Analyzing efficiency in the Chinese life insurance industry

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Abstract

Purpose – The purpose of this paper is to examine the efficiencies of China's foreign and domestic life insurance providers and to explore the relationship between ownership structure and the efficiencies of insurers while taking into consideration other firm attributes.

Design/methodology/approach – The data envelopment analysis (DEA) method is used to estimate the efficiencies of the insurers based on a panel data between 1999 and 2004.

Findings – The results indicate that the average efficiency scores for all the insurers are cyclical. Both technical and scale efficiency reached their peaks in 1999 and 2000 and gradually reduced for the rest of the period under examination until 2004 when average efficiency were improved again. The Tobit regression results show that the insurers' market power, the distribution channels used and the ownership structures may be attributed to the variation in the efficiencies.

Research limitations/implications – Based on the research findings and the discussion, the study provides several recommendations for policy makers, regulators and senior executives of insurers.

Practical implications – The research results highlight the importance of deregulating the sector to allow a further expansion of each individual insurer or encourage mergers and acquisitions of insurers so more efficient resource utilization can be achieved through economies of scale. It also suggests that it is imperative for insurers to recruit motivated insurance agents and offer them on-the-job training as a part of the management strategies for gaining technical efficiency.

Originality/value – The paper reports the development within China's insurance industry and is one of the few studies analyzing the efficiencies of China's insurers.

Keywords China, Insurance companies, Insurance services

Paper type Research paper

Introduction

Since accession by the People's Republic of China (China) to the WTO, foreign insurance providers have been flooding into the country. It is envisaged that long-established foreign insurers will bring their experience in underwriting, claim settlement and management into China's insurance industry. In addition, the entry of foreign insurers into the market will certainly improve the operational efficiency of domestic insurers through intensified competition. Therefore, it is appropriate to compare differences in efficiencies that may exist in the Chinese life insurance industry.

In this study, the data envelopment analysis (DEA) method is used to assess the technical efficiency of both foreign and local life insurance providers and to consider other firm attributes. The relationship between ownership structure and insurers' efficiency is also explored. The paper focuses on life insurance operations because of their relative importance over non-life business in terms of the contribution they make to China's premium income and gross domestic product (GDP).

Development of China's life industry

Although the history of life insurance in China dates back to 1949 when the first provider, the People's Insurance Company of China (PICC), emerged as the comprehensive insurer of that time. PICC was permitted to sell various types of insurance policies across China. In this period, the domestic insurance business was forced to cease due to the restrictions on private ownership of property and the introduction of comprehensive social entitlement programs for the 1959-1979 period (Thomas, 2002). However, following the initiation of reform and introduction of the open door policy initiative by the Chinese government in the late 1970s, the life insurance business was resurrected as a viable industry in the 1980s.

Life insurance has been playing the leading role in the insurance sector since 1997, when premiums collected from life business for the first time surpassed those generated by the non-life insurance business. For instance, in 2004, almost 70 per cent of the year's total premium income was due to life insurance (Swiss Re, 2005). Between 1986 and 2004, China's total written premiums and insurance density increased by more than 20 and 30 times, respectively. As a result, life insurance's contribution to GDP grew to 2.21 per cent in 2004 in contrast to 0.13 per cent in 1986. China holds 11th position on the world list reported by the China Insurance Regulatory Commission (2006) in terms of the total of life premiums written in 2005. In 2005, China's total premium hit $62 billion (AIG, 2007). However, as Table I shows, there remains a big gap in insurance density and penetration in China, whether compared to the world average or to industrialized countries – this is even a gap compared to emerging

markets. On the other hand, this gap may be interpreted as a measure of the great potential of China's insurance industry. Nevertheless, the value of premiums collected will exceed $100 billion by 2008 (Binder *et al.*, 2004) and may soon surpass totals for France and Germany.

An increasing number of insurers were established in the past decade. In 2005, there were 93 fully licensed insurance companies – 42 of these providers offered life insurance. In 1980, there was only one. However, China's insurance market still falls into the oligopolistic category. Market concentration remains very high although it has been gradually reducing (Leverty *et al.*, 2004). In 2005, for example, the "big four" life companies collected more than 80 per cent of the gross premium (see Table II). Specifically, China Life, the life insurer with the longest history, still dominates half of the market when measured by premium income.

