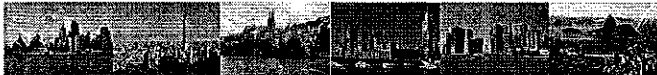


1.1 Setting the Scene

Jules Gribble, Senior Policy Advisor, IAIS
17 July 2017



Faculty

- ▶ Program co-ordinator
 - Jules Gribble
- ▶ Faculty
 - Su Hoong Chang
 - Arup Chatterjee
 - Jules Gribble
 - Shu-Yen Liu
 - Herve Odjo
 - Fred Rowley
 - Rodolfo Wehrhahn

Agenda

- ▶ Housekeeping
- ▶ Objectives
- ▶ Diversity
- ▶ Approach
- ▶ Who knows what tomorrow will bring
- ▶ Program success

Program

- ▶ 10 modules
 - Day 1: Setting the scene
 - Insurer risks and failures
 - Day 2: Valuation of liabilities
 - Communicating risk and uncertainty
 - Day 3: Investments
 - Capital adequacy
 - Day 4: Financial condition and solvency reporting
 - Actuarial advice and reports
 - Day 5: Bringing it together with the Case study
 - Moving forward

Program housekeeping

- ▶ Audio recording of sessions
 - Private, not posted
- ▶ Program 'Handbook'
 - Future reference
 - Anonymised
- ▶ Program website
 - Public
- ▶ Feedback
 - You – daily
 - Your sponsors

Program objectives

- ▶ Focus on best practice principles
 - Actuarial (prudential) perspective
- ▶ Promote understanding, not formulas
 - Not solve your specific issue, but give you better tools
 - Present you with alternatives
 - Provoke you to think and consider
- ▶ Enhance communication between actuaries and their (supervisor) users
 - Benefit of different perspectives
- ▶ Encourage networking

Case study

- ▶ This is where you work – in groups
- ▶ Runs behind the Program
- ▶ Everybody is equal in this Program
- ▶ What you get out depends on what you put in

- ▶ Groups

- ▶ More later

What do (should) actuaries do

- ▶ Good question ...
- ▶ Provide long answers to questions you did not realise you had asked ...
- ▶ Not answer the question you thought you had asked ...
 - Recognise there is a two way challenge between actuaries and their users
 - Both have responsibility to make it work
- ▶ Explain things better in your language (not theirs)
- ▶ Address your issues (not their view of your issues)

What do (should) actuaries do

- ▶ Live in the backroom
 - Determine technical results such as valuations of liabilities, pricing formulas, quantitative modelling and so on
 - Compute lots of complex results using 'sophisticated' models
- ▶ Support management
 - Compliance – actuarial control functions
 - Provide expertise and support the management of risk and risk events – financial, enterprise wide and more locally defined
 - Provide statutorily required services
 - ORSAs

What do (should) actuaries do

- ▶ Give professional advice
 - Provide timely, independent, unbiased, professional, insightful and frank advice to decision makers that improves the quality of their decisions
 - Explain uncertainty and (hence) the impact of stresses
 - Clarify that there may be 'wrong' answers and there may also be a range of acceptable answers for issues. There always remains a key role for professional judgement
 - Financial Condition Reports
 - Whistleblowing
 - 'Make the numbers talk'
 - Requires actuarial associations to develop and monitor profession

Diversity

- ▶ Level of insurance and, more broadly, financial services development
 - Need clarify supervisor role – reactive or proactive
- ▶ Cultural and expectation norms
 - Such as reflecting Takaful considerations
- ▶ Legal system and their effectiveness
- ▶ Local actuarial capacity
 - Formal (associations) and more informal (members of other professions who are resident)
- ▶ No 'one size fits all'
 - Diverse ways to achieve the same goals in different ways
 - Diverse circumstances may lead to diverse solutions, each 'fit for its purpose'
 - Circumstances change, so danger with 'set and forget'

Rule and principles

- ▶ May come from different mind sets
- ▶ Both have a practical place
 - Balance depends on circumstance and capacity
 - Balance changes over time – at supervisory discretion
- ▶ Need reflect circumstances
 - Solvency II is not applicable to inclusive insurance
 - Someone else proceeding is not automatically a good reason for you to proceed
 - Capacity to effectively and sustainably implement
 - Challenge is understanding the better horses for the courses

Rules and principles

- ▶ Rules are 'simpler' and more 'black and white'
 - Once set, easy to use
 - BUT, who sets them
 - Role in issues such as intervention (typically stressed)
- ▶ Principles are more complex, flexible and widely applicable
 - But they require judgement, experience and courage to effectively apply
 - So better (in general), but tougher to use
 - Need the capacity to make them work
 - Depend on precedent and insight not (legal) formula



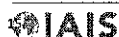
Program approach

- ▶ Principles and Examples
- ▶ Encourage discussion
- ▶ Practical Focus and discussion
- ▶ Groups and Case Studies
- ▶ Faculty available



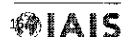
The world continues to experiment

- ▶ New regulatory regimes
- ▶ Not necessarily the best
- ▶ Not necessarily appropriate elsewhere
- ▶ Reviewing and evolving
- ▶ New challenges



The future is fickle

- ▶ Predictions are always wrong
- ▶ Flexibility
- ▶ Continuous change management



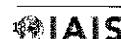
Some predictions ...

- ▶ "I think there is a world market for maybe 5 computers"
 - Thomas Watson, IBM Chairman, 1943
- ▶ "640k ought to be enough for anybody"
 - Bill Gates, Microsoft, 1981
- ▶ "There is no reason anyone would want a computer in their home"
 - Ken Olson, Pres, Digital Equipment Corp, 1977



Some more ...

- ▶ "Stocks have reached what looks like a permanently high plateau"
 - Irving Fisher, Prof Economics, Yale University, 1929
- ▶ "We have the best regulatory system in the world"
 - Various US Financial Services Regulators – ongoing
- ▶ "If you don't keep up with industry they will eat you"
 - Unnamed cynic



Moving forward

- ▶ Success depends on your participation
- ▶ Debate, question, enjoy
- ▶ Questions not answers
- ▶ The end of this Training Program is the beginning of a journey ...



Program success and expectations

- ▶ You participate
- ▶ You learn 3 (or more ☺) things to take back to your day job to do or change
- ▶ You see and better understand alternatives
- ▶ You form networks to use in the future
- ▶ You make some new friends
- ▶ You enjoy yourself
- ▶ You would recommend this (or a similar) Program to your colleagues



Thank you ...

Setting the Scene

Jules Gribble
jules.gribble@bis.org



1.3 Case Study

Jules Gribble, Senior Policy Advisor, IAIS
17 July 2017



Agenda

- ▶ Groups
- ▶ Background
- ▶ Task
- ▶ Process
- ▶ Reporting
- ▶ Information

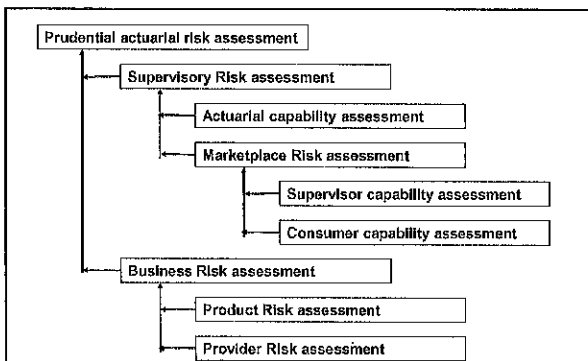
Background

- ▶ Runs 'behind' rest of program
 - Hypothetical
 - Opportunity to apply learnings from Program
 - Not 'yes/no exercise'. Journey is the key
- ▶ Not all data you might want will be available
 - You will have to make (and support) reasonable assumptions and apply your professional judgement
- ▶ For reasons external to your agency
 - Outcome from this project is the subject of a lot of public interest
 - Your Chair is determined to show the agency acts in an independent, unbiased, professional and transparent manner.

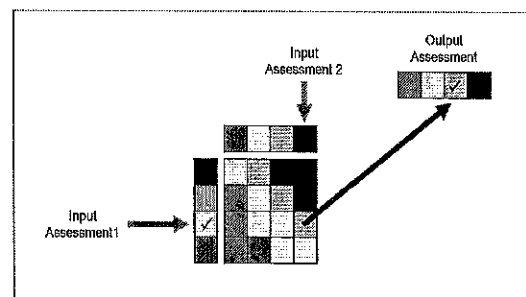
Task

- ▶ You have been asked by Chairperson of your supervisory agency to support the assessment of a new product proposed by an insurer.
- ▶ You are to examine the actuarial component of a prudential assessment.
 - Other teams in your agency will examine other aspects
 - All assessments will be brought together for an overall assessment and decision by a senior team in your agency.

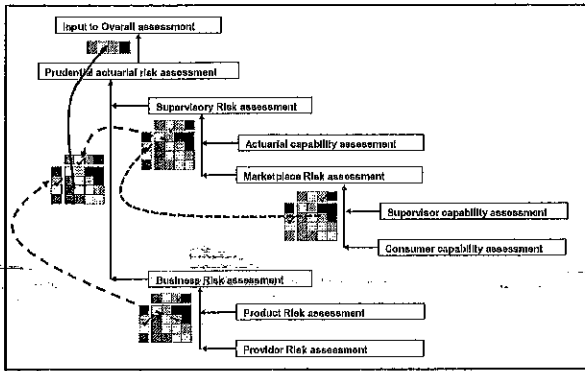
Prudential actuarial risk - components



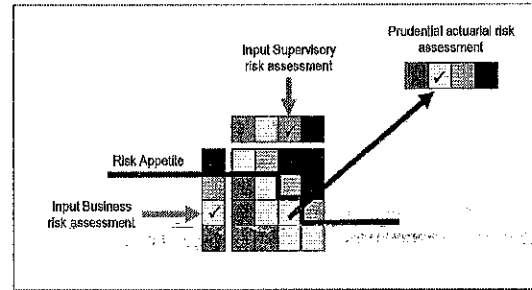
Tool



Apply the tool



Risk appetite



Your key steps

- ▶ Chose appropriate risk heat map(s)
- ▶ Set a risk appetite
- ▶ Apply the process and assess the components of prudential risk to generate a summary risk assessment
- ▶ Apply judgement to asses if the process outcome is adequate and adjust it if appropriate
- ▶ Compare your risk assessment with the risk appetite
- ▶ Consider recommendations for adjustments to reduce the prudential risk assessment to within the risk appetite
- ▶ Apply judgement to asses if the process outcome is adequate and adjust it if appropriate
- ▶ Provide a recommendation and proposed adjustments with supporting reasons

Reporting

- ▶ Your group will
 - Report your recommendation, proposals for adjustments, with supporting reasons.
 - Do so in a 5 minute presentation on the final day of the Program.
- ▶ Presentations will be discussed by Program participants and faculty.

Information

- ▶ Case Study summary
- ▶ Appendix 1: Process
- ▶ Appendix 2: Company information
- ▶ Questions are encouraged during the Program
- ▶ This is not about 'finding' the or a 'right' answer
- ▶ It is about applying a process in an independent, unbiased, professional and transparent manner

Thank you ...

Case Study

Jules Gribble
jules.gribble@bis.org



Supervisory Capacity Building: Actuarial services
Prudential supervision and risk management in insurance

Group Case Study: Assessment Process

Jules Gribble, Program Coordinator

July, 2017

1 Overview

This is a lengthy document that provides a lot of detail as explanation.

The purpose of this section is to provide a summary roadmap of the high level objectives to put the detail into perspective.

The overall objective is to provide a structured process to support the assessment of the prudential actuarial risks involved with a product or proposal under consideration by a supervisor. The scope of this work is limited to the supervisory assessment of prudential actuarial risks.

To make such assessment in a transparent and accountable manner, processes are provided. It is recognised that these processes are somewhat 'mechanical' and so cannot be expected to reflect all the nuances and specifics of any particular situation. There is a clear need for supervisory discussion and judgement to be applied to the outcomes from these process in order to obtain good supervisory decisions.

However the processes provide a common basis for assessments and also provide a common 'language' for discussing outcomes. It is also expected and acknowledged that the outcomes from these processes should be regarded as inputs to broader supervisory discussions and decision making processes. These wider discussions will take into account issues and circumstances not reflected in a prudential actuarial risk assessment.

In summary:

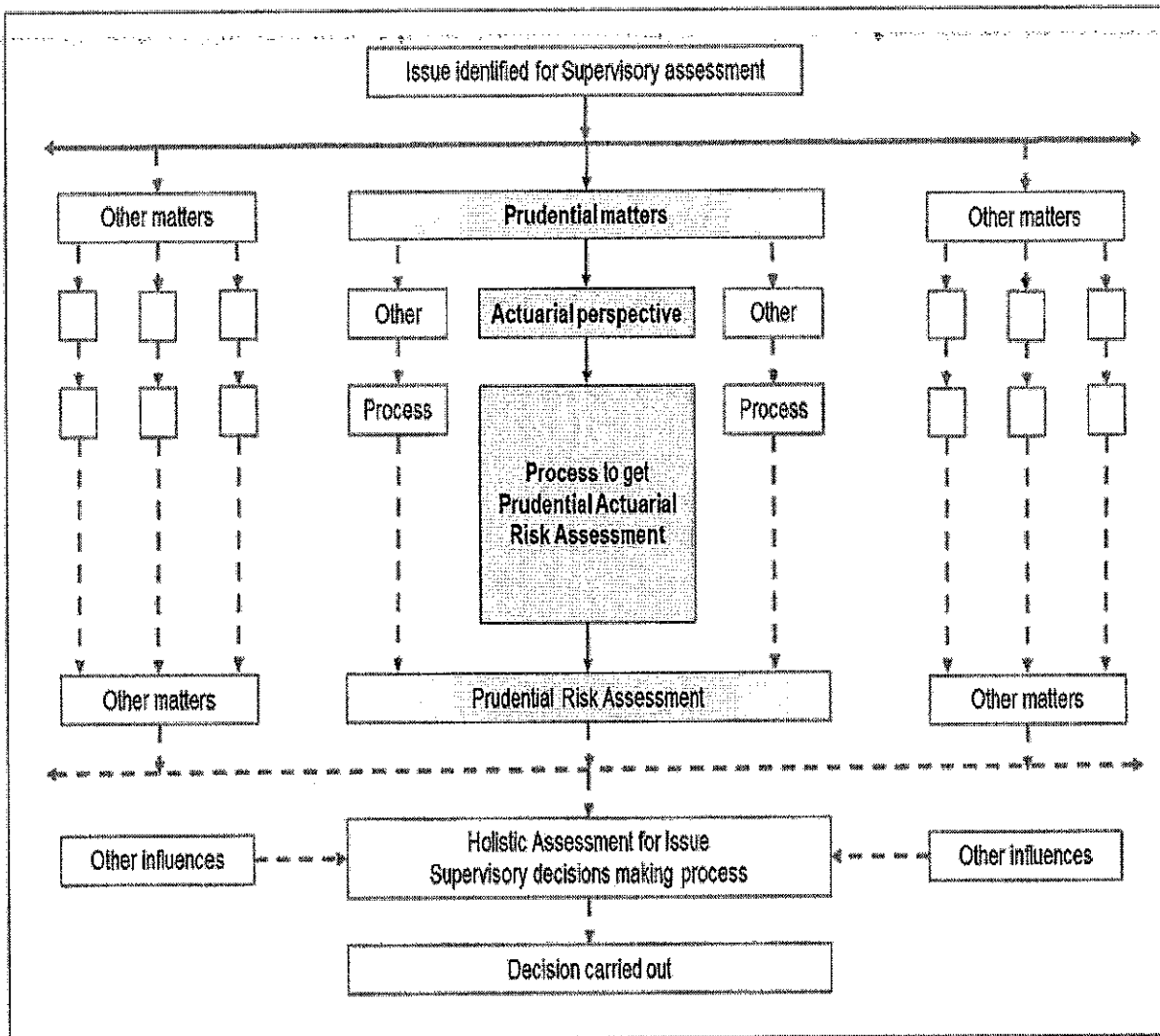
- Prudential actuarial risk assessment is placed in context. See section 2)
- A basic tool (heat maps) and an assessment framework is provided. This includes setting of a risk appetite relevant to the issues under discussion. See section 3.
- The components of the framework are discussed
 - A Prudential actuarial risk assessment process is provided. See section 4.
 - A Business risk assessment process is provided. See section 5.
 - A Proportionality assessment process is provided. See section 6.
 - A Supervisory risk assessment process is provided. See section 7.

1 Overall process

The overall supervisory process provides a high level approach. The focus of this work is on prudential matters and within that an actuarial perspective is taken. Hence the shading in the diagram. This makes it clear that there may well be other issue that should to be addressed to get an appropriate overall prudential perspective on a supervisory matter, but they are outside the actuarial part of prudential considerations so they are out of the scope of this work. The parts of the overall process directly relevant to this paper is just those in the centre and coloured yellow. This emphasises that prudential actuarial risk assessments should not be take in isolation.

The process also makes it clear that the risk assessments are not the supervisory decisions, but input(s) to them.

Process: Overall supervisory process



Examples of issues that may be addressed using this process include

- Approval of a particular product for a particular insurer

- Assessment of a particular product that will be marketed by many insurers. Such as mandatory covers.
- An assessment of regulatory and supervisory changes. Such as the introduction of new capital requirements.

As issues become more focussed the number of aspects needing to be considered may be expected to reduce.

An example of 'other' matters that may need to be considered in a supervisory assessment are Market conduct matters. There is an actuarial aspect here and there are links to the prudential considerations. For example, poor selling practices may lead to increased lapses which in turn may affect the financial position of the insurer. Another aspect of selling practices may be product illustrations which are prepared using actuarial input. These issues are considered out of scope for this paper.

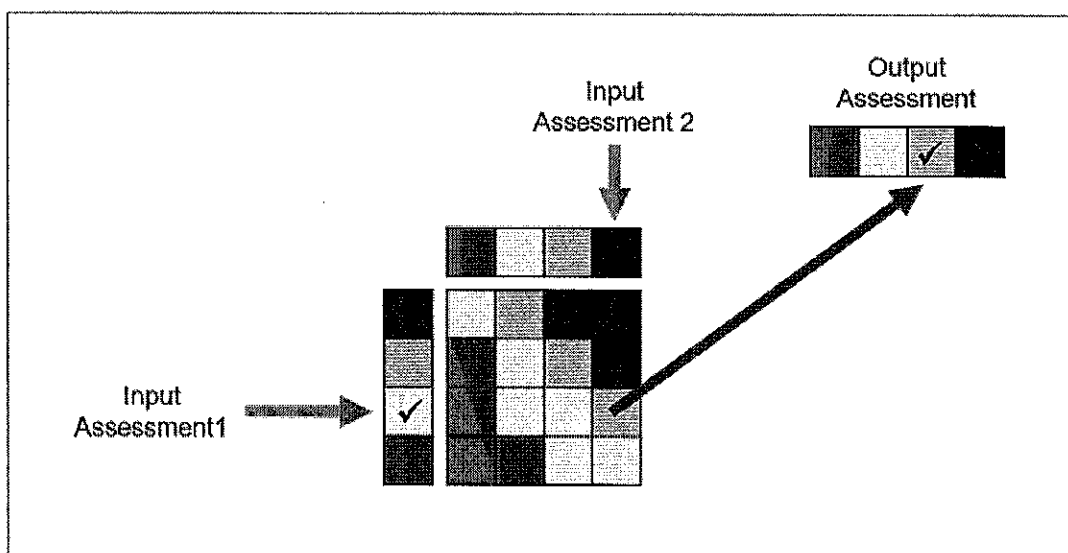
2 The basic tool and assessment framework

There are many things to consider in developing a risk assessment. These are explained in more detail in following sections. The focus of this section is on the process itself. The objective is to break a complex multifaceted task down into smaller, clearer and more manageable components.

2.1 The basic tool

The basic tool used is a 'heat map'. This provides a mechanism to obtain and outcome aggregate risk assessment from two separate input risk assessments. This is illustrated in the following diagram.

Diagram: Heat map and Risk Appetite



The structure (4 cells by 4 cells) and coloring of the heat map is illustrative. In real situations, supervisors would tailor all heat map used to their needs and circumstances. The coloring

indicates the supervisor's level of comfort with the input risks and the aggregate output risk. In this context the idea interpreted more widely, in terms of desirability of input and outcome. This can be interpreted from the perspectives of both risk and capacity.

- **Green.** Indicates comfort and an acceptable outcome. In terms of risk, it suggests low risk. In terms of capacity it suggests high capacity.
- **Yellow.** Indicates some discomfort that may be acceptable. In terms of risk, it suggests some risk. In terms of capacity it suggests adequate capacity.
- **Orange.** Indicates discomfort that may not be acceptable. In terms of risk, it suggests higher risk. In terms of capacity it suggests weak capacity.
- **Red.** Indicates severe discomfort that is very likely not acceptable. In terms of risk, it suggests high risk that may be unacceptable. In terms of capacity it suggests little or no and likely inadequate capacity.

2.2 Components of assessment

The overall assessment reflects multiple component assessments. They are explained in more detail in following sections. They are brought together by repeated use of the 'heat map' approach. This is illustrated in the following diagrams.

Diagram: Component of Prudential actuarial risk assessment

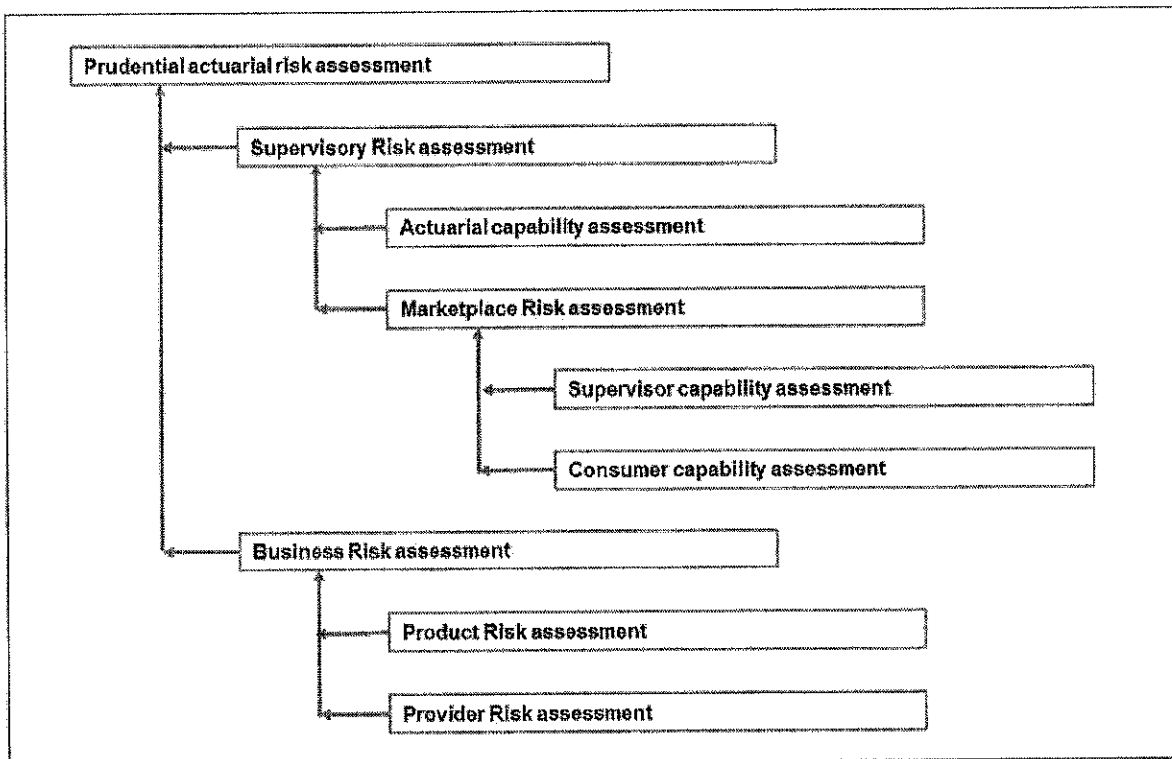
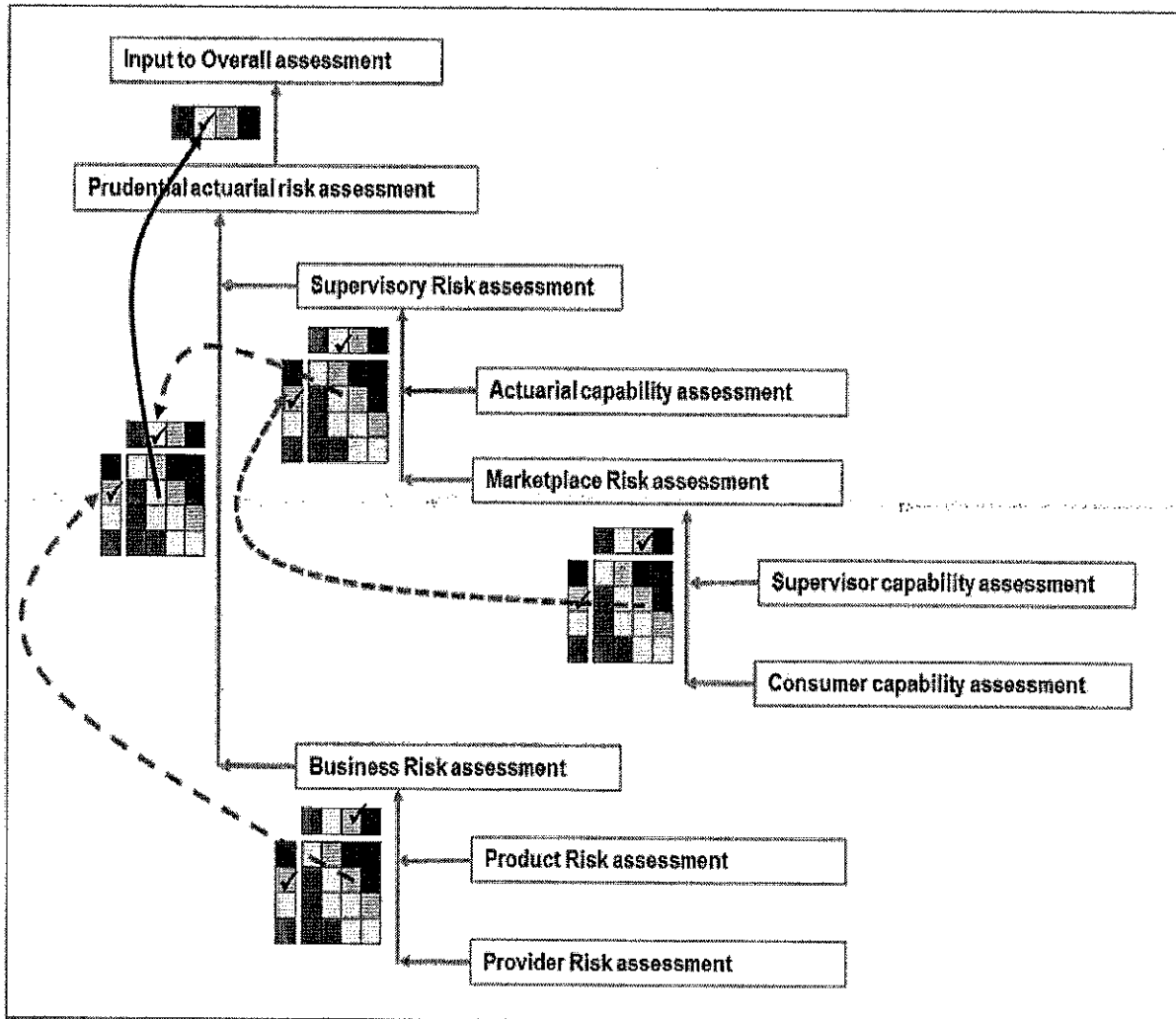


Diagram: Heat maps and prudential actuarial risk assessment



This diagram also includes a hypothetical example of how the outputs from the lower level heat maps combine to contribute to the overall outcome, the prudential actuarial risk assessment. This then is carried forward as an input to a wider overall assessment (which is outside the scope of this work).

2.3 Risk appetite

When the output assessment is obtained there should then be an assessment of whether the level of risk is acceptable. This asks if the output risk assessment lies inside or outside the supervisor's risk appetite. This implies a risk appetite needs to be set so that outcomes can be compared against it. The risk appetite used may vary depending on the specific circumstances being addressed. For example the delivery of a stable and sustainable mandatory product, such as mandatory third party automobile insurance, may have a lower risk appetite for interruption or failure than a discretionary product.

In summary terms, if an outcome lies within the supervisor's risk appetite then the supervisor, all other things being equal, should be comfortable to go ahead and allow or implement the

course of action since it considers that the level of risk involved is both low enough and manageable with the resources it has available. On the contrary, if the assessment falls outside the supervisors risk appetite then the supervisor, all other things being equal, should be uncomfortable to go ahead since it considers that the level of risk involved is too high and not manageable with the resources it has available. This implies that adjustments are needed to reduce some risks so that when the outcome is then reassessed it moves within the supervisory risk appetite. This may be an iterative process.

Of course, in practice things are not as mechanical as this for a number of reasons, such as:

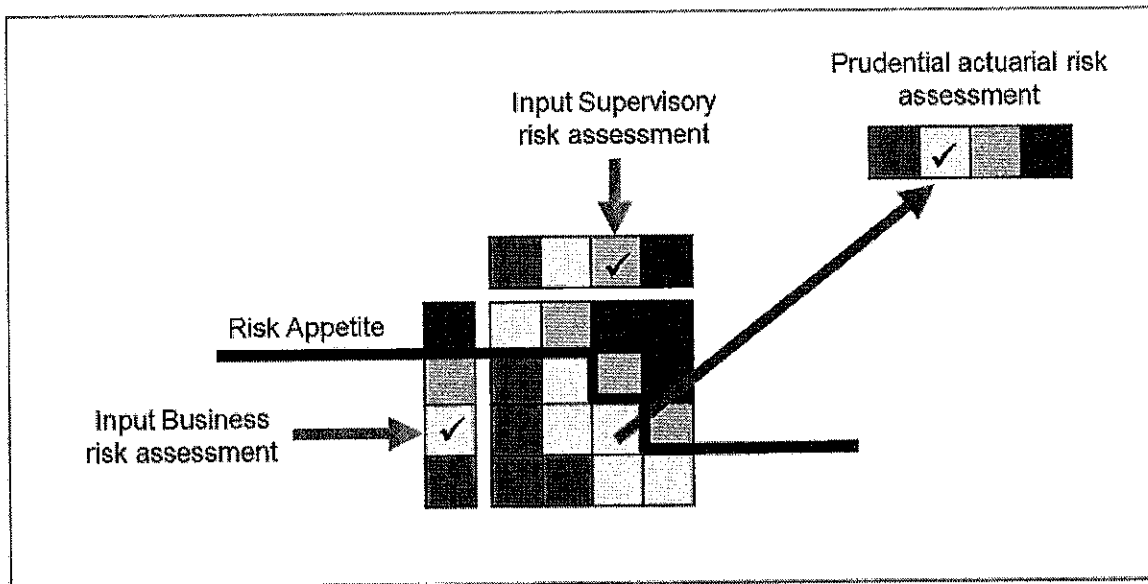
- The 'all things being equal' caveat is not valid
- The supervisor does not have a choice in the matter. For example legislation has been passed requiring the course of action to be taken
- There are judgements made in making risk assessments. These may vary over time or be adjusted on review.

It also follows that the supervisory risk appetite should be considered and set before the initial application of the Assessment framework to avoid the risk of 'back-fitting'

The critical place where a risk appetite should be applied is at the level of the prudential actuarial risk assessment. It may also be useful to consider the component risk assessments, but in some cases there can be offsetting of risk as the steps are moved through, and also it may be onerous and restrictive to attempt to apply risk appetites at each stage. Having said that, it may still be appropriate to have some guidelines in place, such as if a red assessment come up then this must be addressed and, no matter what the final prudential actuarial risk assessment is, it still is deemed to fail due to the presence of a red component.

The application a hypothetical risk appetite is shown in the following diagram.

Diagram: Application of a Risk appetite



2.4 Application

The same heat map (4 by 4 cell structure and coloring) has been used at each step in the process in the above discussion. This is for convenience, and in practice supervisors should consider if this is appropriate and so if the heat maps used should be tailored to reflect their needs and circumstances.

It is noted that this is relatively mechanical process. It should not be expected to reflect all the nuances and issues of any particular situation. Consequently, outputs from this process should not be regarded as 'answers' but as valuable inputs to discussion and providing input to support supervisory judgements and decisions. These supervisory discussions and judgments are separate and in addition to the application of this process. They should not be avoided.

Given this, and the importance of the supervisory decision and judgement process it is suggested that the risk of 'over refining' the approach above be resisted.

Using this approach provides a structure to work with, and this supports more focused discussions and should support improved the quality and transparency of supervisory judgements and decisions made.

