The Study of Chinese P&C Insurance Risk for the Purpose of Solvency Capital Requirement

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Abstract

The purpose of this study is to analyze the regulatory solvency capital requirement related to the insurance risk of P&C insurers in China Market. The core issue is to decide reserving and underwriting risk factors, based on the specific market structure, available data records and a series of assumptions for the P&C insurers. The results of calculation are implemented to several sample P&C companies and compared to the current standards of calculating solvency margin. Finally the study provides recommendations for establishing a risk-oriented approach of solvency supervision and capital requirement model for P&C in China market.

Keywords: capital requirement, insurance risk, reserving risk, underwriting risk

1 Introduction

As one of the IAIS members, the China Insurance Regulatory Commissioner (CIRC) has been trying to catch up with the insurance core principles (2003), the framework for insurance supervision (2005) and the cornerstones towards a common structure and common standards for the assessment of insurance solvency (2005). After implementing the Administration for Solvency Margin and Regulatory Indices (CIRC [No.1, 2003]) on 24 March 2003, CIRC announced its three pillar framework of insurance supervision, i.e. solvency, corporate governance and business conduct, and has then made significant progress on each pillar.

On the pillar one, for instance, CIRC started the project of the assessment and reporting rules for insurers' solvency in same year, which was assumed to be risk-oriented and covered most issues of financial requirements for solvency supervision. One of the key rules is for calculating minimum capital or risk-based capital for insurers. The authors of this paper have been involved in this sub-project and have been working towards the target through the main steps of risk management, i.e. risk identification, evaluation, measurement and so on.

For risk identification and evaluation of insurers in China market, an initial analysis was presented to the 36th ASTIN in Zurich (see Xie, 2005). It classified the insurers in China market into "three worlds", consisted of large, medium and small companies respectively, and then identified their significance of risk characteristics individually. For solvency capital requirement, the paper suggested that CIRC should start from improving the current minimum solvency margin model and to cover more significant quantitative risks step by step, rather than charging various risks by capital requirement.

This paper is to follow up with the above risk analysis and will concern the calculation of solvency capital charge for P&C insurance risk. It starts from analysis the quantitative construction of insurance risk, and then its relationship to reserving risk and underwriting risk. It uses seven sample companies selected from each world of P&C insurers and their available records of data to demonstrate the calculation of reserving and underwriting risk factors, particularly to shows significant deviations of risk factors among the different worlds of P&C insurers in China market.

It arises a specific issue of selecting industry factors of risks, based on significant deviations among the large and small, domestic and foreign companies. It may share some referent experience with other China-like emerging markets looking forward risk-oriented solvency supervision models.

2 Insurance risk and solvency capital requirement

The term of "risk" is neutrally defined by the International Organization for Standardization as the combination of the probability of an event and its consequences, see ISO/IEC Guide 73 (2002). In insurance industry, however, the negative side of the consequences is emphasized and is often described as the loss or the deviation from the expectation.

For our study purpose, insurance risk is defined as the risk of loss arising from the inherent uncertainties about the occurrence, amount and timing of insurance liabilities and premiums. For P&C insurers, insurance risk is mainly consisting of reserving risk, underwriting (pricing) risk and reinsurance risk. Insurance risk is the main quantitative risk of an P&C insurer and hence a dominant element in risk based capital charge. For instance, it covers about 75% of the ICA (individual capital assessment) according to Lloyds ICA 2007 guidance and instructions.

To identify the quantitative construction of insurance risk and its relationship to reserving risk and underwriting risk, we need to define the time horizon of the uncertain consequences at first. As shown in Figure 1, suppose that we are now at 15:00pm, 23 May 2007, and we are to investigate the insurance risk in the time periods of next 1 year, 5 years or 10 years etc. However, the starting point of the time period should be based on the data available to predict future. If the available data is from

annual statements of insurers, the starting time point may be January 1st referring to closing date of December 31st of year n. So, the investigation interval may be denoted as [*n*, *n*+*k*], *k*=1, 3, 5, or 10, and so on.

