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C O L U M B I A U N I V E R S I T Y I N T H E C I T Y O F N E W Y O R K

Insurance Enterprise Risk Management: Toward The Next Generation

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Abstract

The practice of enterprise risk management (ERM) in the insurance industry has improved in recent years. This is partly because insurers have strived to reinforce risk-based management, and partly due to regulatory pressure triggered by the financial crisis as well as increasingly large natural catastrophes.

Insurers' activities have expanded across many countries and markets. They must work within an increasingly difficult and complicated environment due to rapid globalization, technological development, and changes in nature (particularly in terms of climate change and earth movement). In order to overcome such increasing uncertainty around the Internationally Active Insurance Groups (IAIGs), they should improve their ERM, and regulators and insurers should cooperate with each other in order to create a market-based solution for these extreme events.

This paper aims to review the current actions of regulators and insurers, and then summarize how we improve insurance ERM toward the next generation. The main components to consider are complementary mechanisms for the bounds of internal model and rational decision-making, and the reinforcement of a market-based solution mechanism.

Key words: Risk Based Management, Bounds of internal model and rational decision, Market solution mechanism, Internationally Active Insurance Groups (IAIGs)

1. Environment of Enterprise Risk Management (ERM)

A. Movement on Regulatory Regime

The key underlying trends of insurance regulation are the move from the formula-based solvency management to the risk based management and reinforcement, which shall be linked to the global financial stability agenda and the resilience to significant stress scenarios.

As a result of globalization, national financial markets are increasingly integrated internationally. In 1998 and 1999, the Basel Committee established a three-pillar regulatory framework (capital requirement, risk management or supervision and

transparency or disclosure) for assessing the capital requirements for banks, called Basel II¹. Such bank regulation has given an impact on insurance regulation and supervision.

In 1999, the International Association of Insurance Supervisors (IAIS)² began three-pillar approach to an insurer, relying on the Basel II . In addition as the insurance market becomes more globally interconnected, the IAIS is keen to encourage closer collaboration and introduce peer review among members. Then the IAIS promotes common standards for regulation across the world with its Insurance Core Principles³ (ICPs). The contents are in a risk based direction, and key recommendations include the introduction of an own risk and solvency assessment⁴ (ORSA), which would require insurers to assess the viability of their risk management structures, demonstrate how risks influence decision making and set out management's view of the capital needed for its future risk portfolio.

In EU the direction of regulatory policy in each of the main sectors is set by pan-European authorities, which include the European Insurance and Occupational Pensions Authority (EIOPA). The Solvency II project started aiming at reviewing the prudential regime for insurance and reinsurance undertakings in the European Union in November 2009. The Solvency II Directive was adopted by the Council of the European Union and the European Parliament. In March 2013, EIOPA launched a public consultation on Guidelines related to the preparation for Solvency II, which cover the following areas:

*Systems of governance

*A forward looking assessment of undertakings' own risk (based on ORSA principles)

*Submission of information

*Pre-application for internal models

In the US insurance supervision continues to be primarily a state affair while the National Association of Insurance Commissioners (NAIC) proceeds with Solvency Modernization Initiative (SMI) for updating to US regulations to align with the ICPs.

¹ Basel II is the Basel Accords, which are now extended effectively by Basel III, which are recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision. Basel II, initially published in June 2004, was intended to create an international standard for banking regulators to control how much capital banks need to put aside to guard against the typical and operational risks banks (and the whole economy) face.

² The IAIS was founded in 1994 as the global body focusing its attention entirely and exclusively on the regulatory and supervisory issues of the insurance sector.

³ International Association of Insurance Supervisors, 2011, *Insurance Core Principles, Standards, Guidance and Assessment Methodology*, 1 October.

⁴ ORSA required us to take a holistic and forward looking approach to manage risk across the full scope of the insurance group, and to show that the group can maintain and raise the capital to cover solvency requirements for the strategic planning period if necessary. For such purpose the IAIS requires insurers to establish and maintain a risk taking policy and a risk tolerance statement which sets out its overall quantitative and qualitative viewpoints. Such comprehensive statement describing the relationship among return, risk, and capital is called the Risk Appetite Statement.

