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To Complexity and Beyond: A Guided Tour

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Note: In 2014, the Insurance Regulation Committee of the IAA formed a working group to initiate a Risk Book. The main aim of the Risk Book is to provide a high quality resource enabling actuaries and those regulating risk management to reference appropriate materials on the key issues needed for sustainable practices. The work is expected to be completed in 2015.

OUR PROFESSIONAL PRACTICE HAS DEVELOPED TOOLS AND PROCEDURES TO IMPROVE RISK MANAGEMENT BOTH WITHIN AND OUTSIDE THE INSURANCE INDUSTRY.

Because the heart of insurance is the acceptance of risk in a sustainable manner, actuaries have developed many tools and methods to successfully ensure the sustainable acceptance, management and prudent mitigation of risk. These methods help clarify the risk exposures and their sensitivities, and provide needed ongoing management tools. They are as necessary to illuminating the acceptance and transmission of risk as debits and credits are for tracing the acceptance and transmission of cash in an auditable manner.

The challenge is that unlike auditable cash and/or inventory, the quantification of risk has an inherent uncertainty around it. The title of this article alludes to Buzz Lightyear's line in "Toy Story," "To infinity and beyond" and perhaps could have also been titled "To Future Uncertainty and Beyond." We (at the IAA) would like to link the tools our profession has developed to estimate and manage risk to the disclosure and context needed to reveal and/or address the level of uncertainty/volatility that may accompany these estimates.

Fifteen years ago the International Actuarial Association (IAA) applied its efforts to identify emerging best practices and recommended the key principles for the reference *A Global Framework for Insurer Solvency Assessment*. The IAA's new effort intends to add to that previous work through two objectives:

- a. Describe the professional developments of the last 15 years as they have been applied to the management and regulation of insurance risk for both established and evolving structures for pooling risk.

These tools are often discussed in a silo fashion but much of their value comes from being used in an interconnected or complementary fashion. While each topic has value on its own, it is in realizing their interconnectedness that the more robust value and usage can be understood and applied.

- b. Provide a road map to enhance understanding and navigation of some of the more complex tools and risk structures that have been developed. This allows non insurance experts with an interest in sustainable insurance to ask intelligent questions. It also should help everyone to see the forest of key principles in a way that enables them to drill down to the specific trees that may be of interest to them.

This new reference has a working title of "Risk Management and Regulation – Some Practical Views." Each chapter is targeted to 10-20 pages. The chapters are not meant to be an exhaustive coverage of the topic, but to lay out the key issues and identify already published references on those issues. It will provide a place to start one's education or background seeking (a function similar to one provided by Wikipedia). Current tools and processes that we expect to include as chapters are:

1. Regulatory and management tools beyond reserves and capital for micro and macro purposes across various business models for accepting or generating risk.
2. Internal models – Their effective usage, controls and validation especially in relation to uses for possible



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CONTINUED ON PAGE 18

required capital purposes. This includes the value of having the internal model processes being reviewed and signed off by those who are subject to professional standards.

3. Catastrophe Risk & Models – The causes and implications of catastrophe risk are covered with particular emphasis on the key modeling elements which are constructed and maintained by mostly third party providers.
4. Stress Testing. This chapter will build off the prior IAA work done on this topic and the implications of moving from uses for internal assessments to possible uses to set required capital standards-including either: a) stress testing an audited balance sheet, or b) stress testing a set of cash flows. This also includes the options for addressing correlations in times of stress versus normal times and the implications of one year versus multi year approaches.
5. Issues for groups. This chapter will look at risks arising in groups and explain how they are controlled. This chapter will also address the advantages that can flow from group structures. Other topics include risk limits, capital allocation, intra-group reinsurance counterparty risk, governance, culture, contagion, concentration and fungibility of capital.
6. Non-Proportional Reinsurance. This chapter defines the various types of reinsurance, discusses how pricing is performed, and addresses business effects (e.g., volatility reduction, diversification improvement, risk return enhancement and capacity increase).
7. The role and value of professional Actuarial Standards. Examples of such standards are data quality, communication and required disclosures, ERM, and assumption setting. It will discuss the roles of standards of practice, codes of conduct and practice notes as well as the roles of national vs. international standards.
8. Operational Risk. This chapter will summarize the contents of three recently-issued landmark papers on operational risk (OR). The Canadian Institute of Actuaries paper identifies the location and contents of current leading-edge sources on OR. Milliman's *Operational Risk Modeling Framework* focuses

on quantitative assessment. The CRO Forum's *Principles of OR Management and Measurement* highlights the balancing of measurement with the management of people, culture and process issues.