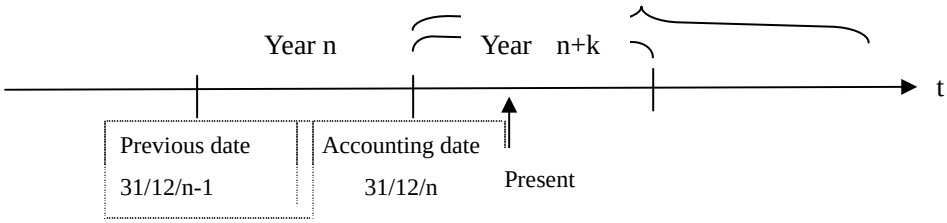

Figure 1: Time horizon for insurance risk analysis

Underwriting risk refers to the "new business" in the investigation period [*n*, *n*+*k*], and is defined as the risk of losses arising from business earned in [*n*, *n*+*k*] and for all prior years of account business.

Reserving risk refers to the "old business", and is defined as the risk that claims reserves set at 31 December of the year n for business earned up to that date prove to be inadequate. Reserving risk includes reserving inadequacy and over reserving if it causes a loss.

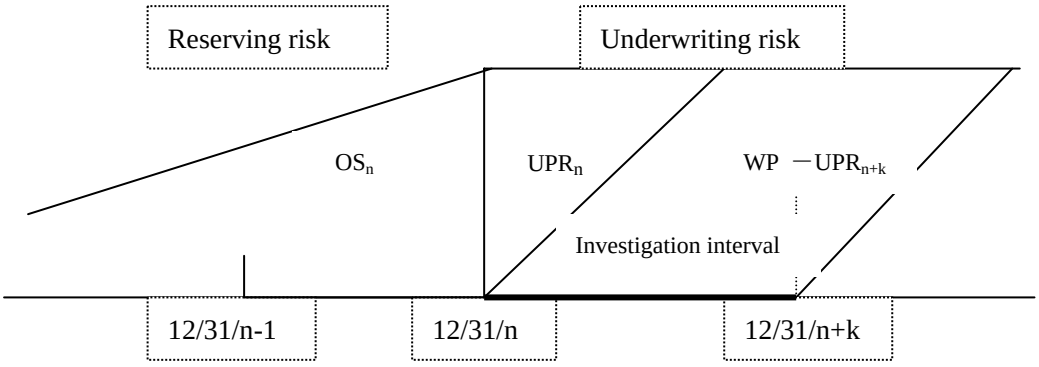

Figure 2: Construction of Insurance Risk

The investigation starts from analyzing the underwriting result in [*n*, *n*+*k*], i.e.

$$\textit{underwriting result} = \textit{premium income} - \textit{business cost}$$

Denote *WP* as the written premium in [*n*, *n*+*k*]; *EP* as the earned premium, *UPR* as the unearned premium reserve, *OS* as the outstanding claims which include reported claims and *IBNR* (including loss adjustment expenses reserves), and all at term end. The premium income is the earned premium in [*n*, *n*+*k*], i.e.

$$EP = WP - (UPR_{n+k} - UPR_n) = (WP - UPR_{n+k}) + UPR_n$$

The business cost consisted of two parties of payment cost and operating expenses cost. The payment cost includes the paid loss and outstanding loss, denoted by *paid claims* and *OS*. The operating cost includes acquisition and commission, taxation and fees, and policy administration cost etc.

$$Business\ cost = paid\ claims + (OS_{n+k} - OS_n) + \text{operating cost E}$$

The *business cost*, both the *paid claims* and the *OS*, can be distinguished further as two parts. The first part aroused from the accidents prior to date *12/31/n* and the second part from the accidents in [*n*, *n+k*], denoted by

$$Paid = Paid(1) + Paid(2); \qquad OS_{n+k} = OS_{n+k}(1) + OS_{n+k}(2)$$

It is therefore concluded that

$$underwriting\ result = premium\ income - [payment\ cost + operating\ expenses]$$

$$= [\mathrm{WP} - (\mathrm{UPR}_{n+k} - UPR_n)] - [Paid + (OS_{n+k} - OS_n) + E]$$

$$= EP - [Paid(1) + Paid(2) + OS_{n+k}(1) + OS_{n+k}(2) - OS_n + \mathrm{E}] \qquad (1\text{-}1)$$

$$= \{OS_n - [Paid(1) + OS_{n+k}(1)]\} + \{\mathrm{E}P - [Paid(2) + OS_{n+k}(2) + E]\}$$

$$= \{OS_n - [Paid(1) + OS_{n+k}(1)]\} + \{[(WP - UPR_{n+k}) + UPR_n] - [(Paid(2) + OS_{n+k}(2)) + E]\}$$

With this separation of “old business” and “new business” of underwriting result, net of reinsurance and referring to the most recent accounting date 31/12/n, insurance risk is further identified as two mutual dependent parts, reserving risk and underwriting risk (or pricing risk), whilst reinsurance risk is separately treated as credit risk in another group.

