

CHINA RISK ORIENTED SOLVENCY SYSTEM (C-ROSS) INTRODUCTION CARe CONFERENCE JUNE 2015

Blanca Qin
FCAS, SVP

Philadelphia, PA

Part I

Evolution of Chinese Solvency Regulation and Introduction to C-ROSS Framework

Overall Construction Planning of C-ROSS

- Prior to 2012, minimum capital requirements were set based on the three year average of net written premium and three year average of net reported losses
 - 18% of first 100M in premium plus 16% of premium in excess of 100M
 - 26% of first 70M in losses plus 23% of losses in excess of 70M
- Starting in 2012, CIRC researched various solvency standards with a target delivery for a new risk-based solvency formula by the end of 2014
- Industry testing started in 2014 with the aim to evaluate the reasonableness and practicability of the C-ROSS formula
- Full implementation of C-ROSS is targeted in 2016 with a transition period with respect to meeting the capital requirements.

Comparison of Existing China Solvency I (S1) and C-ROSS

Solvency I

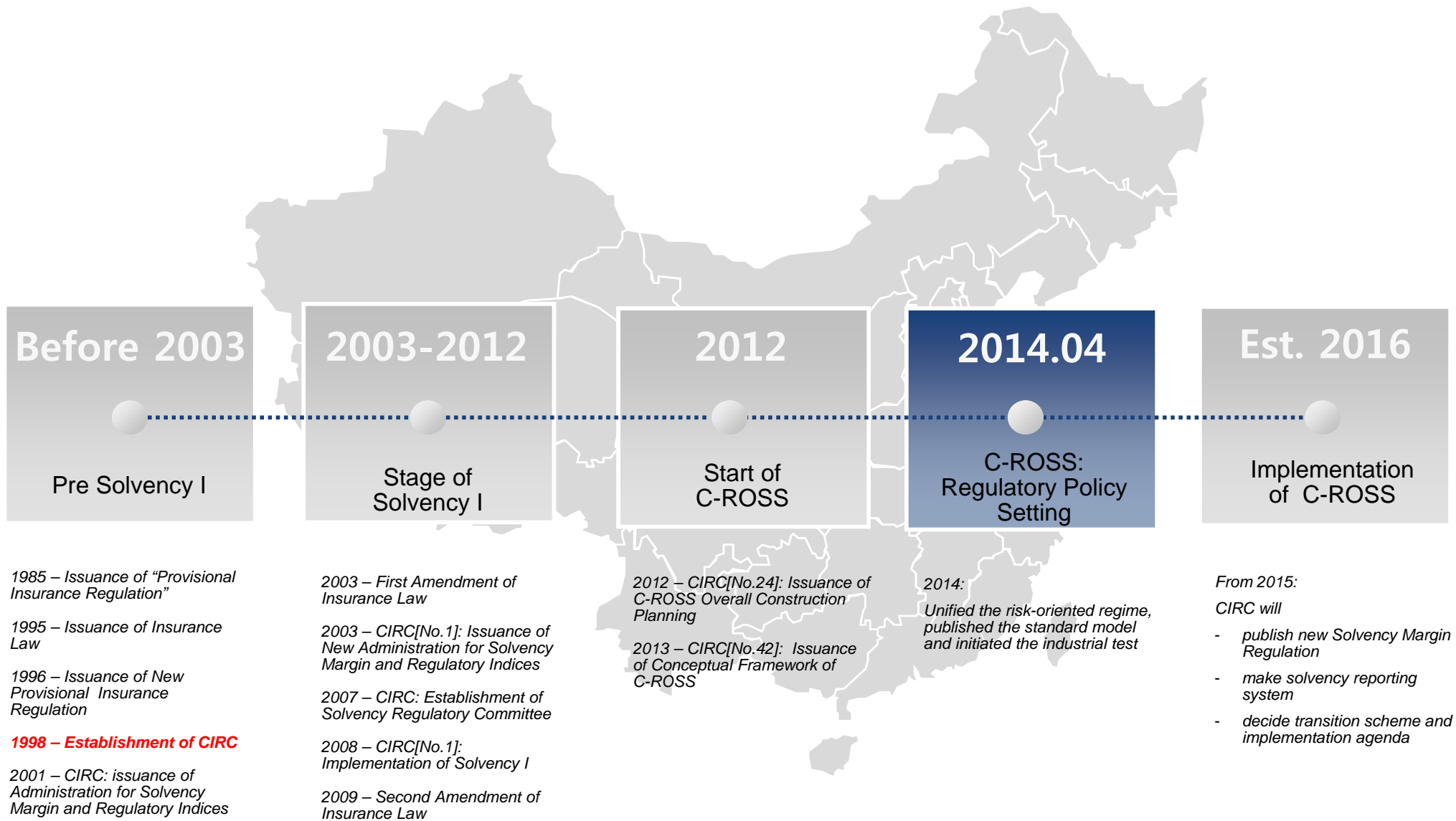
- Based on premium and losses only
- Simple flat risk factors
- No correlation consideration
- Scale Oriented

C-ROSS

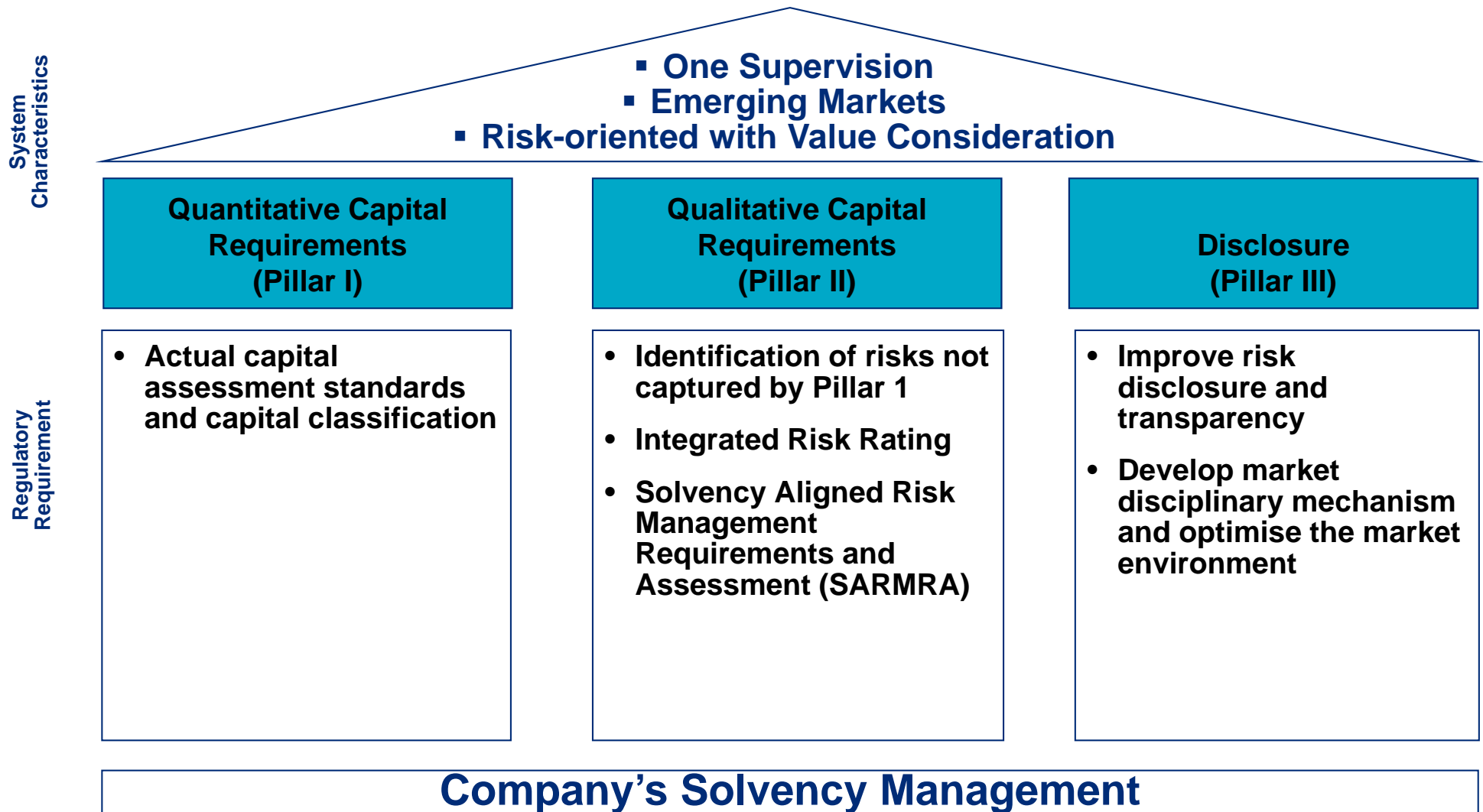
- Based on various risk exposure
- Comprehensive risk factors
- Multi-level correlation
- Risk Oriented

