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the Actuary INDIA

INDIAN ACTUARIAL PROFESSION
Serving the Cause of Public Interest

THE MAGAZINE OF THE INSTITUTE OF ACTUARIES OF INDIA

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*Glimpses from
15th GCA...
Sheer joy of
being there..
16th GCA 2014 AGFA*

For Private Circulation Only



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Who is an Actuary ?

An Actuary is a business professional who analyzes the financial consequences of risk. This is a niche profession with strict standards for qualifying and is also a global profession as it is recognized in most countries. The actuaries attract competitive salaries globally. In a study covering 200 professions, a career website CareerCast.com has found the job of 'actuary' as the best for year 2013. Read the full article at: <http://www.careercast.com>

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Registrations Close

7th May 2014

Examination on

13th & 14th June 2014

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Chief Editor

Sunil Sharma

Email: sunil.sharma@kotak.com

Editors

Kollimarla Subrahmanyam

Email: ksmanyam52@gmail.com

Raunak Jha

Email: Raunak.Jha@towerswatson.com

Puzzle Editor

Shilpa Mainekar

Email: shilpa_vm@hotmail.com

Librarian

Akshata Damre

Email: library@actuariesindia.org

COUNTRY REPORTERS

Krishen Sukdev

South Africa

Email: Krishen.Sukdev@absa.co.za

Frank Munro

Srilanka

Email: Frank.Munro@avivandb.com

Pranshu Maheshwari

Indonesia

Email: Pranshu.Maheshwari@aia.com

John Laurence Smith

New Zealand

Email: Johns@fidelitylife.co.nz

Rajendra Prasad Sharma

USA

Email: rpsharma0617@yahoo.com

Nauman Cheema

Pakistan

Email: info@naumanassociates.com

Andrew Leung

Thailand

Email: andrew.leung@iprbthai.org

Vijay Balgobin

Mauritius

Email: Vijay.Balgobin@sicom.intnet.mu

Kedar Mulgund

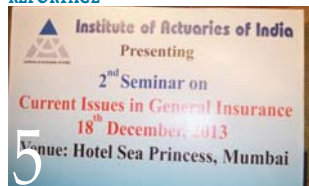
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Email: kedar.mulgund@sunlife.com

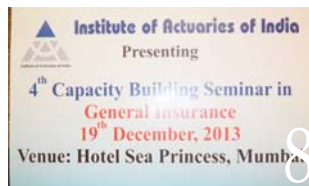
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**K SUBRAHMANYAM**

Ksmanyam52@ymail.com



By the time this issue is in your hands, most of you attend the 16th GCA, at Mumabi. I wish to thank who attended the GCA. Please send your views/feelings/opinions on each event at the GCA. Those who could not attend the GCA, please make it for the next GCA. We would very much like to know your expectations for the 17th GCA in 2015. I also wish to thank our overseas participants who attended the GCA with interest in large numbers from different parts of the globe.

Like Doctors who specialize on specific parts of the body, our actuaries too specialize on different financial areas of public interest. We have actuaries working in Life Insurance, General Insurance, Health Insurance, Employee

Benefit Area (working closely with auditors), Insurance Regulators, Stock Markets, Banks, Government Offices, Actuarial Education, and other wider areas. Some actuaries work as CEOs of insurers. Major contributions in our magazine are from actuaries working for life insurers. We request all of you to contribute your experiences, so that all of us know how we will be beneficial to the society actuarially.

'Evolving frontiers and exciting prospects' is the theme of the 16th GCA for this year 2014. The theme was chosen by a student member. Hope 2014 will get you exciting prospects.

We cannot forget IRDA who encourage actuaries and who set opportunities for actuaries. With Profits Committee is an

excellent idea in the life insurer's office to be chaired by an independent actuary. At present we have peer review for the actuarial reports of appointed actuaries. The peer reviewer is a senior actuary who ensures quality of actuarial services. It is hoped that this would enter into general insurance too shortly. AAs of general insurers can go for peer review voluntarily convincing CEOs of general insurers, till the same becomes mandatory.

With the same note, we cannot ignore our sister professional body, the Institute of Chartered Accountants of India. Because of AS15-R, consulting actuaries have good scope of work.

Please evolve frontiers, exciting prospects wait for you.



We invite opinion and comments on the articles published in the magazine.

E-mail: library@actuariesindia.org

Himmat karne waalon ki haar nahin hoti.....
Lehron se dar kar nauka paar nahi hoti
himmat karne waalon ki haar nahi hoti

Nanhi cheenti jab daana lekar chalti hai
chadhti deewaron par sau baar fisalti hai
Mann ka vishwas ragon mein saahas banta hai
chadh kar girna, gir kar chadhna na akharta hai
Aakhir uski mehnat bekar nahi hoti
koshish karne waalon ki haar nahi hoti...

Dubkiyan sindhu mein gota khor lagaata hai
ja ja kar khaali haath laut aata hai
Milte na saahaj hi moti paani mein
badta doogna utsaah issi hairaani mein

Mutthi uski khaali har baar nahi hoti
himmat karne waalon ki haar nahi hoti...

Asafalta ek chunauti hai sweekar karo
kya kami reh gayi dekho aur sudhaar karo
Jab tak na safal ho neend chain ki tyago
tum sangharshon ka maidaan chhodh mat bhago
tum Kuch kiye bina he jai jai kaar nahi hoti
himmat karne waalon ki haar nahi ho

GREAT POEM

by Harivanshrai Bachchan

English translation:

The boat that qualms the waves Never gets across
The mind that dreads and dares Has never been at loss

The tiny ant, when it carries the grain Lays it up
into the heights of the wall

Falls slipping a hundred times, Just as it tries again
The faith in the mind Stirs courage in the nerves

It soars and slips, then slips and soars again until
its efforts have not been in vain

The diver who scrounges deep into the oceans Comes bare in his fist a number of
times It is not so painless Each time he delves to hit upon a pearl Someday, when
out of those deep seas he whirls And in surprise, that his efforts have brought
Glad, for his fist is not empty everytime And in him that seamless effort herald a
cheery chime

O' accept the failures that cross your way They are just the challenging mile-
stones And build from right here, where you fell Until all the shortcomings cease,
And you soar in success Burn restful sleeps in the sacrificial pyres Until tireless
struggles brought smiles of joy Oh! Do not run away from the battlefields For
triumph always yields such joy Just after relentless endeavors.....





2ND SEMINAR ON CURRENT ISSUES IN GENERAL INSURANCE

- **Organized by:** The Advisory Group on General Insurance, IAI
- **Venue:** Hotel Sea Princess, Juhu, Mumbai
- **Date:** December 18, 2013

The seminar was arranged to facilitate discussions between the industry, the regulator and members of the Indian actuarial profession on vital issues affecting the performance of the industry. Particular emphasis was toward enhancing the understanding on practical issues, risk management and pricing skills of the industry.

Session 1:



M Karunanidhi

M Karunanidhi, President - IAI, set the tone of the session in his welcome address by alluding to a gamut of issues faced both by the industry and the actuarial profession. He pointed out that more regulatory changes are seen in the life insurance sector, the pace of which has been questioned many times. He emphasized that the actuarial profession has to become more proactive and independent to balance stakeholder interests. With the United Nations' recent definition of Sustainable Insurance encompassing environmental, social and governance issues in its ambit, he opined that the actuaries have a central role to play in the emerging policy and social context. He referred to the view prevalent in the market that, there is more optimisation than innovation in the insurance industry. He concluded that the insurance industry would benefit much by learning from other industries.

Session 2:

M Ramaprasad, IRDA Member – Non-Life, delivered the keynote address on "Regulator's perspective on Current Environment." He indicated that the

overall performance of the non-life industry seems better from premium which demonstrated compounded annual growth rate of 17% since 2006 and satisfactory solvency figures. He inferred that the traditional role of actuaries in pricing has got accentuated with fluctuating incurred claims adversely affecting premium adequacy.



M Ramaprasad

While the industry views the pricing of motor third party risk as inadequate, he suggested that the premium adequacy be evaluated from the latest statistics of Ministry of Road Transport on flattening accidents and deaths. He identified the designation of Insurance Information Bureau (IIB) as a custodian of all insurance data as a significant step in meeting the data requirements for actuarial analysis. Another area for critical actuarial assistance is mapping of areas vulnerable to frauds, Mr. Ramaprasad remarked. To a question on how other countries address third party premium inadequacy, he cited limiting time for preferring claim and marking jurisdiction as key differentiating factors. Further, on the question regarding sustainability of third party claims liability at 210% of average premium, he specified gradual

acceptance of periodic pricing correction and 90% of third party risk pool left to companies for free pricing as the mitigating factors. He concluded that government must take care of basic medical facilities and all enhanced medical care must be insurance supported, which will achieve a balance between social assistance and private medical insurance.

Session 3:

Bhargav Dasgupta, CEO, ICICI Lombard, spoke on "Delivering returns: Value to Shareholders." He expounded on various shareholder value measures and



Bhargav Dasgupta

emphasized that any shareholder value measure must have a two pronged strategy of improving returns from existing assets (efficiency) and investing to generate superior returns above the cost of capital (growth). He reasoned that the general insurance industry is a major contributor to the country's economy in that it employs 7 lakhs people, supports the government and society by reducing the financial burden of social welfare, by sharing cost of contingent risk capital and by creating access to financial services and protection. He pointed out that customer appreciation of GI products is increasing.

About the Author



rajesh.s@ecg.in

Rajesh S is Manager, Actuarial Department with Export Credit Guarantee Corporation of India Ltd., Mumbai. He is a Student member with the Institute of Actuaries of India. He is an honours graduate in Mathematics and a post graduate in Economics from Madras School of Economics, Chennai.

especially in motor and health. He stated that even as brands drive preference in GI space, customer's selection is determined by price differentials. With fast paced technological changes and increasing risk complexity, he observed development of actuarial talent as essential for data driven and risk based pricing.

Session 4:

The fourth session of the day was a panel discussion on "Role of Actuaries in the GI Industry." The panellists were G Srinivasan, CMD, New India Assurance, KK Mishra, CEO, Tata AIG General, Joydeep Roy, CEO, L&T General and R Chandrasekaran, Secretary, GI Council (as Moderator). Mr. Srinivasan



G Srinivasan

spoke about evolution of the industry from tariff to de-tariffed regime, multiple factors affecting the industry and the enhanced role of actuaries due to the explosion in information technology industry and the availability of massive data. He listed out pricing, reserving, risk management, reinsurance and investment as some of the vital areas where actuaries play an indispensable role. Mr. Chandrasekaran



K. K. Mishra, R. Chandrasekaran

listed the minimum responsibilities of the actuarial function as stipulated in article 48 of the solvency II regulations and stressed on the need to demystify the actuarial function. Mr. Mishra quoted the example of second largest insurer collapse in Australia and

elaborated that actuary's role extends far beyond reserving and pricing into business planning, underwriting, risk management, reinsurance and solvency.



Joydeep Roy

Mr. Roy spoke on the necessity of a stint for actuaries in business roles to understand business and questioned if it was necessary to have a Chief Risk Officer different from Appointed Actuary. Mr. Chandrasekaran posed a question to participants on whether actuary should be concerned with prediction of worst case scenario only or get into more functions. He elaborated that actuaries must move beyond the regulatory requirement and must play a bigger role working closer to the business and with auditors, underwriters and reinsurers.