The SMI includes potential changes to capital adequacy, governance and risk management regulations. NAIC plans introduction of US ORSA⁵ in parallel with Solvency II and ICPs.

In 2005, Standard & Poor's stated that an insurer's ERM program becomes a critical component in its rating methodology.

B. Regulatory reinforcement after Financial Crisis

The 2007-09 Financial Crisis triggered by the U.S. subprime loan problem hit the financial sectors and economies overall extremely hard and has undermined the widely held belief that the existing global regulatory and supervisory structures are sufficient to cope with possible market excesses and trans border contagion. Since 2008 the global community has initiated a wave of regulatory actions. The G-20 governments and central banks provided more than \$11,000bn to support in a direct as well as indirect way to the financial service sector, while less than \$10bn to the insurance sector.

In the context of the financial system the G-20, the Financial Stability Board (FSB)⁶ and the Joint Forum⁷ have been active in reviewing the regulatory framework for banks and such analysis has invariably flowed across to insurance.

Banking will receive more attention and more power due to the expanding role of the central banks in macroprudential supervision to mitigate systemic risk. Thus central banks will increasingly be charged with responsibility for the supervision of the entire financial system including insurance.

However a bank and an insurance company are different in business model and style of management⁸. Those of a bank are in the shorter term basis, while those of an insurance company are in the longer term basis. Such insurance characteristics come from their cash flows directly transacted between the assured and an insurer not through the financial system therefore the traditional insurance transaction does not generate systemic risk⁹.

On the other hand banks collect deposits, issue loans and provide a variety of fee-based services whose cash flows are closely connected with the financial system and

⁵ National Association of Insurance Commissioners , 2011, U.S. *Own Risk and Solvency Assessment (ORSA) Proposal*, 11 February.

⁶ The FSB is a reincarnation of the FSF(Financial Stability Forum) that has existed in the global financial architecture since the Asian Crisis in 1999 and came into operation in 2009 due to a decision taken by the G-20 Summit in London.

⁷ The Joint Forum was set up in 1996 under the aegis of the BCBS(Basel Committee on Banking Supervision) , IOSCO(International Organization of Securities Commissions) and the IAIS to carry forward the work initiated by the Tripartite Group in 1995. The Group was formed at the initiative of BCBS and was composed of bank, securities and insurance supervisors, each of them acting in their personal capacity.

⁸ The CEA(the European insurance and reinsurance federation) carried out the detailed analysis and issued the report "*Insurance: a unique sector Why insurers differ from banks*" June 2010.

⁹ The FSB defines systemic risk as follows: the risk of disruption to the flow of financial services that is : caused by an impairment of all or parts of the financial system: and , has the potential to have serious negative consequences for the economy. ("Guidance to assess the systemic importance of financial institutions, markets and instruments: Initial considerations", FSB, International Monetary Fund and Bank for International Settlements, October 2009)

therefore their price and condition are quickly adjusted and managed soon in tandem with the movement of market indicators.

Insurance companies are mainly exposed to underwriting risk, market risk, credit risk, operational risk, and relatively benign liquidity. Insurers' Asset Liability Management (ALM) is closely connected with their absorbing liability over its maturity of insurance contract. Therefore basically their price and condition are in longer term basis than those of banks, and insurance companies try to manage their holding risk portfolio in a total balance sheet approach. Their stance is for enjoying diversification benefit from the longer viewpoint and adjust their portfolio with reinsurance or hedge to pursue the efficiency of the Risk Adjusted Capital (RCA) Requirement¹⁰.

Banks are mainly exposed to liquidity, market and credit risk but have no exposure to underwriting risk. Due to their cash flows and risk profile banks make their capital allocation and change their hedging strategy from the shorter viewpoint.

Looking back the Financial Crisis an insurance was neither at the root of the crisis, nor the main recipient of government support. The collapse of AIG was triggered by not conventional insurance risk but substantially financial risk. The subsidiary of AIG; AIGFP (AIG Holding's Financial Product), the subsidiary of AIG sold credit default swap that offered loss protection to investors of assets like multi-sector CDOs. AIGFP sold swaps on \$73bn of CDOs to counterparties without having sufficient reserves to pay any claims that could occur or liquidity to post collateral. Falling value of CDOs protected by AIGFP increased the collateral requirements for AIG Holding, who did not have enough liquidity to post the required collateral and was on the verge of defaulting on its payments to counterparties.