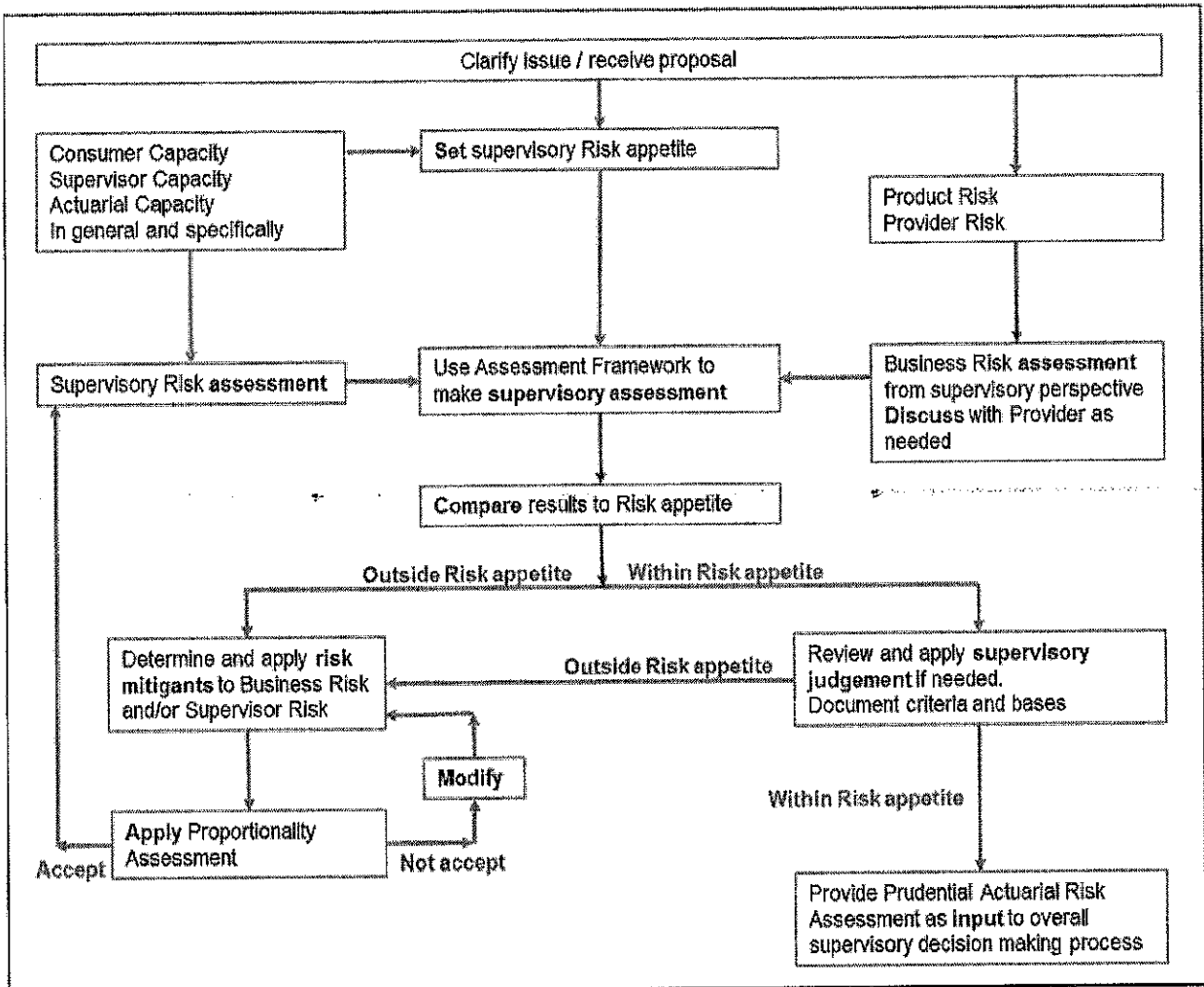
3 Prudential actuarial risk assessment

The following diagram gives a process for assessing prudential actuarial risk. The main steps are:

- Setting a risk appetite and confirm the heat maps use are suitable.
- Assess each component
- Determine the resulting prudential actuarial risk assessment
- If this is within the risk appetite, review and apply supervisory judgement. If the outcome remains acceptable then provide the result as input for the Overall assessment. If not modify one or more component and reassess.
- If this is not within the risk appetite, modify one or more component and reassess

A key outcome of applying this process is that, while the process remains consistent, differing outcomes will emerge, as circumstances change, either between product providers for the same product or between products. Different supervisory decisions may be made in different situations, even when the same product is being discussed. Further, it also follows that even for the same provider and same product different prudential risk assessment may emerge in different jurisdictions. The process provides a way of understanding and explaining such perceived inconsistencies

Process: Prudential actuarial risk assessment



This process includes four further embedded process:

- Using the Assessment framework
- Business risk assessment from a supervisory perspective
- Applying the Proportionality assessment
- Supervisory risk assessment

The application of the Assessment framework has been discussed above. The other processes are discussed below.

4 Business Risk Assessment

When a product is proposed by an insurer for approval the proposal will come with documentation (perhaps in a specified format).

If an issue being considered by the supervisor does not require specific information to be provided by insurers the supervisor will need to form its own view on the topics that are relevant. This may be the case, for example, if the supervisor is considering the impact of a policy change or the implementation of a piece of legislation that has been passed. This may also support to writing or review of regulations.

The Business risk is made up of two components:

- **Product risk.** This focuses on the product itself. It focuses on the contingency or event being insured against and its risk structure and then making an assessment in residual risk, that is, after mitigating steps have been put in place to manage the risks.
- **Provider risk.** This focuses on assesses how well the product provider manages its residual risks in delivery of the products and benefits to its consumers. The provider need to be able to effectively and sustainable deliver the product, and its benefits, to policyholders.

These risks are aggregated as outlined above.

From the actuarial perspective, the process put forward by the IAA paper is followed. It is important to note that the process is followed from a supervisory perspective. Consequently conclusions may differ from those put forward from an industry perspective.

4.1 Product risk assessment

The processes for assessing Product risk is given below:

Process: Assess Product risk

	Product topics	Risk weight (%)	Risk score * (1, 2, 3 or 4)	Weighted risk score (= weight x score)
1	Client insurance awareness and product understanding	15%		
2	Sum insured: amount and predictability	20%		
3	Insured event: frequency and predictability	20%		
4	Data: availability, quality and suitability	10%		
5	Product features: coverage term, deductible, exclusions, waiting period, guarantees, etc	15%		
6	Moral hazard and anti-selection	5%		
7	Fraud potential	5%		
8	Reserving: complexity and significance	5%		
9	Very large and catastrophic risks eg systemic risk	5%		
10	Other product factors	0%		
	Total	100%		

Risk score system is (this matches the 4 cells in the heat maps discussed above)

- 0 = Not relevant
- 1 = Low risk
- 2 = Moderate risk
- 3 = Medium risk
- 4 = High risk

The risk weights are set at the user's discretion but generally speaking the weight given to a factor should reflect the supervisory priorities and concerns. The risk weights should be specified before assessing the risk score.

The Product risk assessment outcome (the rightmost element in the 'Total' row of the table above) is determined as:

- 0 to 0.99 = Low risk (Green in the heat maps above)
- 1 to 1.99 = Moderate risk (Yellow in the heat maps above)
- 2 to 2.99 = Medium risk (Orange in the heat maps above)
- 3 to 4.00 = High risk (Red in the heat maps above)

4.2 Provider risk assessment

The processes for assessing Provider risk is given below:

Process: Assess Provider risk

	Provider capability topics	Risk weight (%)	Risk score (1, 2, 3 or 4)	Weighted risk score (= risk weight x risk score)
1	<u>Product design capability:</u> <ul style="list-style-type: none"> • Market research • Prototype design, testing and rollout • Full product design, testing and rollout • Disclosure and documentation • Review in light of experience 	15%		
2	<u>Sales, marketing and customer education:</u> <ul style="list-style-type: none"> • Sales • Underwriting • Premium collection • Customer marketing and education 	15%		
3	<u>Customer administration:</u>	15%		

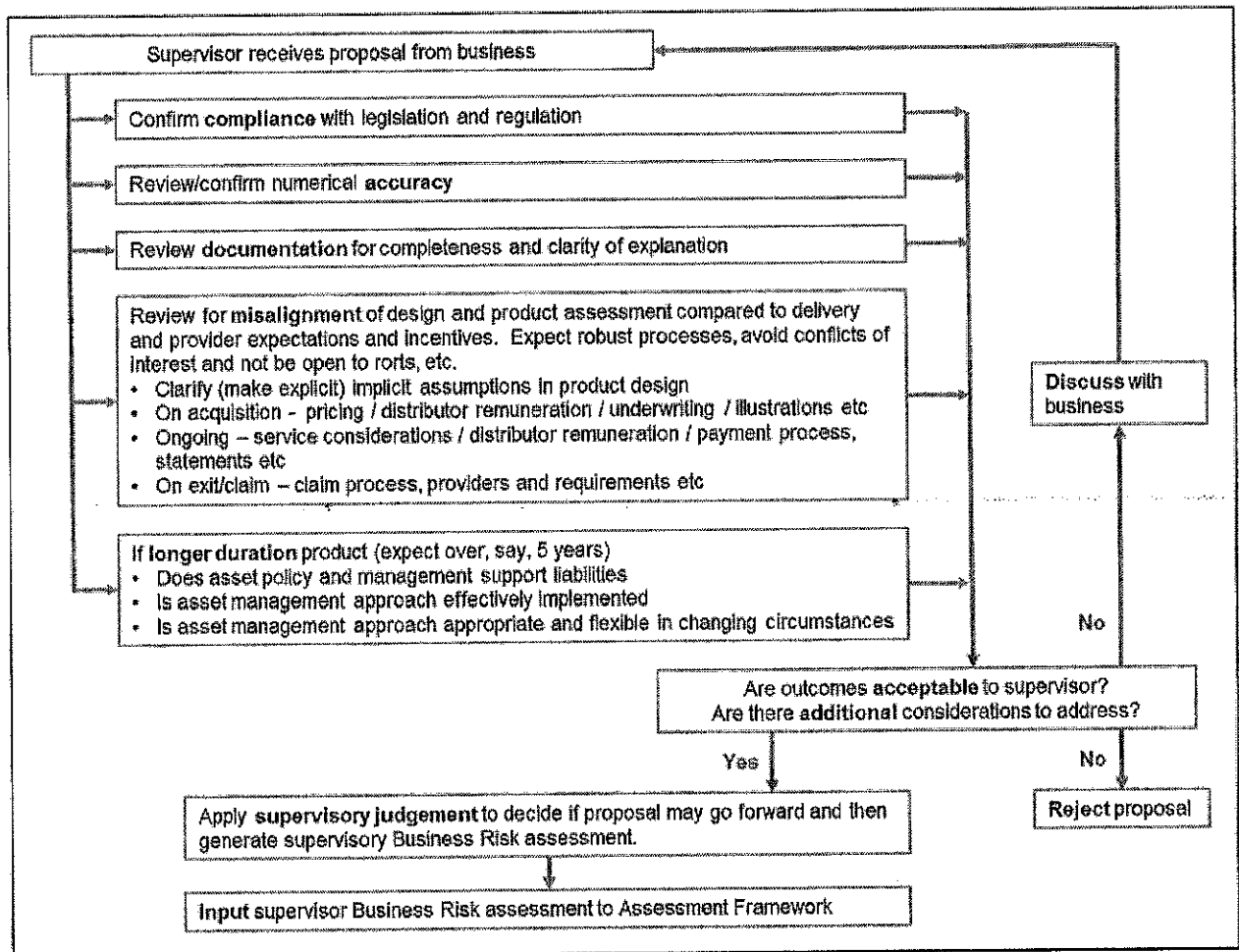
	<ul style="list-style-type: none"> • Customer queries • Claims administration and payments • Dispute resolution 			
4	<u>Technical insurance management:</u> <ul style="list-style-type: none"> • Reserving • Reinsurance • Investment • Capital requirements • Solvency management • Monitoring capability and reporting • Data collection 	20%		
5	<u>Operations:</u> <ul style="list-style-type: none"> • Institutional assessment and internal audit • Finance and administration • Technology • Management of partnerships • Regulatory compliance 	20%		
6	<u>Staff:</u> <ul style="list-style-type: none"> • Technical insurance skills • Skills dealing with customer base • Training and education 	15%		
	Total	100%		

The comments regarding risk scoring system, need for review of risk weights, and conversion of the final risk weighted score back to a risk assessment outcome made for the product risk assessment apply here also.

4.3 Business risk assessment process

The processes for assessing Business risk, from a supervisory perspective, is given below:

Process: Business risk assessment (from a supervisory perspective)



Examples of issues that might arise include:

- In product pricing it is assumed that an 'at work' condition is satisfied, but when the product is sold this requirement is not enforced. This introduces a mismatch between the expected quality of health (as implied by being at work) and the actual outcomes which in practice may also include people too ill to be at work. The consequence of this may be increased incidence of claims and increased size of claims. If this occurs then the product may turn out to be unprofitable in the future.
- If a claims assessment process contains within it incentives for claims managers to refuse claims. The outcome of this may be that legitimate claims are refused for the wrong reasons. While, all other things being equal, this may not impact profitability or even increase it, it is not in consumers interests and ultimately the risk is that the reputation of the product provider (and industry) is tarnished (or worse).
- If claims management is outsourced, for example to independent service providers, then the opportunity to rort the process by inflating or including imaginary claims needs to be avoided. For example, if crash repairs to cars are outsourced to garages without proper control over the actual claims and repairs and costs charged back to the provider may be inflated. An appropriate independent accreditation system might be expected to manage this risk and avoid the natural vested interests and conflicts of interest.

5 Proportionality assessment process

The IAIS defines the 'proportionality principle', by '... supervisors need to adjust certain supervisory requirements and actions in accordance with the nature, scale and complexity of risks posed by individual insurers (i.e. the "proportionality principle")'.

This suggests there are several matters to consider when considering proportionality

- **Appropriateness.** Supervisory measures should achieve their objectives, but not over-reach them. This can have a number of aspects, such as avoiding unintended consequences, appropriate cost-benefit considerations (reflecting all stakeholders), and materiality in the context of impact relative to other issues to be addressed. That is, supervisory measures should be 'fit for purpose'. Assessing outcomes in this regard presupposes that the supervisory objectives are clearly stated and assessable.
- **Flexibility.** Supervisory requirements and actions being tailored and flexible focuses on the supervisory approach, distinct from the outcomes of the approach. Applying diverse approaches to reflect differing characteristics of insurers, while address the same issue, requires a focus on the principles underlying the issue being addressed. This requires expertise and experience to support consistency of outcomes. Directly applying rules based approaches can inhibit the capacity to tailor solutions and flexibility.
- **Focus on risk management.** This implies the need to identify, assess, manage and monitor risks, both separately and as part of the portfolio of risks that apply in practice.

The sentiment of diversity and flexibility also prompts the use of non-traditional approaches and/or channels is very relevant to this paper. Diversity and flexibility refer to both the supervisory approaches and to the financial systems and providers they apply to.

The use of non-traditional approaches leads to the question of comparison between approaches. Two approaches can be considered to be comparable if, from the perspective of the assessor or user of the solutions, outcomes are sufficiently close that the assessor would, under normal circumstances, not change a decision depended on which approach was used.

In emerging markets and/or inclusive insurance contexts, conventional solutions are often not directly applicable. This may be for 'technical' reasons, such as lack of capacity and lack of data, or for 'external' reasons such as the issue being address are new and different (such s distribution channels) or lack of acceptance of actuarial expertise. However, conventional solutions are often taken as a starting point. So the comparison approach above can be rephrased to focus on conventional solution as follows:

A proportionate' approach, relative to a conventional accepted approach, , is a valid outcome if, from the perspective of the assessor, the proportionate approach is attained at a lower cost (broadly interpreted) and has outcomes remains sufficiently close to those of the conventional accepted approach that the assessor would, under normal circumstances, not change a decision that depended on the solution.

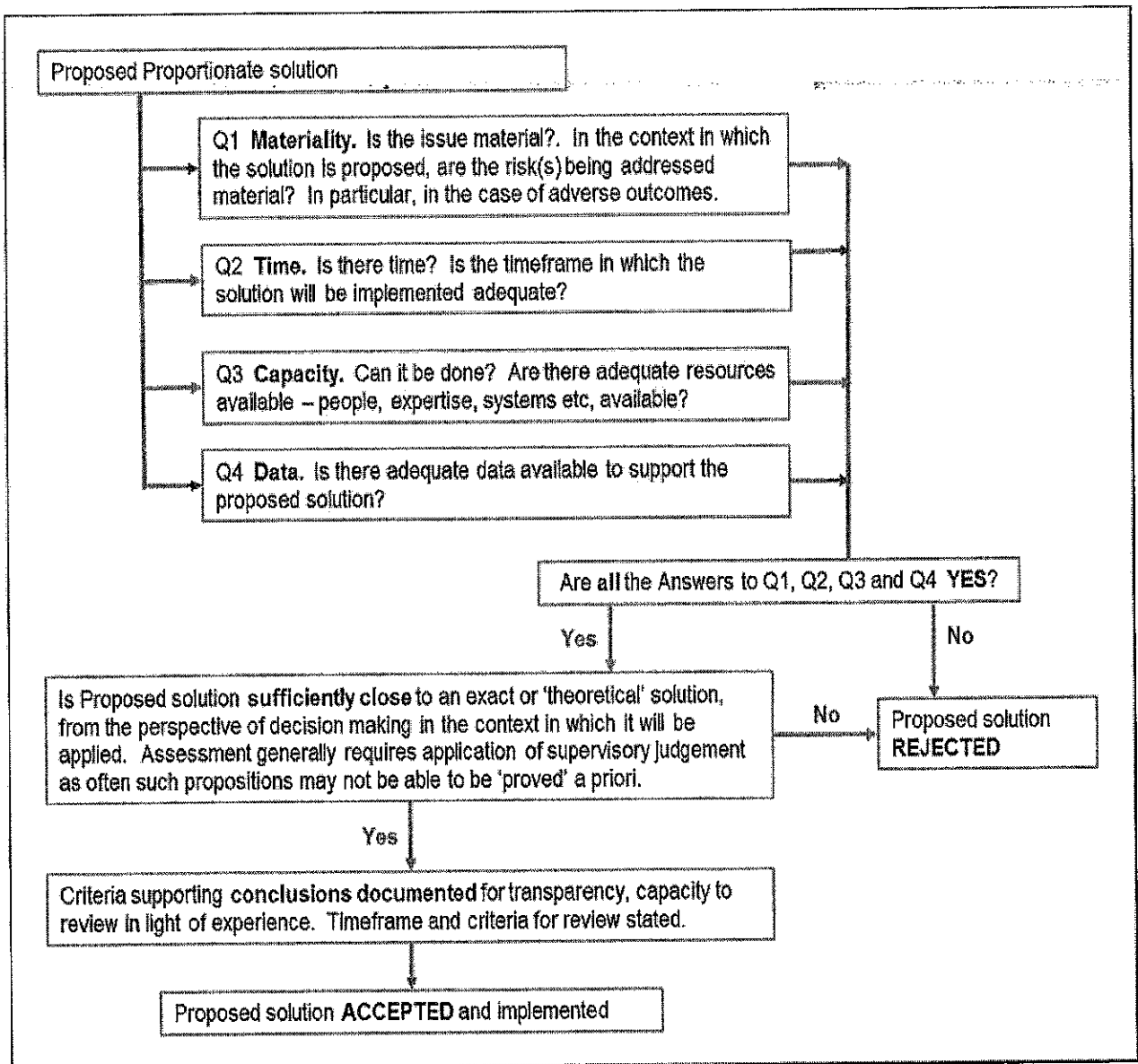
The validity of comparisons between approaches depends on things like clarity of purpose (as comparisons may not be fungible across purposes), acceptability by all key stakeholders, and an understanding of limitations under stress. Using simplifications and approximations may be justified terms of reducing cost and improving accessibility. In particular, this suggests it

may not be appropriate to seek proportionate solutions that are 'cutting edge' and that they may be more conservative than more 'precise' conventional solutions.

There are thus two further considerations that should to be taken into account when assessing proportionality. These are:

- **Relevance of 'conventional' solutions.** Often they are not directly relevant as they cannot be reasonably executed. Now or, potentially, in the foreseeable future.
- **Capacity.** Are there sufficient resources available, to both supervisors and industry, in the time frame needed, to put in place proposed solutions?

Process: Proportionality assessment process is:



6 Supervisory risk assessment

The Supervisory risk is made up of three components:

- The (supervisory) Actuarial capacity
- The Marketplace assessment, which is an aggregation over two assessments:
 - Supervisory capacity
 - Consumer capability.

These risks are aggregated as outlined above.

6.1 Actuarial capacity assessment

The IAA indicates that, in the context of insurance, actuarial skills are used to establish premiums, policy and claim liabilities, and appropriate capital levels. Actuaries apply analytical and technical skills, professionalism, judgment and context to balance the interests of various stakeholders.

These skills are divided split into two groups. These groups overlap in individuals but have different characteristics.

- **Technical skills.** These skills are used to carry out technical roles, such as computing prices, determining reserves and valuation liabilities, carrying our experience analyses, computing and managing capital requirements, modelling (such as for risk management purposes and stress tests), asset-liability management and so on. These technical skill are also more traditionally associated with actuaries.
- **Professional skills.** These skills are used in a broader business context and include the provision of advice to business decision makers, the application of professionalism, considerations of public interest and professional independence, as well as assessing and balancing impacts and consequences of possible actions from the perspectives of various stakeholders. Statutory roles, such as the provision of Financial Condition Reports are also typically included under this wider set of more holistic skills.

Technical actuarial skills, while important and areas of expertise in their own right, particularly if they are applied in standardized or directed environment, either by a superior or by regulation / legislation, may be more widely available than the broader and more holistic professional skills.

In a supervisory context there may be more emphasis on review and of work done by other actuaries who are providing services to insurers. However the underlying skills are the same even if the emphasis has changed.

For the purpose of this work, the actuarial capacity of the supervisor needs to be assessed. In the contest of the approach used in this work, the outcome of this assessment needs to be one of the available heat map categories. Using the hypothetical heat map from above, this means the assessment needs to be put into one of the available green, yellow, orange or red categories.

The category chosen will require some judgment to be applied and will also need to reflect the situations being considered. For example, the outcome may vary if sophisticated knowledge

of indices for agricultural insurance is needed as opposed to a knowledge about more straightforward and better understood credit life insurance.

Some guidance may be obtained from the following illustrative (and incomplete) framework that will help determine the level of actuarial services needed.

Subject to the appropriate governance and management processes being in place, it is noted that the full set of skills a Fellow of an accredited (by the IAA) actuarial association has is unlikely to be required for the Basic level and some of the Medium level actuarial involvements listed below.

- Basic level of actuarial involvement – for simple products with formula-based prudential requirements
 - Product development (including the terms and conditions of insurance policies) and pricing
 - Experience monitoring or advice on experience monitoring
 - Premium and product reviews
 - Advice on underwriting or managing anti-selection, reinsurance and claims management (not necessarily from an actuary could be another technical expert or could get advice from reinsurer)
- Medium level – for more complex products and prudential requirements
 - Calculation of reserves and capital requirements
 - Sufficiency and quality of data used in the calculation of technical provisions
 - Calculation of reserves for transfer of business or mergers and acquisitions
 - Calculation of the value of assets (could be performed by another expert)
 - Comments on appropriateness of investments (could be performed by another expert)
- High level – for long-term products that build up a fund value or has complex risks
 - Asset liability modelling
 - Surrender value calculations
 - Management of reinsurance programs
 - Enterprise risk management modelling
 - Management of pooled savings products, such as with profits
 - Index insurance
- Other services
 - Financial forecasts
 - Capital management
 - Value management (embedded value)
 - Corporate strategy and planning, including mergers and acquisitions

- Advice on risk management and financial condition assessments
- Software modelling
- Statutory roles
 - Certification of premiums
 - Technical provisions
 - Solvency amounts required by the supervisor
 - Financial Condition Reports

6.2 Supervisory capacity assessment

Supervisors and insurance providers operate in the context of their environment. That environment embraces many aspects, including the financial, economic, political, legal, cultural and social. In the context of this document the marketplace perspective of insurance supervisors is focused on two dimensions:

These broader considerations affect both the Supervisory capacity and Consumer capacity assessments.

The tasks that insurance supervisors take on need to be sustainable over time. Limitations on the capacity of an insurance supervisor to properly assess proposed products and successfully complete other aspects of its supervisory obligations should be identified and acknowledged. It is risky for a supervisor to be put in a situation where demands made exceed the capacity to properly and consistently address them.

For the purpose of this work, the supervisory capacity of the supervisor needs to be assessed. In the context of the approach used in this work, the outcome of this assessment needs to be one of the available heat map categories. Using the hypothetical heat map from above, this means the assessment needs to be put into one of the available green, yellow, orange or red categories.

An initial approach is as follows:

Process: Assess supervisory capacity

	Supervisory capacity topics	Risk weight (%)	Risk score * (1, 2, 3 or 4)	Weighted risk score (= Risk weight x Risk score)
1	Extent of published specific and relevant insurance legislation, regulation, resources, policies and supervisory practices	17%		
2	Insurance penetration in the country	17%		
3	Extent to which the supervisor has current actuarial expertise amongst its employees. FTEs, perhaps weighed for level and experience.	17%		

4	Measure of strength of the actuarial profession in the jurisdiction. For example there a local actuarial association is it fully or partly accredited with the IAA.. The number of actuaries resident and providing actuarial services in the jurisdiction (This should be a a relative measure, for example relative to population or GDP to be comparative, for comparability)	17%		
5	Established and reliable access to other (not in jurisdiction) actuarial service and support	17%		
6	Other (specify)	17%		
	Total	100%		

The comments regarding risk scoring system, need for review of risk weights, and conversion of the final risk weighted score back to a risk assessment outcome made for the product risk assessment apply here also.

6.3 Consumer capacity assessment

An understanding of the characteristics of the consumer base is needed. This ties directly to increased protection where there is increased vulnerability and the matter of suitability of products including whether they provide good value to consumers. It is risky for consumers to be put in a situation where the level of financial literacy expected to understand product complexity and purpose may exceed their capacity. A high level assessment of the consumer environment feeds into the overall risk assessment of a product or issue. This assessment may change depending on the product or issue being considered.

It is acknowledged that the control and management of the issues addressed for this assessment may be outside the scope of responsibility of supervisors, including supervisors responsible for both prudential and consumer protection matters. Some matters may be in the scope of responsibility of supervisors directly charged with the development of the insurance industry in their jurisdiction. The approach taken should be to determine a number of independent, objective and publically available criteria.

Despite the control and management of the issues potentially being outside the control of supervisors, an assessment of their position is important as it impacts the scope and practicality of initiatives supervisors may undertake.

For the purpose of this work, the consumer capacity needs to be assessed. In the context of the approach used in this work, the outcome of this assessment needs to be one of the available heat map categories. Using the hypothetical heat map from above, this means the assessment needs to be put into one of the available green, yellow, orange or red categories.

An initial approach is as follows:

Process: Assess consumer capacity

	Consumer / environment topics	Risk weight (%)	Risk score * (1, 2, 3 or 4)	Weighted risk score (= Risk weight x Risk score)
1	Female literacy rate	10%		
2	Political stability	10%		
3	Legal system	10%		
4	Competitiveness of industry	10%		
5	Ease of doing business	10%		
6	Technological infrastructure	10%		
7	Sound and sustainable macroeconomic and financial sector policies	10%		
8	Well developed public infrastructure	10%		
9	Effective market discipline in financial markets	10%		
10	Other (specify)	10%		
	Total	100%		

The comments regarding risk scoring system, need for review of risk weights, and conversion of the final risk weighted score back to a risk assessment outcome made for the product risk assessment apply here also.

6.4 Marketplace risk assessment

This aggregate risk assessment is determined by its component risk assessments and the heat map used.

It is unlikely there will be significant changes in market risk assessment, or its components, in a short time span since the assessment reflects structural matters. However, the marketplace assessment may vary depending on the product and circumstances being considered (and so its components).

This is not to suggest that longer term plans and initiatives should not be undertaken. It is, however, to suggest that in the shorter term the need for effective transition and support process.

6.5 Supervisory risk assessment process

This aggregate risk assessment is determined by its component risk assessments and the heat map used.

The supervisory risk assessment, for a particular matter under consideration, may be moved in the shorter, medium or longer terms as the actuarial capacity is adjusted. As noted above, the marketplace assessment for each matter is unlikely to change quickly over time.

2.2 Insurance failures, causes and risks

Jules Gribble, Senior Policy Advisor, IAIS
17 July 2017



Risk

Risk ...

- ▶ Possibility of not meeting objectives
- ▶ Degree measured by likelihood and extent to which objectives are not met
- ▶ Impacted by many factors
 - Internal and external

Agenda

- ▶ Risk
- ▶ Causes of failures
- ▶ Taxonomy

Reasonable statements?

- ▶ All material risks will be addressed
- ▶ To manage a risk it must be modelled
- ▶ 'We are seeing things that were 25-standard deviation moves, several days in a row'
- ▶ All financial projections (models) are probabilistic statements
- ▶ A risk management process is successful if no (major) risk events occur

Risk management tools

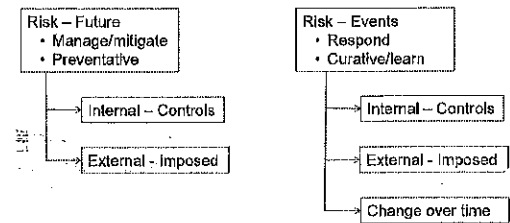
- ▶ Identify
- ▶ Avoid
- ▶ Retain
- ▶ Reduce
 - Probability, severity, variability, cap etc
- ▶ Transfer
 - (re)insure, hedge, participating, users
- ▶ Exploit
 - Diversify, negative correlations
- ▶ Key issue is how these tools perform under stress

Unknown / uncertain

- ▶ Known risks
 - Identified and quantified ex ante – modelled
- ▶ Unknown risk
 - Identified but not meaningfully quantifiable (currently)
 - Unknown = unmanaged financially
- ▶ Unknowable risk
 - Not identified. Let alone quantifiable
 - Unknowable = unmanageable (financially or otherwise directly)
- ▶ Cannot measure so cannot manage ...
 - Does it make sense to hold NIL reserve for unknown or unknowable risks?

The full picture

- ▶ Perspectives
 - Entity – inside looking out
 - Broader – outside looking in. Jurisdictional or global



Varying nature

- ▶ Speculative Risk (gambling)
 - Possibility of gain or loss
 - Voluntary - situation may be deliberately created
- ▶ Pure Risk (insurance)
 - Indemnity - one sided (loss or no loss)
 - Involuntary
 - Often insurable
- ▶ Range in between

Insurable risk

- ▶ Quantifiable, definable (beforehand)
 - Measured probabilistically
 - Sufficient exposure to permit pooling
 - Consequences in financial terms
- ▶ Fortuitous
 - Lack certainty – timing or occurrence
 - Out of control of insured - moral hazard
- ▶ Not threaten public interest
- ▶ Not catastrophic to insured population
- ▶ Risks taken on by, not risks faced by insurers

Risk – management or avoidance

- ▶ Risk often does not go away, it just changes where and how it emerges
- ▶ The 'do nothing option'
 - Often a high risk choice
- ▶ Inherently statistical in nature
 - There are no guarantees
- ▶ Essence of insurance is risk management
- ▶ There WILL be risk events - management
- ▶ 'This will never happen again' - avoidance

Traditional (actuarial) risk focus

- ▶ Assets
- ▶ Liability determination (reserving)
 - Guarantees
- ▶ Asset / Liability management
- ▶ Pricing
- ▶ Factor based capital, and capital management
- ▶ Direct balance sheet impacts
 - 'Total balance sheet'

'Modern' (actuarial) risk focus

- ▶ Enterprise risk management
 - Holistic over enterprise – not siloed
 - Reflects interactions
- ▶ Complex
 - 'Internal' models and stress tests
 - Risk based capital (and in other areas)
 - Supervisory challenges – move from specify to assess
- ▶ Risk (principles?) not rules based supervision
 - Paradigm shifts

ERM

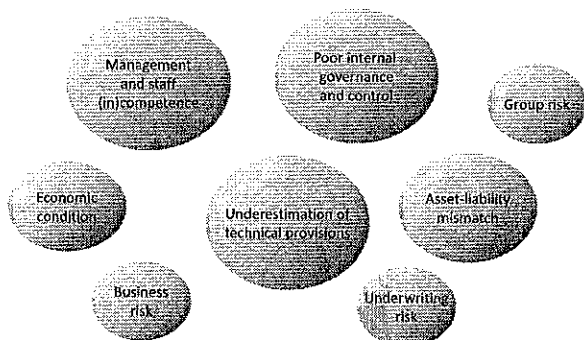
- ▶ No uniform definition – continues to evolve
- ▶ Key features
 - Objectives – need be set to manage to
 - Process - culture, people, tools
 - Value - strategic & long term creation
 - Top down – Board and all levels
 - Risk appetite – target(s) to risk manage to
 - Manage - not avoid - risks
 - Comprehensive – 'all' risks
 - Portfolio – different approach to individual RM

Risk – summary – its tough stuff!

