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Analysis of China's new C-ROSS solvency capital regime

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Section 1 Executive summary

On 13 February 2015, after three years of working and field testing, the China Insurance Regulatory Commission (CIRC) released the rules of the new solvency regime known as China Risk Oriented Solvency System (C-ROSS). The regulator required that companies do parallel runs of their solvency positions using China Solvency I (C-SI) and C-ROSS over the course of 2015. Under the industry's expectation, the exact C-ROSS transition date should be the beginning of 2016. The industry expects to be required to formally transition to C-ROSS at the beginning of 2016.

This report focuses on life insurance and covers the following:

- C-ROSS has a three-pillar structure. To have a better understanding of it, we provide a detailed summary of the new C-ROSS regulatory requirements, including the main rules under each of the three pillars that support the new regime. More detail on insurance assumptions, risk charges and a scoring example of Pillar II are provided in the appendices.
- The 2014 quantitative field testing results and the Q1 2015 trial run results provided by CIRC have been summarised, along with a discussion of the potential impact on life insurers. We aim to show the C-ROSS-related challenges faced by insurers and the far-reaching influence of the new regulation on the industry.
- When designing the new solvency capital regime, one of the goals was to make C-ROSS comparable to international standards without losing touch with the specifics of its own market. We provide a comparison of C-ROSS with two other new solvency regimes around the world: European Solvency II and Risk-based Capital Phase 2 (RBC2) in Singapore.
- Finally, we outline some observations and potential issues around the new regime in areas such as the rules on asset and liability valuation, time value of options and guarantees (TVOG), capital charges on equity, reinsurance assets, interest rate risk and overseas assets, risk margin, cash value guarantees, requirements for Pillar II, etc.

Our view is that this regulation is going to be hugely transformative for the insurance market in China. Below are the key areas which we believe insurers will be impacted:

- Significant change will occur within insurers as they are required to meet not only the Pillar I technical aspects but also the Pillar II and Pillar III requirements. The Pillar II requirements will be particularly challenging for the industry as companies are required to implement full enterprise risk management (ERM) processes and risk management systems.
- The current C-ROSS framework has the potential to distort the behaviour of the insurers if the framework is not monitored and evolved over time. One particular area of concern is the approach used for the calculation of TVOGs in C-ROSS. Our experience from other markets shows that TVOGs evolve significantly over time depending on the prevailing market conditions. Under C-ROSS, the TVOG is a factor-based approach which has been calibrated at a single point in time. If the factors are not changed as market conditions move, companies could find their actual TVOG differing significantly from the C-ROSS TVOG, which would result in companies selling contracts whereby the risk is not being truly reflected in their capital requirement. Another area of concern is the capital charges for certain equity investments which are determined based on the form of the investment, rather than the underlying fundamentals. In particular, the capital charge on direct equity investments is significantly higher than investments in stock funds. Companies could be incentivised to invest in poorly diversified stock funds rather than direct stock investments to reduce the capital charge even though the underlying risks are equivalent.
- The approach that companies are using for asset-liability management (ALM) is certain to change as C-ROSS goes live. In particular, reducing the volatility of the solvency position will become a focus of the industry as it moves away from a very stable Solvency I approach to a volatile C-ROSS type approach. The use of the 750-day average for the yield curve discounting on the liability side and the use of an

amortised cost approach for hold-to-maturity assets will generate significant complexity in this area, as a pure 'economic' approach of cash-flow matching can often lead to increased volatility in the company's solvency position.

- International reinsurance companies will be significantly impacted because the risk charge that is applied for offshore reinsurers is significantly higher than for local reinsurers. In addition, reinsurance companies must hold capital onshore as opposed to the current regulation in which capital can be held offshore for solvency purposes. The combination of these factors will cause a dramatic shift in the reinsurance landscape in China and could potentially increase reinsurance costs across the market and hence increase prices to customers.

Section 2 Technical summary of C-ROSS

Background

In March 2012, CIRC announced plans, and an implementation timeline for, a new risk-based solvency framework. This was followed by the issuance of the Overall Framework of the Second-generation Solvency Supervision System of China, known as C-ROSS, in May 2013.

From July 2014 to November 2014, three rounds of industry-wide field testing on Pillar I (the quantitative capital requirement) were carried out by life insurers. On 13 February 2015, 17 regulatory rules were released by CIRC. The regulator required that companies do parallel runs of their solvency positions using C-SI and C-ROSS over the course of 2015. Depending on the results of these parallel runs, CIRC will decide on the exact C-ROSS transition date, which the industry expects to be the beginning of year 2016.

The factor-based C-SI solvency system, which is similar to Europe's Solvency I regime, does not explicitly link solvency capital with insurers' specific risks. For long-term life insurance, the required capital is the sum of statutory reserve and net amount at risk, multiplied by their respective risk factors. The reserve factor is 1% for unit reserve of unit-linked business and 4% for other reserves. The risk factor for net amount at risk varies from 0.1% to 0.3% as a function of the benefit period. For short-term life insurance, the required capital is the maximum of a percentage of net written premiums and a percentage of the three-year average claim amount. The factors for net written premium are 18% on amounts under RMB 100 million and 16% on amounts above RMB 100 million.

C-SI generally worked well in the early stage of China's life insurance market. However, with subsequent growth of the market and increasing complexity, the current regime falls short of reflecting the actual risks being undertaken by insurers. C-ROSS represents a significant step forward into a more advanced risk-based capital regime.

Overview

There three core principles behind the design of C-ROSS cited by CIRC are:

- Risk-oriented capital requirements
- Adaptation to the reality of China's insurance market (which is still in 'the developing stage and has its own characteristics')
- Comparability with international practice

Similar to other solvency regimes, C-ROSS has a three-pillar structure. Figure 1 shows the key rules under each pillar.

FIGURE 1: C-ROSS RULES BY PILLARS

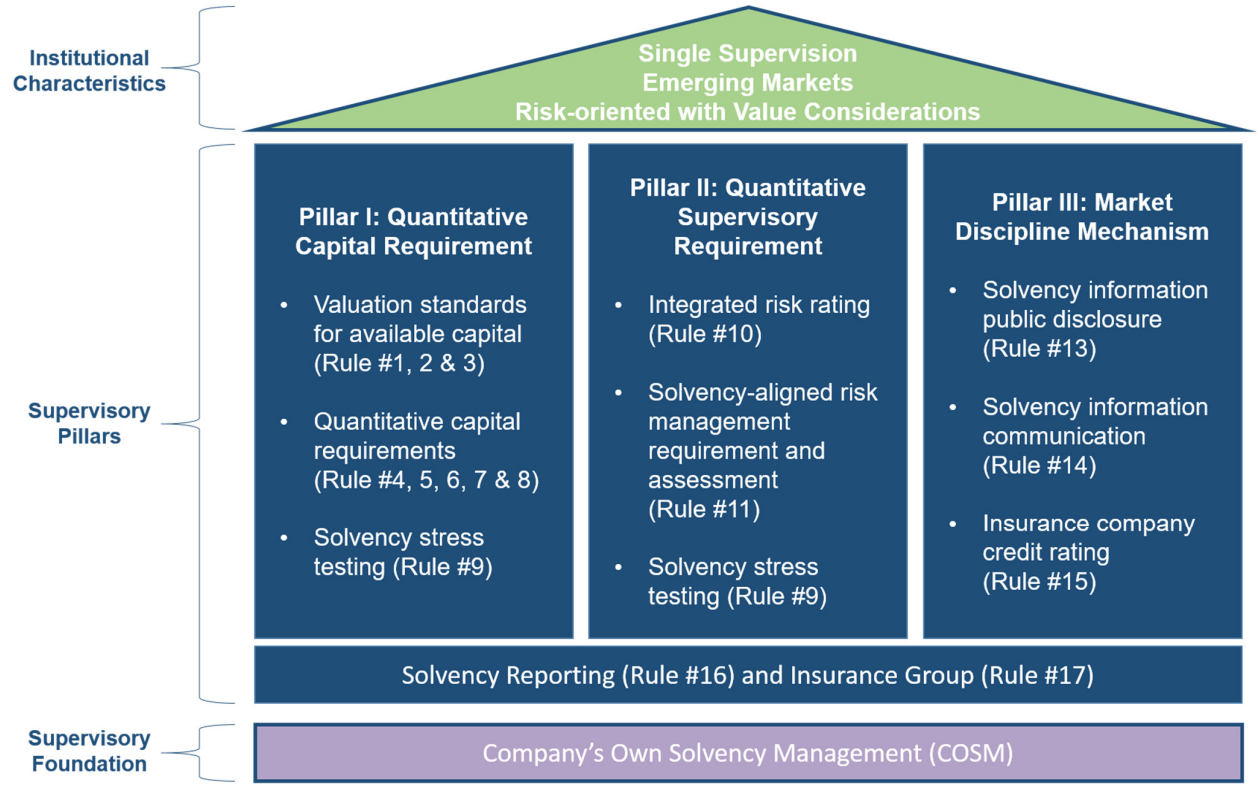


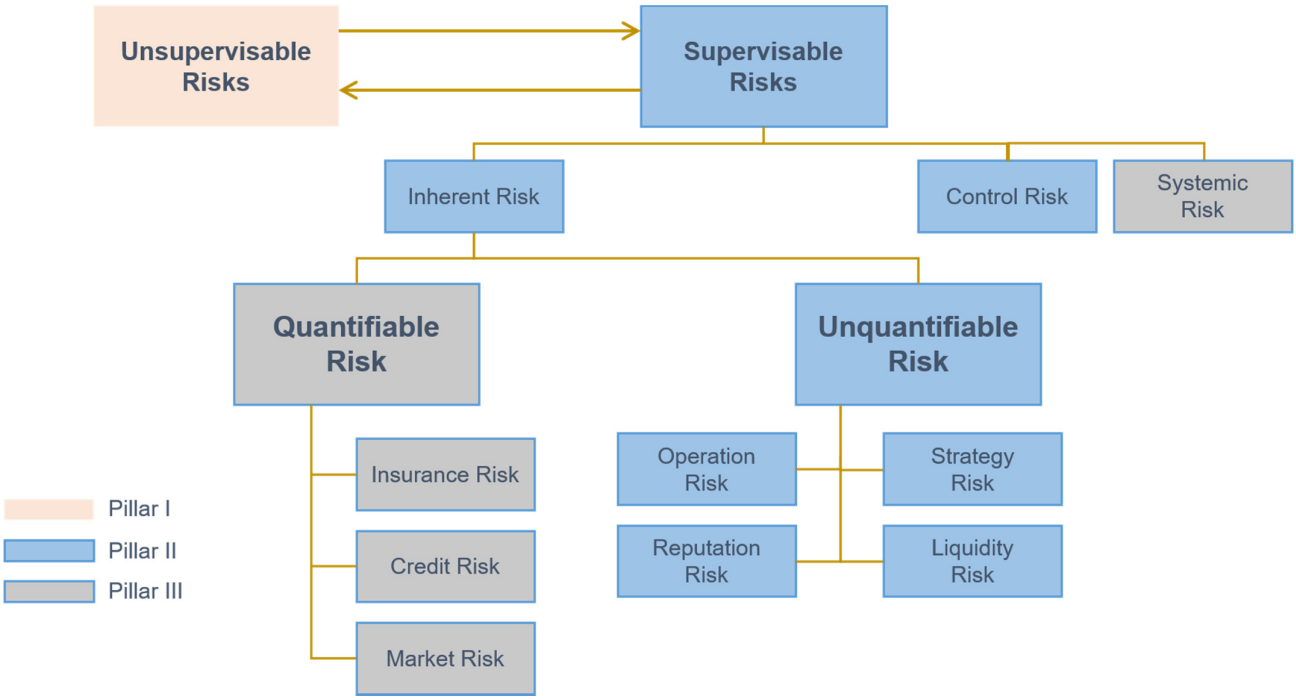
Figure 2 shows the risk stratification under the three pillars of C-ROSS.

Risks are categorised into supervisable and unsupervisable risks.

The supervisable risk category includes inherent risk, control risk and systemic risk. Inherent risk refers to the risks that are unavoidable in the writing of insurance business. It includes both risks that can be quantified (market, credit, insurance, etc.) and those that are difficult to quantify (operational, strategic, etc.). Control risk refers to the risk that management does not react fast enough in the face of the inherent risks due to imperfections in the internal management and control process, potentially subjecting the insurer to excess losses over those expected from inherent risks. Systemic risk encompasses pro-cyclical risk and the additional risk generated within the insurance market as a whole through the combined effect of all insurers, with a particular focus on Global Systemically Important Insurers (GSII) and Domestic Systemically Important Insurers (DSII). Inherent risk can be further split into quantifiable and unquantifiable risks.

The quantifiable risks and systemic risks are covered by Pillar I. The unquantifiable risks and control risks are covered by Pillar II. Unsupervisable risks are covered by Pillar III.

FIGURE 2: RISK STRATIFICATION AND RISKS COVERED BY THREE PILLARS UNDER C-ROSS



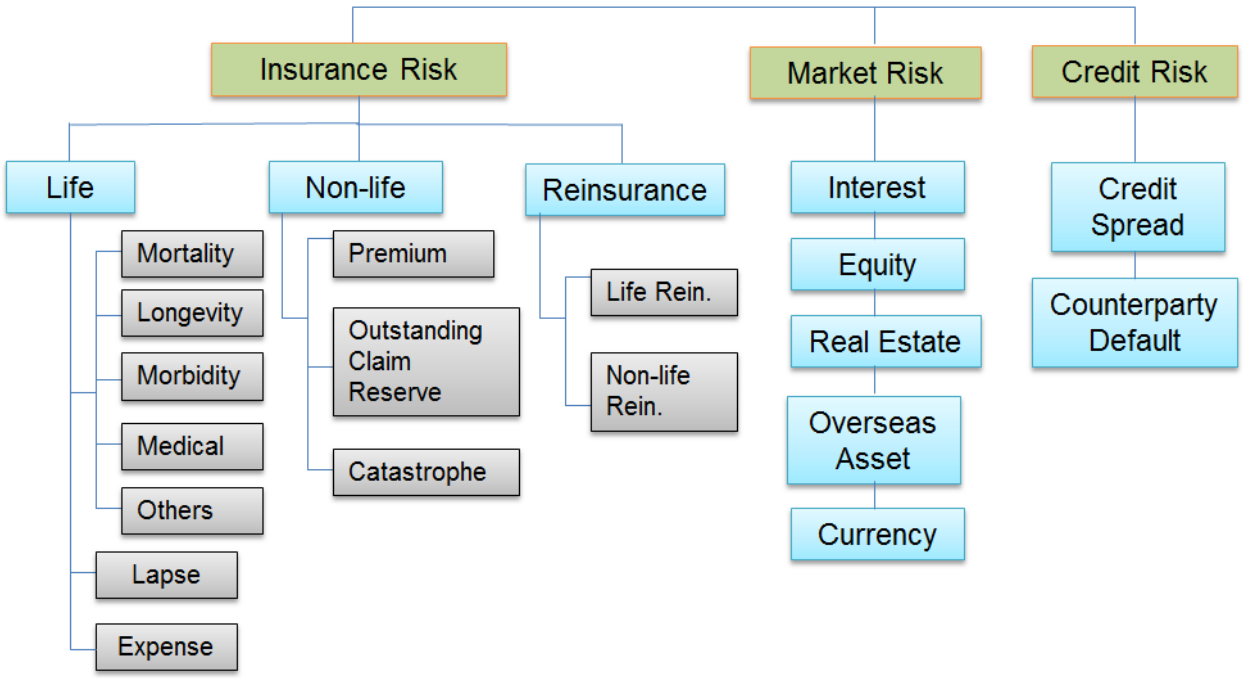
Source: CIRC

Pillar I

Quantitative risks in Pillar I

Under C-ROSS, the quantitative risks in Pillar I include insurance risk for life and non-life business, market risk and credit risk. Figure 3 shows the types of risk considered in the Pillar I calculations.

FIGURE 3: QUANTITATIVE RISKS IN PILLAR I



Available capital

Available capital equals admitted asset minus admitted liability.

Admitted assets, which can be used to pay for the obligations to policyholders without limitation on disposal, include cash and liquidity management tools, investment assets (bank deposit, government bonds, financial bonds, corporate bonds, securitisation products, investment trusts, infrastructure investments, equity investments, investment in real estate, etc.), long-term equity investments, reinsurance assets, fixed assets, receivables and prepayments, separate account assets, etc. Non-admitted assets include intangible assets, deferred tax assets, long-term deferred expenses, assets with limitation on disposal, etc. Goodwill is considered an inadmissible asset, except in the case of long-term equity investments where the goodwill can be recognised as an admissible asset. Asset valuations are to follow the China GAAP accounting value basis. When interest rates change, the admitted asset value of fixed income (FI) assets accounted for on a fair value accounting basis should vary according to the market value movement of those assets. For fixed interest assets accounted for on an amortised cost basis, the admitted asset values should remain unchanged.

Admitted liabilities, whether in a going concern or a run-off situation, include insurance liabilities, financial debts, payables and advance receipts, capital liabilities, estimated debts, separate account liabilities, etc.

The **cash value (CV) guarantee**, added to the admitted liabilities, is equal to max (0, CV – policy liability – minimum capital) at a total company level. The value of insurance liability for non-life business is the same as the accounting basis, whereas the value of the life insurance liability must be recalculated according to the

specific C-ROSS valuation rules (as outlined below). The admitted value of the life insurance liability should be floored at (CV - minimum capital).

