

CHAPTER II

PRELIMINARIES

In this chapter, we introduce some terminology of insurance, the description of the Risk-Based Capital Framework and the Discrete Risk Model where this thesis is organized.

2.1 Insurance

In law and economics, *insurance* is a form of risk management primarily used to hedge against the risk of a contingent, uncertain loss. Insurance is defined as the equitable transfer of the risk of a loss, from one entity to another, in exchange for payment. An *insurer* is a company selling the insurance; an *insured* or *policyholder* is the person or entity buying the insurance policy. The insurance rate is a factor used to determine the amount to be charged for a certain amount of insurance coverage, called the premium.

2.2 Risk-Based Capital Framework

A Risk-Based Capital Framework (the RBC Framework) specifies the capital which an insurer needs to have in excess of its liabilities (mostly technical reserves) based on the risk profile of the individual insurer. The difference between this approach and the current formula that ins in place in Thailand is that:

- The required capital depends on the risk profile of the specific insurer, rather than just the size of its business.
- The basis for valuation of assets and liabilities is more transparent than before, and no longer incorporates undisclosed margins.

The RBC Framework seeks to amend the existing valuation methodology for assets and liabilities, establish new capital required rules, update the role

actuaries, introduce a new set of statutory reporting standards and introduce new regulations or review existing regulations and consider how and when these may require to be amended to harmonise with the new framework. The framework will set out draft regulations, notices and guidelines (including actuarial guidelines).

2.2.1 Aims of Risk-Based Capital in Thailand

The objective of Solvency Capital is to provide a buffer to protect the interests of policyholders. This buffer should be sufficiently large to allow time for management action or regulation action to counter the impact of adverse experience on the ability of the insurer to meet its liabilities to customers. The proposed new basis for Solvency Capital is a Risk Based Capital Framework (RBC Framework).

That is, the required Solvency Capital will directly reflect the risks to which an individual company is exposed. RBC would replace the existing one size fit all system.

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- The required capital depends on the risk profile of the specific insurer, rather than just the size of its business; and
- The basis for valuation of assets and liabilities is more transparent than before, and no longer incorporates undisclosed margins. Such a Framework will drive better risk management and more efficient used of capital.

The proposed RBC Framework itself will trigger changes to regulation in a number of areas. In addition, the role of actuaries and auditors will change to reflect the increased weight given to an insurers own situation in assessing its Solvency Capital requirement.

The RBC Framework has been designed specifically for Thailand, recognizing and reflecting the current situation of the whole industry. In particular, the process recognized that the size and capabilities of different insurers are different, and this is reflected in the relatively standardized and straightforward approach which is proposed.

Where appropriate, certain features of international best practice, drawn in particular from Solvency II and the Malaysian and Singaporean regimes have been incorporated in the proposed RBC Framework. However, the circumstances and interest of Thai companies have always been uppermost in the designers minds.

2.2.2 Principles of Risk-Based Capital and Applicability

All insurers and reinsurers , including branches, will be subject to the RBC requirements. The following principles underline the proposed RBC Framework:

- Allow insurers greater opportunity to achieve efficient use of their capital by linking the required capital more closely to the level of risk entailed by the chosen business strategy.
- Aligned, where possible, with international best practice.
- Provide the regulator with relevant and timely information within the context of the specific risk capital levels, to provide adequate early warning for timely intervention.
- Consistent between life and non-life companies.
- Capital Requirement varies with risk and scale: the capital required of two insurers with similar liabilities and similar risks is to be consistent; conversely, two insurers whose risk profiles are significantly different should experience corresponding capital requirements.
- Thai Government guarantee to be considered the highest level of security (i.e., risk free).

- Separation of buffers and margins from the estimates of technical reserves, combined with explicit levels for the technical reserves, to allow greater transparency and greater comparability of insurers solvency positions.

Some insurers may have developed or have access to internal models for setting their own capital targets or for the purposes of reporting under the Solvency II regime. While the Office of Insurance Commission (OIC) wishes to encourage the development of such models, all companies must still comply with the standard RBC Framework and the results from internal models may not be used as a substitute at present. The OIC will consider allowing the use of such models in the future.

2.2.3 The Formula for the Capital Requirement

The Capital Adequacy Ratio (CAR) for an insurer as defined as: (Total Available Capital) divided by (Risk Capital Requirement). The RBC Framework sets the target to be met by an insurer as a Capital Adequacy Ratio at least equal to 100%. This means that

$$\text{CAR} = \frac{\text{Total Available Capital}}{\text{Risk Capital Requirement}} \geq 100\%.$$

The risks to be taken into account in the Risk Capital Requirement are grouped into the following categories:

1. *Group Risk* represents the risks to which other group companies are exposed could have a financial or operational impact on the insurer.
2. *Operational Risk* is produced by inadequate or failing internal processes, persons or systems, or by external events. Example are fraud or liability for mis-selling.
3. *Liquidity Risk* describes the risk that an insurer while balance sheet solvent, cannot generate enough cash to pay claims and other outgoings.
4. *Market Risk* derives from market prices themselves or from the

volatility of those market prices. Among other risks, market risk includes equity risk, interest rate risk, property risk and currency risk.

