IS THERE AN OPTIMAL STRATEGY TO MANAGING SOLVENCY & PROFITABILITY ISSUES?

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Abstract. While capital is much desired to ensure solvency, often at the prescribed 95% safety level, there is a cost associated with the safety margin. The cost of capital must be met before value is created in a business enterprise. While premiums can be increased to offset the cost of capital, this will increase the burden on policyholders or consumers.

This paper explores if there exist an optimal way to meet the needs of the 3 main stakeholders in an insurance operation, namely the Regulator, Shareholders, and Policyholders. The impact and interaction between the cost of capital, the expectation of policyholders, and shareholders' interests on design and pricing of insurance product is discussed.

The mechanics of trying to reach an optimal solution is illustrated via appropriate pricing and designs of insurance product(s) in the context of maintaining attractive return on capital and affordable premium rates versus the cost of Risk-Based Capital requirements. Graphical techniques are employed, where appropriate, to illustrate and seek an answer.

Key-words: Cost of Capital, Risk-based Capital, Policyholder Expectations, Shareholder's Expectations, Regulator

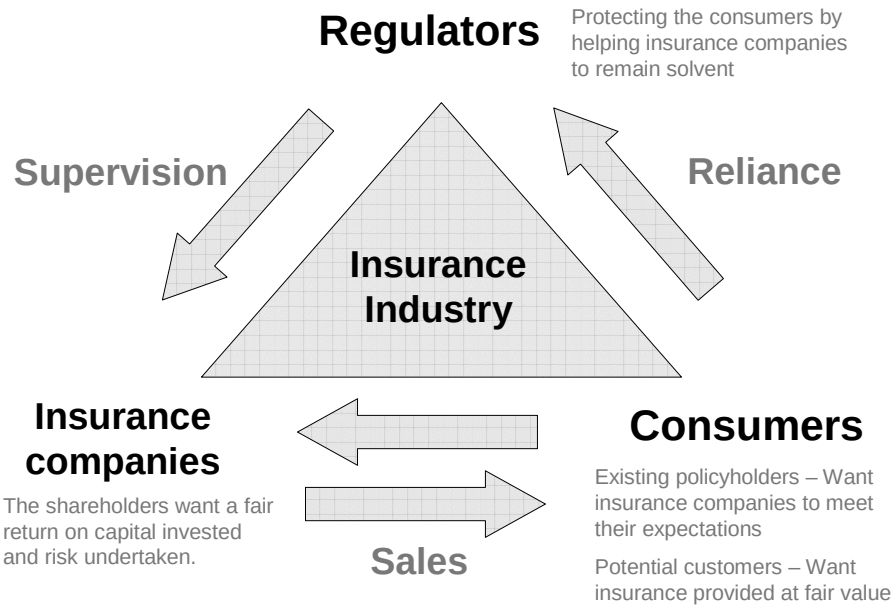
1 Introduction

In an environment of democratic rights, fair competition, and prudential corporate governance and regulations, we need to manage risks which cater to the needs and desires of all interested parties. To ensure viability and sustainability of a business enterprise, the vested interests of all stakeholders must be met.

In the insurance industry, the 3 major stakeholders are the Shareholders, Policyholders and the Regulators. The shareholders demand a return on their invested capital to commensurate with the risks borne and the available market risk premium for taking the risks. The policyholders demand a product that provides insurance cover at an affordable and fair price which they are used to and within their reasonable expectations. Prudential governance and regulations impose a minimum required level of capital to ensure continued solvency and stability of the insurance operation.

The relationship amongst the 3 stakeholders can be described in the following figure:

Figure 1 Stakeholders in an insurance industry



The interests of the three parties seem to be in opposing directions. In such cases, an ideal solution is to have cooperative inputs from all parties. Each party cannot act alone. For example, if the regulator demands an excessive level of capital requirements, the insurance companies may have to either increase the premiums or reduce the profits to shareholders. If premiums are too high, consumers will avoid insurance products. If the returns to shareholders are too low, in the long run, there will be a flight of capital to other business enterprises which can provide higher returns.

Within the context of the interests of the 3 parties, we seek to find an optimal solution when designing and pricing an insurance product. Products must be designed and priced which are affordable to policyholders and yet give adequate return to shareholders after meeting the cost of risk-based capital required by many regulatory regimes.

The remainder of this paper is outlined as follows:

Section 2 describes the cost of capital requirements and its implications.

Section 3 describes the regulatory requirements on minimum capital.

Section 4 describes the reasonable expectations of policyholders.

Section 5 describes the approach we adopted to seek an optimal solution and some practical examples.

Section 6 concludes with our recommendation and point of view.

2 Cost of capital

2.1 Available Capital

Where there is deployment of capital, there is a return demanded, just as in any other business entity. The expected return usually will be comparable to what is available in the markets relating to risk-returns. Generally, available investments employed in an insurance business include equity, fixed interests, bonds and notes, property and real estates, and other hybrids.