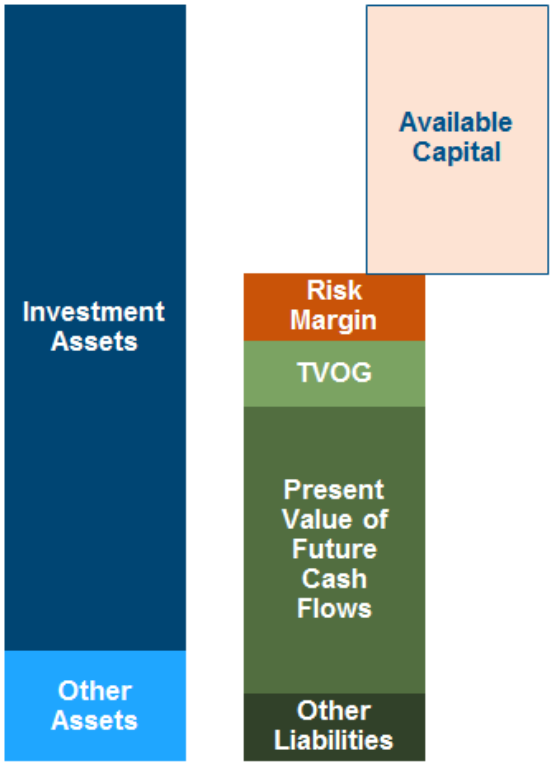
Capital is classified as core capital (tier 1 and 2) and secondary capital (tier 1 and 2) based on the relative loss-absorbing capability of the capital in question. Core capital can absorb losses on both a going concern basis and in a bankruptcy liquidation situation. Secondary capital can absorb losses only in a bankruptcy/liquidation. Companies must therefore calculate two different levels of capital adequacy based on either the total capital or the core capital.

Life insurance liability valuation

Life insurance business includes long-term life business, long-term health business and long-term accidental business.

Life insurance liabilities include policyholder reserves and outstanding claims reserves. Outstanding claims reserves follow the accounting basis. Policyholder reserves are calculated as the sum of the best estimate reserve (BER) and risk margin (RM). Figure 4 shows the main components of a C-ROSS balance sheet.

FIGURE 4: C-ROSS BALANCE SHEET



Best estimate reserve

BER includes the present value of cash flows (PV) and the time value of options and guarantees (TVOG). Insurers can use their own experience or industry experience in estimating cash flows under generally accepted actuarial principles and the relevant regulatory requirements.

Future estimated cash flows include income from premiums and other fees, and outgo covering guaranteed benefits (benefits on death, disability, illness, survival, maturity and surrender, etc.), non-guaranteed benefits (dividends and credit rate amounts), expenses, taxes, and other payments.

Discount rate assumption

The discounting of the future cash flows is based on the 750-day moving average of government bond yield curve with an ultimate rate adjustment.

The ultimate rate is defined by CIRC taking into account the 'long-term economic natural growth rate and the long-term inflation rate in China.' The current interest curve will move to the ultimate rate over time. The yield curve has been split into three sections: Before the 20th year, the curve is based on 750-day moving average of the government bond yield. Between the 20th year and the 40th year, the yield is graded between the 20th year rate and the ultimate rate. Beyond 40 years, the ultimate rate, which has been set to be 4.5%, is used.

$$Base\ Interest\ Curve = \begin{cases} 750-day\ moving\ average\ of\ government\ bond\ yield\ curve & 0 < t \le 20 \\ Ultimate\ Interest\ Rate\ Transition\ Curve & 20 < t \le 40 \\ Ultimate\ Interest\ Rate & t > 40 \end{cases}$$

Over and above the base yield curve, a margin for risk is incorporated into the yield curve to reflect any tax effect, liquidity premium, and counter-cyclical adjustment. There are three levels of the margin for risk to be applied on the yield curve, as a function of the different types of business:

- High-level margin for risk of 70 bps is applied to business issued in 1999 and before (at high pricing interest rates)
- Low-level margin for risk of 30 bps is applied to universal life, unit-linked, variable annuity and high-cash-value (HCV) products[1]
- Middle-level margin for risk of 45 bps is applied to traditional, participating and other business

For other assumptions such as expenses, lapses and incidence rates, insurers can use their own experience or industry experience in estimating cash flows under generally accepted actuarial principles. The assumptions chosen should meet the relevant regulatory requirements (within the assumption caps and floors prescribed by CIRC). Please refer to Appendix A for details.

[1] HCV products are the ones meet two requirements:
- Sum of cash value and accumulated survival benefit is larger than accumulated premium paid at the end of policy year 2
- More than 60% of the policies' expected survival period is less than three years

Time value of options and guarantees

The TVOG is calculated explicitly as part of the BER. TVOG is only derived for participating, universal life and variable annuity (VA) business. The following factor approach is used to calculate TVOG:

$$TVOG = \{\ PV(\text{guaranteed benefits}) + PV(\text{non}-\text{guaranteed benefits})\ \} \times TVOG\ factor$$

TVOG factor is based on adjusted residual duration and the guaranteed interest rate, which is the same for participating business, universal life and VA products.

TABLE 1: TVOG FACTOR

Adjusted Residual Duration (year)		(0, 5]	(5, 10]	(10, 15]	(15, 20]	>20
Guaranteed Interest Rate / Pricing Interest Rate	（0, 2%]	1.0%	1.5%	2.0%	2.5%	3.0%
	（2%, 2.5%]	1.5%	2.0%	2.5%	3.0%	3.5%
	（2.5%, 3%]	2.0%	3.0%	3.5%	4.0%	4.5%
	（3%, 3.5%]	2.5%	4.0%	5.0%	6.0%	7.0%
	（3.5%, +∞）	3.0%	5.5%	7.0%	8.5%	10.0%

$$Adjusted\ residual\ duration = \frac{PV_1 - PV_2}{PV_0} \times \frac{1}{0.02\%}$$

PV_1 is the sum of PV of guaranteed and non-guaranteed benefits as the discount rate curve decreases by 1bps.

PV_2 is the sum of PV of guaranteed and non-guaranteed benefits as the discount rate curve increases by 1bps.

PV_0 is the sum of PV of guaranteed and non-guaranteed benefits with no change of discount rate.

Risk margin

The risk margin can be determined using either a cost-of-capital approach or a scenario-comparison approach. The cost-of-capital approach for the calculation of the risk margin has not been formally released by the CIRC. Under the scenario-comparison method, the risk margin (RM) is the difference between PV under prescribed scenario and the PV under the base scenario.

$$RM = PV_{prescribed} - PV_{base}$$

Insurers should determine the assumptions to be used and the direction of the shock to be applied at a product level. The prescribed scenario for testing is shown in Table 2.

TABLE 2: PRESCRIBED SCENARIOS FOR RM

Assumptions	Prescribed Scenarios
Mortality rate	Choose 105% or 95% based on testing result
Morbidity, medical and health loss ratio	Choose 110% or 90% based on testing result
Lapse rate	Choose 110% or 90% based on testing result
Maintenance expense	110%

Minimum capital for market risk

Market risk contains interest rate risk, equity risk, real estate risk, overseas asset risk, and currency risk. Apart from interest rate risk, a prescribed factor approach (the same as used for property and casualty [P&C] insurers) is used for life insurers as follows:

$MC = EX \times RF$

MC is MC for market risk for a type of asset (liability).

EX is risk exposure of a type of asset (liability). It is the admitted value of the asset (liability).

RF is risk factor, $RF = RF_0 \times (1 + K)$.

RF_0 is base risk factor.

K is characteristic factor, $K = \sum_{i=1}^{n} k_i = k_1 + k_2 + k_3 + \cdots + k_n$. $K \in [-0.25, 0.25]$.

k_i is characteristic factor set for risk category of i, n is number of characteristic factors. Prescribed amount will be set for k_i, if no prescribed amount is set, 0 will be used.

MC for interest rate risk

A scenario-comparison method is used for interest rate risk, where the capital required is the change in the value of the admitted assets less the change in the value of the PV between the adverse scenario and the base scenario. Assets affected by interest rate risk are domestic investment assets with an explicit duration and accounted for on fair value basis under local China GAAP financial reporting. The change of the net amount should not be negative. The formula is:

$MC_{Interest\ Risk} = (AA_{Base} - PV_{Base}) - (AA_{\text{Adverse}} - PV_{\text{Adverse}})$.

$MC_{Interest\ Risk}$ is minimum capital on interest rate risk.

AA_{Base} and AA_{Adverse} are admitted assets under base and adverse scenarios, respectively.

PV_{Base} and PV_{Adverse} are PV under base and adverse scenarios respectively after reinsurance.

Cash flows are kept the same for the calculation of PV_{Base} and PV_{Adverse}.

Note that the PV is computed using the same base cash flows. This means dynamic interaction of asset and liability is not required. Under each adverse scenario, upward and downward shocks are provided. Insurers should do tests on both upward and downward shocks, and then choose the maximum of MC required at a total company level.

MC for equity risk

The domestic equity investment assets include listed common stock, unlisted equity, securities investment funds, convertible bonds, infrastructure investments, asset management products meeting the CIRC's requirement on issuer qualifications, unlisted equity investment plans, equity type trust plans, equity index futures, preferred stock, long-term equity investments, etc. MC for equity risk is the sum of MC for equity risk by type of assets weighted by their respective risk charge factors.

MC for real estate risk

Real estate investment includes the investment in property and the investment in any company that undertakes property-related projects (property company). The exposure to investment in property is the admitted value of the asset, and the property company exposure is the admitted value of the property company shares owned by the insurer. MC for real estate risk is the sum of MC for real estate risk by type of real estate investment weighted by their respective risk charge factors.

MC for overseas asset risk

Overseas investment assets include overseas fixed income (FI) investment assets and overseas equity investment assets. MC for overseas asset risk is the sum of MC for overseas asset risk by type of overseas investment asset weighted by their respective risk charge factors.

MC for currency risk

Insurers must break down the exposure to each individual foreign currency to measure MC for currency risk. The exposure is the net asset (asset – liability) in each of the foreign currencies. MC for currency risk is the sum of the risk for each of the different foreign currencies weighted by their respective risk charge factors.

Details of the risk factors for equity risk, real estate risk, overseas asset risk and currency risk by type of asset can be found in Appendix B.

MC for market risk aggregation

$$MC_{market\ risk} = \sqrt{MC_{vector} \times M_{correlation\ matrix} \times MC_{vector}^{T}}$$

MC_{vector} is row vector with MC for interest rate risk, equity risk, real estate risk, overseas asset risk, and currency risk.

$M_{correlation\ matrix}$ is the market risk correlation matrix, which is set as follows:

TABLE 3: CORRELATION MATRIX OF MC FOR MARKET RISKS

	Interest Rate Risk	Equity Risk	Real Estate Risk	Overseas Asset FI Risk	Overseas Asset Equity Risk	Currency Risk
Interest Rate Risk	1	-0.14	-0.18	0	-0.16	0.07
Equity Risk	-0.14	1	0.22	0.06	0.5	0.04
Real Estate Risk	-0.18	0.22	1	0.18	0.19	-0.14
Overseas Asset FI Risk	0	0.06	0.18	1	0.04	-0.01
Overseas Asset Equity Risk	-0.16	0.5	0.19	0.04	1	-0.19
Currency Risk	0.07	0.04	-0.14	-0.01	-0.19	1

Minimum for credit risk

Credit risk includes credit spread risk and counterparty default risk. To calculate the MC for credit risk, the credit rating for each asset is required. Insurers can use internal and external credit ratings.

The method adopted is a prescribed factor approach, which is the same as the one used for P&C business. The formula of MC for credit risk for all types of assets (liabilities) is as follows:

$$MC = EX \times RF$$

MC is MC for credit risk for a type of asset (liability).

EX is the risk exposure of a type of asset (liability). It is the admitted value of the asset (liability). If the admitted value is negative, then it equals 0.

RF is risk factor, $RF = RF_0 \times (1 + K)$.

RF_0 is base risk factor.

K is characteristic factor, $K = \sum_{i=1}^{n} k_i = k_1 + k_2 + k_3 + \cdots + k_n$. $K \in [-0.25, 0.25]$.

k_i is characteristic factor set for risk category of i, n is number of characteristic factors. If no prescribed amount set for any k_i, 0 will be used.

Any government bonds and quasi-sovereign bonds held by insurers have zero credit risk charges.

MC for credit spread risk

Assets defined to be subject to credit spread risk are domestic investment assets with an explicit duration and accounted for on a fair value basis under local China GAAP financial reporting. These include bonds (financial

bond, corporate bond, etc.), securitisation products, fixed income trust plans, other fixed income assets, etc. MC for credit spread risk is the sum of MC for credit spread risk by type of investment assets weighted by their respective risk charge factors.

MC for counterparty default risk

Assets defined to be subject to counterparty default risk are credit assets and debt guarantees with explicit counterparties, with the admitted asset value determined under an amortised cost or historical cost basis. These include cash and liquidity management tools, fixed income investment assets, currency forwards and interest swaps for hedging, policy loans, reinsurance assets, premiums receivables, interest receivables, other receivables and prepayments, debt guarantees, etc. MC for counterparty default risk is the sum of MC for counterparty default risk by type of asset weighted by their respective risk charge factors.

Details of the risk factors for risks of credit spread and counterparty default by types of assets can be found in Appendix C for reference.

MC for credit risk aggregation

The formula of MC for credit risk is as follows:

$$MC_{credit\ risk} = \sqrt{MC^2_{credit\ spread\ risk} + 2 \times \rho \times MC_{credit\ spread\ risk} \times MC_{counterparty\ default\ risk} + MC^2_{counterparty\ default\ risk}}$$

$MC_{credit\ risk}$ is MC for credit risk.

$MC_{credit\ spread\ risk}$ is MC for credit spread risk.

$MC_{counterparty\ default\ risk}$ is MC for counterparty default risk.

ρ is correlation factor, which is set as 0.25.

Minimum capital for insurance risk

Non-life business written by life insurers

This is applicable to short-term accident, short-term health and short-term life business written by life insurers. The capital requirement covers premium risk and outstanding claims reserve risk. The method adopted is a prescribed factor approach, which is the same as the one used for P&C business.

The formula of MC for premium risk and outstanding claims reserve risk is as follows:

$$MC = EX \times RF$$

MC is the minimum capital on premium risk or outstanding claims reserve risk.

EX is risk exposure.

RF is risk factor, $RF = RF_0 \times (1 + K)$.

RF_0 is base risk factor.

K is characteristic factor, $K = \sum_{i=1}^{n} k_i = k_1 + k_2 + k_3 + \cdots + k_n$. $K \in [-0.25, 0.25]$.

k_i is characteristic factor set for risk category of i, n is number of characteristic factors. If no prescribed amount is set for k_i, 0 will be used.

Risk exposure will be separated into several intervals. Within each exposure interval, risk exposure is multiplied by the respective risk factor to arrive at the MC. The sum of the MC from those intervals is the total

MC required for this type of risk. The risk factors are lower for higher-exposure intervals. Details of risk factors for non-life business can be found in Appendix D.

MC for premium risk and outstanding claims reserve risk aggregation

MC for premium risk and outstanding claims reserve risk for a short-term business is as follows:

$$MC_{prem\&res} = \sqrt{MC_{prem}{}^2 + 2 \times \rho \times MC_{prem} \times MC_{res} + MC_{res}{}^2}$$

$MC_{prem\&res}$ is MC for premium risk and outstanding claims reserve risk.

MC_{prem} is MC for premium risk.

MC_{res} is MC for outstanding claims reserve risk.

ρ is correlation factor, which is set as 0.5.

MC of insurance risk aggregation for non-life business written by life insurers

$$MC_{non-life\ insurance\ risk} = \sqrt{MC_{vector} \times M_{correlation\ matrix} \times MC_{vector}^{T}}$$

MC_{vector} is row vector with MC of premium risk and outstanding claims reserve risk for short-term accident, short-term health and short-term life business.

$M_{correlation\ matrix}$ is correlation matrix, which is set as follows in Table 4:

TABLE 4: CORRELATION MATRIX OF INSURANCE RISK FOR NON-LIFE BUSINESS WRITTEN BY LIFE INSURERS

	Short-term Accident	Short-term Health	Short-term Life
Short-term Accident	1	0.5	0.5
Short-term Health	0.5	1	0.5
Short-term Life	0.5	0.5	1

Life business

Insurance risks for life business measure the loss caused by adverse deviation between assumptions and actual experience. A scenario-comparison method is used. Insurance risks include incidence rate risks (mortality, catastrophe, longevity, morbidity, medical and health loss ratio, etc.), lapse risks (lapse rate assumption deviation and mass lapse events), and expense risks. The capital requirement is the change of PV between the adverse scenario and the base scenario. The formula is as follows:

$$MC = Max(PV_{adverse} - PV_{base},\ 0)$$

MC is minimum capital requirement for insurance risk.

PV_{base} is PV under base scenario assumptions after reinsurance.

$PV_{adverse}$ is PV under adverse scenario assumptions after reinsurance.

The MC is the calculated based on the net amount after reinsurance.

The assumptions under the adverse scenario are defined to be the assumptions under the base scenario multiplied by certain shock factors. The adverse scenario assumption is equal to the base scenario assumption × (1+SF). SF is the adverse scenario factor, which is the proportional shift upward or downward of the underlying assumption. The direction of the shock to be applied, either upward or downward, is determined at the product level when considering mortality (vs. longevity) and lapse risk.

There are additional assumptions for certain specific cases (i.e., catastrophe and mass lapse).

MC for incidence rate risks

- Mortality risk

SF of mortality risk is based on the proportional shift upward of the base mortality assumption at all future policy dates. SF is set according to the total number of basic policies of life business, as follows:

$$SF = \begin{cases} 10\% & \text{Number of basic policies} > 2 \text{ million} \\ 15\% & 1 \text{ million} < \text{Number of basic policies} \le 2 \text{ million} \\ 20\% & \text{Number of basic policies} \le 1 \text{ million} \end{cases}$$

- Mortality catastrophe risk

This covers the risk of unexpected loss due to a significant increase in the mortality rate over a short time caused by catastrophe events, such as an epidemic, earthquake, tsunami, etc. SF is an increase in the mortality rate by an absolute amount of 0.0018 over the base scenario for the 12 months following the valuation date.

