to statistic data from Taiwan Insurance Institute¹, we find that the surrender rates of domestic and foreign life insurance companies in 2013 were 1.26% and 4.76% respectively. The highest and lowest lapse rates of domestic life insurance companies in 2013 were 40.01% and 0.26% respectively. The highest and lowest surrender rates of foreign life insurance companies in 2013 were 8.81% and 0.67% respectively. This shows that the surrender dynamics between domestic and foreign life insurance companies are different.

Since the empirical data has showed that the surrender rates are related to the characteristics of each insurance company, Eling and Kiesenbauer (2012) started analyzing the lapse of the German life insurance market with the company-specific variables such as company size, solvency indicator and so on. Furthermore, Kiesenbauer (2012) not only considered company-specific variables but also incorporated macroeconomic variables to analyze the surrender dynamics of German life insurers. Both of them find that the surrender rates are significantly

¹ Data resources: statistic database of Taiwan Insurance Institute.
(http://www.tii.org.tw/fcontent/database/sta_test2/genrep_selectG.asp?us_license=Z).

influenced by the company-specific variables. Thus, in this study, we analyze life insurance policy lapse behavior in the Taiwan life insurance industry. We try to determine whether surrender is a function of certain macroeconomic variables and company-specific variables.

2. Literature Review

Traditionally, researchers studied the surrender behaviors based on the macroeconomic variables to test the emergency fund hypothesis and the interest rate hypothesis. Linton (1932) proposed the emergency fund hypothesis, in which the policyholders regard their life policies as a source of emergency funds and will withdraw their policies in times of need. Typically, researchers have tested the emergency fund hypothesis based on the unemployment rate variable. The numerical analyses of Cummins (1975), Dar and Dodds (1989) and Outreville (1990) support this hypothesis. Notice that Outreville (1990) also applied the transitory income variable to demonstrate the emergency fund hypothesis.

Moving to the interest rate hypothesis, saving through life insurance is sensitive to rates of return. In other words, when the policyholders can find other financial investment instruments which rate of return is higher than the credit rate of insurance policies, they would be more willing to surrender their insurance policies. Generally, this hypothesis can be examined by the sensitivity of surrender rates and the rates of return of alternative investment instruments, such as commercial papers and corporate bonds. The results of Hogan (1970), Schott (1971), Pesando (1974), Cummins (1975) and Dar & Dodds (1989) appear to support the interest rate hypothesis. Kuo et al. (2003) first report provided evidence for both the emergency fund hypothesis and the interest rate hypothesis through American data.

Furthermore, policy replacement hypothesis assumes that policy lapses may occur simply because the policyholder has identified a more attractive policy with better terms or rates (Outreville, 1990; Carson and Forster, 2000). Russell et al. (2013) used the U.S. data to investigate the emergency fund hypothesis, the interest rate hypothesis and the policy replacement hypothesis. Their numerical results support all of these three hypotheses.

Eling and Kiesenbauer (2012) started analyzing the lapse of the German life insurance market from 1998 to 2008 under company-specific variables, incorporating the company size, the Finsinger rating, the solvency indicator, the company age, the distributional focus and the surplus participation rates. They found that the surplus participation rates have a negative impact on lapse volume. Furthermore, Kiesenbauer (2012) not only considered company-specific variables but also incorporated macroeconomic variables of 133 German life insurers from 1997 to 2009. Five different product categories are considered in his paper (endowment, annuity, term life, group, and other). He applies a logistic regression model to analyze the data and the numerical results show that most explanatory variables are significant. For annuity policies, the surrender rate would decrease with an increasing age of the insurance company.

To sum up, macroeconomic and company-specific variables are also vital explanatory variables of the surrender dynamics. According to the literature, we apply unemployment rate, short-term interest rate, economic growth rate and homeownership ratio as macroeconomic variables. On the other part, we use the premium income, age of insurer, return of asset, domestic/foreign company and main business line as company-specific variables.

3. Variables and Methodology

In this paper, we analyze the determinants of surrender dynamics in Taiwanese life insurance companies. Especially, we not only consider macroeconomic control variables but also incorporate company-specific variables. Samples include domestic and foreign life insurance companies. We use the surrender rate ($S_{i,t}$) as dependent variable, where i designates the company and t the year. $S_{i,t}$ is the ratio of the policies surrendered during the year t to average policies in force during the same year for the i -th firm.