With the open door policy, increased numbers of foreign insurers are doing business in China. According to CIRC (2006), international companies ($n = 24$), including wholly-foreign owned and foreign joint ventures, outnumbered the domestic companies ($n = 18$) in 2005. However, foreign providers have captured only a small part of the gross premiums (cf. Leung and Young, 2002; Leverty *et al.*, 2004; cf. China Development Research Foundation, 2005). For instance, in 2004, no more than 8.89 per cent of the total life premiums were contributed to foreign providers (CIRC at www.circ.gov.cn). In a large part, this was due to various regulatory restrictions placed on these companies. Nevertheless, in the cities that were opened for business earlier, the market share of foreign providers has increased significantly. For instance, in Shanghai

	Total business		Life business	
	Penetration (%)	Density (USD)	Penetration (%)	Density (USD)
World	7.99	502.0	4.55	288.7
Industrialized countries	9.02	2,966.1	5.14	1,691.7
Emerging markets	3.94	68.7	2.41	42.1
China	3.26	42.0	2.21	27.3

Source: Swiss Re, 2005

Table I.
Global and Chinese
insurance in 2004

	Number of firms	Life insurance Share of premiums written (%)			
		1-Firm	2-Firm	3-Firm	4-Firm
1995	6	84.9	92.3	97.9	99.8
2001	21	57.08	85.23	95.31	96.93
2002	23	56.59	80.13	91.08	94.59
2003	31	53.98	73.86	86.56	92.35
2004	33	55.17	72.35	83.15	89.02
2005	42	50.96	67.10	77.03	82.81

Note: [a]AIA Dongguan, Jiangmen and Guangzhou Branch are counted as one company
Source: for data for the year 1995, see CIRC and Samsung Life Co. (2003, p. 53); data for 2001-2003, see Chen (2004, p. 59); 2004 figures, see *Yearbook of China's Insurance*, 2005; 2005 figures are calculated from the data released by CIRC at www.circ.gov.cn

Table II.
Market concentration in
China's life insurance
market

and Guangzhou, the two most open cities in China, international insurers captured, respectively, 17.31 and 20.90 per cent of the total life premiums in 2005. This was much higher than the national average (CIRC, 2005a).

The product composition has also changed recently. In the early days after the resumption of life insurance operations in China, business targeting collective-owned enterprises was concentrated on casualty, group policies and pension coverage. Currently most of the premiums come from individual policies. In 2004, for instance, 81.16 per cent of the overall life premiums were attributed to individual purchases. Among individual products, life insurance was dominatingly popular, followed by health, accident and injury insurance. According to the Insurance Law of China, insurance of persons is classified into life insurance, health insurance and accident and injury insurance.

In 2004, life insurance accounted for more than 90 per cent of the individual premium income. Participating and unit-linked policies have also attracted quite large numbers of Chinese consumers (Wu, 2004). These jointly contributed nearly 70 per cent of the individual life premiums in 2004 (CIRC, 2005b). It appears to be the case that foreign providers have failed to appreciate that the interest of many Chinese consumers in insurance or financial products is closely linked to investment and financial management. This may partly account for the low market share (Ji and Thomas, 2001).

Regional disparities in the development of the insurance sector can also be identified in China. The coastal areas have always been leaders, followed by the central and western areas. For example, two-thirds of national life premiums in 2003 were collected from coastal regions, with an annual grown rate of 38.7 per cent in the period 1998-2003 (Zhang and Zhu, 2005).