- Longevity risk

SF of longevity risk is based on the proportional shift downward of the base mortality assumption at all future policy dates. The SF is set according to policy duration as follows:

$$SF = \begin{cases} (1-3\%)^t - 1 & 0 < t \le 5 \\ (1-3\%)^5 \times (1-2\%)^{t-5} - 1 & 5 < t \le 10 \\ (1-3\%)^5 \times (1-2\%)^5 \times (1-1\%)^{t-10} - 1 & 10 < t \le 20 \\ (1-3\%)^5 \times (1-2\%)^5 \times (1-1\%)^{10} - 1 & t > 20 \end{cases}$$

t is integer amount of policy year.

- Morbidity risk

SF of morbidity risk is based on the proportional shift upward of the base morbidity assumption at all future policy dates. SF is set at 20%.

- Medical and health loss ratio risk

SF of medical and health loss ratio risk is based on the proportional shift upward of base medical and health assumptions at all future policy dates. SF is set at 20%.

For other incidence rate risks not mentioned above, SF is set at 20%.

- MC for incidence rate risks aggregation

A correlation matrix is used to calculate MC for incidence rate risks. The formula is as follows:

$$MC_{incidence\ rate} = \sqrt{MC_{vector} \times M_{correlation\ matrix} \times MC_{vector}^{T}}$$

MC_{vector} is row vector with MC for mortality, catastrophe, longevity, morbidity, medical and health loss ratio and other risks.

$M_{correlation\ matrix}$ is the correlation matrix, which is set as follows in Table 5:

TABLE 5: CORRELATION MATRIX OF MC FOR INCIDENCE RATE RISKS

	Mortality Risk	Mortality Catastrophe Risk	Longevity Risk	Morbidity Risk	Medical and Health Loss Ratio Risk	Other Incidence Rate Risks
Mortality Risk	1	0.25	-0.25	0.25	0.25	0.25
Mortality Catastrophe Risk	0.25	1	0	0.25	0.25	0.25
Longevity Risk	-0.25	0	1	0	0	0
Morbidity Risk	0.25	0.25	0	1	0.25	0.25
Medical and Health Loss Ratio Risk	0.25	0.25	0	0.25	1	0.25
Other Incidence Rate Risks	0.25	0.25	0	0.25	0.25	1

MC for lapse risks

- Lapse rate assumption deviation risk

SF of lapse risk is based on the proportional shift upward or downward of the base lapse assumptions. The direction of the shift, either upward or downward, is determined at the product level. The PV of adverse scenario by product is calculated according to the following formula:

$$PV_{adverse} = Max(PV_{SF1}, PV_{SF2})$$

PV_{SF1} is PV under adverse scenario with scenario factor SF1.

PV_{SF2} is PV under adverse scenario with scenario factor SF2.

SF1 and SF2 are set based on the total number of basic life insurance policies, as follows:

$$SF1 = \begin{cases} 25\% & \text{Number of basic policies} > 10 \text{ million} \\ 30\% & 1 \text{ million} < \text{Number of basic policies} \le 10 \text{ million} \\ 35\% & \text{Number of basic policies} \le 1 \text{ million} \end{cases}$$

$$SF2 = \begin{cases} -25\% & \text{Number of basic policies} > 10 \text{ million} \\ -30\% & 1 \text{ million} < \text{Number of basic policies} \le 10 \text{ million} \\ -35\% & \text{Number of basic policies} \le 1 \text{ million} \end{cases}$$

- Mass lapse risk

This covers the risk of unexpected loss due to a sharp increase in lapses over a short period of time caused by special events, such as a financial crisis or reputational crisis. SF is a proportional shift upward by 150% of the base lapses over the 12-month period after the valuation date. After application of the stress, monthly lapse rates should not be lower than 2.4% or annual lapse rates should not be lower than 25%. The mass lapse stress should be applied to all in-force business (excluding policies with zero cash value) at valuation date.

A cap on the lapse rate of 100% is applied in the lapse upward, downward and mass lapse scenarios.

- MC for lapse risks aggregation

The formula of MC for lapse risks is as follows:

$$MC_{lapse} = Max(MC_{lapse\ rate}, MC_{mass\ lapse})$$

MC_{lapse} is MC for lapse risks.

$MC_{lapse\ rate}$ is MC for lapse rate assumption deviation risk.

$MC_{mass\ lapse}$ is MC for mass lapse risk.

MC for expense risk

SF of expense risk is based on the proportional shift upward of the base expense assumptions. It applies to all maintenance expenses, excluding direct commission, insurance security fund fee, CIRC's fee and premium tax. SF is set as 10%.

MC for insurance risks aggregation

A correlation matrix is used to calculate MC for insurance risks of life business. The formula is as follows:

$$MC_{life\ insurance} = \sqrt{MC_{vector} \times M_{correlation\ matrix} \times MC_{vector}^{T}}$$

MC_{vector} is row vector with MC for incidence rate risks, lapse risks and expense risk.

$M_{correlation\ matrix}$ is the correlation matrix, which is set as follows in Table 6:

TABLE 6: CORRELATION MATRIX OF MC FOR INSURANCE RISKS

	Incidence Rate Risks	Lapse Risks	Expense Risk
Incidence Rate Risks	1	0	0.4
Lapse Risks	0	1	0.5
Expense Risk	0.4	0.5	1

Minimum quantitative capital

The minimum capital requirement for the quantitative risks in Pillar I, including insurance risk, market risk and credit risk, is calibrated using a value at risk (VAR) approach.

Assets and liabilities for separate account (unit-linked) business are not included in the MC calculation.

A correlation matrix between life insurance risk, non-life insurance risk, market risk and credit risk is provided to calculate the total quantitative capital requirement. The formula is as follows:

$$MC_{quantitative\ risks\ of\ life\ insurance} = \sqrt{MC_{vector} \times M_{correlation\ matrix} \times MC_{vector}^{T}} - LA$$

MC_{vector} is row vector with MC for life insurance risk, non-life insurance risk, market risk and credit risk.

$M_{correlation\ matrix}$ is the correlation matrix, which is set as follows in Table 7:

TABLE 7: CORRELATION MATRIX OF MC FOR TOTAL QUANTITATIVE RISKS OF LIFE INSURANCE

	Life Insurance Risk	Non-life Insurance Risk	Market Risk	Credit Risk
Life Insurance Risk	1	0.18	0.5	0.15
Non-life Insurance Risk	0.18	1	0.37	0.2
Market Risk	0.5	0.37	1	0.25
Credit Risk	0.15	0.2	0.25	1

LA is the loss-absorbing adjustment for participating and universal life business.

When unexpected losses arise, insurers can take management actions to adjust non-guaranteed benefit cash flows for participating and universal life business to absorb some or all of the losses incurred, which has the

effect of reducing the total capital requirement. Loss-absorbing ability is only applied to participating and universal life business. The formula is as follows:

$$LA = \min(MC_{participating\ and\ UL} \times \beta, LA_{cap})$$

$MC_{participating\ and\ UL}$ is the minimum capital of market risk and credit risk combining participating and universal life funds.

The formula is:

$$MC_{participating\ and\ UL} = \sqrt{MC_{market}^2 + 2\rho \times MC_{market} \times MC_{credit} + MC_{credit}^2}$$

MC_{market} and MC_{credit} are the minimum capital requirements for market risk and credit risk, respectively, across only participating and universal life business. ρ is the correlation factor, which is set at 0.25.

LA_{cap} is the regulatory cap of loss-absorbing ability.

$$LA_{cap} = Max(PV_{base} - PV_{floor}, 0)$$

PV_{base} is PV of cash flows of participating and universal life business under base scenario. PV_{floor} is PV of cash flows of participating and universal life business assuming a minimum floor to the dividend scales and crediting rates as prescribed by the CIRC, and using the same discount rate as the base scenario.

β is adjustment ratio, the formula is:

$$\beta = \min(0.4,\ 0.2 \times \frac{LA_{cap}}{MC_{participating\ and\ UL}} + 0.042)$$

Stress testing

Insurers are required to conduct stress tests annually. The base scenario and stressed scenarios involve projecting the capital adequacy ratio into the future under both regulatory defined scenarios and a company's own internal scenarios as set out below:

FIGURE 5: STRESS TEST SCENARIOS

Base scenario	Projection of the capital adequacy ratio for the first two years, using the business plan best estimate assumptions including new business
Three prescribed scenarios by CIRC	**Prescribed scenario 1 – Macro-economic scenarios:** The following scenarios happen at the same time: • Risk-free curve up 50 bps • Equities fall by 15% • Credit spreads widen 100 bps • Real estate drops 20% • 30% asset value loss of top three counterparties default with rating below AA
	Prescribed scenario 2 – Insurance risk scenarios: The following scenarios happen at the same time: • Lapse rate * 120% • Expense * 105% or 110% depending on the category of insurers • New business premium growth rate * 120% (80%) or 130% (70%) depending on the category of insurers
	Prescribed scenario 3 – Interest rate scenarios: the following scenarios happen at the same time: • Spot rate curve for asset valuation increases 82% to 4% before duration 50 and 0% thereafter • 750-day moving average of government bond yield curve drops 12% to 3% before duration 40 and 0% thereafter
Internal scenarios	Internally defined scenarios

Pillar II

The Pillar II requirements can be broken down into three key components:

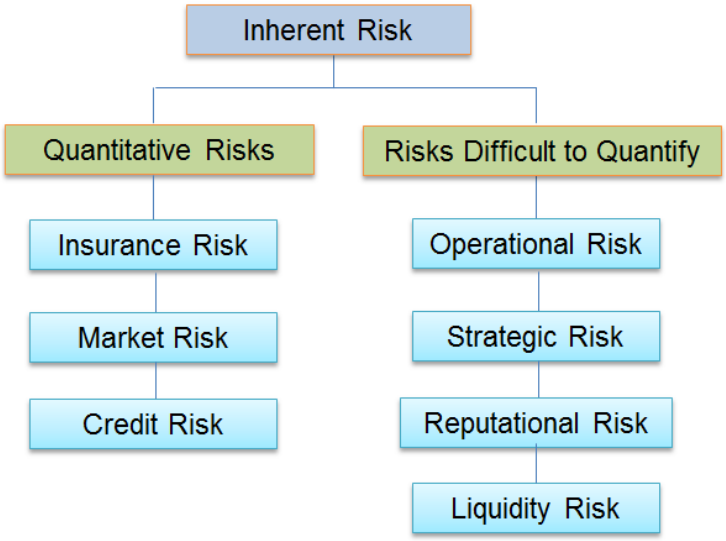
- Integrated risk rating: A rating system used to determine the level of intervention applied by the regulator
- Solvency-aligned Risk Management Requirement and Assessment (SARMRA): An explicit assessment of the risk management processes of a company which has a direct, quantitative impact on the company's MC
- Liquidity risk: A series of liquidity risk indicators that must be calculated and communicated to the CIRC on a regular basis

The following pages summarise the main details of each of these requirements starting by a short introduction of the risks that are covered by Pillar II and how they fit into the overall C-ROSS regulatory framework.

Risks covered in Pillar II

Under C-ROSS, solvency risks of insurers include inherent risk and control risk. Inherent risk refers to the risks that are unavoidable in the writing of insurance business. It includes both risks can be quantified (market, credit, insurance, etc.) and those that are difficult to quantify (operational, strategic, etc.). Control risk refers to the risk that management does not react fast enough in the face of the inherent risks due to imperfections in the internal management and control process, potentially subjecting the insurer to excess losses over those expected from inherent risks. Figure 6 shows the structure of inherent risk.

FIGURE 6: THE STRUCTURE OF INHERENT RISK



CIRC determines an insurer's solvency risk profile according to its inherent risk and control risk level. Pillar I covers the MC on quantitative risks. Control risk is covered by the SARMRA, which also has a direct impact the MC. Under the inherent risk classification, the risks difficult to quantify are assessed via integrated risk rating.

Integrated risk rating

Integrated risk rating is a regulatory activity which CIRC will perform by carrying out risk-oriented analysis and evaluation of insurers' risks through the analysis of a standardised set of data from each of the insurers. As a function of a company's integrated risk rating, the level of CIRC supervision for that company will be classified into one of four different categories, with each category having different regulatory policies and intervention measures.

The assessment of integrated risk rating is determined as an average of:

- The insurer's quantitative score based on the level of level and movement of the core solvency adequacy ratio and the integrated solvency adequacy ratio
- The insurer's score on the 'risks difficult to quantify,' also known as the Four Risks (operational risk, strategic risk, reputational risk and liquidity risk)

Operational risk is the risk of direct and indirect loss caused by a failure in internal operational processes, staff issues, systems or external events, including legal and regulatory compliance risks (excluding strategic risk and reputational risk).

Strategic risk is the risk of a misalignment between the strategy, market environment and company's competency, due to flawed strategy development and/or implementation or change of operating environment.

Reputational risk is the risk of loss caused by negative views of the company from various stakeholders, due to either the insurer's internal management or the impact of external events. It tends to be strongly correlated with other risks.

Liquidity risk is risk that the insurer is unable to obtain sufficient funds in time, or at a reasonable cost, to pay due debt or insurance benefits as they fall due.

CIRC will assess operational risk by analysing the following elements:

- The external environment, including overall industry operational risk level and trends
- Internal control processes by line of business, historical data, empirical distribution and development trend of operational risk
- Staff issues that could cause operational risk within a company
- Issues and risks associated with an insurer's information systems
- External events that would cause operational risk, including regulation, supervisory policy, force majeure, etc.

For liquidity risk, CIRC will assess insurers' liquidity risks through indicators of liquidity ratio, integrated liquidity ratio and liquidity coverage ratio, cash-flow stress tests, and other quantitative and non-quantitative information. These are discussed in detail later in this paper.

Based on solvency adequacy ratios and results of the evaluation of the Four Risks, CIRC will determine an integrated risk rating of solvency risks. Insurers will then be classified into four supervision categories according to the rating levels.

- A category: Solvency adequacy ratio meets the requirement and risk level is very low for the Four Risks
- B category: Solvency adequacy ratio meets the requirement and risk level is low for the Four Risks
- C category: Solvency adequacy ratio does not meet the requirement, or solvency adequacy ratio meets the requirement but risk level is high for one or several of the Four Risks
- D category: Solvency adequacy ratio does not meet the requirement, or solvency adequacy ratio meets the requirement but risk level is serious for one or more of the Four Risks

Different regulatory policies will be applied to each of the four supervision categories with respect to market access (e.g., restriction on opening of new branches), product management (e.g., temporary suspension of new business sales), usage of insurance funds, on-site inspection, etc. CIRC can apply the following supervisory measures to risk issues:

- Risk alert
- Supervisory conversation
- Rectification of identified problems within a specified deadline
- On-site inspection
- Request to submit and implement plans to prevent insolvency

The integrated risk rating will be performed quarterly. Insurers are required to submit related information and data to CIRC, which will apply its risk assessment using a consistent approach across all insurers. The integrated risk rating will be disclosed in appropriate way and with the necessary supervision and intervention being taken as required.

Solvency-aligned Risk Management Requirement and Assessment (SARMRA)

SARMRA, which is the Chinese version of the Own Risk and Solvency Assessment (ORSA), is an important component of C-ROSS Pillar II. CIRC sets minimum regulatory requirements on the internal risk management processes and policies which feed through into an adjustment to the minimum capital requirement for control risk.

Life insurers by groups

CIRC classifies insurers into two groups for SARMRA, according to insurers' stage of development, scale of business and risk characteristics. Insurers meeting any two of the three following conditions are classified in Group I:

- Company was founded more than five years ago
  - Level of gross premiums or total assets exceeds certain pre-defined minimums: For P&C insurers and reinsurers, gross premium exceeds RMB 5 billion or total asset exceeds RMB 20 billion
  - For life insurers, gross premium exceeds RMB 20 billion or total asset exceeds RMB 30 billion
- Number of branch at province level exceeds 15

Local insurers which do not meet any of the above conditions, and foreign insurers with affiliates in China, are classified in Group II. Additional requirements and stricter rules apply for insurers in Group I.

Structure of SARMRA

SARMRA covers the following nine sections:

- Risk management practices and policies
- Risk management objectives and tools
- Another seven sections of risk management on insurance risk, market risk, credit risk, operational risk, strategic risk, reputational risk and liquidity risk

We include below the main requirements of the first two sections: risk management practices and policies and risk management objectives and tools. We have not provided details of the requirements for the other seven sections.

Risk management practices and policies

Insurers are required to establish strong solvency-aligned risk management practices and policies, covering organisational structure, management systems and the inclusion of risk management within internal performance appraisal systems. Some of the key requirements are laid out as follows:

- The board of directors bears the ultimate responsibility of integrity and effectiveness of an insurer's solvency-aligned risk management system.
- An insurer should establish a risk management committee (RMC) under the board. The RMC performs solvency-aligned risk management with the authority of the board. Insurers in Group II are not required to establish a RMC, with the audit committee taking RMC-type responsibilities.
- Insurers should delegate a senior manager as the Chief Risk Officer (CRO) responsible for risk management with approval by CIRC. The CRO should not be involved in any role that represents a conflict of interest with risk management.
- Insurers in Group I should set up a separate risk management department with at least eight staff with backgroud in risk management, finance, actuarial, investment, legal or other related fields. There must be at least five staff with more than three years of relevant work experience. The requirements for insurers in Group II are weaker.

- The risk management department should take the leading role on all risk management work within the company.
- An annual review and report on the solvency-aligned risk management system by the internal audit department is required.
- To enhance the risk awareness and responsibility of managers at all levels, risk management elements must be embedded into a company's performance appraisal system as follows:
  - For insurers in Group I:
    - A certain weight should be applied to solvency-aligned risk management within management's performance appraisals.
    - Related departments and the responsible senior management should be included, such as:
      - ✓ Product sales, product management and other related business departments
      - ✓ Investment, actuarial, risk management and other functional departments
    - The weights should be at least 60% for the risk management department and 30% for the finance, investment and actuarial departments.
  - Insurers in Group II can set weights based their own internal management approach. The weights should not be zero, however.
- Insurers need to develop risk management training programs for senior management, risk management department, functional departments and branches at all levels.