After the Financial Crisis the IAIS has taken an initiative role for harmonization of insurance regulation and supervision as a partner of other relevant bodies in particular the FSB and the IMF.

Regulatory intentions are focusing not only on preventing or at least mitigating a further crisis. Many regulatory frameworks are beginning to include an enhanced ERM framework.

C. Supervision on Internationally Active Insurance Groups

Insurers' activities expand across several countries and markets. In contrast to such increasing global activities, insurance supervision has remained each country's issue focusing on solo supervision. The IAIS introduced the concept of a Common Frame (ComFrame) for the supervision of Internationally Active Insurance Groups (IAIGs). The industry was supporting the overall objective of this endeavor but there are a number of issues to be resolved.

¹⁰ The RAC of an insurance company is evaluated on the basis of a quantitative model of its different risks. The influence of dependence on the aggregated RAC should be carefully analyzed. In case a stress event occurs dependence is not linear correlation. It is possible to use the copulas instead of linear correlation to model dependences.

Each jurisdiction has its own solvency and risk management regime and accounting standards that takes into account the unique characteristics and practices of insurance local market, and IAIGs developed own ERM and capital management practices across globe. Actually each IAIG established its own ERM and capital management practice. The IAIS has reviewed both similarities in principles applied and diversity reflecting individual group characteristics. The Geneva Association surveyed indicated that insurance groups consider such IAIS's reviewing to be beneficial to the market, as uniform approaches to risk management introduce the risk of herd behavior and outcomes¹¹.

I think that as underwriting risks are different in nature from jurisdiction to jurisdiction, and each jurisdiction has created and developed the solution mechanism to fit to the particular market's risk profile ComFrame should build on the collective wisdom and experience of the local frameworks in each jurisdiction. I hope that the IAIS would provide for a way that allows jurisdictions to 'grow into' ComFrame with confidence to get it right through a transitional phase-in period.

The IAIS requires all jurisdictions to set out appropriate target criteria for the calculation of regulatory capital requirements¹² which underlie the calibration of a standardized approach.

The IAIS capital adequacy standard includes general provisions on the use of an internal model to determine regulatory capital requirements. Qualified management information is important, and many insurers are devoting added resources to measurement of economic capital and risk, and the sophistication of their risk management process and toolsets. The IAIS requires insurers to document the design, construction, and governance of the internal model, and the insurer's Board and senior management to understand the consequences of the internal model's outputs and limitations.

2. Risk Based Management and Internal Model

The Basel framework is intended to set the consistent framework to the global banks for maintaining market confidence in regulatory ratios and providing a level playing field for internationally. The Basel Committee has initiated the Regulatory Consistency Assessment Program (RCAP), which observes that the level of Market risk-risk-weighted assets (mRWAs) are various due to the bank's basic Asset Management Policy and supervisory action about the level of capital requirement, and modeling choices by banks ¹³.

¹¹ This is the one of key findings of the survey of 19 insurance groups conducted by the Geneva Association. (The Geneva Association document, Group- wide Risk and Capital Management of International Active Insurance Groups- Current Practices and Challenges, April 2013)

¹² Solvency II pillar1 requires Solvency Capital Requirement (SCR) at a level where eligible own funds will enable insurers to absorb losses to a confidence level of 99.5% VaR over 1 year period (equivalent to a 1 in a 200 year) .

Although at an international level, unlike banking, there is no agreed capital adequacy standard among jurisdictions, the IAIS has recently announced to build a risk-based Insurance Capital Standard into ComFrame.

¹³ Bank for International Settlements, Regulatory consistency assessment programme (RCAP) – Analysis of risk weighted Assets for market risk January 2013.

The actuarial methods aim at calculating best estimated reserves for insurance liability are not standard terminology nor in line with current actuarial practices. Often valuation models and risk assessment models are constructed varying the investment component to project future cash flows stochastically.

Insurance liability cash flows are in a significant level of complexity in creating models. Nevertheless the acceptable modeling is expected to be simplified and enough transparent to enable adequate auditing of the work. Since managing risk is the essence of insurance business insurers should integrate risk into management process as described in COSO II-ERM¹⁴.

