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Research on the Competitiveness of Life Insurance Companies in China

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Abstract

Life insurance industry is an inseparable part of China's financial industry. According to the " China Statistical Yearbook" data, as of the end of 2019, China's total life insurance premium income reached 2962.84 billion yuan. However, China's life insurance industry is still not yet perfect. In order to gain a foothold in the fierce market competition, life insurance companies need to work hard to improve their competitiveness.Under the above background, this paper will combine the enterprise competitiveness theory to construct the life competitiveness enterprise core competitiveness evaluation index system ,ranking the competitiveness comprehensive score, and give corresponding suggestions. The research results show that from the perspective of comprehensive scores, the comprehensive competitiveness of Chinese-funded companies is stronger than that of Sino-foreign joint ventures. From the perspective of the scores of various public factors, Chinese life insurance companies have an advantage in terms of market size and solvency. Besides,some small and medium-sized life insurance companies with small market share have certain advantages and development potential. In terms of development factors, Sino-foreign joint venture life insurance companies have stronger operational capabilities, while established life insurance companies such as China Life Insurance are weaker in growth capacity indicators.

Keywords

Life Insurance Company; Competitiveness; Factor Analysis; Entropy Method.

1. The Topic Selection

1.1. Research Background

China's life insurance industry is a rising industry with great potential. According to the data from the "2020 China Statistical Yearbook[1]", as of the end of 2019, China's per capita GDP has exceeded 9,000 US dollars, and China's total life insurance premium income reached 2962.84 billion yuan. At the same time, opportunities are always accompanied by challenges. The development of China's insurance companies is slightly inadequate compared with the level of countries in the world or meeting the needs of our people. First, oligopoly is still the main theme of market competition. Guobang, Ping An Life and An-bang Life accounted for over 40% of the premium income of the life insurance industry in 2019. Second, the development level of China's life insurance industry is relatively low. According to the statistics of the world insurance industry in 2019, the premium income of Mainland China is 541.4 billion US dollars, ranking second in the world, nearly three times the difference between the premium income of the United States, and the depth of life insurance (2.68%) is lower than the global average (3.3%), There is a big gap with developed countries. Third, the current level cannot match the insurance needs of residents.

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2. The Innovation

Different from the previous research, the main innovations of this article have the following two aspects:

(1) Combining factor analysis and entropy method to conduct an empirical analysis of the core competitiveness of life insurance companies.

At present, the research on the competitiveness of life insurance companies mainly uses principal component analysis, data envelopment method, multiple regression method, analytic hierarchy process, factor analysis method, etc. This paper expands the factor analysis method, organically combines factor analysis and entropy method, which not only eliminates the correlation between indicators but also considers the influence of the dispersion of each index on comprehensive evaluation, and more scientifically comprehensively evaluates the competition of life insurance companies Force .

(2) Combining reality and enterprise competitiveness theory, constructing a core competitiveness evaluation index system of China's life insurance companies with practical significance.

According to the existing literature, a large number of tedious and complex indicators are generally used to select the evaluation indicators of life insurance companies. It is not possible to study and analyze the company's competitiveness very well. This article attempts to streamline and highlight the company's core competitiveness, combined with the company's actual operating situation.

3. Data Selection

In order to ensure the completeness and authenticity of the data, it comes from "China Insurance Yearbook" in 2020, "China Statistical Yearbook" in 2020, the annual report data and the CIRC data published by the official websites of major life insurance companies in 2019. According to the proportion of Chinese-funded and Sino-foreign joint ventures, it plans to select 18 Chinese life insurance companies and Chinese-foreign joint venture life insurance companies, accounting for 70% market share.

3.1. Constructing Evaluation Index System of Life Insurance Companies

This article will select 10 key indicators from a large number of indicators, aiming to use the most simplified evaluation index model to effectively analyze the competitiveness of life insurance companies. These 10 indicators specifically reflect the core competitiveness of the four aspects of solvency, profitability, growth capacity and scale strength.