Session 5:

Sanjay Datta, ICICI Lombard dealt with



Sanjay Datta

"Effective Management of Third Party Claims." He explained that third party risk cover is the most customer-centric feature in today's general insurance industry. It is mandatory, has fixed premium, no time limit for preferring claim, no compulsion on the insured to prefer claim and to cap it all even if premium was not paid courts decree insurance companies to pay first and recover premium later from the insured. On the other hand, from the insurers' side it represents the biggest risk with tail of the business not deciphered yet and sometimes even with the prospect

of claims of one insurance company landing at the desk of a different insurance company. He pointed out that in many foreign countries third party liability is limited to a certain amount and if desired the insured may take higher cover. He elucidated that the precedent of a recent verdict may lead to more courts requiring computation of compensation based on the injured person's potential future income rather than past income. Suggestions poured in from the participants that third party premium may be collected when vehicle is registered for the first time, may be included in vehicle license renewal and an extra cess may be levied at toll plazas for big vehicles. He ended the session with a suggestion that the Institute of Actuaries of India could train members on pricing and reserving for long tail lines as claim development and claims inflation remain primary concerns.

Session 6:

R Raghavan, CEO, Insurance Information



R Raghavan

Bureau (IIB) enlightened the participants on "Does Analytics matter in Non-Life Insurance." He illustrated that in the general insurance industry there have been many consecutive years of technical deficits turned into overall profits by investment incomes. He clarified that while natural catastrophes and business cycles posed external challenges, lack of innovation and backseat for actuarial science have proved to be the acute internal challenges. He observed that the challenges need to be tackled with better analytics and it is now possible with the data support of the IIB. The session ended with the information that a *Score Card on Data Quality* to be put up to the respective insurer's Board of Directors shall be made mandatory for all insurance companies in near future.

Session 7:

The last session of the day was on "Claims and Fraud Analytics" by



Debashish Banerjee

Debashish Banerjee, Practice Lead - Deloitte. He started the session with basic information on internal fraud, intermediary fraud and fraud by customer. He elaborated on techniques of predictive modelling viz. supervised techniques and unsupervised techniques. Under the former, he elaborated on statistical modelling of rare events while under latter he elaborated on stochastic modelling which is a statistics based approach and

clustering that is a distance based approach. The primary problem he pointed out was that many fraudulent claims remaining undetected and hence termed legitimate.

Mehul Shah, Chairperson, Advisory Group on General Insurance thanked the speakers of the day for sparing time out of their hectic schedule and sharing valuable insights on several important issues. He also thanked the audience for their active participation.

PHOTO FEATURES OF 2ND SEMINAR ON CURRENT ISSUES IN GENERAL INSURANCE



Funny Actuary

An actuary and a farmer were traveling by train. When they passed a flock of sheep in a meadow, the actuary said, "There are 1,248 sheep out there." The farmer replied, "Amazing. By chance, I know the owner, and the figure is absolutely correct. How did you count them so quickly?" The actuary answered, "Easy, I just counted the number of legs and divided by four."

- Leif Osvold



4TH CAPACITY BUILDING SEMINAR ON GENERAL INSURANCE

- Organized By: Advisory Group on General Insurance, IAI
- Venue: Hotel Sea Princess, Mumbai • Date: 19 Dec 2013

4th Capacity Building General Insurance Seminar brought together eminent speakers, actuaries and actuarial students from various corners of the country. The seminar was opened by Mehul Shah, Chair-General Insurance Advisory Group, IAI. Mr. Shah highlighted the Capacity Building Seminar as the platform for exchanging the emerging General Insurance actuarial aspects.



Mehul Shah

Session 1: Analytics at Work - For Actuaries

Speaker: R. Raghavan, CEO, IIB

In his presentation, which was delivered by R. Raghavan, CEO, IIB, enunciated the importance of analytics for the General Insurance industry. Mr. Raghavan began



R. Raghavan

by mentioning current state of the General Insurance industry. Non-life insurance has grown at rate higher than overall industrial and services growth. However, the underwriting results have largely remained negative owing to competition and price war. The savior has been the decent investment income which has kept total profitability above zero and return on capital employed attractive.

To highlight the power of analytics, Mr. Raghavan mentioned about certain projects undertaken by IIB. He stated that IIB has investigated and found that the luxury car portfolio has low gross incurred claim ratio. Further, the Premium Rates estimated for 2013-14 need to be revised only by ₹ 0.10 per mille on an average to maintain

combined ratio in Fire Portfolio below 100% with an assumed operating expenses & acquisition cost of 25-30% and an IC ratio of 70%. He concluded the speech by asserting the commitment of IIB to high quality analytics.

Session 2: Telematics

Speakers: Ankur Agrawal and Vipul Goel, Axa Business Services

The following speaker duo was Ankur Agrawal and Vipul Goel who presented on Telematics. Motor Telematics is the integrated use of telecommunications



Ankur Agrawal

and information technology for vehicles. This technology can be used to capture behavioral information to underwrite and price motor risks. The main



Vipul Goel

About the Authors



atreyee.biswas@ltinsurance.com

Atreyee Biswas is Associate from the Society of Actuaries (SOA), and is presently working with L&T General Insurance.



Gargi.Joshi@tata-aig.com

Gargi Joshi is a part of Actuarial team at Tata-AIG General Insurance Company.

products presently available include Pay as You Drive (PAYD) product which is a usage based product in which premium depends on how much vehicle is driven over a specified period and Pay How You Drive (PHYD) product which is a user behavior based product in which premium depends on how safely a vehicle is driven.

Several Telematics products and technology currently available in the international market were illustrated. As an example, Progressive in USA offers a product called Snapshot which involves using an OBD II dongle to track braking, miles driven, driving between midnight to 4am and so on.

After presenting a SWOT analysis on Motor Telematics, the speakers talked about the actuarial roles in this arena. The rating factors generated by Telematics include Speed, Mileage, Garaging, Lane Driving, Road Usage, Time of Driving, Hard Braking and so on. These can be used for initial pricing as data available while launching a new motor product is scarce. For re-pricing, a regression model can be

build around Telematics data to revise the discounting structure. Further, the possible actuarial roles could comprise product development support, driving score, portfolio, monitoring and other exploratory analysis.

On the other hand, the key challenge here is controlling the deluge of data. Telematics data records or data sets can represent approximately 5-15 MB of data annually, per customer. With a customer base of 1,00,000 vehicles, this represents more than 1 terabyte of data per year. The speakers concluded by highlighting the difficulties of introducing Telematics in India of which the key point was low average ticket size.

Session 3: Catastrophe Modeling

Speaker: Sonu Agarwal, Weather Risk Management Services Limited

Sonu Agarwal took over next, and he spoke elaborately on Catastrophe modeling which included Flood and Cyclones modeling. For Flood modeling,



Sonu Agarwal

the Rational Method was elucidated. The Rational Method is a statistical link between the frequency distribution of rainfall and runoff.

The Peak Discharge is the product of Runoff Coefficient, Rainfall Intensity and Drainage Area of no more than 300 acres. Runoff Coefficient depends on the slope and imperviousness of surface and can be derived in collaboration with hydrologists.

For Rational Method, it is assumed that a rainfall duration equal to the time of concentration results in the greatest peak discharge. The time of concentration is the time required for runoff to travel from the most distant point of the watershed to the outlet. Using these information, flood maps can be constructed which display the floodplains, more explicitly special

hazard areas and risk premium zones. These maps can be used to set rates of insurance against risk of flood and whether buildings are insurable at all against flood.

Mr. Agarwal then spoke about cyclone modeling. Wind speed and direction can be obtained using Captive WRF models. This wind speed can be used to calculate wind load and finally impact of wind load on structures.

The first procedure to calculate wind load is the static procedure which is appropriate for most low- and medium-rise buildings as well as the cladding of all buildings. The second procedure, called the dynamic procedure is applicable for primarily tall buildings and slender structures but not for cladding and secondary structural members.

Wind load is function of Exposure, Gust Factor and Pressure Coefficient.. The exposure depends on height of the building, roughness of the upwind side and altitude of the surface. Gust factors are defined as the ratio of the maximum effect of the loading to the mean effect of the load. Pressure coefficients are the non-dimensional ratios of actual wind-induced pressures on a building surface to the velocity pressure of the wind at the reference height. Then, the structural impact analysis is conducted.

Presently for risk analysis, 1 in 30 year event is considered. For excess rain or drought for some cases we can go to 1 in 100 years based on actual data. For other events/or higher VAR analysis we have to rely on Extreme loss models. As the speech ended, the audience was in agreement that actuaries had greater role to play in catastrophe modeling.

Session 4: Reinsurance Structuring and Optimization

Speaker: Hiten Kothari, Almondz Reinsurance Brokers Pvt. Ltd.



Hiten Kothari,

The first session in the second half of the day started with an introduction to Indian Reinsurance Market. Hiten gave a brief prologue about the expected reinsurance premium being ceded under Treaty and Facultative Reinsurance and a further split into proportional and non-proportional treaty RI business. The retained premiums of public and private insurance companies under different lines of businesses were discussed. A different RI structure can be observed in public and private reinsurance companies since private insurance companies either do not write big risks or have co-insurance in place.

He continued the discussion by putting forward the probable considerations by insurance companies for adopting a particular reinsurance structure. A company decides its RI structure based on its risk appetite, its risk capacity and tolerance. The decision is also affected by business objectives, peer comparison and reinsurance pricing. Hiten also discussed the various factors affecting risk retention, some of them being the company's financial strength and capacity, RI market, regulation, tradition and business mix.

The session moved on to an explanation about the different stages in the method used for optimization of proportional reinsurance such as:

Stage 1- Gross loss modeling gives a risk profile based modeling which allows for a change in risk retention appropriately.

Stage 2- Model existing RI structure and then determine the appropriate risk matrices and pricing factors.

Stage 3- Model alternate risk retentions

Stage 4- Under which the risk matrix under different structures is compared to select the risk retention that optimizes the risk matrix.

He illustrated the stages using an example showing alternate scenarios to explain the impact of profitability and capital at risk and thus economic return on capital.

Making use of statistical tools, he illustrated the reduction in volatility in underwriting results due to reinsurance and compared different RI structure for effectiveness.

The session concluded with Hiten emphasizing on the role of actuaries in the decision making process.

Session 5: New Frontiers: - A round-up of new emerging Reserving Techniques

Speaker: Debarshi Chatterjee, Head-Actuary, Tata-AIG General Insurance Company



Debarshi Chatterjee

Debarshi commenced the session by giving a brief about the evolution of reserving techniques.

The triangulation methods used for reserving do not make full use of the policy data and claims data that insurance companies have. For example, reporting delays, reserve movement of claims, ratio of outstanding to incurred amounts are not captured in the triangles. As a result of this, valuable information is lost.