Risk management objectives and tools

Risk appetite system

Insurers should develop a risk appetite framework with the aim of defining the risk management objectives and determining the level of risk that can be taken on to achieve its business strategy. CIRC's main risk appetite related requirements include:

- Based on company's business development strategy and its current risk position, an insurer needs to establish a risk appetite framework with approval from the board of directors.
- A combination of qualitative and quantitative approaches should be used to define risk tolerances and limits for different risks, including insurance risk, market risk, credit risk and liquidity risk.
- An insurer should set up the internal procedures to embed the risk appetite system into its management decision-making process and ensure that a feedback loop brings constant improvement to the risk appetite framework.
- An insurer should continuously monitor the current position with respect to the risk tolerances and risk limits, and report any breaches of those limits in a timely manner.
- Annual assessment and update/approval procedures for the risk appetite framework are required.

Risk management tools

- Business plan and comprehensive budget management requirement:
  - The risk management department should do an independent risk assessment and make sure it complies with the company's risk appetite. The CRO's sign-off is required before sending to the board.
  - Stress test results should be considered to assess the management decisions required to mitigate the impact of the adverse scenarios considered.

- Asset-liability management requirement:
  - Insurers should embed solvency risk management objectives into their asset-liability management (ALM) processes and decision making.
  - ALM practice must include the interaction between assets and liabilities to ensure that the ALM risk is within a company's risk appetite.
- Insurers should establish a capital management system and perform annually a three-year capital plan that takes into consideration the company's future development strategy and the capital that will be needed to achieve those goals.
- Insurers in Group I should set up an economic capital (EC) model and other capital management models under the C-ROSS solvency framework taking into account its own business structure, risk characteristics and risk appetite. Insurers in Group II can choose whether to use EC or other tools according to companies' actual needs.
- Insurers should set up a system of stress tests according to solvency regulatory rules, incorporating the following:
  - Clear structure, responsibility and methodology must be defined and documented.
  - Results should be used to analyse a company's risk position and to assist the development of management actions in the face of stress scenarios.
- Insurers should establish a risk management information system, and periodically review its effectiveness and revise it as necessary. The system should have the following functionality:
  - Be linked to the business and accounting system to automatically collect/process data and produce key risk indicators.
  - Incorporate risk-monitoring dashboards based on key indicators for insurance, market, credit, operation, strategy, reputation and liquidity risks.
  - Be able to perform stress tests.
  - Automatically generate risk management reports and documentation.
  - Aggregate risk management information from different functional departments and branches, and share across all levels.
  - Use data that is timely, accurate and consistent.

Solvency-aligned Risk Management Requirement and Assessment

The Solvency-aligned Risk Management Requirement and Assessment has two key dimensions:

- System soundness: Whether or not the risk management framework, environment, objectives and tools are scientific, comprehensive and compliant
- Implementation effectiveness: Whether or not the risk management system and mechinism can be effectively implemented

Within each of the nine sections in the SARMRA, weightings of 60% and 40% are applied to system soundness and implementation effectiveness, respectively.

CIRC has specified four categories of assessment results: 'fully meet requirements,' 'mostly meet requirements,' 'partially meet requirements' and 'does not meet requirements.' The scoring is laid out in Table 8.

TABLE 8: RULES OF ASSESSMENT RESULTS

Assessment Results	Description	Weight for Scoring
Fully meet requirements	According to system soundness and implementation effectiveness, the insurer fully meets CIRC's requirements.	100%
Mostly meet requirements	The insurer meets more than 80% of the requirements but not 100%.	80%
Partially meet requirements	The insurer meets more than 50% of the requirements but below 80%.	50%
Does not meet requirements	The insurer does not meet the requirements or meets less than 50%.	0%

If some items are 'not applicable' to an insurer, the scores on these items are zero and total scores of other items will be increased accordingly to keep an overall maximum of 100.

Please refer to Appendix E for details of how the scoring will be derived. There is a SARMRA scoring example with a summary table of final scores and a detail table of objectives and tools section for reference. Example inputs are used to show how the final scores are calculated.

SARMRA will be done annually between April and October by CIRC. If significant changes occurs within a year of the previous SARMRA, CIRC can request an insurer to perform an interim assessment. CIRC can delegate an independent third-party insititution to perform the assessment if necessary.

Insurers should calculate MC on control risks as a function of the SARMRA results and the MC on quantitative risks. The formula is as follows:

$$MC_{control\ risks} = Q \times MC_{quantitative\ risks}$$

$MC_{control\ risks}$ stands for minumim capital required on control risks.

$MC_{quantitative\ risks}$ stands for total minimum capital required on quantitative risks.

Q is risk factor, Q=-0.005S+0.4, S is the score of SARMRA.

Based on the formula of calculation of MC on control risks, an insurer can obtain MC credit/reduction if its score is higher than 80, or MC add-on if the score is below 80. In the best-case scenario, when an insurer receives a SARMRA score of 100, a reduction of 10% of MC on quantitative risks will apply for control risks, in the worst-case scenario, a 40% capital add-on with respect to MC on quantitative risks is required for control risks.

Liquidity risk

Liquidity risk is the risk that insurer is unable to obtain sufficient funds in time or with reasonable cost to pay due debt or insurance benefits. The rules in this area cover three sections, including requirements on liquidity risk management, liquidity risk indicators and supervision. Insurers are required to set up reporting procedures for liquidity risk indicators and undertake cash-flow stress tests.

Liquidity risk management

The requirement covers the liquidity risk related to the following items:

- Structure of liquidity risk management
- Risk appetite, tolerence and limit on liquidity risk
- Daily cash-flow management
- Insurance business management
- Investment management
- Financing mangement
- Reinsurance mangement
- Liquidity risk monitoring
- Cash flow stress test
- Liquidity contingency plan

Liquidity risk indicators

Three indicators are required for liquidity risk:

- Net cash flow. This reflects the net cash flows within the current reporting period, and the net cash flows in future periods under both base and stress scenarios.
- Integrated liquidity ratio. This reflects both the distribution of cash flows in future periods from certain types of assets and liabilities, and the matching of cash flows in and out. The formula of integrated liquidity ratio is as follows:

$$Integrated\ \ liquidity\ \ ratio = \frac{Expected\ total\ \ cash\ \ flow\ in\ \ from\ existing\ assets}{Expected\ total\ \ cash\ \ flow\ out\ \ from\ existing\ liabilities} \times 100\%$$

- Liquidity coverage ratio. This reflects the level of liquidity for the next quarter under stress scenario. The formula of liquidity coverage ratio is as follows:

$$Liquidity\ \ coverage\ \ ratio = \frac{Book\ value\ of\ \ high\ quality\ liquidity\ assets\ at\ the\ end\ of\ \ period}{Net\ cash\ \ flows\ of\ \ next\ \ quarter} \times 100\%$$

Insurers should calculate and report the liquidity risk indicators and results of cash flow stress tests quarterly.

Pillar III

Pillar III covers unsupervisable risks which include the systemic risk of the entire market. Due to the holisitic nature of the unsupervisable risks, CIRC's goal is to build up a mechanism which improves transparency and communication across all market participants. The supervisory mechanism includes three regulatory tools, including company disclosures, regulatory disclosures and credit rating. The risk disclosure and supervisory process will therefore not be limited to the CIRC, but will ensure interaction between all market players to improve the risk management level across the whole industry.

FIGURE 7: MARKET DISCIPLINE MECHANISM

Source: CIRC's presentation

Under C-SI, there are no formal rules for insurance companies to disclose solvency information and company credit ratings. Insurers are only required to disclose the solvency status in a single page in their Annual Information Disclosure. Under C-ROSS, new rules require that:

- Insurers should prepare and publicly disclose a summary solvency report on a quarterly basis. The quarterly report should be available on the insurers' websites, or additional channels such as microblog, WeChat, etc. Requirements differ for listed companies, unlisted companies, and IPO related disclosures.
- CIRC will publicly disclose insurers' integrated risk rating results quarterly, and disclose information of solvency supervision every six months. CIRC will keep ongoing and interactive communication with insurance consumers, shareholders of insurance companies, credit rating agencies, industry analysts, research institutions, government departments and the media.
- Credit rating information disclosure is required in the quarterly solvency report if insurers have obtained a credit rating by domestic or foreign rating agencies.

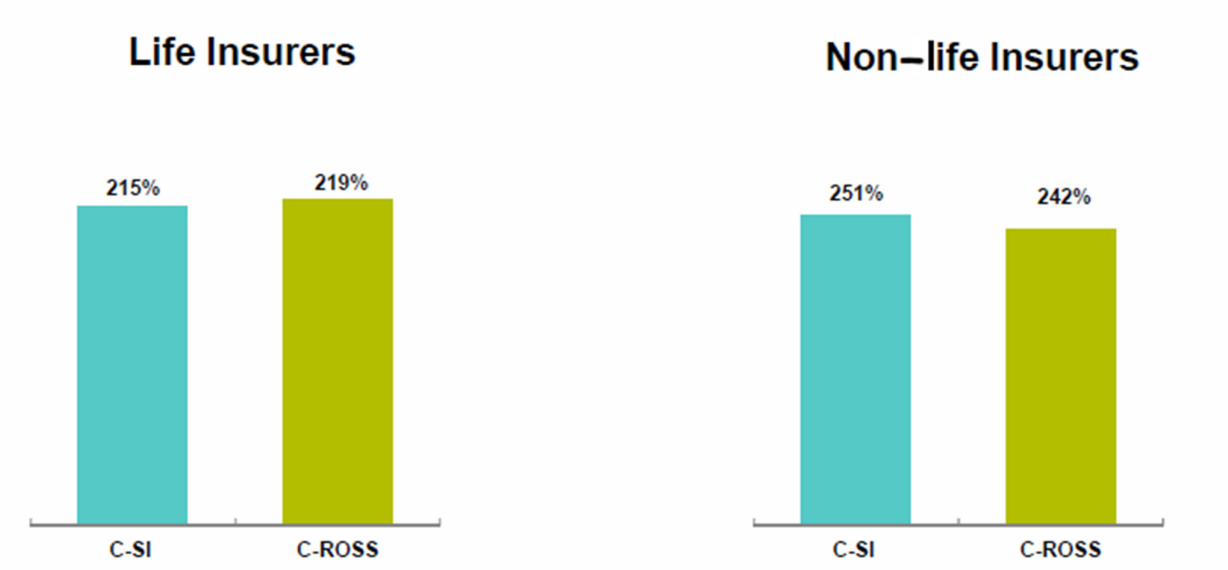
Section 3 Potential impact on life insurers

Quantitative field testing results

At the end of 2014, CIRC officially released summarised results from the initial 'field test.' The release showed that, generally, the solvency adequacy ratios were comparable between C-SI and C-ROSS. For the insurance industry as a whole, actual available capital increased by around RMB 1,000 billion and minimum capital increased by around RMB 450 billion, while capital surplus increased by around RMB 550 billion.

The average solvency ratio under C-ROSS increased slightly, by 4%, when compared with that under C-SI for life insurers. For non-life insurers, the average solvency ratio decreased by 9%.

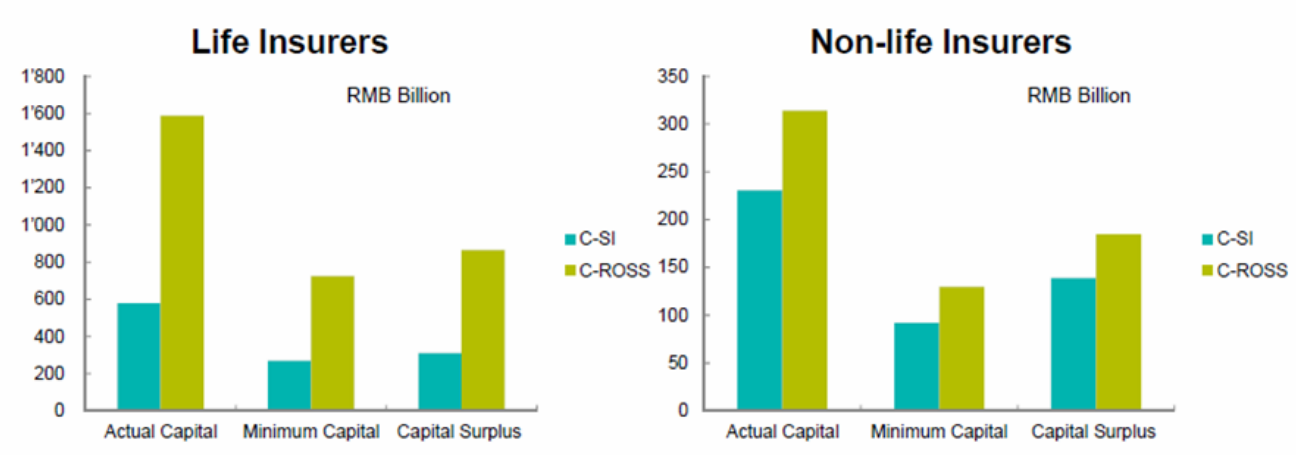
FIGURE 8: AVERAGE SOLVENCY RATIO COMPARISON



Source: CIRC's presentation

For life insurers, the significant actual capital increase under C-ROSS was mainly due to a decrease in reserves, as the reserving approach was changed from the net level premium (NPL) basis under C-SI to the gross premium valuation (GPV) basis under C-ROSS.

FIGURE 9: ACTUAL CAPITAL, MINIMUM CAPITAL AND CAPITAL SURPLUS CHANGES UNDER C-ROSS

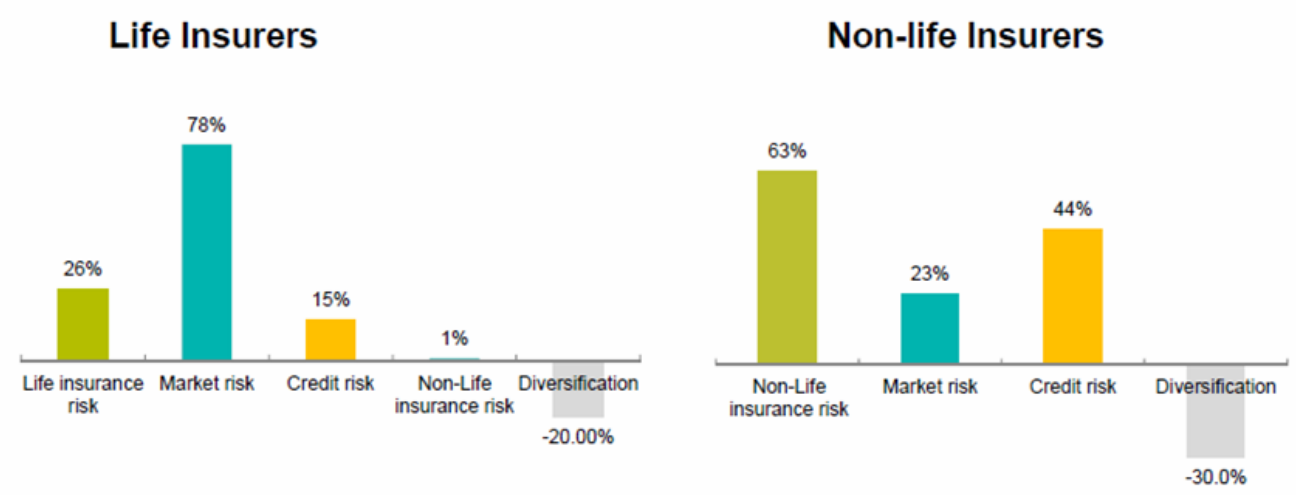


Source: CIRC's presentation

For life insurers, minimum capital consumption by risk in order of decreasing size was market risk, life insurance risk, credit risk and non-life business risk. The diversification effect was 20%.

For non-life insurers, the minimum capital consumption by risk in order of decreasing size was non-life business risk, credit risk and market risk. The diversification effect was 30%.

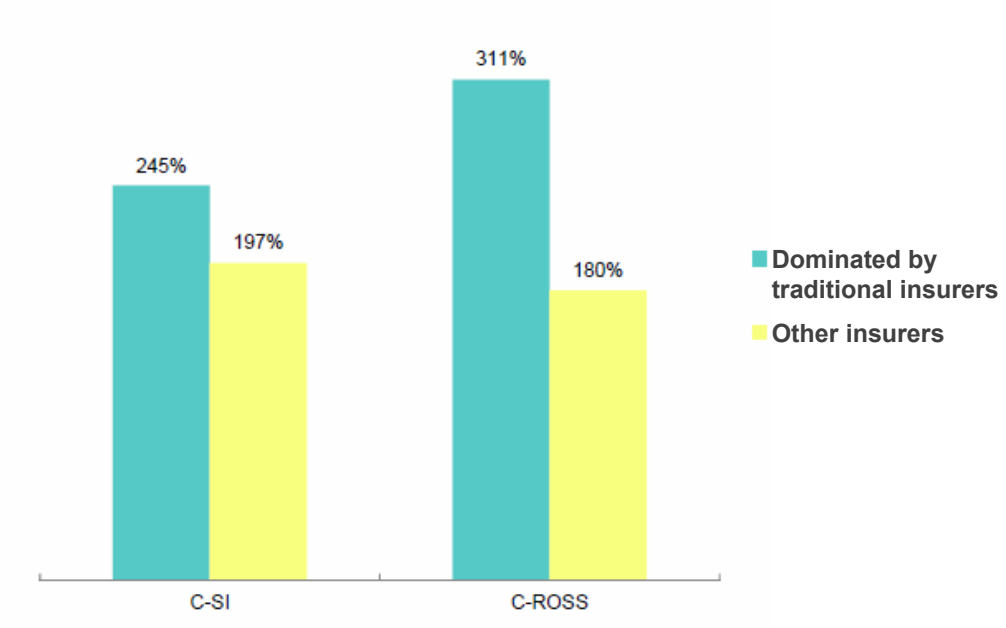
FIGURE 10: MIX OF MINIMUM CAPITAL BY LEVEL I RISKS



Source: CIRC's presentation

Life insurers with more traditional products tended to have higher solvency ratios than other life insurers.