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Table 1. Selected samples

Number	Company	Capital structure	Market share
1	Sun life Everbright Life	Sino-foreign joint venture	0.26%
2	HSBC Insurance	Sino-foreign joint venture	0.04%
3	Tianan Life	Sino-foreign joint venture	1.80%
4	AIA Company limited Guangdong	Sino-foreign joint venture	0.26%
5	Zhonghong Life	Sino-foreign joint venture	0.25%
6	CITIC Prudential	Sino-foreign joint venture	0.45%
7	Zhongyi Life	Sino-foreign joint venture	0.35%
8	Fude Life	Chinese-funded	3.01%
9	Union Life	Chinese-funded	0.89%
10	Huaxia Life	Chinese-funded	3.34%
11	Minsheng Life	Chinese-funded	0.42%
12	Pin An Life	Chinese-funded	13.80%
13	Taiping Life	Chinese-funded	4.26%
14	Pacific Life	Chinese-funded	6.57%
15	Xinhua Life	Chinese-funded	4.09%
16	Chinese People's Life	Chinese-funded	3.97%
17	China Life Insurance	Chinese-funded	24.12%

Table 2. Selected indicators

Overall index	Level 1 Index	Level 2 Index	Index type
Core competitiveness	Solvency	Assets and liabilities	Inverse indicator
		Retention premiums divided by net assets	Positive index
	Profitability	Underwriting margin	Positive index
		Roe	Positive index
	Management capacity	Comprehensive cost rate	Inverse indicator
		Surrender rate	Inverse indicator
	growth capacity	Earned premium growth rate	Positive index
		Operating profit growth rate	Positive index
	scale strength	Total assets	Positive index
		market share	Positive index

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3.2. Performing Factor Analysis

3.2.1. Descriptive Statistics for Sample Evaluation Indicators

Table 3. Descriptive statistics

Variable	Quantity	Minimum	Maximum	Average	Standard Deviation
Assets and liabilities(a1)	18	0.8684	0.9712	0.9182	0.0286
Retention premiums divided by net assets(a2)	18	1.1507	10.3053	3.0524	2.0723
Underwriting margin(b1)	18	-0.1331	0.8367	0.1348	0.2379
Roe(b2)	18	-0.0489	0.2208	0.1034	0.0886
Comprehensive cost rate(c1)	18	0.1633	1.2694	0.8788	0.2540
Surrender rate(c2)	18	0.0198	0.9784	0.2359	0.2523
Earned premium growth rate(d1)	18	-0.2147	0.6252	0.2318	0.2326
Operating profit growth rate(d2)	18	-0.1801	0.5752	0.2128	0.2037
Total assets(e1)	18	7341.2600	3599577.0000	545466.6656	935199.7067
market share(e2)	18	0.0004	0.2412	0.0386	0.0607

3.2.2. Data Pre-processing

The evaluation indicators constructed in this paper have indicators in both positive and negative directions. Therefore, the indicators need to be positivized. At the same time, the sample data were standardized due to the elimination of quantitative and order-of-magnitude differences in the data.

Besides, the variables need to be examined before the variables are processed for factor analysis. The correlation between variables can be analyzed using the KMO test and bartlett's spherical test.

The pre-processed data were entered into R language for the KMO test and bartlett's spherical test. The p-value approximated by the test data was approximately 0, and the KMO test value was 0.5372>0.5. The results of both tests met the condition of passing the test and could be followed up by factor analysis.

3.2.3. Extract Common Factors

Factor analysis to determine the number of common factors can use the size of the eigenvalues to determine the number of factors, retaining the factors with the largest eigenvalues, i. e. only those with eigenvalues greater than 1. The feature roots are calculated from the inter-variable correlation coefficient matrix and run as follows.

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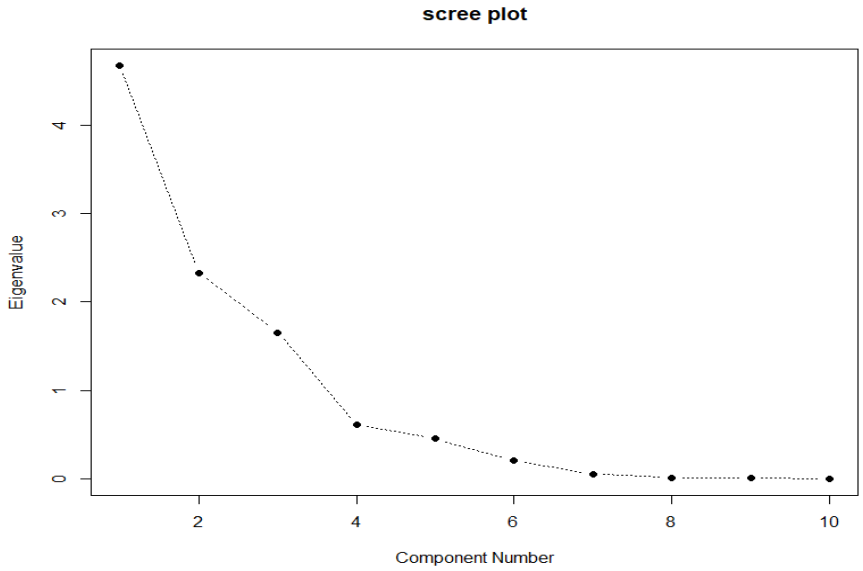