He discussed two papers which use stochastic methods and make full use of the extra unused information from the data:

Paper 1-Pietro Parodi's Paper – Triangle free Reserving: A non-traditional framework for estimating reserves and reserve uncertainty – February 2013

Paper 2- Antonio and Plat's Paper- Micro-level Stochastic Reserving for General Insurance – May 2012

The **Parodi's framework** argues that in order to avoid loss of information it is necessary to adopt an approach which is similar to that used in pricing, where separate frequency and severity model are developed and then combined to produce aggregate loss distribution. He discussed in detail the steps in calculating the reserves under the Parodi's Framework. In the process, he gave out many useful pointers on calculating delay distribution, fitting various frequencies and severity distributions and GLM model to simulate IBNR and

IBNER amounts. He also explained different factors like, change in business mix, inflation and adjustments for truncating effects in reporting delays that should be considered while fitting any distribution or model. Similar method is used to estimate unexpired risk reserves distribution.

The **Antonio and Plat's** method uses simulations for number and occurrence time of IBNR claims, reporting delays for each IBNR claim and initial reserve amount from empirical distributions. Simulations are also carried out for event of payments' times and the type of event and payment. He discussed each step giving the different distributions that could be used at various steps.

In the concluding part of his session, he got the audience back to the comfort zone of triangulation method by discussing a paper by Schlemmer and Tarkowski which gives a method of estimating IBNR and IBNER separately.

Session 6: Commercial Lines (Fire) Pricing

Speaker: Manalur Sandilya, Appointed Actuary, ICICI Lombard



Manalur Sandilya

Manalur Sandilya started the last session of the day by discussing the current status of pricing of commercial lines products. Though the subject of the presentation focused on fire line of business, he also discussed the pricing of a few other lines. He used his own experience to put light on a few issues that he has come across regarding pricing of products. This session was a very interactive with many participants sharing their individual views and experiences regarding these issues.

He went on to discuss the appropriateness of different approaches currently used and those that could be adopted in the future while pricing any product. The principles of rate making were discussed. Various factors such as subsidies between risks and lines of businesses, risk sharing and risk bearing should be taken into consideration while pricing.

This was followed by a very enthused discussion on the possible pricing structures. The need for introducing sensible factors into pricing and making use of new and appropriate estimation techniques rather than keeping the tariff rates alone as the benchmark was debated over.

The seminar ended on a very inspiring note, leaving all the actuaries enthusiastic about the various topics broached and the actuarial students awed and motivated.

■■■

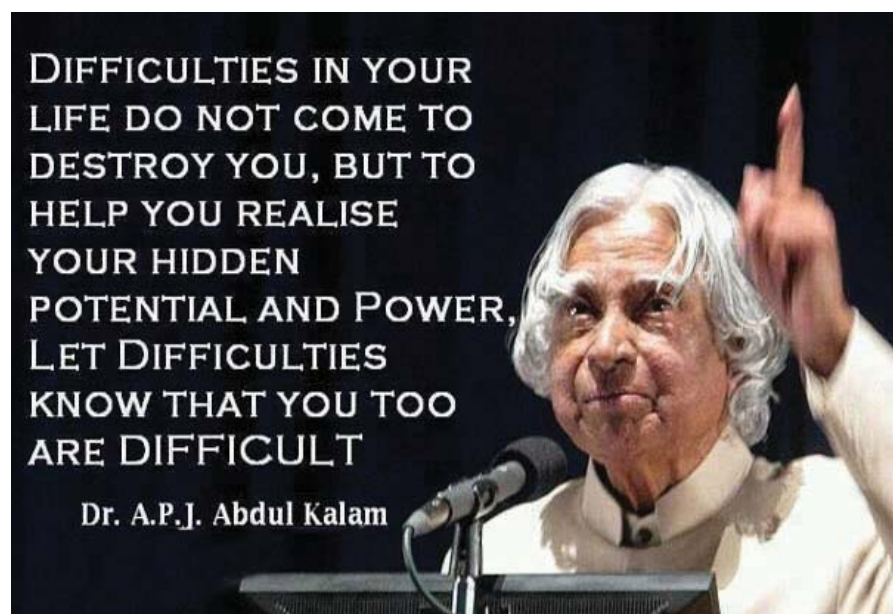


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Agriculture Insurance Company of India Ltd., (AIC) is engaged in providing Crop Insurance cover to Indian farmers against various risks so as to mitigate the losses suffered by them and to bring financial stability in their livelihood. AIC was incorporated on 20th December, 2002 and started its operations on 01.04.2003.

AIC invites applications from resident Indian Citizens for one post of "APPOINTED ACTUARY" on consultant basis.

The candidate should be a "Fellow" of Actuarial Society of India/Institute of Actuaries of India and he/she should satisfy all the requirements specified in

Regulations No. 3 sub regulations 2 of IRDA (Appointed Actuary) Regulations, 2000 & Regulation 3 of IRDA (Appointed Actuary) Regulations 2004

- Preference will be given to candidates with experience in General Insurance Industry.
- The candidate should preferably be less than 55 years of age as on 01.03.2014
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INCREASING RETENTION LIMIT OF LIFE INSURANCE COMPANIES AND CONSEQUENT IMPACT ON RISKS AND CAPITAL MANAGEMENT

[This article is a summary of the presentation made by the authors at the India Fellowship Seminar held in Mumbai in December. Shamit Gupta is a Consulting Actuary in Milliman's life insurance practice in New Delhi.]

Why do insurers reinsure their business?

To understand the impact of retention limits on the life insurance industry, it is important to understand why insurers use reinsurance. Given below are some of the drivers that lead life insurance companies to reinsure their business:

- It reduces mortality parameter risk and claims volatility, which helps them stabilize their experience. It also gives them the option to transfer unwanted or excessive risks.
- It facilitates better financial management by potentially improving capital position of the company.
- It helps manage catastrophe risk.
- To leverage reinsurer's technical expertise in the areas of product design, pricing and underwriting practices.

Factors affecting level of retention

The following factors impact selection of level of retention limits by life insurers:

- **Risk appetite:** the amount of mortality / morbidity risk that the company is willing to bear;
- **Risk limits:** the mortality / morbidity risk limits set by the company for various types of business based on the company's loss absorption capacity;
- **Risk-return trade-off:** how much return the company expects from retaining the risk v/s transferring it to the reinsurers;

- **Effect on capital position:** the impact on capital due to of transferring the risk v/s retaining it.
- **Technical expertise:** the company's gain from the reinsurer's technical expertise at the cost of transferring some of the risk.

When a company opts to increase its retention limits, it retains a higher amount of mortality / morbidity risks. This would generally lead to lower reinsurance premiums, but could potentially lead to higher claim pay-outs. Additionally, as the company retains a higher level of risk, it could also lead to higher capital requirements.

Why increase retention limits?

An insurance company might want to increase its retention limits for a number of reasons. Some of these reasons are given below:

- an increase in risk appetite of the insurer;
- the insurer's ability or desire to retain higher mortality risk;
- a reduction in the expected volatility of claims experience for the retained business;
- launching products with lower mortality / morbidity risks;
- increased confidence in the company's own experience to set assumptions;
- increased cost of reinsurance; and / or
- regulatory changes.

The regulator of a country might also want companies to increase retention limits. This may be due to the following factors:

About the Authors



shamit.gupta@milliman.com

Shamit Gupta is a Consulting Actuary in Milliman's life insurance practice in New Delhi.



ankur.goel1@genpact.com

Ankur Goel has 12+ years of experience in Life Insurance. She is associate member of IAI and working as Assistant Vice President in Genpact India.



actuary.ajai@gmail.com

Ajai Kumar Tripathi is a fellow member and has around 13+ years of experience in Life Insurance currently working with Sahara India Life Insurance.



sachin.garg@maxlifeinsurance.com

Sachin Garg works in risk management area at Max Life Insurance in Gurgaon.

- avoid 'fronting' of business by reinsurers and foster a healthy insurance business environment in the market;
- encourage development of robust in-house risk management capabilities;

- minimize counterparty risk for the insurer;
- minimize reinsurance cost for the insurer; and / or
- retain life insurance premium within the country.

Impact of increasing retention limits – micro

This section details the impact of increasing retention limits on the balance sheet and revenue account of an insurance company.

It starts by considering the impact of claims volatility on the total reinsurance premiums. If a company increases its retention limits, the reinsured business is expected to have lower number of claims due to lower exposure with higher claim sizes. Hence from the reinsurer's perspective, the reinsured business will have higher claims volatility in the frequency and size of claims. As claims volatility increases, reinsurers would tend to increase their premium rates. As a result of this, while companies would expect their total reinsurance premium to reduce as they increase their retention limits, the amount of decrease would be slower than their expectations if reinsurers were to increase their premium rates. This is illustrated in the figures given below

Other factors that might impact reinsurance premium rates and

consequently the overall premiums would include:

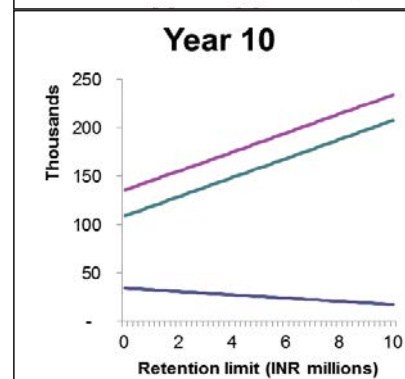
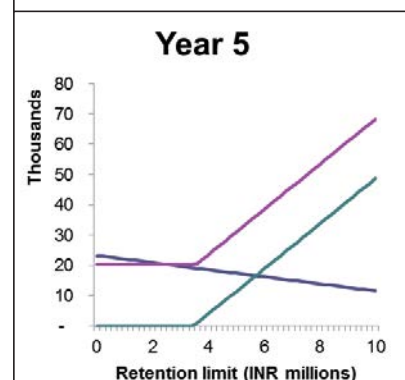
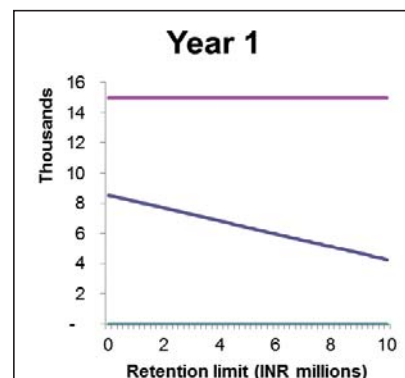
- **Fixed costs:** if the total business reinsured for a reinsurer were to reduce as a result of insurers opting for higher retention limits, it might be forced to increase premium rates in order to meet its fixed costs.
- **Improved selection:** it can be argued that at higher retention limits, which correspond to higher sums assured, the demographic characteristics exhibited by policyholders might improve significantly. This might lead reinsurance companies to decrease their premium rates.
- **Increased competition:** if a lot of life insurance companies in India were to increase their retention limits, it might lead to a reduction in the total business written by reinsurers operating in India. If this leads to increased competition, it might drive down reinsurance premiums.

It is difficult to gauge the net impact of above factors on reinsurance premiums and would depend upon the circumstances of each insurer / reinsurer.