Table 1 below summarizes the total capitalization value of equity and bonds on all the various exchanges worldwide by region, together with the corresponding total GDP of the associated countries. The total capital value of US$39.2 trillion is about 97% of total GDP US$40.3 trillion in these regions. If the average cost of capital is 10 %, one can say that the total cost of servicing capital in these exchanges alone takes up about 10% of the GDP in these countries.

Table 1 APRIL 2005 (in millions of US Dollars)

REGION	Equity – Domestic Market Capitalization[1]	Value of Bond Trading[2]	Total GDP[3]
Americas	17,502,689.76	47,887.62	15,471,454.00
Europe – Africa – Middle East	10,602,305.55	999,556.58	14,587,731.00
Asia – Pacific	9,961,315.50	45,187.28	10,248,430.00
TOTAL	38,066,310.81	1,092,631.47	40,307,615.00

Sources: [1,2] World Federation of Exchanges, www.world-exchanges.org
[3] International Monetary Fund, www.imf.org

With regards to expected returns, capital markets usually think in terms of a risk-free rate plus risk margins associated with the investments and activities supported by the capital. Where there is higher risk or volatility in the outcome, high risk premiums are demanded. Factors that affect an enterprise's risks are:

- C1 risks – Investment strategy and profile
- C2 risks – Pricing and underwriting efficiency
- C3 risks – Interest rate, liquidity and mismatch risks
- C4 risks – Business risks, management risks and risks associated with the external environment such as economic and socio-political elements.

2.2 Method of Defining Cost of Capital

Common models that are used to define the cost of capital are:

- Capital Adequacy Pricing Model (CAPM) – Markowitz 1952, Tobin 1984-85 and Sharpe 1964
- Dividend Growth Model – Gordon 1962
- Arbitrage Pricing Theory – Ross and Ross 1984

In this paper, we shall use the CAPM model to derive the cost of capital. We define cost of capital to be the required return on the capital deployed.

Let

Cost of equity capital, K_e = $r + \beta . (R_m - r)$ by CAPM model
Pretax cost of debt capital, K_b = $r + \theta$

where

r	=	Risk-free rate
θ	=	Risk margins or market spread on comparable bonds
β	=	Stock beta
$R_m - r$	=	Market risk premium

In a mixture of equity and debt capital, the weighted average cost of capital (k) is given by:

$$k = W_e . K_e + (1-T) . W_b . K_b$$

where

T	=	Corporate tax rate
W_e	=	Proportion of equity over total capital
W_b	=	Proportion of debt over total capital
$W_e + W_b$	=	100%

A simple illustration is given here to demonstrate CAPM:

Assumptions	**Values**
Stock beta, β	1.1
Risk-free rate based on a 10-yr government bond, r	4.5%
Market risk premium, $R_m - r$	7.2%
θ for an A-rated bond	1.75%
Equity proportion, W_e	80%
Debt proportion, W_b	20%
Corporate tax rate, T	30%
k	?

Balance Sheet	**Values**
Assets	$110,000
Liabilities	$100,000
Equity	$10,000
Asset returns, i	7%
Cost of capital, K (absolute amount)	?

From the information in the illustration above:

K_e = $R + \beta (R_m - r)$
= 4.5% + 1.1 x 7.20% ←see ***Table a***
= 12.42%

K_b = $R + \theta$
= 4.5%+1.75%
= 6.25%

k = W_e x K_e + (1-T) x W_b x K_b
= 80% x 12.42% + (1-30%) x 20% x 6.25%←see ***Table b***
= 10.81%

K = 10.81% x $10,000
= $1,081

Thus, if the gross asset returns is only 7%, the extra required profits to make up for the deficit in the asset returns due to the required k% on capital is :

10,000 * (10.81%-7%*0.7)= $591

Table a

Cost of Equity (CAPM)	
Risk-Free Rate	4.5%
Long-term Equity Returns (from Hang Seng and Straits Times Indices)	11.7%
Risk Premium	7.2%
Stock beta, β	1.1
Cost of Equity (CAPM)	12.42%

Table b

	Weight	**Tax rate**	**Cost of Capital**
Long-term debt	20%	30%	6.25% x 70%
Common Equity	80%		12.42%
Total Capital	100%		10.81%

Summarizing,

PV of CoC = PV [{k-(1-T)*i}*required capital for each year]

Where
PV = present value
CoC = Cost of Capital
...i = earning rate on assets backing solvency

3 Regulatory requirements on minimum capital

3.1 Regulatory Developments

Risk-based capital (RBC) requirements are well established in developed insurance markets in US, Canada and United Kingdom. In these countries, stochastic modeling and stress testing are employed to evaluate costs of certain types of guarantees under adverse scenarios.