Methodology of DEA
DEA involves the use of linear programming methods to construct a non-parametric piece-wise surface over the data.
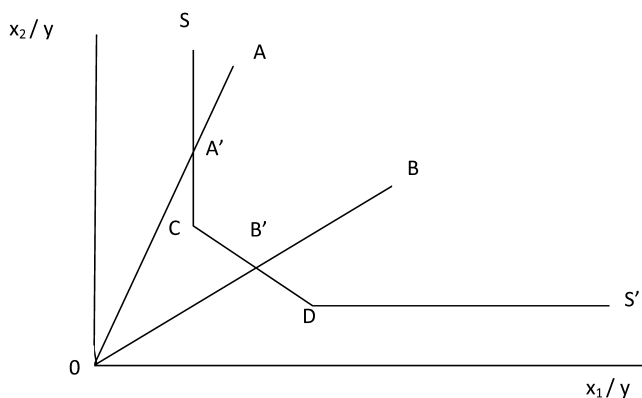
$$\min_{\theta, \lambda} \theta,$$
$$\text{s.t.} \ -y_i + Y\lambda \geq 0,$$
$$\theta x_i - X\lambda \geq 0,$$
$$\lambda \geq 0,$$

(1)

Banker *et al.* (1984) suggested an extension of the CRS DEA model to account for a variable returns to scale (VRS) situation. Hence, the input-oriented VRS model solves the following linear programming problem for the i-th firm in each year:
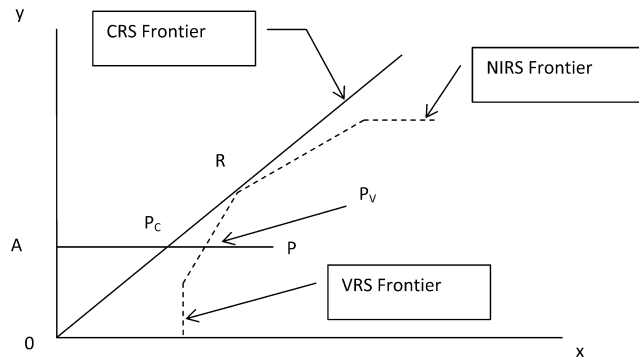
$$\begin{aligned}
&\min_{\theta,\lambda} \ \theta, \\
&\text{s.t.} -y_i + Y\lambda \geq 0, \\
&\quad \theta x_i - X\lambda \geq 0, \\
&\quad N1'\lambda = 1, \\
&\quad \lambda \geq 0,
\end{aligned} \qquad (2)$$

These concepts can be expressed in ratio efficiency measures as:

Figure 1.
Efficiency measurement
in the CRS DEA model

Figure 2.
Calculation of scale
economies in DEA

$$\text{OTE} = \overline{\text{AP}_c,}/\overline{\text{AP}} \quad \text{PTE} = \overline{\text{AP}_V,}/\overline{\text{AP}} \quad \text{SE} = \overline{\text{AP}_c,}/\overline{\text{AP}_V}; \tag{3}$$
$$\text{OTE} = \text{PTE} \times \text{SE}. \tag{4}$$

That is, OTE can be further decomposed into PTE and SE. This SE measure can be explained as the ratio of the average product of a firm operating at the point PV to the average product of the point operating at a point of optimal scale (point R).

Data description

In general, there are two alternative approaches, which have been used by researchers when conducting efficiency analyses of financial firms. These approaches are the production approach and the intermediary approach. The former treats financial firms analogously to manufacturing firms when selecting the means of measuring outputs and inputs. Therefore, it is termed the "production approach". The latter approach, emphasizing the intermediation function of financial firms, is called the "intermediary" or "value-added approach".

While adopting the "production approach" in research into the insurance industry, insurance premiums are widely used as proxies for outputs, while the capital and labor utilized to collect these premiums are identified as inputs (Boonyasai *et al.*, 2002; for insurance firms have been increased. In reality, however, if the pay outs of insurance companies suddenly increased due to an unexpected natural disaster (such as a hurricane, earthquake or terrorist attack), *ceteris paribus*, the surge of payment of real losses would certainly constitute a distortion of insurance companies' achievements.

Inputs associated with insurers normally consist of three groups: labor, business services and materials, and capital. Based on the data availability, the inputs used in this study only include working capital (equity capital and debt capital) and operating expenses, which represent business services. In contrast to Leverty *et al.* (2004), we also include a human capital variable, which is defined as the total personnel who gained qualifications at of diploma level or above.

The descriptive statistics of the variables used in this study are as depicted in Table III. All nominal variables are transformed into real variables at the 1999 price level by using GDP deflators.