FIGURE 11: C-ROSS IMPACT VARIES BY LIFE INSURERS



Source: CIRC's presentation

Trial run results

On 22 July 2015, CIRC announced the results of the first C-ROSS trial run as of Q1 2015. The solvency adequacy ratios stood at 264%, 282%, 256% and 383% for the whole insurance industry, property and casualty insurance companies, life insurance companies and reinsurance companies, respectively. CIRC concluded that the risk capital charge reflected the real risk profile of the insurance industry. The regulator also stated that the results showed positive changes in areas such as business development, marketing strategy and risk management of insurance companies under the guidance of C-ROSS.

Compared with C-SI, about one-third of the companies' solvency adequacy ratios increased under C-ROSS, including life insurance companies with higher business mix in long-term business, while about two-thirds of the companies' experienced lower solvency adequacy ratios. Thirteen insurance companies posted solvency adequacy ratios below the minimum requirement, including seven life companies with a high concentration in the so-called 'high-cash-value' products and/or aggressive investment strategies. CIRC stated that solvency positions had significantly improved in Q1 2015 compared with the field test results in Q2 2014. We note that this overall industry result is perhaps heavily weighted by the results of large companies which generally recorded improved results.

Challenges in C-ROSS implementation

Life insurers are facing serious challenges in C-ROSS implementation in areas such as:

- The complexity of the MC calculations. The production of C-ROSS results is a complicated process involving many systems, tools, sources of data and cooperation from different departments. It also requires efficient modelling and reporting processes. Regular and timely C-ROSS reporting means significant additional workload for companies.
- For Pillar II, substantial effort will be required to establish risk and capital management frameworks that meet the CIRC requirements. Insurers will be rated by the CIRC on compliance.

Pillar III requires public disclosure. Turnaround time can be short, and accurate, high-quality reporting is required. Life insurers will need to consider ways to streamline the reporting process and to automate much of the work in order to shorten reporting time and reduce operational risks. Assets will need to be explicitly modelled, which is not common currently in the industry. Companies will also need to increase their efforts to acquire advanced modelling skills.

Impact on EV and VNB

The new capital standard will need to be incorporated in many areas, including product pricing, capital planning, business planning, embedded value (EV) and value of new business (VNB) calculations. The most important area for life insurers could be related to EV and VNB reporting.

It is difficult to estimate the impact on EV and VNB at this stage. On one hand, the statutory (or solvency) reserves may reduce, which should result in an acceleration of statutory profits. On the other hand, capital requirements may increase, leading to higher cost of capital. The precise impact on EV and VNB will depend upon the specifics of each company's product and asset portfolios in particular.

CIRC may consider TVOG in EV calculation as using the similar approach as is used in C-ROSS. It would move Chinese insurers from Traditional EV to more similar to European EV method.

Solvency ratio volatility

Mainly due to market risks, solvency ratios will be difficult to predict and manage since both sides of the balance sheet are subject to market forces. Skills in investment strategy and asset-liability management will need to be greatly enhanced. The need for hedging or reinsurance solutions will increase at a time when the market for financial derivatives is still in its infancy.

Companies will need to better establish their risk appetite frameworks and set sufficient buffers in their capital management for adverse scenarios to protect their solvency ratios, as companies in Europe are doing in preparation for Solvency II. Many insurers will need to make significant investments in enhancing these capabilities.

Capital requirements will also be sensitive to credit rating downgrades in a market where credit risks are perceived to be accumulating to a tipping point where defaults could start to show. Lower credit ratings lead to higher capital charges.

The change in the capital requirements combined with increased volatility in solvency adequacy ratio and modified profitability profiles are some of the major challenges in moving to a risk-based capital regime. Senior management must understand and integrate these new realities within the daily management of businesses.

Other potential impacts

C-ROSS may promote asset mix shifts, as different types of assets have different risk factors for market and credit risks. The accounting basis (amortised cost or fair value) used for assets could have significant impact on capital requirements. The more advanced insurers will invest in an integrated investment strategy, capital strategy and risk appetite system. Many insurers started proactively managing their interest rate risk and reducing ALM mismatch from the end of 2014.

On the products front, the new capital standard may change the profitability of products in different ways and provide new perspectives for product review. Given the lack of long-term fixed income assets in China, the asset/liability mismatch will make traditional long-term savings products more capital-intensive than previously. We may expect a shift in strategy toward more protection and unit-linked products, although this may be challenging in practice given ingrained consumer preferences. We can expect greater focus on rationalisation between product lines for capital efficiency.

Risk management will become a significant long-term positive for the industry. C-ROSS will elevate the importance of risk management within insurers and incentivise risk mitigation given the requirements to establish risk and capital management framework and to implement regular reporting.

C-ROSS may also drive industry consolidation, as it could materially change the risk and reward equation for some owners of the insurance companies. This could take the form of companies looking to divest capital-intensive blocks of business as they seek capital optimisation.

C-ROSS brings about a new era in China's insurance market. The whole insurance industry has spent and will continue to invest significant resources to install the necessary systems and controls. In the end, we expect that the new capital regime will bring about far-reaching changes to the life insurance industry in China.

Section 4 Comparisons with European Solvency II and Singapore RBC2

When designing the new solvency capital regime, CIRC studied the major solvency regimes around the world. One of the goals was to make C-ROSS comparable to international standards without losing touch with the specifics of its own market, with particular recognition of the fact that China's insurance market is still young.

Key variances

In comparison with Europe's Solvency II and Singapore's RBC2, C-ROSS has notable differences in the following areas.

Asset valuation

Under Solvency II and RBC2, asset valuation marks to market. Under C-ROSS, asset valuation follows China GAAP accounting value basis, under which assets categorised as trading or available for sale (AFS) are held on a fair value basis and the other assets are held on a book value basis. The value of long-term equity investments follows the equity accounting method. In C-ROSS, interest rate risk and credit spread risk are applied only to assets accounted on a fair value basis, while assets on amortised cost basis or historical cost basis are subject to counterparty default risk but not interest rate risk and credit spread risk.

Discounting yield

Under Solvency II and RBC2, the base yield curve for liability discounting is the current risk-free curve (swap rates are used for Solvency II and Singapore government bonds are used for RBC2), while C-ROSS utilises the 750-day moving average of the government bond yield curve. Under C-ROSS, a risk margin, depending on the product type, is added to the base yield curve. An uplift to the base yield curve also applies under Solvency II and RBC2, but the conditions and amplitude of the uplift vary between the different regimes.

TVOG

Under Solvency II, the cost of options and guarantees is a core element of the best estimate liability. Under RBC2, options and guarantees are explicitly excluded. C-ROSS utilises a factor-based approach whereby TVOG equals PV of benefits multiplied by factors prescribed by CIRC. The TVOG factors are based on adjusted residual durations and guaranteed interest rates.

Real estate risk

The risk charge factors for real estate investment under C-ROSS are much lower than the requirements under Solvency II and RBC2.

Overseas asset risk

Under C-ROSS, overseas assets carry specific risk charges based on asset types (overseas fixed income and overseas equity) and market types (developed and emerging markets). This is in addition to currency risk charges. There is no specified risk charge for overseas assets under Solvency II (except for equity investment outside of the OECD which has a higher capital charge than the equity investments within the OECD) and RBC2, except for currency risks.

Currency risk

The risk charge for currency risk under C-ROSS is much lower than the risk charges under Solvency II and RBC2.

Operational risk

Under Solvency II and RBC2, factors are applied to obtain operational risk charges. Under C-ROSS, operational risk is categorised as unquantifiable risk and there is no capital required for operational risk in Pillar I. Rather, operational risk is indirectly charged in Pillar II in the form of control risks as part of the requirements for an effective risk management framework.

Credit spread risk

Credit spread risk is categorised within market risks under Solvency II, while it falls in C2 risk under RBC2. In C-ROSS credit spread risk falls in credit risk under C-ROSS. The methods for MC calculation are comparable among these regimes.

SARMRA

Comparing the Own Risk and Solvency Assessment (ORSA) in Solvency II to SARMRA reveals some key differences:

- ORSA is an insurer's own assessment, while SARMRA requires the regulator to do the assessment and give insurers their scores annually.
- SARMRA will have a direct impact on the level of capital required to be held to cover the control and operational risk within the company. A score on the SARMRA higher than 80 will result in a MC reduction, and inversely, will result in an increase in MC if the score is below 80. SARMRA is a well defined process which insurers can undertake internally and hence determine prior to speaking to the regulator whether they will have a capital add-on or capital reduction. Under Solvency II, any capital add-ons are a totally discretionary element which gives insurers less certainty in how it is derived.
- ORSA gives insurers more room to use internal models, which are not allowed in C-ROSS.

Technical comparisons

Table 9 is a technical comparison of the three regimes.

TABLE 9: TECHNICAL COMPARISONS BETWEEN C-ROSS, EUROPE SOLVENCY II AND SINGAPORE RBC2

Items		China C-ROSS Pillar 1	Europe Solvency II Pillar 1 (Standard Formula)	Singapore RBC2
Asset	**Asset valuation**	The value of long-term equity investment should follow equity accounting method. Other asset values follow China GAAP accounting basis, under which assets categorised as trading or AFS are valued on fair value basis and the other assets are valued on book value basis.	Fair value	Fair value
Liability	**Liability valuation**	Gross premium valuation	Gross premium valuation	Gross premium valuation
	Risk margin (PAD)	Yes	Yes	Yes
	Discount rate	Base interest curve with risk margin. The base curve is 750-day moving average of government bond yield curve. Higher risk margin applies for high-interest rate guarantee products which were issued before 1999; lower risk margin is applied for universal life, investment-linked, variable annuities and high-cash-value products; other products have medium risk margin.	Swap curve rate plus an interest rate uplift, a volatility adjustment or matching adjustment depending on the product type and other qualifying criteria (see 'Allowance to partially offset movement of asset price' below for further details)	Singapore government bond yield curve plus a matching adjustment for qualifying business lines (see 'Allowance to partially offset movement of asset price' below for further details)
	Cost of options and guarantees	Yes – factor-based approach	Yes – stochastic evaluation	No
Market risk charge (C2 risk charge under RBC 2)	**Interest rate risk charge**	Interest rate up/down shocks are applied as a % change. The up shocks are slightly more severe than the down shocks.	Interest rate up/down shocks are applied as a % change. The up shocks and down shocks are quite symmetrical.	Interest rate up/down shocks are applied as a % change. The up shocks are slightly more severe than the down shocks.
	Equity risk charge	Different factors are applied for different types of equities: listed equity, unlisted equity, securities investment fund, convertible bond, equity investment plan on infrastructure. Factors for equity risk charge range from 4.8% to 60%. Taking listed common stocks as an example, factors range from 23% to 60%.	The equity risk charge is 39% for type 1 exposure and 49% for type 2 exposure, and then there is a dampener of +/- 10% depending on the current position of the market relative to the expected trend.	Singapore and developed market equities: 40% Equities listed in other markets: 50% Unlisted equities: 60%
	Property risk charge	Different factors are applied depending on method of valuation, variation of real estate market value, real estate's weight in total admitted asset and location of the real estate. Factors for real estate risk charge range from 6% to 15%.	25% on immovable properties	30% on immovable properties and 35% on collective real estate investment vehicle

Items		China C-ROSS Pillar 1	Europe Solvency II Pillar 1 (Standard Formula)	Singapore RBC2
	Overseas asset risk charge	Risk for overseas assets is charged differently from risk for local assets. For overseas assets, different risk factors are applied to different asset types (overseas fixed income and overseas equity) and different market types (developed market and emerging market).	N/A	N/A
	Currency mismatch risk charge	Risk factor is applied to foreign currency net position (asset - liability). Risk factor is 3.5% for USD, 3.675% for euro & GBP and 3.92% for other foreign currencies. The total risk charge is the arithmetic aggregation of risk charge on each foreign currency.	For each foreign currency, the risk charge is 25% of the absolute of the currency's net position. The total currency mismatch risk is the sum of risk charges of all foreign currencies.	The higher of (a) 12% of the aggregate of net positions in all currencies where the net position is positive and (b) 12% of the absolute for currencies where it is negative.
	Spread risk	Spread risk falls in credit risk (not market risk) in C-ROSS. It is a factor shock that is based on credit rating and duration is applied on the value of the credit risk exposure.	Spread risk falls in market risk under Solvency II. It is a factor shock that is based on credit rating and duration is applied on the value of the credit risk exposure.	Spread risk falls in C2 risk under RBC 2. It is a basis point credit spread shock is applied based on credit rating and duration of the securities.
	Diversification	The market sub-risks are combined to an overall capital risk charge for market risk using a correlation matrix as shown in Table 3.	The market sub-risks are combined to an overall capital risk charge for market risk using a correlation matrix as shown in Table 10.	Under RBC 2, the various market risk charges have been calibrated to implicitly allow for diversification.
Credit risk charge (C3 risk charge under RBC 2)	**Counterparty default risk**	Counterparty default risk is calculated as a factor shock based on asset type and credit rating applied to the value of risk exposure.	Calculated based on estimated 'loss-given default' and probability of default (which are based on credit ratings).	A default risk charge based on credit rating and outstanding exposure is applied.
Insurance risk charge (C1 risk charge under RBC 2)	**Mortality risk charge**	10% - 20% shift upward to mortality rates depending on number of basic policies of life business	15% shift upward to mortality rates	20% shift upward to mortality rates
	Catastrophe risk charge	+1.8 death per 1,000 to mortality for the next 12 months	+1.5 death per 1,000 to mortality rates	+0.5 death per 1,000 to mortality rates; +40 hospitalisation claims per 1,000 to rates
	Longevity risk charge	Shift downward to mortality rates based on future policy duration. Accumulated adjustment factor is used, annual decrease ratio is 3% for the first 5 years, 2% for years 6-10, 1% for years 11-20, 0% for years after 20.	20% shift downward to mortality rates	25% shift downward to mortality rates
	Morbidity risk charge	20% shift upward to morbidity assumptions, medical loss ratios and other incident rates	35% shift upward to disability/morbidity rates in the 1st 12 months; +25% in second 12 months; +20% thereafter	20% shift upward to disability rates; 40% shift upward to DD and other insured events if premium is guaranteed and 30% shift upward if premium is non-guaranteed

Items		China C-ROSS Pillar 1	Europe Solvency II Pillar 1 (Standard Formula)	Singapore RBC2
	Lapse risk charge	Maximum of lapse rate deviation risk charge and mass lapse risk charge. Lapse rate deviation risk charge: +/- (30% to 40%) to lapse rates depending on number of basic policies of life business; mass lapse risk charge: +150% to lapse rates for the next 12 months.	MAX(+/-50% to lapse rates, Mass Lapse of 40% at time 0)	+/-50% to lapse rates
	Expense risk charge	10% to expense	10% to expense and +1% to inflation rate	20% in the 1st year; 10% thereafter
	Conversion of options	None	None	+/-50% to conversion rates
	Revision	None	+3% to annual amount payable for annuities exposed	None
	Diversification	Risk charge for incidence rate risks is calculated using a correlation matrix shown in Table 5 and overall insurance risk is calculated using a correlation matrix shown in Table 6.	Correlation matrix shown in Table 11 is applied to all insurance risks.	Correlation matrix shown in Table 12 is applied to mortality, longevity, morbidity and catastrophe risks only.
Operational risk charge		There is no capital required for operational risk in Pillar 1 under C-ROSS. Risk management requirements on operational risk exist in Pillar 2, which can have impact to total capital required.	The calculation consists of applying factors to the past one-year gross premium income and policy liabilities (excluding investment-linked products); and taking whichever is higher. This is then capped at 30% of total capital requirements before operational risk charge. For investment-linked products, a factor of 25% is applied to the past one-year expenses and added to the final sum. Factors: 4% on gross premium income 0.45% on policy liabilities	The calculation consists of applying a factor to the two components, namely: three-year historic average gross premium income and gross policy liabilities; and taking whichever is higher. This is then capped at 10% of total capital requirements before operational risk charge. Factors: 4% on gross premium income and policy liabilities (excluding ILP) 0.25% on gross premium income and policy liabilities of ILP
Diversification among various risk modules		C-ROSS allows diversification benefits among insurance risk, market risk and credit risk.	Solvency II allows for diversification benefits among all risk modules.	RBC2 allows for diversification benefits between C1 and C2 risk charges.
Allowance for discretionary benefits		When unexpected losses happen, insurers can adjust non-guaranteed benefit cash flows for participating and universal life business based on management actions to absorb all or partial losses, which reduces the capital requirement.	Loss-absorbing capacity is taken into account for all shock scenarios (For example, when investment returns drop, bonuses to policyholders are reduced through the management actions that are implemented in the model). A cap, equal to the loss-absorbing capacity in the best estimate, is applied on the total loss absorption that is taken into account in stress scenarios to avoid double counting of the loss-absorbing capacity.	For participating products, policy liability is effectively set equal to value of par fund assets. Minimum of policy liability - MCL (minimum conditional liability which is PV of guaranteed benefits discounted at risk free rate) and 50% of allowance for non-guaranteed benefits can be used as financial resource to support capital requirement.