Recent regulatory developments in Asia-Pacific pointed to adoption of risk-based capital requirements in insurance. It is expected that most, if not all, countries in this region will adopt RBC in one form or another in the long run. RBC regime were formally adopted by the regulators in the following countries – Australia in 1995, Indonesia in 1999, Taiwan in 2003, and Singapore in 2004. China, India and Malaysia are already at proposal and consultation stages of introducing RBC, with expected date of adoption as early as 2006.

In addition, rating agencies frequently rely on some forms of risk-based capital requirements to assess capital adequacy of financial institutions.

Table 2 below briefly summarizes the forms of risk-based capital adopted by countries worldwide.

Table 2

Country	**Risk Identifier/Coverage**	**General Calculation Method**
US	Asset Risk, Insurance Risk, ALM/Interest Rate Risk, Business Risks	1.Formulaic Approach with covariance adjustment to combine each risk. Since mid 1990's stress testing required for P & C business. Stochastic Modelling of interest rate scenarios under RBC C3-phase 2 calculation
Canada	Asset Risk Mortality/Morbidity/Lapse/Interest Rate Risks	1.Formulaic Approach. Stress testing in DCAT (Dynamic Capital Adequacy Test) Stochastic Testing for certain guarantees and options.
UK	ALM/Interest Rate/Insurance Risks Integration of All Other Significant Risks : General business risks, asset risks including liquidity and credit risks, new business risks	1.Formulaic Approach under Pillar 1 (% of notional risk exposures). Scenario testing in resilience reserves under ECR(Enhanced Capital Requirements). Integrated Stress Testing under ICA (Individual Capital Assessment).
Australia	1. Insurance Risks 2. Asset Risks (ALM risks, Expense risks, Concentration risks) 3. New business Strain	1& 3 Projection Method. 2. Formulaic Approach Scenario testing in resilience reserves
Singapore	1. Insurance Risks 2. Asset Risks (Default, ALM, Currency Mismatch) Concentration Risks Other Residual Risks	1. Projection Method 2. Formulaic Approach

3.2 Insurance Core Principles, IAIS

To obtain an idea of the trend of regulatory development and processes, a good reference is the Insurance Core Principles (ICPs) promulgated by the International Association of Insurance Supervisors (IAIS). These ICPs form the core regulatory principles that IAIS hope ultimately all regulators would adhere to. Each ICP is an abstraction of a Principle, followed by Explanatory Notes on the rationale, and Criteria to judge and assess compliance with it.

Besides the prudential requirements on risk-based capital adequacy and solvency, there is recognition of need for protection of policyholders' and consumers' rights, and of the need for responsiveness to market environment to promote its stability.

3.2.1 Capital Requirements

Prudential requirements touching on various aspects of the insurance operations are contained in the ICPs. These include Risk Assessment and Management, handling and managing risks related to Insurance activities, Liabilities, Investments and Derivatives, and setting adequate Capital to cover all significant risks.

ICP 18 Risk assessment and management states: The supervisory authority requires insurers to recognize the range of risks that they face and to assess and manage them effectively.

ICP 23 Capital adequacy and solvency states: The supervisory authority requires insurers to comply with the prescribed solvency regime. This regime includes capital adequacy requirements and requires suitable forms of capital that enable the insurer to absorb significant unforeseen losses.

The Explanatory Note explains: A solvency regime should take into account not only the sufficiency of technical provisions to cover all expected and some unexpected claims and expenses but also the sufficiency of capital to absorb significant unexpected loses – to the extent not covered by the technical provisions – on the risks for which capital is explicitly required. It should also require additional capital to absorb losses from risks not explicitly identified. The Note seems to imply a level of adequacy generally above the 90th percentile level.

The Essential criteria states among other principles:

1. The solvency regime addresses in a consistent manner:
   a) Valuation of liabilities, including technical provisions and the margins contained therein
   b) Quality, liquidity, and valuation of assets
   c) Matching of assets and liabilities
   d) Suitable forms of capital
   e) Capital adequacy requirements

2. Suitable forms of capital are defined.

3. Capital adequacy requirements are sensitive to the size, complexity and risks of an insurer's operations, as well as the accounting requirements that apply to the insurer.

4. The minimum capital adequacy requirements should be set at a sufficiently prudent level to give reasonable assurance that policyholder interests will be protected.

5. Capital adequacy requirements are established at a level such that an insurer having assets equal to the total of liabilities and required capital will be able to absorb significant unforeseen losses.

3.2.2 Policyholders' Rights

Under ICP 2 Supervisory objectives, it is stated under Essential criteria: The key objectives of supervision promote the maintenance of efficient, fair, safe and stable insurance markets for the benefit and protection of policyholders.