Fig 1. Factor eigenvalues gravel plot

The first three variables can be clearly seen to have eigenvalues greater than 1, and the initial determination of the number of common factors is 3. Continue to predict the number of common factors using the function fa. parallel in R. The predicted result is 3, and the number of common factors further determined from the debris map is 3, indicating that the first 3 factors explain most of the overall information.

The cumulative contribution of the variance between the common factor is obtained by extracting three common factors, which can be used for factor analysis in R using the principal function, as follows.

Table 4. The cumulative contribution, the variance and eigenvalues

Common factor	F1	F2	F3
Eigenvalues	4.668	2.327	1.654
variance	0.467	0.233	0.165
Cumulative contribution rate	0.467	0.7	0.865

After extracting the 3 public factors, the cumulative contribution of variance reaches 86.5%>80%, so the selection of 3 public factors is appropriate. The commonality is then calculated to give

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Table 5. Commonality of indicators

Indicators	Initial value	commonality
Assets and liabilities(a1)	1.0000	0.7654
Retention premiums divided by net assets(a2)	1.0000	0.8677
Underwriting margin(b1)	1.0000	0.9120
Roe(b2)	1.0000	0.6001
Comprehensive cost rate(c1)	1.0000	0.9086
Surrender rate(c2)	1.0000	0.9332
Earned premium growth rate(d1)	1.0000	0.8502
Operating profit growth rate(d2)	1.0000	0.8767
Total assets(e1)	1.0000	0.9627
market share(e2)	1.0000	0.9498

Table 5 gives the degree of commonality before and after extraction of each original variable. On the whole, the raw variables lose only a small amount of information.

3.2.4. Factor Naming

Using an orthogonal rotation with the largest variance, which always maintains the feature of the mutual irrelevance between the common factors. After performing the orthogonal rotation with the largest variance, the load distribution of the original variables on the common factor is no longer confused, favoring the interpretation of the common factor.

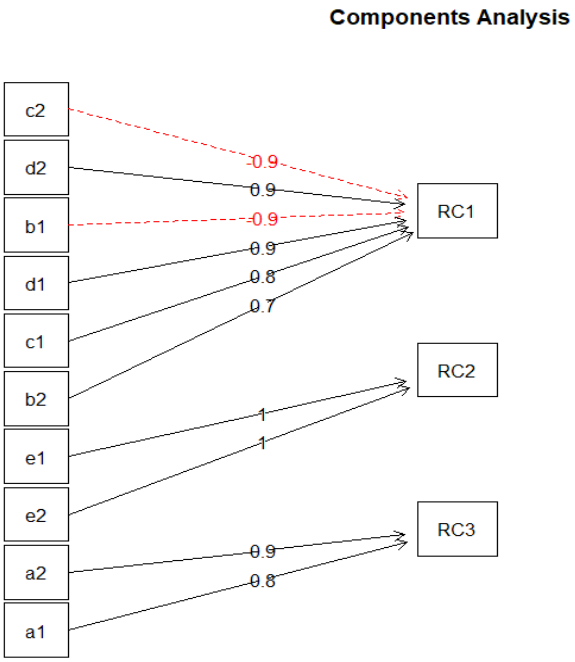

Fig 2. Common factors

Drawing with fa. diagram function in R makes it easier to see which variables converge into a single factor.

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The variables in the first common factor have positive and negative factor loadings, positive loadings have operating profit growth rate d2, earned premium growth rate d1, combined cost rate c1 and return on net assets e2. Negative loadings have surrender rate c2 and underwriting profit rate b1, grouping these six variables together. The second public factor has total assets e1 and market share e2, which fall into the same category. Third public factor grouping gearing ratioa1 and retained premiums to net assets a2.