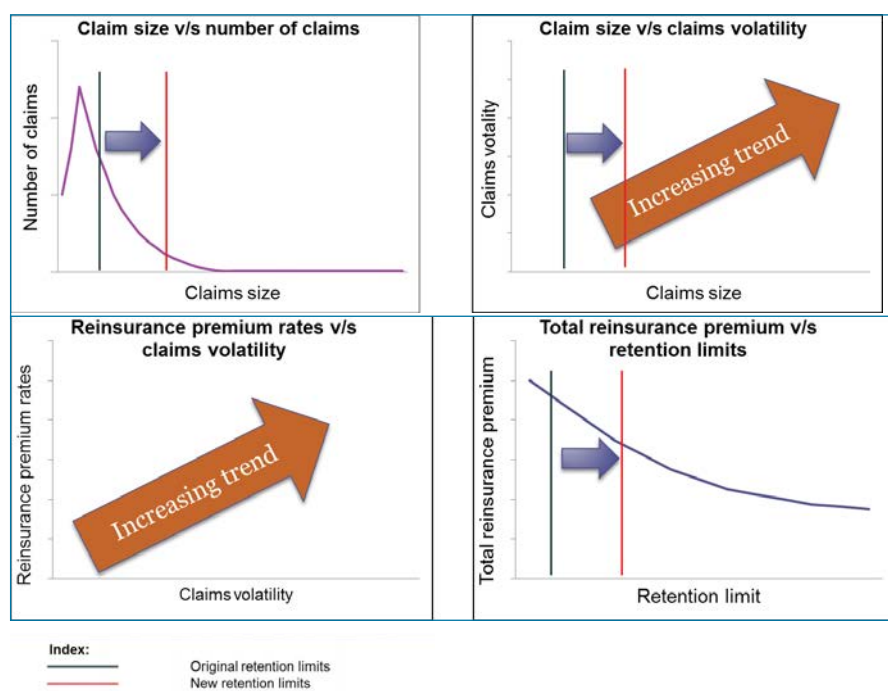
The set of graphs shown illustrate the impact on reinsurance premium (assumed to remain constant for all

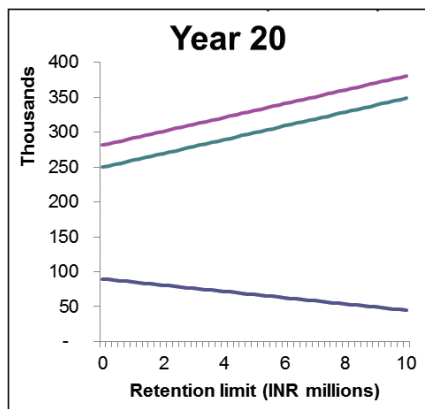
retention limits), net reserves and the sum of net reserves and solvency margin, for a model point for a term insurance policy, at various policy durations.

As the retention limit increases, the life insurance company retains a greater level of the sum assured leading to lower reinsurance premiums. It would also result in higher level of reinsurance reserves and solvency capital requirements. This impact can be seen in the graphs shown below.



Model point details	
• Age = 36	
• Gender = Male	
• Policy term = 25	
• Premium term = 25	
• Sum assured = INR2 Crores	
• Premium = INR53,800	





— Reinsurance premium
— Net reserves
— Net reserve + solvency margin

The impact of an increase in the retention limits would vary depending upon the product type. The likely impact on various product types is discussed below:

- **Protection oriented products:**
 - o If reinsurers were to discontinue the current practice of offering very attractive reinsurance rates for protection oriented business, i.e. increase their reinsurance premiums, it might lead to an upward pressure on the premium levels for such products.
 - o Increasing the retention limits would mean that the insurance company would need to retain more business of varying claim sizes including those with higher sum assured, which would add to the overall claims volatility of the insurance company. It could prompt the company to become more prudent while setting its reserves.
 - o In aggregate, increasing retention limits would lead to a higher level of reserves and solvency capital requirements. This could force the company to increase its premiums.
- **Unit-linked products:**
 - o Mortality risk is a very small portion of the overall risks in a

unit-linked product. Therefore, increasing retention limits is likely to have a very small impact on the overall risk profile of such products. There might be a very small impact on the reserves and solvency capital held by insurance companies. Also, some companies might vary their mortality charges, although, this seems highly unlikely given that most life insurance companies already have healthy margins built into their mortality rates.

- **Participating / non-participating products:**
 - o Again, mortality risk is a small proportion of the overall risk profile of such products. Increasing the retention limits would therefore have a small impact on the overall risk profile of an insurance company. It might have a small impact on the reserves and solvency capital requirements of insurance companies. Insurers are unlikely to re-price their products as the profitability of such products would not be impacted much.

It is important to note here that, in other markets, where economic capital has been implemented, there might be a significant impact on the solvency capital requirements for protections business, given increased claims volatility.

Impact of increasing retention limits – macro

The section discusses the macro level impact of increasing retention limits on life insurers and reinsurers. Increasing retention limits would have an impact on the risks faced by life insurance companies as it:

- may lead to increased parameter risk;
- may lead to increased claim size / claim volatility risk;
- might reduce counterparty risk arising from the reinsurance arrangement;

- might lead to increased premium levels, which might lead to marketing risk;
- might reduce operational risk as lower number of policies will get reinsured or increase operational risk due to the larger number of reinsurance arrangements to be managed;
- might require an increase in risk tolerances / limits;
- might reduce the company's risk mitigation options; and
- might increase liquidity risks if there is an increase in capital requirements.

Increasing retention limits would have an impact on the products offered by an insurance company. The impact would depend largely on the type of product being offered. The impact on product development is discussed below:

- protection oriented products will most likely need to be re-priced;
- other products (ULIP charges / savings oriented products) might need to re-price;
- reinsurers might be less inclined to provide other types of support especially technical, such as support in setting assumptions;
- it might limit innovation in product development;
- if claims volatility is impacted, it might lead to higher valuation MADs;
- underwriting might become more stringent at the inception and claims stage;
- there might be more exclusions in the terms and conditions of the product; and
- if the company prices a larger proportion of the mortality / morbidity risk, the price might be more realistic than if the reinsurer prices the same risk.

Increasing retention limits would also impact the capital requirements for life insurers. The potential impact on capital management for life insurance

companies could include the following:

- it may lead to an increase in reserves and solvency capital requirements, especially for protection business;
- it might lead to a reduced solvency ratio, with potential consequences for smaller companies;
- it might lead to modifications to the risk appetite / limits / reallocation of economic capital;
- it may result in increased cost of capital;
- it could lead to fluctuation in dividends to shareholders; and
- in extreme circumstances, it might lead to capital infusion.

The impact on risks, products and capital management listed above, could lead to companies altering their business strategies. Life insurance companies might undertake some of the following activities as a result of the increased retention limits:

- they might need to set business volume limits on some kinds of products, mainly protection oriented products;
- they might need to alter their distribution channel strategy (such as online selling); and
- if reinsurers reduce their technical support, they might be less inclined to enter new markets or introduce niche products for which they don't have prior experience.

Increasing retention limits would largely have negative impact on reinsurance companies. The reinsurance companies would be impacted in the following ways:

- the total reinsurance premiums of the companies would be reduced;
- it might impact the reinsurance rates offered by the reinsurer;
- lower premiums might make it difficult for reinsurers to meet their fixed costs;

- it might lead to some reinsurers possibly cease operation in the country;
- if the number of reinsurers reduce, there might be lesser competition amongst the existing reinsurers resulting into higher reinsurance premiums; and
- it might act as a deterrent for new reinsurers seeking to enter the market.

In summary, increasing retention limits could have an impact on risk and capital management for life insurance companies, especially smaller companies and those writing protection oriented business. It will also significantly impact the business of reinsurance companies operating in the country. The impact would depend upon the exact circumstances and capital position of the company.

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ASSETS AND LIABILITY MANAGEMENT IN THE INDIAN CONTEXT

There is a turnaround in the product mix portfolios in the Indian Life industry from 80% Unit Linked and 20% Traditional in late 2000 to 75% Traditional and 25% unit linked in recent past due to distribution reward constraints in selling linked business. This has led to increasing attention on managing the interest rate risk while selling guaranteed maturity payout traditional products. The risks in such products stem out from fall in the future interest rate.

The interest rate risk is managed through assets and liability management ("ALM") by matching duration of assets and liability. However, there is a difficulty in calculating the duration of liability in regular premium products because sign of liability cash flows (Premium minus outgo) remain positive in initial years and later become negative. This happens because premium is level whereas the outgoes are increasing due to age resulting into positive liability cash flows in initial years and as outgoes increases over premium in later years, liability cash flows become negative leading to non-sensical value of liability duration. For example a product of term 20 years, may have duration 50 years or so during initial years. The assets on the other hand are of shorter duration of say 10 years which are backing the liabilities. The problem is, it is impossible to match the duration of liability with the duration of assets during these initial years.

This is a perennial problem prevalent in all long term regular premium paying life insurance products (and world round) mainly resulting from the definition of the duration. The purpose of duration matching is to purchase the assets of similar interest rate sensitivity as liability so that when interest rate changes, their value moves in same direction and in same quantity. This can

be achieved through altering the definition of duration and yet achieving the purpose thereby enabling an objective way of purchasing the assets to back liability.

The duration definition is

$D = -(1/P) \cdot (\Delta P/\Delta i)$, where P is the price of the asset and i is the interest rate.

$(\Delta P/\Delta i)$ is change in the price of assets (or liability) with the change in the interest rate. When this change in price is divided by P, it gives the percentage change per unit value of assets (or liability).

In life insurance regular premium paying products, the problem in duration number comes out due to dividing "change in price" by P. It is the P that creates the problem.

This happens because liability cash flows in initial years are negative followed by positive cash flows, when these cash flows are discounted and added to calculate the value of P, it gives a smaller value of P compared to $(\Delta P/\Delta i)$ and when divided, it gives inflated value of duration (divided by smaller value). This happens till the time the liability cash flows changes its sign. After this change in the sign of liability cash flows, duration value becomes sensible. Till the time the Company has mature portfolio; writing new business would cause change in sign of liability cash flows and duration calculation would be tricky.

The objective of managing the interest rate risk can be achieved by just concentrating on $(\Delta P/\Delta i)$ and not dividing by P.

The objective is achieved, if following equality can be reached

$\Delta A/\Delta i = \Delta L/\Delta i$, Where A is the Assets and L is Liability cash flows.

This is equivalent to

$$\sum t A_t v^t = \sum t L_t v^t v = 1/(1+i)$$

About the Author



Sonjai.kumar@avivaindia.com

Sonjai is working in Aviva India Life Insurance as a Head- Insurance and Financial risk in a Risk Team.

The values of both side of the equation are sensible. This equation provides an "objective" way in allowing life companies purchasing assets so that left hand side of the equation comes in close proximity to right hand side of the equation.

The right hand side of the equation has a fixed value at each time as all the variables are known on the date of valuation, the key challenge in finding the assets because assets term run for shorter length compared to liability term, for example under whole life product, t' runs would run to 100 years whereas t for assets would runs to 30 to 40 years depending upon the availability of assets.

There are two key elements that that need attention that may bring the sensitivity of assets close to the sensitivity of liability, they are

- "Timing" of Cash flows of coupons and redemptions
- "Amount" of coupons and redemptions

This boils down to two variable problems with one equation to identify the timing and the amount. This can be done on trial and error basis by pushing the coupon and redemptions to an optimum distance from origin so that the value to LHS of the equation could be maximized to achieve RHS. The "Optimum distance" is important because by too far pushing the assets, the discounting effect would nullify their effect.

