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# Intellectual capital and performance in the Chinese life insurance industry



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## ABSTRACT

This study applies the dynamic slack-based measure (DSBM) model to evaluate the performance of 34 Chinese life insurance companies for the period 2006–2010. This study also examines the relationship between intellectual capital and performance using the truncated regression approach. Our findings indicate that over the period of the study, the mean efficiency scores of life insurers are relatively stable, ranging from 0.905 to 0.973. We verify that the efficiency scores of the DSBM model differ significantly from those of the traditional data envelopment analysis (DEA) model, which supports the use of the DSBM model. Our regression analysis reveals that intellectual capitals are significantly positively associated with firm operating efficiency. Our findings corroborate prior studies which show that intellectual capital can make a company rich. In this dynamic business world, life insurers' managers should invest and fully utilize intellectual capital to gain a competitive advantage.

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## 1. Introduction

Since economic reforms were carried out in China, the Chinese insurance industry has grown rapidly. China's fastest-growing economy has grabbed worldwide attention, yet its overall growth rate has been dwarfed by that of the Chinese insurance industry. The Chinese life insurance market experienced particularly strong growth from 2007 to 2010. In 2011, the industry recorded a 6.8% rise in premium income, reaching RMB 969.98 billion (about USD 154 billion) [2], and it is expected to have a value of USD 237.5 billion in 2015, an increase of 66.3% over 2010. The largest segment of the Chinese insurance market is life insurance, accounting for 97.3% of the market's total value [3]. This segment has grown significantly with the number of life insurers increasing from 29 in 2004 to 61 in 2010.<sup>2</sup>

The Chinese insurance industry indeed holds enormous potential and offers opportunities to international insurers equipped with expertise and scale economies [4]. Nevertheless, mounting competition has caused domestic insurers to lose their advantage in efficiency. As a result, the gap between domestic and foreign insurers has narrowed since 2005 [5]. Yao et al. [6] point out that

low productivity and low efficiency could stop the Chinese insurance industry from developing further. Many academicians and practitioners have studied whether efficient growth and development exist in the industry. Specifically, a considerable number of extant studies have investigated the performance of the industry by applying the data envelopment analysis (DEA) approach [7–9]. Overall, prior literature suggests that the DEA technique is a valuable addition to traditional methods such as ratio analysis, because DEA is able to compare companies' multiple input–output data [10–17]. For a company that operates in a multidimensional setting, aggregating a set of financial ratios can be complicated and require imagination and experience [10,15,17]. Another advantage of DEA is that it does not require any distributional assumptions.

However, none of the prior studies specifically investigated the operating efficiency of a life insurer using a dynamic production process. In today's dynamic business world, life insurance companies must focus on changes in operating performance over long time periods. The capital<sup>3</sup> allocation and planning processes are of central importance for life insurance companies [18]. Efficient resource allocation can provide a life insurer with a competitive advantage that can sustain its business over time. Several methods such as window analysis [19] and the Malmquist index [20] are effective for evaluating efficiency changes over time. However, to deal with the long-term dynamic process of a company, the dynamic slack-based measure (DSBM) model developed by Tone

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<sup>2</sup> We obtained the statistics from the website of China Insurance Regulatory Commission (CIRC).

<sup>3</sup> Capital is a type of resource that is carried over from one term to another.

and Tsutsui [21] is particularly suitable because it incorporates carry-over activities into the model and enables researchers to measure period-specific efficiency based on long time optimization [20–24]. Thus, this paper aims to examine the operating efficiency of China's insurance companies using the DSBM model in the first stage.

In the Chinese insurance industry, a lot of talent and technical know-how have been outsourced [25]. The industry is a knowledge-intensive industry that has to count on intellectual capital (IC) for continuous growth since insurers equipped with IC are more competitive [4]. IC is the key success factor for a company's success [26–28]. Thus, companies should focus on IC management to maximize long-run corporate wealth [29–31].

While there are various application areas in the insurance industry [7–9], no other published study has reported an association between IC and the operating efficiency of life insurers.<sup>4</sup> In this study, we employ the Value Added Intellectual Coefficient (VAIC™) to measure IC. To further investigate whether Chinese insurance companies are able to improve their efficiency through IC investment, this paper utilizes truncated regression with a bootstrapping procedure introduced by Simar and Wilson [32,33], which better describes the efficiency scores in the second-stage regression analysis.

Although research on insurers' efficiency has been increasing, this is the first paper to employ the DSBM model to evaluate the efficiency performance of Chinese life insurers by using a dynamic process. Furthermore, we are the first to apply Simar and Wilson's [32,33] approach to testing the relationship between intellectual capital and firm operating efficiency for the Chinese life insurance industry. Our analysis is particularly relevant to life insurers' managers, who may be interested in knowing whether investment in intellectual capital serves as a key performance driver.