- ▶ ERM and 'risk based' are good ideas, but tough and resource hungry in practice
 - Industry focus - Business as Usual (BaU)
 - Supervisory focus – Not BaU (adverse stresses)
- ▶ Understanding does not necessarily imply should do
 - Need reflect own environment, industry and capacity
- ▶ Cannot measure everything so there is always a key role for professional and supervisory judgement
- ▶ Humans tend to have little intuition into risks and statistics, including those who are 'professionals'

Causes of failures

Empirical evidence: causes of insurer failure



The Sharma report

- ▶ 2002, EU, analysis of failures and near failures
- ▶ Management issues seem root cause of all failures
 - Increased focus on underlying internal causes
- ▶ Risks interact in complex ways
 - Seek understand causal links and unexpected correlations (under stress) – review groups risk maps
- ▶ Moving to risk based approach has benefits, but increased need for judgment and 'more subjective assessments'
- ▶ Get right balance between prescriptive rules, principles, incentives and diagnostic tools

Commentary

- ▶ All case studies had significant underlying management or governance causes
 - Many had significant systems and controls issues
 - Widespread underwriting and asset problems arose due to these weaknesses
 - Combination of poorly managed risks made the firm particularly vulnerable to adverse external events
- ▶ Four forms of management problem
 - Incompetence, straying outside their field of expertise or uncritically following herd instinct;
 - Excessive risk appetite or objectives that are at odds with prudent management of the business;
 - Lack of integrity
 - Lack of autonomy and inappropriate pressure e.g. from parent company.

Supervisory toolkit

- ▶ Sharma proposes tools to address each of the 7 main risk areas (see 'Main causes' chart) operating mainly at one of 4 levels
 - Organisation and governance
 - Strategy and decision-making
 - Monitoring and flow of information
 - Investigation and corrective action
- ▶ Sharma report contains extensive list of tools in each of these 28 cells
 - Although we are post GFC, approach remains relevant even if detail an focus may be enhanced

New(er) examples of failures ...

- ▶ ...
- ▶ ...

References

- ▶ McDonnell W, 'Managing Risk: Practical lessons from recent "failures" of EU insurers', FSA Occasional Papers 20, 2002. See www.fsa.gov.uk
- ▶ Sharma R et al, 'Prudential Supervision of Insurance Undertakings', Conference of Insurance Supervisory Services of the Member States of the European Union, 2002. See http://ec.europa.eu/internal_market/insurance/docs/solve_ncy/impactassess/annex-c02_en.pdf

Taxonomy

- ▶ Use a structure to categorise risks
 - Tiered from broad to granular
- ▶ Value in the categorization process itself
 - Supports discussion and understanding interactions
- ▶ No single 'right' answer
 - Need consistency and completeness
- ▶ There as few new risks
 - May change priority and impact over time
 - Changes often (but not only) driven by technology
- ▶ Example – 'cyber risk' (and current focus on it)

Risk categories

- ▶ Underwriting
- ▶ Credit
- ▶ Market
- ▶ Operational
- ▶ Liquidity
- ▶ Other
- ▶ Application

See: IAA WP for IAIS (2004), Basel II



Supervisory Capacity Building: Actuarial Services, July 2017

Underwriting risk

- ▶ Insurers assume risk, perils & processes
- ▶ Risks:
 - Underwriting process
 - Pricing
 - Product design
 - Claims
 - Economic environment
 - Net retention
 - Policyholder behaviour
 - Reserving



Supervisory Capacity Building: Actuarial Services, July 2017

Credit risk

- ▶ Default, change in credit quality of security issuers, counter-parties, intermediaries
- ▶ Risks:
 - Business credit
 - Invested asset credit
 - Political risk
 - Sovereign risk



Supervisory Capacity Building: Actuarial Services, July 2017

Market risk

- ▶ Level or volatility of market prices of assets, including options
- ▶ Risks:
 - Interest Rate
 - Equity and Property
 - Currency
 - Basis
 - Reinvestment
 - Concentration
 - Asset/Liability Management
 - Off-balance sheet



Supervisory Capacity Building: Actuarial Services, July 2017

Operational risk

- ▶ Inadequate or failure of internal process, people or systems or external events
- ▶ Risks (Basel 2):
 - Internal fraud
 - External fraud
 - Employment practices & workplace safety
 - Clients, products & business practices
 - Damage to physical assets
 - Business disruptions and systems failure
 - Execution, delivery and process management



Supervisory Capacity Building: Actuarial Services, July 2017

Key Operational risk areas

- ▶ Corporate culture and accountability
- ▶ Internal risk management frameworks
- ▶ Business continuity planning
- ▶ Outsourcing
- ▶ Fraud management
- ▶ IT including e-commerce and systems migrations
- ▶ Key personnel risk



Supervisory Capacity Building: Actuarial Services, July 2017

Liquidity risk

- ▶ Insufficient liquid assets to meet obligations as they fall due
- ▶ Risks:
 - Liquidation value – poor market conditions
 - Affiliated company – hard to sell/drain
 - Capital markets – insufficient funding

Other risks

- ▶ Strategic / Business
- ▶ Reputational
- ▶ Systemic
- ▶ Regulatory/political change
- ▶ Distribution (& competition)
- ▶ Expense
- ▶ Contagion & related party
- ▶ Extreme events
- ▶ Changing social attitudes

Application risk

- ▶ Theory + Application = Success
 - Not only need to know what to do, but need to do it
- ▶ Weakest link in the chain the key
- ▶ Multiple approaches – no single 'correct'
- ▶ Volatility of reality
 - World an inherently risky place
 - Cannot – should not seek - cater for all risks
 - Limit coverage eg 1 in 200 years
- ▶ Failures will happen

Application risks

- ▶ Governance and culture
 - Process and its execution
 - Regulator and those regulated
 - Key risk is entity management
- ▶ Model errors
- ▶ Evaluation 'trap'
- ▶ Regulatory prescription - detail
- ▶ Balanced approach
 - Reflect needs of multiple stakeholders
 - Independence – regulatory capture

Perspectives

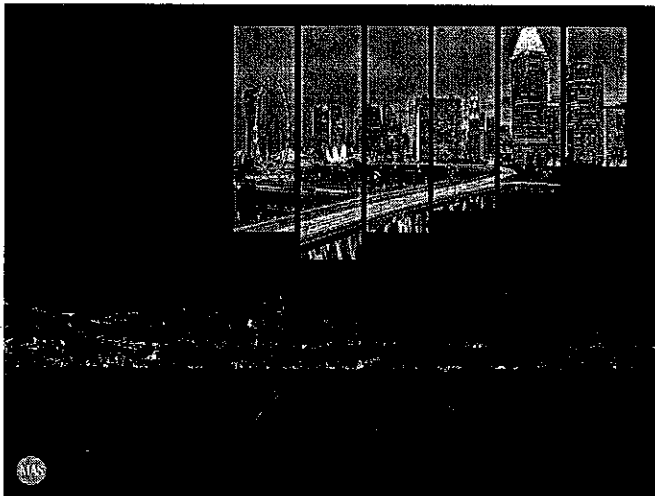
- ▶ Regulatory
 - Reduce risk failure
 - Worst case
 - Intervention triggers
- ▶ Business
 - Best estimate
 - Market forces – external judgements
- ▶ Inherently different

Thank you ...

Insurance failures, causes and risks

Jules Gribble
jules.gribble@bis.org





Agenda

1. Key Insurance Core Principles (ICPs) on Risk Management
2. Supervisory Perspective
 - a) Risk-based Supervision Regimes
 - b) Singapore CRAFT
 - Overview of a Risk Assessment Process
 - Risk Rating
 - Impact Assessment
3. Conclusion: Putting it together

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1. Key ICPs on Risk Management

ICP 8: Risk Management and Internal Controls

ICP 13: Reinsurance and Other Forms of Risk Transfer

ICP 16: Enterprise Risk Management

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ICP 8: Risk Management & Internal Controls

ICP 8: "The supervisor requires an insurer to have, as part of its overall corporate governance framework, effective systems of risk management and internal controls, including effective functions for **risk management**, compliance, **actuarial matters** and internal audit."

"the Board is ultimately responsible for ensuring that the insurer has in place effective systems of risk management and internal controls and functions to address the key risks it faces" - ICP 8.0.1

"The systems and functions should be adequate for the insurer's objectives, strategy, risk profile, and the applicable legal and regulatory requirements. They should be adapted as the insurer's business and internal and external circumstances change." - ICP 8.0.3

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ICP 16 – Enterprise Risk Management

ICP 16: "The supervisor establishes enterprise risk management requirements for solvency purposes that require insurers to address all relevant and material risks."

"The objective of ERM is not to eliminate risk. Rather, it is to manage risks within a framework that includes self-imposed limits." - ICP 16.0.8

"The IAIS recognises the different levels of sophistication of supervisors and insurance markets... this ICP may not be fully achievable by some insurers and in some markets in the near future. Nevertheless... good risk management practices and procedures need to be in place for solvency requirements to be effective." - ICP 16.0.9

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ICP 13 – Reinsurance and Other Forms of Risk Transfer

ICP 13: "The supervisor sets standards for the use of reinsurance and other forms of risk transfer, ensuring that **insurers adequately control and transparently report their risk transfer programmes**. The supervisor takes into account the nature of reinsurance business when supervising reinsurers based in its jurisdiction."

A reinsurance contract... does not constitute a legal transfer of part of the underlying risk... Nonetheless, it is normal... to refer to reinsurance contracts as having the effect of transferring part of the underlying risk, and this is true in an economic (although not legal) sense. - ICP 13.0.13

"The supervisor takes into account the nature of supervision of reinsurers and other counterparties, including any supervisory recognition arrangements in place" - ICP 13.3

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2. Supervisory Perspective

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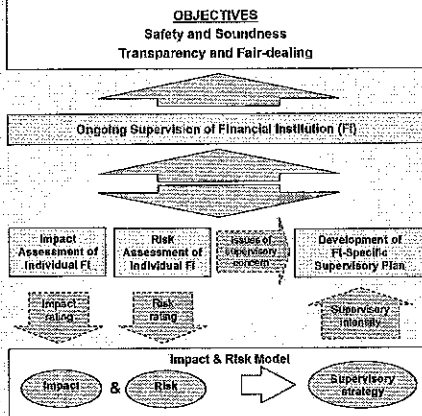
Risk-based Supervision Regimes

- Many supervisors have implemented risk-based supervision
- Examples:
 - **Australian Prudential Regulatory Authority**
 - Probability and Impact Rating System (PAIRS) – risk assessment model
 - Supervisory Oversight and Response System (SOARS) – supervisory stance based on PAIRS assessment
 - **Canada's Office of the Superintendent of Financial Institutions**
 - Supervisory Framework – a) significant activities, b) inherent risks and risk management for each activity (=> net risks); c) Overall net risks; d) Composite Risk Rating
 - **Monetary Authority of Singapore**
 - Comprehensive Risk Assessment Framework and Techniques (CRAFT)

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MAS - Supervisory Approach



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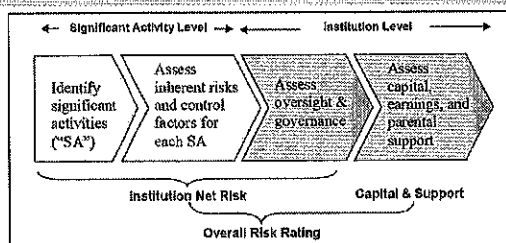
CRAFT – Factors behind the risk rating

Overall Risk Rating			
Institution Net Risk			Capital & Support
Inherent Risks	Control Factors	Oversight & Governance	
<ul style="list-style-type: none"> • Credit / asset • Liquidity • Market • Operational • Technology • Insurance • Market conduct • Money laundering / Terrorism financing • Legal, reputational and regulatory 	<ul style="list-style-type: none"> • Risk management systems and control • Operational management • Internal audit • Compliance 	<ul style="list-style-type: none"> • Board of Directors • Senior management • Head office / parent company 	<ul style="list-style-type: none"> • Capital • Earnings • Parental support
<< Assessed at Significant Activity Level >>			<< Assessed at Institution Level >>

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Overview of the Risk Assessment Process



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Identification of Significant Activities ("SA")

- SAs have a material impact on an insurer's ability to achieve its business objectives and comply with solvency requirements
- Can be a significant line of business or business function
- Should be consistent with insurer's business model and organizational structure
- **Role of Actuarial function**
 - Should consider the materiality and impact of business line SAs
 - For life insurers, actuarial function is typically a SA
 - On its own e.g. product development & pricing, actuarial valuation
 - Within certain functional SAs e.g. asset-liability management within investment

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Common SAs for Life Insurers

- Investment
- Product Development & Pricing
- Actuarial Valuation
- Accounts, Financial Reporting & Credit Control
- Underwriting
- Operations
- Claims
- AML/CFT
- Participating Fund
- Distribution
- Reinsurance Management

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What is Inherent Risk?

- Any uncertainty that is intrinsic to a business activity.
- Evaluated by the potential impact and probability of material loss arising from the SA.
- Not all inherent risks are assessed for every SA
- Differentiate between primary and secondary inherent risks.
 - Primary inherent risks have greater influence on net risk score
- Differentiate between gross and net inherent risk
 - Net inherent risk is the level of inherent risk as mitigated or aggravated by the intervention or absence of control factors present in the insurer.

Examples:

Significant Activities	Primary Inherent Risks	Secondary Inherent Risks
Pricing & Product Development	Pricing risk Operational risk	Technology risk Legal risk
Reinsurance Management	Credit/Asset risk	Liquidity risk Operational risk

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What are Control Factors?

- Oversight infrastructure to manage inherent risks
- Assessed in the context of the risk profile of the insurer.

Risk management systems and controls	Management Oversight (Operational)	Internal Audit	Compliance
<ul style="list-style-type: none"> • Independent oversight of risk management • Identify/assess risks, establish policies/controls to manage risk, develop risk tolerance limits, monitor risks, report results 	<ul style="list-style-type: none"> • Line management / department heads to exercise effective oversight of day to-day ops • Ensuring controls are in place to manage and mitigate risks 	<ul style="list-style-type: none"> • Independent assurance of the effectiveness of / adherence to control and governance processes 	<ul style="list-style-type: none"> • Independent oversight of an insurers' compliance with all relevant laws, regulations, codes of conduct and standards of good practice

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Other Factors to Consider

- Quality of oversight by Board, Senior Management or Head Office
- Consistency/Strength of Earnings
 - Earnings represent an internal source of incremental capital to support growth or replenish reserves when needed
- Capital
 - Strength of regulatory capital ratio
 - Resilience of capital position based on results of stress testing and Own Risk and Solvency Assessment (ORSA)
- Parental Support
 - For foreign branches and foreign owned subsidiaries: quality of support from the Head Office/Parent Company.

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Impact Assessment

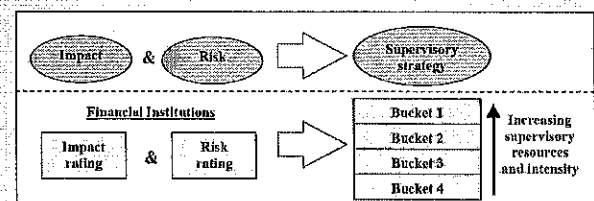
Considerations for assessing impact:

- Relative size and importance
 - E.g. gross premiums or asset base relative to total population of insurers
- Relative scale of retail reach
 - Number of customers
 - Number of representatives
 - Type of business
- Degree to which the insurer is critical to the stable functioning of and confidence in the financial system

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Impact & Risk Model



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MAS CRAFT Scoresheet

Significant Activities (SA)	Inherent Risk (IR)									Control Factors (CF)				Net Risk of SA
	IR 1	IR 2	IR 3	IR 4	IR 5	IR 6	IR 7	IR 8	IR 9	CF 1	CF 2	CF 3	CF 4	
SA 1														
SA 2														
SA 8														
Inherent Risk Rating / Net Risk Rating / Overall Risk Rating 4-point scale: Low, Medium Low, Medium High, High										Board & Senior Mgmt Oversight				
										Institution Net Risk Rating				
										Capital				
										Earnings				
										Parental Support				
										Overall Risk Rating				

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3. Conclusion: Putting it together

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Putting it together - SA: Actuarial Valuation

Primary Inherent Risk	Secondary Inherent Risk
Insurance (reserving) risk	Operational risk
	Technology risk
	Regulatory risk

- Gross IR is lower when:
 - Less complex products to value and less use of approximation methods or model points
 - Comprehensive data for valuation, and greater granularity in valuation assumptions
 - Use of established actuarial valuation software
- Net IR is lower when:
 - Insurer has well established and documented process and procedures for setting and reviewing reserving methodology and assumptions, and reviewing the valuation results
 - Granular experience studies to back assumptions used
 - Experienced staff, and good management oversight

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Putting it together - SA: Pdt Devpt & Pricing

Primary Inherent Risk	Secondary Inherent Risk
Insurance (pricing) risk	Technology risk
Operational risk	Legal risk

- Gross IR is lower when:
 - Insurer sells more traditional products which are less complex to price, or offers lower guarantees
- Net IR is lower when:
 - Insurer has well established and documented processes and policies in place (e.g. assumption setting, peer review, product approval process, monitoring experience post-launch etc)
 - Clear and well articulated procedures and criteria for withdrawal and re-pricing of existing products
 - Clear documentation when quoting a rate that is different from the technical base rate for competitive reasons
 - Good audit process to monitor compliance with insurer's policies and procedures

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Questions?

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Joint Supervisory Capacity Building Program

3.4 Reporting Liability Results – Interface with Accounting Requirements

Shu-Yen Liu TSA MAAA
PwC Asia Pacific Senior Advisor

Beijing & Chongli, China
July 17-21, 2017



Accounting Principles

- The rules and guidelines that companies must follow when reporting financial data.
- In general, Statutory versus GAAP
 - Statutory – Regulatory requirements
 - GAAP – Generally Accepted Accounting Principles
 - Fair playing field cross industries if common characters



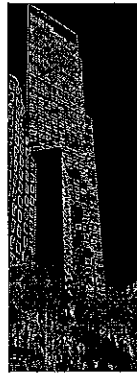
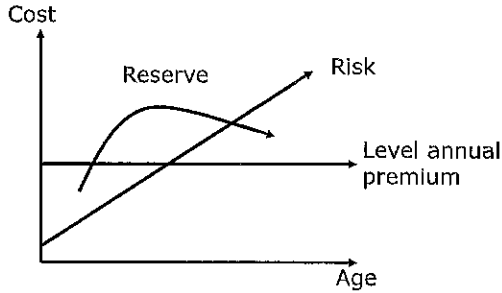
GAAP

- i. the basic accounting principles and guidelines,
- ii. the detailed rules and standards issued by accounting organizations such as IASB (IFRS) or FASB (US GAAP), and
- iii. the generally accepted industry practices. The rules and guidelines that companies must follow when reporting financial data.

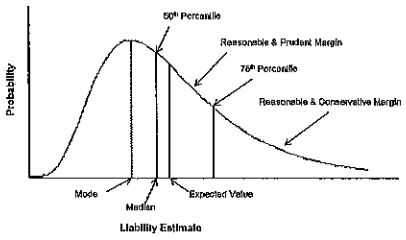
Such standards are essential to the efficient functioning of the economy because investors, creditors, auditors, and others rely on credible, transparent, and comparable financial information.



Reserving Mechanism



Reserving Mechanism – Probability View



Reserving Mechanism need Assumptions

- Example:
- Expense/Commission
 - Lapse/Surrender
 - Mortality/Critical illness
 - Bonus/Dividends
 - Reinsurance
 - Discount rate / Investment yield
 - Loss ratio for short term business including general insurance
 - ...

Most Recent Update – IFRS 17

Reasonability, comparability and operability are 3 key considerations in accounting standard setting.

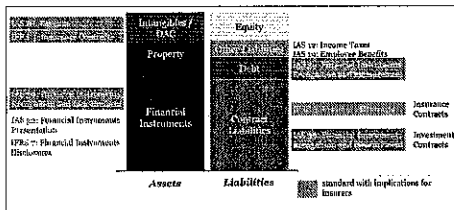
Issues in Accounting Standards

Reasonability, comparability and operability are 3 key considerations in accounting standard setting.

<p>Comparability – accounting methods varying by product and territory</p>	<p>Understanding – it is difficult for investors and analysts to see the key drivers of insurance contract profitability</p>	<p>There is not a clear quantitative assessment of risk</p>
<p>More than 100 different national financial reporting standards exist in the world</p>	<p>Differences between revenue recognition for insurance industry and that for the other financial industries</p>	<p>Economic mismatches between asset and liabilities are not always clear</p>

Existing IFRS

IFRS 17 provides OCI accounting policy to reduce the accounting mismatch, which leads to closer interaction between IFRS 17 and IFRS 9.



Proposed IFRS

IFRS 17: Insurance contracts standard (to replace IFRS 4, mandatory effective date of 2024, Jan, 1st)

- IASB has published finalized insurance contracts standard in May, 2017.
- Valuation of insurance contract liability – BBA/VFA/FAA

IFRS 9: Financial instruments (to replace IAS 39, mandatory effective date of 2018, Jan, 1st)

- Classification and measurement of financial assets - Fair value (P/L or OCI) or Amortised cost
- Liability deposit floor retained; affects business classified as "investment contracts" (e.g. Certain unit linked pension contracts)

IFRS 15: Revenue recognition standard (to replace IAS 18, mandatory effective date of 2017, Jan, 1st)

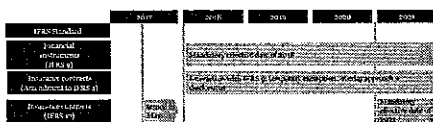
- Affects business classified as "investment contracts"
- Retains DAC incremental at contract level

IFRS 13: Fair value measurement (new standard defining how to fair value)

- "... the price that would be received to sell an asset or transfer a liability in an orderly transaction between market participants at the measurement date"
- The fair value of a liability should reflect the effect of non-performance risk

IFRS Timeline

The change of business criteria to 17 will be a huge challenge for insurers in areas of data, model and systems. However, with these changes, they can expect a more consistent approach.



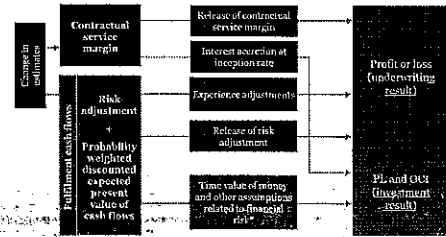
Due to the early effective date of IFRS 9 (2018 Jan 1st), and later effective date of IFRS 17 (2024 Jan 1st), insurance company will implement IFRS 9 without fully assessment of financial impact of IFRS 17, so for the companies meeting the requirement, overlay approach or temporary exemption can be used during transition period.

IFRS 17 Liability Model – How does it work?

Overview of Building Block Approach (BBA)

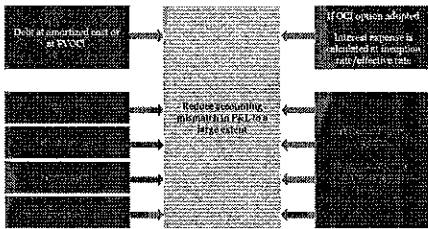
- Based on discounted best estimate of future cash flows
 - Contractual service margin**: Represents unearned profit for contract, amortized equally to each coverage unit. The number of coverage units in a group is determined by considering for each contract the quantity of the benefits provided under a contract and its expected coverage duration.
- Day 1 gain, viable and deferred through Contractual service margin
 - Risk adjustment**: Reflects compensation that entity requires for bearing uncertainty.
- Onshore contracts recorded at Day 1 in income statement
 - Present value of cash flows**: Discounting future cash flows using 'top-down' or 'bottom-up' approach for discount rates to reflect characteristics of the liabilities.
 - Best estimated liability**: Best estimate cash flows – explicit, unbiased and probability weighted estimate of fulfillment cash flows.

Core Principle of Building Block Approach



* Accounting policy choice: (1) recognize all in profit or loss or (2) recognize amount of locked-in discount rate at inception in profit or loss and changes in OCI.

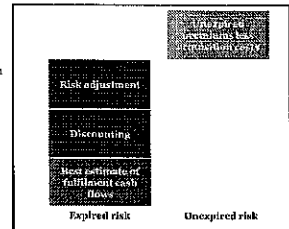
Core Principle of Building Block Approach (Con 't)



Overview of Premium Allocation Approach (PAA)

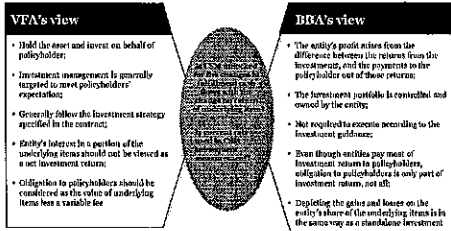
Premium allocation approach is broadly consistent with existing accounting standard.

- Optional simplified model for future cover based on the unearned premium.
- Permitted for short duration contracts (period of cover <= 1 year) or where a 'reasonable approximation' of BBA.
- 'Reasonable approximation' does not apply where entity expects significant variability in cash flows.
- Incurred claims liability (including IBNR) calculated in the same way as for the BBA approach.



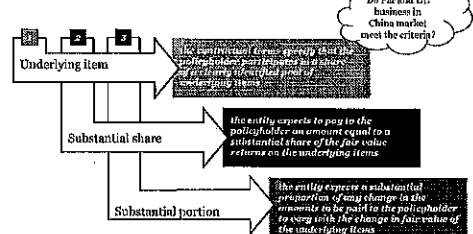
Variable Fee Approach: Background

For the products with benefits varying with the return of underlying item, choosing VFA or BBA model reflects the difference in business concept of products.

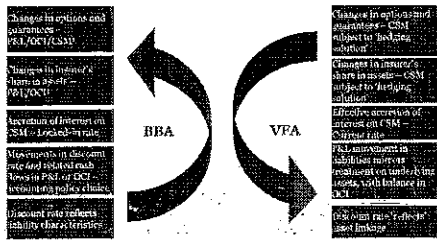


Variable Fee Approach: Eligibility

All the 3 criteria should be met to be eligible for variable fee approach. If not, building block approach should be adopted.



Comparison between BBA and VFA



* Depends on whether PFA or OCI depending on accounting policy election, non-market (CSM)

Overview of the IFRS 17 Liability Model

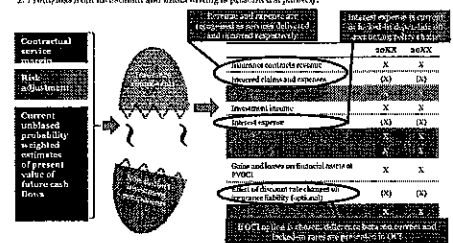
Our existing accounting standard is closer to building block approach, but far away from variable fee approach.

Key features	Key features	Type of treatment
<ul style="list-style-type: none"> Contractual service margin (CSM) is recognized as an asset CSM is subject to impairment CSM is recognized as a liability CSM is subject to impairment 	<ul style="list-style-type: none"> CSM is recognized as an asset CSM is subject to impairment CSM is recognized as a liability CSM is subject to impairment 	<ul style="list-style-type: none"> CSM is recognized as an asset CSM is subject to impairment CSM is recognized as a liability CSM is subject to impairment

IFRS 17 Presentation – Income Statement

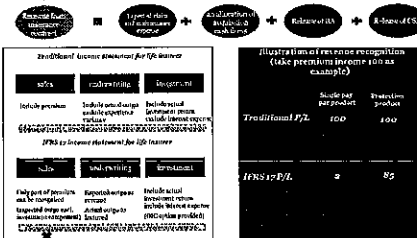
Presentation of Income Statement under IFRS 17

- Only revenue related to insurance service can be presented. Investment component need to be disaggregated. Presentation of premium information that is not consistent with commonly understood means of revenue, such as premium due or premium written, is prohibited.
- Premiums from investment and underwriting is presented separately.



Presentation of Income Statement under IFRS 17 (Con 1)

There are substantial changes to presentation of income statement under IFRS 17, which leads to the more comparable income statement of insurance industry with other financial industry.



Presentation of Income Statement under IFRS 17 (Con 1)

As the requirement under IFRS 17, investment component should be disaggregate and not recognized as revenue, which has significant impact on insurers' revenue, especially for saving products.

Investment component is the amount that insurer has obligation to pay to policyholder regardless the occur or no of insurance events.

Product type	Investment component	Insurance component
Term Life	None	Whole Contract
Whole Life	Survival benefit and surrender value	The remaining
Endowment	Survival benefit, maturity benefit and surrender value	The remaining
Universal Life	Account Value, deducted surrender charge	The remaining
Fixed Index	Account Value, deducted surrender charge	The remaining
Health/Annuity	None	Whole Contract
Annuity (Whole Life)	None	Whole Contract
Annuity (partial)	Certain annuity benefit	The remaining

Income Statement Comparison under Traditional and IFRS17

The revenues under IFRS17 are actuarial-driven results, not actual accounting figures. Disaggregation of investment components largely decreases the revenue of insurance companies and puts forward a high requirement for system. The item "change of reserve" will no longer be on income statement.

IFRS 17 presentation		20XX	20XX-X	Traditional presentation		20XX	20XX-X
Revenue	X	X		Revenue	X	X	
Expected claim level investment component	X	X		Premium income	X	X	
Expected maintenance expense	X	X		Investment income	X	X	
Allocation of acquisition cost	X	X					
Release of CSM	X	X		Other			
Release of BA	X	X		All other change	(X)	(X)	
Other	(X)	(X)		Expenses	(X)	(X)	
Actual claims (including investment component) and expenses	(X)	(X)		Commission	(X)	(X)	
Investment income	X	X		Change of reserve	(X)	(X)	
Other	(X)	(X)					

OCI Accounting Policy in Income Statement

OCI accounting policy only affects interest expense in income statement, not liability measurement in balance sheet.

	20XX	20XX-X	
Insurance contract revenue	X	X	OCI Accounting Policy
Insurance contract expense	(X)	(X)	
Investment income	X	X	OCI Accounting Policy
Interest expense	(X)	(X)	
OCI Accounting Policy			OCI Accounting Policy
OCI Accounting Policy	X	X	
OCI Accounting Policy			OCI Accounting Policy
OCI Accounting Policy	(X)	(X)	

IFRS 17 Presentation -- Income Statement Sample Comparison

IFRS 17					20XX				
Year	2021	2022	2023	2024	Year	2021	2022	2023	2024
Revenue	1,234	1,234	1,234	1,234	Revenue	1,234	1,234	1,234	1,234
Expenses	(1,234)	(1,234)	(1,234)	(1,234)	Expenses	(1,234)	(1,234)	(1,234)	(1,234)
Profit	0	0	0	0	Profit	0	0	0	0

Comparison between IFRS17 and China GAAP

IFRS17	China GAAP
<ul style="list-style-type: none"> Reflect the time value of money, the characteristics of the cash flows and the liquidity characteristics of the insurance contracts "Top down" or "Bottom up" approach Risk free rate plus liquidity premium under bottom up approach Chin. GAAP that may based on the interest on underlying bond to be discount using rates that reflect that variability or to be adjusted for the effect of that variability and discount at a rate that reflects the adjustment result. 	<ul style="list-style-type: none"> Non-pooling products 200-day moving average government bond yield curve with spread Multi-rating products Portfolio return

Comparison between IFRS17 and China GAAP (Con't)

IFRS17	China GAAP
<ul style="list-style-type: none"> Different investment components, embedded derivatives and distinct performance obligations need to be separated. According to the requirement, maturity existing Unearned Life and Investment-Linked products in China don't need to separate. 	<ul style="list-style-type: none"> Separate if the insurance risk component and other risk component for the contracts can be identified and measured independently. All the Unearned Life and Investment-Linked products are needed to be separated.

Comparison between IFRS17 and China GAAP (Con't)

IFRS17	China GAAP
<ul style="list-style-type: none"> Based on coverage units, reflecting the equality of the benefits provided under a contract and expected coverage duration in a group. 	<ul style="list-style-type: none"> Residual margin should be recognized in 20 years over the coverage period in a straight line and reasonable way. However, no requirement on amortization pattern is provided.

Comparison between IFRS17 and China GAAP (Con't)

4. Contractual Service Margin - Subsequent Measurement

IFRS17	China GAAP
<ul style="list-style-type: none"> For insurance contract with direct participating features: Use the discount rates specified as initial recognition, unchanged for any economic assumption change impact. For insurance contract with direct participating features: Use the current rate, unchanged for all assumption change impact. CSM can not be negative, but can be positive forecast. Previous losses have to be recovered before reinstating the CSM by recalculating the loss exposures. 	<ul style="list-style-type: none"> No specific requirement about subsequent measurement of contractual margin. Industry Practice: The contractual margin is locked in and does not absorb the assumption change from SFIL and risk margin. The assumption change impact is recognized in P/L of current period.

Practical Impact Analysis

- The contractual service margin is required to be an inclusion and reserve (based on original contract) if any. This requirement is a significant improvement of existing technical model system and approach.
- The volatility of profit would decrease due to the CSM absorption of assumption change from SFIL and risk margin which would be absorbed in future period.

Comparison between IFRS17 and China GAAP (Con't)

5. Presentation of Income Statement

IFRS17	China GAAP
<ul style="list-style-type: none"> Only revenue related to insurance service can be presented. Investment component need to be disaggregated. Presentation of specific information that is not consistent with commonly understood notions of revenue such as premiums due or premiums written, is prohibited. Profit flow from investment and underwriting is presented separately. Provides OCI accounting policy to reduce the accounting mismatch. 	<ul style="list-style-type: none"> The revenue is problem. Investment component is not disaggregated. Include change of reserve.

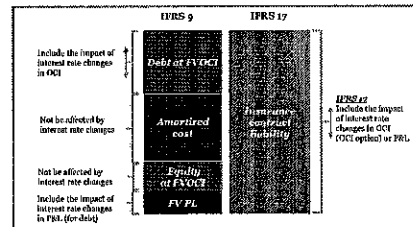
Practical Impact Analysis

- Totally different from existing practices.
- The revenue under IFRS17 are presented differently and better presenting figures. "Disaggregation of investment component" might decrease the scope of insurance companies, especially for rating products.
- The presentation is complicated in practice and requires accountants deep involvement. Accounting system and external system are needed to be modified.

