International Journal of Applied Econometrics and Quantitative Studies. Vol.2-4(2005)

COST EFFICIENCY AND PROFITABILITY IN THAILAND'S LIFE INSURANCE INDUSTRY: A STOCHASTIC COST FRONTIER APPROACH

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Abstract

Liberalized environments brought about by trade agreements and other restructuring of international markets under the General Agreement on Trade and Services (GATS) have increased market opportunities for foreign firms. This opening up of domestic market under GATS will cause the inflow of foreign insurance firm hence heighten competitive pressures. As such, insurance firm in Thailand need to be efficient to ensure their survival. Hence, the purpose of this paper is to evaluate the cost efficiency and its relationship with profitability in Thailand's life insurance firms during the period 1997-2002 using the stochastic cost frontier approach. We find that the industry is on average 82 to 140 percent inefficient. There is no significant relationship between inefficiency and age. But, the mean inefficiency is negatively correlated with size suggesting the need for rationalization in the insurance industry in Thailand. Consolidating the large number of smaller insurers should be high on the government's agenda, and the capital requirements for life insurers need to be increase. We show that inefficiency is negatively correlated with ROE and ROA ratios. This shows that efficient firms, on average, have higher return on equity and on assets. This indicates that inefficiency has substantial effect on the profitability of life insurance companies.

Keywords: Cost efficiency; Profitability; Insurance industry; Thailand
JEL classification: G22

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1. Introduction

The insurance industry plays a critical role, providing individuals and businesses with a broad spectrum of financial security products and playing a major role in financial intermediation, thus enhancing a nation's financial and economic development. Individuals and their families look to insurance companies to provide life insurance, retirement income, health insurance, and automobile and homeowners property and liability coverage. Businesses rely on insurers for similar coverage as well as workers compensation and more specialized products like marine insurance. The insurance industry will become an increasingly important sector as a country develops. As real and per capita income level of Thailand rises, demand for insurance services, particularly life insurance, tend to increase. The association of Thai insurance industry estimates that, within five years, about thirty percent of the total population will have life insurance policy with total premium of 6.3 billion dollars. Within the next ten years, life insurance policyholders will number about fifty four percent of the population with total premium of about 15.8 billion dollars. For the non-life insurance sector, they estimate that total premium will be about 3 billion dollars within the next five years.

As such, insurance industry in Thailand is set to have a bright future. However, international insurance markets are becoming increasingly open to foreign competitors. Liberalized environments brought about by trade agreements and other restructuring of international markets under the General Agreement on Trade and Services (GATS) have increased market opportunities for foreign firms. This opening up of domestic market under GATS will cause the inflow of foreign insurance firm hence heighten competitive pressures. Inefficient insurers cannot survive long in a competitive market. As such, insurance firm in Thailand need to be efficient to ensure their survival. Hence, this paper attempts to investigate the cost efficiency of life insurance firms in Thailand during the period 1997 to 2002 using the stochastic cost frontier method.

Efficiency of the financial services industry particularly in the banking industry has been widely studied since the last decade. However, these studies focus mainly on developed countries as surveyed by Berger and Humphrey (1997), and Cummins and Weiss (2001). Cummins and Weiss (2001) recorded 20 studies of insurance efficiency across countries in which, most of them focus on the US. Moreover, in their survey, they do not report any study that deals with insurance industry in the developing countries. However, Boonyasai, Grace and Skipper (2002) did a study on the effect of liberalization and regulation on life insurer efficiency in Korea, Philippines, Taiwan and Thailand. They argue that the liberalization have had little effect on improvements in productivity in the Thai's life insurance industry. They conclude that in a restrictive regulatory environment, welfare gains will be minimal if deregulation does not closely follow liberalization.

The rest of the paper is organized as follows. Section 2 presents an overview of the Thai's life insurance industry. Section 3 describes the methodology in estimating cost efficiency and its relation with profitability. Section 4 describes the data and defines outputs, inputs and input price use for this study. Section 5 contains the empirical results. Section 6 concludes.

2. An overview of the Thailand life insurance industry

The Thai insurance market had been closed for decades until the government adopted in the late 1990s a three-stage development plan. This new plan resulted in over 100 insurance companies operating in the market. Insurance industry sales (measured by net premiums) are fairly high compared with other industries (Table1).