Also with above analysis of insurance risk construction, the investigation of solvency capital charge is clearly indicated as the capital charges for reserving risk, pricing risk and the adjustment for their dependence level. These three issues are processed in following sessions.

3 Principle of calculating reserving and underwriting risk factors

Risk factors are investigated with each individual line of business or risk group, consistent to the classification of business lines in the Statutory Report of Technical Reserves regulated by the Administration Rules of Technical Provisions for P& C Insurers, CIRC (2004).

For each individual line of business or group, denote *L* as the incurred (before 31/12/n) loss in [*n*, *n+k*], i.e. $L = Paid(1) + OS_{n+k}(1)$ according to formula (1-1), and regard OS_n as the estimate of *L* and with a selected confidence level $1-\alpha$（α=0.1%、1%、5% etc）, it is then that the capital charge *C*

is in principle determined by

$$P\{C+OS_n > L\} \geq 1-\alpha$$

With the further investigation of claim loss variable L, an estimate of $L(\alpha)$ will be determined with the selected α. Denote $C=L(\alpha)-OS_n$ and $k=\frac{L(\alpha)-OS_n}{OS_n}$ as the risk factor, it follows then that $C=k\times OS_n$. Once the risk factor is determined, the capital charge can be simply calculated based on the estimate amount of outstanding reserves in the period of $[n, n+k]$.

Similarly, underwriting or pricing risk is measured by the deviation between the net earned premium EP and the cost (including claims loss U and operating expenses E). But the net earned premium consists of two elements, UPR_n and the written premium WP.

For the element of WP, the capital charge C for the risk is determined by

$$P\{C+WP > (U+E)\} \geq 1-\alpha$$

Denote $k=\mathrm{Max}\{U(\alpha)+E-WP, 0\}/WP$, it follows then that $C=k\times WP$. Once the risk factor is determined, the capital charge for pricing risk can be simply calculated based on the estimate amount of net earned premium in the period of $[n, n+k]$.

For the element of UPR_n, it refers to the forwarded premium from the previous period. But this part of premium should not be simply added into new premium of WP because it was conservatively set according to the Administration Rules of Technical Provisions for P& C Insurers, CIRC (2004). The acquisition cost of the written premium in previous period is not allowed be deferred into the new period when UPR_n was set. Hence underwriting risk refers to the element of WP only.

In summary, the core issue of calculating the above two risk factors is to simulate the probability distributions of claim loss variables L *or* U, based on the available data records of paid claims or claim reserves.

4 Description of the sample companies and their businesses

Up to 2005, there were 25 P&C insurers writing business on China market. The biggest company PICC held more than half of market share and was regarded as the first world company. The second and the third companies each shared 12% and 9% of market shares in 2004 and was regarded as the second world companies. Although another two companies were approaching to the second world group in 2005 and 2006, most P&C insurers still belongs the third world companies. The third world companies may be divided into two groups, domestic and foreign insurers, which have different business structures.

With this background information, we select 7 sample companies for the demonstration of calculating risk factors and the capital charges. As shown in Table 2, the companies No.1 and No.2-3 are clearly the first and the second world companies. No.4 and No.5 are domestic, and No.6 and No.7 are foreign companies selected from the third world group.

Table 2: Used sample companies and loss reserve data records

Insurer	Market share in 2004	Data records and form	No of Records
No.1	58%	1h/2001 --- 1h/2005	10
No.2	12%	4q/2000 --- 3q/2005	20
No.3	9%	a/1997 --- a/2005	9
No.4	0.82%	h/2002 --- h/2005	10
No.5	0.88%	1q/2001 --- 3q/2005	19
No.6	0.04%	h/2000 --- h/2004	10
No.7	0.04%	h/2000 --- h/2004	10

(Note: CIRC Statistics 2004; h, q and a refers to half year, quarterly and annual records)

The P&C insurance market has been motor insurance dominated for about 10 years. According to the CIRC statistics in 2004, auto insurance covers 65% of total general business. However, foreign insurers are not allowed to write compulsory third party liability auto insurance, their main businesses are cargo and commercial property insurance.