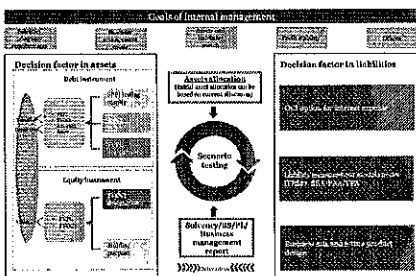
Interactive between IFRS 17 and IFRS9

Goals of Interaction between IFRS17 and IFRS9

Main Goal: reduce accounting mismatch
To consistently reflect the impact from economic environment change on book value of asset and liability through appropriate classification and presentation of asset and liability



Comprehensive Analysis of IFRS17 and IFRS9 Interaction



Are we all ready for IFRS 17

IFRS 17 - Topics on a CEO/CFO Agenda

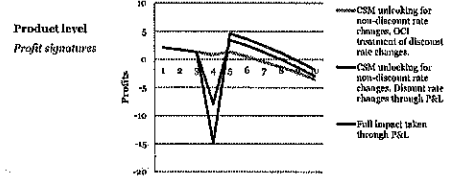
How long after the release of IFRS 17 do you think it will be before analysts start asking about its impact?

How well do you understand the IFRS profit profiles of your products and the overall impact on your published numbers?

If your peers are ahead of you around this but a concern?

In case you have issued multi-year forecasts to the market, are you aware of the potential impact of IFRS 17 on those forecasts?

IFRS 17 Financial Impact Assessment (Illustration)



IFRS 17 Practical Impact Assessment

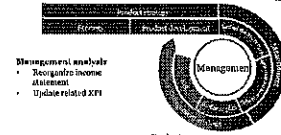
# Key feature of the amendment	Mildest	Low	Medium	High
1 Scope				
2 Contract boundary				
3 Disabling				
4 Best estimate cash flows				
5 Acquisition date				
6 Premium rate				
7 Risk adjustment				
8 Contractual service margin				
9 Participating (non-fully) contracts				
10 Refinement				
11 P&L				
12 Transition				
13 Presentation & disclosure				

Impact on Company's Management in IFRS 17 Implementation

Implementation of a new accounting standard will not only bring great challenges to company's data, systems and processes, but also bring significant changes to company's daily management after implementation.

- Product strategy**
- Participating products eligibility for VMA model
 - Re-evaluate the existing product strategy

- Measurement**
- Rate definition
 - Build or modify actuarial model
 - Build or modify accounting system
 - Supplement and optimize the valuation process



- Management analysis**
- Recognize income statement
 - Update related KPI

- Budget**
- Update and optimize the budget process
 - Update and optimize the profit forecast

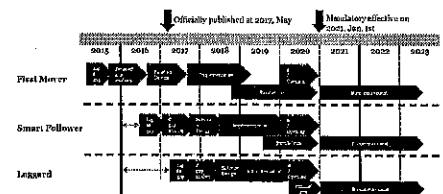
Industry Progress in IFRS 17 Implementation

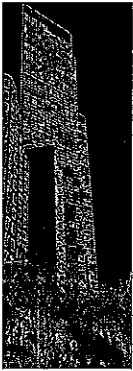
The implementation of IFRS 17 will strongly impact the daily management, accounting and assessment of insurance companies, so companies need to prepare for it as soon as possible.

Industry Progress	Technology	Market
<p>Global Top 20:</p> <ul style="list-style-type: none"> 20% - 60% finish analysis of impact 20% in progress 20% get under way <p>What CEO/CFO concern:</p> <ul style="list-style-type: none"> Cost Resource How to deliver it to capital market 	<ul style="list-style-type: none"> Transition Unit of account Profits won't get worsen so much as expectation, only source of earning will be changed 	<ul style="list-style-type: none"> Great demand to build new or amend existing system (actuarial, general ledger and database) Currently IT vendors have no solution, which need insurance company to be involved.

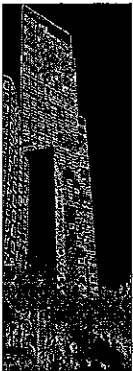
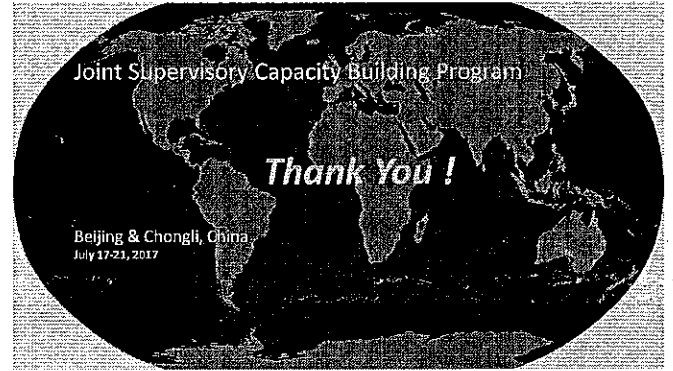
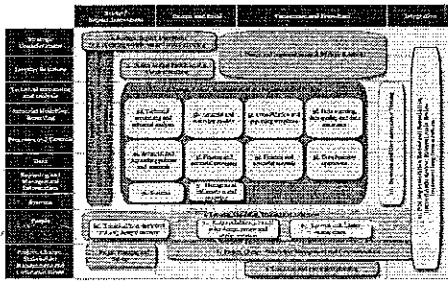
Illustration of Roadmap from Now to 2024

Implementation of IFRS 17 is likely to be a complex project. Insurance company need to plan ahead and then complete this project step-wise.





Implementation Likely to be a Complex Project

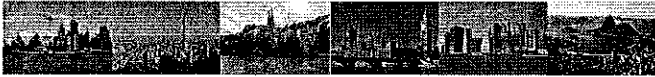


Right or Wrong?

- Statutory?
- GAAP? China PRC GAAP? US GAAP? Korea GAAP? Dutch GAAP?
- Solvency Requirements and Financial Reporting ...
- Are we better off now than 30 years ago?

4.2 Mathematics and uncertainty

Jules Gribble, Senior Policy Advisor, IAIS
18 July 2017



Agenda

- ▶ Quantification of risk is statistical
- ▶ Know risks can have known distributions
- ▶ The world is not Normal
- ▶ Distributions, hence models based on them, are approximations
- ▶ Combining risks – 2 portfolios
- ▶ A challenge

Some questions

- ▶ You hold capital, Capital1, at the 95% confidence level for Risk1. You hold capital, Capital2, at the 95% confidence level for Risk2. How much capital do you need hold for the Portfolio of Risk1 and Risk2 at the 95% confidence level?
 - What assumptions (implicit or explicit) have you made in coming to your answer?
- ▶ Your regulatory risk tolerance for the failure of single insurer is 1 to 100 (in a year). You have an industry of 100 insurers. You have 3 failures. Does this mean your company requirements have not been met?
 - What assumptions (implicit or explicit) have you made in coming to your answer?

Inherently statistical

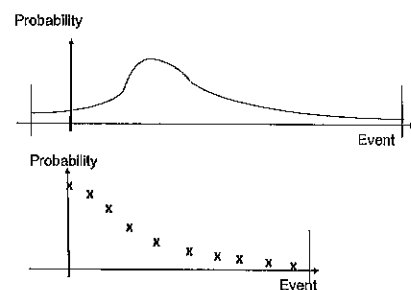
- ▶ Risk management is forward looking
 - Risk event management is 'after the event'
- ▶ The future is uncertain
 - No guarantees or known outcomes
 - Events are specific realisations from a set of possible outcomes, may be 'typical' or not
 - Objective is to understand what the set of outcomes is and then do analysis and make decisions reflecting this
- ▶ Risk management is therefore inherently statistical
- ▶ Challenges
 - What tools are available
 - When and how they can be used
 - Including what data is available and its level of noise

Modelling

- ▶ **Known known risks**
 - Identified and quantified
 - Data and experience to develop structures
 - Can be mathematically modelled – standard focus
 - Management (before event): Informed decisions within risk appetite (in ERM framework) etc
- ▶ **Known unknown risks**
 - Identified, but not quantified
 - Maybe some data and examples (experience)
 - Some basis for estimation
 - Management: Role of scenarios and practice
- ▶ **Unknown unknown risks**
 - Not identified or quantified
 - No data or structure
 - No basis for estimation. NIL is a bad implicit estimate ...

Distributions

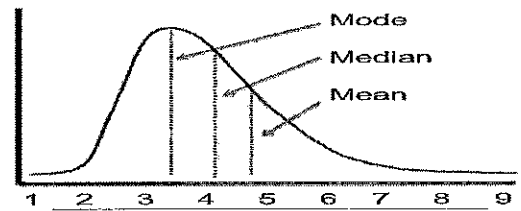
- ▶ Varying patterns
- ▶ Continuous or discrete



Properties of distributions

- ▶ Distributions have properties
 - Central tendency
 - Mean (μ) - Probability weighted average outcome
 - Median – half values above and half values below
 - Mode – most common value
 - Dispersion (from mean)
 - Variance (Var, σ^2)
 - Standard deviation (SD, σ) = Square root Var
 - Percentile
 - Xth percentile is outcome with x% of outcomes less than it
 - Why are they important?
- ▶ And lots more ...

Skewed distribution

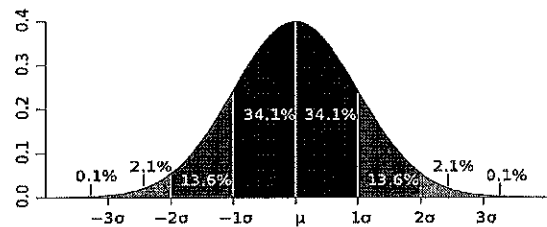


- ▶ Symmetric distribution, all are equal

Properties of distributions

- ▶ If can specify mathematically, by formula, very convenient and powerful.
 - Small number of parameters fully determine the distribution and all its properties
 - Eg Normal $N(\mu, \sigma^2)$ if know μ and σ ,
 - Lognormal $LN(\mu, \sigma^2)$ know μ and σ (Direct or underlying $N(\mu, \sigma^2)$)
 - Binomial $B(p, n)$ if know probability of success, n = number of trials
 - Lots of statistical theory available to help address problems.
- ▶ If cannot parameterise
 - Can still estimate properties empirically, but can be cumbersome and time consuming
 - Can be hard to get additional properties from known (estimates of) properties
 - Eg percentiles if know if know μ and σ^2

Normal distribution



The world is NOT Normal

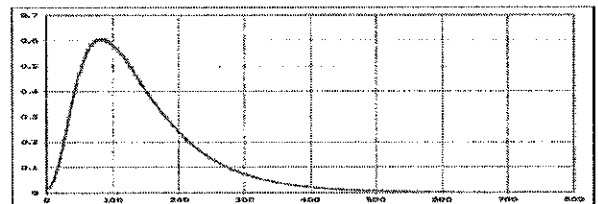
- ▶ Who recognises

Num SD to right of μ	1.28	1.65	1.96	2.33	2.56	3.01
Percentile	90	95	97.5	99	99.5	99.9

- ▶ What basic assumption is made?
- ▶ Does this really matter?

- ▶ Loss distributions are typically long-tailed

Lognormal distribution



- ▶ $LN(,)$ is essentially $exp(N(,))$
- ▶ Hence only positive and long tailed

How good is your intuition?

- ▶ Loss data
 - Expected \$4.5m, $P[< \$8.2m] = 75\%$
 - Want higher percentile for capital purposes
- ▶ Typical approaches
 - Linearly extrapolation
 - Normal distribution
 - Lognormal distribution



How good is your intuition?

- ▶ Loss data
 - Expected \$4.5m, $P[< \$8.2m] = 75\%$
- ▶ Typical approaches
 - Normal distribution
 - Lognormal distribution

P[<]	50%	75%	90%	95%	99%	99.9%
N	4.5	8.2	11.6	13.6	17.4	21.6
LogN	4.5	8.2	14.2	19.7	36.4	72.3
Ratio	1.00	1.00	1.22	1.45	2.10	3.35

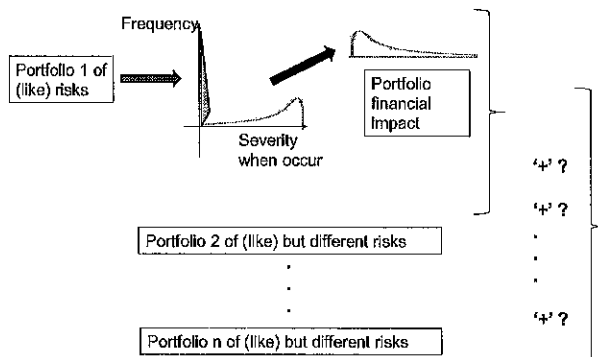
Noise (a reality) in distributions

- ▶ Even if you have good reason to assume a particular underlying distribution
 - Still need parameters
- ▶ Exact parameters are unknown
 - Fitted from data
- ▶ Data is always noisy
 - Parameters are therefore estimate, but not exact
 - They can themselves be treated as distributions
 - But we are not going there
- ▶ Key message:
 - Since the parameters are approximations, so are the distributions
 - Hence models based on them are approximations

Combining distributions

- ▶ Models have multiple inputs
 - Each may be a distribution
- ▶ Challenge is to combine them (so the risks or parameters they approximate) to get outputs
- ▶ Financial losses often measured using two distributions (specific to the type of loss)
 - Distribution of number of events that occur
 - Losses, given that an event occurs
- ▶ These are then combined to model total financial loss, reflecting uncertainty in both number of claims and size of claims

Combining risks - core challenge of ERM



Portfolio of risks

- ▶ Portfolios behave differently than each of their constituent risks
 - We 'know' this, for example, since we 'believe' in diversification in asset portfolios to reduce volatility (that being a measure of risk) and impact of an investment failing – concentration risk
- ▶ Mathematics of this can get very hard very quickly
 - Valuable if you can do it as analytic formulas are very powerful
 - Danger is the tendency to use 'convenient models to get the mathematics when reality does not justify it
 - Especially in stressful situations – the tails

Stochastic modelling

- ▶ When cannot combine distributions analytically, use stochastic modelling
- ▶ Brute force approach
 - Greatly improved by clever coding and algorithms
 - Both art and skill – sophisticated (and opaque)
 - Also requirement assumptions about structures and links
- ▶ In essence:
 - For each input parameter choose a random value from its distribution
 - Run the deterministic model with these values
 - Keep the outcome
 - Do this lots of times (thousands)
 - Result is an empirical approximate distribution
 - Apply statistical tools to these results

How good is your intuition?

- ▶ Combining claims distributions
- ▶ Two risk types
 - Each have number of claims and size of claim distributions
- ▶ Aim is to estimate the high percentiles of the portfolio (of two portfolios) to set capital requirements
 - Seek 99th percentile so capital is different between expected value and this outcome
- ▶ Hypothetical situation, but a real model to use

Risk 1

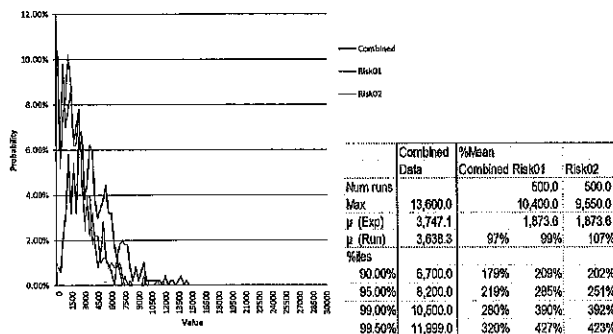
Occurrence										
Cell	1	2	3	4	5	6	7	8	9	10
Num Occ	0	1	2	3	4	5	6	7	8	9
Prob 1 = Direct	12.0%	27.0%	28.0%	18.0%	9.0%	4.0%	1.0%	1.0%		
1) Prob Used	12.0%	27.0%	28.0%	18.0%	9.0%	4.0%	1.0%	1.0%	0.0%	0.0%
Cum Prob	12.0%	39.0%	67.0%	85.0%	94.0%	98.0%	100.0%	100.0%	100.0%	100.0%
Total	100.0%	NOTE: Need this to sum to 100% else overstate number of claims compared to expected in calc								
Expected	2.00									
Outcome distribution for a single occurrence given it occurs										
Cell	1	2	3	4	5	6	7	8	9	10
Size	200	300	500	700	1000	1350	1700	2100	3000	5000
Prob 1 = Direct	5.0%	15.0%	25.0%	18.0%	12.5%	10.0%	7.5%	5.0%	2.5%	1.0%
1) Prob Used	5.0%	15.0%	25.0%	18.0%	12.5%	10.0%	7.5%	5.0%	2.5%	1.0%
Cum Prob	5.0%	20.0%	45.0%	61.0%	73.5%	83.5%	91.0%	96.0%	98.5%	99.5%
Total	100%									
Expected	909.5									

Risk 2

Occurrence										
Cell	1	2	3	4	5	6	7	8	9	10
Num Occ	0	1	2	3	4	5	6	7	8	9
Prob 1 = Direct	12.0%	27.0%	28.0%	18.0%	9.0%	4.0%	1.0%	1.0%		
2 = Poisson										
1) Prob Used	12.0%	27.0%	28.0%	18.0%	9.0%	4.0%	1.0%	1.0%	0.0%	0.0%
Cum Prob	12.0%	39.0%	67.0%	85.0%	94.0%	98.0%	100.0%	100.0%	100.0%	100.0%
Total	100.0%									
Expected	2.00									
Outcome distribution for a single occurrence given it occurs										
Cell	1	2	3	4	5	6	7	8	9	10
Size	200	300	500	700	1000	1350	1700	2100	3000	5000
Prob 1 = Direct	5.0%	15.0%	25.0%	18.0%	12.5%	10.0%	7.5%	5.0%	2.5%	1.0%
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Cum Prob	5.0%	20.0%	45.0%	61.0%	73.5%	83.5%	91.0%	96.0%	98.5%	99.5%
Total	100%									
Expected	909.5									

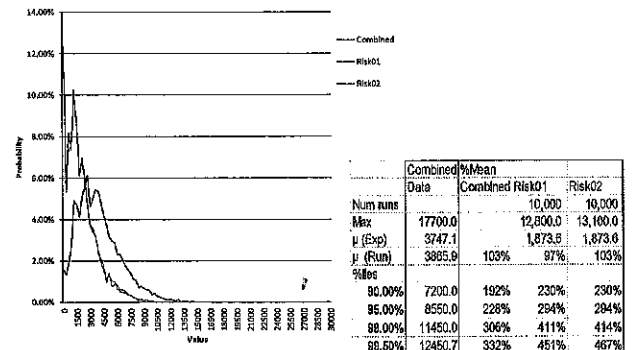
Output 500 runs

Risk PDF - Combined: Smaller Num Run



Output – 10,000 runs

Risk PDF - Combined: Max Num Run



Some insights the model provides

- ▶ It can take a long time (many runs) for result to 'settle'
 - Especially as you move into the tails of distributions
- ▶ This is 'simple' (stochastic) model
 - Real models combine many disparate risks and there are more levels ... ERM
- ▶ Have not considered the issues around interrelations between risks (assumed independence)
 - Within and between portfolios
 - These are many, varied and hard to identify

A challenge – individual underwriting

- ▶ Statistics provides a basis that justifies pooling of (like or similar) risks
 - The portfolio behavior can be better managed and than that of the individual risks in it
 - The relative need for capital to meet a given level of confidence declines as the portfolio size increases
 - N independent risks each with same μ and σ
 - Portfolio has mean = μN and SD = $\sigma\sqrt{N}$
 - A risk event, while potentially catastrophic of the individual, is not for the insurer
- ▶ How does this work when there is Individual underwriting (and all expect lower premiums)

Some key take-aways

- ▶ Quantifying (future) risk outcomes is inherently statistical
- ▶ Portfolios of risks behave differently than their components
- ▶ Financial outcomes are the product of models that
 - Combine many parameters, many of which are distributions
 - Embed many assumptions (and limitations)
 - Depend on implementation and data used
- ▶ Supervisory role is not to reproduce, but gain understanding and comfort with models and their outputs
- ▶ Getting statistical model results is the beginning of a process (input to decisions), not the end of that process (decisions)
- ▶ 'Beware of geeks bearing models' (Warren Buffet)

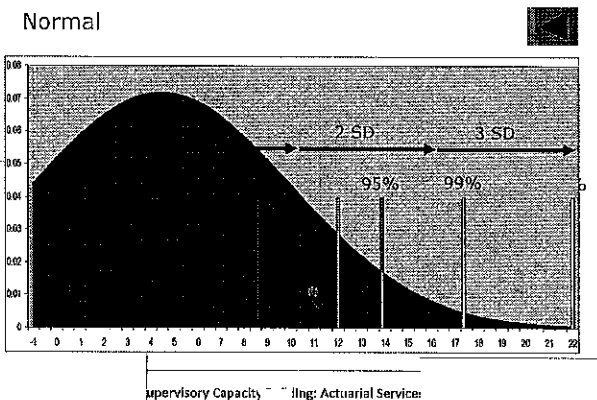
Thank you ...

Mathematics and uncertainty

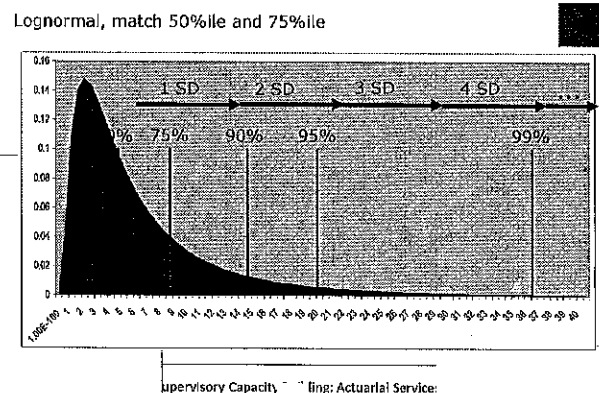
Jules Gribble
jules.gribble@bis.org

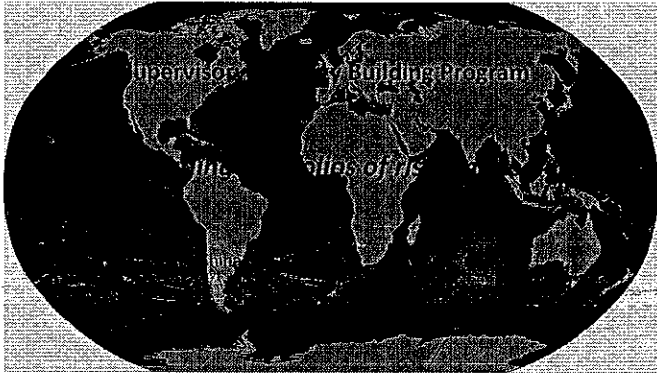


A Tail



A Realistic Tail





In real life ...

companies manage portfolios of risks

- As time passes (very quickly during a stress event) the key risk events move from one category to another.
- Today's key risks may be overtaken by others. So no static picture is complete.
- This suggests a portfolio and scenario approach rather than 'individual risks'.

***In Almost Real Life (AR Life) ...
hypothetical case study***

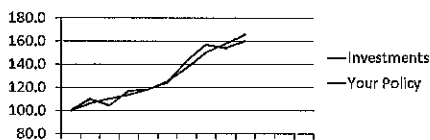
- We will consider a fictional case study, moving from stage to stage as events occur
- Consider (at each stage):
 - What should the company be thinking?
 - How would the supervisor find out what the issues were?

Almost Real Life: how companies experience "portfolios of risks"

- "AR Life" has written a \$5bn of single premium investment business with 50% equity backing; and a "smoothed" account balance with a "market value adjustment" mechanism ('investment account' or 'IWP')
- Although it is mainly a retirement product, customers can withdraw at any time, including 14-day "free look" period
- Product marketed with "low exit fees"

AR Life: Marketing the Product

➤ Illustrated Growth:



- Product will give a smooth investment return that reflects long-term investment returns
- Company can apply "market adjustment"

AR Life: Selling the Product

- Positive (marketing) product features:
 - long-term equity returns combined with liquidity
 - low exit fee
 - financially strong company
- Product brochure is complex and hard to read: expected rates of return are vague
- Sales staff minimise the market downside, and many don't mention the market adjustment factor

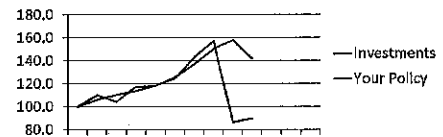
AR Life: Investing for Growth

- Investment mix 45% equities, 30% bonds (incl corporate), 10% real estate and 5% cash
- Product brochure features the investment mix (ranges) without emphasising any need or power to change them
- AR Life's capital is invested in the same mix

Discuss ALM position

AR Life: Riding the Storm

- Actual Growth:



- Should the company apply the "market adjustment"? Show of hands & discuss

AR Life: Facing the Public

- After market crash, markets didn't recover quickly so AR Life applied the adjustments "gradually" over a one-year period
- Was this fair to everyone? Discuss
- Many customers complained that they had not known about the market adjustment
- AR Life's capital reduced by more than 25%: but liabilities and capital requirements were increased by this delay (alone)

AR Life: Financial Impact

- Cash outflows forced AR Life to sell assets at depressed values when others were not
- IT expenditure was almost as much as the compensation cost and delayed the next product launch
- Unit costs increased, which reduced profits and increased liabilities and capital charges
- AR Life's capital further reduced by actions of Prudential Regulator to increase all risk capital charges and Co.-specific charges

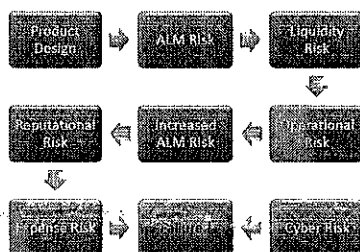
AR Life: Consumer Regulation

- Large number of complaints and publicity attracts the Competition & Consumer Commission
- They recommend retrospective compensation for all policyholders
- Use of market adjustment much restricted
- AR Life's liabilities and capital requirements increase again Discuss conflicts here
- Reputational issues affect morale and stability for staff and salesforce: sales drop

AR Life: Wannacry?

- Shortly after this, an IT contractor working on the solution is targeted by malware that hacks a file of customer information
- AR Life is fined 4% of gross revenues for breaching data privacy laws
- AR Life's capital falls by 5% of net revenue (> one years' profits)
- AR Life Board calls the Regulator: no longer has adequate capital

Let's replay that again



AR Life: Questions

- How would you detect product weaknesses?
- How would you monitor product operation (e.g. market adjustment)?
- How would you know that was a key risk factor? (What would you ask AR Life Board?)
- How would you prioritise this against other risks?
- Would you monitor the customer complaints?
- Any other new information requirements?
- What would you do during the Consumer Investigation?

AR Life: Lessons for the Company?

- Only sell feasible products – test them using real-world assumptions
- If it's 'too good to be true', it's not true
- Ensure the customers understand the product (or don't sell it)
- Do what you said you would do
- Don't cover things up – they come back later
- Don't take your eye off the ball when the trouble starts – things can get worse
- Ask: what other mishaps might happen?

Relevant ICP's for the Company ?

- ICP 8 Risk Management and Internal Controls
- ICP 16 Enterprise Risk Management for Solvency Purposes
- ICP 14 Valuation & ICP 17 Capital Adequacy
- ICP 18 Intermediaries & ICP 19 Conduct of Business

Relevant ICP's for the Supervisor ?

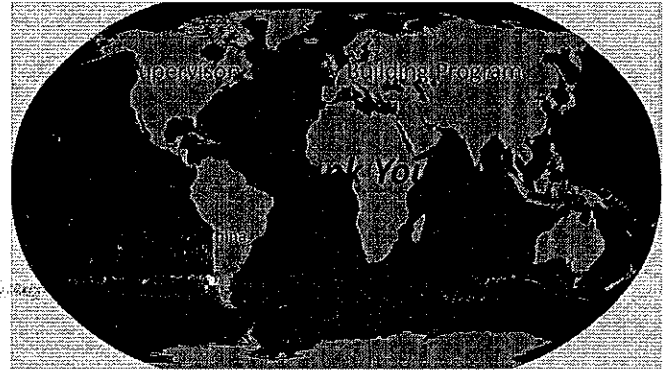
- ICP 5 Suitability of Persons & ICP 7 Corporate Governance
- ICP 9 Supervisory Review and Reporting
- ICP 10 Preventive and Corrective Measures & ICP 11 Enforcement
- ICP 12 Winding-up and Exit from the Market
- ICP 24 Macroprudential Surveillance and Insurance Supervision

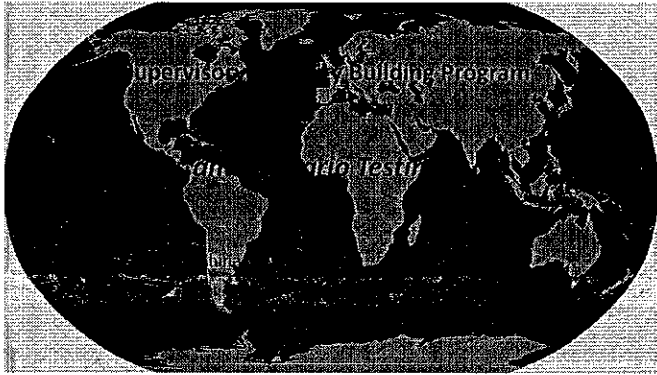
AR Life: Lessons for the Supervisor

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-
-
-

AR Life: Lessons for the Supervisor?

- Monitor economic capital position if you can
- Look at what they're stress-testing for
- Get them to talk you through the results
- Take technical advice as needed
- Monitor products from a critical point of view
- Monitor customer feedback from all angles
- Look for system-wide issues – and manage up
- Ask: what other mishaps might happen?

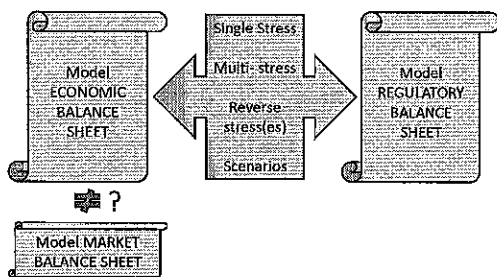





What are we doing and why?

- Assess (and if possible, quantify) the impact/severity of some known risks
- Inform the risk-management process
- Inform the accountable Boards/CEOs
- Face up to issues we might ignore
- Allow/facilitate risk-management or capital-management action before events occur = Risk & Capital Planning
- Build real value from the ORSA work

What are we testing?



What are we testing?

- The key to understanding the underlying economic position (see ICP 14) is a model balance sheet 
- Set baseline assumptions and define variations to be tested – work out the economic gain/loss from stress
- Resolution process is an input?
- How relevant is the MOCE?

What if the reported financial position is different?

- All stress tests must be worked through the regulatory balance sheet for impact, in order to include capital charges etc
- Regulatory balance sheet is the 'bottom line' for regulated firms ... BUT
- Knowledge of the (sometime hidden) margins can influence decisions and outcomes

What stresses (or combinations)?

- Single-stress tests
- Reverse stress tests
- Multi-stress tests (simultaneous stresses allowing for correlations)
- Scenario Tests: 'Walk-through' tests featuring staged impact of stress events and allowing for intermediate responses

Over to Almost Real Reinsurance (AR Re) ... hypothetical case study

- We will illustrate some stress tests
- Consider correlations in multi-stress tests
- Consider a scenario test
- Consider company and regulatory view at each stage

AR Re: Basic Sensitivities (before)

(actually an extract from the accounts of a real-world reinsurer)

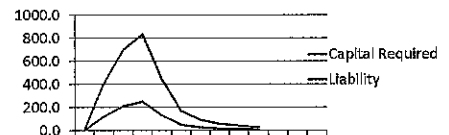
	Gross of reinsurance		
	Change (\$)	Profit / Loss	Life Insurance Liabilities
	in rates	(\$m)	(\$bn)
Balance:		95	1,715
Variable:			
Mortality incidence	5%	-13	19
Income claim terminations	5%	-23	33
Unreported claims development	5%	-27	38
Fixed interest bond yield	1%	-5	-9

AR Re: A Profitable Product

- "AR Re" has written a \$500m (p.a.) of monthly premium 3-year group life and TPD (total permanent disability) risk business.
- Death claims are usually reported early (2 months average).
- TPD claims can take up to 10 years to report(!). Average delay is 2.5 years.
- TPD Definition: "unlikely ever to return to gainful employment in an occupation they are suited to by training, experience etc."

AR Re: Group life financial projection

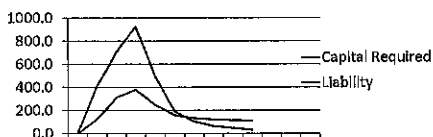
- Liabilities and Required Capital:



- Does the plan include raising \$250m capital?
- When? What happens if things deteriorate?
- Is there a reinsurance in place?

AR Re: Really simple stress test

- Required Capital (10% underpriced):



- We notice the 10% underpricing in year 3
- Need to find 100m capital (to fund net losses) even if liability doesn't grow so much.