The Thai life insurance industry starts with the establishment of a foreign company, American Life assurance, AIA, in 1931. Only eleven years later another insurance company, Thai Life Insurance, was establish and owns by local. Since then, the number of life insurance companies has increased to 25 at present, three of which are listed on the Stock Exchange of Thailand. According to the Annual Insurance Report of Thailand, in the life insurance sector, only fifteen percent of the population hold insurance policy with a premium of about 3 billion dollars. On the other hand, in non-life insurance sector, the premium is about 1.3 billion dollars. The Thai insurance industry is heavily concentrated with the five largest insurer controls 91 percent of the market share (based on premium). The market is dominated by AIA, a foreign branches, which holds 52.1 percent of the market. The four other largest insurers in terms of total assets in Thailand, Thai Life, Ocean, Muang Thai and Ayudhaya Alliance CP controls 23, 9, 6 and 5 percent of the market share respectively. In terms of total assets, AIA is the largest insurance company with total assets exceeding 4 billion dollars (Table 2) while the largest local company, Thai Life Insurance, has total assets of 1.6 billion dollars.

Table 1: Number of Companies in Thailand's Insurance Industry as of 12 December 2003

Line of Insurance Business	Domestics Company	Foreign's Branch	Total
Life Insurance	24	1	25
Non-life Insurance	66	5	71
Health Insurance	5	0	5
Re-Insurance(Life Insurance)	1	0	1
Re-Insurance (Non-life Insurance)	1	0	1
Total	97	6	103

Ten of the insurance companies have total assets less than 25 million dollars. Benefit payments of life insurance to insured and beneficiaries amounted to 742.3 million dollars. Out of this, benefit payments of 627.3 million dollars come from the five largest insurance companies. The general insurance market is not as concentrated as the life market, with over 77 insurers. The largest general insurer holds only 12 percent of the market and there is considerable competition in the market.

Table 2: Business commencement, total assets, net profit and benefit payment incurred (all type) of life insurance firms in 2002, mill.US.$

	Insurance Firm	Business commencement	Total assets	Net profit (loss)	Benefit payment
1	Bangkok Life	1951	345.3779	5.8714	31.4755
2	Krungthai Axa Life	1997	24.3185	-6.8005	1.1658
3	Allianz C.P. Life	1997	8.5485	-0.3960	0.2291
4	TPI Life	1997	10.3331	0.1074	0.2660
5	Millea Life Insurance	1997	8.2465	-2.7439	0.1634
6	Thai Life Insurance	1942	1,570.8347	21.2348	185.1556
7	Nationwide Life	1947	83.7513	-10.5710	28.7590
8	Siam Commercial New York Life	1976	73.8086	0.5080	9.3761
9	Thai Cardif Life	1997	6.4729	-2.2479	0.2865
10	Ocean Life	1949	747.5656	0.6327	72.3990
11	Zurich National Life	1997	40.4128	-0.2436	3.6500
12	Ayudhaya Allianz C.P.	1951	443.2314	-3.5635	30.5042
13	General Life	1997	10.1547	-1.5885	2.8430
14	Prudential TS.Life	1983	45.4159	-3.7239	2.9378
15	Muang Thai Life	1951	440.9099	3.0834	41.7775
16	ACE Life Assurance	1997	7.8768	-1.2548	0.0376
17	Max Life Assurance	1997	12.8221	-0.1222	0.0290
18	Siam Samsung Life	1997	15.5727	-0.4725	0.3715
19	Siam Life Insurance	1984	12.6645	-0.2326	2.8467
20	Saha Life Insurance	1994	7.3838	-1.3845	5.2274
21	South East Life	1946	92.1181	-5.9253	17.7031
22	Inter life John Hancock	1951	52.7582	-0.6221	5.8435
23	Advance MLC Assurance	1997	3.2083	-4.7715	0.0244
24	ING Aetna Osotspa	1997	19.2964	-8.5708	1.7538
25	A.I.A	1931	4,018.0841	140.4254	297.4988
	Total		8,101.1672	116.6281	742.3242

In 2002, most of the insurance companies incurred losses with only six local companies experienced profit ranging from 93,000 dollars to 22 million dollars. The increased competition for a slowing market at the onset of the economic crisis made it very difficult for these companies issued with new licenses in 1997 to gain a foothold in the market. Rate cutting and lower investment returns resulted in a general erosion of the capital base of most Thai insurers. The structure of the Thai market exacerbated the problems faced by most insurers.