In terms of economics and relevance, the public factor is named as follows

Table 6. Common factors naming

Common factor	naming
F1	Development factor
F2	Scale factor
F3	Solvency factor

Table 7. The core competitiveness evaluation system related to common factors

Overall index	Common factors	Level 1 Index	Level 2 Index
Core competitiveness	Solvency factor（F3）	Solvency	Assets and liabilities(a1)
			Retention premiums divided by net assets(a2)
		Profitability	Underwriting margin(b1)
			Roe(b2)
	Development factor(F1)	Management capacity	Comprehensive cost rate(c1)
			Surrender rate(c2)
		Development	Earned premium growth rate(d1)
			Operating profit growth rate(d2)
	Scale factor(F2)	Scale	Total assets(e1)
			market share(e2)

3.2.5. Factors Scoring

The common factor scores for each sample were calculated and the factor score coefficients were obtained as follows

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Table 8. Factor score coefficients

Common factors	F1	F2	F3
Assets and liabilities(a1)	0.04447088	0.13959848	0.417458573
Retention premiums divided by net assets(a2)	0.07333016	-0.0604529	0.504898163
Underwriting margin(b1)	-0.18427646	-0.0625965	0.070456835
Roe(b2)	0.11969498	0.02154494	-0.161486992
Comprehensive cost rate(c1)	0.16574555	0.13835243	-0.063952899
Surrender rate(c2)	-0.19534286	-0.017084	0.070284481
Earned premium growth rate(d1)	0.25418382	-0.1463526	0.209352214
Operating profit growth rate(d2)	0.25786428	-0.1260868	0.208043892
Total assets(e1)	-0.02873601	0.42232269	0.004995136
market share(e2)	-0.02936904	0.41834613	0.0224196

SetY_1, Y_2, Y_3 for each life insurance company's score on 3 public factors, and $X_1, X_2, \ldots, X_{10}$ for each indicator standardized data. The factor score function is obtained as follows.

Table 9. Life Insurance Company Score Ranking

Company	Development factor(F1)	Rank	Scale factor(F2)	Rank	Solvency factor（F3）	Rank
China Life Insurance	0.0842	10	3.2289	1	0.2542	6
Ping An Life	0.6793	5	1.5417	2	-0.0657	12
Chinese People's Life	-1.2708	17	-0.0948	8	0.0366	8
Taiping Life	-0.0030	12	-0.0658	6	-0.0220	11
Pacific Life	0.5579	6	0.5911	3	0.0352	9
Minsheng Life	-0.6758	15	-0.0837	7	-1.5141	18
Xinhua Life	-0.6675	14	0.4186	4	-0.8806	15
Zhongyi Life	-1.2660	16	-0.3435	10	-0.6386	14
Zhonghong Life	0.4364	7	-0.6723	16	-1.0203	16
Zhongyou Life	-0.2066	13	-0.9359	18	0.2663	5
Sun life Everbright Life	0.0773	11	-0.6415	15	-0.2796	13
Funde sino Life	-2.6330	18	-0.1174	9	1.1552	2
Tianan Life	0.8416	4	-0.7810	17	0.7899	3
Union Life	0.1809	9	-0.4946	11	2.8199	1
Hua Insurance	1.1230	2	0.1069	5	0.4566	4
CITIC Prudential	1.0824	3	-0.5611	14	0.0199	10
HSBC Insurance	1.2643	1	-0.5452	12	0.0502	7
AIA Company limited Guangdong	0.3956	8	-0.5504	13	-1.4631	17

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3.3. Using Entropy Method to Determine Comprehensive Score Weight

3.3.1. Introduction to Entropy Method

The entropy method is an objective method of assigning weights by the size of the entropy value. The entropy value is positively correlated with the weight, the higher the entropy value, the greater the weight. And entropy value refers to the variability of data between a certain indicator, then the greater the variability between the data, the greater the entropy value, i. e. the greater the weight.