An insurance group should maintain the financial strength even under the severe stress situations for securing commitments made to policyholders and customers. Furthermore, prudent deployment of capital has the objective of meeting heterogeneous expectations of various interested parties (e.g. high shareholders' return expectations versus stringent regulatory capital requirements versus clients' expectations of reasonably priced products). Higher quality risk data equates to more confident and better business decision and allocation of finite resources. Internal models are considered to be an integral component of business steering processes. They enable a consistent view across business units, ensure that the long-term nature of insurance business is properly accounted for and support strategic decision-making such as:

*market consistent valuation of all assets and liability (so called "economic balance sheet")

*evaluation of integrated risk

*underpin the set up risk appetite statement

*build up own risk and solvency assessment framework and so on.

3. Improvement factors of insurance ERM towards the next generation

Insurance ERM has been developed steadily in the past. However the uncertainty has been increasing as well at the same time. Therefore we should evolve ERM further as the tool of better risk based management. I would like to raise several points with which the next generated insurance ERM should be equipped.

A. Improve internal model and complement its bounds

Insurers' strategy is particular by them own because the nature of portfolio, future vision, values, and basic values are different. Therefore management should set their strategy, risk tolerance and appetite and make positive risk communication to share the

¹⁴ The Committee of Sponsoring Organizations of the Treadway Commission (COSO) is a joint initiative of the five sector organizations, and their mission is to provide thought leadership through the development of frameworks and guidance on enterprise risk management, internal control and fraud deterrence. The COSO was originally designed to provide a standard for structuring internal control systems and expanding to ERM.

stake holders. In order to execute corporate mission and secure the shareholders' return and sustainable growth, management should adjust the corporate strategy, risk tolerance, and risk appetite comprehensively because there are not necessarily in coherent direction rather in trade off relationship among the regulators' solvency requirement for the policy holders' protection, corporate expected level of financial soundness, longer term economic value, and shorter term realized profit. Insurers' assets and liabilities react so complicatedly due to economical scenarios. Therefore insurers try to make an appropriate internal model to review and analyze them for better rational decision making.

None can predict exactly the future. Insurers challenge their opportunities for success and growth, and at the same time they should make a great effort to restrain its risk within the tolerable level.

Frank H. Knight was the first to propose a clear distinction between risk and uncertainty¹⁵. He defines "Risk" as the randomness with knowable probabilities (measurable uncertainty), while "Uncertainty" is the randomness with unknowable probabilities (unmeasurable uncertainty).

For rational decision against uncertainty, insurers have been developing their internal model. It is said that while internal models of different insurers superficially might look differently, the underlying structure is quite similar. The structure is easiest to explain for a model with a scenario approach. In such a model, scenarios are generated which allow the estimation of the value of assets and liabilities as well as the required solvency capital¹⁶.

Internal model is powerful tool for management but we should clearly notice its bounds and the uncertainty embedded in it. The model is simplified under the built-in assumptions and we do not always have enough data to underpin modeling in order to value insurers' liabilities from the economical basis by replication of the deeply and liquidly traded financial instruments. As a result, insurance liabilities cannot be perfectly replicated. An optimal replicating portfolio has the mismatch with the actual liability cash flows, and therefore we should recognize the basis risk.

In the case of the fat tail risk like Natural Catastrophe risk (ex. Earthquake, wind storm, typhoon etc.) the model consist of a hazard module, a vulnerability module, and a financial module. The understanding of the hazard's mechanism and its mathematical representation are generally difficult for scientists. The hazard information mainly comes from a historic event catalog that covers the range of observed events with respect to size, location and probability of occurrence. The potential impact of the hazard at each location is translated into damage through so-called vulnerability functions which are derived from insurance claims data and engineering analysis. Those sets of relationships describe the degree of loss to a structure resulting from exposure to a hazard of a given intensity. The models incorporate regional damage functions specified by structure and occupancy type.