3. Methodology

Estimation of Cost inefficiency

Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) independently introduced the general form of stochastic frontier model. They were motivated by the idea that deviation from the production frontier might not be entirely under the control of the firm being studied. The main difference of stochastic frontier model from deterministic model is the composite error term.

Cost efficiency is derived from a cost function in which the variable, cost, depends on price of variable inputs, quantity of outputs, random errors and (in) efficiency. Cost efficiency show that how far is the life insurers' cost relative to its best practice cost that would be for producing the same output bundle under the same conditions. Therefore, a cost function can be written as.

$$C = C(Y,P,U_i,V_i) \quad (1)$$

Where *Y is* the vector of quantities of outputs; *P is* the vector of the price of input; *U* is an inefficiency factor which can cause cost to rise above the best-practice level; *V* is the random error term that incorporates measurement error that can increase or decrease cost.

The independent variable of the cost function can be separated into three groups; the quantity of outputs and price of inputs; the inefficiency, *U*; and the random error, *V*. After taking natural log of both sides of equation (1), the cost function can be depicted as:

$$lnC_{ti} = lnC^{*}(Y_{it},P_{itt}) + ln(U_{it}+V_{it}) \quad (2)$$

where i is indexes of firms; t is indexes of time period; lnC is the natural log of observed total cost; $lnC^*(Y_i,P_i,)$ is the natural log of the cost function of firm i; U_i is a one sided error term that capture cost inefficiency ($U_i \geq 0$); V is a random error or two sided error term; and U_i+V_i is the composite error term.

A two side error term, V represents the random error that is unrelated to inefficiency. A one sided error term, U represents inefficiency. The procedure of stochastic frontier has to make assumption on both errors. Generally, both components of composite errors are assumed to be independent and identically distribution*(iid)* (Greene, 1997). Therefore, $exp(U_i) = C/C^* \; exp(V_i)$ or cost inefficiency is mean to the proportion by which the firm could have reduced its cost and still attain the same level of outputs that can be computed as follow (Greene et. al, 2004);

$$Inefficiency = 1-exp(-U_i) \tag{3}$$

Conventionally, the random error component assumed to be normally distributed. The distribution assumption of inefficiency component or non-negative random variable can be assumed as half-normal model, exponential model, truncated normal model and gamma model (Kumbhakar and Lovel, 2000). Technical details pertaining to these distributions are given by Greene (1993, 1995).

With assumption on the two errors term, the estimator is maximum likelihood. The firm inefficiency are computed which is not observed directly as the conditional expectation $E(U_{it}|e_{it})$ or the condition distribution U_{it} given e_{it} as in Jondrow et al (1982).

Assuming a translog cost function, the stochastic cost frontier can be written as follow.

$$\ln C_{it} = \alpha_0 + \sum_{j=1}^{n} \alpha_j \ln Y_{jit} + \sum_{k=1}^{m} \beta_k \ln P_{kit} + \frac{1}{2} \sum_{j}^{n} \sum_{k}^{m} \gamma_{jk} \ln Y_{jit} \ln Y_{kit}$$

$$+ \frac{1}{2} \sum_{k}^{m} \sum_{q}^{m} \delta_{kq} \ln P_{kit} \ln P_{qit} + \frac{1}{2} \sum_{j}^{n} \sum_{k}^{m} \theta_{jk} \ln Y_{jit} \ln P_{qit} + \rho_1 t + V_{it} + U_{it} \tag{4}$$

Where $\ln C_{it}$ is the natural logarithm of the total cost (discussion of what constitutes an insurance firm's input and output will be in the next section; $\ln Y_{jit}$ is the natural logarithm of the jth output (j = 1,2,…,n); $\ln P_{kit}$ is the natural logarithm of the kth input price (k = 1,2,…,m); t is the time trend and a, b, g, d, q and r are the parameters to be estimated; and t is the time trend variable.