3.2.3 Responsiveness to Market

Market participants

Under ICP 3 Supervisory authority, in relation to Independence and accountability, one of the Essential criteria states as follows: All material changes to the insurance legislation and supervisory practices are normally subject to prior consultations with market participants. ICP 3 thus recognizes the valuable input from market participants to ensure a viable operation for all stakeholders.

Under ICP 11 Market analysis, it states: Making use of all available sources, the supervisory authority monitors and analyses all factors that may have an impact on insurers and insurance markets. It draws conclusions and takes action as appropriate.
In the explanatory note, the analysis include among other things the number of insurers and re-insurers entering and exiting the market; and reasons for market exits.

ICP 26 Information, disclosure & transparency towards the market states:
The supervisory authority requires insurers to disclose relevant information on a timely basis in order to give stakeholders a clear view of their business activities and financial position and to facilitate the understanding of the risks to which they are exposed.
These disclosures are meant to promote market forces toward efficient, fair, safe and stable insurance operations.

Consumers

Protection of consumers is provided via ICP 25 which states: The supervisory authority sets minimum requirements for insurers and intermediaries in dealing with consumers in its jurisdiction, including foreign insurers selling products on a cross-border basis. The requirements include provision of timely, complete and relevant information to consumers both before a contract is entered into through to the point at which all obligations under a contract have been satisfied.

Besides transparency, information to consumers should promote consumers' understanding of the insurance contracts.

3.2.4 Example of Regulatory Implementation, MAS

As implemented by Monetary Authority of Singapore (MAS), MAS supervisory system are risk-based, business friendly and operates in consultation with market

participants in an environment of fairness, equity, full disclosure and transparency. Furthermore consumers are empowered and educated to exercise and elect suitable options appropriate to their needs and risk-profiles.

The seeds are sown for a prudent, pragmatic, dynamic and a reconciliatory approach to regulating financial institutions.

Thus a foundational Regulatory approach exists to align the interests of policyholders and shareholders in the insurance business.

4 Reasonable expectations of policyholders

Traditionally, policyholders depend on insurance company to decide on the premium rates charged for the level of cover provided. The rates charged are subject to market competitive forces. However consumers are generally ignorant in the nuances and intricacies of the insurance business and its long-term risks. Most consumers depend on insurers under the supervision of regulators to charge a fair premium rate. Regulations may impose proper disclosure rules on the benefits provided and the cost of coverage and may regulate premium increases.

Even though historical circumstances may be different to current situation, the historical level of premium charged to policyholders may influence them to expect similar level of premium rates. Furthermore, with the rise of consumerism rights movements in many countries, many consumers may actually demand the level of premium rates they expect to be 'fair' to pay or to which they are accustomed to.

In 1988, the Proposition 103 was passed by ballot vote in California. Proposition 103 was written by Harvey Rosenfield of the Foundation for Taxpayer and Consumer Rights. The Proposition limits premium rate increases for P&C insurance to those that are statistically justifiable. It has forced insurance companies to refund over $1.2 billion premiums from the property-casualty insurance policies to Californians, and has blocked over $23 billion in automobile insurance rate increases since 1988. Proposition 103 also provides that insurers who are more efficient and who can reduce waste, high overhead and institute procedures for preventing and limiting claims should be rewarded with higher rate of return.

What is clear is that fairness and equity are demanded by consumers. Compared to the pre 90's period, consumers now have relatively better access to the comparisons of premium rates offered industry wide. They have the options to select the insurance cover which suits their risk profiles. Their expectations cannot be ignored in the impact on market stability.

5 Seeking an optimal solution

To the shareholders the goal is to obtain the maximum profits. There is an expectation of a minimum level of profits for them to be interested continuing their investments.

In algebraic terms the objective is to maximize P:

i.e. Max P = f(premium, investment income, claims, expenses, cost of capital) = f(p,i,q,e, CoC)

The various factors that affect level of profit interact in a complex and inter-related manner. Certain aspects of the relationships are not easily quantifiable. For example, policy-holders' behaviour which affects lapses and claims are not easily quantified. Capital requirements depend on both liability and asset risk profiles, and on management's cost and control of those risks. In addition, research indicates that there are frictional costs involved in managing capital.

However, for our illustrative example, we only explore the variation between premium rates, cost of capital and profitability assuming all other factors being equal. Moreover, frictional cost of capital is not taken into account. We estimated the capital requirements for asset risks to be about 5% of assets held to support capital requirements, based on a well managed and high quality portfolio of assets.

For determining capital adequacy requirements, however, adverse changes to the expected values of all significant variables that affect liability are assumed.

Thus our goal is to optimize P subject to constraints of premium rates and cost of capital requirements. Inter-relationships between cost of capital requirements, premium rates and profitability are illustrated in the following.

Higher premium rates tend to increase P while higher capital requirements tend to decrease P.

The illustrative example refers to pricing a stand-alone 20-benefits Critical Illness product. Best estimate risk rates are assumed available with appropriate contingency loadings where uncertainties exist.