A typical life company may have following first derivative of assets and liability on base assets CFs and revised assets cash flows as shown below.

Year	Assets CFs	Sum (At*t*Vt) (Cr)	Sum (Lt*t*Vt) (Cr)	Gap	Revised Assets CFs	Sum (At*t*Vt) (Cr)	Sum (Lt*t*Vt) (Cr)	Gap
1	1,300	9,520	15,658	6,138	0	10,566	15,658	5,092
2	800				0			
3	750				0			
4	740				0			
5	750				750			
6	850				850			
7	950				950			
8	1,000				1,000			
9	900				900			
10	750				1,490			
11	700				1,450			
12	800				1,600			
13	1,000				2,300			
14	800				800			
15	1,000				1,000			
16	650				650			
17	1,000				1,000			
18	1,500				1,500			
19	1,000				1,000			
20	400				400			
21	450				450			
22	400				400			
23	550				550			
24	1,000				1,000			
25	300				300			
26	300				300			
27	1,500				1,500			
28	250				250			
29	2,000				2,000			
30	850				850			

This example illustrates that the timing and amount of cash flows are important in managing the interest rate risk using first derivative.

The gap between the first derivative of assets and liability reduces by around Rs1000 Cr when the assets from the first four years were pushed to 10th to 13th year. On pushing the assets farther than this, the impact on the gap reduces due to discounting effect (Optimum distance). This suggests that the realignment of assets based on first derivative of assets and liability helps in bringing the assets sensitivity nearer to liability sensitivity. This method would also help in setting purchasing philosophy of future assets from future increase in reserves.

If Company has surplus assets say Rs.1000 Cr in this example, and can invest for 13 years would reduce the gap totally.

So in place of duration, first derivative of assets and liability may be used in addressing the ALM problem.

Challenges with Other Methods

- Other method to manage interest rate risk are performed by projecting the assets and liability cash flows; this method presents two challenges, one is, it does not provide an "objectivity way" in measuring level of matching or mismatching between assets and liability apart from visual realization as there is a no way to quantification. Also as

new business keep pouring in, the method would give no idea how the efforts of risk management is bearing fruits as the gap between the assets and liability cash flows will keep on widening. The second challenge is, as the future premium is not yet received it is impossible to judge the level of assets and liability matching.

- To calculate the duration of liability as a sensible number; may move the premium into assets side so that liability cash flow are of same sign. Though this helps in calculating a sensible value of duration of liability, however as the duration of premium is shorter than the liability duration which pulls down the overall duration of assets making difficult to do duration matching of assets and liability.

So in summary,

- Duration of liability under regular premium traditional products does not give sensible value.
- The duration definition can be changed in managing the assets and liability matching as the purpose is managing the sensitivity of assets and liability with respect to interest rate.
- Using the first derivative of assets and liability provide a objective way in addressing the ALM problem which is otherwise deterred by absurd value of liability duration.
- The method can be used in deciding the assets purchasing philosophy based on sensitivity of liability to interest rate.
- The timing and value of coupons and redemptions amount can be adjusted to optimize its value.
- Other methods such as assets and liability cash flows projections or moving premium into assets side may be used but has challenges.

**Happiness is not something you postpone for the future;
it is something you design for the present.**

- Jim Rohn



REPORT

THE 17TH EAST ASIAN ACTUARIAL CONGRESS, A REPORT

• Organized By: Singapore Actuarial Society

• Venue: Resorts World Sentosa, Singapore • Date: October 15- 18, 2013

Introduction : The East Asian Actuarial Congress (EAAC) is a forum for actuaries across 12 actuarial institutes across the Asia-Pacific region, to get together and exchange ideas and information on all kinds of actuarial subjects. It is one of the largest events for the actuarial profession in Asia. The member institutes are listed below.

- Australia • China • Hong Kong • India • Indonesia • Japan • Korea • Malaysia
- Philippines • Singapore • Chinese Taipei • Thailand

The first EAAC was held in 1981. Since then, various member countries have had the opportunity to host the event.

The 17th EAAC was organized by the Singapore Actuarial Society and was held in Singapore from October 15 to October 18, 2013. The main theme for the 2013 event was "Redefining Risk, Creating Value", a headline, which in the organizers' opinion, was appropriate for what is turning out to be a challenging time for the Asian insurance industry. In this backdrop, the focus of the sessions was on the role that actuaries will have to play in mitigation measures to cope with the dynamic business environment, in particular, coping with:

1. shrinking profit margins,
2. the enhancement of risk management practices and frameworks at insurance companies, and
3. enabling management to take strategic decisions through actuarial analyses and business acumen.

The first day of the conference was dedicated to the registration of delegates, the executive board meeting, a meeting of contributors, and a welcome reception. The various plenary and parallel sessions began from October 16, 2013.

The various plenary and parallel sessions began from the second day with the opening ceremony, with welcoming remarks from Mr. Wil Chong, the President of the 17th EAAC. Mr. Chong welcomed all delegates, in particular the newest member, the China Actuarial Association, and set the stage for the events by talking about the theme of the conference. Mr. Chong also thanked the representatives from all the member actuarial associations for their support towards the event. Mr. M. Karunanidhi represented the Institute of Actuaries of India at the conference.

Opening Address

The opening address at the 17th EAAC

was delivered by Mr. Lee Boon Ngiap, the Assistant Managing Director, Monetary Authority of Singapore. Mr. Ngiap spoke about the role of the actuarial profession in the prevailing dynamic and risky environment. He touched on various themes relevant to the profession, the prominent among them being:

1. the increase in the risks to which businesses are exposed and the profession's role in increasing management awareness, quantification as well as mitigation of risk,
2. the emerging responsibilities of actuaries, in developing better stress tests on companies' balance sheets and a robust ERM framework for the industry. He said that surveys had demonstrated that better ERM practices contributed to a better quality of business.
3. the development of risk based capital frameworks. In this context, he spoke about the need for the development of a global capital standard. He referred the audience to the work done by the International Association of Insurance Supervisors (IAIS) in this area.
4. Contribution towards the evolution of a "macro" prudential policy and surveillance systems to identify, assess and monitor systemic risks.

Keynote speech

The keynote speech at the conference was made on the opening day by Professor Robert L Brown, President Elect, International Actuarial Association (IAA). The theme of his address was "Impact of ageing populations – he search for stability". Professor Brown illustrated the theme by referring to the following research studies in his session.

1. A study of the impact of the ageing population in Singapore, focusing on the factors underling the decline in the

About the Author



balaji.bajirao@gmail.com

Balaji Ravi is a member of the IAI. He is the Head of Actuarial at Prudential (Cambodia) Life Assurance PLC.

working population in the country. The trends for the "baby boomer" and the "echo" cohorts and the impact of their retirement were presented. The policy responses of the government, for example their "pro family" initiatives were described.

2. A paper by the Boston Consulting Group on ageing of populations around the world, leading to a fall in working populations and an impact on GDP growth. The example of Japan, where the projected dependency ratios are expected to be 1.4:1 as compared to 4:1 for the rest of the world was given. Another example was of the situation in China, where the consequences of population control measures on the projections of working population were examined.

3. A study by the Canadian Institute of Actuaries (CIA) on the retirement age and dependency ratios in Canada. Clearly, this is a big concern for governments. The impact of this on policy measures to manage emerging pension liabilities, and the funding of pension schemes was discussed.

CEO Panel

One of the most informative and insightful discussion at the conference was held during the CEO panel. The members of the panel were Mr. Karl Heinz Jung of Allianz SE Reinsurance, Mr. David Fried of QBE Insurance and Dr Khao Kah Siang of Great Eastern Life. There was a candid discussion on a wide range of topics. One of these was "what keeps us up at night". The top reasons on which the panelists in agreement are given below:

1. Regulatory uncertainty – in particular they spoke about regulatory developments across the Asian region.
2. The growing emphasis on the regulation of the sales process. The examples quoted were: Australia (Future of Financial Advice - FOFA), Singapore (Financial Advisory Industry Review - FAIR) and the United Kingdom (Retail Distribution Review - RDR).

3. Political uncertainty in the United States, and its impact on global markets.
4. The lingering financial crisis in the European Union.
5. Capital calculation and its allocation to business – this included a discussion on the global developments in ERM, ORSA and RBC 2.
6. Continuous monitoring of which businesses to stay in.
7. The identification, motivation and retention of local talent.
8. Redefining roles in line with new developments in the industry.
9. Quantification of catastrophe risk in light of events like the floods in Thailand. They felt that in light of the increased risk, actuaries need to take a closer look at data, and use their understanding of the contract to build buffers into the assumptions used to value the liability and capital requirements.

Their advice to the actuaries at the conference was to become "futurists". They also recommended the actuarial staff to not be bystanders in the business, but to become involved and understand the sales process. Continuing with this theme, they stressed on the need for actuaries to demystify the numbers and become real business partners. They felt that actuaries are in a key position to help management adopt a strategic approach to risk and its management and mitigation.

Parallel Sessions

Apart from the plenary sessions mentioned above, there were a number of parallel sessions. These sessions were centred around four key themes. These are listed below.

1. Life Insurance

- a. Variable annuities: risk management in emerging markets
- b. Resources and environment: A new challenge for actuaries
- c. Dynamic asset liability Management in today's complex economic development
- d. Catastrophic mortality bonds – and effective hedge?
- e. Dangers of reviewable products
- f. Behavioural economics
- g. Numerical impact study of bonus distribution on default
- h. Key global product trends
- i. Art of integration
- j. Actuarial models for takaful
- k. Coping with longevity risk within retirement provision in Singapore
- l. Participating insurance in China

2. General Insurance

- a. Empowering non-life actuaries in Asia
- b. The science and art of CAT modeling – a case study of the Thailand flood
- c. Ratios: are standard comparisons appropriate?
- d. Actuarial values of housing markets
- e. Lessons learned from the crop insurance program in Korea
- f. Professional and management liability in Asia
- g. Succeeding in the rapidly changing personal lines in Asian markets

3. Health Insurance

- a. Using RI as an alternative capital market funding solution in health insurance securitization
- b. Managing the volatility of the health portfolio
- c. Cancer: changing landscape in Asia
- d. An actuarial model for hospitalization insurance with limited benefit: cancer impaired risk
- e. Strategies for the management of the monthly medical insurance valuation process

4. Risk Management

- a. Risk management: a cultural challenge
- b. Recent development in solvency regulation in Asia
- c. Yardstick for ERM: risk appetite
- d. The ORSA process in action
- e. Diversification benefit working party
- f. Managing and measuring operational risk for insurance companies in Asia
- g. ORSA requirements and its key building blocks
- h. ORSA – modeling, scenarios and embedding
- i. Quantitative tools for risk management – stress testing and beyond
- j. Operational risk modeling: current approached and new frontiers
- k. Economic capital (EC) – framework and implementation challenges
- l. Stochastic loss reserving for capital management of general insurance: a Gaussian approach

Other Sessions

Apart from the various plenary and parallel sessions, some sessions on the conference aimed at getting the audience to know other actuarial bodies from around the world, as well as their work in the area of improving the standards of the profession. Some of these are discussed below

1. An introduction to the Institute and Faculty of Actuaries (IFOA), by Ms. Wen Li. This was an introduction to the institute

for geographies where the Institute does not have a footprint.