The macroeconomic control variables include the economic growth rate, the homeownership ratio², unemployment rate and the short-term interest rate. Kiesenbauer (2012) and Russell et al. (2013) applied gross domestic product index (GDP) as the parameter to test the emergency fund hypothesis since this variable

² Russell et al. (2013) indicated that homeowners would have to cover the homeownership cost, and then would not have additional money to pay the life insurance premiums.

could be viewed as the buyer confidence of the policyholders. However, the correlation between GDP and homeownership ratio is too high, so we apply the economic growth rate to replace this variable. Moreover, we use 31-90 days commercial paper rates to represent the short-term interest rate.

We also consider company-specific explanatory variables. Similar to Kiesenbauer (2012) and Fier and Kiesenbauer (2012), we apply company age and premium incomes as variables. Company age could be used to represent the stability and reputation of the company (Kiesenbauer, 2012). The gross premium written could be applied to represent the size of the insurer. Moreover, we also include a dummy variable to test the surrender rates between domestic and foreign companies. ROA is another vital parameter and it shows the performance of the insurer. If ROA is low or even negative, then policyholders tend to surrender the policies. Fier and Kiesenbauer (2012) discuss the influence of distribution channels for surrender dynamics. Instead of this, we focus on studying the influence of the business lines for the surrender rates, therefore, we also consider the ratio between premium income of annuity and life insurance products.

We use multivariate linear regression models. The model is as follows:

$$S = \alpha + \sum_{k=1}^n \beta_k \cdot x_k + \varepsilon \quad (\text{Eq.1})$$

4. Data and Numerical Results

In this study, we collect the data from Taiwan life insurance companies from 1999 to 2009. We have 239 samples. The data of surrender rates and the company-specific explanatory variables such as dummy variable, ROA, company age, premium income and business line are from the statistic database of Taiwan Insurance Institute³. The data of economic growth rate, unemployment rate and homeownership ratio are from the Directorate-General of Budget, Accounting and Statistics, Executive Yuan of Taiwan⁴. Last, the data of short-term interest rate is collected from Central Bank of Republic of China⁵.

³ The website is http://www.tii.org.tw/fcontent/database/sta_test2/genrep_selectG.asp?us_license=Z.

⁴ The website is <http://www.stat.gov.tw/ct.asp?xItem=32985&CtNode=4944&mp=4>.

⁵ The website is <http://www.cbc.gov.tw/public/data/economic/statistics/key/interest.xls>.

Table 1. Summary statistics for variables

Variables	Mean	Min.	Max.	SD.
Surrender rate (%)	2.1740	0.0032	34.2345	3.4738
business lines	0.3230	0	29.2625	1.9991
premium income	10.1490	6.9891	11.6853	0.7830
company age	22.8368	1.0000	68.0000	17.5840
ROA (%)	-2.9823	-132.8400	12.5100	11.7831
dummy(D=1/F=0)	0.6444	0	1	0.4797
unemployment rate (%)	4.3075	2.9200	5.8500	0.8327
homeownership ratio(%)	86.5860	84.9100	88.1446	1.1957
short-term interest rate (%)	1.9823	0.2700	5.2800	1.4715
economic growth rate (%)	3.9359	-1.5700	6.7200	3.1116

Table 1 displays the summary statistics for dependent variable and explanatory variables. Surrender rates are between 0.0032% and 34.2345% from 1999 to 2009. The average and standard deviation of surrender rate are 2.1740% and 3.4738% respectively. It shows that some companies have higher lapse ratios and we are interested in which variables cause this high surrender ratio. Business lines are calculated by the ratio between premium income of annuity and life insurance products. In other words, if this index exceeds 1, it means that the main premium income of this life insurer is based on the annuity line. From Table 1, we know that most life insurers in Taiwan still focus on life insurance products since the average of business lines variable is 0.3230.

Subsequently, premium income is measured by the logarithm of gross premium written. The average and standard deviation of premium income are 10.1490 and 0.7830 respectively. Regarding company age, we find that there are some new life insurers in our samples since the minimum age is one year. But on average, the lifetime of Taiwan life insurance companies is long since the mean is 22.8 years. ROA is used to represent the performance of life insurers. From Table 1, we find that the performance during this sample period is not good. The average ROA is -2.9823%. Dummy variable is used to present domestic (1) or foreign (0)

companies. Most companies are domestic insurers as the mean is 0.6444. Unemployment rates between 1999 and 2009 vary from 2.92% to 5.85%. The highest and lowest homeownership ratios are 88.1446% and 84.91% respectively. We apply 31-90 days commercial paper rate to represent the short-term interest rate and it varies from 0.27% to 5.28% during the sample period. The highest and lowest economic growth rates are -1.57% and 6.72%.

Table 2 shows the correlation coefficients matrix of the explanatory variables. We find that the unemployment rate and the short-term interest rate are highly correlated. Thus, in the regression models, we will analyze these two variables separately. Table 3 shows the VIF (variance inflation factor); all parameters are below 10.