With this in mind, we list the main business lines in Table 3 according their percentages in the total business amount, and then use business data from the suitable sample companies to the test purpose. It is noted that the data of two foreign companies (No. 6 and No.7) are only used for commercial property and cargo insurance. It is also noted that the “others” of business lines includes small business but it varies for different companies. Considering its representative characteristic, we use the data of the company No.3 for this group of business.

Table 3: Main business lines and selected sample companies

Business Line		Business Percentage (in 2004)	Sample insurers selected
Motor	Damage	65%	No.1-5, total 5
	CTP		
	Others		
Commercial Property		15%	No.1-4, No.6-7, total 6
Cargo		5%	No.1-4, No. 6-7, total 7
Liability		3.5%	No.1-4, total 4
Home Property		2.5%	No.1-4, total 4
Casualty		3%	No.1-4, total 4
Others		about 6%	No. 3 only

5 Calculating risk factors for sample companies

For the purpose of setting up a minimum standard of solvency capital requirement, insurance commissioner expects to provide an industry risk factor for each individual line of business to all the insurers. Hence, the data of business claims losses and others for each business line or group should be collected as the industry data rather than as individual company. However, for the market structure of the No.1 company covers about 60% and the top three companies cover 80% of business, it is meaningless to add all the small companies' data into the dominant companies'. This is the specific and main characteristic of China insurance market.

Another characteristic of P&C insurance in China is its short tail business dominance. As shown in Figure 3, more than 60% of business is auto insurance and claims are normally run off within 1 to 5 years. Long tail business of Liability and others are only with very small percentage. For this reason, the evaluation of for claim losses is based on ultimate perspective.

To clearly show the calculation principle and process for reserving and underwriting risk factors, we use sample No.2 and its vehicle damage of motor insurance for demonstration. The calculations of the two risk factors are presented in example 1 and 2 below respectively.

Example 1: Calculating reserving risk factor for the vehicle damage line of the company No.2

A set of 20 quarterly records of the outstanding reserves data（4q/2000-3q/2005）are collected from the vehicle damage line of the sample company No.2, which constructs a run-off triangle of outstanding claims, see Table 4 in appendix 1. It is then followed by the application of the Bootstrapping method for 2000 times of simulation. The simulation process is the same as introduced in England (1999) and Mack (1993). The 2000 simulation results will form a histogram of the expected distribution.

The next step is to fit the histogram by a normal or lognormal distribution with use of the Matlab software. A fitting test comparison for these two distributions is given in Table 5. It is clearly that the Lognormal(13.1732, 0.05313) fits the outstanding claims distribution well.

Table 5: Estimated parameters of the fitted distributions

Parameter / distribution	mean	variance	μ		σ		Log likelihood
			Estimate	Std. Err.	Estimate	Std. Err.	
Normal（μ，σ^2）	526845	7.91E+08	526845	629.147	28122.2	445.041	23302.7
Lognormal（μ，σ^2）	526843	7.85E+08	13.1732	0.001189	0.0531277	0.000841	23490.4

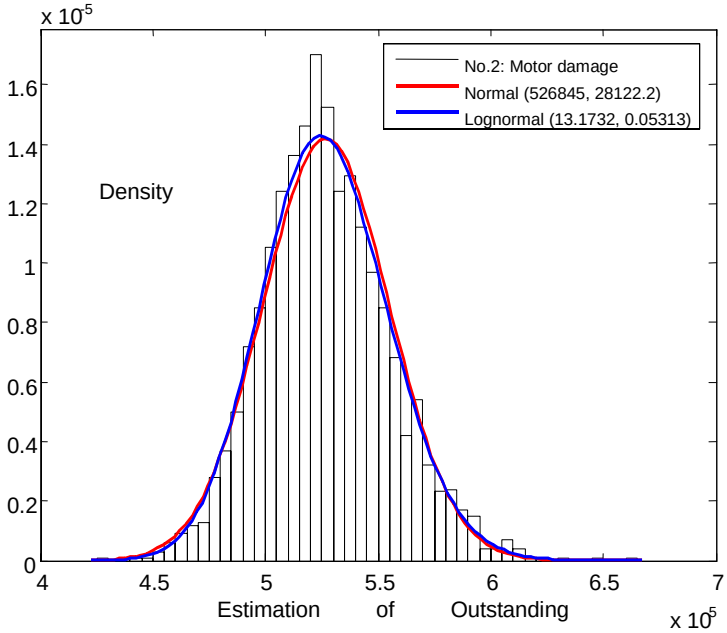

Figure 3: Estimated distribution of outstanding claims

With this distribution and the selected corresponding confidence levels of 95%, 97.5% and 99%, the reserving factors for this business line are calculated as 8.67％, 11.37％ and 13.20％ respectively.