5. *Credit Risk* includes both the risk that issuer of a bond, or other creditor defaults and the risk that the counterparty in a risk mitigating contract is unable to meet its obligations to the insurer. This latter risk is especially relevant to reinsurance contracts, but also arises in the case financial derivatives.

6. *Life Insurance liability risk* is the risk specific to policy held with life insurers. It includes the risk of unexpectedly high or low mortality or morbidity among policyholders, or an unexpectedly large increase in administrative costs.

7. *Non-life insurance liability risk* is risk specific to non-life insurance policies associated in particular with unexpectedly many or unexpectedly high claims.

The Risk Capital Requirement is calculated by applying risk charges to the value of specific items within the assets and the liabilities and to exposure measures for other risks. Each type of asset or liability attracts a charge according to the risks to which is exposed and the sum (subject to diversification adjustments) of these charges equals the Risk Capital Requirement.

There will continue to be an absolute minimum amount of capital which an insurer or reinsurer must hold. This amount is currency Baht 50m for life insurers and Baht 30m for general insurers. These amounts will be reviewed once the RBC Framework is completed.

The RBC Framework is not a substitute for good risk management, but acts to strengthen it. Insurers are expected to continue to develop and implement sound risk management and governance regimes. Insurers will be required to make sure that strategy, internal controls and decision making processes are effective in ensuring that they assume only their intended level of risk. In addition, insurers will be expected to actively manage their capital adequacy ratio by taking into account the potential impact of business strategies on the insurers risk profile as part of the decision making process. The OIC will retain the power to intervene in the management of companies

which do not meet adequate risk management standards.

2.3 The Discrete-Time Risk Model

In 2006, Chan and Zhang [5] studied the discrete-time surplus process

$$U_n = u + c_0 n - \sum_{i=1}^n X_i, \quad n = 1, 2, 3, \dots \quad (2.3.1)$$

where $U_0 = u$ is the initial surplus, $c_0 > 0$ is the constant premium rate and $\{X_n, n \in \mathbb{N}\}$ is a sequence of i.i.d. claim size random variables.

In the discrete-time equation (2.3.1), the ruin can occur at time instants $n = 1, 2, 3, \dots$. The general approach for studying ruin probabilities in the discrete-time model is through the so-called Gerber-Shui discounted penalty function. Chan and Zhang proposed another approach to derive recursive and explicit formulas for finite-time ruin probabilities with exponential or geometric claim severities.

From equation (2.3.1), let

$$\varphi_n(u) = P(U(1) \geq 0, U(2) \geq 0, \dots, U(n) \geq 0 \mid U(0) = u)$$

denote the survival probability at time instants $1, 2, 3, \dots, n$ with the initial surplus $u \geq 0$. The probability of ruin at time instants $1, 2, 3, \dots, n$ denoted by

$$\Phi_n(u) = 1 - \varphi_n(u).$$

In the case of exponential claims, Chan and Zhang found the recursive relations for the ruin probabilities:

$$\begin{aligned} \Phi_n(u) &= \Phi_{n-1}(u) + \frac{[\lambda(u+nc)]^{n-1}}{(n-1)!} e^{-\lambda(u+nc)} \frac{(u+c)}{(u+nc)} \\ &= \sum_{k=1}^n \frac{[\lambda(u+kc)]^{k-1}}{(k-1)!} e^{-\lambda(u+kc)} \frac{(u+c)}{(u+kc)}. \end{aligned} \quad (2.3.2)$$

The derivation for the case of exponential claims relies on the special structure of exponential distribution and their proposed method, as compared with the general Gerber-Shui approach, is able to provide simpler derivation

and straightforward expression for these two special families of claims.

In this thesis, we study the discrete-time surplus process

$$U_n = u + c_0 n - \sum_{i=1}^n X_i K_i, \quad n = 1, 2, 3, \dots \quad (2.3.3)$$

where $U_0 = u$ is the initial capital, $c_0 > 0$ is the constant premium rate and $\{X_n K_n, n \in \mathbb{N}\}$ is a sequence of i.i.d. claim size random variables. We also find recursive formulas for finite-time ruin probability which are simple derivative and straight forward expressions. Further, we study the discrete-time surplus process

$$V_0 = u, \quad V_n = V_{n-1} + c_0 Z_n - X_n, \quad n = 1, 2, 3, \dots \quad (2.3.4)$$

where V_n is the surplus at time n , $c_0 > 0$ is the constant premium rate and $\{X_n, n \in \mathbb{N}\}$ is an i.i.d. claim size process and $\{Z_n, n \in \mathbb{N}\}$ is an i.i.d. interarrival time process taking values in $N = \{0, 1, 2, \dots\}$. And the relation between equations (2.3.3) and (2.3.4) is mentioned in the part of main results.