Premium and benefit term is 20 years. Premium rate is level and guaranteed. For illustrative purposes, we base our calculation of the capital adequacy requirements on the basis as prescribed in the Singapore MAS risk-based capital adequacy regulation. For capital requirements, we consider insurance risks and estimate risks related to assets, business and miscellaneous considerations. Frictional costs of capital are excluded in the illustration. Including them will only increase capital requirements.

The assumptions and bases of the base scenario used in the illustrative projection are detailed in Appendix 1. Abstracting from Appendix 1, the main considerations are:

1. Constraints on premium rate, p <= $6.05 per mille. We derive this constraint based on considerations of minimum loss ratio and available market rates.

2. Expenses translate to about 13% of premiums. Commissions translate to about 15% of premiums

3. Cost on Capital, k = 10.81% compared to gross asset return, i=4.35%. Tax rate on operating surplus, T=30%.

4. Minimum Capital Adequacy liabilities are calculated assuming 40% load on best estimate morbidity experience, 10% load on expenses, and adverse 25%(relative) change in lapse assumption. This is denoted as Min ReqCap level = 100% in the examples following.

5. Policy liabilities are calculated with provisions for adverse deviations of 15% load on best estimate morbidity experience, 5% load on expenses, and adverse 12.5%(relative) change in lapse assumption.

6. Capital held assumes a Capital Adequacy Ratio of 150% of minimum capital requirements calculated.

Thus, the optimization problem is:

Max P (p, i, q, e, CoC)

subject to:
0<p<6.05
P>0
PV of CoC = PV [{k-(1-T)*i}*required capital for each year]

The results of the projections are described below under each of the scenarios.

Base Scenario: Guaranteed Premium Rates

The projection was done over a range of premium rates. As an example, at premium rate of $6.05 per mille, the following results are obtained with respect to capital requirements per $100,000 SA at issue over the next 20 years.

Age at issue= 35, Per $100,000 SA at issue; results at beginning of year

Policy year	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Premium	605	514	462	429	406	397	389
Policy Liability	0	0	0	0	0	0	0
Capital in excess of Policy Liability	370	188	223	540	813	1043	1243
Policy year	**8**	**10**	**13**	**16**	**19**	**20**	
Premium	380	363	338	313	289	280	
Policy Liability	51	364	679	743	452	258	
Capital in excess of Policy Liability	1497	1716	1726	1444	750	407	

The graph in Figure 2 shows the profit margin obtainable at the respective premium rate.

From Figure 2, we can see that there is no optimal solution based on the illustration and assumptions in Appendix 1. Profit margin at the maximum acceptable premium rate is < 0 i.e graph of acceptable profit margin does not fall in the feasible region of shareholders' and consumers' expectation. The cost of capital for a guaranteed premium rate is high, and the consumers are not willing to pay such a high premium for this guarantee.