Evolution of Solvency Regulation in China

Milestones



Conceptual Framework of C-ROSS



Draft Regulatory Rules

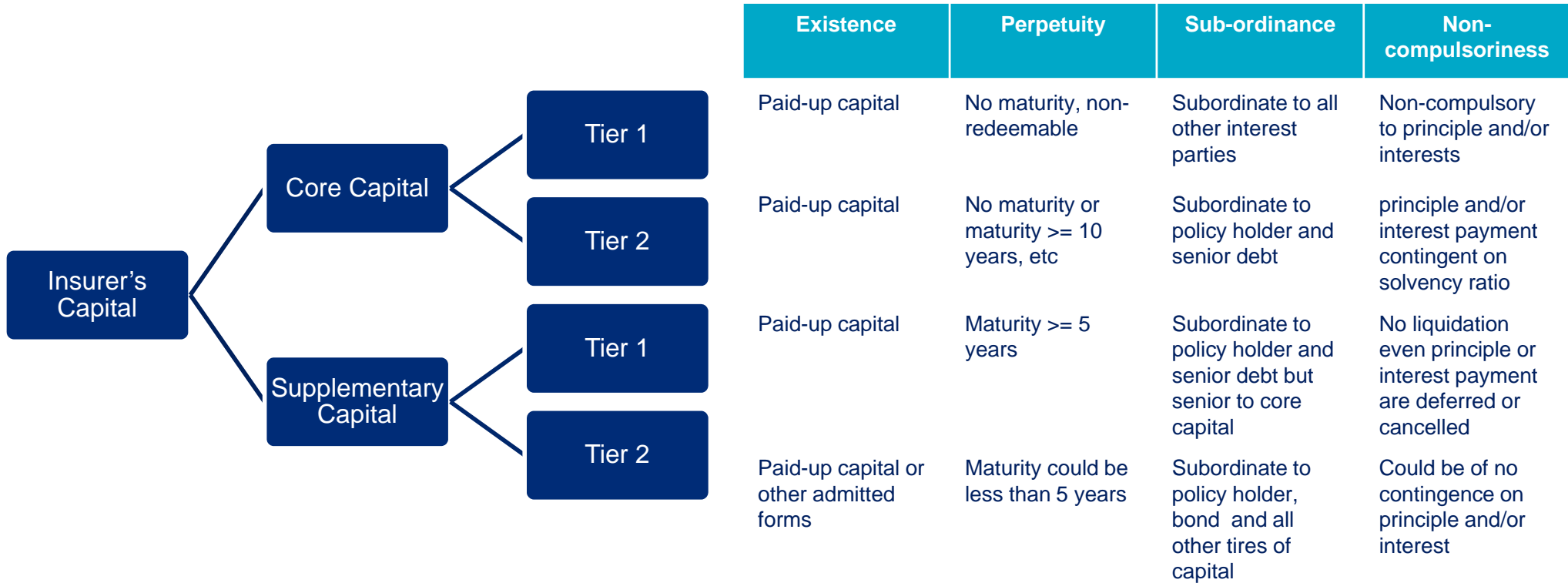
Additional rules will be published in the future

1. Insurer Solvency Regulation No. 1 – Available Capital
2. Insurer Solvency Regulation No. 2 – Minimum Capital
3. Insurer Solvency Regulation No. 4 – Minimum Capital for Insurance Risk (Non – Life)
4. Insurer Solvency Regulation No. 7 – Minimum Capital for Market Risk
5. Insurer Solvency Regulation No. 8 – Minimum Capital for Credit Risk
6. Insurer Solvency Regulation No. 9 – Dynamic Solvency Test
7. Insurer Solvency Regulation No. 10 – Integrated Risk Rating
8. Insurer Solvency Regulation No. 11 – Solvency Aligned Risk Management Requirement and Assessment
9. Insurer Solvency Regulation No. 12 – Liquidity Risk
10. Insurer Solvency Regulation No. 13 – Solvency Public Information Disclosure
11. Insurer Solvency Regulation No. 14 – Solvency Information Communication
12. Insurer Solvency Regulation No. 15 – Insurance Company Rating
13. Insurer Solvency Regulation No. 16 – Solvency Report
14. Insurer Solvency Regulation No. 17 – Insurance Group Regulation

Available Capital

Insurer Solvency Regulation No. 1

For the first time, CIRC classifies insurer's capital based on the quality of capital



$$\text{Available capital} = \text{Admitted Assets} - \text{Admitted Liability}$$

Solvency Ratio Under Capital Classification

- Core solvency ratio =
Core capital / Minimum capital
- Overall solvency ratio =
Overall capital / Minimum capital

Additional regulatory requirements:

- Supplementary Capital \leq Core Capital
- Tier 2 Core Capital \leq 30% of Total Core Capital
- Tier 2 Supplementary Capital \leq 25% of Total Core Capital