¹⁵ Frank H. Knight, *Risk, Uncertainty and Profit* (1921) Signalman Publishing 2009

¹⁶ Philipp Keller, Internal Models for the Swiss Solvency Test, *Mitteilungen der schweiz. Aktuarvereinigung*. Heft 1/2007 53-68

Catastrophe modeling technology is not static and the models themselves continue to evolve in terms of detail, realism, and accuracy. However commercial models may not cover all the geographical areas and perils of interest or reach a satisfactory level of accuracy. In general, probabilistic cat models capture two type of uncertainty, commonly named primary (aleatory) and secondary (epistemic) uncertainty. The former related to the likelihood of a certain event to occur. And the latter is defined as uncertainty in the amount of loss, given that a particular event has occurred. Uncertainty is associated with the modeling of hazard, the level of vulnerability and specification,(e.g. geographic resolution, construction characteristics, and local conditions) and the portfolio data. That is partially because it is difficult to collect enough scientific data and information to make the model's parameter robust. Actually the return period of earthquake is said hundreds and thousands, while written record on the oldest earthquake in Japan is the one just about 1,600 years ago. It goes without saying that the data is not enough to eliminate uncertainty from the model.

For complementing the bounds of internal model we should reinforce stress testing and emerging risk monitoring.

Stress testing

Insurers need to set aside a capital buffer to secure their resilience and cover losses arising from unexpected extreme events that may not necessarily be modeled or even foreseen.¹⁷ To evaluate a proper level of stress buffer we should reinforce the stress testing from the following aspects.

- *Providing forward-looking assessments of risk.
- *Complementing limitations of models and historical data.
- *Supporting internal and external communication on stress events.
- *Informing the setting of risk tolerance.
- *Facilitating the development of risk mitigation or contingency plan across a range of stressed conditions.

The following weakness¹⁸ in stress testing practices was pointed out.

- *Direct involvement of senior management in deciding the stress testing framework and in developing stress scenarios is not deep enough.
- *Degree of stress assumed in the stress scenario is often intentionally set within tolerable risk limit.

¹⁷ Further reference to Goto, S., 2013, Building up capital buffers and recognizing judgement risk, *Asia Insurance Review January 2013*, PP.76,77.

¹⁸ Further reference to the following papers. *Principles for sound stress testing practices and supervision*, May 2009, Bank for International Settlements, *Stress Testing Thematic Review*, UK FSA, October 2006, *Final Report of the Institute of International Finance (IIF) Committee on Market Best Practices: Principles of Conduct and Best Practice Recommendations Financial Services Industry Response to the Market Turmoil of 2007-2008*, July 2008.

*Stress testing results are not used for management discussions on how to strengthen the firm against risks.

*Scenario based on a firm- or group-wide perspective has not been developed.

*"Forward-looking" scenario has not been developed.

*Scenarios are developed only by a small group of experts within the risk management department and are not reviewed by a third party, such as internal audit.

A statistical risk measure like Value at Risk (VaR) shows the largest loss given a certain probability, but it does not tell anything about the reasons of such loss. Stress testing, in contrast, is about to depict the background story and shows what happens to the portfolio under such stressful circumstance. Estimated loss together with its background information would help the management understand the risk profiles of the balance sheet and/or business portfolios. Stress testing would make manager to complement the bounds of model risk and to consider the contingency plan¹⁹ in advance.

Emerging risk monitoring

Insurers review in a form of risk register the important potential risky events to give the heavy impact to their balance sheet which reflect the assumptions for the business plan and risk management plan.

However risk is always changing and new risks emerge due to changes of internal and external hazard. Like blind men and an elephant we could not easily recognize the whole features of risk. It illustrates that the behavior of experts in fields where there is inaccessibility of information is likely to be a fallacy. To prevent from such situation we need maintain broad communication network and carry on an interactive review with respect for different perspectives. The assessment from only the framework of insurer's individual risk portfolio is like the one from the limited part of an elephant, which results in walking into a trap of relativism. The rapid globalization, technological development, and changes in nature (particularly in terms of climate change and earth movement) force us be close to such a trap.

The particular events treated unthinkable to happen at the time of plan setting will increase the possibility of its occurrence we should recognize it as a scope of our usual monitoring. When they become to be probable we should treat it to the one of risk categories for day to day management and should change and amend the current policies and business plans if any. A forward looking exercise is practical monitoring to better anticipate the future, we should carefully monitor the symptom of the important hazard changing.