Figure 2 Guaranteed Premium Rates

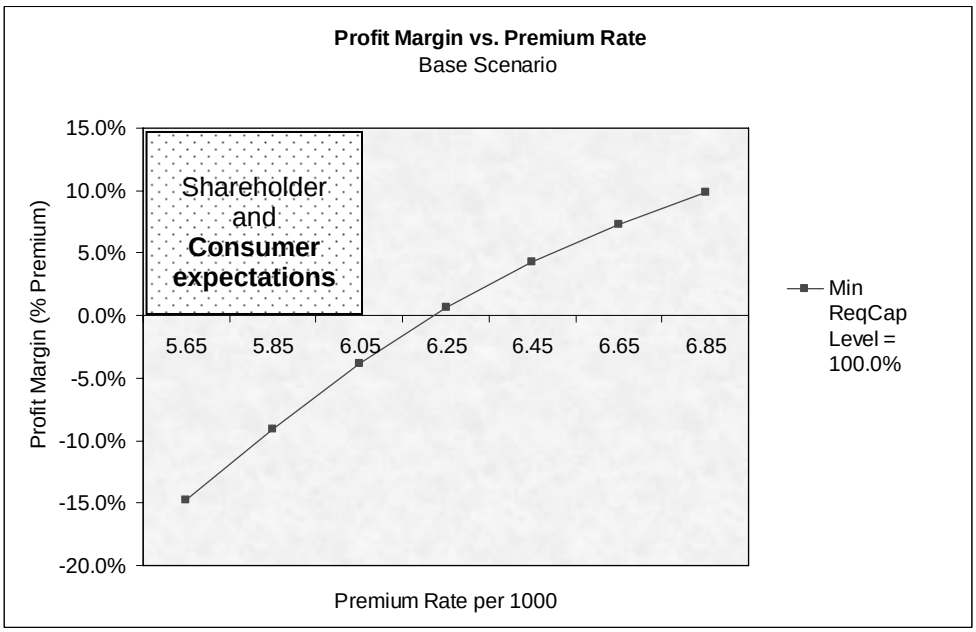
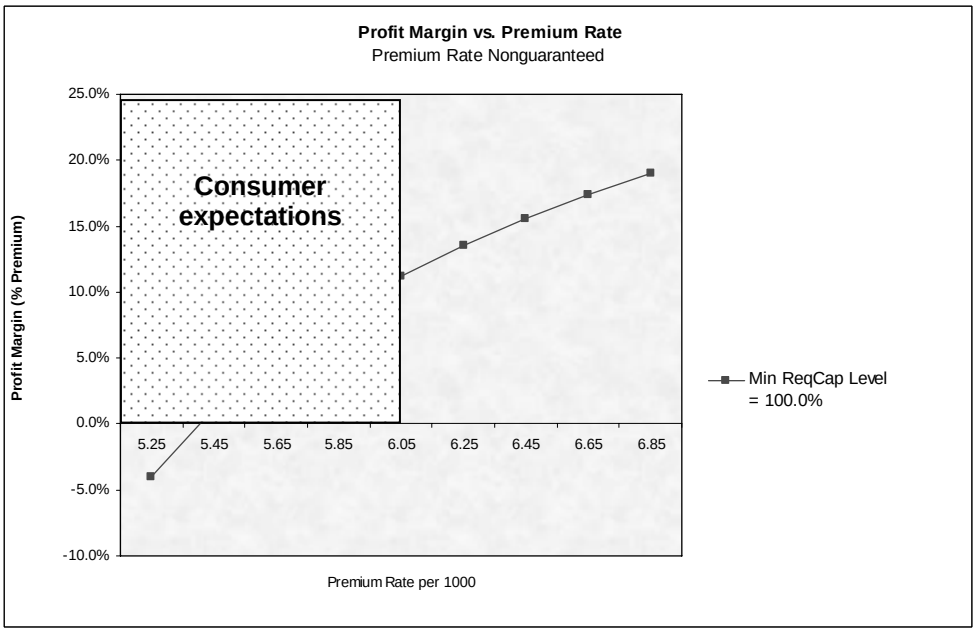


Figure 3 Non-Guaranteed Premium Rate



Scenario #1:

For this scenario, we adjust product feature from guaranteed to non-guaranteed premium rate to reduce capital requirements. Thus cost of capital, CoC, is reduced.

For non-guaranteed rate: Best estimate morbidity experience is set at 85% that of guaranteed rate best estimate morbidity assumption, due to reduced contingency margins.

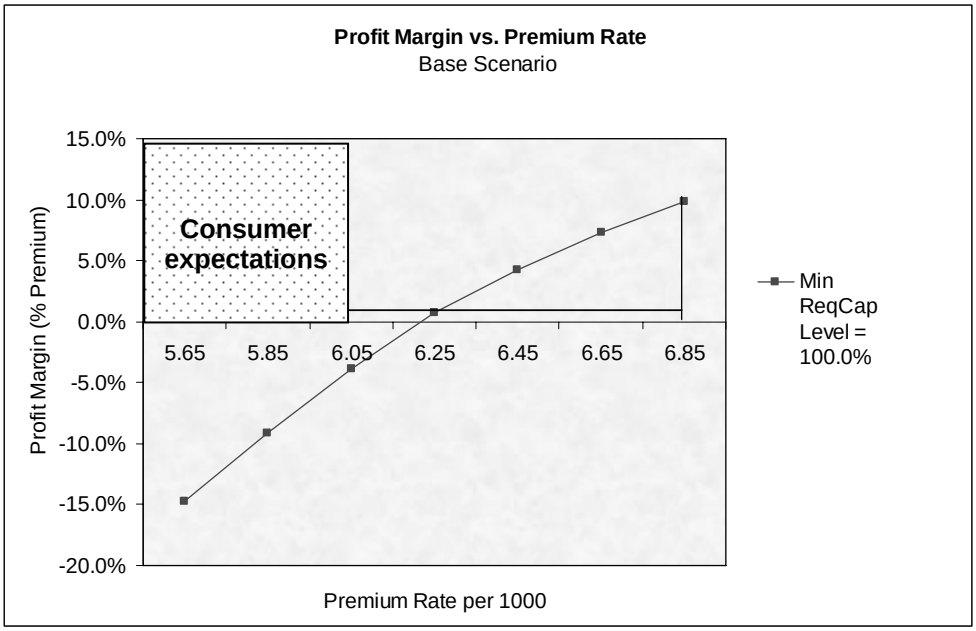
Capital requirements is reduced compared to guaranteed rate, as risk loading to best estimate morbidity experience is only 20% compared to 40% for guaranteed rate.

Figure 3 shows that that an optimal solution exists at least for premium rate > 5.40 per mille.