Impact on insurer's capital base

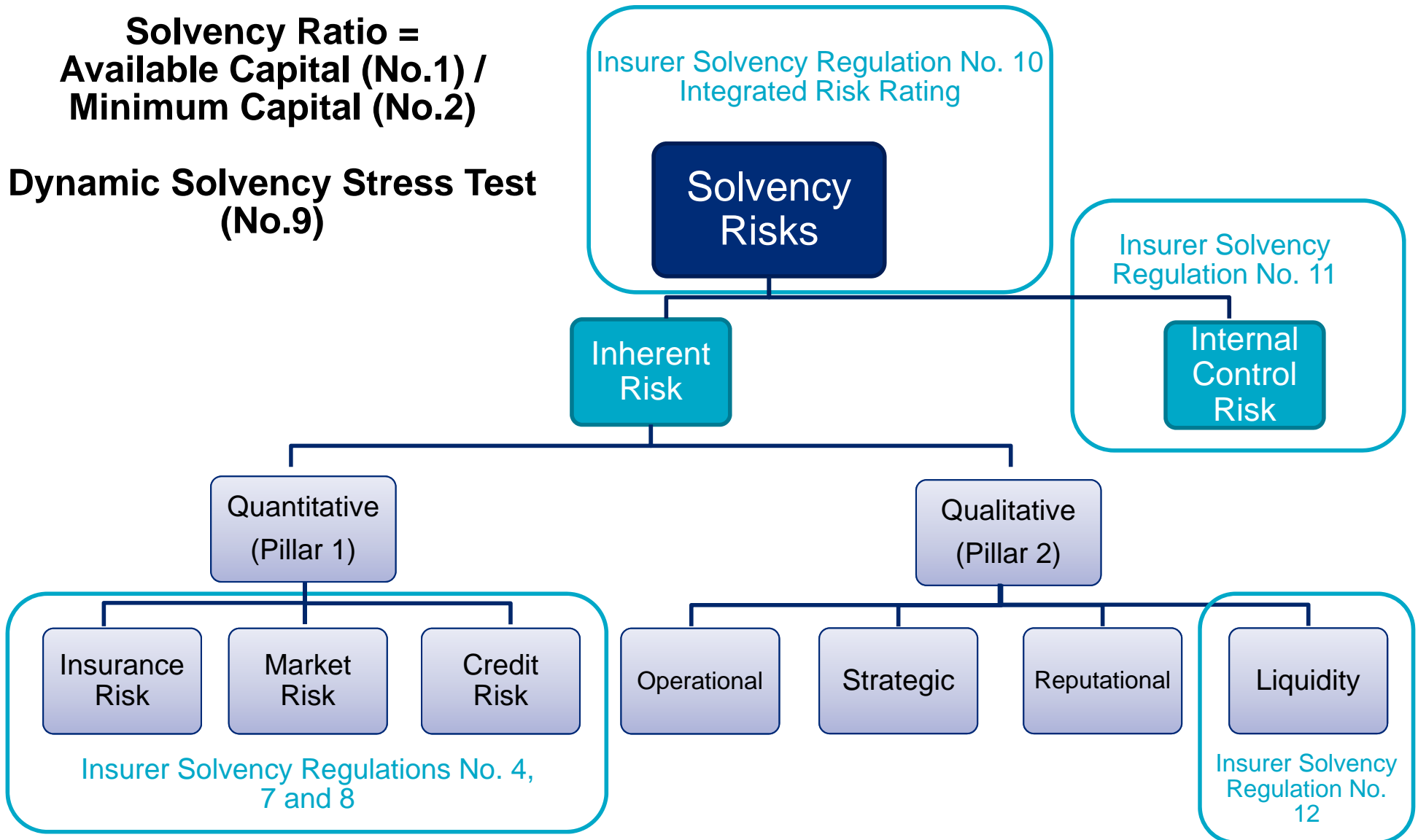
- Subordinate debt (surplus notes) are either tier 2 core capital or tier 1 supplementary capital
- Agriculture* CAT reserve now qualified as tier 1 core capital

* PA also has cat reserve but not mentioned in the document whether it is qualified as core capital

How Each Document Connects with Each Other

**Solvency Ratio =
Available Capital (No.1) /
Minimum Capital (No.2)**

**Dynamic Solvency Stress Test
(No.9)**



Quantitative Risk

Insurer Solvency Regulation No. 4 , No 7 and No 8

Insurance Risk

- Premium Risk
- Reserve Risk
- Catastrophe Risk
- 10 Separate Lines



Market Risk

- Interest Rate
- Equity
- Real Estate
- Overseas Investment
- Exchange Rate



Credit Risk

- Interest rate spread risk
- Counter party default risk
- Domestic vs Foreign



$$\begin{pmatrix} \text{Ins. Risk} \\ \text{Market Risk} \\ \text{Credit Risk} \end{pmatrix} \begin{pmatrix} 1.00 & 0.37 & 0.20 \\ 0.37 & 1.00 & 0.25 \\ 0.20 & 0.25 & 1.00 \end{pmatrix} \begin{pmatrix} \text{Ins. Risk} \\ \text{Market Risk} \\ \text{Credit Risk} \end{pmatrix}$$

Integrated Risk Rating

Insurer Solvency Regulation No. 10

Grouping	C-ROSS Score	Regulatory Action Requirements
Group A	>200%	<ul style="list-style-type: none"> No action required
Group B	150%-200%	<ul style="list-style-type: none"> Regulatory communication Onsite examination Correction plan
Group C	100%-150%	<ul style="list-style-type: none"> Capital injection No new branches No commercial advertising Business scope restrictions
Group D	<100%	<ul style="list-style-type: none"> Develop a reform plan Stop writing new business Investment restrictions Management change

Overall risk score is weighted 50% on the qualitative measures from Pillar 1 and 50% of the qualitative score from Pillar 2

The quantitative score = (Core Capital Ratio) / 2 + (Overall Capital Ratio) / 2

Core capital excludes some items such as...

Solvency Aligned Risk Management Requirement and Assessment (SARMRA)

Insurer Solvency Regulation No. 11

- This regulation is trying to regulate and capture the internal control risk (risk of failure to identify, evaluate, manage inherent risk)
- Detail internal control requirements provided by CIRC
- Risk management of insurer is assessed by CIRC or an independent third party authorized by CIRC
- As an assessment result, score (S) given to a company is scaled from 0 to 100 and used to calculate minimum capital (MC) for control risk by prescribed formula

$$MC = (1+Q) * MC_{QR}$$

$Q = -0.005S + 0.4$, S is the score given to company's risk management level

MC_{QR} , minimum capital for quantitative risk

Part II

Premium and Reserve Risk Charges

Insurance Risk Under C-ROSS

Premium Risk

- Measure unexpected underwriting loss
- Based on the latest 12 months net written premium

Reserve Risk

- Measure unexpected reserve development
- Based on net loss reserve but not UEPR

Catastrophe Risk

- Cover property/engineering line of business
- Charge Motor (Motor Damage only), Property (Earthquake, Wind and wind related Flood losses), and Agriculture line of business
- Based on net retained aggregates

Lines of Business Classification

- Premium and reserve risks are charged based on lines of business

Motor	• Motor Own Damage	• Carrier's Liability	• Commercial Motor
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Property	• Commercial Property	• Residential Property	• Engineering
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Marine	• Hull	• Cargo	• Special Insurance
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Liability	• Liability		
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Agricultural	• Crop	• Livestock	• Forestry
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Credit & Surety	• Credit	• Surety	
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Short Term PA	• Personal Accidental		
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Short Term Health	• Health		
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Short Term Life	• Life		
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Others	• Any type of insurance not listed above		
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Risk Factor Comparison