Following Huang and Liu (1994) and Greene et. al. (2004), we also model the inefficiency as a function of firm specific variables, rather than a two-stage analysis where the inefficiency term is regressed on firm specific variables. The inefficiency effects ,U_{it} , are assumed to be defined as

$$U_{it} = a_0 + a_1 SIZE_{it} + a_2 AGE_{it} + a_3 D_{crisis} + a_4 t + u_{it} \qquad (5)$$

where SIZE is the natural log of total asset; AGE is the age of the insurers. More experience firm is argued to be more efficient that less experience firm. In Jovanovic (1982) model, technical efficiency is positively related to firm's age. New firms are unaware of their abilities, and need time to decide on their optimal size. Over time, the least-efficient firms exit, leaving a technically more-efficient population of firms; D_{crisis} is a dummy variable which equals 1 if year 2000 to 2002 and zero if otherwise. This dummy variable is to control for period of financial crisis. Based on the study by Moon (2001), financial turmoil was eliminated in March 1999. Thus for our study, the post-crisis period starts from year 2000; and t is the time trend.

Profitability and inefficiency

We examine the association between profitability and inefficiency by examining the association between annual profitability and inefficiency. We measure profitability by ROE and ROA. The ROE, return on equity, is computed as net profit on equity in year t divided by equity on year t. The ROA, return on asset, is computed as net profit on equity in year t divided total asset in the same period. The independent variables consist of the inefficiency estimates, log of assets, ownership variable and time trend. We estimate by random effect panel data model with both firm and time effect. The models are as follows.

$$\ln ROE_{it} = j_0 + j_1 U_{it} + j_2 LASS_{it} + j_3 OWN + j_4 t + n_{it} \qquad (6)$$

$$\ln ROA_{it} = f_0 + f_1 U_{it} + f_2 LASS_{it} + f_3 OWN + f_4 t + w_{it} \qquad (7)$$

Where *U* is the inefficiency estimates; LASS is a proxy for size and is computed as the log of total assets; OWN is dummy variable which equals 1 if foreign owned and 0 otherwise; and t is the time trend.

4. Data and Measurement of Output and Input

All the data used for this study except for number of agents are from the "Annual Insurance Report of Thailand" published by the Department of Insurance, Ministry of Commerce, Thailand. Number of agents was obtained directly from the Department of Insurance Altogether, there are twenty-five life insurance firms in our study and the time period is from 1997-2002.

Outputs

Greene et. al. (2004) defined output of insurance as consists of investment, life insurance, and annuities and accident and health. Meanwhile, Cummins and Zi (1997,1998) defined output as individual life insurance benefit payments, group life insurance benefit payments, individual annuities benefit payment, group annuities benefit payment, accident and health insurance benefit payment and additions to reserves. Benefit incurred in Thai's life insurance consists of ordinary, industrial and group, which represent 85, 15 and 5 percent of the total benefit, incurred respectively. Ordinary can be classified into life or main policy, accident, and health. Thus, in this study we separate benefit incurred into five categories that is life insurance (Y_1), accident (Y_2), health (Y_3), industrial (Y_4) and group (Y_5). Following Cummins and Rubio-Misas (2001), the other outputs are based on the intermediary function, life policy reserve (Y_6) and investment asset (Y_7). There is no annuity in

Thai life insurance. All of the outputs are expressed in real terms by deflating it with the Thailand's consumer price index (CPI).

Input

Cummins & Zi (1997,1998) separates input into three categories namely quantity of labor, quantity of financial capital, and quantity of materials. Meanwhile, Greene et. al. (2004) also defined similarly, but they defined labor in terms of number of working hours.

In this study, we separates inputs into three types; labor, financial capital, and materials or business services. Labor consists of home office labors (X_1) and agent labors (X_2) following Cummins Tennyson and Weiss (1998). Home office labor is defined as the number of staff and executive agents while Agents labor is defined as number of agents. Financial capital input (X_3) is defined as the amount of equity capital following Cummins Tennyson and Weiss (1998). Finally, business services (X_4), includes materials and physical capital expense (excluding labor expenses) which is related to selling and servicing policies. The price of office labor, (P_1), is computed as the total salaries and welfare divided by the total number of staff. The price of agents labor (P_2), is calculated as total commission and brokerages paid divided by total number of agents. The price of financial capital (P_3), following (Greene et al, 2004), is computed as the difference between the ratio of total net income to total financial capital (return on equity) and the ratio of total investment income to total assets (return on investments) over the same period. The price of business services (P_4) is calculated as underwriting expenses[1] divided by the total number of policies sold and terminated. All the values are deflated by consumer price index (CPI).