Similarly the reserving risk factors of other business lines are calculated and then summarized in Table 6 (Reserving factors of individual line of business by the sample company No.1---7) in the appendix 2.

Example 2: Calculating underwriting risk factor for the vehicle damage line of the company No.2

To estimate underwriting risk factor, it would be also appropriate to assume that the loss ratio variable *U* is log-normally distributed, with a positive skewed, long and heavy tail. A set of 23 quarterly loss ratio records of motor vehicle damage insurance are collected (1q/2000 ---3q/2005) from the sample company No.2, as shown below:

	2000	2001	2002	2003	2004	2005
Quarter1	102%	73%	67%	83%	80%	78%
Quarter2	72%	61%	69%	77%	69%	70%
Quarter3	62%	63%	76%	80%	73%	77%
Quarter4	71%	67%	81%	82%	76%	

With the One-sample Kolmogorov-Smirnov test to the log values of the above records, it shows P=0.885 > 0.05 and hence concludes that the hypothesis of Lognormal distribution is statistically significant. The scale and shape parameters of the distribution are 0.738 and 0.115 respectively.

The lognormal Q-Q plot and the detrended lognormal Q-Q plot of the loss ratio *U* are presented in

Figure 4 respectively. The left plot shows that most points well fit the line. The right plot indicates that all point randomly distribute along the line, except for one point.

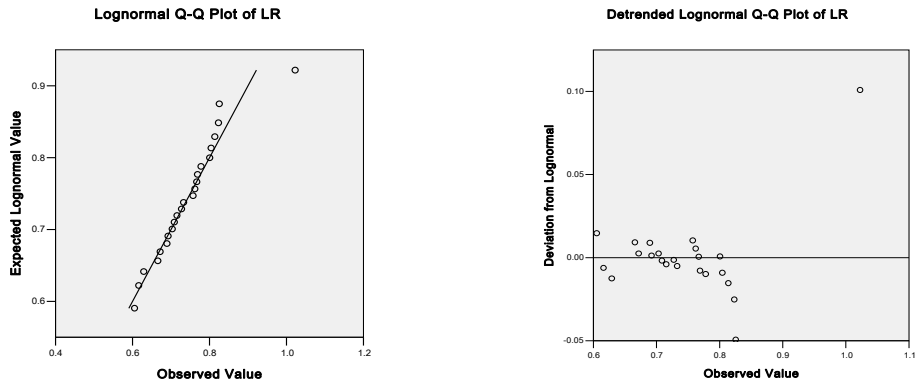

Figure 4: Lognormal Q-Q plot and the detrended lognormal Q-Q plot of the loss ratio

This statistical test shows that data accumulation is not sufficient and the effect of abnormal values fit the loss ratio distribution significantly. Hence, traditional statistic methods may be not appropriate to fit the distribution. We therefore choose Bootstrap method to simulate the mean and variance of the loss ratio distribution, to reduce the influence of contaminated data.

After determining the mean and the variance for the assumed lognormal distribution, the underwriting risk factor is calculated by following formula.

Underwriting risk factor=max{ *x* percentile of loss ratio + expense ratio-1, 0}, where *x*=95% , 97.5 % or 99%.

It may be noted that the expense ratio={operating expense net recoverable reinsurance + commission +reinsurance expenses + premium tax and add-on + insurance guarantee}/net written premium. The average value of expense ratios of the recent two years is used in the formula.

With the same example above, the estimated mean and standard deviation of the loss ratio *U* is 73.8% and 0.115, the coefficient of variation equals 0.115/ 0.738=0.1558. The aggregate expense is the average of 32.7％ in year 2003 and 31.1％ in year 2004, i.e. 31.9％. With the confidence levels of 95 ％, 97.5％ and 99％, the underwriting factors are 19.03%、22.29%、26.23% respectively。

Similarly the underwriting risk factors of other business lines are calculated and then summarized in Table 7 (Underwriting factors of individual line of business by the sample company No.1---7) in the appendix 2.