3.3.2. Entropy Method Steps

(1) Standardize common factors

$$F_{ij}{}^{a} = \frac{F_{ij} - \min(F_{ij})}{\max(F_{ij}) - \min(F_{ij})}; (i = 1,2 \ldots,18, j = 1,2,3)$$

(2) Non-negative

$$F_{ij}{}^{b} = F_{ij}{}^{a} + g; g = 1$$

1) Calculate the proportion of the i sample life insurance company under the j public factor

$$P_{ij} = \frac{F_{ij}{}^{b}}{\sum_{i=1}^{18} F_{ij}{}^{b}} (i = 1,2, \ldots,18; j = 1,2,3)$$

2) Calculate the entropy of the j common factor

$$S_j = -\mathrm{k}\sum_{i=1}^{18} P_{ij} * \ln(P_{ij}) \left(k = \frac{1}{ln18}\right)$$

3) Calculate information entropy redundancy

$$d_j = 1 - S_j (\mathrm{j} = 1,2,3)$$

4) Calculate the weight of each common factor

$$w_j = \frac{d_j}{\sum_{j=1}^{3} d_j} (j = 1,2,3)$$

After the calculation of the above steps, the weights of the 3 common factors are w_j = (0.285448083, 0.393070241, 0.321481676)

3.3.3. Calculating the Overall Score and Rank

Assume the comprehensive score of the sample life insurance company is v_i, w_j is the weight of the j common factor determined for the entropy method. $F_j{}^{i}$ is the factor score value of the j public factor of the i sample life insurance company. The life insurance company's core competitiveness comprehensive score model is

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$$v_i = \sum_{j=1}^{3} w_j * F_j^{\,i} (i = 1,2, \dots ,18)$$

In summary, the core competencies of 18 life insurance companies were scored

Table 10. 18 life insurance companies ranked for their core competencies

Company	Score	Rank
China Life Insurance	1.374936	1
Ping An Life	0.778789	2
Union Life	0.763745	3
Hua Insurance	0.509382	4
Pacific Life	0.402912	5
Tianan Life	0.187171	6
HSBC Insurance	0.162725	7
CITIC Prudential	0.094805	8
Taiping Life	-0.03378	9
Xinhua Life	-0.3091	10
Sun life Everbright Life	-0.32	11
Zhongyou Life	-0.34124	12
Chinese People's Life	-0.38826	13
Funde sino Life	-0.42637	14
Zhonghong Life	-0.46771	15
AIA Company limited Guangdong	-0.57378	16
Zhongyi Life	-0.70168	17
Minsheng Life	-0.71255	18

4. Analysis of Empirical Results

Combining tables 9 and 10 to obtain a comprehensive ranking of the 18 life insurance companies for the core competitiveness evaluation indicators.

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Table 11. A comprehensive ranking of 18 life insurance companies by metrics

Company	Score	Rank	Score	Rank	Score	Rank	Score	Rank	
China Life Insurance	0.0841861	10	3.228895	1	0.254207	6	1.374936	1	Chinese-funde
Ping An Life	0.67926307	5	1.54173267	2	-0.06567787	12	0.778789342	2	Chinese-funde
Union Life	0.1809041	9	-0.49464	11	2.819863	1	0.763745	3	Chinese-funde
Hua Insurance	1.1229726	2	0.106926	5	0.456644	4	0.509382	4	Chinese-funde
Pacific Life	0.55792	6	0.591088	3	0.035198	9	0.402912	5	Chinese-funde
Tianan Life	0.8415597	4	-0.78104	17	0.789947	3	0.187171	6	Sino-foreign joint v
HSBC Insurance	1.2642715	1	-0.54518	12	0.050191	7	0.162725	7	Sino-foreign joint v
CITIC Prudential	1.0823552	3	-0.56111	14	0.019916	10	0.094805	8	Sino-foreign joint v
Taiping Life	-0.002961	12	-0.0658	6	-0.02199	11	-0.03378	9	Chinese-funde
Xinhua Life	-0.667522	14	0.418629	4	-0.88063	15	-0.3091	10	Chinese-funde
an life Everbright Life	0.0772675	11	-0.64152	15	-0.2796	13	-0.32	11	Sino-foreign joint v
Zhongyou Life	-0.206578	13	-0.9359	18	0.266262	5	-0.34124	12	Chinese-funde
Chinese People's Life	-1.27081	17	-0.09479	8	0.036561	8	-0.38826	13	Chinese-funde
Funde sino Life	-2.632997	18	-0.11743	9	1.155186	2	-0.42637	14	Chinese-funde
Zhonghong Life	0.436384	7	-0.6723	16	-1.02032	16	-0.46771	15	Sino-foreign joint v
ompany limited Guangdong	0.3956248	8	-0.5504	13	-1.4631	17	-0.57378	16	Sino-foreign joint v
Zhongyi Life	-1.266009	16	-0.34346	10	-0.6386	14	-0.70168	17	Sino-foreign joint v
Minsheng Life	-0.67583	15	-0.0837	7	-1.51405	18	-0.71255	18	Chinese-funde