Premium Factor

C-ROSS Line	Risk Factor (RF)	Solvency II Line	RF ≈ Std. Dev x 3	RBC	
Motor	8.43~9.3%	Motor vehicle liability	29%	Private Auto	17%
		Motor, other classes	22%	Comm. Auto	14%
Property /CEAR	29.1~40.2%	Fire	22%	Homeowner	17%
				Comm Multi Perils	67%
Marine	24.6~28.0%	Marine, aviation, transport (MAT)	45%	Special Liability	13%
				Special Prop	9%
Liability	9.0~14.5%	Third-party liability	42%	Other Liability	13%
				Product Liability	21%
Agriculture	18.9~33.8%				
PA	3.5~8.5%			Other(Credit, Accidental & Health)	59%
Health	8.4~20.8%				
Credit	37.3~46.3%	Credit and surety	35%		

Risk Factor Comparison

Reserve Factor

C-ROSS Line	Risk Factor (RF)	Solvency II Line	RF \approx Std. Dev x 3	RBC	RF Prior to discounted factor applied
Motor	10.03~11.45%	Motor vehicle liability	26%	Private Auto	11%
		Motor, other classes	22%	Comm. Auto	10%
Property /CEAR	57.3~64.1%	Fire	29%	Homeowner	11%
				Comm Multi Perils	24%
Marine	51.3~63.2%	Marine, aviation, transport (MAT)	32%	Special Liability	29%
				Special Prop	9%
Liability	35.0~42.2%	Third-party liability	32%	Other Liability	29%
				Product Liability	38%
Agriculture	27.8~39.8%				
PA	13.0~19.3%	Assistance	63%	Other(Credit, Accidental & Health)	11%
Health	16.8~24.7%				
Credit	40.2~50.5%	Credit and surety	60%		

Insurance Risk Charges Under Various Regimes

	China	Australia	Japan *	Korea	Singapore	Solvency II	US
Premium	✓	✗	✓	✓	✗	✓	✓
Premium Liability	✗	✓	✗	✗	✓	✗	✗
Outstanding Claims	✓	✓	✓	✓	✓	✓	✓
Catastrophe Exposure	Explicitly (Motor, Ppty & CEAR and Agro only)	Explicitly	Explicitly	Implicitly	Implicitly	Explicitly	Implicitly

- In Japan (*)
 - For premium and outstanding claims risks, the adopted risk charge is based on the greater of the two risk charges
 - For catastrophe exposure, it takes the largest of wind/flood and EQ risk charges

Insurance Risk Charges Under Various Regimes

	China	Australia*	Japan	Korea	Singapore	Solvency II	US
Charged by Line of Business	✓	✓	✓	✓	✓	✓	✓
Geographic Diversification	✗	✗	✗	✗	✗	✓	✗
Business Diversification Effect	✓	✓	✓	✗	✓	✓	✓
Large Scale Effect	✓	✗	✗	✗	✗	✗	✗
Excessive Growth Penalty	✗	✓	✗	✗	✗	✗	✓
Risk Factors Blended with Company's Experience	Implicitly	✓	✗	Implicitly	✗	✓	✓
Internal Model	✗	✓	✗	✗	✗	✓	✗

- In Australia (*)
 - Excessive growth (> 20%) penalty is embedded in the operational risk charge

Example of Premium and Reserve Risk Charge

Motor

Assumptions

- This is a mono line insurer
- Gross written premium in 2013 = 75B RMB
- Proportional QS = 20%
- Gross loss reserve = 30B RMB
- All K factors are zero

The charge will be adjusted based on

- Premium/reserve scale
- Your loss and underwriting experience
- Your non proportional reinsurance cession rate

Premium Charge is

- Net Premium of 60B times average charge of 8.73%
 - 9.3% of first 1B
 - 9.25% of next 4B
 - 9.04% of next 15B
 - 8.66% of next 20B
 - 8.43% of all premium excess 40B

Reserve Charge is

- Net Reserves of 24B times average charge of 10.63%
 - 11.45% of first 0.5B
 - 11.37% of next 2B
 - 11.02% of next 7.5B
 - 10.04% of next 10B
 - 10.03% of all reserves excess 20B

Aggregating MC for Premium & Reserve Risks

Motor Example

$$MC_{Prem \& Res, LOB} = \sqrt{MC_{Prem, LOB}^2 + MC_{Res, LOB}^2 + MC_{Prem, LOB} \times MC_{Res, LOB}}$$

Minimum Capital Charge

- $MC_{Premium} = 5.237B$
- $MC_{Reserve} = 2.552B$
- $MC_{Premium \& Reserve} = \sqrt{5.237B^2 + 2.552B^2 + 5.237B \times 2.552B} = 6.878B$

Note, the correlation between premium and reserves is assumed to be 50%. Thus, the risk charge is

$$\sqrt{5.237B^2 + 2.552B^2 + 2 \times 0.50 \times 5.237B \times 2.552B}$$

Aggregating MC for Premium & Reserve Risks for All Lines of Business

In general, correlation is accounted for by aggregating charges using the following formula:

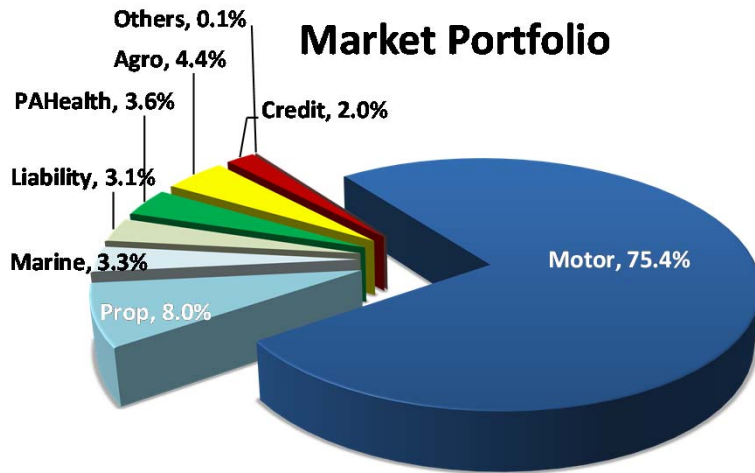
$$= \sqrt{(\text{Market Charges})^T (\text{Correlation Matrix}) (\text{Market Charges})}$$

$$MC_{Prem \& Res, LOB} = \sqrt{\sum_{J,K} \rho_{J,K} \times MC_{Prem \& Res, LOB_J} \times MC_{Prem \& Res, LOB_K}}$$

	Prop	Motor	Marine	Agro	Credit	PA	Health	Liability	Life	Others
Prop	1.00	0.20	0.20	0.25	0.05	0.00	0.00	0.10	0.00	0.00
Motor	0.20	1.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.00
Marine	0.20	0.00	1.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Agro	0.25	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Credit	0.05	0.00	0.05	0.00	1.00	0.00	0.00	0.30	0.00	0.00
PA	0.00	0.20	0.00	0.00	0.00	1.00	0.50	0.25	0.50	0.00
Health	0.00	0.20	0.00	0.00	0.00	0.50	1.00	0.25	0.50	0.00
Liability	0.10	0.20	0.00	0.00	0.30	0.25	0.25	1.00	0.25	0.00
Life	0.00	0.20	0.00	0.00	0.00	0.50	0.50	0.25	1.00	0.00
Others	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Overall Premium & Reserve Risk Charge

- Overall charge varies by portfolio mixed



Assuming 100% motor portfolio, premiums that are twice the reserves and premium and reserve charges of 9% and 11% respectively, then the combined premium and reserve charge (as a percent of premium) would be 12.68%.