Items	China C-ROSS Pillar 1	Europe Solvency II Pillar 1 (Standard Formula)	Singapore RBC2
Treatment for negative reserves	Insurers are allowed to have negative best estimate reserves. The negative reserves are fully recognised in the balance sheet, while cash value guarantee is applied to floor reserves at (CV-MC) at the total company level.	Insurers are allowed to have negative best estimate reserves. The negative reserves are fully recognised in balance sheet.	Only part of negative reserves (50% for participating and non-participating and 25% for unit linked products) is recognised as positive adjustment in financial resource used to support capital requirement.
Allowance to partially offset movement of asset price	None	The matching adjustment and volatility balancer are allowed in Solvency II. The matching adjustment is for illiquid and pre-defined liabilities – for example, life time annuities without participation. This will primarily be used in the UK. The volatility balancer is for business not affected by the matching adjustment. Basically it is an uplift to the base yield curve to remove some of the effects of the volatility in the interest rates.	Matching adjustment is allowed as a parallel upward adjustment to the risk-free rate discount rate for certain business. The adjustment is the spread of the weighted average yield-to-maturity of the asset portfolio over the average risk-free discount rate, less the spread for default and downgrade. Criteria for eligibility is very strict (on predictability of liability, asset class and asset-liability matching).

TABLE 10: CORRELATION MATRIX FOR MARKET RISK CHARGE UNDER EU SOLVENCY II

	Interest Rate Risk	Equity Risk	Property Risk	Spread Risk	Currency Risk	Concentration
Interest Rate Risk	1	0	0	0	0.25	0
Equity Risk	0	1	0.22	0.75	0.25	0
Property Risk	0	0.22	1	0.5	0.25	0
Spread Risk	0	0.75	0.5	1	0.25	0
Currency Risk	0.25	0.25	0.25	0.25	1	0
Concentration	0	0	0	0	0	1

TABLE 11: CORRELATION MATRIX FOR INSURANCE RISKS UNDER EU SOLVENCY II

	Mortality	Longevity	Disability	Lapse	Expense	Revision	CAT
Mortality	1	-0.25	0.25	0	0.25	0	0.25
Longevity	-0.25	1	0	0.25	0.25	0.25	0
Disability	0.25	0	1	0	0.5	0	0.25
Lapse	0	0.25	0	1	0.5	0	0.25
Expense	0.25	0.25	0.5	0.5	1	0.5	0.25
Revision	0	0.25	0	0	0.5	1	0
CAT	0.25	0	0.25	0.25	0.25	0	1

TABLE 12: CORRELATION MATRIX FOR C1 RISKS UNDER SINGAPORE RBC2

	Mortality	Longevity	Other insured events	Dread disease	CAT (mortality)	CAT (morbidity)
Mortality	1	-0.25	0.5	0.5	0.25	0.75
Longevity	-0.25	1	0	0.25	0	0.25
Other insured events	0.5	0	1	0.5	0.75	0.5
Dread disease	0.5	0.25	0.5	1	0.5	0.25
CAT (mortality)	0.25	0	0.75	0.5	1	0.75
CAT (morbidity)	0.75	0.25	0.5	0.25	0.75	1

Section 5 Observations on C-ROSS

Simplifications to meet market characteristics

One of the core principles of C-ROSS is to reflect 'the characteristics of the China market.' The Chinese insurance market is still in a developmental stage. In 2014, the premium volume was more than USD 320 billion for the insurance industry, with life insurance accounting for more than USD 200 billion. Levels of insurance penetration (at 3.18% of GDP) and insurance density (at USD 237.2 per capita) are far below those of more developed countries. Many mid-sized and small insurance companies are still in the early stage of development. These companies are fewer than 10 years old, with limited experience in risk management. C-ROSS has adapted international best practices to the nature of the Chinese market and provided for simplifications where deemed necessary.

- The methodology chosen for asset and liability valuation is generally considered the most appropriate for current China market on the grounds that:
  - The valuation of the long-term equity investment follows the equity accounting method under which any goodwill in the investment is included. Other asset valuations follow the China GAAP accounting value basis, under which assets categorised as trading or AFS are valued on a market value basis and the other assets are valued on a book value basis. The admitted asset value is therefore to a large degree the same as the accounting value under China GAAP basis, which means that it can be directly extracted from current GAAP balance sheet with minor adjustments for non-admitted assets.
  - The method to determine the discounting yield under C-ROSS is similar to the method used for the valuation of China GAAP liabilities. The base yield curve is the 750-day moving average of government bond yield curve with an adjustment for the ultimate rate. Three different margins for risk are applied to the yield curve depending on the nature of the underlying line of business. Although this approach has less volatility than marking-to-market of the discount rate, the total balance sheet volatility could end up increasing if the assets are fully marked-to-market. The liability cash flows under C-ROSS should be comparable to liability cash flows under the China GAAP basis.

A simplified approach has been implemented for the TVOG calculation but with a tacit understanding that additional evolution of the framework might be needed in the future. It is summarised below:

- The TVOG calculation under C-ROSS is a factor-based approach. TVOG equals PV of benefits multiplied by factors prescribed by CIRC. The TVOG factors are based on adjusted residual duration and guaranteed interest rate, which are the same for participating business, universal life and VA products.
- In previous consultation papers, three to five economic scenarios with equal weights were considered. The TVOG was determined comparing the results from these scenarios to the base scenario. The choice of the three to five scenarios obviously has a significant impact on the value. This scenario approach was replaced by the factor-based approach in the latest rules.

The simplified approach was put forward as it was not considered practical to require stochastic modelling for life companies in China at this point in time.

That said, we think it is a positive step to consider TVOG as an explicit part of the liability because this recognises the additional risk associated with these elements. In addition, it provides for easy evolution of the framework, as and when the market is considered to have the technical capacity to take on more complex stochastic calculations.

The current TVOG approach and the factors applied will be tested as and when different real economic environments are encountered. If the factors are not updated regularly, it could result in significant deviation between the C-ROSS charge and the actual TVOG for the products being sold. It is our belief that companies should aim to understand the true TVOG of their products at product design and pricing to ensure that they are not exposed to excessive risk in this area, especially given the recent moves to deregulate pricing interest rates.

Analysis and comment on regulatory rules

Capital charge on equity

- For investment on common stock, C-ROSS rules include a counter-cyclical adjustment which is based on the difference between the purchase price and the current market value. As this difference increases, the capital charge factor increases, and vice versa. If a company is in a difficult capital position, this can give a perverse incentive to turn over their portfolio of common stock to increase its purchase price before the reporting date in order to reduce the overall capital requirements.
- The base risk factors of capital charge on stock funds and hybrid funds are lower than the base risk factors of direct investment in common stock. The base risk factor of hybrid fund is 20%, while the base risk factors of common stock are 31% to 48% depending on stock types (index component stock, middle and small-cap stock or ChiNext stock). CIRC encourages insurers to invest in investment funds as the risk is diversified, as opposed to a direct investment in common stock. This could incentivise insurers or fund managers to develop tailor-made stock funds or hybrid funds with a very low bond exposure in order to maximise equity exposure whilst minimising the capital charge.

Capital charge on reinsurance assets

- With respect to reinsurance, the domestics (e.g., China Re) will have a capital advantage under C-ROSS because of significantly higher-risk charge factors imposed on offshore reinsurers. The risk factor of China Re is only 0.5%, while the base risk factors are 19.2% and 58.8% for offshore reinsurers meeting the regulatory solvency requirement with collateral and without collateral, respectively. The capital advantage currently enjoyed by international reinsurers with affiliates in China will be eliminated under the new regime. In the past, international reinsurers with affiliates in China were able to meet the local solvency requirements using the solvency ratios of their parents, without having to hold the capital in their local affiliates.
- This situation may cause more business to be ceded to domestic reinsurers or international reinsurers with local affiliates. More insurance risk will be kept onshore. If the domestic reinsurer and international reinsurers with local affiliates have to transfer and cede the business again to offshore reinsurers, it will increase the overall reinsurance cost of whole industry.
- To be able to compete and win business, international reinsurers with affiliates will have to inject capital into local affiliates and keep local capital adequacy ratios at a high level on an ongoing basis. Offshore reinsurers will have to consider entering the Chinese market to set up branches if they want to sustain their business.
- As the risk factor can be lower (10% decrease) for an offshore reinsurer under same group as the ceding insurer, some insurers may consider acquiring offshore reinsurers to help minimise capital. With the further opening of China reinsurance market, there should be more domestic reinsurers and local insurers willing to apply for a reinsurance license in the future, given that China Re is currently the only domestic reinsurer in the market.

Capital charge on interest rate risk

- For life business, the capital charge for interest rate risk derives from both the asset and liability sides of the balance sheet. Asset and liability management will be very important for C-ROSS capital management. Given the typical long life insurance policy durations and fixed income asset durations of normally less than 10 or 15 years in China, durational matching should become more of a focus.
- As only assets under fair value basis will be impacted by interest rate shocks, insurers should consider the capital charge impact due to accounting basis category within their investment strategy. Life insurers should retain a major proportion of fixed income assets under fair value basis. That said, a change of accounting basis could increase the volatility of a company's earnings. If insurers move to AFS assets, they can end up in a situation where in the short term they are exposed to interest rate up movements on the asset side but little movement on the liability side since discount rate for liabilities is a 750-day moving

average. The opposite can be true as well. This can make asset and liability management particularly difficult.

- In the face of C-ROSS, some insurers have already been proactively managing their interest rate risk and reducing ALM mismatch by:
  - Investing more in government bonds to increase asset duration
  - Classifying new bond investments to AFS instead of HTM

Capital charge on overseas assets

- Overseas investment assets mainly include overseas fixed income investment assets, overseas equity investment assets and overseas real estate assets. The capital charge on overseas assets is not significantly higher than for domestic investments. The capital charge for emerging market overseas assets is much higher than for developed market overseas assets. The capital charge for overseas real estate assets is comparable with domestic real estate assets. Even considering the capital charge for currency risk (3.5% to 3.92% by currencies), the overall capital charge for overseas assets is not prohibitively high, unlike in some other developed market solvency capital regimes. This approach appears to be consistent with the government's policy in encouraging insurers to expand overseas.
- Under current regulations, a maximum 15% of an insurer's total assets can be invested overseas. Considering capital consumption, risk level and investment return as a whole, if insurers have good opportunities to invest overseas in developed markets, it should be possible to control capital requirement to an acceptable level. In some cases, the capital charge on overseas investments may be lower than for the same type of domestic investment.

Risk margin

- Under current regulatory rules, the risk margin is determined by a scenario-comparison method, which is similar to adding a provision for adverse deviation (PAD) to best estimate assumptions. Insurance assumptions used to calculate the PV must meet the relevant regulatory requirements and hence be within the assumption caps and floors prescribed by CIRC. For insurers with good operating experience and who are affected by these cap or floors, a double counting of the PAD will occur as they implicitly already have some conservatism built into the best estimate assumptions. Such an approach could become detrimental to insurers with good operating experience.
- CIRC stated that the cost-of-capital method for risk margin will be released at a later stage. It is not clear what the detailed method and its impact will be. If both methods are allowed, it will also make comparison difficult.

Cash value guarantee

- Life insurers should consider cash value guarantee if CV is higher than sum of policy liability and MC at total company level. It means that the admitted value related to life insurance liability should be floored at (CV - MC). This implies that in certain situations, the change of MC will impact available capital. As a result, the increase in the MC can have the impact of increasing the available capital, which will partially offset the adverse impact to solvency adequacy ratio.
- Questions remain around whether, given that the capital charge on lapse risk and regulatory requirements on liquidity risk management are meant to fully cover the lapse and liquidity risks, it is appropriate to further consider a cash value guarantee on the admitted liability.
- Market information shows that some insurers may have triggered the cash value guarantee at the end of 2014 and Q1 2015.

Loss-absorbing adjustment/management action

- A loss-absorbing adjustment is considered in the final step of total MC of quantitative risks. It is not considered in the capital charge calculation under each risk shock. CIRC has prescribed the formula and

rules to determine the allowable loss-absorbing adjustment. It is equal to MC of market risk and credit risk combining participating and universal life funds multiplied by adjustment ratios. Some prescribed parameters are used to determine the adjustment ratio to restrict the amount of loss-absorbing adjustment.

Rules of integrated risk rating and SARMRA

- In the current Chinese market, it was considered difficult to allow insurers to develop internal models to do their own solvency risk assessments. Therefore CIRC released the rules and detailed requirements for the integrated risk rating and SARMRA. All insurers follow the same rules to derive their risk ratings and SARMRA scores.
- The regulator will assess the overall risks of insurance companies quarterly and SARMRA scores annually. This will present a serious challenge for the regulator, given the demands on CIRC's technical and professional staff. CIRC may do this centrally, or arrange related provincial bureaus to assess the local insurers, or delegate to independent third-parties to perform assessments. If third-party consultants helped insurers to implement or reivew the requirements of Pillar II, there could be conflicts in taking on the CIRC assistance role, especially given some of the subjectivity involved. The key issue for CIRC will likely be how to maintain the same assessment standards across the whole country.
- In July 2015, CIRC started its 'trial run' assessment of SARMRA. This was a combination of self-assessment by insurers and sample reassessment by bureaus delegated by CIRC. The whole process will be finished around November and CIRC will summarise the results and announce the final rules in January 2016.

It is quite normal for the development of any regulatory regime to be somewhat evolutionary. Some rules and methodologies can only be fully verified after implementation. At the current stage, many rules of C-ROSS are still under testing and may be revised after the initial trial run period. C-ROSS will definitely involve an ongoing process of improvement and revision.

Section 6 Appendix A: Regulatory rules on insurance assumptions

Maintenance expense assumption

For the maintenance expense assumptions used in the BER calculation, excluding the expenses on renewal commissions, insurance guarantee fund charge and CIRC regulatory charge which are set at actual level, the other maintenance expense assumptions should take into account future inflation and observe the following rules:

- The expense assumptions used should be no lower than the relevant expense budget approved by the insurer's board or management, which means that the expense overrun on these other maintenance expenses is considered.
- The expense assumptions used should be no lower than the floor set by CIRC unless insurers have appropriate evidence to prove that their actual maintenance expenses over the past three years are no more than 105% of their own expense assumptions.

Based on the premium volume in the prior year and the number of long-term base policies, CIRC categorises insurers into five groups. Each group has different floor of expense assumption as shown in Table A1.

TABLE A1: INSURER GROUPINGS FOR EXPENSE FLOOR PURPOSE

	Premium Income Prior Year (Unit: RMB 100 Million)	Number of Total In-Force Base Policy of Long-Term Insurance (Unit: 10,000)
Group 1	>=1000	>=2000
Group 2	>=200	>=500
Group 3	>=50	>=200
Group 4	>=20	>=50
Group 5	Others	Others

The expense floors are shown in Table A2. For those sales channels not covered in Table A2, insurers can use their own assumptions.

TABLE A2: FLOORS OF EXPENSE ASSUMPTIONS

For Base Policies							
Insurer Group \ Channel		Agency	Bancassurance	Group	E-business	Telemarketing	Broker
Group 1	Per Premium	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
	Per Policy (RMB/each policy year)	40	30	15	15	40	40
Group 2	Per Premium	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Per Policy (RMB/each policy year)	60	50	30	30	60	60
Group 3	Per Premium	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Per Policy (RMB/each policy year)	100	80	60	60	100	100
Group 4	Per Premium	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
	Per Policy (RMB/each policy year)	120	100	80	80	120	120
Group 5	Per Premium	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
	Per Policy (RMB/each policy year)	150	120	100	100	150	150
For Riders							
Insurer Group \ Channel		Agency	Bancassurance	Group	E-business	Telemarketing	Broker
Group 1	Per Premium	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
	Per Policy (RMB/each policy year)	10	10	5	5	10	20
Group 2	Per Premium	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Per Policy (RMB/each policy year)	20	20	10	10	30	40
Group 3	Per Premium	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Per Policy (RMB/each policy year)	20	20	10	10	30	40
Group 4	Per Premium	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
	Per Policy (RMB/each policy year)	30	30	20	20	40	50
Group 5	Per Premium	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
	Per Policy (RMB/each policy year)	30	30	20	20	40	50

The floor of inflation assumption for per policy expense is 2% annually.

Lapse assumption

Insurers should determine best estimate lapse assumptions based on their own lapse experience (including premium persistency rate and partial withdrawal rate). Those insurers who cannot provide appropriate supporting material to the CIRC to show the reasonability of lapse assumptions should take the following steps to set up the lapse assumptions used in BER:

- Use appropriate method to set lapse rate assumptions.
- Set assumptions by following the prescribed ranges determined by CIRC.
- Calculate the PV by using the assumptions set in step 1) and step 2) above respectively and choose the one which produce the higher PV at each product level.

$Max(PV_{\text{OWN}}, PV_{\text{Prescribed Rang}})$

PV_{OWN} stands for PV based on insurers' own best estimate lapse assumptions.

$PV_{\text{Prescribed Rang}}$ stands for PV based on lapse assumptions set up by following the prescribed ranges determined by CIRC.

For high-cash-value products, the lapse rate floor determined by CIRC is shown in Table A3.

TABLE A3: LAPSE FLOOR OF HIGH-CASH-VALUE PRODUCT

Expected Actual Insurance Period \ Policy Year	1	2	3	4	5+
(0, 1 year]	60%	3%	3%	3%	3%
(1 year, 2 years]	3%	60%	3%	3%	3%
(2 years, 3 years]	3%	20%	60%	3%	3%
(3 years, 4 years]	3%	3%	20%	60%	3%

For traditional, participating, universal life and unit-linked products, the lapse rate ranges determined by CIRC are shown in Table A4, A5, A6 and A7 separately. The ranges for partial withdrawal rate and premium persistency rate for universal life and unit-linked are shown in Table A8 and A9.