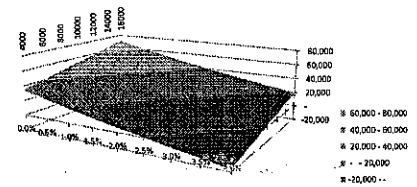
Back to AR Life for our Multi-Stress – Interest Rates & Equities/Property

- Need to select most appropriate input variables, and consider how correlated they are: looking for worst case
- A more complex calculation, but not much more
- Much more difficult to present numerically
- Graphical is usually best: range of options
- Often part of a "dashboard"

AR Life: Multi-Stress
– Interest Rates & Equities/Property

FREE ASSETS (\$,000)	Band Yield	0.0%	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
Equity Index										
14000										19,240
12000										17,240
10000										15,240
8000										13,240
6000										11,240
4000										9,240

AR Life: Multi-Stress
– Alternative Presentation



What about Reverse Stress Tests?

- Usually illustrated for a range of key risks
- Useful to show relevance/ranking of key business risks
- Example1: "How far would the [Equity Index] need to fall until we hit [the SCR]?"
- Example2: "What increase in the mortality rate would be needed to wipe out one year's expected profit?"
- Easy to use with unquantifiable risks?

AR Re: Scenario Workshop for the Board – Possible Process (1)

- Use an "offsite day" approach to keep their attention. Maybe use facilitator?
- Talk and act as if it were Board meeting
- Start by reminding them of what the ORSA requires of them and of you (see ICP 16)
- Put the purpose of this day into that context
- Start with a scenario that is familiar
- Move to progressively more severe situations that are plausible (if unlikely)
- Ask them to think about what they would do

AR Re: Scenario Workshop for the Board – Possible Process (2)

- As each stage works out, ask if they want to re-visit some of the earlier stages
- Challenge whether plans are realistic, especially if other parties are relied on
- Remind them of the "Risk Appetite" position
- Ask them to consider what customers, supervisor and shareholders would think
- Throw in a really difficult event if 'needed'
- Make a record of their thinking and use it as input to the next plan. Act now if needed

AR Re: Walk through Scenario (1)

- Step 1: baseline B/S as above:
 - Consider retrocession level
 - Assess the availability of new capital
- Consider impact on company:
 - Available future capacity?
 - Business plan?

then "roll the model B/S forward" for one year ...

AR Re: Walk through Scenario (2)

- Step 2: new baseline B/S.
Experience deteriorates +10% as above in year 2
- Impact on Underwriting policies?
- Impact on Products?
- Decide what options you have then
- Change 'decisions' in Step 1?
then "roll the model B/S forward" for one year ...

AR Re: Walk through Scenarios (3)

- Step 3: new baseline B/S.
You discover in year 3 that there has been a landmark legal case which rules that "unlikely" means "< 50% probability".
- Not many remaining future premiums but further severe increase in IBNR liability
"roll the model B/S forward" instantly
Decide what options you have then
- Change decisions in Step 1 or 2?

AR Re: Walk through Scenarios (4)

- Step 4: new baseline B/S.
Model Company is now below MCR.
- Decide what options you have then
- Change decisions in Step 1 2 or 3?

AR Re: Questions from the Walkthrough

- How plausible/probable is each step?
(Note: never discuss probabilities)
- If they are all plausible, what do we want to do to defend ourselves?
- Is there a best time to seek capital? (Noting that these events are 'unlikely').
- Does the company need any extra data, processes or analysis or resources to fill gaps detected?
- Does the Capital Plan/ ORSA report need to be updated?

Relevant ICP's for the Company ?

- ICP 8 Risk Management and Internal Controls
- ICP 16 Enterprise Risk Management for Solvency Purposes
- ICP 14 Valuation &
ICP 17 Capital Adequacy
- ICP 18 Intermediaries &
ICP 19 Conduct of Business

Relevant ICP's for the Supervisor ?

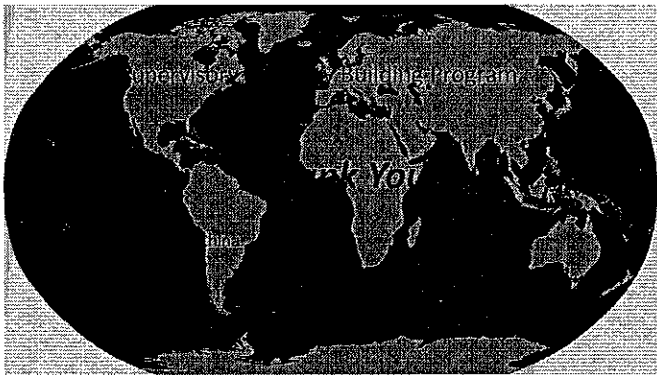
- ICP 5 Suitability of Persons &
ICP 7 Corporate Governance
- ICP 9 Supervisory Review and Reporting
- ICP 10 Preventive and Corrective Measures &
ICP 11 Enforcement
- ICP 12 Winding-up and Exit from the Market
- ICP 24 Macroprudential Surveillance and Insurance Supervision

AR Life: Lessons for the Supervisor

- ...
- ...
- ...
- ...

AR Life: Lessons for the Supervisor?

- The outputs of these sessions are easy to collect
- Any changes to Capital Plan need to be noted with reasons – should be in the ORSA
- Look at what they're stress-testing for: ask them (and their actuary) if they are the most relevant
- Ask actuary and auditor if they are complete?
- Get them to talk you through the approach and results, so you understand what they're thinking
- Take technical advice as needed
- Look for system-wide issues – and manage up



Joint Supervisory Capacity Building Program

5.2 Key Issues for Insurers investing in the region and how they are addressed and risk managed

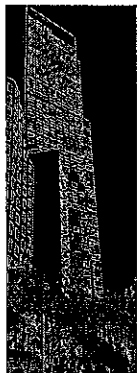
Shu-Yen Liu FSA MAAA
PwC Asia Pacific Senior Advisor

Beijing & Chongli, China
21, 2017



China Trends - Increasing alternative investment

- Deregulation of insurance funds brings more investment types and larger configuration space. Configuration structure of insurance funds is constantly optimized, presented a situation as "One-, Two- and Three-".
 - "One-" refers to that bond and bank deposits steadily dropped.
 - "Two-" refers to that the corporate bond investment with high yield and alternative investment grow quickly.
 - "Three-" refers to that more diverse configuration structure, more long-term assets and more innovative products;
- In 2011 and 2012, the investment portfolios of insurance company are relatively stable.
- Influenced by 13 New Deal of Insurance Investment, in 2013 the investment portfolios of insurance company have a significant change: other investment ratio increased by 8%. The main reason is that alternative investments increased such as credit debts and infrastructure investments;

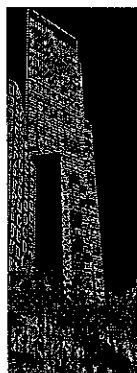
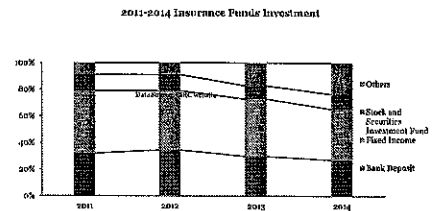


China Trends - Increasing alternative investment (cont.)

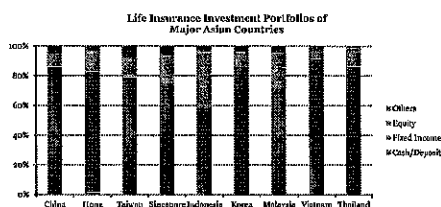
- In 2014, by the effect of diversified investment channels and periodic warming in stock market, the share of fixed income and bank deposit decreased, the share of stock/equity increased;
- China has more cash and deposits because there are agreement deposits in insurance company. In general the term of agreement deposits is five years, so it can be regarded as five-year bonds. In addition, because in recent years liability duration of China is shorter than mature insurance market, so we can invest the short substituting duration assets.



China Insurance Industry Overview



Life Insurance Investment Portfolios of Major Asian Countries

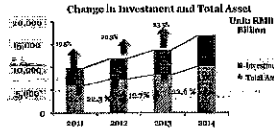


China - Insurance companies seek new investment opportunities

- Example: In December 12, 2014, Minsheng Insurance sold a universal life insurance product "Gold Ingot" through E-Business platform, the first year expected annual yield was 6.2%. This product has linked to the project "Minsheng Tonghui-Alibaba Financial Support Program I" which joint by Minsheng Tonghui Asset Management Company owned by Minsheng Insurance, and Ant Micro Loan owned by Ant Financial Services Group. With funds from this project, Ant Micro Loan can meet the financing needs of 200,000 micro enterprises. Consumers can also invest in this product, which also led to the connection of premium-end and investment-end in insurance company;
- Insurance company investing financial products such as commercial bank financial products, credit asset-backed securities of banking financial institutions, collective fund trust plan of trust company, special asset management of security company, infrastructure investment plan issued by insurance asset management company, real estate investment plan, project asset support plan and asset management products; the insurance industry investments are fully liberalized.

China - Insurance companies seek new investment opportunities (Cont.)

- Many small and medium insurance companies see the advantages of professional insurance asset management company, and started to enter this field. By 2014, the number of professional asset management companies in China insurance industry has reached to 22.



China Experience - Insurance companies actively investing listed companies

- In February 2014, the CIRC issued "The notice about strengthening and improving supervision of insurance funds investment proportion", which rule that the book balance of insurance company investing equity assets can not be more than 30% of the total company assets of the last quarter-end, and the book balance of major equity investment can not be more than the net assets of the last quarter-end.
- Meanwhile, insurance companies which invested in listed companies, have participated in the financial and business decisions of listed companies, or be able to control listed companies, so these insurers should be under equity investment management and follow the relevant rules of insurance fund equity investment.
- As the results, several insurance companies have participated significant amount of equity holdings and became top 10 shareholders for various companies, one common contractor from the listed stock companies is profitable and financially sound companies including Kailuo, China Coal Energy, Beijing Tourism, Gemdale Group, Agricultural Products, Shenzhen Zhenyuan, China Merchants Bank, Kweichow Moutai, Wuliangye, Minsheng Bank & others. Investing in banks also provided a product distribution channel for some of them.

China Experience - Insurance companies investing overseas real estate in 2014-2015

- In October 2012, CIRC has issued "Interim management measures implementation rules of insurance funds overseas investments" and first time clarified the range of insurance institutions investing overseas real estate. That is, limited to core areas which located in 25 major cities of developed markets, including Europe, United States, Australia, Japan, Singapore and Hong Kong, and also limited to office real estate and mature commercial real estate with stable income.
- "The notice about strengthening and improving supervision of insurance funds investment proportion" issued by CIRC, the overseas investment balance of insurance funds can not be more than 15% of total company assets of the last quarter-end. Relative to 10 trillion insurance funds, the amount can be used for overseas investment is 1.5 trillion.
- The volatility in foreign currency exchange also made an impact on investing overseas from insurance companies as asset overseas may be appreciated.

China Experience - Insurance companies investing overseas real estate in 2014-2015 (Cont.)

- History of the insurance companies has indicated commercially viable real estate projects have been utilized as a long term invested assets from matured markets. The investment return from overseas real estate is stable and can be matched up with long term liabilities.

Table below is a list of some of the real estate assets that are in the public's eyes from insurance companies:

Company	Year	Area	Investment Details	Investment Reason
China Life	2013	London Real Estate	Special Enterprise Capital to purchase 110,000 sqm building and become the first Chinese insurance company who invest in overseas real estate.	Invest in valuable commercial property and office building and receive stable and substantial rental return.
China Life	2014	London Real Estate	Co-Invest with other investment entities and complete acquisition of "100 Upper Bank Street" in London's Canary Wharf area (a prime CBP 200 million).	Investment diversification can reduce investment risk and receive return from appreciation of overseas real estate development, and increase brand awareness.
Sunshine	2014	Sydney Real Estate	Special AID 400 million to purchase 100,000 sqm on the Park in Sydney.	Overseas investment projects is commercially viable, the occupying rate of this hotel has maintained a healthy level for quite a long time. The risk of this investment is quite low, and the only risk needed to be considered is foreign exchange rate.
Zhongyu	2014	New York Real Estate	Special USD 100 million to purchase 100,000 sqm in the Wall Street New York.	Through the comprehensive global strategy, effectively use the opportunity of overseas globalization, and possible globalize experience to invest. By investing in high-quality real estate in North America, the company can receive a long-term, stable investment return.

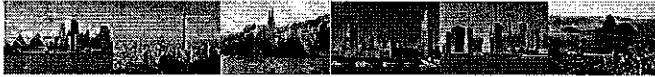
China Experience - Insurance companies investing overseas real estate in 2014-2015 (Cont.)

Company	Year	Area	Investment Details	Investment Reason
Taiping	2015	New York Real Estate	China Taiping set up an overseas investment fund with Kalyson City Development Funds and Hign Investment Management. The fund is going to work with the New York developer Fisher Brothers and Wilkoff to invest in Tribeca 111 Project, which is located in the core area of Manhattan, New York at approximately USD 800 million (GBP 600 million). Baccostone Group will provide the project loans.	With the gradual recovery of American economy, the strong interest of American first-tier cities' real estate market has been established. Investing in and developing high quality American real estate project and dollar assets can effectively diversify the investment risk and improve the investment return.
Taibang	2015	London Real Estate	Taibang Life and Caw Capital Partners spend £200 million to purchase the Millon Gate.	Diversify the investment, reduce investment risks, and receive stable returns.
Sunshine	2015	New York Real Estate	Purchase the Baccostone Hotel from Barry Sternick's Starwood Hotels & Resorts Worldwide for more than \$200 million.	With the expectation of the appreciation of RMB continuously weaken, overseas investment gradually becomes an important part of investors' asset allocation.



5.4 ALM

Jules Gribble, Senior Policy Advisor, IAIS
19 July 2017



Agenda

- ▶ Liabilities drive assets
- ▶ ICP references – ALM is embedded
- ▶ xx

Liabilities drive assets

- ▶ Insurer's risk insurance products generate liabilities to support insurance obligations
- ▶ Assets to support those liabilities are held
 - May be the majority of the assets held by the insurer
- ▶ Assets need to be invested
- ▶ Insurers investment policy should be driven by liability needs
 - Insurance and investment products

ICPs (Introduction)

- ▶ Insurers investment and financial operations incur
 - Market
 - Credit
 - Liquidity
 - Operational risk
 - Risks arising from **asset-liability mismatches**
- ▶ Efficient financial markets
 - Important to provide for both long-term and short-term investment opportunities for insurers
 - Supervisors need give due consideration to the impact of financial market efficiency on the effectiveness of their supervisory measures

ICP 8 (Governance)

- ▶ The risk management system should at least cover underwriting and reserving, **asset-liability management**, investments, liquidity and concentration risk management, operational risk management, conduct of business, and reinsurance and other risk-mitigation techniques.
- ▶ The insurer's risk policies should be written in a way to help employees understand their risk responsibilities. ... At a minimum, these should include policies related to the risk appetite framework, an **asset-liability management policy**, an investment policy, and an underwriting risk policy.
- ▶ The actuarial function evaluates and provides advice to the insurer on matters including; ... **asset liability management** with regards to the adequacy and the sufficiency of assets ...

ICP 15 (Investments)

- ▶ ICP 15: The supervisor establishes requirements for solvency purposes on the investment activities of insurers in order to address the risks faced by insurers.
- ▶ 15.4 The supervisor requires the insurer to invest in a manner that is **appropriate to the nature of its liabilities**
- ▶ 15.5 The supervisor requires the insurer to **invest only in assets whose risks it can properly assess and manage**

ICP 16 (ERM and Solvency)

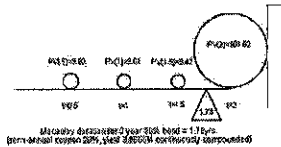
- ▶ 16.5 The supervisor requires the insurer to have a risk management policy which includes an explicit **asset-liability management (ALM) policy** ...
 - ALM does not imply that assets should be matched as closely as possible to liabilities but that mismatches are effectively managed
 - Recognise interdependence between all of the insurer's assets and liabilities, take into account the correlation of risk between different asset classes and correlations between different products and business lines
 - Different strategies may be appropriate for different categories of assets and liabilities
 - For some types of insurance business it may not be appropriate to manage risks by combining liability segments.
 - Assets with sufficiently long duration may not be available to match the liabilities. ... explicit attention within its ALM policy to risks arising ...

ALM: M = ?

- ▶ Asset – Liability
 - Monitor?
 - Manage?
 - Match?
- ▶ ICPs seem clear that cash-flow matching is not required ...
 - Even if it may theoretically be ideal ... for risk management/minimisation from the (siloed) perspective of reducing mismatching

Duration

- ▶ Macaulay duration
 - Weighted average time to maturity of cash flows
 - $$MacD = \frac{\sum_{i=1}^n t_i PV_i}{V} = \sum_{i=1}^n t_i \frac{PV_i}{V} \quad V = \sum PV_i$$
 - Commonly use yield to maturity for discount rate



Modified duration

- ▶ Modified duration (ModD) is a price sensitivity measure
 - Change in duration a function of discount rate
 - $$ModD = \frac{MacD}{(1 + y_k/k)}$$
 - y_k yield to maturity, compounded k time per year
- ▶ $\Delta V \approx -V \cdot ModD \cdot \Delta y$
 - ModD ~ percentage change in price for given change in yield.
Eg: A 15-year bond with MacD = 7 years has ModD ~ 7%. So would fall about 7% in value if interest rate increased by one percentage point (eg 6% to 7%)

Application

- ▶ Obtain initial (average) estimated of duration of liabilities
 - Implies desired (average) asset duration
- ▶ Impact of change in interest rates
 - Assume same PV of liability (L) and asset (A) before change
 - Rates go up by 1%
 - $L \rightarrow L - L \text{ ModL } 1\% = L(1 - 1\% \text{ ModL})$
 - $A \rightarrow A - A \text{ ModA } 1\% = A(1 - 1\% \text{ ModA})$
 - Impact: Difference $L - A = 0 \rightarrow -1\% L (\text{ModL} - \text{ModA})$

Uncertainty

- ▶ Both liability and asset cash flows are uncertain
 - Influenced by many things
- ▶ So need consider how realistic it is to seek full cash-flow matching
 - Even if instruments are available
 - Direct or synthetic
- ▶ Needs ongoing (sophisticated) management
 - Capacity to do and Operational risk

A challenge

- ▶ Government wants
 - Insurers to offer long term products but there is a lack of suitable long term investments to support liabilities
 - Safe and stable insurance industry. Proposes capital requirements to address ALM.
- ▶ Industry then need raise additional capital and pass costs back to policyholders through higher premiums
 - Public and government outcry at this consequence
 - Reduced sales and so investment by industry (eg. from retirement accumulation / decumulation products)
- ▶ Industry / supervisors present common proposal to government to provide longer term investment to support industry and societal insurance objectives



Thank you ...

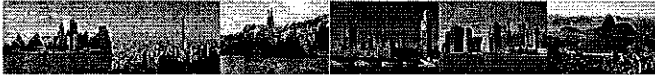
ALM

Jules Gribble
jules.gribble@bis.org



5.5 Workshop: Historic unit pricing

Jules Gribble, Senior Policy Advisor, IAIS
19 July 2017



Agenda

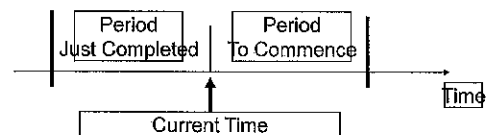
- ▶ Unit pricing
- ▶ Situation
- ▶ Your response(s)

Value attribution

- ▶ Invest account
 - Account \$ balance
 - Add value by crediting interest
- ▶ Unitised
 - Value = Units * Unit price
 - Change value by changing unit price
 - Performance from value movement
 - NOT individual component movement

Unit Pricing: 'Forward' / 'Historic'

- Determine UP for unit pricing period:
 - Forward – period just completed (Retrospective)
 - Historic – period to commence (Prospective)



- Should use 'Forward' unit pricing
 - Else provider risk: Adverse invest + anti-selection

Situation

- ▶ Company pricing using historic unit pricing
- ▶ Pricing on a weekly basis
 - New price each Friday at 6pm – after close of markets
- ▶ 50 - 70% assets in listed equities
- ▶ This product is main company product (by policyholder liabilities)
- ▶ Company available capital is 10% of policyholder liabilities
- ▶ Monday 10am, equity market unexpectedly drops by 25%

Situation

- ▶ Company reports that some key agents are advising policyholders to withdraw their funds immediately
- ▶ Company applies to supervisor for permission to immediately freeze all withdrawals

Supervisor response?

- ▶ Immediate
- ▶ Longer term
- ▶ Policy implications

Reference

- ▶ APRA and ASIC, 'Unit pricing: Guide to Good Practice', 2008. See http://www.apra.gov.au/CrossIndustry/Documents/UP_GGP_082008_ex_final.pdf



Thank you ...

Historic unit pricing

Jules Gribble
jules.gribble@bis.org



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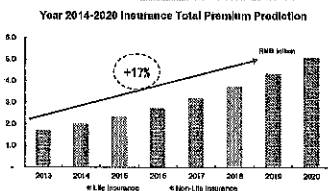


State Ten Opinions

"State Ten Opinions" is a "top level" document that outlines the comprehensive development of the insurance industry, enhances the insurance industry to be a strategic industry for China, and significantly expands available opportunities.



On 13 August 2014, the state council's opinions about speeding up the development of modern insurance services, known as the "State Ten Opinions" were issued. The "State Ten Opinions" clarify the position of modern insurance industry in the development of the economy and society as a whole, point out the "insurance is a critical industry in the modern economy, a basic approach to risk management, and an important element for social civilization progress, economic development and social governance". The healthy development of the insurance industry will provide protection to the stability and development of the society as a whole.

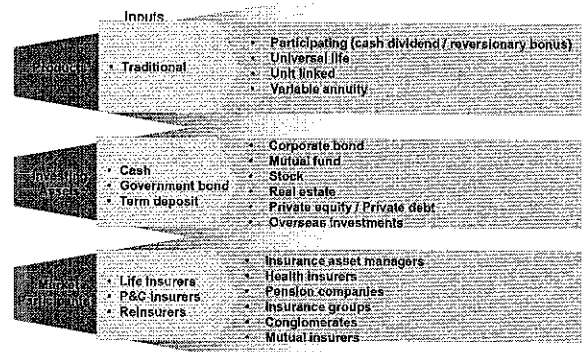


State Ten Opinions

By 2020:

- ✓ Insurance premium is expected to reach RMB 5.1 trillion, with an average annual growth rate of 17%.
- ✓ Total insurance assets is expected to reach RMB 20 trillion.
- ✓ Premium for new policies is expected to reach RMB 1.2 trillion.

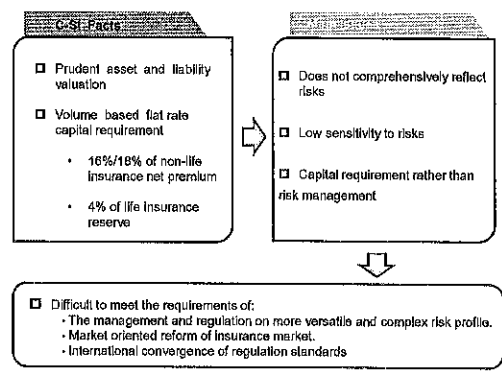
China's insurance risks have become more versatile and complex



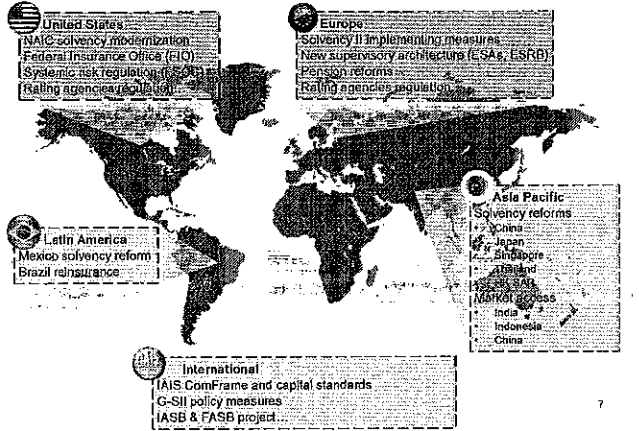
Market Oriented Reform of China's Insurance Industry

The facts and main issues of "C-SI"

- Deregulation of Investment: (2013)
- Deregulation of Pricing:
 - Traditional life (2013)
 - Universal life (2015)
 - Unit-link life (2015)
 - Auto insurance (2015)
- Market entry and exit
 - Business exit
 - Region exit
 - Executive exit
 - Shareholder exit
 - Entity exit



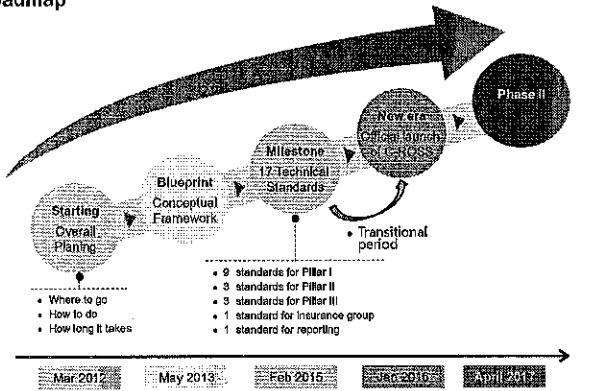
Overview Global of Solvency Regulations



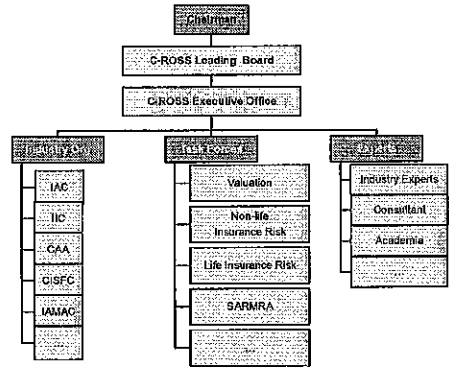
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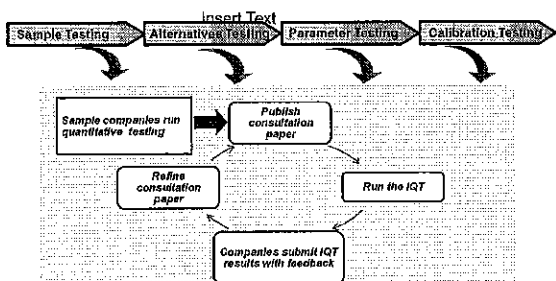
Roadmap



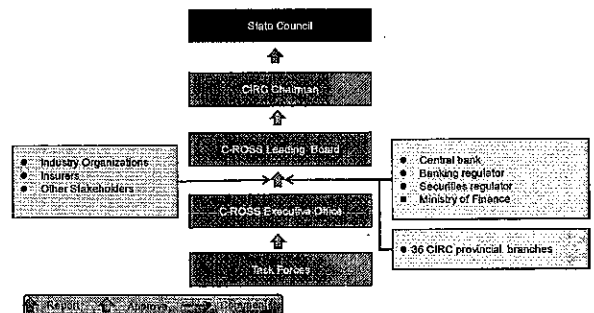
Organization Chart



Technical Process



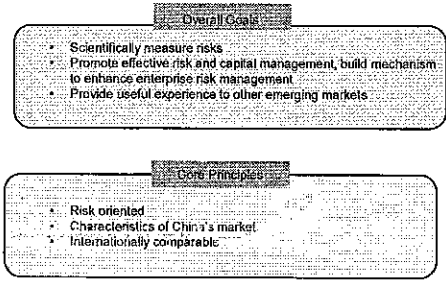
Policy Making Process



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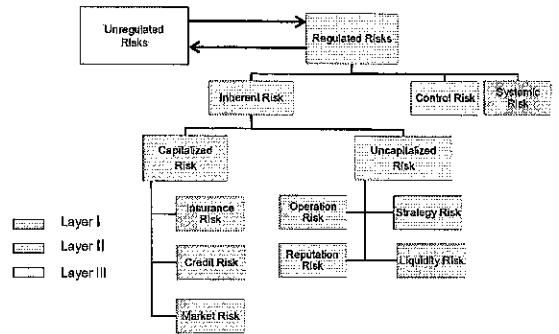
Goals and Principles of C-ROSS



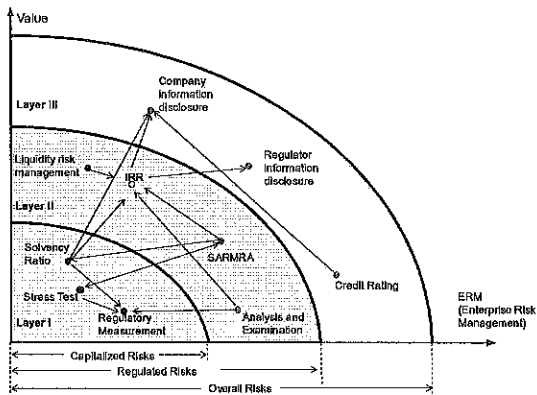
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Risk Stratification



Three-Layer Framework: Risk, Capital and Value



Transformation: Three-Pillar Regulatory Framework

	Capitalized Risks	Uncapitalized Risks	Unregulated Risks
Quantitative Capital Requirements	<ul style="list-style-type: none"> • Insurance Risk • Credit Risk • Market Risk 	<ul style="list-style-type: none"> • Operation Risk • Strategy Risk • Reputation Risk • Liquidity Risk 	
Supervisory Tools	<ul style="list-style-type: none"> • Quantitative capital requirement • Actual capital assessment • Capital stratification • Stress test • Regulatory measurement 	<ul style="list-style-type: none"> • Integrated Risk Rating (IRR) • Solvency Aligned Risk Management Requirements and Assessment (SARFRA) • Liquidity Risks • Analysis and Examination (A&E) • Regulatory Measurement 	<ul style="list-style-type: none"> • Company Information Disclosure • Regulator Information Disclosure • Credit Rating
Regulatory Discipline	<ul style="list-style-type: none"> • Comprehensive Solvency Ratio • Core Solvency Ratio 	<ul style="list-style-type: none"> • IRR Ratings • Control Risk Scores 	<ul style="list-style-type: none"> • Market Discipline
Market Disciplining Mechanisms			

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Risk oriented solvency system

- More comprehensive risk coverage**
 - Three pillar regulatory framework:
 - More complete coverage of risks
 - Risk identification, risk measurement and defense system
- More scientific risk measure**
 - Capitalized risk: practical, accurate models were implemented
 - Uncapitalized risk: Integrated Risk Rating
- More sensitive risk response**
 - Accurate measure associated risks due to changes in:
 - Operational behavior, business structure, investment strategy, etc
 - More capital requirement for irrational competition, high risk investment
- Strengthen risk management**
 - Risk management capability tied to capital requirement
 - In depth risk management indicators

Reflect China's insurance characteristics

- Gross premium growth rates in 2016:
 - ◆ China: 27.6%; Global: 3.1%
- Frequent changes: economic environment, associated market, business model, legal system, capital markets, consumer behavior etc.
- Emerging markets deviate further from complete, perfect, efficient market hypothesis
- Risk management tools used in mature markets sometimes are inefficient and ineffective in emerging markets

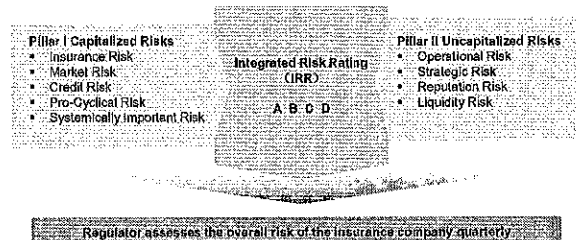
Reflect China's insurance characteristics

- With high growth potential, companies normally tend to focus more on the growth of market shares
- Fewer lessons learnt from crisis and losses
- Incomprehensive legal system and poor corporate governance lead to relatively high moral hazard
- Lack of experience for insurance professionals
- Small/medium, recently established insurers, Capital Shortage
- Face greater uncertainty comparing with mature market
- Immature financial market brings more volatility
- Financial systems in emerging markets are more vulnerable

Reflect China's insurance characteristics

- Pillar I reflect China's unique risk characteristics, capitalized risk measurements adopted scientific, practical methods.**
- Unique risks and different risk characteristics
 - Net risk model
 - Composite factor (K - factor) method
 - 750 days moving average gov't bond yield curve used in liabilities discounting
 - Factor based time value of options and guarantees (TVOG) valuation
 -
- Attach more importance to Pillar II effect**
- More attention paid to uncapitalized risk e.g. strategic and reputation risk
 - Regulator guides companies to improve risk management capability
 - Integrated risk rating (IRR)
 - Solvency Aligned Risk Management Requirement and Assessment (SARMRA)
 - Liquidity risk: integrated current ratio, liquidity coverage ratio
 -

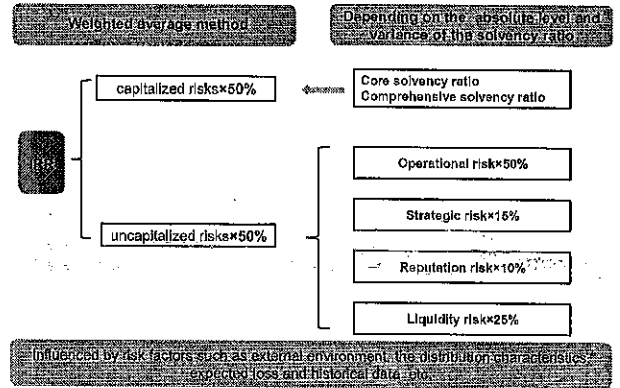
IRR



Categorize insurance companies according to their risk level and take interventions for companies with C and D rating according to their risk exposure.