4.1. Comprehensive Score and Ranking Analysis

From Table 11, the weights of development factor, scale factor, and solvency factor are 28.54%, 39.31%, and 32.15%, respectively, among the three common factors, the largest share is the scale factor, indicating that company size is the most important indicator to measure the core competitiveness of life insurance companies. The top three are all Chinese companies.

4.2. Analysis of Scores and Rankings for Each Common Factor

4.2.1. Analysis of Development Factor

The development factor is composed of three levels of indicators: profitability, management capacity and growth capacity, with a weight of 28.54%. From Table 10, the top three are HSBC Life, Huaxia Life and CITIC Prudential. The analysis is presented below through three level 1 indicators.

(1) Profitability indicators

The profitability indicator consists of the contracting margin and the return on net assets indicator. Both underwriting margin and net asset margin are important evaluation indicators for analyzing the earnings performance of life insurance companies and are both positive indicators. As can be seen from Fig 3, Fidelity Life is well ahead in terms of underwriting margin, exceeding 0.8, which is close to double that of China People's Life. In summary, among the life insurance companies with higher underwriting margins, there are more Chinese companies, and large life insurance companies such as China Life, Ping An Life does not perform well in terms of underwriting margins. Most Sino-foreign life insurance joint ventures have higher yields on net assets.

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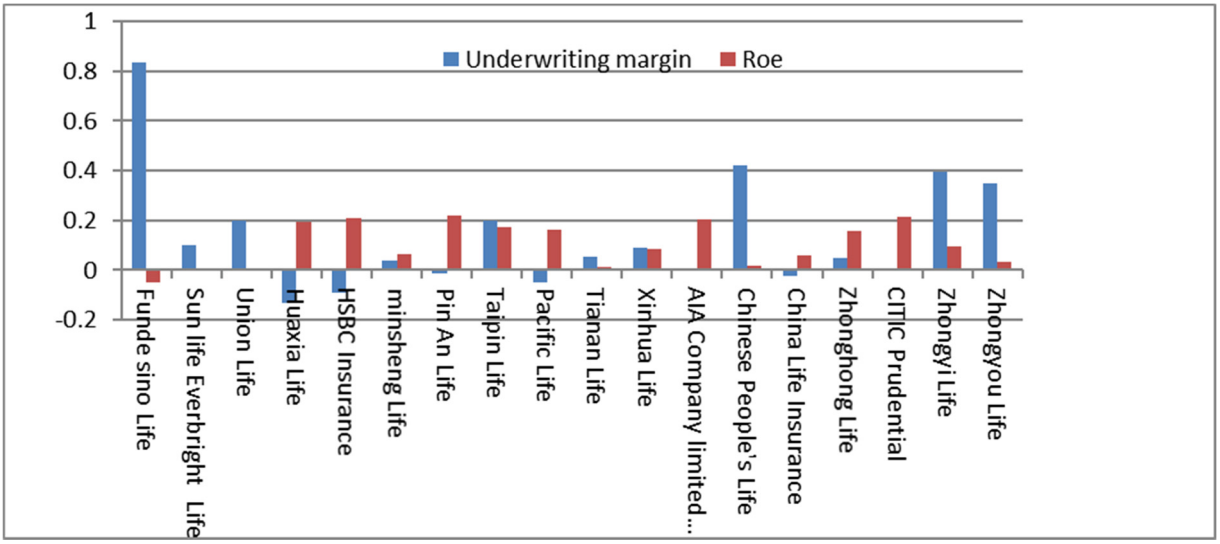

Fig 3. Life Insurance Company 2019 Underwriting Margin and Net Asset Return Comparison Chart

(2) Management capacity indicators

Management capacity is judged by the comprehensive cost rate and surrender rate.