However, the other risks needed to be added to this before comparing with the prior risk charges of 16%-18% of premium.

Part III

Catastrophe Risk Charges

Minimum Capital for Catastrophe Risk

Property & CEAR

- 10,000 annual scenarios for earthquakes and typhoons are provided with charges by province
- Loss factor applies to net retained (after pro rata reinsurance) exposure
- Sum over each province and get the countrywide 10,000 event scenario loss table
- Use the 50th largest loss which is the 1 in 200 year.

Motor and Agriculture

- Similar to Property & CEAR risk

R/I mitigation

- Reinsurance program is applied to 1 in 200 year loss in China (50th largest countrywide loss)
- *Worldwide loss for each LOB = $\sqrt{\text{loss in China after RI program}^2 + \text{overseas loss}^2}$*

Total Min. Capital Charge

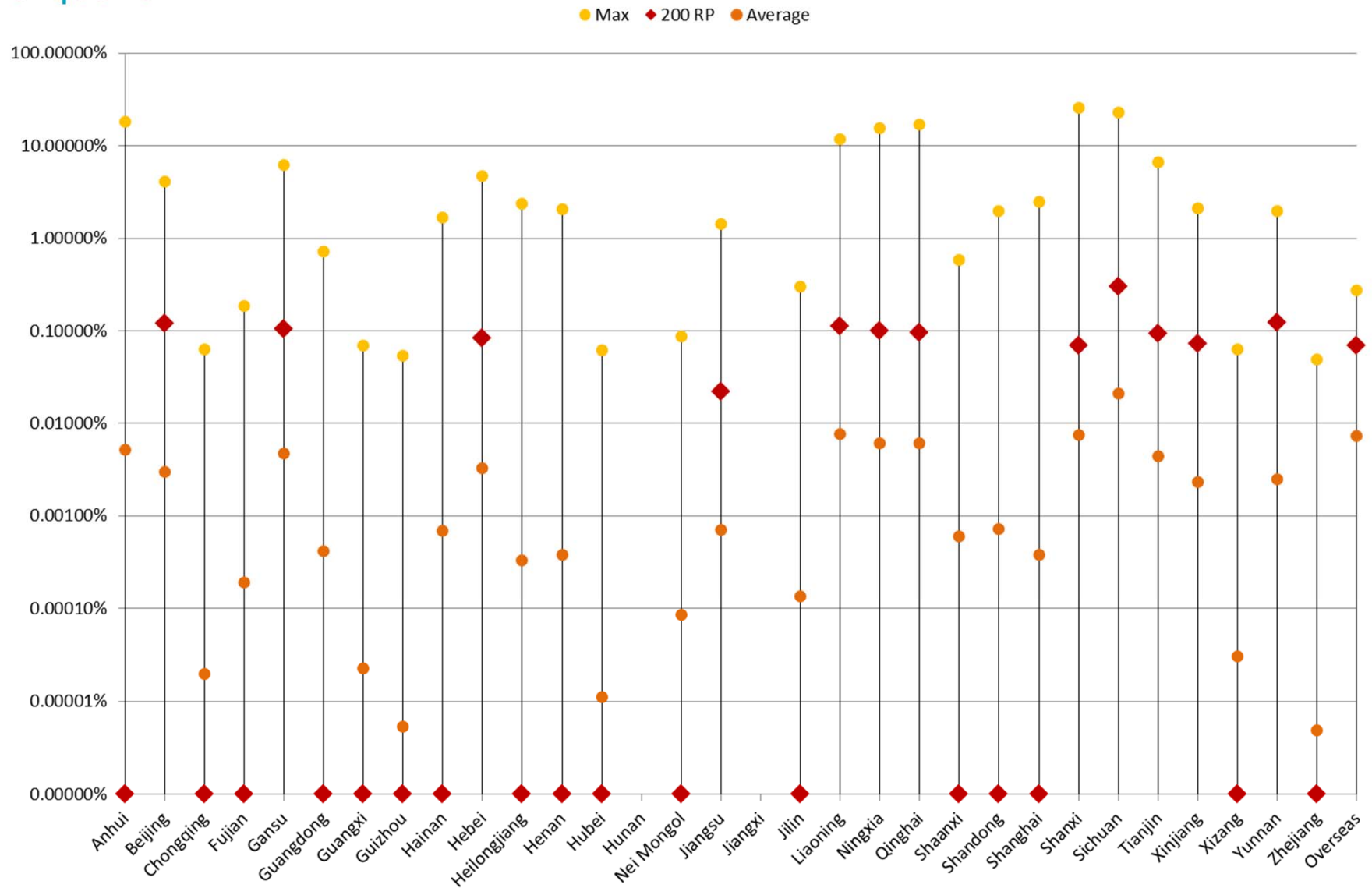
- $MC_{Cat} = \sqrt{\sum MC_{Cat i}^2 + \sum 2\rho MC_{Cat i} MC_{Cat j}}$
- Correlation ρ is shown on the right