An analysis of inter-company efficiency difference
Comparing the efficiency scores

The results also demonstrate that for each year during the test period, there were more scale efficient insurers than technical efficient insurers. However, the mean OTE score was not high – ranging from 0.874 in 1999 to 0.586 in 2003, indicating an efficiency gap among the insurers under investigation. In addition, there was a sudden decrease of efficiency scores in 2003, which might be attributed to the number of insurance companies increasing in that year.

Variable	N	Minimum	Maximum	Mean	Std. deviation
Total premium		0.3	2,71,647.5	17,070.8	46,890.0
Million RenMinBi (RMB)	115				
Net premium		0.3	2,45,288.4	16,218.1	44,272.8
Million RMB	115				
Equity capital		4.8	86,681.4	2,993.1	9,514.6
Million RMB	115				
Deb capital		2.0	8,09,590.9	38,999.0	1,16,523.3
RMB	115				
Operation expenses		0.3	8,87,962.7	18,270.0	86,621.3
RMB	115				
Human capital		42.0	93,671	5,716.1	15,314.0
Person	115				

Table III.
Descriptive statistics of variables

In the following section, the efficiency scores by ownership are presented. The mean efficiency scores for the state-owned insurance company were "1" in all the cases – total technical efficiency, PTE and scale efficiency, for the period 1999-2004. This suggests that China Life, the state-owned insurance company, demonstrated best industry practice in China. The efficiency scores for other types of ownership are reported in Tables V-VII.

	Overall technical efficiency	Pure technical efficiency	Scale efficiency
1999	0.874	0.914	0.945
2000	0.874	0.914	0.945
2001	0.745	0.911	0.806
2002	0.777	0.901	0.836
2003	0.586	0.772	0.760
2004	0.820	0.913	0.899

Table IV.
Mean scores of efficiency of all Chinese insurance companies 1999-2004

	1999	2000	2001	2002	2003	2004
Total technical efficiency	0.685	0.685	0.823	0.909	0.734	0.897
Pure technical efficiency	0.784	0.784	0.923	0.965	0.873	0.953
Scale efficiency	0.862	0.862	0.882	0.938	0.843	0.943

Table V.
Mean efficiency scores for stock-holding companies

	1999	2000	2001	2002	2003	2004
Total technical efficiency	1	1	0.596	0.568	0.422	0.744
Pure technical efficiency	1	1	0.884	0.808	0.650	0.879
Scale efficiency	1	1	0.664	0.691	0.788	0.0850

Table VI.
Mean efficiency scores for joint ventures

	1999	2000	2001	2002	2003	2004
Total technical efficiency	1	1	0.903	0.943	0.661	0.914
Pure technical efficiency	1	1	0.927	0.983	0.951	0.950
Scale efficiency	1	1	0.969	0.956	0.697	0.964

Table VII.
Mean efficiency scores for wholly-foreign owned companies

Identifying the determinants of efficiency

In our model, the dependent variables are the scores of total technical efficiency, PTE and SE (see Table VIII). The independent variables are:

- The logarithm of market power (proxied by the share of each company's net premium income among the total net premium);

- Ownership – in our sample, there are four types of companies: state-owned, joint stock companies, wholly-foreign operations and joint ventures (since there is only one state-owned company in the sample, we put the state-owned company and the joint-stock companies together as the reference group in regression);

- Human capital (proxied by the proportion of employees with a diploma or above qualification among all the total personnel);

- The distribution channel used, which is mainly the *bancassurance* channel and brokers (*bancassurance* is a French term for the selling of insurance through a bank's established distribution channels and brokers);

- The vintage of the company (the number of years of operation in China); and

- The location of the organization's headquarters.

Five dummy variables were used to represent the city where the headquarters are located and take Shanghai as the reference.