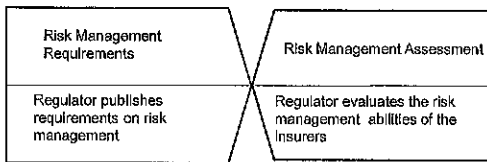
Rating	Capitalized risk	Uncapitalized risk
A	Solvency ratio meets regulatory requirements	Minor operational risk, strategic risk, reputation risk and liquidity risk
B	Solvency ratio meets regulatory requirements	Relatively minor operational risk, strategic risk, reputation risk and liquidity risk
C	Solvency ratio meets or doesn't meet regulatory requirements	Relatively severe operational risk, strategic risk, reputation risk or liquidity risk
D	Solvency ratio meets or doesn't meet regulatory requirements	Severe operational risk, strategic risk, reputation risk or liquidity risk

Rating Method of IRR

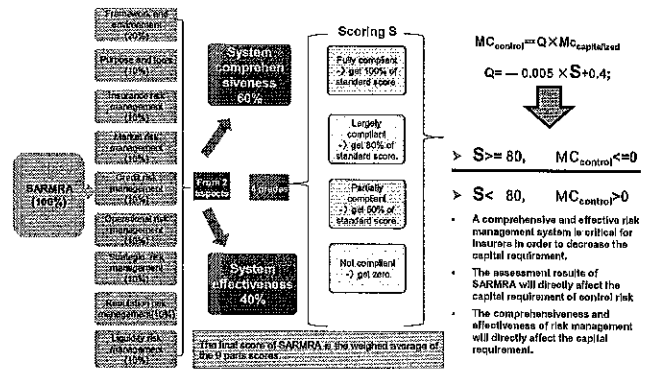


Solvency Aligned Risk Management Requirement and Assessment (SARMRA)

Risk Management Requirement and Regulatory Assessment



SARMRA



International comparable


<p>Design ideas</p> <ul style="list-style-type: none"> Risk oriented solvency system Insurance group supervision: corresponding three pillar provisions for insurance groups, with specific regulatory standards Counter-cyclical (K-factor): minimum capital requirement for stocks, investment property etc. 	<p>Standards & methods</p> <ul style="list-style-type: none"> Capital measurement methods & models for capitalized risks Capital tiering Information disclosure
<p>Framework</p> <ul style="list-style-type: none"> Three-layer framework transformed to three pillar framework: comparable with international mainstream practices 	<p>Regulatory means</p> <ul style="list-style-type: none"> XBRL (eXtensible Business Reporting Language) used to C-ROSS IT system Off-site analysis & on-site assessment




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Combination of quantitative and qualitative regulation



C-SI



C-ROSS


Focus on quantitative supervision, lack of qualitative supervision

- Solvency ratio is only standard
- Risk management capabilities were not taken into account.


Focus on both quantitative and qualitative aspects

- Integrated Risk Rating (IRR) was invented to assess uncapitalized risks (operation risk, strategy risk, reputation risk, liquidity risk)
- IRR combines quantitative and qualitative assessment result, performing comprehensive evaluation towards company's risk exposure
- SARMRA is used to evaluate company's risk management capabilities, i.e. control risk, and lead to capital requirement

Linkage between CIRC and CIRC local bureaus



C-SI



C-ROSS


CIRC local bureaus:

- Unclear responsibility
- Less participations
- Not fully developed joint supervision with CIRC


CIRC local bureaus:

- Integrated Risk Rating (Quarterly)*
- Participate risk rating for insurance companies
- Evaluate operation risks in sales, underwriting, finance management of insurance companies, branches
- SARMRA (Annually)*
- Conduct on-site assessment

External supervision and market discipline



C-SI



C-ROSS

Annual disclosure, limited information

Lack of transparency, less market discipline

Information Disclosure

Company

- Quarterly disclosure, more comprehensive
- Daily disclosure


Regulator

- Regular disclose solvency information


Market mechanism

- Encourage insurance companies to do credit rating, regulate rating agencies behavior
- Exchange information with stakeholders, analysts, agencies, etc.

Capital constraint and capital supplement



C-SI



C-ROSS

Build capital supplement framework, enriching the diversity of capital supplement methods with enlarged financing alternatives for insurance companies

- Available capital includes: core tier 1, core tier 2, supplementary tier 1, supplementary tier 2
- Capital tools include: subordinated debts, capital supplement bonds and subordinated convertible bonds, etc.

Strict and sound capital requirement, relaxed and flexible capital supplement

Three Biggest Shifts

C-SI



C-ROSS

From volume-orientation to risk-orientation

- Increase the risk-sensitivity and risk-coverage of regulatory approaches
- Create incentives of more sophisticated risk-taking and risk management
- Change the industry focus from scale to risk & value

C-SI



C-ROSS

From single approach to integrated approach

- Utilize uniform framework of financial reporting valuation, value measurement and capital management, to minimize the inconsistency of decision-making indicators
- Balance sheet, capital allocation, risk management and performance measurement within one "basket"

C-SI



C-ROSS

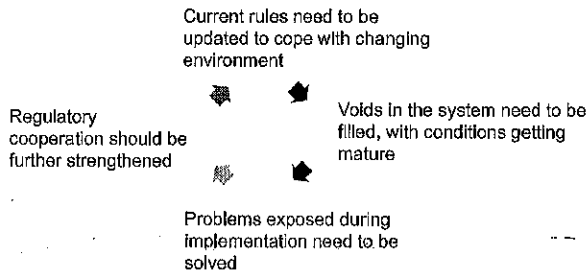
From country focus to market focus

- China is the largest emerging insurance market
- Emerging markets shared many common key features
- As compatible system, C-ROSS could provide useful experiences to other emerging markets

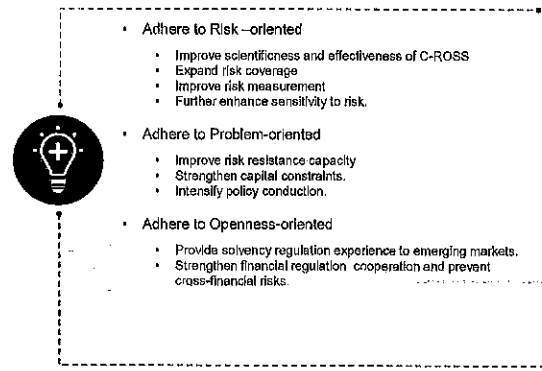
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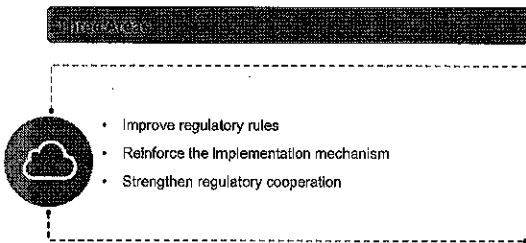
Issues C-ROSS are facing



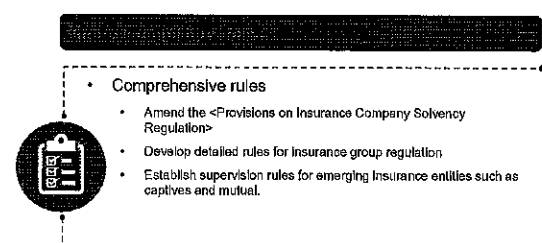
C-ROSS Phase II: Overall Target



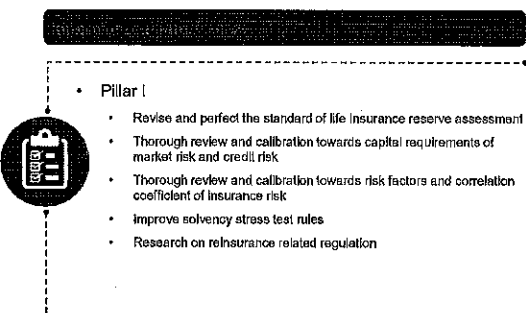
C-ROSS Phase II: Three Areas



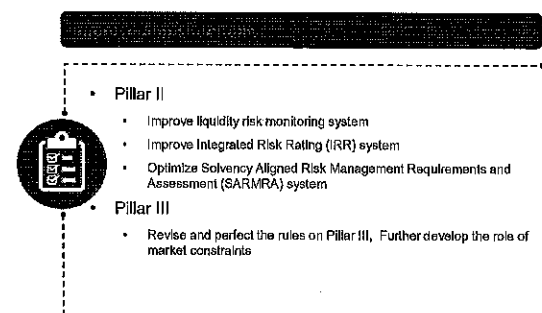
C-ROSS Phase II: Preliminary considerations



C-ROSS Phase II: Preliminary considerations



C-ROSS Phase II: Preliminary considerations



C-ROSS Phase II: Preliminary considerations

主要考虑 (Main Considerations)

- Establish solvency risk analysis and monitoring system, form a mechanism for regulators, insurance institutes, academia and related units to participate jointly in supervision and decision support
- Establish a regular data quality and authenticity inspection mechanism
- Strengthen the supervision and assessment of accounting firms, actuarial advisory institutions, credit rating agencies and other intermediaries involved in the insurance business
- Improve C-ROSS Information system

C-ROSS Phase II: Preliminary considerations

主要考虑 (Main Considerations)

- Strengthen domestic supervision cooperation with PBOC, CBRC, CSRC and relevant departments; prevent and control cross-financial risks
- Strengthen communication and cooperation with foreign regulators; explore equivalence assessment mechanism with supervisory regimes in foreign markets
- Adhere to the basic ideas and principles of C-ROSS, actively participate in International rule-making process, and contribute China experiences and ideas.

C-ROSS Phase II: Working Mechanism

统一领导 (Unified Leadership)

由 CIRC 党委牵头，CIRC 金融与会计、偿付能力监管部、偿付能力监管委员会成员单位及相关处室共同参与。

项目制 (Project-based)

Phase II 将采取项目制，任务将分解为项目并委托给 C-ROSS 咨询委员会成员、保险机构、中介机构、会计师事务所、行业专家。CIRC 及相关处室将专门作为项目团队。

C-ROSS Phase II: Working Mechanism

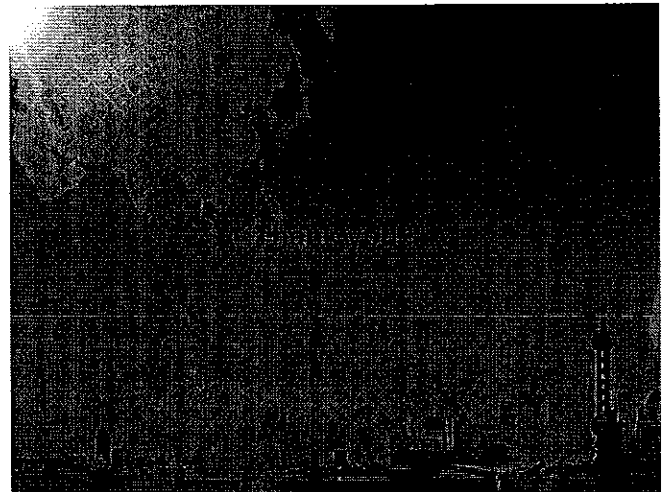
充分借力 C-ROSS 咨询委员会专家，负责提供咨询和示范，对整体规划、框架、技术标准及实施计划进行研究和评审，确保系统的科学性和有效性。

公开透明 (Open and Transparent)

及时公开任务、进度、测试结果、实施情况。C-ROSS 咨询委员会成员、保险机构、消费者协会、媒体和相关单位广泛参与，促进各方理解、支持和配合 C-ROSS。

C-ROSS Phase II: Schedule

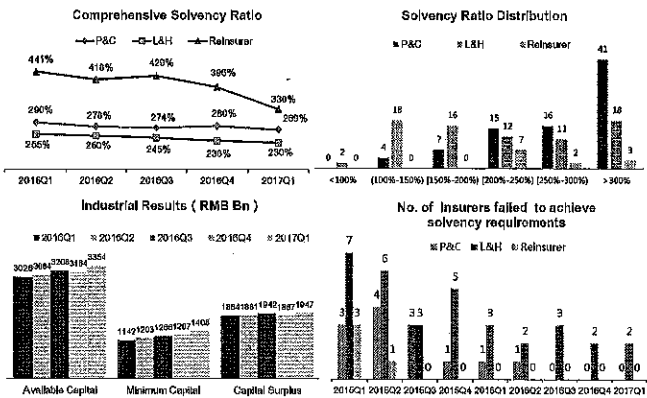
工具 (Tools)



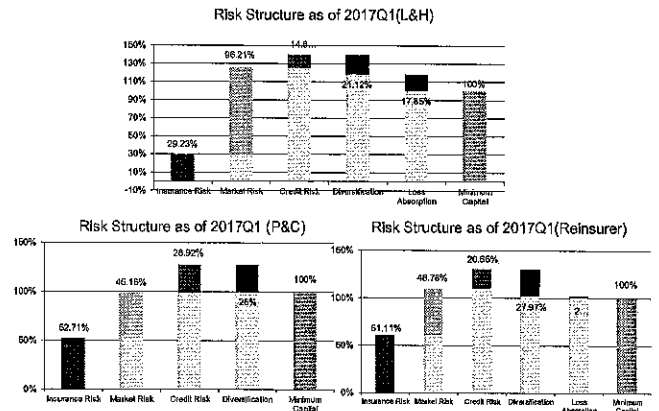
Agenda

- Implementation of C-ROSS
- Technical Issues

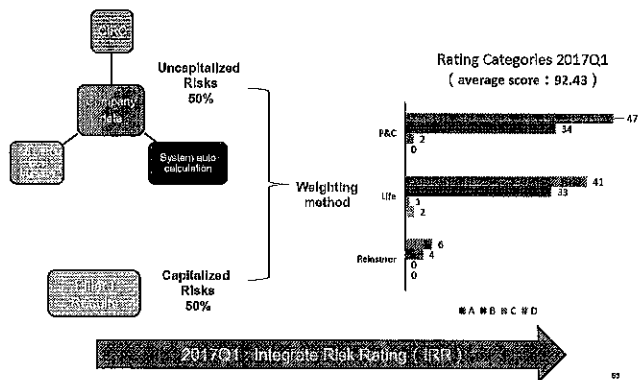
Full Implementation of C-ROSS Pillar I



Full Implementation of C-ROSS Pillar I



Full Implementation of C-ROSS Pillar II (IRR)



Full Implementation of C-ROSS Pillar II SARMRA

Category	Score	Quantity	Program	Average
P&C	14.96	5.74	7.68	6.96
L&H	15.60	6.56	8.14	7.45
Reinsurer	16.44	7.27	8.78	8.38

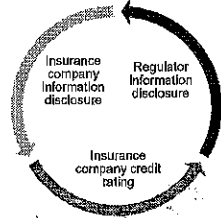
Score	Quantity	Program	Average
<60	6	7.8%	42.89
60-65	7	9.1%	61.55
65-70	18	12%	67.9%
70-75	25	33.6%	72.28
75-80	22	28.6%	77.42
>80	6	7.8%	82.51

Score	Quantity	Program	Average
<60	2	2.3%	48.39
60-65	1	1.2%	62.6
65-70	4	5.6%	68.25
70-75	34	39.4%	72.72
75-80	31	43.1%	77.79
>80	20	23.8%	82.37

Full Implementation of C-ROSS Pillar III

Insurance companies should disclose solvency information to the public and stakeholders

- Quarterly Disclosure**
 - Disclosing an abstract of quarterly solvency report
 - Within 30 days after the end of each quarter
 - On official website, as well as on official website of Insurance Association of China (IAC)
- Regular Disclosure**
 - Disclosing solvency information to stakeholders in the course of day-to-day operations



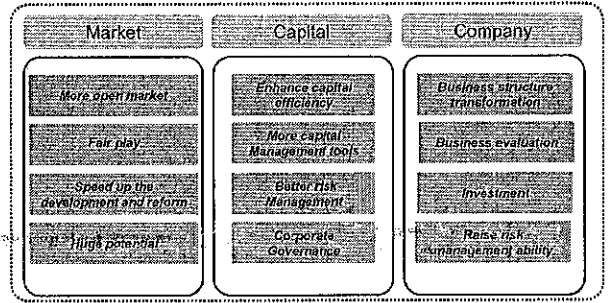
Continuous and interactive solvency information exchange mechanism with stakeholders

- Quarterly Disclosure**
 - CIRC&CIRC local Bureaus release quarterly integrated risk rating (IRR) Results.
- Semi-annual Disclosure**
 - CIRC disclose semi-annual solvency regulation information, including solvency profile of the industry, CIRC solvency regulation work, and other regulation information.

Insurance company credit rating

- Insurance companies should conduct credit rating when issuing debt instrument and capital instruments
- Regulating rating agencies' behavior with qualification requirements, administration and supervision

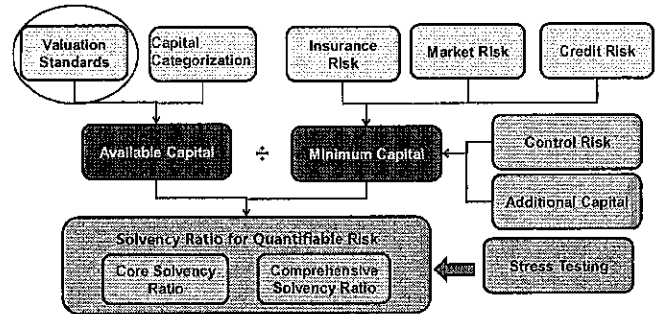
Impacts From C-ROSS



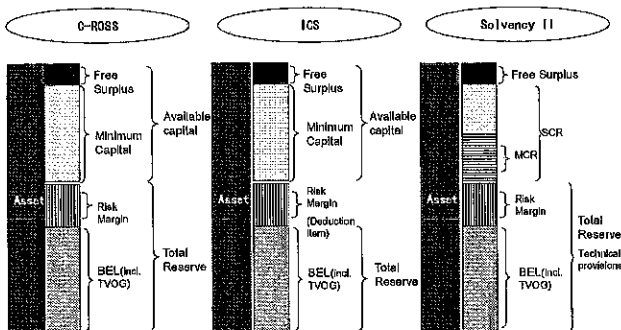
Agenda

- Implementation of C-ROSS
- Technical Issues

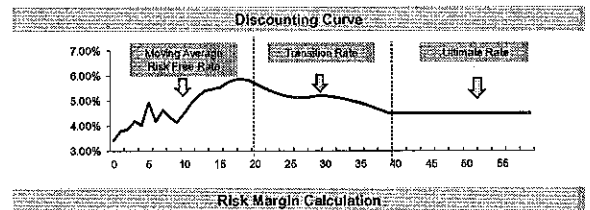
Pillar I: Solvency Ratio



Balance Sheet for C-ROSS ICS, Solvency II



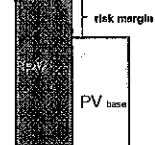
Pillar I: Valuation of Insurance Liabilities Under C-ROSS



Approach 1: Cost of Capital

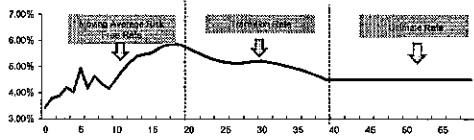
Approach 2: Scenario Based

- Article 21 of the Regulatory Standards No. 3: Insurance liabilities for life insurance contracts states the cost of capital method should be adopted in calculating risk margin



Pillar I: Valuation of insurance liabilities

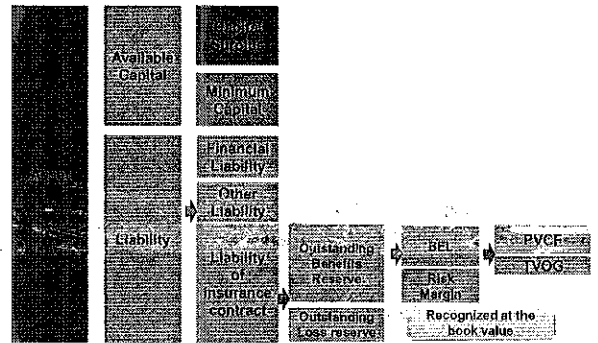
Spurious volatility



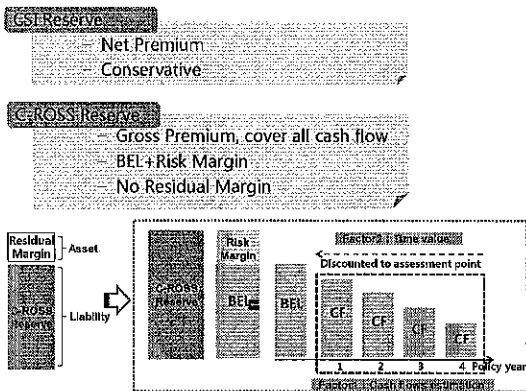
Application of 750 days moving average of government bond yield to avoid the swap rate volatility on the valuation date.

Application of ultimate rate of 4.5% to avoid unnecessary far end volatility of the interest rate yield curve.

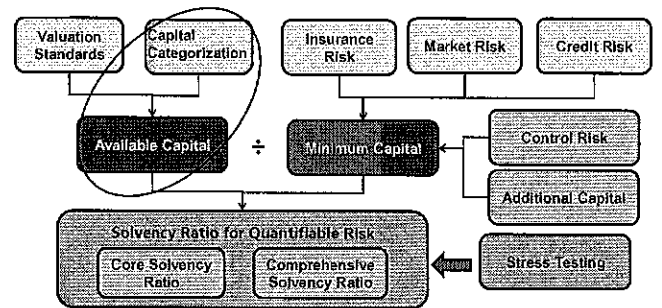
Valuation of Life Insurance Contracts



Differences for life insurance contract



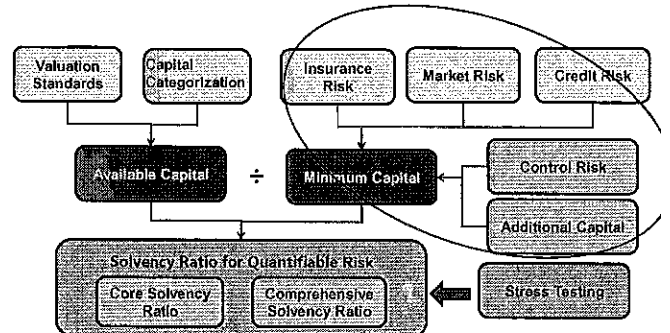
Pillar I: Solvency Ratio



Pillar I: Capital Definition and Categorization

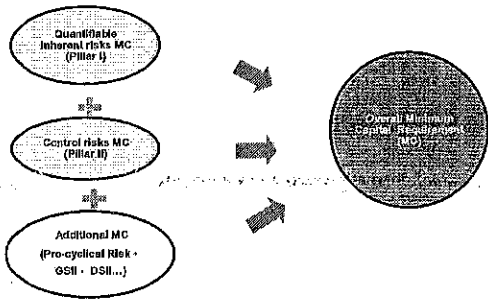
- **Capital Definition:**
Available capital shall demonstrate four key characteristics:
 - Permanence
 - Subordination
 - Availability
 - Absence of Encumbrances
- **Capital Categorization**
Distinguish available capital resources from high quality to low quality according to their loss absorbing capacity :
 - Tier 1 Core
 - Tier 2 Core
 - Tier 1 Supplemental
 - Tier 2 Supplemental

Pillar I: Solvency Ratio

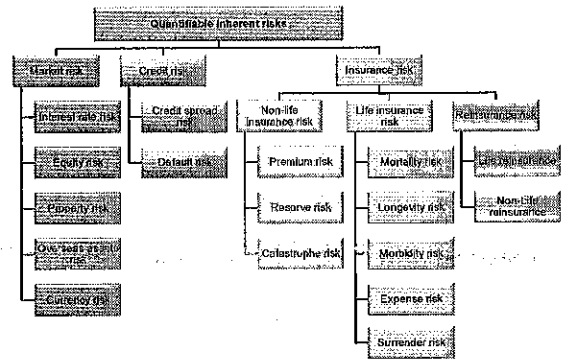


Pillar I: Methodology – Net Risk Model

Net Risk = Inherent Risk × Control Risk × Systemic Risk



Pillar I: Methodology – MC Components



Pillar I: Methodology - MC Calculations



> Composite factor based method:

$MC = EX \times RF$

which: EX is the risk exposure;

RF is the risk factor; $RF = RF_0 \times (1+K)$

RF_0 is the base risk factor, K is the characteristic factor

$K = \sum_{i=1}^n k_i = k_1 + k_2 + k_3 + \dots + k_n$

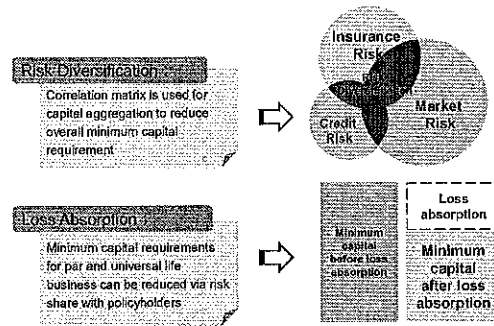
k_i is the characteristic factor based on specific risk or entity, n is the number of characteristic factors

> Scenario based method:

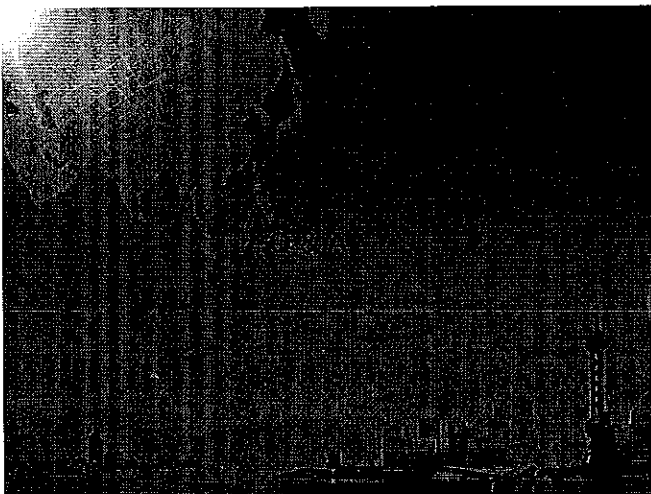
Used to calculate one year VaR;

Applied on catastrophe risk for non-life, interest rate risk and insurance risk for life insurers

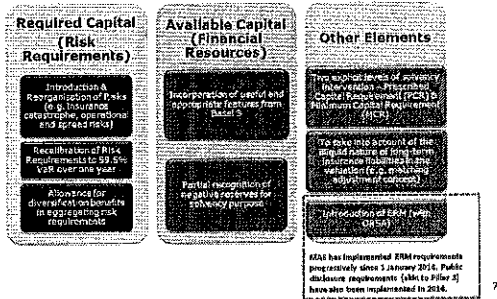
Minimum Capital Risk Diversification:



No risk diversification or loss absorption under SI



Another view: Singapore's "RBC 2"



What do we see in a modern system?

1. Requirements on Company's Technical Systems & Structures

Appropriate and full-range emphasis on ERM – mechanisms through to culture, which includes:

- Top-down, risk-open, culture and 'use tests';
- Risk appetite – analysis as input to a statement from the Board
- Risk strategy – how key risks are to be dealt with, including:
- How risk take-on is managed against risk appetite
- How risk limits are to be operated, with 'cascading'
- How risk processes are to be executed
- Risk events process with escalation of exceptional events

What do we see in a modern system?

2. Requirements for Financial Condition reporting => ORSA

- Full requirement for actuarial function to produce (confidential) annual + ORSA to international standards, working with general Risk function
- Influential and properly resourced CRO & Chief Actuarial functions with defined and material role in governance
- Involvement of actuarial function in all risk and strategy matters with material financial impact
- Board access for CRO, Auditors and Chief Actuary.

What do we see in a modern system?

3. ORSA Contents (NOT complete)

- Current and projected financial positions, including capital targets and supervisory limits; capital plan
- Current and emerging key risks, with explicit strategies to address them
- Key stress sensitivities and implications
- Assessment of the financial and risk functions including material exceptions
- Comparisons of actual with projected reporting material divergences (e.g. profits; claims development; capital; risk capabilities; new business & operational features).

What do we see in a modern system?

4. Requirements on Company's Governance

- Fit & Proper tests for key executives and Board
- Risk thinking integrated into strategy and transactions
- Direct Board involvement in through Risk/Audit Committees
- Open risk event process and reporting requirements, right through to Board level
- Realistic resourcing, capabilities and competencies
- Whistle-blower protections and obligations.

What do we see in a modern system?

5. Requirements on Company's Operations

- Distribution
- Customer/Reputation
- Privacy
- Cyber
- Outsourcing
- Anti-fraud & money-laundering
- Business Strategy (how ?)

What do we see in a modern system?

6. Powers for Supervisor

- Balance between healthy industry & markets, and Prudential supervision
- Effective, but progressive and transparent intervention powers; dealing especially with powers in SCR/MCR breach situations, going right through to possible takeover
- Powers flexible enough to intervene and amend requirements quickly in individual cases where (a) situation not covered by regulations; or (b) actions not in accordance with requirements.

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What do we see in a modern system?

7. Obligations on Supervisor/Government

- Framework acknowledges and requires monitoring of system-wide risks; and provides for escalation through appropriate political channels
- Realistic resourcing and adequate capabilities, including access to actuarial resources
- Practice Guidance Notes (non-enforceable) help companies and Boards understand expectations and monitor their own performance
- Appropriate responses from companies are sought, encouraged, observed, checked.

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What do we see in a modern system?

8. Realistic and full Disclosure regime

- (a) Public; and (b) Confidential Supervisory; disclosure needs are distinguished
- Public disclosures are seen as consistent with other reporting (e.g.) IFRS and shareholder briefings – or if not, they are reconciled to it
- Public encouraged to use the information.

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CAPITAL : Framework Attributes

- Intention to realistically assess the underlying economic picture, as a basis for all actions
- Stated basis on principles; based around specified risk tests and assumed intentions as regards resolution
- Principles may sometimes override 'letter of the law' – with required reporting and explanation
- Full range of quantifiable risks covered appropriately, consistently and explicitly
- Well-defined and simple-to-calculate capital charges
- Avoids systemic or pro-cyclic issues
- ... and (dynamic) discontinuity traps



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AVAILABLE CAPITAL : Quantification

- Defined relationship between Capital (Tier 1, Tier 2 etc) Definitions and Banking Capital Definitions
- Basel standards are based on loss-absorbing capabilities and well understood and respected; consistency alone is valuable within groups
- Some assets adjusted/disallowed where economic value is deemed not to be realisable.

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Aiming for this picture ?



18

REQUIRED CAPITAL : Quantification

- Baseline Asset & Liability Valuation Calculations
- Active realistic asset valuation reasonably (or fully?) consistent with active realistic liability valuation
- Various treatments of :
 - Time Value of Guarantees/Options
 - Yield curve assumptions, margins and ultimate rate;
 - Liability risk margins (MOCE)
 - Asset liquidity risk margins
- Some credit may given for future profit margins (as a source of capital).

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REQUIRED CAPITAL : Quantification

- Stressed Calculations (Architecture)
- Basic Capital Charge is often the difference between a stressed value and the baseline (assets and liabilities)
- Separate capital charges may be specified for:
 - Insurance risks; (may include pandemic);
 - Asset/Market risks;
 - Operational risks;
- Over-riding concentration limits
- Maybe two levels of diversification allowances
- Specified treatments usually specified for reinsurance.

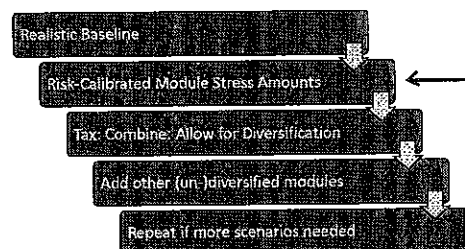
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REQUIRED CAPITAL : Quantification

- Stressed Calculations (Detail)
- Assumption changes specified or calibrated realistically
- Calculate change in asset/liability for change in assumption(s)
- Allow for diversification within risk type if not 100% correlated (in the tail)
- Allow realistically for tax effects within the above
- Allow for diversification between ALM risks and Insured risks (i.e. between risk modules)
- Add operational risk charges (assumed correlated)
- Repeat if several scenarios required (e.g. SCR/MCR).

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Let's replay that again



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What else do we get from this?

- Understand baseline and stress assumptions better
- Understanding the impact of key stresses on the underlying economic position in a model balance sheet
- Inputs & awareness for strategy
- Planning for the subsequent years

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What don't we get from this?

- Risk impacts not included in the model
- Certainty
- Free time !



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<<Time for a review before closing?>>

- Ad-lib a review that is brief ???

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Relevant ICP's for the Company ?

- ICP 8 Risk Management and Internal Controls
- ICP 16 Enterprise Risk Management for Solvency Purposes
- ICP 14 Valuation & ICP 17 Capital Adequacy
- ICP 18 Intermediaries & ICP 19 Conduct of Business

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Relevant ICP's for the Supervisor ?