6 From company factors to industry factors

As mentioned above, what we expect are industry factors for each individual line of business, rather than company factors. But industry factors cannot be directly calculated by collecting claim data records of each business line together written by all companies, for reasons discussed above.

Hence, we are now facing a decision problem of how to form industry factors based on the calculations by the individual companies. We may have following choices:

(1) use simple average of all the sample companies for each line of business

(2) use the weighted average of all the sample companies for each line of business, weighted by their business amounts;

(3) For each individual line of business, analyze the deviations of the sample companies and then make judgmental adjustment.

For example of choices (1) and (2), the industry factors are the simple average values and the weighted average values, based on Table 6 and Table 7 in appendix 2.

For **reserving risk factors**, results by using choices (1) and (2) are shown in Tables 8 and 9.

Table 8: Industry factors with the simple average (%)

line / α	Commercial Property	Home Property	Liability	Motor			Cargo	Casualty	Others
				CTP	Damage	Others			
95%	30.96	30.27	21.89	9.00	9.99	13.61	45.33	34.67	41.10
99%	49.04	47.77	34.66	13.38	14.74	18.94	68.70	60.36	62.23

Table 9: Industry factors based weighted average (%)

line / α	Commercial Property	Household	Liability	Motor			Cargo	Casualty	Others
				CTP	Damage	Others			
95%	31.21	29.21	24.10	9.00	9.99	13.61	48.10	32.00	46.73
99%	46.40	45.58	36.81	13.38	14.74	18.94	72.12	61.01	70.33

To reach the final selection of industry factors for reserving risk, we compare the results in Table 6, 8 and 9. It is clear that there is no difference for the dominant business of motor insurance. Results given by either (1) or (2) can be selected as the industry factors.

For the other lines of business, however, risk factors show big differences. For instance of commercial property and cargo insurance, which are main businesses of foreign insurers in China market, the calculation results as below show significant deviations between foreign and domestic insurers. This causes difficulty for selection. If the factors are dominated by domestic insurers, the foreign companies

will be with little capital charges, not reasonable for their risk concentrations of these two lines of business. If the factors are selected closing to foreign insurers', the domestic insurers will feel not fair for their true risk profiles on these two lines, particularly considering their relative higher business amounts. Considering the business evolving status of foreign insurers, we take the simple average of all the sample companies as the final selection for these two lines of business.

line / α	Commercial Property		Cargo	
	Domestic	Foreign	Domestic	Foreign
95%	31.04	92.52	47.75	97.02
99%	46.02	211.19	71.50	169.54

For the similar consideration, we use weighted average values for the other lines of insurance.

In summery, the recommended selections of reserving factors are given in the Table 10.

Table 10: Recommended industry factors for reserving risk (%)

line / α	Commercial Property	Household	Liability	Motor			Cargo	Casualty	Others
				CTP	Damage	Others			
95.00%	58.37	29.21	24.10	11.07	11.12	13.61	72.87	32.00	46.73
99.00%	112.19	45.58	36.81	16.18	16.10	18.94	125.82	61.01	70.33

For underwriting **risk factors**, we have almost the similar situation and difficulty of selection as the previous one.

For motor insurance (classified as the CTP and the vehicle damage only) and liability insurance, weighted average values are selected. Household insurance shows relatively stable factors among the sample insurers, we use simple average value as the factor.

For commercial property and cargo insurance, it also shows significant deviations between domestic and foreign insurers. Considering the relatively short history of foreign insurers and much higher expenses rate in early business years, we use simple average values for recommended factors.

It is noted that casualty and short-term health insurance are distinguished for underwriting risk. Casualty is considered as profitable business and no need for capital charge. But health insurance has been proved risky business. We recommend the factors of sample company No.3 as the selection.

In summery, the recommended industry factors for underwriting risk are given in Table 11.

Table 11: Recommended industry factors for underwriting risk (%)

Line / α	Commercial Property	Household	Liability	Motor		Cargo	Casualty	Health
				CTP	Damage			

95%	21.43	0.00	0.04	20.23	29.28	28.73	0.00	27.36
99%	46.45	5.11	5.02	54.71	46.11	60.45	0.00	29.62

7 Insurance risk capital and its comparison to the current SM model

It is understandable that both insurers and regulators concern about the risk capital charge level, particularly compared to the current statutory minimum solvency margin standards required in the Administration for Solvency Margin and Regulatory Indices (CIRC [No.1, 2003]). Although the capital charge on insurance risk is not the total amount of risk-based capital, it is no doubt the main part of that and it still make sense to compare this part of risk capital to the current SMSM level. In fact, the current SMSM is simplified version of the EU solvency directive（Directive 73/239/EEC） which corresponding to insurance risk only.