	EQ	TY	Auto	Agri
EQ	1	0	0	0
TY	0	1	0.75	0.5
Auto	0	0.75	1	0.25
Agri	0	0.5	0.25	1

C-ROSS Damage Ratio Summary

Earthquake

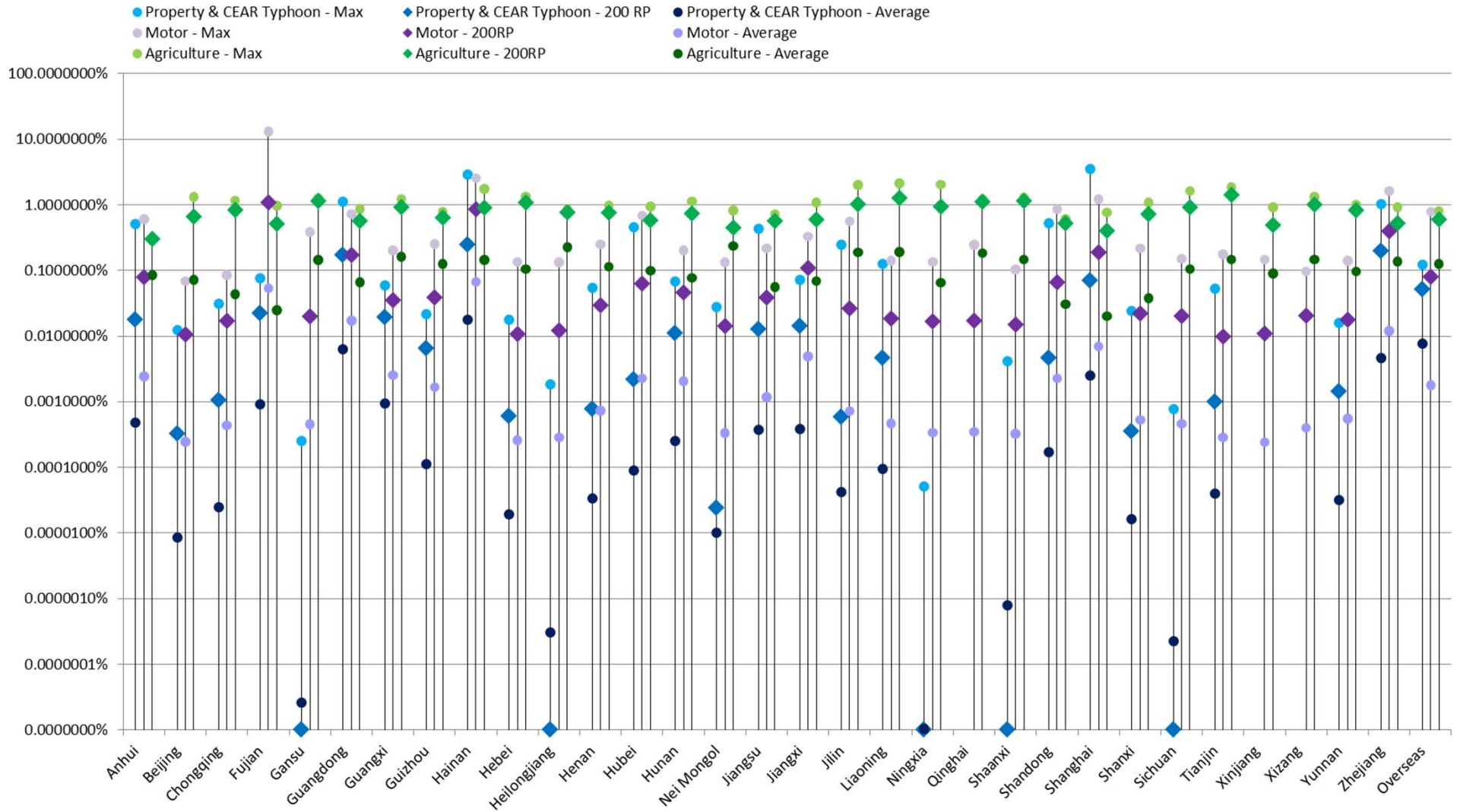
- Hunan and Jiangxi are considered to have no earthquake risks.



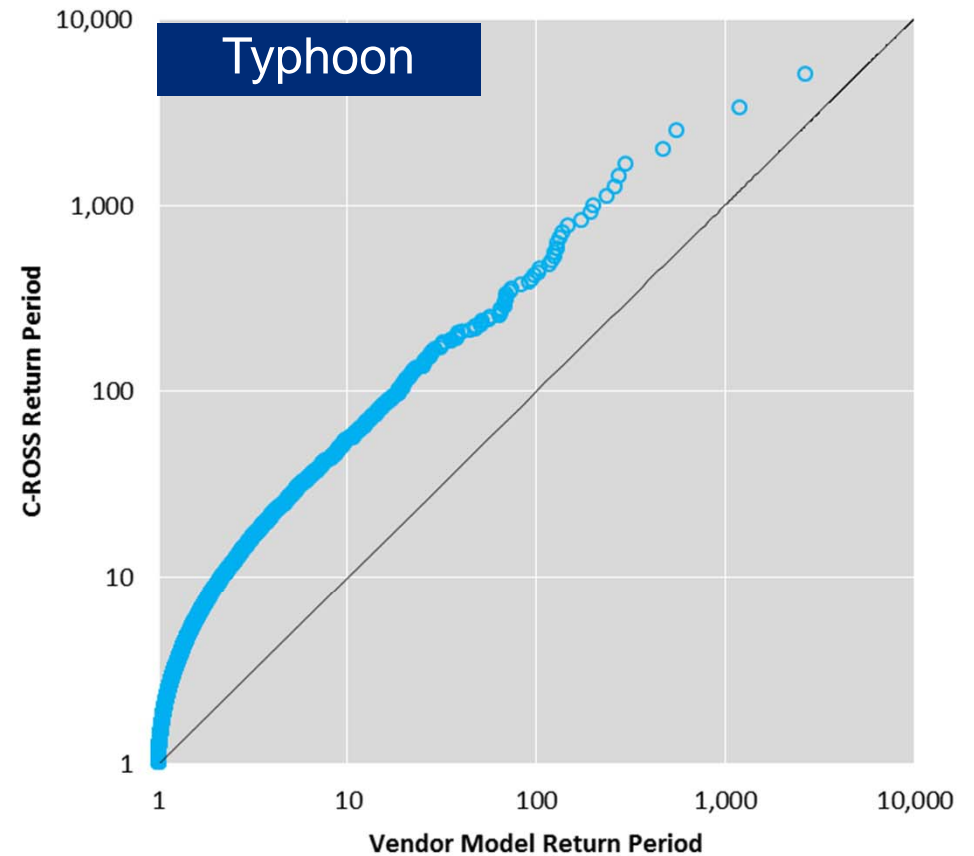
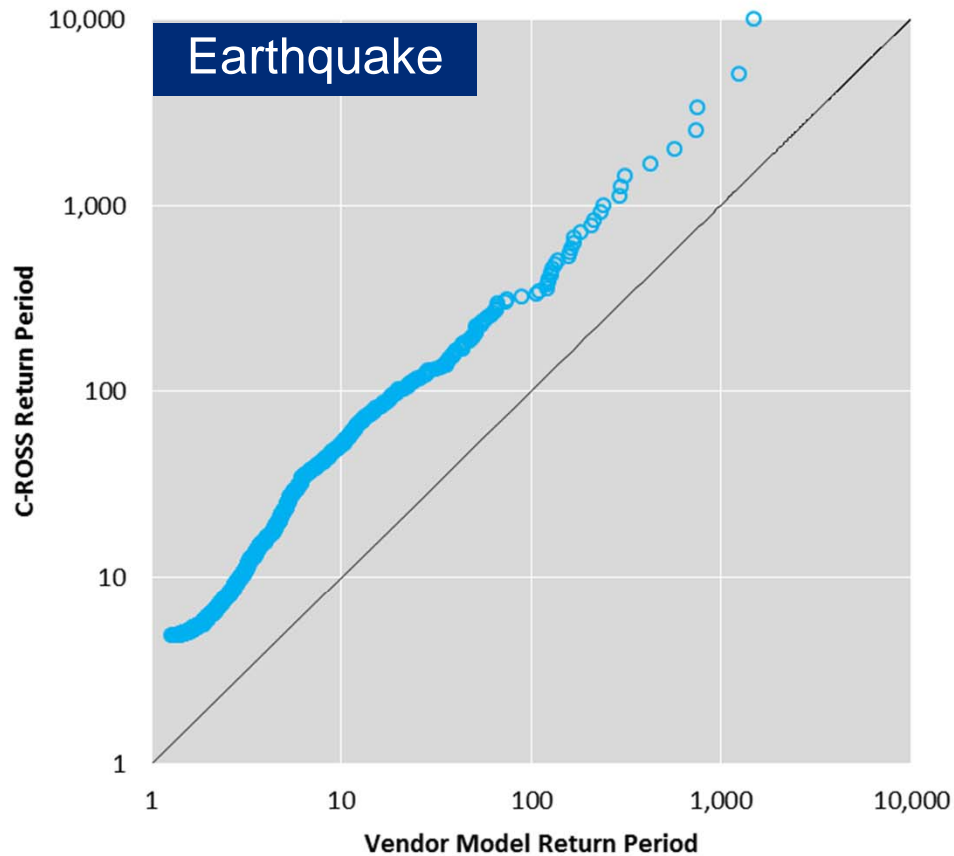
C-ROSS Damage Ratio Summary