1. International Congress of Actuaries (ICA), 2014. This session was chaired by Mr. Bob Conger, the president of the Organising Committee of ICA 2014, to be held in Washington DC from March 30 to April 4, 2014.

2. Society of Actuaries - mortality studies. The support provided by the SOA to its members in the development of experience studies was described in this session.

3. China delegate address. The China Association of Actuaries (CAA) is the latest entrant to the EAAC, having joined for this event. Mr. John Zhang Yuan Han of the CAA introduced the association to the delegates.

Closing Ceremony

The organisers of the 17th EAAC disclosed that this was the biggest event of the association to date. 623 delegates from various countries and organisations registered to participate at the conference.

The presentation on "Catastrophic mortality bonds – an effective hedge?" was adjudged the best presentation on the conference.

The 17th EAAC concluded on the 18th of October, 2013 with the closing ceremony and a farewell gala dinner. The organizing committee received tokens of appreciation from the actuarial fraternity. The organising committee of the 18th EAAC, to be held in Taipei, were introduced.

Conclusion

The sessions were well attended and saw active participation from the delegates. The key take-aways for actuaries attending the conference were as given below.

1. An awareness of the latest developments in markets for insurance across the Asia Pacific region.
2. Emerging regulations in the business.
3. Technical discussions on
 - a. the management of life insurance companies,
 - b. the identification, quantification and mitigation of risk to all types of contracts,
 - c. the management of guarantees in the business,
 - d. modeling approaches, be they deterministic, stochastic or dynamic,
 - e. hedging strategies and their effectiveness and
 - f. mitigating risks in product design, etc.
4. Insightful discussions on a range of trending actuarial topics.
5. Professional and career advice from senior actuaries.



INTRODUCTION TO DURATION

If you own bonds or have money in a bond fund, there is a number you should know. It is called duration. However, owing to the complexity of the topic, it is important for investors to gain a thorough understanding of duration and how it can be used to help assess the appropriateness of a security within an overall portfolio.

The basic concept of bond duration was derived by Frederick Macaulay in 1938. Notably, the original purpose of duration was as a superior measure of the time pattern of bond flows compared to term to maturity which is the typical measure. Although, the concept was accepted but it was ignored until it was rediscovered in 1960s when it was identified as measure of price volatility due to interest rate changes. As a result some authors also suggested duration to be used as a proxy for risk.

Since duration is basically a measure of the time pattern of returns from an earning asset, there is no reason its use must be limited to bonds. Therefore, it could be applied to common stock as well. Therefore, over time the following uses have been suggested for duration:

- Superior measure of the time flow of bond/ common stocks returns
- An excellent indicator of the expected price volatility for a bond for given changes in market interest rates
- A means whereby a bond portfolio can be immunized against changes in market interest rates
- Assuming duration is a good proxy for risk, the concept has been used to derive a bond market line and therefore to evaluate bond portfolio performance

Duration as a Time Flow Measure of Returns

Clearly the most well-known and popular measure of the time flow of returns is term to maturity. The problem is that this measure ignores the amount and timing of all cash flows except the

final payment.

Payback Period as a technique fails to take into account the time value of money and any cash flows beyond the project date. It is used by many firms as a coarse filter for projects.

Discounted Payback although does take into account the time value of money but it is still possible for projects with highly negative terminal cash flows to appear attractive because of their initial favorable cash flows. Conversely, discounted payback may lead a project to be discarded that has highly favorable cash flows after the payback date.

Duration captures both the time value of money and the whole of the cash flows of a project. It is also a measure which can be used across projects to indicate when the bulk of the project value will be captured.

Macaulay's Duration

Macaulay's duration measures the weighted average time until cash flow payment. The weights are the present values of the cash flows themselves. The formula for duration follows:

$$Duration = \frac{\sum_{t=1}^N \frac{tC_t}{(1+i_t)^t} + \frac{nR_n}{(1+i_n)^n}}{\sum_{t=1}^N \frac{C_t}{(1+i_t)^t} + \frac{R_n}{(1+i_n)^n}}$$

where, C_t = Cash Flow at time,

R_n = Redemption Payment

i_t = Yield of the bonds, N = Temp to Maturity

In other words, a measurement of how long, in years, it takes for the price of a bond to be repaid by its internal cash flows. Some useful insights can be drawn by examining the formula. For example, consider a zero-coupon bond.

About the Author



Adnan.Zafar@towerswatson.com

Adnan Zafar is a student member of IAI and is working as an analyst in P&C team at Towers Watson

For a zerocoupon bond, all of the C_t 's are zero, except for the final R_n payment, and the formula reduces to:

$$Duration_{ZCB} = \frac{\frac{nR_n}{(1+i_n)^n}}{\frac{R_n}{(1+i_n)^n}} = n$$

Hence, the duration of a zero coupon bond is equal to its term to maturity.

Let's look at the concept of duration from a different viewpoint. Figure 1 shows the cash flows of a sevenyear bond: The shaded area of each cash flow represents the present value of that cash flow. We can view Figure 1 as a series of containers resting on a board or seesaw. The capacity of each container is the nominal amount of the cash flow to be received at that time, and each is filled to the present value of its cash flow. The distance between the centers of each cash flow container represents the amount of time between the cash flows. Thus, horizontal distance is actually a measure of time.

If an investor was evaluating the "bond" on a coupon date, the first container would be placed one full period from the investor, the second two periods, etc. The duration would be the distance from the investor to the point at which we could place a fulcrum and balance the whole system.

Thus, the duration of this seven year annual pay bond is approximately 5 years. Placing a zero coupon bond on this see-saw would clearly show that the duration of a zero-coupon bond is equal

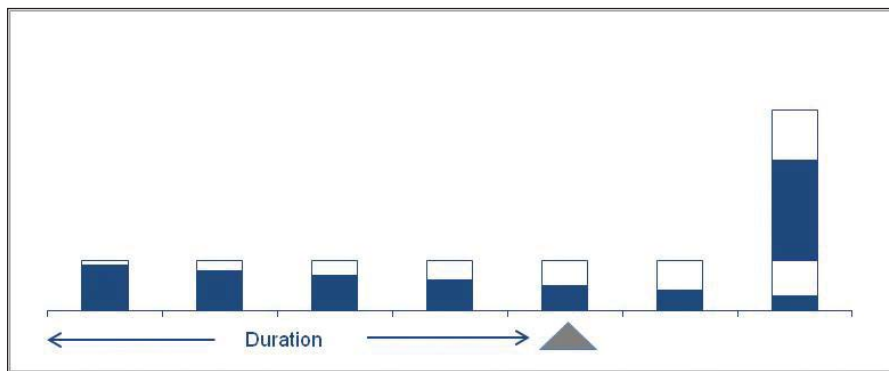


Figure1 : Cash Flow a 7 year bond resting on a see-saw

to it term to maturity. Because there is only one cash flow the balance point must lie at that cash flow.

Factors Affecting Duration

Let us have a look at how various factors affect duration. We can refer to Figure 1 while considering these factors.

Yield to Maturity (parallel shift in yield curve): As the yield increases the present values of the cash flows decrease with intensity proportional to the time of payment of each cash flow. Hence, the farther the cash flow on the see-saw the more is the decrease. As a result, the early cash flows would have a greater weight relative to the later cash flows, and the fulcrum would have to be moved to the left (shorter duration) to keep the system in balance.

Another interpretation would be that an increase in yield causes an increased rate of cash flow, and hence the true cost would be recovered earlier. Hence, duration decreases.

Coupon Frequency: Increase in coupon frequency increases the rate of cash flow and hence the true cost would be recovered earlier. Hence, the duration would decrease.

Referring to the see-saw, if the coupon frequency was doubled, each container would be split into two and one of the two parts would be placed one half-period earlier. This would cause a shift of weight to the left (present value would increase) and fulcrum will move to the left decreasing the duration.

Time: Referring to the see-saw, as the term increases, on one hand an extra coupon payment (weight) is introduced and on the other the present value of

the redemption payment decreases as it moves farther away. As a result of this domino effect the duration increases with increasing term but by less and less for each additional term.

In reality however, duration exhibits a saw-toothed time pattern. As each day passes by (immediately after a coupon payment has been made) the duration decreases proportionally with time. This can be imagined by moving the entire see-saw one day towards the left. Though the relative position of cash flows does not change but the fulcrum has now moved one day closer to the point $t=0$. This pattern is observed until the next coupon payment approaches.

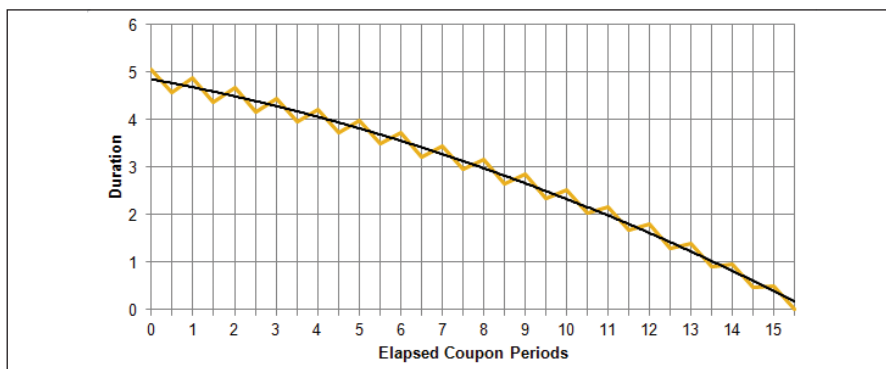


Figure2 : Saw toothed time pattern of duration

On the next coupon date, that coupon (on the imaginary see-saw) is discarded (as it has now been paid). As a result the weight on the right side of the see-saw increases and the balance point moves to the right almost by the same amount as elapsed coupon period.

For a semi-annual coupon bond, for example, the proportion of a period, from the day before a coupon date to the coupon date, is $1/180 = 0.00556$ for a 360-day year. For bonds with practically relevant coupon rates, the corresponding current yields do exceed $0.00556 =$

0.556% by some wide margins. Thus, in practice, we can normally expect an upward jump in duration, from the day before a coupon date to the coupon date.

Modified Duration

Modified duration builds on Macaulay duration to measure the responsiveness of a bond's price to interest rate changes. It is reflected as the percentage change in price for a 100 basis point change in interest rates. The specific relationship is:

$$\Delta \text{Bond Price} = -D * (\Delta r)$$

where, ΔPrice = percent change in price for the bond, D = modified duration, Δr = change in the market yield in basis points divided by 100 (e.g., a 50 basis point decline would be -0.5). The modified duration in the expression above is derived from Macaulay's duration.

$$\text{Duration}_{\text{Modified}} = \frac{\text{Duration}_{\text{Macaulay's}}}{1 + r}$$

How to use Duration

Generally, the higher a bond's duration, the more its price will fall as interest rates rise, because when rates go up bond prices fall and vice-versa. If an investor

expects interest rates to fall during the course of time the bond is held, a bond with a longer duration would be appealing because the bond's price would increase more than comparable bonds with shorter duration.