The capital charge for insurance risk may be reached by simply adding the capital charges for reserving risk and for underwriting risk, without taking account of their dependence. This is a direct confliction to our intuition. Reserving risk and underwriting risk are thought as significantly dependent each other. However, there have not been substantial research progresses on this issue. Referring to a typical study by NAIC (1993), it used the collected industry data in 1982---1991 and suggested a correlation coefficient ρ=0.26 of the two risk factors. We use this reference number to add the reserving and underwriting risk capital together as the insurance risk capital charge, and the other two extreme situations, ρ=0 and ρ=1, are also listed comparatively for the 6 sample companies in Table 12. The sample company No.5 is not included in the comparison because we only collected its motor insurance data for the test.

Table 12: insurance risks capital requirement for sample companies (RMB’000)

Capital charge \ Sample company		No.1	No.2	No.3	No.4	No.6	No.7
Reserving risk		3,086,635	1,056,597	1,086,407	62,259	5,816	8,293
Underwriting risk		13,150,594	2,291,339	1,796,893	217,574	7,699	9,516
Insurance risk	ρ=0	6,753,988	1,261,609	1,049,914	113,153	4,825	6,311
	ρ=1	8,118,614	1,673,968	1,141,690	139,916	6,758	8,904
	ρ=0.26	7,133,947	1,380,721	1,164,525	120,684	5,394	7,078

(Note: The risk capital charges are based on the same confidence level of 95%.)

To compare the capital charge for insurance risk and the current SMSM level, we collected reported SMSM records of year 2004 of the above 6 sample companies. The comparative results are shown in Table 13 below, which indicates that the insurance risk capital charge covers more than 85%. It is even larger than the SMSM amount for the fast business growing companies No.3 and No.4.

Table 13: Insurance risks capital v.s SMSM (RMB'000)

Company / Capital	No.1	No.2	No.3	No.4	No.6	No.7
Insurance risk capital (ρ =0.26)	7,133,947	1,380,721	1,164,525	120,684	5,394	7,078
Statutory Minimum SM	8,437,200	1,554,246	1,105,410	111,440	5,518	9,423
Insurance risk capital/ SMSM (%)	84.55%	88.84%	105.35%	108.29%	97.76%	75.11%

This comparison suggests that the total risk based capital model can leave small space for investment risk, credit risk and other risks if the current SMSM standard is a reasonable benchmark.

8 Conclusion and Recommendations

China P&C insurance market is with a "three worlds" structure. The risk profile of each world varies significantly. The third world companies have been growing fast and without stable growing tend. Even for the No.1 company and its dominant line of motor insurance, the claims experience data was not separately recorded by motor damage, compulsory third party liability and the others in the past years. It is therefore very much difficult for the insurance commissioner either to set up an industry benchmark of minimum solvency capital requirement or to allow insurers to assess the solvency capital individually or using internal models.

Although it is definitely correct to follow up with the direction of NAIC's three pillar principle and framework for insurance regulation and supervision, it is also important for the commissioner to understand that the minimum solvency capital requirement is just only one of the elements under the pillar one of financial requirements. The appropriateness of setting minimum solvency capital requirement heavily depends on another element, the assessment and report of technical provisions, which has only been strictly implemented to P&C insurers in China from year 2004.

It is therefore highly recommended that the insurance commissioner should put more attention and enhance the practice and implementation of the Administration Rules of Technical Provisions for P&C Insurers (CIRC, 2004) in next 2 or 3 years, including the data statistics and disclosure regulations.

As to the minimum capital requirement, it will be reasonable to analyze risks and calculate corresponding capital charges from the main business lines to the small ones. Our investigation suggests that the capital charge for insurance risk nearly equals to the current SMSM standard. If the current SMSM standard is not too low or if the insurance regulator and most P&C insurers don't expect to rise it up, the total risk-based capital model will have only small space for other risks of investment, credit or operational etc.