Typhoon, Motor, Agriculture

- Qinghai, Xinjiang and Xizang are considered to have no typhoon risks
- Generally, Agriculture DR > Motor DR > Property & CEAR typhoon DR



Comparison between C-ROSS and Vendor Model



Compare the relative return period

- The 1/200 OEP C-ROSS is roughly the 1/40 Wind or 1/50 EQ vendor model loss
- C-ROSS damage ratios are in general lower than that of vendor model.

- Based on total 2014 renewal aggregate received by Guy Carpenter
- Model assumptions based on Guy Carpenter's understanding on China market
- Overseas exposure excluded

Part IV

Reinsurance Credit Risk Charges

Formula

- The basic formula is:

$$MC = EX * RF_0 * (1 + \sum K)$$

- EX is the reinsurance receivables; the receivables and payables with the same counterparty could be offset if it is stipulated in the reinsurance contract
- Where **RF₀** on reinsurance recoverables ceded to domestic counterparties are below:

Counterparty Solvency Margin Ratio		RF ₀
Domestic Counterparty *	>= 200%	0.5%
	[150%, 200%)	1.3%
	[100%, 150%)	4.7%
	[50%, 100%)	26.1%
	<50%	74.5%

* Domestic counterparty is defined as domestic (re)insurers + domestic branches set up by overseas reinsurers.

Regulated cedants are classified into primary insurers and reinsurers

And different criteria will apply when ceding business to overseas counterparty

- **RF₀** on reinsurance assets ceded by **primary insurers** to overseas counterparties is determined by the counterparty's solvency status and whether collaterals exist

Counterparty Solvency Level			RF ₀
Overseas Counterparty	Meet solvency requirement in domiciled country	With collaterals	8.7%
		Without collateral	58.8%
	Fail to meet solvency requirement in domiciled country		86.7%

- **RF₀** on reinsurance assets ceded by **reinsurers** to overseas counterparties is determined by counterparty credit ratings

Counterparty Credit Rating		RF ₀
Overseas Counterparty	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%

If the counterparty is rated by more than one rating agencies, the lowest rating applies.

Regulated cedants are classified into primary insurers and reinsurers

And different criteria will apply when ceding business to overseas counterparty

- **K₁** that applies to **primary cedant and domestic reinsurer** is determined by the counterparty's legal entity status

$$K_1 = \begin{cases} 0 & \text{if the assuming counterparty is a domestic independent legal entity} \\ 0.05 & \text{if the assuming counterparty is not a domestic independent legal entity} \end{cases}$$

- **K₂** that applies to **primary cedant and overseas reinsurer** is determined by affiliation transaction status

$$K_2 = \begin{cases} -0.1 & \text{if the assuming counterparty is parent or affiliate company of cedent} \\ 0 & \text{if the assuming counterparty is not parent or affiliate company of cedent} \end{cases}$$

- **K₃** that applies to **retro cedant** is determined by whether collaterals are provided

$$K_3 = \begin{cases} -0.25 & \text{Collateral provided} \\ 0.25 & \text{Not collateralized} \end{cases}$$

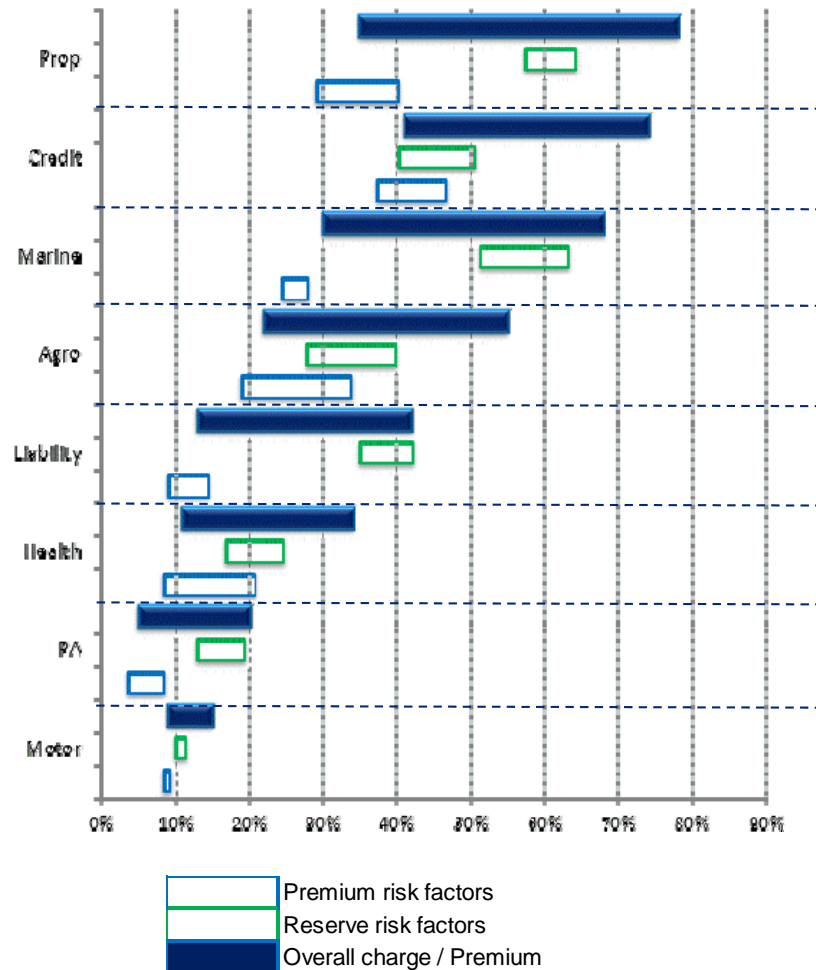
Part V

New Challenges under C-ROSS

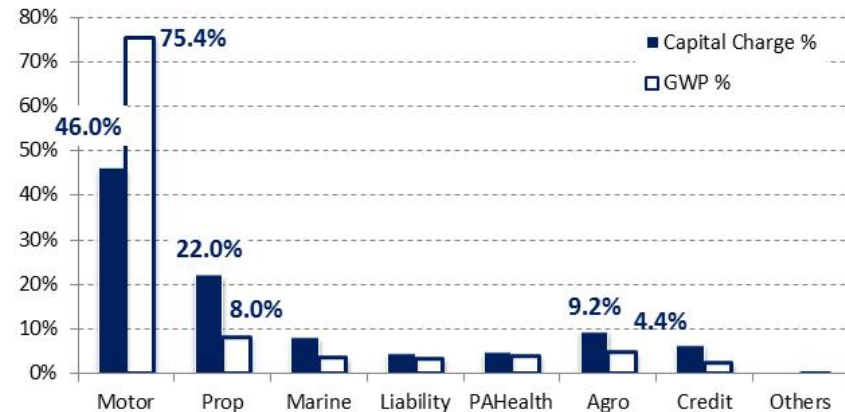
Key Capital Drivers Behind the Insurance Risk Charge