Table 2 The correlation coefficients matrix

	business lines	premium income	company age	dummy	ROA	unemployment rate	short-term interest rate	homeownership ratio	economic growth rate
business lines	1								
premium income	-0.0158	1							
company age	-0.1070	0.5519	1						
dummy	-0.1128	0.5993	0.4558	1					
ROA	-0.0198	0.4976	0.2561	0.1875	1				
unemployment rate	0.1334	0.1585	0.0484	-0.0456	0.1715	1			
short-term interest rate	-0.1302	-0.2704	-0.0913	0.0181	-0.1607	<u>-0.8234</u>	1		
homeownership ratio	0.1149	0.2470	0.1078	-0.0058	0.0024	0.1895	-0.5469	1	-0.1650
economic growth rate	-0.1467	-0.0535	-0.0246	0.0768	-0.0694	-0.5905	0.4356	-0.1650	1

Table 3 VIF

Variable	VIF	Variable	VIF
business lines	1.0560	business lines	1.0545
premium income	2.6717	premium income	2.7044
company age	1.5072	company age	1.5091
dummy	1.7843	dummy	1.7887
ROA	1.4277	ROA	1.4245
unemployment rate	1.6232	short-term interest rate	1.8307
homeownership ratio	1.1829	homeownership ratio	1.5428
economic growth rate	1.5615	economic growth rate	1.2696

Table 4 shows the numerical results of the OLS models. Since the unemployment rate and the short-term interest rate are highly correlated, in model I we consider the unemployment rate and replace it to the short-term interest rate in model II. We find that business lines and homeownership ratio variables are the most significant factors ($p\text{-value} < 0.001$) for the surrender rates. The regression coefficient of business lines is 0.9592 and this means the life insurers will have higher surrender rate when they focus more on the annuity business line. The parameter of homeownership ratio is also positive (0.6372) and it is consistent with Russell et al. (2013). Given extra budget for owning a house, homeowners would not have additional money to pay the life insurance premiums.

Subsequently, we discuss the variables of premium income and company age. In Taiwan, the older life insurers are usually getting higher gross written premium since long-historical life insurers mean higher reputations. Thus, in both models, the regression coefficients are negative. It means older and bigger life insurers have lower surrender rates. The numerical results also show that the surrender rate of domestic company is higher since the parameter is positive. However, observing ROA, we find that high ROA leads to high surrender rate.

Regarding macroeconomic control variables, we apply economic growth rate and unemployment rate to test the emergency fund hypothesis. Under model I, we find that the parameters of economic growth rate and unemployment rate are positive and negative respectively. This is in contradiction with the emergency fund hypothesis. Under model II, we apply the short-term interest rate variable to

test the interest rate hypothesis. The coefficient is 0.0851 and is not significant.

Table 4 Results of the OLS models

Variables	Model I	Model II
	Coefficients	
inception	-50.0288***	-54.4697***
business lines	0.9592***	0.9601***
premium income	-0.2869	-0.2605
company age	-0.0235	-0.0237
dummy	0.2937	0.2725
ROA	0.0215	0.0222
economic growth rate	0.0348	0.0242
unemployment rate	-0.0208	
short-term interest rate		0.0851
homeownership ratio	0.6372***	0.6831***
R-squared	0.3877	0.3884
Adjusted R-squared	0.3664	0.3671

***: p-value<0.001; **: p-value<0.01; *: p-value<0.05

5. Conclusions

In this study, we analyze life insurance policy lapse behavior in the Taiwan life insurance industry. We consider macroeconomic variables and company-specific variables. Under the sample period between 1999 and 2009, we use OLS regression models to test the main determinants of surrender dynamics.

Firstly, we test the emergency fund hypothesis. However, the numerical results are in contradiction with the hypothesis. We also apply the short-term interest rate variable to test the interest rate hypothesis and our model doesn't support the interest rate hypothesis. The company-specific variables show that the higher reputation and bigger companies have lower surrender rates. It suggests the life insurers should maintain their reputation to increase the confidence of policyholders.

Most importantly, the type of business line is the most significant determinant of lapse dynamics. The numerical results show that life insurers have higher

surrender rate if their business is focused on annuity products. The possible reason is that the premium is higher thus policyholders might lose the ability to pay the premium. On the other hand, life insurers sell a lot of variable annuity and the declared interest rates are variable. Especially, the surrender rates increase when the regulator announces rules for the declared interest rates or when the financial market is more volatile. This suggests that insurers should be more carefully to design the annuity product to decrease the surrender rates.

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