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Appendix 1

Table 4: The run-off triangular data of motor vehicle damage

Accident Quarter	Delay Development(Quarter)																			
	3 Mths	6 Mths	9 Mths	12 Mths	15 Mths	18 Mths	21Mths	24 Mths	27 Mths	30 Mths	33 Mths	36 Mths	39 Mths	42 Mths	45 Mths	48 Mths	51 Mths	54Mths	57Mths	60Mths
4q/2000	47605	116693	139741	149026	158501	162861	167170	167993	168401	168592	168999	169487	169560	169594	169598	169632	169665	169666	169704	169719
1q/2001	72740	150867	173422	193543	198056	201408	202959	203664	204124	204300	204576	204665	204735	205050	205084	205279	205377	205454	205506	
2q/2001	70922	145366	177567	186077	190569	192609	193640	194538	195126	196043	196257	196438	196652	196901	197575	197670	197727	197748		
3q/2001	89048	186773	210044	219540	223697	226701	228003	229143	229846	230150	230404	230678	230774	231054	231126	231207	231249			
4q/2001	114108	213644	240343	250302	255916	257921	259693	260717	261188	261673	262153	262528	263283	263461	263498	263629				
1q/2002	111960	228735	253837	264427	268960	271873	273091	274014	274797	275401	275772	276043	276351	276564	276611					
2q/2002	134188	256608	284470	293902	298621	300522	302746	304178	304964	305657	305973	306140	306452	306615						
3q/2002	166221	305852	336510	350251	355144	358739	360968	362615	363505	364365	365221	365548	365949							
4q/2002	180582	343074	390583	404955	412046	416569	419332	421153	422250	423152	423867	424415								
1q/2003	170807	355193	397345	414327	423798	428954	431452	434044	435678	436665	437513									
2q/2003	181952	338288	384949	403845	413690	418204	421466	423764	425854	426482										
3q/2003	168678	336417	393365	416467	427863	433640	437957	439878	441653											
4q/2003	160064	321943	378167	400704	411055	417955	421270	423379												
1q/2004	146178	301973	343756	361497	372245	376957	379880													
2q/2004	132111	259188	292498	309220	315907	319466														
3q/2004	146090	280474	331817	349106	356696															
4q/2004	139466	324844	377199	398292																
1q/2005	156578	363818	421163																	
2q/2005	164492	347687																		
3q/2005	194783																			

Appendix 2

Table 6: Reserving factors of individual line of business by the sample company No.1---7

Line of Business		Reserving risk factors (%)													
		No.1		No.2		No.3		No.4		No.5		No.6		No.7	
		95%	99%	95%	99%	95%	99%	95%	99%	95%	99%	95%	99%	95%	99%
Motor	Damage	13.04	19.21	8.67	13.20	11.30	16.28	23.55	36.12	14.26	20.84				
	TPL			6.65	10.21	11.35	16.54	25.38	39.52	10.73	15.97				
	Other			8.03	11.32	19.19	26.56								
Commercial Property		42.19	64.08	22.34	42.90	28.36	40.13	54.18	87.91			121.70	236.57	81.46	201.57
Cargo		48.08	75.22	39.44	59.59	48.47	71.28	95.35	179.31			116.06	218.55	89.80	150.96
Liability		24.06	37.57	17.05	29.47	24.56	36.96	51.00	83.54						
Home Property		34.13	50.87	34.81	55.95	21.88	36.49	75.01	120.24						
Casualty		14.70	20.76	41.12	58.78	48.20	101.05	47.74	71.53						
Others		48.21	75.65	27.82	39.82	47.28	71.21	37.70	59.96						

Table 7: Underwriting risk factors of individual line of business by the sample company No.1---7

Line of Business		Underwriting risk factors (%)													
		No.1		No.2		No.3		No.4		No.5		No.6		No.7	
		95%	99%	95%	99%	95%	99%	95%	99%	95%	99%	95%	99%	95%	99%
Motor	Damage	10.09	15.85	19.03	26.23	26.82	38.88	76.77	95.81	31.74	53.33				
	CTP			43.09	63.00	10.42	16.43	52.57	75.62	20.31	55.01				
Commercial Property		2.14	11.17	5.92	29.01	0.00	9.57	0.00	33.51			15.97	32.71	104.55	162.73
Cargo		0.00	0.00	29.46	68.09	0.00	0.00	18.16	65.10			24.28	40.00	100.40	189.53
Liability		0.00	4.72	0.40	7.86	0.00	2.43	12.68	24.97						
Home Property		0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.44						
Casualty		0.00	0.00	0.00	0.00	35.19	43.59	0.00	0.00						