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1 In the Annual Insurance Report of Thailand, the underwriting expenses consists of 25 items that are related to selling and servicing policies including salary and welfare. In this study, salary and welfare has been included in the price of home labor office. Therefore, price of business services excludes salary and welfare.

Table 3: Statistics of 25 Thai's Life Insurance Firm: 1997-2002

Variable	Mean	Standard Deviation	Minimum	Maximum
Cost (mil. USD) Output (mil.USD)	584	2813	.0006	19291
Y_1	19.39	56.34	0	276.18
Y_2	1.43	4.53	0	28.63
Y_3	3.33	10.05	0	59.97
Y_4	3.82	12.72	0	65.11
Y_5	1.26	2.26	0	11.73
Y_6	172.43	441.13	0	2932.61
Y_7	196.69	525.3	1.34	3677.05
Input				
X_1	4.93	6.91	0.07	41.9
X_2	51.85	137.99	0	981.7
X_3(mil.USD)	1078.25	874.92	.0001	4387.62
X_4(mil USD.)	7.37	16.55	0	79.68
Value Driven				
Total assets (mil USD)	222.94	571.75	2.44	40179.31
PREM	69.12	184.00	0	1308.93

5. Estimation results

Cost inefficiency

Firstly, we test whether the translog function is more appropriate than the Cobb-Douglas function. The LR statistic of 2.35 is less than the upper 5 per cent of the $?^2$ distribution indicating that the null hypothesis that the second-order coefficients in the translog cost function are zero cannot be rejected. Hence, we estimates cost inefficiency using a Cobb-Douglas stochastic cost frontier function under the model assumption of truncated normal, half normal and exponential distribution.

Table 4 presents the result of cost frontier model estimates for each of the model assumption, truncated normal, half normal and exponential. The results for truncated normal and half normal are quite similar. The likelihood ratios for testing the overall significance of the frontier model are -211.73, -211.38 and -201.03 of truncated normal, half normal and exponential respectively. Since the critical value of a chi-square distribution with twelve degree of freedom at 5% level is 21.03, we reject the null hypothesis that all of the explanatory variables are zero.

Table 4: Maximum-Likelihood Estimates for parameters of the Stochastic Cost Function. Dependent variable lnCOST

	Truncated Normal(U_1)			Half-normal l(U_2)			Exp.l (U_3)		
	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat
c	-4.016	1.864	-2.15	-5.3233	1.335	-3.98*	-6.9297	0.966	-7.17*
lnP_1	0.1667	0.209	0.79	0.2498	0.206	1.20	0.2751	0.096	2.85*
lnP_2	0.1687	0.086	1.94*	0.1779	0.085	2.07*	0.493	0.084	5.80*
lnP_3	0.1413	0.028	4.92*	0.1135	0.028	4.04*	0.0266	0.031	0.85
lnP_4	0.2201	0.041	5.34*	0.2428	0.041	5.8*	0.1889	0.047	3.94*
lnY_1	-0.0199	0.086	-0.23	-0.0319	0.079	-0.40	-0.0972	0.051	-1.89
lnY_2	0.0039	0.091	0.04	-0.0082	0.088	-0.09	-0.1348	0.054	-2.48*
lnY_3	0.1343	0.099	1.35	0.1322	0.101	1.30	0.1172	0.044	2.62*
lnY_4	-0.1293	0.060	-2.13*	-0.1222	0.061	-1.99*	-0.0458	0.041	-1.09
lnY_5	-0.0382	0.085	-0.44	-0.0232	0.082	-0.28	-0.1803	0.069	-2.61*
lnY_6	0.2129	0.098	2.15*	0.2654	0.093	2.83*	0.6741	0.095	7.02*
lnY_7	0.4499	0.126	3.55*	0.4601	0.127	3.60*	0.3539	0.128	2.74*
T	0.0971	0.065	1.48	0.0926	0.063	1.46	-0.0458	0.068	-0.67
Inefficiency Model									
Intercept	1.657	0.860	1.92	1.7547	1.086	1.61	2.5354*	1.493	1.69
SIZE	-0.1336	0.032	-4.13*	-0.235	0.041	-5.70*	-0.5456	0.051	-10.6*
AGE	-0.0341	0.063	-0.53	-0.0661	0.080	-0.81	0.1175	0.100	1.16
Dcrisis	0.1114	0.041	2.66*	0.1213	0.053	2.28*	0.078	0.064	1.21
T	0.0168	0.059	0.28	0.063	0.074	0.84	0.0355	0.105	0.33
Variance Parameters									
Gamma	1.601	1.922	0.83	2.4575	0.753	3.26	0.7446	0.080	9.28
$Sigma^2$	1.4202	1.714	0.82	1.5167	0.185	8.19	0.0027	0.067	0.04