- ICP 5 Suitability of Persons & ICP 7 Corporate Governance
- ICP 9 Supervisory Review and Reporting
- ICP 10 Preventive and Corrective Measures & ICP 11 Enforcement
- ICP 12 Winding-up and Exit from the Market
- ICP 24 Macroprudential Surveillance and Insurance Supervision

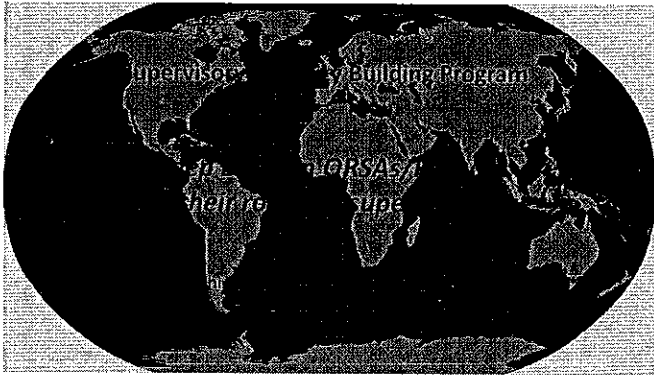
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Lessons for the Supervisor

- ...
- ...
- ...
- ...

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Agenda for this Dive

- Review what should be in an FCR/ ORSA
- Consider why that information is there
- And what lies beneath! (and around)
 - supporting and connected materials
- Ask how a Supervisor can use it all

FCR / ICAAP

- Actuarial Financial Condition Reports have been used in Australia for 30+ years: originally based on Realistic Pricing but Regulatory Solvency reporting (like EU S1)
- Modernised to include realistic profit and capital reporting in 1995: influenced current IFRS and IAIS
- In line with international developments, they now include business commentary, Profitability reporting and Risk-based Solvency and Capital Adequacy assessments, and review of the ERM framework
- ICAAP is a Basel II term adopted in Australia (as part of a cross-industry regulatory system) to enlarge the scope of reporting and include matters of Board 'ownership'.

ORSA: Article 45 of Solvency 2 framework directive (extracts)

- *As part of its risk-management system every insurance undertaking and reinsurance undertaking shall conduct its own risk and solvency assessment.*
- ... *Assessment shall include at least the following:*
 - (a) the overall solvency needs, taking into account the specific risk profile, approved risk tolerance limits and the business strategy of the undertaking;
 - (b) the compliance, on a continuous basis, with the capital requirements, and with requirements regarding technical provisions;
 - (c) the significance with which the risk profile ... deviates from the assumptions underlying the SCR.

ORSA: Article 45 of Solvency 2 framework directive (extracts)

- ... processes ... proportionate to the nature, scale and complexity of the risks inherent in its business and which enable it to properly identify and assess the risks ... to which it is or could be exposed ... demonstrate the methods used internal model calibration
- [ORSA] ... shall be an integral part of the business strategy and shall be taken into account on an ongoing basis in the strategic decisions of the undertaking
- No delays: Supervisor informed
- Doesn't override the SCR

FCR vs ORSA / ICAAP

- Major difference is that ICAAP and ORSA are designed as the Company's own internal assessments: whereas FCR is an actuarial report to the Board and the Supervisor
- There are differences in content: there are some advantages and disadvantages in both approaches
- It is a fact that in an insurer, both ICAAP and ORSA rely to a large extent on actuarial opinions: however, since they are produced by the company, and approved by the Board and CEO, they contain a lot of material that represents policies and positions taken by the Board
- This reflects a more modern approach to accountability that is intended to make companies more responsive

What does IAA say about ORSA?

- ORSA is an ongoing part of risk and capital management practices and has merit beyond any regulatory requirement
- Both quantitative and qualitative analyses support ORSA processes
- ORSA is not a "one-size-fits-all" process: significant variations occur from company to company, and even within groups
- ORSA processes are most effective when integrated within other business processes, particularly strategic and business planning, capital management, product pricing and underwriting
- Promoting ORSA disciplines has value at both a macro (i.e. industry-wide) and at a micro (i.e. company- or group-specific) level

(see IAA Risk Book Chapter 10)

7

What can we say about ORSA?

- ORSA & ICAAP certainly overlap and both include much content from (effectively) an FCR
- Because companies design and use their own ORSA there is no standard model: In practice, the minimum requirements are set by supervisors
- However, seeing the ORSA as a compliance exercise doesn't meet anybody's needs – not company or supervisor (discuss why?)
- ORSA processes are most effective when integrated within other business processes, particularly strategic and business planning, capital management, product pricing and underwriting
- All of these mechanisms rely on a mass of supporting material, including statistical analyses, valuation reports, pricing reports, audit reports etc etc

8

What does ORSA include/ rely on?

- Company Policies and supporting documents and people:
 - Risk Appetite Statement
 - Risk Management Strategy
 - Risk limits, measures, calculations, processes, reports
 - Risk Event handling Procedures and Governance
 - Provisions and Charter for Risk Committee and CRO
- *adequate policies, procedures, systems, controls and personnel to identify, measure, monitor and manage the risks arising from the life company's activities on a continuous basis, and the capital held against such risks (APRA - LPS110)*

9

What does ORSA include/ rely on?

- 3-year Capital Plan linked to Business Plan & Policies
- NB: Target levels above the required level
- Review of latest period against that Plan (including changes)
- *a strategy for ensuring adequate capital is maintained over time, including specific capital targets set in the context of the life company's risk profile, the Board's risk appetite and regulatory capital requirements. This includes plans for how target levels of capital are to be met and the means available for sourcing additional capital where required (APRA - LPS110)*

10

What does ORSA include/ rely on?

- Risk Management Strategy links to Actions & Procedures
- Definitions of Trigger levels & Specific Actions available
- Review of compliance covers this too
- *actions and procedures for monitoring the life company's compliance with its regulatory capital requirements and capital targets. This includes the setting of triggers to alert management to, and specified actions to avert and rectify, potential breaches of the regulatory capital requirements (APRA - LPS110)*

11

What does ORSA include/ rely on?

- Stress testing: single and multi-stress
- Scenario analysis considering capital impacts and sources of additional capital and/or risk reduction
- *stress testing and scenario analysis relating to potential risk exposures and available capital resources*
- *processes for reporting on the ICAAP and its outcomes to the Board and senior management of the life company, and for ensuring that the ICAAP is taken into account in making business decisions*
- *policies to address the capital impact of material risks not covered by explicit regulatory capital requirements (APRA - LPS110)*

12

What else might ORSA include?

- Overall objectives of process: expected level of financial soundness associated with capital targets and time horizon
 - Key assumptions and methodologies used, including stress testing and scenario analysis
 - Triggers for review in light of changes to business operations, regulatory, economic and financial market conditions, and other factors
 - Policy for routine reviews, including responsibilities, frequency and scope, and reporting outcomes to the Board and senior management
 - explanation of any differences in measurement of capital
- (See - APRA - LPS110 – ICAAP Summary Statement)*

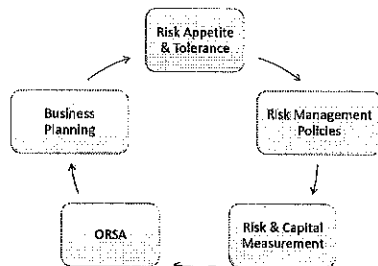
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What else might ORSA rely on?

- Underlying data quality
- Detailed analyses of statistical (e.g claims, lapse) experience
- Pricing reports, profitability/sensitivities
- Expense/tax allocations and analyses
- Analyses of change and variance
- Claims, Expense, and Profit forecasts
- Accounting and statutory financial reports
- Actuarial and Audit opinions concerning the above and ...
- THE ACTUARIAL CONTROL CYCLE |

14

The Actuarial Control Cycle



15

What else do we get from this?

- Understand baseline and stress assumptions and sensitivities better, and the bases for them
- Understand the relationships between forecasts and actuals: use 'drill-down' to find causes
- Look at risk experience and culture to evaluate ERM system performance
- Use named reports to drive inquiries and investigations
- Use references to point to underlying analyses, opinions, statistics, etc
- Professional advice on (almost) all the above

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What don't we get from this?

- No automatic process – judgement still matters
- No 100% certainty
- No easy ride - it still takes time and effort!



17

<<Time for a review before closing?>>

18

Relevant ICP's for the Company ?

- ICP 8 Risk Management and Internal Controls

- ICP 16 Enterprise Risk Management for Solvency Purposes

- ICP 14 Valuation &
ICP 17 Capital Adequacy

- ICP 18 Intermediaries &
ICP 19 Conduct of Business

19

Relevant ICP's for the Supervisor ?

- ICP 5 Suitability of Persons &
ICP 7 Corporate Governance

- ICP 9 Supervisory Review and Reporting

- ICP 10 Preventive and Corrective Measures &
ICP 11 Enforcement

- ICP 12 Winding-up and Exit from the Market

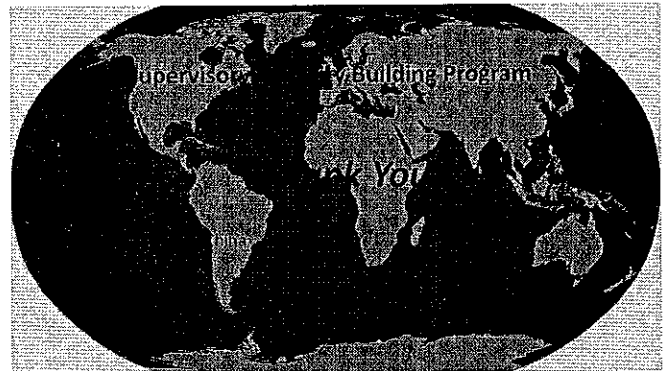
- ICP 24 Macroprudential Surveillance and
Insurance Supervision

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Lessons for the Supervisor

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-
-
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21



9.4 Relationship between actuaries and supervisors

Jules Gribble, Senior Policy Advisor, IAIS
21 July 2017



Agenda

- ▶ Context
- ▶ IAIS SAPRs and capacity building
- ▶ Actuarial control cycle

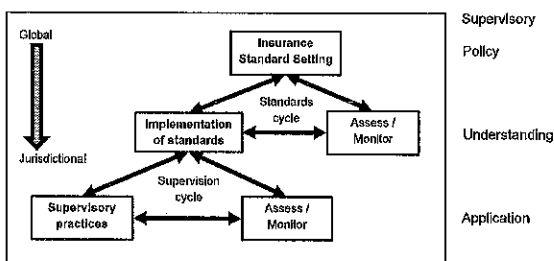
IAIS - a global standard setter

- ▶ Mission
 - Promote **effective and globally consistent** supervision of the insurance industry in order to **develop and maintain** fair, safe and stable insurance markets for the **benefit and protection of policyholders**
 - Contribute to **global financial stability**
- ▶ IAIS membership is broad and diverse:
 - About 200 jurisdictions in nearly 140 countries
 - 97% of the world's insurance premiums

IAIS works with Members and others

	IAIS role
Standard setting	IAIS with Member input, in cooperation with other standard setters
Adoption of standards	IAIS Members, and other elements of government, in their jurisdiction
Capacity building	IAIS Partners and others (such as educational and professional bodies)
Supervisory practices	IAIS Partners and others
Assessments	IAIS with Member input, in cooperation with other standard setters, in particular through the ICPs, ORSA, and other tools

Control cycles



Key ICPs: Actuarial perspective

- ▶ Taking a broader perspective:
 - ICP 8: Risk Management and Internal Controls (Includes Actuarial function)
 - ICP 9: Supervisory Review and Reporting
 - ICP 13: Reinsurance and Other Forms of Risk Transfer
 - ICP 14: Valuation
 - ICP 15: Investment
 - ICP 16: Enterprise Risk Management for Solvency Purposes (includes ORSA)
 - ICP 17: Capital Adequacy

IAIS Assessment

- ▶ Self Assessment and Peer Reviews (SAPRs)
 - Conducted for almost all 2011 ICPs
 - In depth questions to supervisors on groups of ICPs
 - Generally well, but not universally, responded to
 - Reports on public IAIS website
- ▶ FSAPs
 - Conducted by WB and IMF
 - ICPs are basis for assessments of insurance sector
 - G20 focus
 - In future may not cover all ICPs



IAIS Capacity building survey

- ▶ Supervisory Capacity building and Development Needs Survey Results Report, survey conducted in 2016.
- ▶ Third in a sequence (2010, 2013)
- ▶ Results over time are consistent
- ▶ 45 respondents. Asia (9), largest of 8 regions



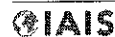
Key focus areas

- ▶ Next three years, priority areas for the capacity building of insurance supervisors (in order)
 - ICP 8 Risk Management and Internal Controls
 - ICP 17 Capital Adequacy
 - ICP 7 Corporate Governance
 - ICP 16 ERM for Solvency Purposes
- ▶ All these ICPs were also in the top five that would benefit from clarification or development of additional guidance
- ▶ Strongly actuarially related



Q5. Priority of supervision (next 3 years)

- ▶ Top 10
 1. Prudential supervision of underwriters of conventional insurance
 2. Macroprudential supervision
 3. Market conduct supervision of conventional insurance
 4. Market conduct supervision of intermediaries of conventional insurance
 5. Development of the conventional insurance market
 6. Development of the microinsurance market
 7. Prudential supervision of microinsurance
 8. Market conduct supervision of microinsurance
 9. Market conduct supervision of intermediaries of microinsurance
 10. Development of the offshore insurance market



Q6. Priority for capacity building (next 3 years)

- ▶ Top 10
 1. Macroprudential supervision
 2. Prudential supervision of underwriters of conventional insurance
 3. Market conduct supervision of underwriters of conventional insurance
 4. Market conduct supervision of intermediaries of conventional insurance
 5. Development of conventional insurance markets
 6. Development of microinsurance market
 7. Prudential supervision of microinsurance
 8. Market conduct supervision of microinsurance
 9. Market conduct supervision of intermediaries of microinsurance
 10. Prudential supervision of offshore insurers



SAPR: ICP 8 – Results by region

	O	LO	PO	NO	N/A	Total	Index
Americas	2	10	0	0	2	14	7.5
Asia-Oceania	4	5	2	0	3	14	7.5
Central, Eastern Europe and Transcaucasia	0	7	1	0	1	9	6.6
Middle East and North Africa	3	1	1	0	0	5	8.2
Offshore and Caribbean Islands	2	4	0	0	0	6	8.0
Sub-Saharan Africa	0	5	1	0	0	6	6.5
Western Europe	5	5	4	0	1	15	7.2
Total participating authorities	16	37	9	0	7	69	7.3

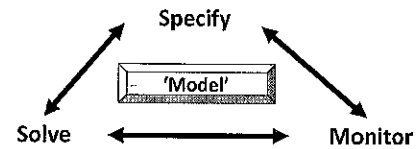


Control cycles ...

- ▶ Not new
- ▶ Not inherently actuarial
 - Despite some legislative enshrining
 - Pilots control cycle
- ▶ Why has the 'actuarial control cycle' caught on?
 - With actuaries at least ...

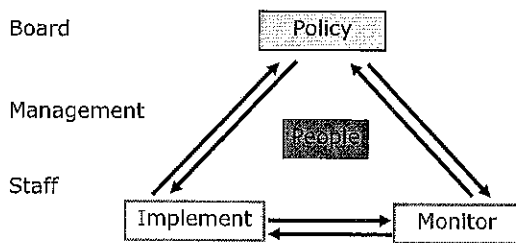
Analytic cycle

- ▶ After identifying the issue / opportunity

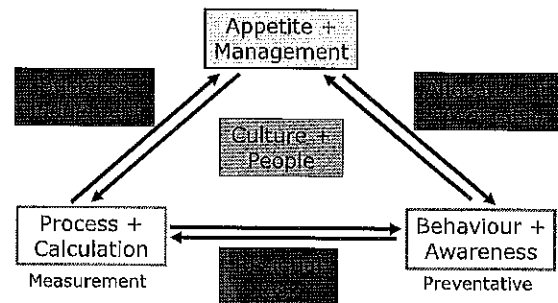


- ▶ Conceptually
 - What do you want to do
 - Implement It
 - Did it work
- ▶ Broadly applicable ...

Governance & (enterprise) risk management

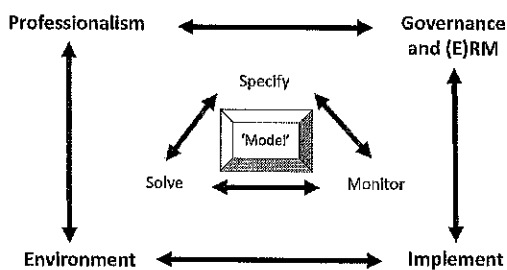


(E) Risk management – many models



Professional cycle

- ▶ But models live in the real world:

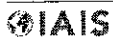


Statutory roles

- ▶ In place in many countries
 - Appointed actuary (or similar designation)
 - FCRs, ORSAs, Liability Valuations etc
 - Especially for life insurance (long term)
 - Also pensions and non-life insurance
- ▶ Supervisors, as users, challenge:
 - Specifying what is wanted (legislation, regulation)
 - Partnering with actuarial profession
 - Analysing and applying information in statutory and other actuarial reports
- ▶ Key actuarial role, but not the only key one

The actuarial value path

- Assess symptoms and identify the issue / opportunity
- = Apply Actuarial tools + Develop model
 - + Analytic cycle
- = Govern model + Actuarial paradigms
 - + Professional cycle
- = Actuarial control cycle
 - + Apply to financial services
- = Actuarial control
 - + Actuarial capabilities and experience
- = Actuarial practice
 - + Deliver relevant, timely, respected advice to users
- = **Actuarial value for decision makers**



Supervisory Capacity Building: Actuarial Services, July 2017

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Summary

- ▶ The ideal actuary
 - Understands your issues
 - Analytic, adaptable, and technically competent
 - Assimilates information from a wide variety of sources and make sense of it in a business context
 - Communicates frankly with you in your language
 - Provides value through timely, unbiased, relevant and practical advice and alternatives to inform and support decision making
 - Behaves professionally and openly
- ▶ Actuaries are useful people to have around to help identify, monitor, manage, and communicate risks and risk events
 - The whole is greater than sum of (technical) parts
- ▶ Challenge for actuaries and their users: Realise the value



Supervisory Capacity Building: Actuarial Services, July 2017

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Some references

- ▶ IAA Risk Book, see Risk Book, under Publication on www.actuaries.org
 - 'Chapter 2 – Actuarial Function',
 - 'Chapter 10—Own Risk and Solvency Assessment (ORSA)
- ▶ IAIS Insurance Core Principles, see Insurance Core Principles under Supervisory Material on www.iaisweb.org
 - ICP 8 includes Actuarial Control Function
 - ICP 16 includes ORSA
 - ICP 12 13, 14, 15, 16 and 17 cover prudential matters



Supervisory Capacity Building: Actuarial Services, July 2017

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References

- ▶ IAIS SAPRs etc
 - See www.iaisweb.org (public website), under 'Supervisory Material', then 'Implementation and Capacity Building' and then 'Assessments'



Supervisory Capacity Building: Actuarial Services, July 2017

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Thank you ...

Actuaries and supervisors

Jules Gribble
jules.gribble@bis.org



9.5 Workshop: Developing actuarial capacity

Jules Gribble, Senior Policy Advisor, IAIS
21 July 2017



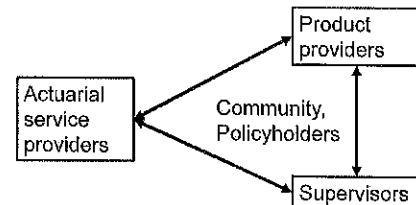
Agenda

- ▶ Background
- ▶ Questions for discussion

Numbers of actuaries

- ▶ Fellows in Full Member Associations of the IAA
 - Approximately 60,000 individuals
 - Very unevenly spread
 - Doctors – estimated at 15m (shortfall of 5m)
 - Engineers – estimated 7m
 - Accountants, Lawyers – estimated 5m each
- ▶ Two orders of magnitude smaller

Context – 3 key players



- ▶ Progress limited by key player with least capacity
- ▶ Common 'language' encourages discussion and improves understanding between and within key players

The ideal actuary

- ▶ The ideal actuary
 - Understands your issues
 - Analytic, adaptable, and technically competent
 - Assimilates information from a wide variety of sources and make sense of it in a business context
 - Communicates frankly with you in your language
 - Provides value through timely, unbiased, relevant and practical advice and alternatives to inform and support decision making
 - Behaves professionally and openly
- ▶ Actuaries are useful people to have around to help identify, monitor, manage, and communicate risks and risk events
 - The whole is greater than sum of (technical) parts

▶ Challenge for actuaries and their users: Realise the value

Some areas to consider

- ▶ Statutory – interactions with supervisor
 - Requirements (FCR, ORSA, other reporting)
 - Wider use
 - Regulatory standards/guidelines
 - Independence
 - Whistle blowing
- ▶ Profession
 - Establishment and governance
 - Recognition and status ('seat at the table')
 - Professional standards (who is responsible)
 - Wider value add than statutory role
- ▶ Role of industry and industry bodies in these processes

How can your agency support?

- ▶ By your agency
 - Individual level
 - Professional association level
- ▶ More generally in your jurisdiction
 - Education
 - Profile
 - Other
- ▼ What is the role of
 - IAIS
 - IAA
 - Jurisdictional insurance related associations
 - Industry and others



Thank you ...

Developing actuarial capacity

Jules Gribble
jules.gribble@bls.org





INTRODUCING RISK BASED SUPERVISION: ADB NBRK PARTNERSHIP

CHONGLI, PEOPLE'S REPUBLIC OF CHINA, JULY 20TH 2017
DR. RODOLFO WEHRHAHN

Supervisory Capacity Building: Actuarial services Prudential supervision and risk management in Insurance

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CONTENT

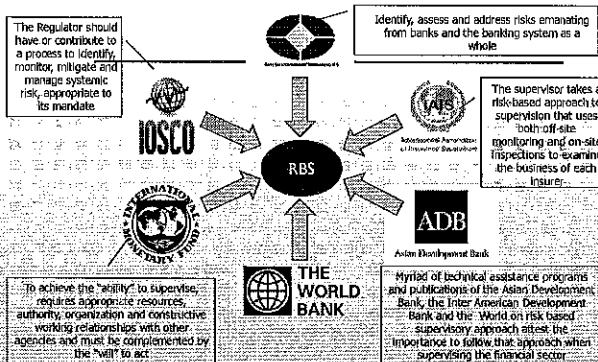
- Moving towards international standards in insurance supervision
- The new approach to supervision
- Risk based supervisory tools

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CONTENT

- Moving towards international standards in insurance supervision
- The new approach to supervision
- Risk based supervisory tools

INTERNATIONAL BODIES SUPPORT A FORWARD LOOKING RISK BASED SUPERVISORY APPROACH



ARE THESE INTERNATIONAL RECOMMENDATIONS RELEVANT FOR US?

Use its resources in the most effective manner:

Allocate scarce resources where it matters most, i.e. to deal with the risks to the supervision's objectives of financial stability and consumer protection

Act on a preventive mode rather than having to cure:

Possible future problems are linked to existing risks, thus identifying risks before they materialize is key for an effective supervision

ARE THESE INTERNATIONAL RECOMMENDATIONS RELEVANT FOR US?

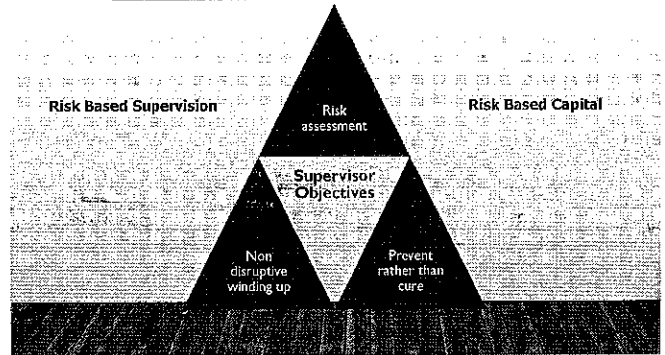
The FSAP results can help to identify the improvement areas in the insurance supervision:

Close supervisory gaps:

There is no perfect compliance based supervisory framework. In a rules-compliance based supervision the objective to reduce risks in the system is not always achieved due to "creative" interpretation of the rule by some market participants.

PROBLEMS TO BE ADDRESSED BY A RISK BASED SUPERVISORY APPROACH

Alignment with international standards on supervision



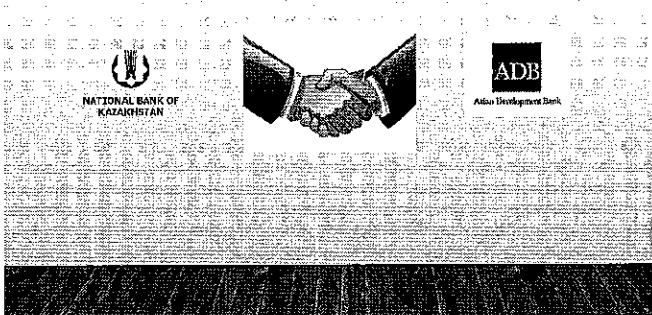
COOPERATION

To address the highlighted issues and achieve alignment with international standards on supervision three years program has been carried out

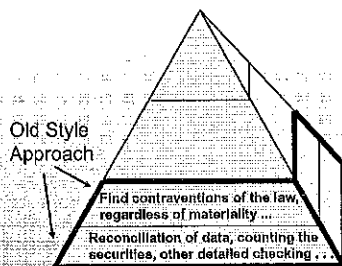
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- Moving towards international standards in insurance supervision
- The new approach to supervision
- Risk based supervisory tools

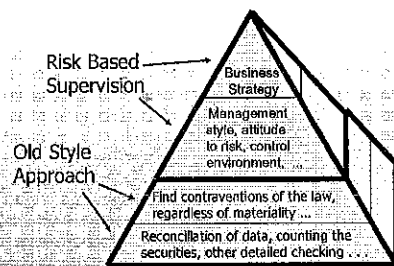


Evolution of Supervisory Approaches



Source: I. Serega

Evolution of Supervisory Approaches



→ Today, we are concerned with assessing the degree of risk in the company's business operations – and how to reduce risk as required

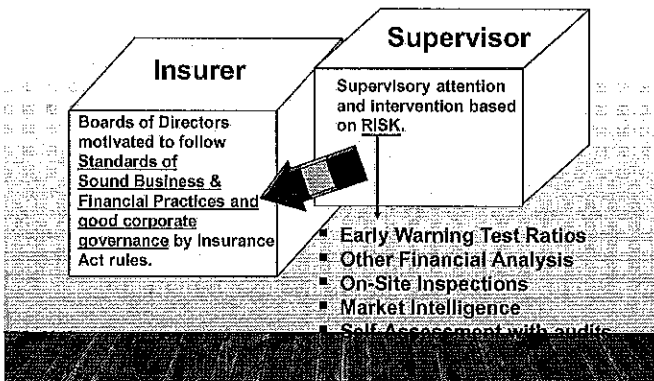
ELEMENTS OF RBS

- Insurer risk ratings
- Risk sensitive capital regime
- Early warning systems
- Stress testing
- Data collection that identifies and assesses risk (not only compliance)
- Ladder of supervisory intervention
- More targeted and less general on site inspections
- Requests to companies go beyond correcting legal breaches: improved governance, risk management and internal controls

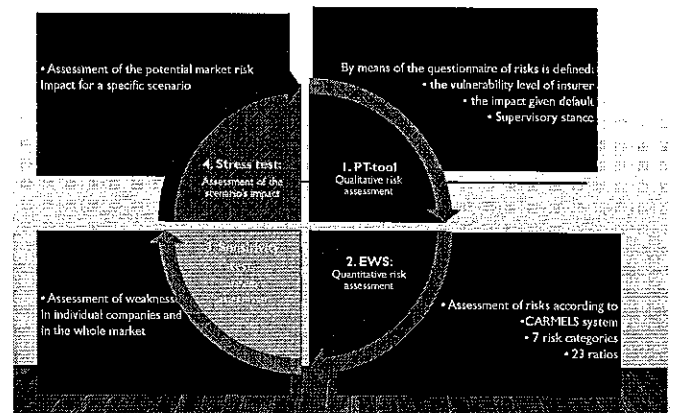
RBS CHALLENGES

- RBS is a long term process
- Reduction in supervisory staff ?
- RBS is "arms length" supervisory approach ?
- Requires considerable investment in technical capacity and process development across the whole supervisory authority
- A new mindset for both supervisors and insurers

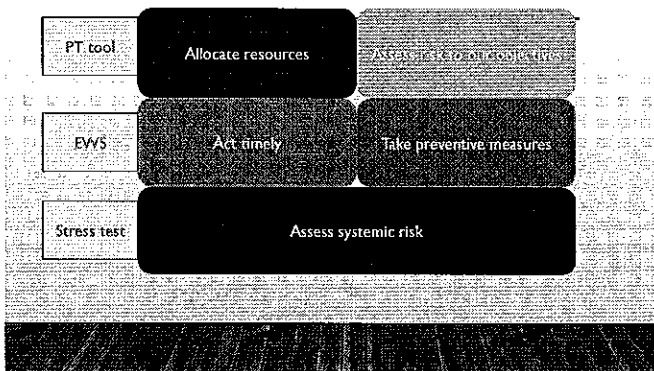
Risk Based Supervision forces management to improve



RISK BASED SUPERVISION in KAZAKHSTAN



EFFECTIVE CONSTRUCTIVE INSURANCE SUPERVISION



MOVING TO A MODERN WORLD OF SUPERVISION

- The supervisory tools have been tested for two years and back-tested for several years;
- The PT-KAZ tool confidently indicates the companies that have higher residual risk and /or are of systemic importance.
- It helps to allocate sufficient resources to supervise the companies with the required level of attention.

MOVING TO A MODERN WORLD OF SUPERVISION

- The KAZ-EWS predicted in the past failing companies well.
- It help to better understand if a risk is materializing by interacting with the insurers on the right topics.
- Early measures can be designed based on the KAZ-EWS and guided by the Sensitivity tool to prevent rather than to cure.

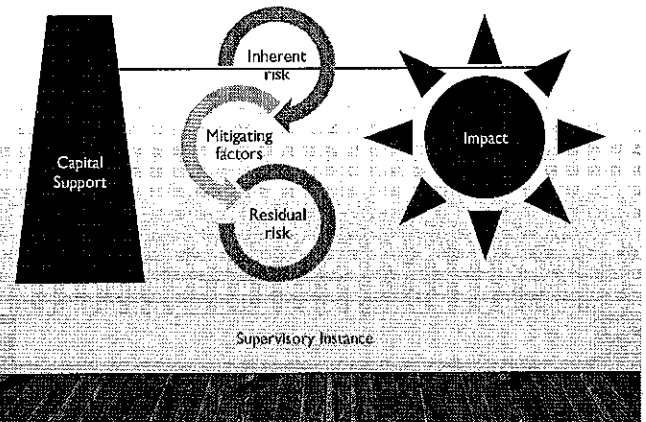
MOVING TO A MODERN WORLD OF SUPERVISION

- The market-wide stress test indicates systemic risks that need to be addressed by regulation or special measures.
- It also tests the quality of the individual risk management and highlights the improvement needs.