TABLE A4: LAPSE RATE RANGE OF TRADITIONAL PRODUCT

Policy Year	1	2	3	4	5	6~10	11+
Agency Single Pay	2%~5%						
Agency Regular Pay	15%~25%	7%~15%	5%~10%	4%~6%	3%~5%	2%~5%	2%~5%
Bancassurance Single Pay	3%~5%						
Bancassurance Regular Pay	10%~20%	6%~10%	5%~8%	3%~5%	3%~5%	2%~5%	2%~5%

TABLE A5: LAPSE RATE RANGE OF PARTICIPATING PRODUCT

Policy Year	1	2	3	4	5	6~10	11+
Agency Term Single Pay	2%~5%	2%~5%	2%~5%	2%~5%	2%~5%	2%~5%	2%~3%
Agency Term Regular Pay	10%~25%	5%~10%	4%~8%	3%~5%	3%~5%	3%~5%	2%~5%
Agency Endowment Single Pay	2%~5%	2%~5%	2%~5%	2%~5%	2%~5%	2%~5%	2%~3%
Agency Endowment Regular Pay	10%~25%	5%~10%	4%~8%	3%~5%	3%~5%	2%~5%	2%~5%
Agency Whole Life Single Pay	2%~5%	2%~5%	2%~5%	2%~5%	2%~5%	2%~3%	2%~3%
Agency Whole Life Regular Pay	13%~25%	7%~15%	5%~8%	5%~8%	3%~5%	3%~5%	2%~5%
Bancassurance Term Single Pay	3%~5%						
Bancassurance Term Regular Pay	10%~20%	4%~10%	3%~5%	2%~5%	2%~5%	2%~5%	2%~5%
Bancassurance Endowment Single Pay	3%~5%						
Bancassurance Endowment Regular Pay	10%~15%	5%~10%	4%~8%	3%~5%	3%~5%	2%~5%	2%~5%
Bancassurance Whole Life Single Pay	3%~5%						
Bancassurance Whole Life Regular Pay	10%~15%	4%~8%	3%~5%	3%~5%	3%~5%	3%~5%	3%~5%

TABLE A6: LAPSE RATE RANGE OF UNIVERSAL LIFE PRODUCT

Policy Year	1	2	3	4	5	6~10	11+
Agency Single Pay	3%~15%	3%~15%	3%~15%	3%~15%	3%~15%	3%~15%	3%~15%
Agency Regular Pay	5%~20%	5%~10%	5%~8%	5%~8%	5%~8%	3%~7%	3%~7%
Bancassurance Single Pay	2%~5%	2%~5%	3%~15%	5%~25%	5%~25%	5%~25%	5%~25%
Bancassurance Regular Pay	10%~20%	5%~10%	5%~8%	5%~8%	5%~8%	5%~8%	5%~8%

TABLE A7: LAPSE RATE RANGE OF UNIT-LINKED PRODUCT

Policy Year	1	2	3	4	5	6~10	11+
Agency Single Pay	10%~15%	10%~15%	10%~15%	10%~15%	10%~15%	10%~15%	10%~15%
Agency Regular Pay	5%~20%	5%~15%	5%~10%	5%~10%	5%~10%	5%~10%	3%~10%
Bancassurance Single Pay	5%~20%	5%~20%	5%~20%	5%~20%	5%~20%	5%~20%	5%~20%
Bancassurance Regular Pay	5%~20%	5%~10%	5%~10%	5%~10%	5%~10%	5%~10%	5%~10%

TABLE A8: PARTIAL WITHDRAWAL RATE RANGE OF UNIVERSAL LIFE AND UNIT-LINKED PRODUCT

Policy Year	1	2	3	4	5	6+
Agency UL	1%~25%	2%~20%	3%~20%	4%~20%	4%~20%	4%~20%
Bancassurance UL	0%~6%	0%~8%	0%~10%	0%~15%	0%~15%	0%~20%
Agency Unit-linked	2%~15%	3%~20%	3%~20%	3%~20%	3%~25%	3%~25%
Bancassurance Unit-linked	3%~15%	3%~15%	3%~15%	3%~15%	3%~15%	3%~15%

TABLE A9: PREMIUM PERSISTENCY RANGE OF UNIVERSAL LIFE AND UNIT-LINKED PRODUCT

Policy Year	2	3	4	5	6+
Agency	70%~90%	70%~90%	40%~90%	45%~90%	40%~90%
Bancassurance	50%~85%	35%~85%	35%~85%	30%~85%	30%~85%
Telemarketing	75%~85%	80%~90%	85%~90%	85%~90%	90%~95%

For high pricing interest rate products issued before and in 1999, products in other channels (broker, e-business, telemarketing etc.) and annuity products in annuity payment period, no prescribed ranges are set by CIRC. Insurers must determine reasonable assumptions based on their own experience analysis.

Incidence rate assumptions

CIRC will release the floor and cap of incidence rate assumptions periodically. Insurers using incidence rate assumptions in BER should consider their own experience and future development trends while still subject to

the floor and cap limits prescribed by CIRC. The floor and cap limits of incidence rate assumptions are as follows.

Mortality rate assumption

Mortality rate assumption = q_x in base mortality table × multiplier × underwriting selection factor

The base mortality table is China Life Insurance Experience Table (2000-2003). The multipliers should follow the floor (for non-annuity business) and cap (for annuity business) limits set by CIRC in Table A10.

TABLE A10: FLOOR AND CAP LIMITS OF MULTIPLIER

Floor for Non-annuity Business			
Business	Base Table	Multiplier for Male	Multiplier for Female
Individual	CL1/CL2	65%	65%
Group	CL1/CL2	65%	60%
Cap for Annuity Business			
Business	Base Table	Multiplier for Male	Multiplier for Female
Annuity	CL3/CL4	90%	90%

Tables of CL1/2 stand for China Life Table (2000-2003) of male and female used for non-annuity business. Tables of CL3/4 stand for male and female used for annuity business.

Insurers can determine the selection factors of the first three policy years based on their own experience. The selection factors in the other policy years are set as 1.

Critical illness (CI) morbidity rate assumption

Morbidity rate assumption = i_x in base morbidity table × multiplier × underwriting selection factor

The base morbidity table is China Life Insurance CI Experience Table (2006-2010). The multipliers should follow the floor set by CIRC.

TABLE A11: FLOOR OF CI ASSUMPTION

Number of Dread Diseases Covered	Base Table	Multiplier for Male	Multiplier for Female
6 to 25	CI1/CI2	80%	80%
25 or more	CI3/CI4	80%	80%

Tables of CI1/2 stand for CI tables of male and female covering six to 25 dread diseases. Tables of CI3/4 stand for CI tables of male and female covering 25 or more kinds of dread diseases.

Insurers can determine the selection factors of the first three policy years based on their own experience. The selection factors in other policy years are set as 1.

For the other incidence rate assumptions, insurers should use the ones they once filed with CIRC or the ones that are more prudent.

Section 7 Appendix B: Risk factors for market risks

Risk factors for equity risk

Domestic equity investments include listed equity, unlisted equity, securities investment funds, convertible bonds, equity investment plan on infrastructure, asset management products issued by entities meeting CIRC's requirements, unlisted equity investment plan, equity type trust plan, equity index future, preferred stock, long-term equity investments, etc. The minimum required capital for equity risk is the arithmetic sum of minimum required capital for each equity asset.

The risk charges of major types of equity investment are as follows.

Listed equity

RF_0 is set as follows:

$$RF_0 = \begin{cases} 0.31 & Main\ Board\ stocks\ listed\ in\ Shanghai\ and\ Shenzhen\ stock\ exchange \\ 0.41 & Small\ and\ medium\ enterprise\ stocks \\ 0.48 & ChiNext\ stocks \end{cases}$$

k_1 is determined by the change in stock price compared with its purchase cost:

$$k_1 = \begin{cases} 1 & x \geq 1 \\ x^2 & 0 \leq x < 1 \\ -x^2 & -1 \leq x < 0 \end{cases}$$

x = (admitted value - purchase cost) / purchase cost. Purchase cost is the weighted average of all purchase prices if it is purchased at different time point.

k_2 is set according to whether or not the stock is China Securities Index (CSI) 300 component stocks:

$$k_2 = \begin{cases} -0.05 & yes \\ 0 & no \end{cases}$$

Unlisted equity

RF_0 is set as 0.28.

Securities investment fund

Securities investment funds include bond funds, stock funds, hybrid funds and money market funds.

For bond funds, RF_0 is set as 0.06. If it is structured bond funds, k_1 is set according to the priority.

$$k_1 = \begin{cases} -0.2 & high\ priority \\ 0.2 & low\ priority \end{cases}$$

For stock funds, RF_0 is set as 0.25. If it is structured stock funds, k_1 is set according to the priority.

$$k_1 = \begin{cases} 0.1 & high\ priority \\ 0.45 & low\ priority \end{cases}$$

For hybrid funds, RF_0 is set as 0.2.

For money market funds, RF_0 is set as 0.01.

Convertible bonds

RF_0 is set as 0.18.

Equity investment plan on infrastructure

RF_0 is set as 0.12.

Risk factors for real estate risks

Real estate investment includes investment in property and the investment in the real estate company. The exposure (EX) of real estate investment in property is the admitted value and EX of investment in a real estate company is the proportion of the admitted value of the real estate company's equity owned by the insurer. MC for real estate risk is the arithmetic sum of the minimum capital for real estate risk of each real estate asset.

The risk factor is set as follows:

If asset value is under historical cost basis, RF_0 is set as 0.08.

If asset value is under fair value basis, RF_0 is set as 0.12 and k_1 , k_2 and k_3 are set as follows:
k_1 is set according to the value movement of real estate investment:

$$k_1 = \begin{cases} 1 & x \geq 1 \\ x^2 & 0 \leq x < 1 \\ -x^2 & -1 \leq x < 0 \end{cases}$$

x = (admitted value - purchase cost) / purchase cost.

k_2 is set according to the proportion of total real estate assets to company's total admitted assets:

$$k_2 = \begin{cases} 0.2 & x \geq 10\% \\ 0.1 & 5\% < x < 10\% \\ 0.05 & 0 < x \leq 5\% \end{cases}$$

r is the proportion of total real estate assets to total assets.

k_3 is set according to the location of real estate investment:

$$k_3 = \begin{cases} 0.03 & \text{Municipality, provincial capitals, cities with special planning} \\ 0.05 & \text{Other domestic areas} \\ 0.06 & \text{Overseas} \end{cases}$$

Risk factors for overseas asset risk

Overseas investments include overseas fixed income (FI) investment assets and overseas equity investment assets. MC for overseas asset risk is the arithmetic sum of MC for each overseas asset.

For overseas fixed income investment assets, RF_0 is set as follows:

$$RF_0 = \begin{cases} 0.0762 & \text{Developed market} \\ 0.2139 & \text{Emerging market} \end{cases}$$

$$MC_{Overseas\_FI} = \sqrt{MC^2_{Overseas\_FI\_deveolped} + 0.273 \times MC_{Overseas\_FI\_deveolped} \times MC_{Overseas\_FI\_emerging} + MC^2_{Overseas\_FI\_emerging}}$$

$MC_{Overseas\_FI}$ is MC for overseas fixed income investment assets.

$MC_{Overseas\_FI\_deveolped}$ is MC for overseas fixed income investment assets under developed market.

$MC_{Overseas\_FI\_emerging}$ is MC for overseas fixed income investment assets under emerging market.

For overseas equity investment assets, RF_0 is set as follows:

$$RF_0 = \begin{cases} 0.3 & \text{Developed market} \\ 0.45 & \text{Emerging market} \end{cases}$$

$$MC_{Overseas\_E} = \sqrt{MC^2_{Overseas\_E\_deveolped} + 0.75 \times MC_{Overseas\_E\_deveolped} \times MC_{Overseas\_E\_emerging} + MC^2_{Overseas\_E\_emerging}}$$

$MC_{Overseas\_E}$ is MC for overseas equity investment assets.

$MC_{Overseas\_E\_deveolped}$ is MC for overseas equity investment assets under developed market.

$MC_{Overseas\_E\_emerging}$ is MC for overseas equity investment assets under emerging market.

Risk factors for currency risk

Insurers should distinguish foreign currencies to measure MC for currency risk. EX is net asset (asset – liability) in same foreign currency. RF_0 is set as 0.035, and k_1 is set as follows:

$$k_1 = \begin{cases} 0 & \textit{USD and currencies with exhange rate pegged to USD} \\ 0.05 & \text{EUR } \textit{and } \text{GBP} \\ 0.12 & \text{Others} \end{cases}$$

MC for currency risk is the arithmetic sum of MC for currency risk of each foreign currency.

Section 8 Appendix C: Risk factors for credit risks

Risk factors for credit spread risk

Assets required for credit spread risk are domestic investment assets with explicit duration and under fair value basis in the financial report. This includes bonds (financial bonds, corporate bonds, etc.), securitisation products, fixed income trust plans, other fixed income assets, etc.

Financial bonds issued by policy banks

RF_0 is set as follows in Table C1.

TABLE C1: RISK FACTORS OF FINANCIAL BONDS ISSUED BY POLICY BANKS

Modified Duration (year)	RF0
(0, 5]	D×(-0.0012×D+0.012)
Above 5	0.006×D

D is modified duration.

Assets other than financial bonds issued by policy banks

RF_0 is set as follows in Table C2.

TABLE C2: RISK FACTORS OF ASSETS OTHER THAN FINANCIAL BONDS ISSUED BY POLICY BANKS

Credit Rating	Modified Duration (year)	RF0
AAA	0<D≤5	D×(-0.0015×D＋0.0175)
	D>5	D×0.010
AA+	0<D≤5	D×(-0.0014×D＋0.018)
	D>5	D×0.011
AA	0<D≤5	D×(-0.0013×D＋0.0195)
	D>5	D×0.013
AA-	0<D≤5	D×(-0.0012×D＋0.022)
	D>5	D×0.016
A	0<D≤5	D×(-0.0017×D＋0.0285)
	D>5	D×0.02
BBB+/BBB/BBB-	0<D≤5	D×(-0.0016×D＋0.0304)
Or no rating	D>5	D×0.0224

D is modified duration.

MC for credit spread risk is arithmetic sum of MC for credit spread risk of each asset.

Risk factors for counterparty default risk

Assets with credit exposures and debt guarantees are required to calculate counterparty default risk if they have explicit counterparties and the admitted value is determined under an amortised cost basis or historical cost basis. This includes cash and liquidity management tools, fixed income investment assets, currency forward and interest swap used for hedging, policy loans, reinsurance assets, premiums receivable, interests receivable, other receivables and prepayments, debt guarantees, etc.

The risk charges of major types of assets for counterparty default risk are shown in detail as follows:

Cash and liquidity management tools

RF_0 is set as follows:

$$RF_0 = \begin{cases} 5\% & \text{Deposit in third-party payment institution} \\ 3\% & \text{Short-term financial bill} \\ 0 & \text{Others} \end{cases}$$

Term deposit, negotiated deposit and structured deposit

RF_0 is set as follows in Table C3.

TABLE C3: RISK FACTORS OF DEPOSITS

Deposit Type	Deposit Institution Type		RF0
Term Deposits and Negotiated Deposits	Commercial banks with capital adequacy ratios at all levels meet the regulatory requirements	State-owned commercial banks	0
		Joint-stock commercial banks and post saving bank	1%
		Urban commercial banks	3%
		Other commercial banks	5%
	Commercial banks with capital adequacy ratio not meet all the regulatory requirements		10%
	Other deposit institutions		10%
Structured deposits with principal guaranteed when withdrawal	Commercial banks with capital adequacy ratios at all levels meet the regulatory requirements	State-owned commercial banks	0
		Joint-stock commercial banks and post saving banks	4%
		Urban commercial banks	8%
		Other commercial banks	12%
	Commercial banks with capital adequacy ratio not meet all the regulatory requirements		20%
Structured deposits with principal non-guaranteed when withdrawal			50%

Financial bond

RF_0 is set as follows in Table C4.

TABLE C4: RISK FACTORS OF FINANCIAL BONDS

Financial Bond Types		RF0
Issuers with capital adequacy ratios at all levels meet the regulatory requirements	State policy banks and state-owned commercial banks	0
	Joint-stock commercial banks, postal savings bank and insurance companies	1%
	Urban commercial banks	3%
	Other commercial banks	3.5%
Issued by non-bank financial institution with credit rating at AA and above		5%
Issued by non-state-owned commercial banks or insurance companies with capital adequacy ratios not meeting all the regulatory requirements, or the bonds issued by non-bank financial institution with credit rating below AA		20%

Corporate bond

RF_0 is set as follows in Table C5.

TABLE C5: RISK FACTORS OF CORPORATE BONDS

Asset Credit Rating	Risk Factor
AAA	1.5%
AA+	3.6%
AA	4.5%
AA-	4.9%
A/A-/A+	9.0%
BBB/BBB-/BBB+ or no rating	13.5%

k_1 is set according to residual maturity as follows:

$$k_1 = \begin{cases} 0 & \text{residual maturity} \le 1 \text{ years} \\ 0.05 & 1 \text{ year} < \text{residual maturity} \le 5 \text{ years} \\ 0.1 & \text{residual maturity} > 5 \text{ years} \end{cases}$$

Securitisation product

RF_0 is set as follows in Table C6.

TABLE C6: RISK FACTORS OF SECURITISATION PRODUCTS

Asset Credit Rating	Risk Factor
AAA	2.0%
AA+	4.1%
AA	5.0%
AA-	5.4%
A/A-/A+	9.5%
BBB/BBB-/BBB+ or no rating	14.0%

Infrastructure credit plan and infrastructure equity plan with warranty

RF_0 is set as follows in Table C7.

TABLE C7: RISK FACTORS OF INFRASTRUCTURE PLAN

Asset Credit Rating	Risk Factor
AAA	1.0%
AA+	3.1%
AA	4.0%
AA-	4.4%
A/A-/A+	8.5%
BBB/BBB-/BBB+ or no rating	13.0%

Currency forward and interest swap used for hedging

EX is notional principal and RF_0 follows risk factors of securitisation product.