B. Overcome the bounded rationality²⁰

¹⁹ A contingency plan is one of the crisis management methods and describes reactions to pre-determined crisis before it actually comes true. This approach is useful to avoid mess-up in operation and enables systemic responses to the crisis.

²⁰ Bounded rationality is the idea proposed by Herbert A. Simon that in decision-making, rationality

We should reinforce our own decision mechanism as well. Our decision itself is surrounded by unconscious behavioral risk. Our past experience is meaningless for the newly born risks. Even the familiar risk our current knowledge is not perfect due to changing nature of risk in addition our rationality is bounded and we have a chance to cloud our eyes by our own biases ²¹. In these reasons risk management must address the behavior– the biases, attitudes and habits –of the persons making risk-related decisions.

We have a tendency to make a decision with heuristics based on past experiences and knowledge (System 1 Think) and in cases where we feel it failed, then we move on to analytical consideration (System 2 Think). In other words we naturally and unconsciously make almost all decisions by System 1 Think. [See FIGURE 1.]

Insert FIGURE 1

FIGURE 2 shows an illustration of improper risk in real decision process comparing with the normative one.

Insert FIGURE 2

ERM should hold the organizational mechanism to cope with the bounded rationality and to eliminate improper risk takings²². [See FIGURE 3.]

Insert FIGURE 3

C. Reinforce the market solution mechanism

We should clearly recognize the bounds of private insurance system against uncertainty. That means the risk out of the scope of law of large numbers could not be underwritten by the usual private insurance system. However for such risk like the fat tail events (high-severity, low-frequency events), if the insurance coverage is needed from political, social, and economical viewpoints, the initiatives for the special solution mechanism like pre-funded catastrophe reserve system, mandatory pooling schemes, and government reinsurance scheme for highly public lines of business should be taken. Such market solution mechanism and private insurance system should be effectively

of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make a decision. In *Models of Man*, Simon points out most people are only partly rational, and are emotional in the remaining part of their actions. Sharing such idea Kahneman and Tversky developed Frame, Heuristics, and Prospect Theory.

²¹ Every individual is influenced by his or her own biases to some extent. Max H. Bazerman and Don A. Moore, *Judgment in Managerial Decision Making*, 2012 Wiley, examines judgment in a variety of organizational contexts, and provides practical strategies for changing and improving decision-making processes.

²² Further reference to Goto, S. ,2007, The Bounds of Classical Risk Management and the Importance of a Behavioral Approach, *Risk Management and Insurance Review* 2007, Vol.10, No.2, 267-282., Goto, S., 2009, Behavioral Risk Management for Improper Risk Taking, *Advances in Management*, 2009, Vol. 2(4) April, 7~15.

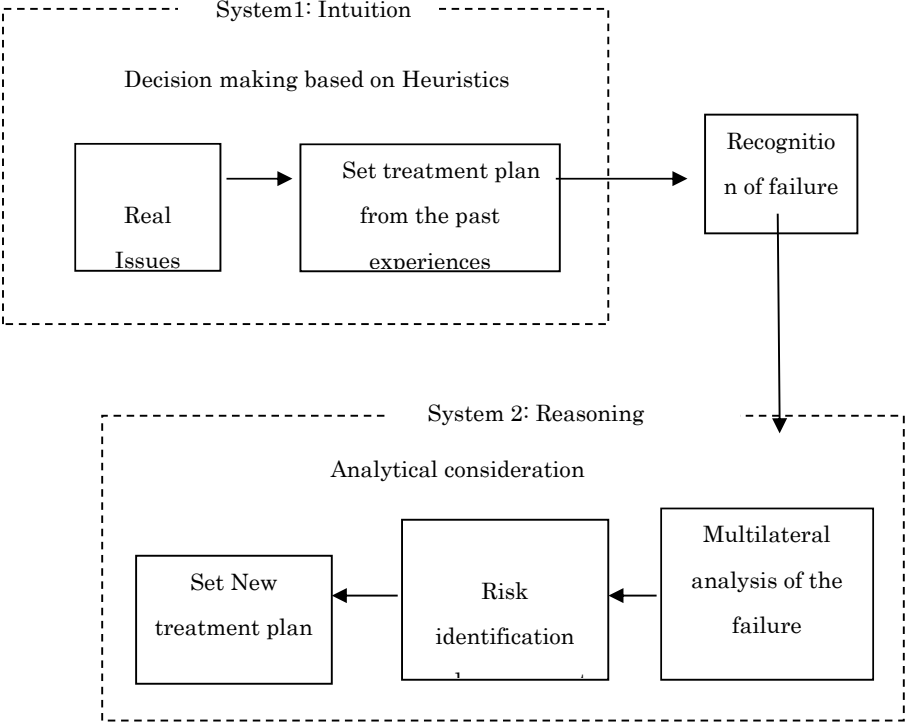
collaborated and coordinated. In such sense how the market solution mechanism works should be considered clearly as a complementing factor in the term of ERM.