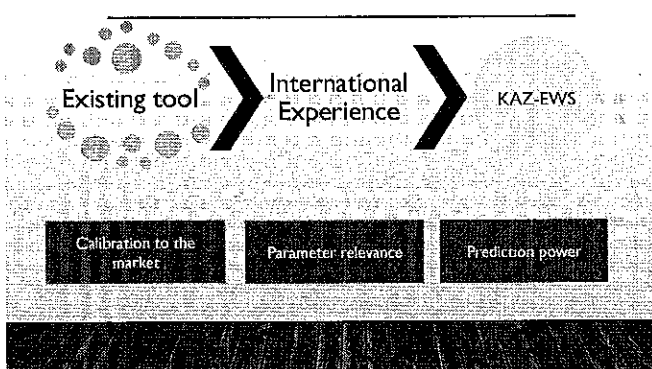
CONTENT

- Moving towards International standards in Insurance supervision
- The new approach to supervision
- Risk based supervisory tools

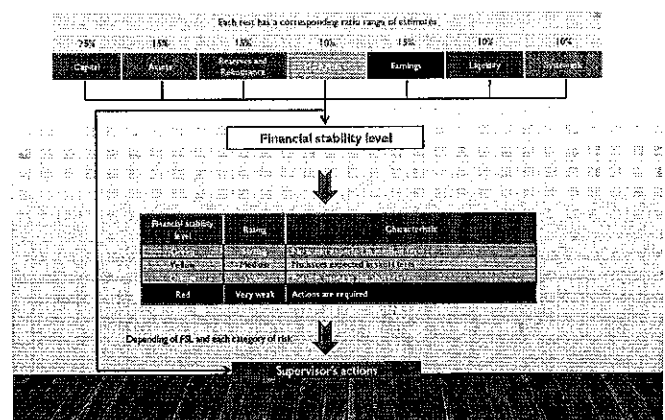
KAZ-PT Tool



KAZ-EARLY WARNING Tool



EARLY WARNING SYSTEM (EWS)



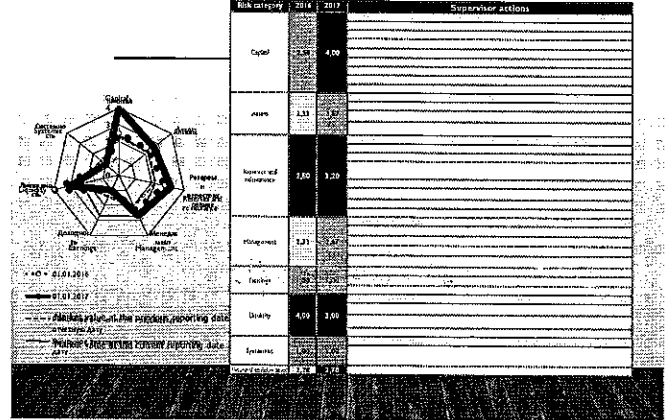
EARLY WARNING SYSTEM (EWS)

Identification of appropriate responses against each risk category:

Risk category	Indicator	Current	Target	Alert
Capital	Capital ratio	100%	100%	100%
	Capital adequacy	100%	100%	100%
Assets	Asset quality	100%	100%	100%
	Asset growth	100%	100%	100%
Liabilities	Liability growth	100%	100%	100%
	Liability quality	100%	100%	100%
Profitability	Profit margin	100%	100%	100%
	Return on assets	100%	100%	100%
Operational	Operational risk	100%	100%	100%
	Operational efficiency	100%	100%	100%
Compliance	Compliance score	100%	100%	100%
	Compliance incidents	100%	100%	100%
Reputation	Reputation score	100%	100%	100%
	Reputation incidents	100%	100%	100%

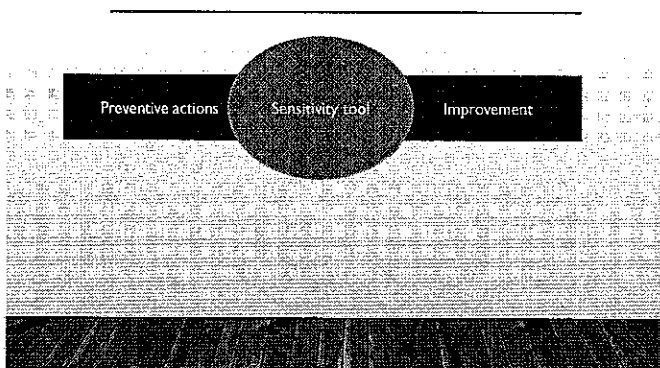
EXAMPLE EARLY WARNING SYSTEM

Evaluation by examples on EWS of an insurance company



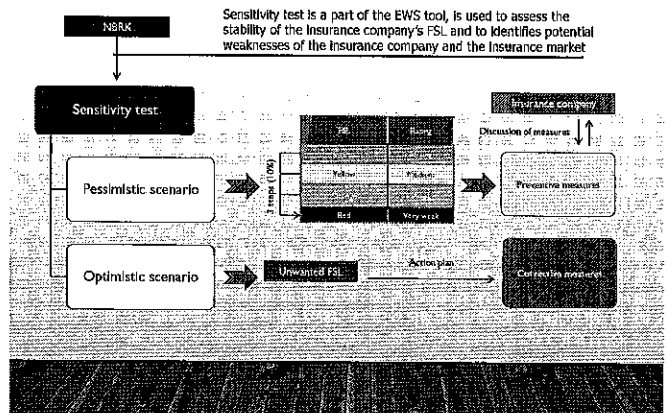
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KAZ-SENSITIVITY Tool



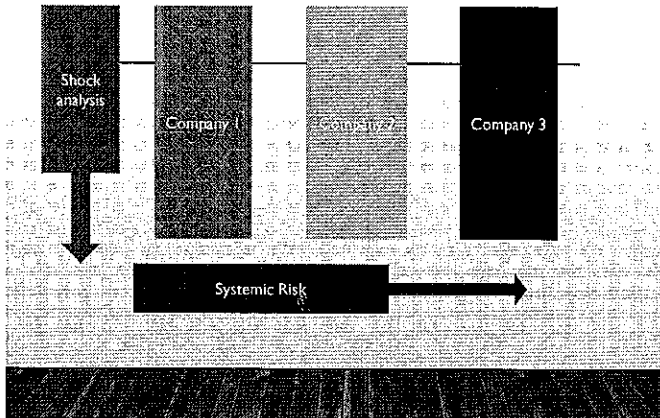
SENSITIVITY TEST

Stability assessment



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MACROECONOMIC STRESS TEST



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RISK BASED CAPITAL SUPPORTING RBS

- A capital regime needs to be risk sensitive: Solvency I is not
- Introducing a risk sensitive capital regime requires:
 - Several rounds of Quantitative Impact Analysis (QIS)
 - Sufficient data over a long period of time
 - Companies ready to run stress tests

RISK BASED CAPITAL SUPPORTING RBS

- A Solvency II capital regime can be safely introduced using the risk based supervisory approach.
- Due to limited statistics the required capital determination for a 1 in 200 years event (Solvency II) is a difficult estimation.
- After a few QIS exercises the supervisor could introduce a provisional capital requirement for a NEW-Capital regime similar to Solvency II.

RISK BASED CAPITAL SUPPORTING RBS

- The new capital requirement would be monitored in parallel to the existing regime.
- The KAZ-EWS that allows to determine the financial condition of the insurers can be used to assess if the required capital estimate is sufficient without risking market failures:
 - No financially weak insurers under the KAZ-EWS should show sufficient NEW-Capital.
 - If necessary the NEW-Capital should be adjusted, until the KAZ-EWS and the NEW-Capital levels are aligned.

INTRODUCING RISK BASED SUPERVISION: ADB NBRK PARTNERSHIP

MANY THANKS

Chongli, People's Republic of China, July 20th 2017
DR. Rodolfo Wehrhahn



INTRODUCTION TO INSURANCE STRESS TESTING

CHONGLI, PEOPLE'S REPUBLIC OF CHINA, JULY 20TH 2017
DR. RODOLFO WEHRHAHN

Supervisory Capacity Building: Actuarial services

Prudential supervision and risk management in Insurance

WHY STRESS TESTS

Inappropriate risk cultures

- Inability to imagine extreme events
 - Group think and pressure to conform
 - Compliance culture rather than a willingness to deal with real risks
 - Short-term thinking
- ### Regulation and Supervision
- Simple models and rules that can easily be arbitrated against
 - Models that do not keep up with changing risk landscape
 - Rules-based approaches
 - Often calibrated to a market average

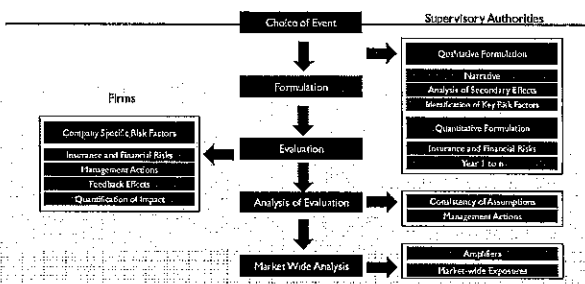
Stress testing and scenario approaches are powerful tools to make managers, supervisors and policy makers aware of potential risks

Stress tests / scenarios expose managers and policy makers to inconvenient facts and can act therefore as checks against overly optimistic assumptions and group-think

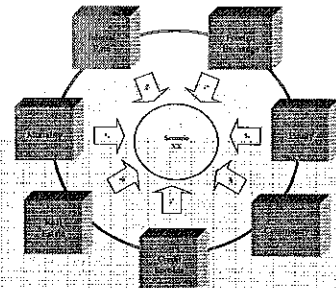
USE OF STRESS TESTING FOR SUPERVISORS

- As an Indicator for the quality of insurers' risk management
- To identify and assess events to which several insurers are exposed to, e.g. market wide risk concentrations
- To assess the impact of events across different sectors, e.g. contagion effects
- If test results unsatisfactory, the supervisor could require:
 - An increase in the insurer's capital
 - Strengthening of systems and controls
 - Change to business plan and strategies
 - Additional stress testing so as to better understand the situation

ROADMAP TO A STRESS TEST



RELEVANT RISK FACTORS CREATE THE STRESS SCENARIOS



RISK FACTORS IN A STRESS TEST

- **Insurance Risks:** the risk of an inappropriate underwriting strategy
 - Underwriting risk
 - Catastrophe risk
 - Risk of deterioration of technical provisions

RISK FACTORS IN A STRESS TEST

- **Market Risk:** Adverse movement in the value of an insurer's assets and liabilities
 - Both on-balance sheet and off-balance sheet
 - Interest rate movements
 - Foreign exchange rate movements
 - Equity price changes
- Have to consider corresponding movements in the value of liabilities

RISK FACTORS IN A STRESS TEST

- **Credit Risk:** Possibility that a counterparty will fail to perform its obligations
- Insurers' counterparties include:
 - Debtors
 - Borrowers
 - Brokers
 - Policyholders
 - Reinsurers
 - Guarantors

RISK FACTORS IN A STRESS TEST

- **Liquidity Risk:** the risk that an insurer will be unable to realise assets to fund its obligations when they fall due.
 - Mismatching between expected asset and liability cash flows
 - Inability to sell assets quickly
 - Unexpected outflows of funds to pay claims
 - Unexpected drop in the inflow of premiums

RISK FACTORS IN A STRESS TEST

- **Operational Risk:** Risks arising from failure of systems, internal procedures and controls leading to financial loss.
- Operational risks may be very difficult to identify and measure
 - Disaster recovery planning
 - Fraudulent activities
 - Risks to hardware and software systems
 - Political changes, taxation changes or legal risks

RISK FACTORS IN A STRESS TEST

- **Group Risk:** Membership in a group can be a source of strength, but can also pose risks, particularly as a result of contagion
 - Financial support no longer guaranteed by parent
 - Effect on insurer of an impaired parent or affiliate
 - High degree of dependence on group resources
 - Reputational risk if one member of the group is downgraded

RISK FACTORS IN A STRESS TEST

- Systemic Risk
 - The failure or downgrading of one significant insurer in a market could result in marketing or reputational risk for other insurers
 - The failure or downgrading of other financial institutions, such as banks, in a jurisdiction could affect an insurer's operations

REQUIREMENTS FOR A GOOD STRESS SCENARIO

- Relevance
The stress scenario should be relevant to analyze the current position in the firm's portfolio example
- Realistic
The stress scenario should be consistent with the current economic environment.
- Internal Consistency
There should be no inconsistencies in terms of the market risk shocks in the stress test (e.g. negative volatilities or interest rates).
- Granularity
The stress scenario should be conducted with sufficient detail to provide meaningful results at various sub-portfolio levels.

NARRATIVE

- One of the main difficulties of stress testing is to define sufficiently adverse events, while still being taken seriously. This can lead to scenarios being weak and underestimating the impact of rare but adverse events
- To achieve buy-in from the key stakeholders (companies and supervisory authorities) also for sufficiently adverse stress tests, a narrative explaining the rationale and story of the event is essential
- The narrative should detail the rationale for the choice of the scenario and a story explaining the history leading up to the event, the actual event and the impact on the firm
- The narrative should be formulated such that also non-specialists can discuss and question the assumptions

NARRATIVE

- The narrative should contain:
 - The reasons for the choice of the scenario
 - A description of the event
 - A description of potential changes in risk factors after the event occurred
 - The basic assumptions in qualitative and quantitative form

EXAMPLE: OIL CRISIS SCENARIO ANALYSIS

- Ongoing fears of supply restrictions
- Extreme weather conditions trigger a 40% increase in crude prices (with a high of 70% around day 40)
- US releases oil from the strategic reserve
Constrained capacity at refineries mitigates the relief somewhat
- Fed raises rates to respond to potential inflation
Towards the end of the quarter, safe-haven buying of short-term Treasury securities reverses some of the impact
- Credit spreads widen sharply as the US economy deteriorates and declines by 1% (B by 400 bps, BBB by 130bps)
- US Dollar gains moderately (4% vs. JPY, 6% vs. EUR, 6% vs. CAD)
Dollar strengthening is limited by the possibility that oil producers will seek to price oil in Euros rather than Dollars
- Rates rise modestly with a flattening bias (40bps in the long end, 100 bps in the short end)
Initial higher increases being offset by safe-haven buying in the later stage of the quarter

WORLD ECONOMIC FORUM EMERGING RISKS SCENARIOS

- | | |
|--|--|
| <ul style="list-style-type: none"> • Oil price shock • Fall in value of US\$ • Large economy hard landing • Demographic shift • Blow up in asset prices | <ul style="list-style-type: none"> • Climate change • Freshwater loss • Tropical storms • Earthquakes • Inland flooding |
|--|--|

WORLD ECONOMIC FORUM EMERGING RISKS SCENARIOS

Geopolitical

- International terrorism
- Interstate/civil wars
- Failed states
- Transnational crime
- Globalization fallback
- Regional instability

Societal

- Pandemics
- Infectious diseases
- Chronic diseases
- Liability regimes
- Critical Information Infrastructure
- Nanotechnology

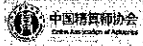
Technological

DESIGNING A STRESS SCENARIO (GROUP EXERCISE)

- Choose the area: Technological, Environmental, Societal (Three groups, 15 mins preparation, 10 mins presentation (5 presentation, 5 questions)).
- Provide a description of the event, the reasons for the choice of the scenario, a description of potential changes in risk factors after the event occurred and the basic assumptions in qualitative form (include at least liquidity risk, group risk and operational risk).
- Remember the scenario should be: (provide an explanation for each point):
 - Relevant
 - Realistic
 - Should have internal consistency and
 - Sufficient granularity (here indicate what you would need to do to reach the level of granularity needed)



CIRC



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RISK BASED SUPERVISION OF INSURERS SOLVENCY MANAGEMENT

CHONGLI, PEOPLE'S REPUBLIC OF CHINA, JULY 20TH 2017
DR. RODOLFO WEHRHAHN

Supervisory Capacity Building: Actuarial services

Prudential supervision and risk management in insurance

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ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor establishes enterprise risk management requirements for solvency purposes that require Insurers to address all relevant and material risks.
- THESE REQUIREMENTS NEED TO BE SUPERVISED ON A RISK BASED MANNER.

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ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer's enterprise risk management framework to provide for the identification and quantification of risk under a sufficiently wide range of outcomes using techniques which are appropriate to the nature, scale and complexity of the risks the Insurer bears and adequate for risk and capital management and for solvency purposes.

CHALLENGE FOR THE SUPERVISOR IS TO DETERMINE:

- WHAT IS A SUFFICIENTLY WIDE RANGE OF OUTCOMES.
- WHICH TECHNIQUES ARE APPROPRIATE TO THE RISKS FACED BY THE INSURER.
- STRESS TEST IS AN INTEGRAL PART OF ERM

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ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer's measurement of risk to be supported by accurate documentation providing appropriately detailed descriptions and explanations of the risks covered, the measurement approaches used and the key assumptions made.
- THE DOCUMENTATION SHOULD BE HELPFUL TO THE SUPERVISOR TO BUILT HIS/HER JUDGEMENT

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ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to have a risk management policy which outlines how all relevant and material categories of risk are managed, both in the Insurer's business strategy and its day-to-day operations.
- THE SUPERVISOR LOOKS INTO THE RISK MANAGEMENT POLICY TO DETERMINE:
 - IF ALL RELEVANT RISKS ARE MENTIONNED (AFFECTING SOLVENCY)
 - IF THESE RISKS ARE WELL MANAGED (TODAY AND IN THE PLANNED FUTURE)

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to have a risk management policy which describes the **relationship between the Insurer's tolerance limits, regulatory capital requirements, economic capital and the processes and methods for monitoring risk.**
- **ARE THE RISK TOLERANCE LIMITS ALIGNED WITH SOLVENCY=CAPITAL?**
- **ARE THE PROCESSES AND METHODS OK TO MONITOR RISK?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

The supervisor requires the Insurer to:

- **establish and maintain a risk tolerance statement which sets out its overall quantitative and qualitative risk tolerance levels and defines risk tolerance limits which take into account all relevant and material categories of risk and the relationships between them;**
- **make use of its risk tolerance levels in its business strategy; and**
- **embed its defined risk tolerance limits in its day-to-day operations via its risk management policies and procedures.**
- **HOW EFFECTIVE IS THE RISK TOLERANCE STATEMENT?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to have a risk management policy which includes an explicit asset-liability management (ALM) policy which clearly specifies the nature, role and extent of ALM activities and their relationship with **product development, pricing functions and investment management.**
- **ALM IS CENTRAL FOR MAINTAINING SOLVENCY. IS THIS RECOGNIZED BY THE INSURER?**
- **HOW DEEP ENTEGRATED IS ALM INTO THE INSURERS' ACTIVITIES?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to have a risk management policy which is reflected in an explicit investment policy which:
 - **specifies the nature, role and extent of the Insurer's investment activities and how the Insurer complies with the regulatory investment requirements established by the supervisor; and**
 - **establishes explicit risk management procedures within its investment policy with regard to more complex and less transparent classes of asset and investment in markets or instruments that are subject to less governance or regulation.**
- **INVESTMENTS ARE CENTRAL FOR MAINTAINING SOLVENCY**
- **WHAT ARE THOSE COMPLEX, ETC. INVESTMENTS?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to have a risk management policy which includes explicit policies in relation to underwriting risk.
- **UNDERWRITING RISK IS KEY FOR SOLVENCY PURPOSES.**
- **SHOULD THE SUPERVISOR ASSESS THE QUALITY OF SUCH A POLICY?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer's ERM framework to be responsive to changes in its risk profile.
- **HOW SHOULD THE SUPERVISOR ASSESS THIS?**
- **DOES THE INSURER MONITOR ITS RISK PROFILE?**
- **ARE EMERGING RISKS INCORPORATED INTO THE ERM?**
- **ARE MITIGANTS REACTIVE TO RISK?**

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer's ERM framework to incorporate a feedback loop, based on appropriate and good quality information, management processes and objective assessment, which enables it to take the necessary action in a timely manner in response to changes in its risk profile.
- VERY CHALLENGING ASSESSMENT

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer to perform its own risk and solvency assessment (ORSA) regularly to assess the adequacy of its risk management and current, and likely future, solvency position.
- THE ORSA COMPLEMENTS THE REGULATORY CAPITAL REQUIREMENTS
- THE ORSA TEST THE QUALITY OF THE RISK MANAGEMENT AND THUS HELPS THE SUPERVISOR TO ASSESS IT

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires the Insurer's ORSA to encompass all reasonably foreseeable and relevant material risks including, as a minimum, underwriting, credit, market, operational and liquidity risks and additional risks arising due to membership of a group. The assessment is required to identify the relationship between risk management and the level and quality of financial resources needed and available.
- POOR RM REQUIRES MORE CAPITAL, BUT THE RELATIONSHIP CAN BE TRICKY TO ASSESS

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor requires:
 - the Insurer, as part of its ORSA, to analyse its ability to continue in business, and the risk management and financial resources required to do so over a longer time horizon than typically used to determine regulatory capital requirements;
 - the Insurer's continuity analysis to address a combination of quantitative and qualitative elements in the medium and longer-term business strategy of the Insurer and include projections of its future financial position and analysis of its ability to meet future regulatory capital requirements
 - THE ORSA IS FORWARD LOOKING

ENTERPRISE RISK MANAGEMENT FOR SOLVENCY PURPOSES ICP 16

- The supervisor undertakes reviews of an Insurer's risk management processes and its financial condition, including the ORSA. Where necessary, the supervisor requires strengthening of the Insurer's risk management, solvency assessment and capital management processes.
- THE ORSA SHOULD ALSO BE SUPERVISED.
- WHERE IS THE BALANCE BETWEEN INSURERS OWNERSHIP OF THE ORSA AND THE SUPERVISOR'S WISHES?

OBJECTIVES OF ORSA

- ORSA should ensure that an Insurer does not engage in business for which it does not have sufficient capital
- ORSA should allow an Insurer to assess the quality and quantity of financial resources available to it, relative to its needs

INTERNAL AND SUPERVISORY UNDERSTANDING

- The ORSA should help senior management, key staff, the Board and the insurance supervisor to:
 - understand the current and projected risk profile of the insurer and its key drivers
 - understand the adequacy of capital available to support its business plan
 - understand any material changes to risk profile
 - understand risks not covered by regulatory capital
 - understand key drivers of the balance sheet
 - identify potential management actions to mitigate risk

WHAT SHOULD ORSA NOT BE?

- ORSA should not become a compliance reporting exercise (no box ticking)
- ORSA should not be performed solely for the benefit of the supervisor
- ORSA should not be seen or be used as a new capital requirement
- ORSA should not replace regulatory capital requirements

RISK BASED SUPERVISION OF INSURERS SOLVENCY MANAGEMENT

MANY THANKS

Chongli, People's Republic of China, July 20th 2017
DR. Rodolfo Wehrhahn

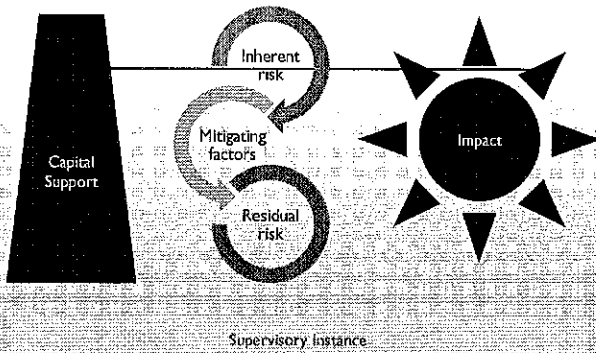


Supervisory Capacity Building: Actuarial services
Prudential supervision and risk management in Insurance

THE ADB PT-TOOL

CHONGLI, PEOPLE'S REPUBLIC OF CHINA, JULY 20TH 2017
 DR. RODOLFO WEHRHAFIN

KAZ-PT Tool



STARTING POINT

- Understand the Insurers' risk profile
- Are they operating close to the regulatory requirements limits?
- Are they pricing very aggressively?
- Is governance strong?
- Is the management experienced?
- Large amount of outstanding claims/complaints?

THE PROFILING TOOL

- Assess 8 risks and the exposure of Insurers to those risks
- Assess the 7 aspects that mitigates the risk exposure
- Assess the availability of capital
- Assess the impact to the objectives of the supervisor

THE EIGHT GENERIC RISKS

- Insurance risk evaluation
 - Pricing and underwriting practices are inadequate to provide for risks assumed.
 - Actual losses or other contractual payments reflected in reported reserves or other liabilities will be greater than estimated.
 - Reinsurance turns out to be insufficient.
- Operational risk
 - Operational problems such as inadequate information systems, breaches in internal controls, fraud, or unforeseen catastrophes will result in unexpected losses.

THE EIGHT GENERIC RISKS

- Credit risk:
 - Amounts actually collected or collectible are less than those contractually due.
- Liquidity risk
 - Inability to meet contractual obligations as they become due because of an inability to liquidate assets or obtain adequate funding without incurring significant losses.

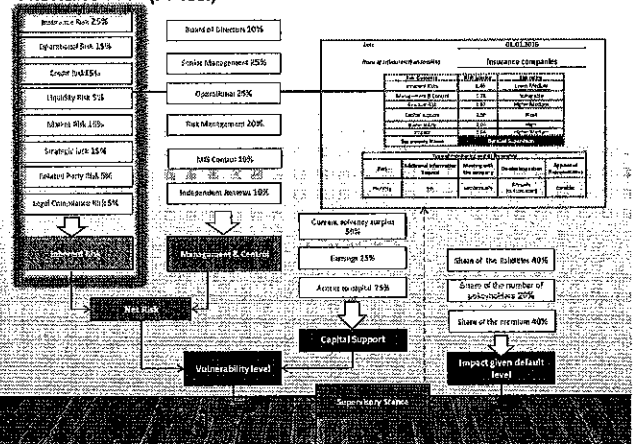
THE EIGHT GENERIC RISKS

- Market risk
 - Movement in market prices, such as interest rates, foreign exchange rates, or equity prices adversely affect the reported and/or market value of investments.
- Strategic risk
 - Inability to implement appropriate business plans, to make decisions, to allocate resources or to adapt to changes in the business environment will adversely affect competitive position and financial condition.

THE EIGHT GENERIC RISKS

- Related Party risk
 - Contagious through related party dependence/connection
- Legal risk
 - Non-conformance with laws, rules and regulations, prescribed practices or ethical standards in any jurisdiction in which the entity operates will result in a disruption in business and financial loss

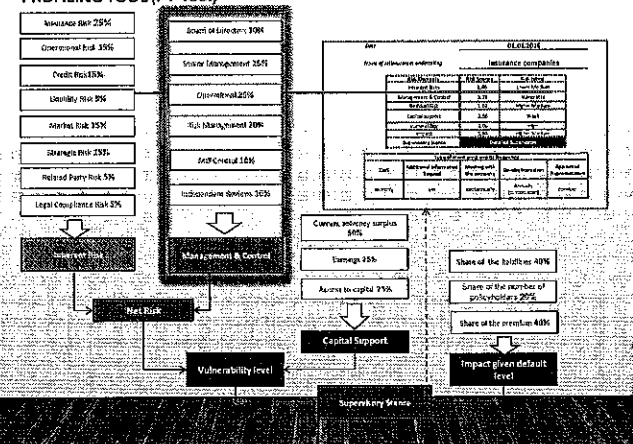
PROFILING TOOL (PT-Tool)



RISK MITIGATION QUALITATIVE

- Board evaluation
- Senior management
- Operational management
- Risk management function
- MIS internal controls
- External audits
- Compliance officer

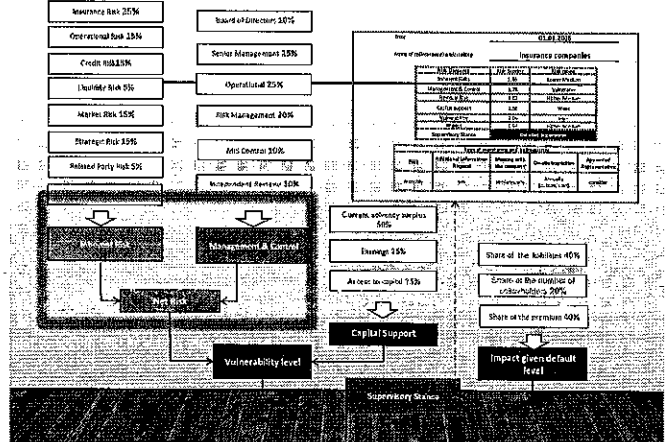
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THE NET RISK

- Risk and mitigation determines the net-risk assumed by the insurer

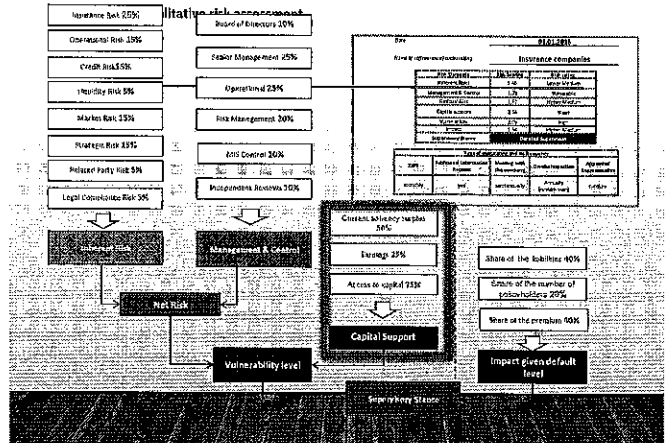
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RISK MITIGATION QUANTITATIVE

- Availability of capital
- Sources of capital
- Lines of credit available
- Shareholders' financial soundness

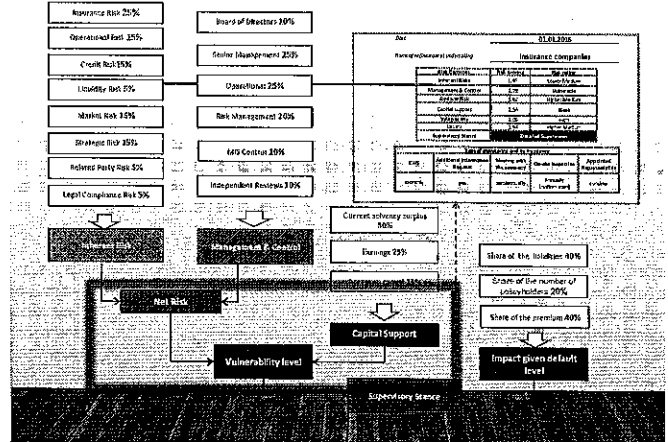
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THE VULNERABILITY LEVEL

- Net Risk and Capital support determines the vulnerability level

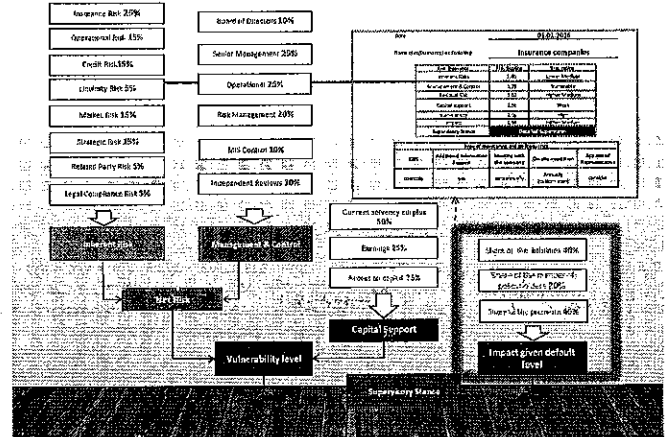
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IMPACT AND RELEVANCE

- Market share:
 - In premium
 - In assets
 - In clients
- Uniqueness/ Specialty
- Social impact

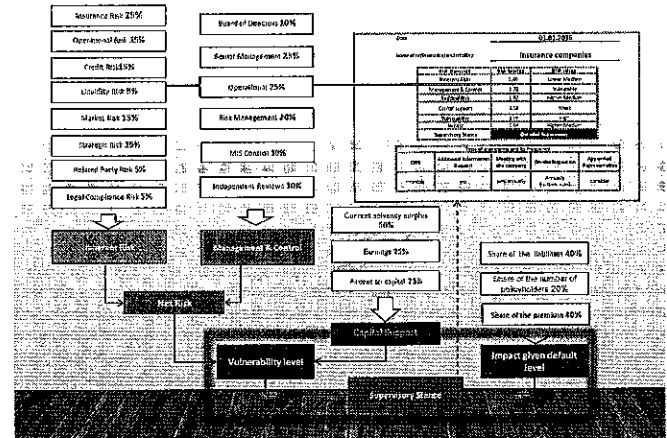
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RESIDUAL RISK

The risk exposure = inherent risk
 Minus
 Mitigations + Capital
Vulnerability level
 Plus
 Impact assessment
Supervisory stance

PROFILING TOOL (PT-Tool)



USE OF THE PROFILING TOOL

- The vulnerability assessment and ultimate supervisory attention is done by:
 - Curators' knowledge of the company
 - Self assessment of the company
 - Onsite examination

SUPERVISORY ATTENTION

- Five categories for the level of supervisory attention are recommended
 - Normal
 - Watch list
 - Remedial Action
 - Close supervision
 - Provisional management

PROFILING TOOL (PT-Tool)

Supervisory Stance

Type of monitoring and its frequency					
Supervisory Stance	EWS	Additional Information Request	Meeting with the company	On-site inspection	Appointed Representative
Controlled Supervision	Quarterly	No	1 year	1 year	No
Watch List	Monthly	Yes	Quarterly	3 year	Yes
Controlled Supervision	Monthly	Yes	Semi-annually	Annually (on-site visit)	Consider
Controlled Supervision	Monthly	Yes	Monthly	Annually	Yes
Controlled Supervision	Monthly	Yes	Monthly	Annually	Yes

EXAMPLE, PT-TOOL

Date: 01.01.2016		
Name of Insurer and country		
Insurance Company		
Risk Metrics	Risk Ratio	Risk Rating
Capital Ratio	1.46	Lower/Medium
Management & Control	3.20	Vulnerable
Reserve Ratio	3.22	Higher/Medium
Claims Ratio	2.58	Weak
Liability	2.09	High
Supervisory Stance	2.54	Higher/Medium

Type of monitoring and its frequency					
Supervisory Stance	EWS	Additional Information Request	Meeting with the company	On-site inspection	Appointed Representative
Controlled Supervision	Quarterly	No	1 year	1 year	No
Watch List	Monthly	Yes	Quarterly	3 year	Yes
Controlled Supervision	Monthly	Yes	Semi-annually	Annually (on-site visit)	Consider
Controlled Supervision	Monthly	Yes	Monthly	Annually	Yes
Controlled Supervision	Monthly	Yes	Monthly	Annually	Yes

USE OF THE PROFILING TOOL

- Every company should be classified once a year or whenever there is new event, whether internal or external:
 - Changed market conditions.
 - Onsite inspection carried out.
 - Change of board/ownership/ key management

SUPERVISORY ACTION

- Based on the supervisory attention and the additional resilience test carried out by the EWS different level of supervisory action is triggered.

SUPPORTING INSTRUMENTS OF THE PROFILING TOOL

- The EWS should be run every month to:
 - Rank each Insurer into four conditions of financial stability:
 - Strong no issues expected (in medium term)
 - Medium no issues expected (in short term)
 - Weak Possible issues
 - Very weak Action is required

SUPERVISORY ACTIONS

- Depending on the risk profile of the insurer and the results of the supporting tools supervisory action should be taken

Profile/EWS	strong	Medium	Weak	Very weak
Watch List	NA	AR	UAR	UAR
Controlled Supervision	NA	AR	UAR	UAR
Close supervision	AR	UAR	OS	OS
Provisional management	UAR	OS	OS	OS

NA=no action, AR= action required, UAR= urgent action required, OS= onsite inspection.

THE ADB PT-TOOL

MANY THANKS

Chongli, People's Republic of China, July 20th 2017
DR. Rodolfo Wehrhahn