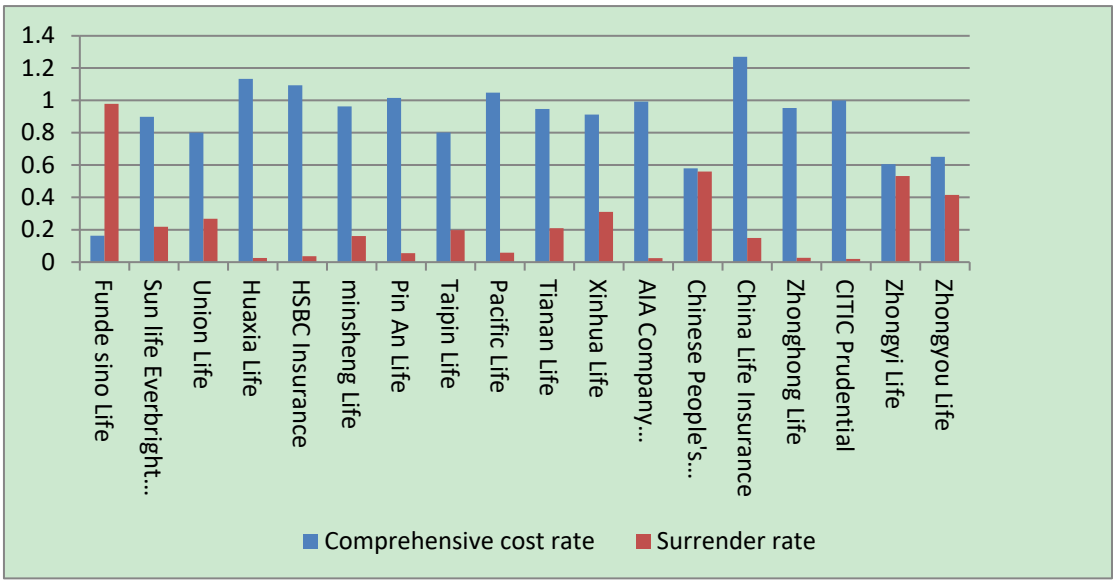

Fig 4. Life Insurance Company 2019 Comprehensive cost rate and Surrender rate Chart

The comprehensive cost rate and the surrender rate look at a life insurance company's ability to operate from a cost and product perspective, respectively, both of which are reverse indicators. The comprehensive cost rate is divided into a combined payout rate and a combined expense rate, which generally does not exceed 100%, and above a threshold of 100% indicates a negative underwriting profit. Companies that need to be strengthened in this regard are Huaxia Life, HSBC Life, Pacific Life and China Life, with the majority of Chinese companies. In terms of surrender rates, the products and services of Sino-foreign joint ventures are significantly better than those of Chinese companies, with the top 4 being all Sino-foreign joint ventures. As a result, the Chinese and foreign joint venture are more capable in terms of operational capacity. Small and medium-sized life insurers such as Fidelity Life and China Post Life have surrender rates greater than 0.4 and overall surrender rates are too high.

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(3) Development Capacity Indicators

Development capacity is measured primarily by the rate of growth in earned premiums and operating profit.