Premium & Reserve Charge by Lines of Business before Aggregation

Risk Charge by LOB before Aggregation



Market Portfolio Before Aggregation



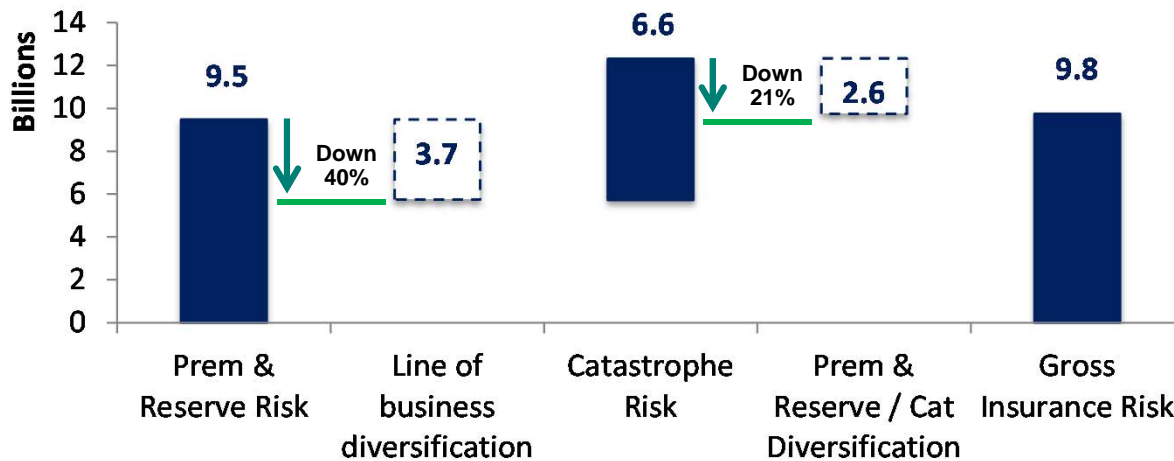
- Risk charges vary by lines of business, size of premium and reserve to premium ratio
- For a typical insurer, **Motor** and **Property** are the main capital drivers
 - Motor has the lowest capital charge but takes up nearly half of the premium & reserve capital due to its premium volume
 - Property has the highest charge; Marine, Agriculture and Credit are the 2nd tier; so their capital charges % are higher than the GWP%

Note:
 1. Characteristic factors are not considered here
 2. The range of overall factor is calculated with varies premium size (from market study) and reserve to premium ratio (0.2~0.5) assumptions

The Role of Business Diversification

*Adding Catastrophe Risk and Aggregate all Line of Business, But **Before** Reinsurance*

Market Portfolio

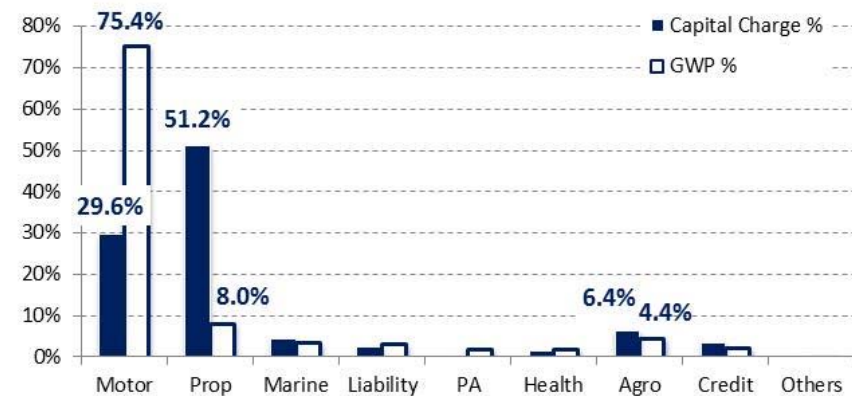


- Business diversification has a significant impact on insurance capital charge
- **Property** becomes the **key capital driver** and the most **capital intensive** line before any reinsurance purchase

Note:

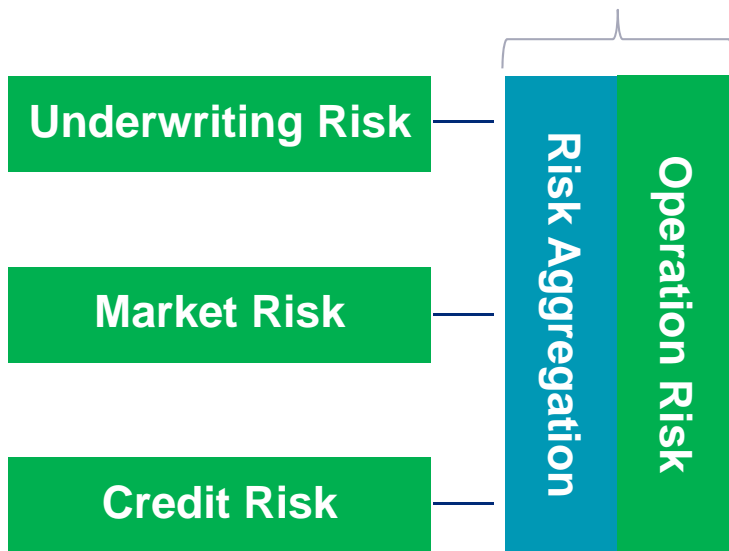
1. Market geographic aggregate distribution is assumed in calculating the catastrophe risk charge

Capital Contribution After Aggregation



Introducing Capital Planning Premium & Reserve Charge by Lines of Business Before Aggregation

Required Capital



Uncertainty Impact

- Operational risk could increase/decrease overall charge
- Business growth
- Underwriting result uncertainty
- Ruin of capital due to catastrophe events
- Asset allocation and investment strategy
- External economic environment
- Counterpart credit rating/ solvency
- Change in receivable / recoverable account balance

Solution

- Understand the key capital drivers
- Use scenario testing to understand capital constraints and set aside buffer capital
- Use reinsurance as alternative capital to reduce uncertainty

- Cost of capital in supporting business growth is an on-going concern
- Achieving economic efficiency under capital constraints requires sophisticated economic risk management

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