Duration's Relation to Interest Rate and Price

Duration	Interest Rate Change	Approx. Bond Price Change
5 years	+1%	-5%
5 years	-1%	+5%

Risk-averse investors, or those concerned about wide fluctuations in the principal values of their bond holdings, should consider a bond fund with a very short duration. Investors who are more comfortable with these fluctuations, or who are confident that interest rates will fall, should look for a longer duration.

It can be an extremely useful tool for building client portfolios and managing risk. As a portfolio manager's interest rate outlook changes, he can adjust the portfolio duration (weighted average of individual securities duration with market values as weights) to coincide with the forecast.

These adjustments can be either for the portfolio as a whole or for a particular sector within a portfolio. The duration can be altered according to the speculations on the interest rate. It can also be moved closer to zero to minimize the negative effect on prices.

In contrast to the more typical "positive" duration, a negative duration strategy can be employed by a manager with a very high conviction that the interest rates will rise to both protect the portfolio and potentially enhance returns. A portfolio with negative duration will increase in value when interest rates rise, barring other impacts.

The Insurance Perspective

It is hard to generalize about the insurance sector as whole, as individual companies have different mixes of asset and liabilities, and operate in different environments, so that the implications of interest rate sensitivity would differ from company to company. That said, a distinction can be made between life and non-life insurers, with adverse effects more likely to arise for life as compared to non-life insurance companies.

Mostly non-life insurance contracts are rather short term, extending over one year (although they are typically tactically renewed), with payouts for short-tailed risks expected to be paid in the short to medium term.

By contrast, life insurance companies have more long-term liabilities, which could stretch even over several decades. Additionally, they may have explicit return guarantees, such as guaranteed interest rate returns, guaranteed minimum income (annuity) streams or other guarantees that could be difficult to fulfill in an environment of protracted low interest rates on government bonds and stagnating or deteriorating capital market valuations.

As a result of these differences, the duration of liabilities of life versus non-life insurance companies differs and so does their investment portfolios. As a consequence of the structure of their liabilities, life insurance companies tend to invest in longer duration assets than non-life insurance companies.

The structure of non-life insurance liabilities will also affect interest rate sensitivity. Non-life insurers with short tailed liabilities can be expected to have lower interest rate sensitivity than insurers with longer-tailed risks, whose claims would be paid further into the future. Overall, in comparison with life insurers, one would expect non-life insurers to have a smaller negative duration gap; therefore, they would be less affected by drop in interest rates.

However, there are exceptions to this general observation for particular companies. This is because irrespective of asset-liability matching, an investor would always yearn for higher returns. This is exactly how insurers with short termed liabilities tend to invest in longer duration high yielding bonds and become susceptible to interest rate and risk.

Limitations of Duration

While duration can be an extremely useful analytical tool, it has its own drawbacks and limitations.

- It is not a complete measure of bond risk. For example, duration does not tell you anything about the credit

quality of a bond or bond fund. This can be particularly important with lower rated securities (such as high yield bonds), which tend to react as much, if not more, to investor's concerns about the stability of the issuing company as they do to changes in interest rates.

- Another limitation to using duration when evaluating a bond fund is that a fund's average duration may change as the bonds within the portfolio mature and interest rates change. So the duration at the time of purchase may not be accurate after the fund's holdings have been adjusted.
- Duration assumes a linear relationship between bond prices and changes in interest rates, which is not always true in cases of significant changes in interest rates. In order to compensate for this incongruity, the concept of convexity was developed. Convexity measures the rate of change in duration, thereby fully accounting for the dynamic relationship between price and rate.

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I can't change the direction of the wind,
but I can adjust my sails to always reach my destination.

- Jimmy Dean



INFLATION: A COMMON MAN'S VIEW

What is inflation really? In economic terms, **inflation** refers to an increase in the general price level of goods as well as services in a particular economy over a span of time. Due to a rise in price level, each currency unit has the power to purchase less goods and services. In other words, inflation results in eroding of money's purchasing power.

A universal thought regarding inflation is that it is the result of money supply increasing at a faster pace in comparison to the economic growth rate as well as it creates the situation of more demand of goods and products than supply.

But if we asked a common man about what is inflation then the answer would be quite different. He would not know the economical or industrial terms but he/she would be able to tell us in the layman's terms that inflation is something that is eating into their pockets and sucking up almost all that they are earning.

Causes of inflation: As said above, inflation is caused by large flow of supply of money in the market. Many economists say that the main cause of high rise in inflation is that money supply in the market grows more than the economic growth and that the effect of it has to be borne by everybody (even those who are not working/earning by choice and the ones that are willing to work but are unemployed).

That way, it can be said that the effect of inflation falls gruesomely on the uneven people (common man) depending upon the incomes they earn. So, the effect of inflation is more negative than positive.

Now coming back to the common man's view of inflation. In the survey that I conducted, about a 100 people participated in which 33% of the sample population who participated were women and rest 67% were men; with their ages ranging from 25-76 (inclusive). Their educational qualification ranged

from "never going to school to some having done only graduation to some having completed their further studies like M. tech/PhD/MBA etc... Therefore, from college professors to businessmen to retired pensioners, junior researchers to cobblers, shopkeepers, house maids, security guards and last but not the least servicemen, everyone came up with their own share of difficulties and viewpoints. The participants were asked a series of questions about the national issue Inflation in which several life style related questions, what effects Inflation has had on their lives since past three years and how well are they coping with were asked.

Their income group, consumption, savings and other details are provided via the charts below.

About the Author



suruchiverma.india@gmsil.com

Suruchi Verma is a student member of IAI and currently in final year of graduation.

people that participated in the survey conducted. (Income in 1000s)

»Our data (chart 1 & 2 combined) shows

Income	Own house	Loans	Insured
Below 15	23	5	7
15-25	33.333	41	33.333
25-50	70	60	47
Above 50	75	64	72

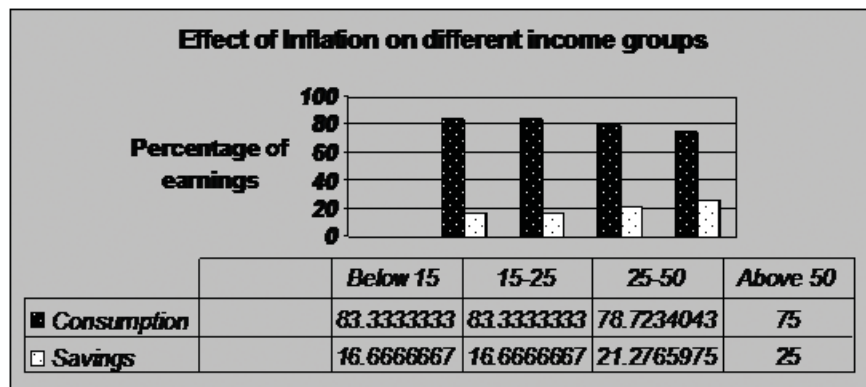


Chart 1

Here, the box part (below 15, 15-25, 25-50, above 50) denotes the different categories of income groups of different

us that the **Income group below 15 (k)** consume about 83% and their marginal propensity to save up is approximately

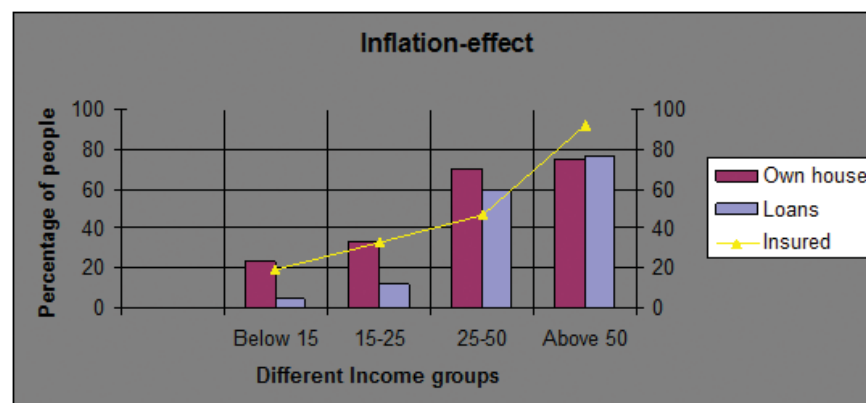


Chart 2

17% out of their earnings. 23% of people in this group live in their own houses, 5% have loan liability on them and 7% of them have insurance policy taken. Maximum numbers of people in this group own no vehicle, some a bicycle and very few own a motorbike and rarely anyone owns a car. When asked about what expenses have they avoided lately to keep up with the rising prices to which most answered to having cut costs on their clothing and eating habits. About expanding their money, 98% said that they are consuming all that they are earning leaving about not much to save or expand as the inflation has left a big hole in their pockets. According to this group, the maximum hiked commodity for them was vegetables (grocery).

The **income group ranging from 15-25 (k)** albeit shows the same percentage about its consumption and savings but when it comes to owning their own houses, the figure moves up to about 33%. 41% have loan liability and approximately 33% people are insured. In this particular group, most people own a motorbike or scooty, and many own cars. These people have confessed to have cut their costs on traveling or outing and opted for a sober living style. Food inflation have let them to cook less costly food items at home meaning costly dishes are slowly being reduced for cooking in middle class households. They either choose to invest in bank FDs or shares or in gold (women) for expansion of their saved money. The price rise in grocery, fuel and electricity have hit them the most and they want government should regulate the prices of these items.

»The **income group ranging between 25-50 (k)** provide us with the information that people falling into this category of income spend about 79% of their earnings while their marginal propensity to save is 21%. 70% of this group claim to have living in their own homes, where 60% carry a loan liability and as low as 47% of people are insured. The average people under this group own a car or a two wheeler or both. They also said to have cut costs on their living style and outing. PFs, Society funds, equities, mutual funds, FDs are their way of expanding money. The commodity that they want

to be regulated by the government of India is their kids' education, cooking gas, and grocery.

The **income group with above 50 (k)** share a ratio of 75%-25% as their consumption and saving pattern respectively. 75% of people are living in their own houses. 64% hold loan liability whereas 72% have insurance taken. Almost all of them own cars normally apart from 2 or more two wheelers in the house. About when asked what expenses have they avoided recently due to rising inflation, many accepted to have cut costs on their living style as in outing (going out for enjoyment, traveling for fun, vacation trips etc due to rising fuel expenses in the past few years). They generally expand their left off savings via bank FDs, shares, buying



gold, or by investing in insurance. Vegetables and fuel price hike give them all the reasons to worry.

Therefore, we noticed the following trend. That the lowest income group consume everything that they earn leaving them with hardly anything to save. While the middle income groups in the urban settlement have either a house loan or a car loan and the rising EMIs are serving as a black hole in their lives. Mostly retired people have their own houses to live in and this is that one asset that they at least achieve by that age. Most participants in the first three groups live in their parents' house while most of the service class and middle class people were said to have been living on rent. When asked about how many of them were insured, we noticed that the worrisome working class has the upper hand in this as almost 72% of them had taken insurance. While the "Below 10 (k) Income Group"

hardly have any money to eat leave alone getting insured. Also it was seen that few of retired men did not have Insurance taken since Insurance was not that common back then in their time. Participants were asked about that one (or two) commodity whose price hike has pinched them the most. To which the obvious and most common answer was grocery or the vegetable price rise. Fuel came second on their list, electricity third; kids' education on the fourth and clothes were on the fifth number in the top five list.