Log-likelihood	-211.7328	-211.3838	-201.0321
Mean Inefficiency	0.8322	1.1059	1.4011

Notes: * Indicates significant at 5% level of significance

In both model, the coefficient of price of agent labor (P_2), price of financial capital (P_3), price of business service (P_4), industrial net benefit payment incurred (Y_4), life policy reserve (Y_6) and investment asset (Y_7) are significantly from zero. In the exponential model, all coefficients are statistically significant except for the coefficients of the price of financial capital, industrial benefit payment incurred, and the time trend.

Panel B of Table 4 presents the estimated parameter of the mean inefficiency term (Equation 5). The coefficient of SIZE is negatively significant in all the truncated normal, half normal, and exponential models indicating that inefficiency increases with size suggesting the need for rationalization in the insurance industry in Thailand. Since insurance companies in Thailand are relatively small in size, consolidating the large number of smaller insurers should be high on the Thai government's agenda. The coefficient of Age is negative but not significant for all truncated normal, half normal, and exponential indicating that age of firms does not matter to efficiency. The coefficient of the time trend is not significant in all of the models implying that the distribution of inefficiency has not shifted over time.

Table 5 provides the mean inefficiency estimates of the insurance firm. The ranking by mean inefficiency of firms from the three models are quite similar particularly between the truncated normal and half normal. The overall mean inefficiency is 0.83 to 1.40. This indicates that the life insurance industry in Thailand use about 83 to 140 percent more input than if they were fully efficient.

Table 5: Mean cost inefficiency by firm

No.	Firms	Inefficiency					
		Truncated/Rank		Half-normal/Rank		Exponential/Rank	
1	Bangkok Life	0.8197	13	1.1221	16	1.3945	17
2	Krungthai Axa Life	1.2850	23	1.8642	24	2.3349	21
3	Allianz C.P. Life	0.9351	19	1.3290	20	2.4618	22
4	TPI Life	0.7642	12	1.0386	12	2.5585	23
5	Millea Life Insurance	0.5394	6	0.6984	8	1.2960	16
6	Thai Life Insurance	0.5690	8	0.6878	7	0.3404	2
7	Nationwide Life	1.3201	24	1.7945	23	0.9488	11
8	Siam Commercial New York Life	0.8259	14	1.1141	15	1.1206	13
9	Thai Cardiff Life	0.8326	15	1.0460	13	0.7828	8
10	Ocean Life	0.9537	18	1.4060	19	1.0126	12
11	Zurich National Life	0.5138	5	0.5470	5	0.8555	9
12	Ayudhaya Allianz C.P.	0.6687	10	0.8466	10	0.8767	10
13	General Life	0.8337	16	1.0953	14	1.5297	18
14	Prudential TS. Life	0.7289	11	0.9109	11	0.4401	5
15	Muang Thai Life	2.3028	25	3.2131	25	4.5862	25
16	ACE Life Assurance	1.0039	21	1.4360	21	4.3413	24
17	Max Life Assurance	0.5102	4	0.5555	4	0.7045	7
18	Siam Samsung Life	0.6633	9	0.8411	9	1.2739	15
19	Siam Life Insurance	0.4563	3	0.4787	3	0.1345	1