Scenario #2:

In this scenario, premium rates are made participating and equal $6.85 per mille. At this rate, there is a profit margin of 9.8% of premium. Though payable premium rates is > $6.05 per mille, but net of premium refunds (being 95% of profits) and tax, effective premium rates are about $5.94 per mille ie within policyholders' expectations. With proper disclosure of costs to policyholders, an optimal situation is created. See Figure 4.

Figure 4 – Participating Rate



Scenario #3:

An effective way of capital planning is via reinsurance. We conduct tests on reinsuring 50% sum insured on two types of reinsurance, on risk premium basis and on coinsurance basis. Net reinsurance premiums on both reinsurance types are made equivalent via 20% profit and expense loading in the case of net risk premium basis and the equivalent reinsurance commission in the case of coinsurance basis.

For this product design, reinsurance via coinsurance method is more effective to reduce cost of capital. In coinsurance, the level of reinsurance premiums outgo can be made proportional to the original level gross premium. Whereas, in risk premium reinsurance, the stepped reinsurance premium rate causes a strain at later duration. See Figures 5a, 5b below.

Scenario #4:

If markets prefer less cost and more risk, then Regulator may impose less stringent capital requirements. But policyholders face potential financial losses as their claims may not be fully met. Insolvency results in loss of confidence in the insurance market and increased pressures on social welfare systems and government reserves. The collapse of HIH in Australia was a reminder of how real those risks are and of how serious the consequences of an insurer's failure can be.

By reducing calculated minimum capital requirements to 80% of Scenario 1, an optimal solution is created as shown in figure 6.