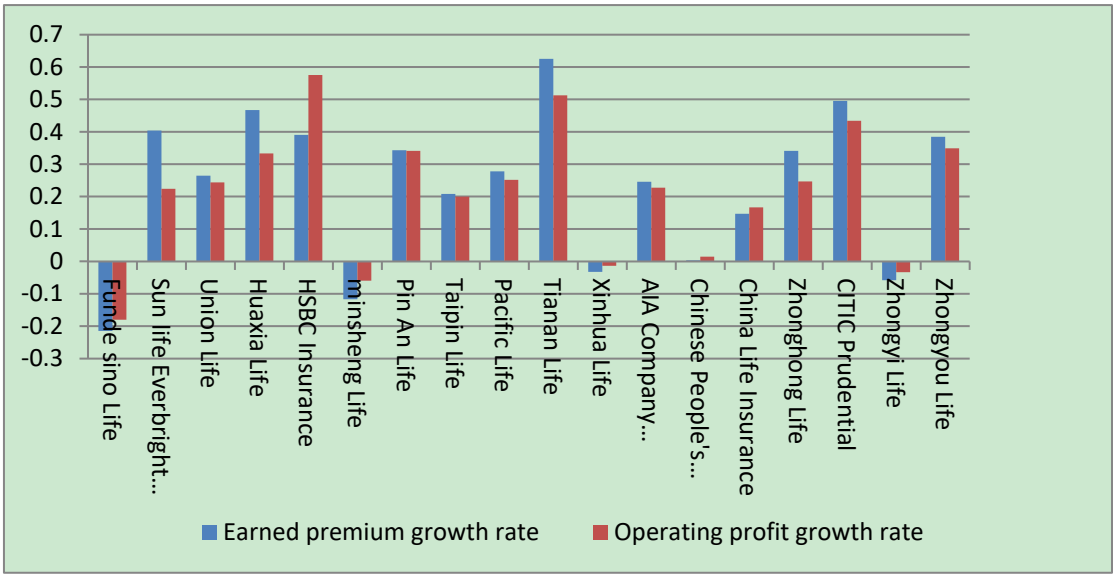

Fig 5. Life Insurance Company 2019 the rate of growth in earned premiums and operating profit Chart

The growth rate of earned premiums and operating profit are both comprehensive indicators of a life insurance company's operating performance, as they provide a more visual picture of the company's growth and development capabilities. From Fig 5, small life insurers such as Tianan Life and China Post Life are at the growth stage of their business life cycle. The oldest life insurance companies, such as China Life and Pacific Life, have passed the stage of rapid corporate development and do not show a significant advantage in either of these indicators.

4.2.2. Analysis of Scale Factor

The scale factor consists of the scale strength and market share.

From Table 11, the top five in the size factor are China Life, Ping An Life, Pacific Life, Xinhua Life and Huaxia Life, both Chinese-owned companies.

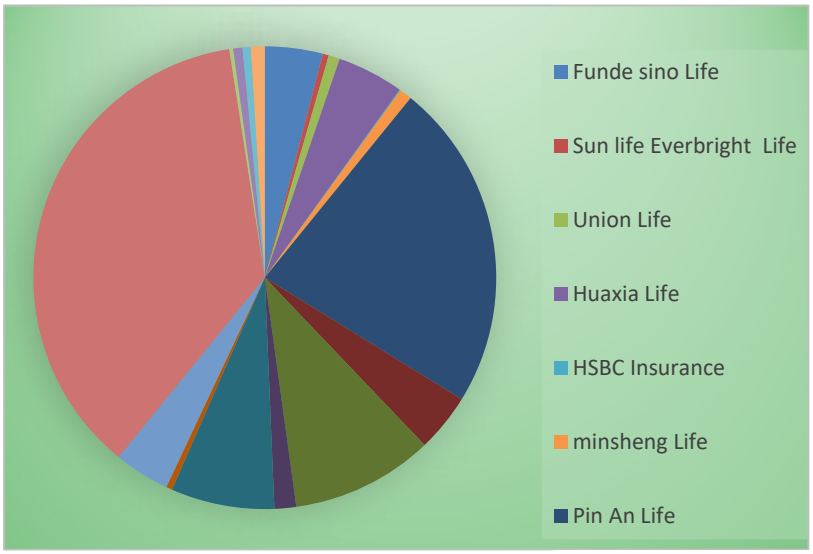

Fig 6. Comparative Market Share Chart of Life Insurance Companies in 2019

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China Life, Ping An Life, Pacific Life, and Xinhua Life are the leading companies in the life insurance industry, data show that in 2019, respectively had total premium revenue of 598.7 billion yuan, 558.23 billion yuan, 212.27 billion yuan, and 129.68 billion yuan, respectively, with a combined premium revenue of 177.92 billion yuan and a combined market share of 46 percent.

As a nascent force, Huaxia Life performed brightly, with the original premium income growth rate reaching 47% as of the first August 2019. Taken together, Chinese life insurance companies have a homegrown advantage , holding the majority of the overall market share.

4.2.3. Analysis of Solvency Factor

The solvency factor consists of two secondary indicators, the primary indicator solvency, the gearing ratio and the retained premium to net assets ratio, with a weight of 32.15 percent.

The Assets and liabilities indicator reflects the ability of a business to weigh its liabilities and assets, and retained premiums are a prerequisite for a life insurance company to be well solvent. From Table 11, the top three payout factor companies are companies with a small market share. Adequate solvency is essential if an insurance company is to be healthy and long-lasting, especially at a time of rapid expansion. Overall, small and medium-sized life insurance companies have some strengths and potential for growth on this indicator.

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