20	Saha Life Insurance	0.9151	17	1.3000	17	1.7218	19
21	South East Life	0.3995	2	0.4472	2	0.3688	4
22	Inter life John Hancock	0.5460	7	0.6439	6	0.3452	3
23	Advance MLC Assurance	1.1170	22	1.5513	22	1.9385	20
24	ING Aetna Osotspa	0.9608	20	1.3334	19	1.1744	14
25	A.I.A	0.3388	1	0.3458	1	0.4855	6

Profitability and Efficiency

We investigate the relationship of profit and cost inefficiency using random effect with time and individual effect. We represent profitability by ROE and ROA Table 6 shows the regression results of the ROE model. We estimate the model using random effect panel data to maintain heterogeneity across firms. Hausman test suggests we cannot reject the assumptions of the random effects estimator (Hausman statistics is 1.72).

Table 6: Panel data Estimation Results of the Profitability Equation, ROE

	Dependent variable(ROE)								
Variable	Truncated Normal			Half Normal			Exponential		
	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat
U	-0.346	0.174	-1.985*	-0.355	0.163	-2.177*	-0.397	0.1073	-3.699*
LASS	0.612	0.4711	1.299	0.642	0.465	1.380	0.826	0.449	1.838*
OWN	-0.0003	0.0005	-0.505	-0.0003	0.0005	-0.445	-0.0002	0.0006	-0.404
t	-0.064	0.081	-0.788	-0.055	0.061	-0.91	-0.057	0.041	-1.399
Constant	-1.232	3.754	-0.328	-1.356	3.694	-0.367	-2.678	3.531	-0.758
R^2	0.77			0.77			0.78		
Hausman statistic	1.72								

Notes:* Indicates significant at 5% level of significance.

The coefficient of the inefficiency estimate is negative and significant at the 5% level for all truncated normal, half normal, and exponential in the ROE model. The coefficient of LASS is only significant in the exponential model. However, the coefficient of ownership is not significant in each of the model.

Table 7 shows the regression results of the ROA model. Similar to the ROA model, Hausman test suggests we cannot reject the assumptions of the random effects estimator (Hausman statistics is 2.76). The results show that the coefficient of the inefficiency estimates is negatively significant at the 5 percent level for all truncated normal, half normal, and exponential model. Similarly, the coefficient of LASS is significant in each of the model. Similar to the ROE case, the coefficient of ownership is not significant in each of the model. The results show that efficient firms, on average, have higher return on equity and on assets. This indicates that inefficiency has substantial effect on the profitability of life insurance companies. Hence, for Thai life insurance firms to be profitable, they have to increase their efficiency by reducing cost possibly through consolidation in the life insurance industry.

Table 7: Panel data Estimation Results of the Profitability Equation (ROA)

	Dependent variable(ROA)								
Variable	Truncated Normal			Half Normal			Exponential		
	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat	Coef.	s.e.	t-stat
U	-0.0645	0.030	-2.134*	-0.056	0.029	-1.910*	-0.058	0.024	-2.399*
LASS	1.072	0.161	7.448*	1.078	0.1601	6.737*	1.100	0.1581	6.956*
OWN	-0.0002	0.0003	-0.667	-0.0003	0.0005	-0.609	-0.0002	0.0007	-0.269
t	-0.0508	0.2807	-0.181	0.0231	0.3574	0.065	0.2563	0.4362	0.588
Constant	-3.5095	1.2386	-2.833*	-3.5519	1.2284	-2.891*	-3.7116	1.2042	-3.082*
R^2	0.73			0.74			0.77		
Hausman statistic	2.76								

Notes: * Indicates significant at 5% level of significance.

6. Conclusion

The main purpose of this study is investigates cost efficiency of the Thai's life insurance industry and to study the relationship between profitability and efficiency. We find that the industry is on average

82 to 140 percent inefficient. There is no significant relationship between inefficiency and age. But, the mean inefficiency is negatively correlated with size suggesting the need for rationalization in the insurance industry in Thailand. Consolidating the large number of smaller insurers should be high on the government's agenda, and the capital requirements for life insurers need to be increase.

In addition, we show that inefficiency is negatively correlated with ROE and ROA ratios. This shows that efficient firms, on average, have higher return on equity and on assets. This indicates that inefficiency has substantial effect on the profitability of life insurance companies. Hence, increasing efficiency should be the main priority for the Thai life insurance industry.

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