To foster the innovative workable solution mechanism interactive communication between regulators and insurers becomes much more important. When regulators design the market solution mechanism their analysis and simulation should be matched with the objective and the nature of target risk because they are classified the regional context and the global one. Also the regional issue and global one would be different due to the related laws, regulations, market practice, and connected systems.

The solution of natural catastrophe is a regional issue because its occurrence, the social preventing system, and the crisis management system are different from market to market. Therefore its treatment should be fit to the local context and initiated by the local regulator and insurers. On the other hand the systemic risk like the Financial Crisis becomes much more globally connected and need to be treated with global context, and interactive communication among group-wide regulators and IAIGs is vital.

FIGURES Improving insurance ERM towards next generation

FIGURE 1: Tendency of real decision making



(Generated by considering Kahneman, D. Nobel Prize Lecture “Maps of Bounded Rationality: Perspective on Intuitive Judgment and Choice” Dec. 8 2002 and Finkelstein, S., Whitehead, J. and Campbell, A., 2008, *Think Again*, Harvard Business Press)

FIGURE 2 : Risk management process – Normative v. Real

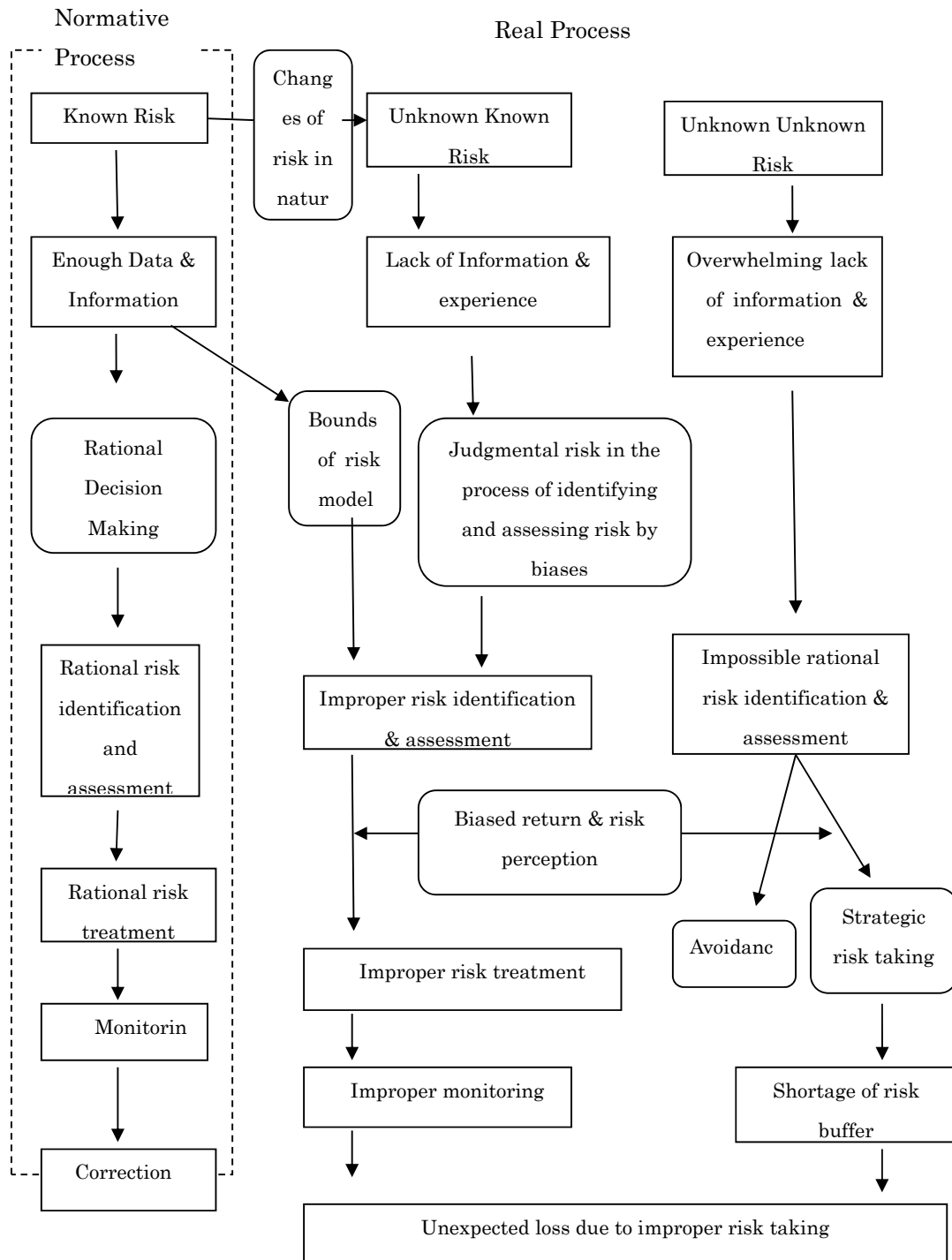
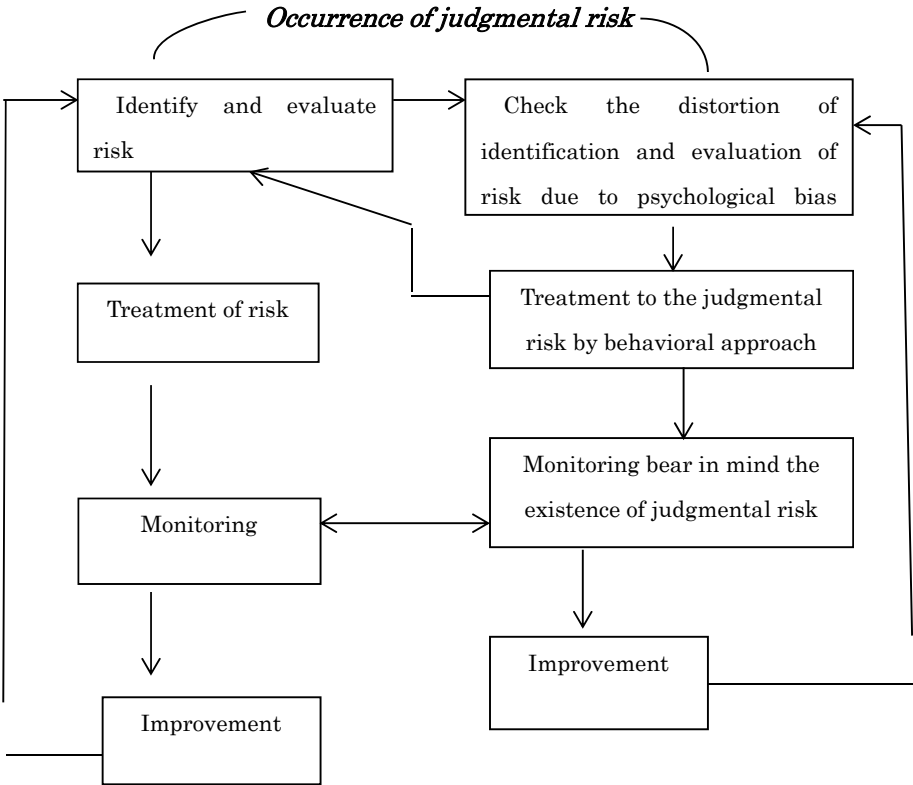


FIGURE 3: Additional reviewing and checking mechanism

<Normal risk management flow>

<Additional flow (Sub-routine)>



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