When people were asked that whether they spend or save the same percentage of money (with proportion to income) that they were spending/saving 5 years before and 91% of people were against it and said that the inflation eats up

their savings just like that leaving them to wonder where all of their money is going.

The last question was about naming that commodity which they feel should be regulated or controlled by the government. And vegetables and fuel shared the first position. Many felt that cooking has become quite expensive and so is going to work.

For individuals like these, uncertainty about the future value of money puts them into the dilemma as far as investments and savings are concerned.

For the 1st time in the history of mankind "NEED" "COMFORT" & "LUXURY" are sold at the "Same Price" in India.... !!!!





FINALIZATION OF THE RISK-BASED CAPITAL FRAMEWORK IN SRI LANKA



RBC in Sri Lanka - Background

A proposed Sri Lankan RBC framework was first presented by the Insurance Board of Sri Lanka (IBSL) to the market in March 2012; following this a 'Road Test' was carried out during the period September 2012 to June 2013 inclusive to facilitate the fine-tuning of the framework. In September 2013 the IBSL presented the final framework to the market.

This article provides a summary of the Road Test results as well as the next steps for implementation as well as briefly covering the use of RBC as a decision-making tool.

RBC Framework

Under the RBC framework capital requirements reflect a company's risk profile and encourage 'risk management' rather than 'rules management'. Hence the framework provides a better platform for the IBSL to supervise companies based on risk. The framework document explains the approach taken whereby a standard formula is the default approach with the option of companies individually calibrating their own risks and potentially benefiting from reduced capital requirements.

Road Test Results – Life Insurance

The IBSL presented the Road Test results to the life insurance market after summarizing its expectations based on international experience, namely:

- Capital requirements should go up for some companies and down for others compared to the previous regime

- Life insurance tends to feature considerable market risk, of a similar or greater order of magnitude to liability risk
- Smaller companies may experience concentration risk issues, often from investments
- Transitional issues arising can be evaluated based on the Road Test results
- A solvency ratio of around 150% for the sector would be normal

Bearing the above in mind, the IBSL presented a summary of the market's capital adequacy ratios (CAR) under the final framework. Most companies were well above the minimum 120% RBC threshold with only one company marginally below it.

The IBSL next presented the ratio of Risk Capital Requirement (RCR) to current Required Solvency Margin (RSM). On average the RCR was, as expected, significantly higher than the RSM. The RBC impact to the liabilities was not disclosed explicitly, but one could infer from the above two pieces of information (and noting that the current and RBC asset valuation methods are very similar) that the RBC technical provision has as expected decreased versus the net premium valuation, since it capitalizes future profits.

Next the IBSL presented the market breakdown of risk capital by risk type. Market risk exceeded insurance risk with large contributions from concentration risk, equity risk and interest rate risk.

Implementation Timeline

The framework becomes compulsory for all market participants in 2016. Prior to that all market participants are required to submit parallel RBC results during a 'Parallel Run' phase from 2014-2016.

Companies may apply for early adoption of the RBC framework during the Parallel Run phase.

Using RBC as a Decision-Making Tool

When implementing the RBC framework, companies should first start by looking at the risk capital that is already required as per their RBC balance sheets.

From this initial evaluation, future company strategy can be formulated with explicit reference to risk (i.e. which risks the company wishes to accept and to what extent) and return on capital.

The RBC framework therefore encourages the evaluation of risk-adjusted rates of return on capital and can be a powerful tool for business decisions affecting both sides of the balance sheet.

About the Author



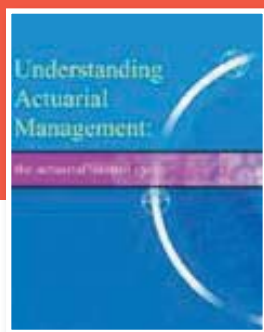
Frank.Munro@avivandb.com

Frank Munro FIA is the Chief Actuary of AIA Insurance Lanka PLC and is the only internationally qualified Fellow working full-time in Sri Lanka

All birds find shelter during a rain . But Eagles avoid rain by flying above the clouds.

Problems are common ,but attitude make the difference

– Dr. APJ Abdul Kalam



UNDERSTANDING ACTUARIAL MANAGEMENT

ACC No : B11900

Status : available at IAI Library

Reviewed by : Dinesh Khansili

dineshkhansili@rediffmail.com

A magnificent book produced as a result of combined effort of numerous Actuaries and published by Institute of Actuaries of Australia. The book has been edited by Clare Bellis, John Shepherd and Richard Lyon. The book has been divided into 19 chapters covering- Overview, Being Professional, The context of Actuarial Work, Regulation, Meeting Consumers' needs, Assessing Risk, Product design, Modelling, The needs for capital, Valuing Liabilities, Pricing, Investments, Constructing and monitoring investment portfolio, Solvency, Profit, Monitoring and responding to experience, AND Applying the Actuarial Control Cycle (ACC). ACC is the base of the book around which the chapters revolve. Those studied or studying UK actuarial material would find a new term in ACC, i.e. **Investment Process**.

The book explains the actuarial terminologies including the complex one in simple language by defining the term and giving examples wherever required. To explain the terms which we hear in day to day working life is the most challenging job. And writers have made that possible by answering 'WHY' and THIS IS THE BEAUTY OF THE BOOK.

For example - We hear and fully believe that Actuaries should be true professional. The book answers to the questions - What is Profession, Why Professions exist, Why Professions granted monopoly powers, what are

professional standards, etc. It conclude professional standards in one line- Essence of a profession is that service can't be reduced to a series of written rules.

Generally a combined approach for actuarial topics combining Life Insurance, General Insurance and Superannuation is missing from Actuarial Literature. Most Literature tackle them in isolation But this book tackles them. You may come across such at many places. One such example is Product Design where Underwriting captures Life Insurance Underwriting, General Insurance Underwriting and Superannuation Underwriting.

As explained earlier that Book explains in simple term the most heard actuarial terminologies. Such popular word in Actuarial Fraternity is PRE. This is a fascinating word especially when one start studying ST2. The book explains- Why PRE come into picture, where from it emerged. Generally one guess that PRE is limited to with profit products. But Book takes you to a further step that PRE is not limited to with profit products, PRE arises wherever the behaviour of the Company impacts the outcome to the Policyholders.

Likewise, In Solvency chapter one would find explanation- Why some assets are excluded from the computation of Solvency Ratio. The live example of HIH would further strengthen one's understanding of solvency, how HIH Insurance became insolvent in just 9 months despite the fact that as on 30th Jun 2000, HIH had assets exceeding Liabilities by 940 million dollars. The

reason given is as most of the surplus arose from intangible assets.

An eye opener for a novice actuarial entrant having brief pricing model experience would be to know how many issues a Pricing Actuary has to keep in mind, right from various stakeholders, cost and charges, cost of capital, profit targets, marginal cost and contribution, subsidies, product life cycle, cost of expected benefits payable, reliability of data based on which pricing being done, cost of reinsurance, simplicity, guarantee and options, margins, expenses - their drivers, and amortisation, overheads, commissions, pricing components- mortality cost, administration expenses, marketing and distribution expenses, allowance for profits, model points, determining sum assured, initial profit test results, issues in pricing process, etc.

The model lovers would find answers to questions- what is a model, model process, purpose of model, users of models, examples giving explanation of deterministic model, stochastic models and their comparison, examples of models- demographic models, EV and Appraisal Value calculations, profit tests, customer life time value models, model offices, economic models, ALM Models, fully dynamic models, assumption setting, models testing sensitivity and continuous monitoring, etc.

The Book is not only recommended to read but to keep a copy in one's personal library which may be referred time and again irrespective of fact where one is employed.

■■■

Thought is the wind, knowledge the sail, and mankind the vessel.

- Augustus Hare



PUZZLE

Puzzle No 207:

Which word is the odd one out?

laughing canopy stupid
thunder hijack burst

Puzzle No 208:

If Alan is from New Zealand,
And Britain is where Rita is from,
Please tell me if you are so able,
The countries of Eric and Don?

Solutions to Puzzles

Puzzle No 203:

Dimensions of the hole:
Length 15", width 3"

Puzzle No 204:

1. Egypt
2. Qatar
3. Brazil
4. Rwanda
5. Vietnam
6. Senegal
7. Algeria
8. Estonia

9. Portugal
10. Cameroon
11. Pakistan
12. Honduras
13. Argentina
14. Greenland
15. Costa Rica
16. Switzerland



shilpa_vm@hotmail.com

Correct solutions were received from:

Puzzle No 203:

1. Kailash Mittal
2. Shilpi Jain
3. K. S. Pujari
4. R. Mythili

Puzzle No 204:

1. Shilpi Jain
2. Pravendra Singh Rajput
3. VirajPoojary
4. Vishnupriya S.
5. R. Mythili



MANY HAPPY RETURNS OF THE DAY

the Actuary India wishes many more years of healthy life to the following fellow members whose Birthday fall in

FEBRUARY 2014

HANUMANTHA K. RAO

CHANDAN K. KHASNOBIS

A. P. PEETHAMBARAN

RAJAGOPALAN V.

A. VENKATASUBRAMANIAN

M. VENKATESAN

(Birthday greetings to fellow members who have attained 60 years of age)



SUDOKU

SUDOKU No. 19 for the month of FEBRUARY 2014

SUDOKU MEDIUM

				5		6	1	8
			4	3	2			
7	9	5						
9	4			8	3			
1	3						8	2
			1	7			9	3
						5	4	7
			3	6	9			
2	8	1		4				

HOW TO PLAY

Fill in the grid so that every horizontal row, every vertical column and every 3x3 box contains the digits 1-9, without repeating the numbers in the same row, column or box. You can't change the digits already given in the grid.

- Sudoku Puzzle by Vinod Kumar

Solution of Sudoku Puzzle No. 18 published in the Month of January 2014

SOLUTION

3	7	4	2	8	5	1	6	9
2	8	9	1	6	7	4	3	5
1	5	6	4	3	9	7	8	2
9	4	7	3	2	1	8	5	6
5	6	1	9	4	8	2	7	3
8	2	3	5	7	6	9	4	1
6	9	2	7	5	4	3	1	8
7	3	5	8	1	2	6	9	4
4	1	8	6	9	3	5	2	7



Mark your Dates 16th GCA

Indian Actuarial Profession
Serving the Cause of Public Interest

SWISS RE
150
YEARS

Your
insight

+

Our
ideas

=

Their
world



At Swiss Re, it's our business to enable risk-taking. Why? Because that's how progress happens. That's how societies become better, safer, and more resilient. And that's why we believe in forging equally resilient partnerships with our clients. Because when we work together, share our ideas, and open our minds to the risks facing both today's communities and future generations, that's when we can identify not just the risks that are out there – but the opportunities too. Not just for you, not just for us, but for everyone. **We're smarter together.**

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