Policy loan

RF_0 of policy loans is zero.

Reinsurance assets

For life and P&C insurers' ceded out business, RF_0 of reinsurance assets is set as follows in Table C8.

TABLE C8: RISK FACTORS OF INSURERS' CEDED OUT BUSINESS

Reinsurer's Solvency Adequacy Ratio			RF0
Domestic reinsurers including the local branch offices of international reinsurers	200% or above		0.5%
	[150%, 200%)		1.3%
	[100%, 150%)		4.7%
	[50%, 100%)		26.1%
	below 50%		74.5%
Offshore reinsurers	Solvency adequacy ratios at all levels meet the regulatory requirements	With collateral	8.7%
		Without collateral	58.8%
	Solvency adequacy ratio not meet all the regulatory requirements		86.7%

k_1 is set according to whether or not the domestic reinsurer is independent legal entity as follows:

$$k_1 = \begin{cases} 0 & \text{yes} \\ 0.05 & \text{no} \end{cases}$$

k_2 is set as follows, according to whether or not the offshore reinsurer is the parent company of domestic ceding insurer or they are affiliated companies under same group:

$$k_2 = \begin{cases} -0.1 & relationship\ of\ parent\ company\ or\ affiliated\ company \\ 0 & others \end{cases}$$

For reinsurers' ceded out business, RF_0 of reinsurance assets is set as follows in Table C9.

TABLE C9: RISK FACTORS OF REINSURERS' CEDED OUT BUSINESS

Reinsurer's Solvency Adequacy Ratio		RF0
Solvency adequacy ratio of domestic reinsurers including the local branch offices of international reinsurers	200% or above	0.5%
	[150%, 200%)	1.3%
	[100%, 150%)	4.7%
	[50%, 100%)	26.1%
	below 50%	74.5%
Offshore reinsurers' credit rating	AAA	0.5%
	AA+	1.2%
	AA	3.1%
	AA-	4.5%
	A+, A, A-	6.6%
	BBB+, BBB, BBB-	11.5%
	Others	65.8%

k_1 is set according to whether or not the domestic reinsurer provide collateral support as follows:

$$k_1 = \begin{cases} -0.25 & \text{with} \\ 0.25 & \text{without} \end{cases}$$

If offshore reinsurers have several credit ratings, RF_0 is determined by the lowest one.

The mapping table of major international credit rating agencies is as shown in Table C10.

TABLE C10: MAPPING TABLE OF MAJOR INTERNATIONAL CREDIT RATING AGENCIES

Credit Rating	Standard & Poor's	Moody's	A.M. Best	Fitch
AAA	AAA	Aaa	A++	AAA
AA+	AA+	Aa1		AA+
AA	AA	Aa2	A+	AA
AA-	AA-	Aa3		AA-
A+, A, A-	A+	A1		A+
	A	A2	A	A
	A-	A3	A-	A-
BBB+, BBB, BBB-	BBB+	Baa1		BBB+
	BBB	Baa2	B++	BBB
	BBB-	Baa3	B+	BBB-
Others	BB+ or below	Ba1 or below	B or below	BB+ or below

For ceded in reinsurance assets, RF_0 is set as follows in Table C11.

TABLE C11: RISK FACTOR OF CEDED IN REINSURANCE ASSETS

Account Receivable Age	RF0
Within 6 months	0.0%
(6 months, 12 months]	70.0%
Above 12 months	100.0%

MC for counterparty default risk is the arithmetic sum of MC for each asset.

Section 9 Appendix D: Risk factors for non-life business

Risk factors for premium risk

Short-term accident business

The EX of MC for premium risk is the retained written premium (per RMB 100 million) during the past 12 months. RF0 is as follows:

$$RF_0 = \begin{cases} 8.5\% & EX \in (0, 1] \\ 7.8\% & EX \in (1, 3] \\ 6.7\% & EX \in (3, 6] \\ 5.4\% & EX \in (6, 10] \\ 3.5\% & EX \in (10, \infty) \end{cases}$$

k_1 is set according to the combined ratio C during the past 12 months as follows:

$$k_1 = \begin{cases} -0.1 & \mathrm{C} \in (0, 95\%] \\ -0.05 & \mathrm{C} \in (95\%, 100\%] \\ 0 & \mathrm{C} \in (100\%, 102\%] \\ 0.05 & \mathrm{C} \in (102\%, 105\%] \\ 0.1 & \mathrm{C} \in (105\%, \infty) \end{cases}$$

k_2 is set according to the ceding ratio of non-proportional reinsurance (NE) from the past 12 months as follows:

$$k_2 = \begin{cases} 13.6\% & \mathrm{NE} \in (-\infty, -1\%) \\ 1.2\% & \mathrm{NE} \in [-1\%, 0) \\ 0\% & \mathrm{NE} \in [0, 2.5\%] \\ -1.8\% & \mathrm{NE} \in [2.5\%, 5\%] \\ -4.7\% & \mathrm{NE} \in (5\%, \infty) \end{cases}$$

NE equals (ceding out premium of non-proportional reinsurance – ceding in premium of non-proportional reinsurance) / retained written premium.

Short-term health business

The EX of MC for premium risk is the retained written premium (per RMB 100 million) during past 12 months. RF0 is as follows:

$$RF_0 = \begin{cases} 20.8\% & EX \in (0, 1] \\ 19.7\% & EX \in (1, 6] \\ 16.6\% & EX \in (6, 12] \\ 13\% & EX \in (12, 19] \\ 8.4\% & EX \in (19, \infty) \end{cases}$$

k_1 is set according to the combined ratio C during the past 12 months as follows:

$$k_1 = \begin{cases} -0.1 & C \in (0, 95\%] \\ -0.05 & C \in (95\%, 100\%] \\ 0 & C \in (100\%, 102\%] \\ 0.05 & C \in (102\%, 105\%] \\ 0.1 & C \in (105\%, \infty) \end{cases}$$

k_2 is set according to the ceding ratio of non-proportional reinsurance (NE) from the past 12 months as follows:

$$k_2 = \begin{cases} 13.6\% & NE \in (-\infty, -1\%) \\ 1.2\% & NE \in [-1\%, 0) \\ 0\% & NE \in [0, 2.5\%] \\ -1.8\% & NE \in [2.5\%, 5\%] \\ -4.7\% & NE \in (5\%, \infty) \end{cases}$$

Short-term life business

The EX of MC for premium risk is the retained written premium (per RMB 100 million) during the past 12 months. RF0 is as follows:

$$RF_0 = \begin{cases} 8.5\% & EX \in (0, 1] \\ 7.8\% & EX \in (1, 3] \\ 6.7\% & EX \in (3, 6] \\ 5.4\% & EX \in (6, 10] \\ 3.5\% & EX \in (10, \infty) \end{cases}$$

k_1 is set according to the combined ratio C during the past 12 months as follows:

$$k_1 = \begin{cases} -0.1 & C \in (0, 95\%] \\ -0.05 & C \in (95\%, 100\%] \\ 0 & C \in (100\%, 102\%] \\ 0.05 & C \in (102\%, 105\%] \\ 0.1 & C \in (105\%, \infty) \end{cases}$$

k_2 is set according to the ceding ratio of non-proportional reinsurance (NE) from the past 12 months as follows:

$$k_2 = \begin{cases} 13.6\% & NE \in (-\infty, -1\%) \\ 1.2\% & NE \in [-1\%, 0) \\ 0\% & NE \in [0, 2.5\%] \\ -1.8\% & NE \in [2.5\%, 5\%] \\ -4.7\% & NE \in (5\%, \infty) \end{cases}$$

Risk factors for outstanding claims reserve risk

Short-term accident business

The EX of MC for outstanding claims reserve risk is the outstanding claims reserve (per RMB 100 million) after reinsurance. RF0 is as follows:

$$RF_0 = \begin{cases} 19.3\% & EX \in (0, 1] \\ 18.4\% & EX \in (1, 2] \\ 16.9\% & EX \in (2, 3] \\ 14.8\% & EX \in (3, 6] \\ 13.0\% & EX \in (6, \infty) \end{cases}$$

k_1 is set according to R, which is the arithmetic average of the retrospective development ratios of all non-auto insurance for the past two accounting year-ends. It is the retrospective development ratio of outstanding claims reserve after reinsurance. It is the difference ratio between re-estimated outstanding claims reserve and the original one.

$$k_1 = \begin{cases} 0.05 & R \in (-\infty, -5\%) \\ 0 & R \in [-5\%, 5\%] \\ 0.05 & R \in (5\%, 10\%) \\ 0.1 & R \in (10\%, \infty) \end{cases}$$

Short-term health business

The EX of MC for outstanding claims reserve risk is the outstanding claims reserve (per RMB 100 million) after reinsurance. RF0 is as follows:

$$RF_0 = \begin{cases} 24.7\% & EX \in (0, 1] \\ 23.6\% & EX \in (1, 2] \\ 21.6\% & EX \in (2, 4] \\ 18.9\% & EX \in (4, 8] \\ 16.8\% & EX \in (8, \infty) \end{cases}$$

k_1 is set according to R, which is the arithmetic average of the retrospective development ratios of all non-auto insurance for the past two accounting year-ends. It is the retrospective development ratio of outstanding claims reserve after reinsurance. It is the difference ratio between re-estimated outstanding claims reserve and the original one.

$$k_1 = \begin{cases} 0.05 & R \in (-\infty, -5\%) \\ 0 & R \in [-5\%, 5\%] \\ 0.05 & R \in (5\%, 10\%) \\ 0.1 & R \in (10\%, \infty) \end{cases}$$

Short-term life business

The EX of MC for outstanding claims reserve risk is outstanding claims reserve (per RMB 100 million) after reinsurance. RF0 is as follows:

$$RF_0 = \begin{cases} 19.3\% & \text{EX} \in (0, 1] \\ 18.4\% & \text{EX} \in (1, 2] \\ 16.9\% & \text{EX} \in (2, 3] \\ 14.8\% & \text{EX} \in (3, 6] \\ 13.0\% & \text{EX} \in (6, \infty) \end{cases}$$

k_1 is set according to R, which is the arithmetic average of the retrospective development ratios of all non-auto insurance for the past two accounting year-ends. It is the retrospective development ratio of outstanding claims reserve after reinsurance. It is the difference ratio between re-estimated outstanding claims reserve and the original one.

$$k_1 = \begin{cases} 0.05 & \text{R} \in (-\infty, -5\%) \\ 0 & \text{R} \in [-5\%, 5\%] \\ 0.05 & \text{R} \in (5\%, 10\%) \\ 0.1 & \text{R} \in (10\%, \infty) \end{cases}$$

Section 10 Appendix E: SARMRA scoring example

This section shows a Solvency-aligned Risk Management Requirement and Assessment (SARMRA) scoring example with a summary table of final scores and a detailed table of objectives and tools section. Sample inputs have been selected to show how the final scores are calculated.

Summary table of final scores

TABLE E1: SUMMARY TABLE OF RISK MANAGEMENT SCORING RESULT

Items	Standard Scores	Scoring Result (b/f adjustment on not applicable items)			Scoring Result (a/f adjustment on not applicable items)	Weight	Final Scores
		System Soundness (60%)	Implementation Effectiveness (40%)	Sub-total			
(1)	(2)	(3)	(4)	(5) = (3) + (4)	(6)	(7)	(8) = (6) × (7)
Fundamental and Environment	**100**	50.00	35.00	85	85.00	**20%**	**17.00**
Objectives and Tools	**100**	41.64	27.44	69.08	71.22	**10%**	**7.12**
Insurance Risk Management	**100**	60.00	40.00	100	100.00	**10%**	**10.00**
Market Risk Management	**100**	40.00	25.00	65	70.00	**10%**	**7.00**
Credit Risk Management	**100**	45.00	30.00	75	80.00	**10%**	**8.00**
Operational Risk Management	**100**	40.00	30.00	70	70.00	**10%**	**7.00**
Strategic Risk Management	**100**	50.00	35.00	85	85.00	**10%**	**8.50**
Reputational Risk Management	**100**	55.00	40.00	95	95.00	**10%**	**9.50**
Liquidity Risk Management	**100**	40.00	30.00	70	75.00	**10%**	**7.50**
Total		421.64	292.44	714.08	731.22	**100%**	**81.62**

Assessment rule

TABLE E2: ASSESSMENT RULES FOR SARMRA SCORING

Assessment Results	Description	Weight for Scoring
Fully meet requirements	According to system soundness and implementation effectiveness, insurer fully meets CIRC's requirements.	100%
Mostly meet requirements	Insurer meets more than 80% of requirements but not to 100%.	80%
Partially meet requirements	Insurer meets more than 50% of requirements but below 80%.	50%
Don’t meet requirements	Does not meet with requirement or is below 50%.	0%

Risk management assessment table - Objectives and tools

TABLE E3: RISK MANAGEMENT ASSESSMENT TABLE - OBJECTIVES AND TOOLS

Assessment Standard		Standard Scores Sub-total	System Soundness（60%）			Implementation Effectiveness（40%）			Sub-total (System Soundness + Implementation Effectiveness)
			Standard Scores	Assessment Result	Scores	Standard Scores	Assessment Result	Scores	
1	**Risk Appetite System and Objectives**	**25**							
1.1	Based on business development strategy and current risk condition, insurer needs to establish risk appetite system with approval of board of directors. Combination of qualitative and quantitative approach can be used to define risk tolerance and risk limit for various kinds of risks.	7	4.2	Mostly meet	3.36	2.8	Mostly meet	2.24	5.60
1.2	Insurer should set up the transmission mechanism of risk appetite and make constant improvement on it to bring risk appetite system into company's management decision-making process.	7	4.2	Mostly meet	3.36	2.8	Mostly meet	2.24	5.60
1.3	Insurer should periodically monitor the implementation of risk tolerance and limit, and the timely report of cases breaching the risk limit.	6	3.6	Fully meet	3.60	2.4	Fully meet	2.40	6.00
1.4	Annual assessment, update and approval procedure on risk appetite system is required.	5	3.0	Fully meet	3.00	2.0	Fully meet	2.00	5.00
2	**Risk Management Tools**	**75**							
2.1	Insurers should use appropriate risk management tools to manage risks. Risk management tools include but not limited to: 1) comprehensive budget management, 2) asset liability management, 3) capital plan and allocation, 4) economic capital, 5) stress test, 6) risk management information system.	6	3.6	Fully meet	3.60	2.4	Mostly meet	1.92	5.52
2.2	Requirements of business plan and comprehensive budget management: Independent risk assessment is required to comply with risk appetite. Risk management department takes the responsibility and CRO's sign-off is required before submission to the board.	7	4.2	Fully meet	4.20	2.8	Mostly meet	2.24	6.44
2.3	Requirements of business plan and comprehensive budget management: Stress test results should be considered to make necessary adjustment on impact of adverse scenario.	7	4.2	Partially meet	2.10	2.8	Mostly meet	2.24	4.34
2.4	Insurers should embed solvency risk management objectives into ALM procedure. Solvency issues should be considered during ALM planning and decision making.	7	4.2	Partially meet	2.10	2.8	Mostly meet	2.24	4.34
2.5	Insurer should strengthen ALM practice to make sure the interaction between asset and liability and its impact complies with risk appetite.	7	4.2	Mostly meet	3.36	2.8	Mostly meet	2.24	5.60
2.6	Insurer should establish capital management system and three-year capital plan project according to company's development strategy.	7	4.2	Don't meet	0.00	2.8	Don't meet	0.00	0.00
2.7	Insurer belonging to Group I should set up economic capital model and other capital management models appropriate to its own business structure, risk characteristic and risk appetite.	3	1.8	Not applicable	0.00	1.2	Not applicable	0.00	0.00

Assessment Standard		Standard Scores Sub-total	System Soundness（60%）			Implementation Effectiveness（40%）			Sub-total (System Soundness + Implementation Effectiveness)
			Standard Scores	Assessment Result	Scores	Standard Scores	Assessment Result	Scores	
2.8	Insurer should set up stress tests according to solvency regulatory rules. Clear approach, roles and responsibilities are required.	6	3.6	Fully meet	3.60	2.4	Fully meet	2.40	6.00
2.9	Stress test result should be utilised in risk analysis with appropriate documentation.	6	3.6	Fully meet	3.60	2.4	Mostly meet	1.92	5.52
2.10	Insurer should establish risk management information system meeting the following criteria: 1) Links to business and accounting system are required to automatically realise data collection and processing, key risk indicators calculation, saving, query and exportation. 2) Based on key indicators, insurer is required to satisfy risk profile presentation, analysis and alert for insurance, market, credit, operation, strategy, reputation and liquidity risks. 3) Information system can support the setting of parameters and scenarios and do automatic calculation for stress test. 4) Automatic generation, delivery and documentation are required for risk management report. 5) System needs to aggregate and share risk management information between functional departments and branches at all levels. Information can be listed differently according to access authority.	8	4.8	Partially meet	2.40	3.2	Partially meet	1.60	4.00
2.11	Data in risk management information system should be on time, accurate, consistent and integrated.	3	1.8	Mostly meet	1.44	1.2	Mostly meet	0.96	2.40
2.12	Periodically review the effectiveness of system and make necessary adjustment.	3	1.8		0	1.2		0	0.00
2.13	Insurers are encouraged to employ qualified external credit rating agencies to do credit rating, and publish the results.	1	0.6	Don't meet	0.00	0.4	Don't meet	0.00	0.00
2.14	Insurers should establish solvency risk emergency management mechanism, including clear definition and classification of emergency events, event reporting, management structure, response plan. Insurers should conduct emergency drills if necessary to improve capabilities.	4	2.4	Mostly meet	1.92	1.6	Partially meet	0.80	2.72
Sores		**100**	**60**		41.64	**40**		27.44	
Total Scores		**69.08**							
Total Scores (not applicable items)		**3.00**							
Total Scores (a/f adjustment on not applicable items)		**71.22**							

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