The study is also significant in that it may provide insights into potential avenues of policy improvement. Since utilizing IC is essential to improve efficiency, policy makers, who are capable of influencing the direction of the Chinese life insurance business environment, may make changes to the existing policies to promote the development of IC in the life insurance industry. Even more significant, policy makers may promote greater understanding of the IC concept to increase investment planning policy at the corporate level. Since the contribution of the life insurance industry to China's economic growth is substantial, continuous investment in IC by Chinese life insurers may have positive consequences.

The remainder of this study proceeds as follows. Section 2 presents a review of the literature, followed by hypotheses development, while Section 3 describes the methodology and procedures adopted for data collection. The empirical results of the various analyses are presented in Section 4. Finally, conclusions are presented and suggestions are made for further research.

## 2. Literature review

### 2.1. Efficiency in the insurance industry

Efficiency measurement of the insurance industry is one of the most rapidly growing areas of research [12]. The econometric approaches and the mathematical programming approaches are the two frontier efficiency techniques available for efficiency measurement [7,34]. The DEA approach is a mathematical programming approach, while stochastic frontier analysis (SFA) is an econometric approach. Although both the econometric and

mathematical programming approaches have their advantages and disadvantages, Eling and Luhn [35] find that the results obtained using the DEA approach differs slightly from those obtained using SFA for 6462 insurers in 36 countries. Similarly, Cummins and Zi [34] apply a wide range of econometric and mathematical programming techniques to a sample of US life insurers and found that the results obtained using the DEA and FDH mathematical programming methodologies differ significantly. No conclusive evidence exists to show which assessment approach is superior [34].

Fecher et al. [36] use the DEA approach and SFA to analyze 84 life and 243 non-life insurance companies in France from 1984 to 1989, and their results show a high correlation between the two measurement approaches. Fenn et al. [37] apply a procedure developed by Kumbhakar and Lovell [38] to control for the impact of potential heteroskedasticity in order to overcome the weakness of SFA. Drawing on European insurance company data from 1995 to 2001, Fenn et al. [37] show that most European insurers operate at increasing returns to scale. Yuengert [39] also employs SFA to estimate the efficiency of US life insurance companies.

In addition, contemporary studies on the insurance industry have widely used the DEA model to evaluate firm performance [5,21,40–45]. In 95 surveyed papers focusing on the insurance industry, the DEA approach was most frequently applied, followed by SFA [7]. Using the DEA model, Fukuyama [46] investigates the productive efficiency and productivity changes of Japanese life insurance companies from 1988 to 1993, and finds that mutuals and stocks had identical technology. Barros et al. [47] study the effects of deregulation on the efficiency of the Greek insurance industry using the two-stage procedure of Simar and Wilson [32], wherein the efficiency is estimated using the DEA approach.

The traditional DEA model, nevertheless, cannot be applied to assess long-term efficiency changes because it ignores the effect of carry-over activities<sup>5</sup> between two consecutive terms. As such, the dynamic DEA model<sup>6</sup> which provides a more accurate measurement of time-specific dynamic efficiencies over long time periods, is more appropriate than a single period static evaluation [21]. In contrast to the radial models that assume proportional changes in inputs or outputs, the DSBM model developed by Tone and Tsutsui [21] is a non-radial dynamic DEA model that can deal individually with inputs, outputs, and carry-overs. Furthermore, the DSBM model allows carry-over activities to be categorized into four types: desirable, undesirable, discretionary, and non-discretionary. Up to this point, no research has used dynamic DEA to evaluate the corporate performance of insurance companies.

### 2.2. Overview of the Chinese life insurance industry

The Chinese life insurance industry is often described as having experienced rapid expansion over the past decade, with life insurance premiums increasing from RMB 406 billion in 2006 to approximately RMB 1.05 trillion in 2010. Records show that the growth rate was a remarkable 158%. During the same period, the number of life insurance companies increased from 45 to 61. Increasing demand and the immaturity of the industry all explain the strong growth and the potential of the Chinese life insurance industry to help drive China's growing economy.

Since China's accession to the World Trade Organization (WTO) on 11 December 2001 [50], it has experienced an influx of foreign insurance companies. Most restrictions on ownership and

<sup>5</sup> For example, fixed assets of an insurer are carried forward from one period to another continuously.

<sup>6</sup> Färe and Grosskopf [48] are the first innovative scholars who formally deal with inter-connecting activities. Dynamic DEA has been used to examine efficiency performance in industries other than the insurance industry [22–24,49].

<sup>4</sup> For the other application areas, refer to Eling and Luhn [7] for an overview.

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