One way we intend to accomplish the desired integration of these topics is by organizing a risk map. Desired functions of this map include:

- a. Design and build stress tests (For example, is the purpose an internal or external assessment or to set a capital requirement?)
- b. Map results of stress tests to the actions that can be taken to mitigate them—capital, management or regulatory actions, ex ante and ex post.
- c. Compare similar risks with the ability to nuance risk profiles and the impact of differing relative risk exposures across business models.

Design issues that will need to be addressed for a useful risk mapping include:

1. A time dimension over which the risk exposure is manifested as well as for the corrective action(s) that can/will be taken. What does risk look like at one month, one year and three to five years into the future?
2. The map needs to work across differing business models with different relative risk exposures and time horizons.
3. How to address the reasonableness of the correlations in normal times vs. stressed times.
4. A visual output/representation via network theory tools is needed to reflect the character of the mapping instead of the traditional reliance on spreadsheets, formulas or pages of text. Could the map show a systemic landscape of risks and their current linkages? And, could it also be interactive and show different levels of resolution (e.g., google maps) and serve as a mass collaboration tool to communicate and sense and respond to emerging risks?
5. Instead of cataloging/lumping all risks into frequency/severity to calculate capital, focus on

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which parts are addressed via capital and which through processes.

6. Could we build a public mapping/database of financial and economic variables that apply to a company’s unique risk profile? Could this mapping also reflect all past observed correlations (including regime shifts) plus the ability to dynamically alter them as well?
7. How and when to separate scenario generation from liability valuation.

Coincident to this work by the IAA is the desire from the Financial Stability Board to create a Global International Capital Standard (ICS) for insurance. There are two contrasting methods that can be used in this regard. One is to define a set of factors to be applied to various balance sheet and or other measures (like premiums or face amounts). The other is to use internal models.

Both approaches have important benefits and shortcomings. The simplicity of a factor based approach means that it will always be lacking in capturing changes in risk due to either new products or changed environment (state of the physical world and economic/political conditions). While the internal model may be based on a better mapping/revelation of the risk exposures of the organization, the results are based on what is likely to be complex algorithms with differing governance and validation tools across organizations. The IAA *Risk Book* chapters will be very helpful in suggesting tools, procedures and review processes to address the shortcomings of which ever method(s) are chosen for an ICS.

For example, one important contribution would be to increase the comfort with (and the ability to review and rely on) the results of models. A common line heard about internal models is that “All models are wrong.” While true, it is also misleading as everything we do is a model and subject to limitations including accounting reporting and the “law” of gravity.¹ The key is to clarify the limitations and possible variability of the model output.

Twenty five years ago in the United States, two actu-

arial roles were developed to address this conflict between factors and subjectivity. For life products, the role of the actuary was to write a report (subject to regulatory and actuarial standards) that identified any missing risks that were missed by the factor reserves and increase them, if needed. The other role was for P&C actuaries to define a reasonable range for the reserve instead of being expected to produce a “single” number. We need the actuarial role to further expand on this idea of reasonable ranges for uncertain futures. In both cases, the actuary is being used to provide a more relevant risk context to an accounting number that can take on a too literal implication without that context.

In conclusion, it is the hope that this work will come to fruition during 2015 and will highlight and clarify the increased role and value of the actuary in managing the processes needed for the sustainable development of pooled risk. Traditionally we have been asked to calculate numbers based on the specifications of other professions and have missed important ways to clarify their context and implications for “To Infinity and Beyond.” ■

ENDNOTES

¹ The “law” states that all objects fall at the same rate. But it depends on a key assumption of no friction. A piece of paper slowly falling is not an indication that the proposed model for gravity is “wrong” it just shows the limits of the model.