Figure 5a

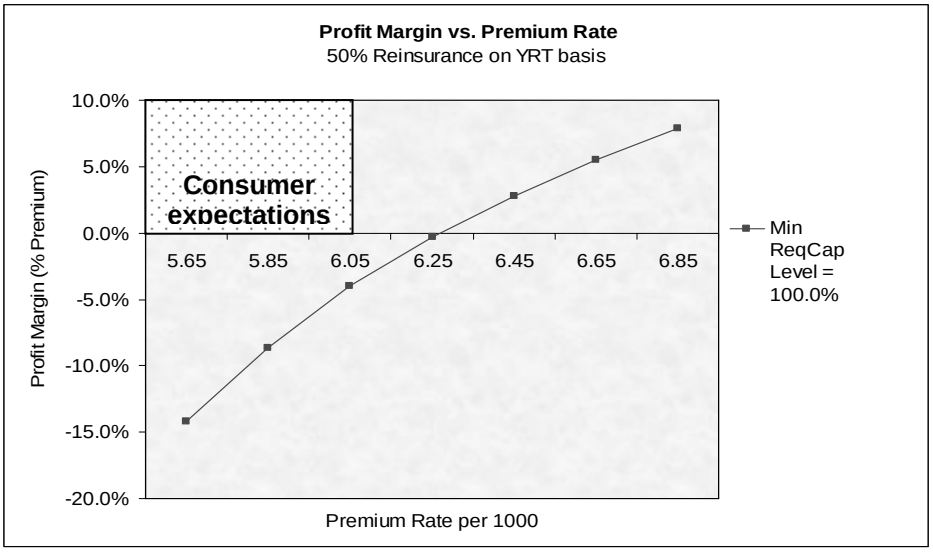


Figure 5b

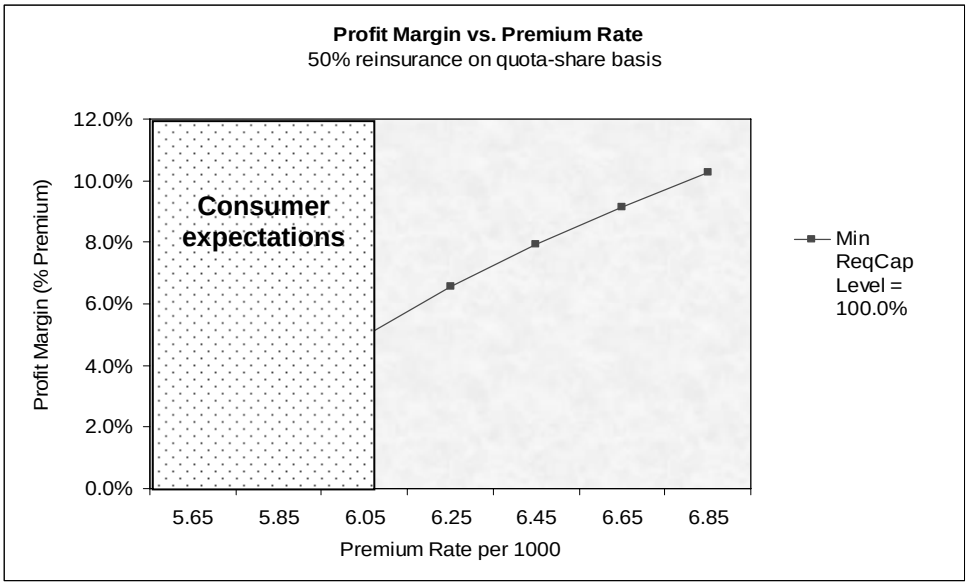
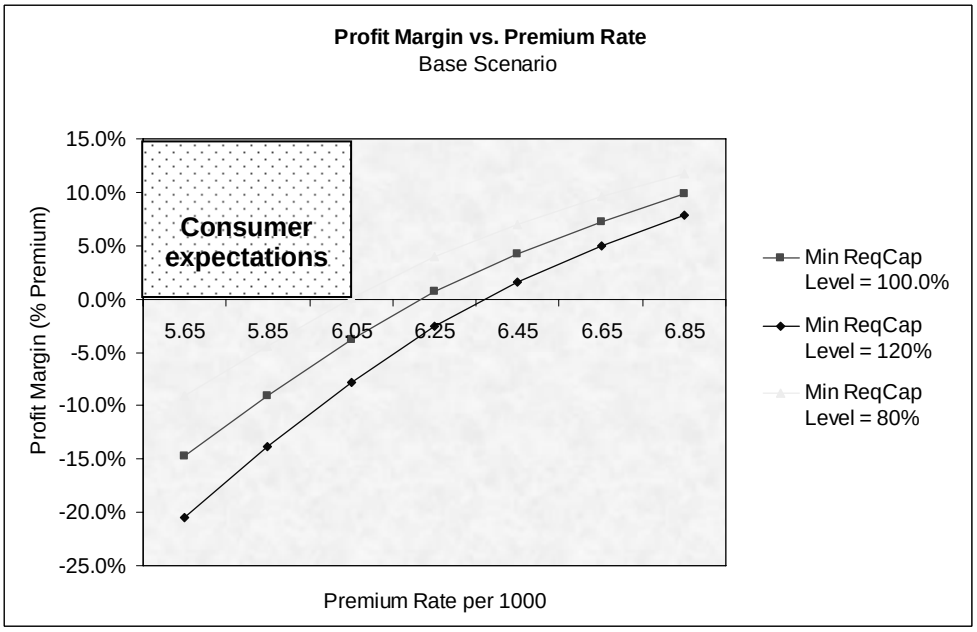


Figure 6



6 Conclusion

Managing the risks of capital cost is a forward-looking, dynamic and reactive process. The interests of the 3 major stakeholders in the insurance business have to be considered. While their interests seem to move in opposite directions, they can be aligned to meet and thus produce an optimal solution. Consultation and responsiveness to each other's interests promotes the most effective long term solution for the stability of the insurance enterprise. This approach is implicit in the Insurance Core Principles promulgated by the IAIS.

Where no optimal solution exists in a particular situation, we can still create an optimal situation by modifying liability or asset risk profiles. We demonstrated modifying liability risk profiles via changing product designs or benefits, or via appropriate risks transfer as in reinsurance. The alternatives would be for consumers to accept the additional costs of safer prudential regulation; or to accept less stringent regulation at lower costs but at increased risk of insolvency. Managing risk profiles effectively under efficient management control naturally leads to lower level of capital requirements and costs.

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Appendix: Projection Assumptions – Base Scenario

Product Name	20 Stand-alone Critical Illness				
Critical Illnesses Covered	Heart attack, Major cancer, Blindness, Major organ transplant, Paralysis, Stroke, Serious burns, Fulminant viral hepatitis, Coronary artery bypass surgery, Surgery to aorta, Alzheimer's disease, Aplastic anaemia, Pulmonary hypertension, Parkinson's disease, Multiple sclerosis, Poliomyelitis, Encephalitis, Meningitis, Vegetative state, Heart valve surgery.				
Model Cell:	Male, Age 35, Non Smoker				
	Non Par, Benefit Term = Premium Term = 20 years, Guaranteed Premium Rate				
	Sum Assured (SA) = 100,000, Premium Rate = 6.05 per 1000 SA				
Assumptions	Year 1	Year 2	Year 3	Year 4	Year 5+
Expense					
Per policy	$ 230	$ 40	$40	$40	$40
As % of Premium	6%	5%	5%	5%	5%
Commission	50%	45%	20%	20%	20%
Lapse	15%	10%	7%	5%	2%
Tax on Surplus	30%				
Cost of Capital	10.8%				
Interest Rate					
Pricing	4.35%				
Reserve	3.55%				
Cash Surrender Value	n/a				
Hurdle Rate	8.5%				
Liability Basis	***Policy Liability***			***Capital Adequacy***	
PAD on Expenses	5%			10%	
PAD on Mortality	15%			40%	
PAD on Other Claims	15%			40%	
PAD on Lapse	12.5%			25%	