	Tobit			Random-effects Tobit		
	Total technical efficiency	Pure efficiency	Scale efficiency	Total technical efficiency	Pure efficiency	Scale efficiency
Logarithm of market share	0.028*** (2.90)	−0.030** (−2.10)	0.044*** (5.23)	0.028*** (2.94)	−0.030** (−2.07)	0.044*** (5.23)
Logarithm of proportion of employees with a diploma or above qualification in the total personnel	−0.002 (−0.01)	−0.031 (−0.22)	0.032 (0.30)	0.002 (0.02)	−0.009 (−0.06)	0.030 (0.29)
Distribution channel used	0.377*** (6.84)	0.335*** (4.90)	0.201*** (4.17)	0.377*** (6.94)	0.335*** (4.91)	0.201*** (4.17)
Age of the company	0.004 (0.80)	0.009 (1.31)	0.001 (0.31)	0.003 (0.71)	0.009 (1.29)	0.001 (0.28)
Ownership (Ref. State-owned and Stock company)						
Wholly-foreign	0.172** (2.02)	0.125 (1.13)	0.079 (1.05)	0.151* (1.75)	0.145 (1.21)	0.072 (0.95)
Joint venture	0.051 (0.66)	−0.085 (−0.86)	0.043 (0.64)	0.039 (0.51)	−0.068 (−0.65)	0.039 (0.57)
Location of the headquarter (Ref. Shanghai)						
Beijing	0.128 (1.58)	0.162 (1.55)	0.020 (0.28)	0.122 (1.49)	0.182 (1.61)	0.017 (0.24)
Guangzhou	−0.061 (−0.69)	−0.084 (−0.82)	−0.004 (−0.05)	−0.062 (−0.71)	−0.077 (−0.75)	−0.004 (−0.05)
Tianjin	−0.186 (−1.49)	−0.067 (−0.46)	−0.176 (−1.62)	−0.188 (−1.54)	−0.066 (−0.46)	−0.176 (−1.63)
Shenzhen	−0.034 (−0.34)	−0.020 (−0.17)	−0.218** (−2.52)	−0.055 (−0.54)	−0.025 (−0.21)	−0.222** (−2.55)
Dalian	0.358 (1.52)	0.197 (0.74)	0.168 (0.82)	0.365 (1.58)	0.225 (0.83)	0.167 (0.82)
Constant	0.597*** (7.02)	0.731*** (6.79)	0.881*** (11.84)	0.614*** (7.13)	0.720*** (6.42)	0.887*** (11.84)
Log likelihood	−18.320	−33.729	−5.709	−17.375	−33.574	−5.555
Pseudo R^2	0.729	0.431	0.880			
Number of observations	115	115	115	115	115	115

Notes: The *t*-students are in brackets. ***significance at 1 percent; **significance at 5 percent; *significance at 10 percent

Table VIII.
Determinants of efficiency

Summary and conclusions

The purpose of this paper has been to use the DEA method to estimate the technical efficiency of both foreign and domestic life insurance providers in China and to explore the relationship between ownership structure and the efficiency of insurers while considering other attributes of the enterprises. We estimated OTE, PTE and SE for 35 Chinese insurance companies transacting life insurance between 1999 and 2004. The average efficiency scores for all the insurers behave in a cyclical fashion. Both technical and scale efficiency scores reached their peaks in 1999 and 2000 and gradually reduced for the rest of the examination period until 2004 when average efficiency improved again. The new establishment of a large number of life insurance companies and branches might have contributed the sudden decrease of the average efficiency in 2003.

Our results also show that there are significant differences in efficiency among the companies according to ownership. Firstly, the state-owned insurer achieved the highest efficiency among all the insurers included in the sample. This may be due to its long-term support received from the central and local governments and its monopoly status that renders economies of scale and economies of scope. Secondly, the wholly-foreign owned insurance companies were both in technical and scale terms more efficient than the joint stock companies and the joint ventures.

Our results show that market power and the distribution channels adopted by the insurers are the most important determinants of efficiencies.

Two recommendations can be made based on the empirical results. Firstly, the policy maker or senior executives of the Chinese insurers should either allow the further expansion of each individual insurer or encourage mergers and acquisitions of insurers in order that more efficient resource utilization may be achieved through economies of scale. Secondly, recruiting motivated insurance agents and offering them on-the-job training may be more important than hiring graduates with a diploma or higher qualification since it appears to be profitable to employ front line salesmen rather than increase the level of managerial staff.

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