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INDIAN ACTUARIAL PROFESSION
Serving the Cause of Public Interest

Ayushman Bharat

Celebrating 75 years of Indian Actuarial Profession

(1893–1962)

ACTUARIES DAY

21st AUGUST

In Memory of Late Shri L. S. Vaidyanathan, the first Actuary of India

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"A noble man's thoughts will never go in vain. -Mahatma Gandhi."
"I hold every person a debtor to his profession, from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to help and ornament thereunto - Francis Bacon"

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From President's Desk

Mr. Sunil Sharma

I would like to share an important quote from Steve Jobs, "if you are working on something that you really care about, you don't have to be pushed. It's the vision that pulls you".

This is perhaps the last column from me as the President of Institute of Actuaries of India. I would like to capture few memoirs of past two years of my Presidential Term for which the countdown has already started.

When I look back, past 2 years of my tenure along with preceding 4 years as the Council member, it is indeed a period which I would always look back to cherish my memories and also to feel proud. I really feel grateful to have been given me the opportunity to serve the Actuarial Profession in India which I believe to have served with all my full dedication within my potential and with full professionalism.

The show of the profession always have been on run with wholehearted support from volunteers with special reference to fellow members in various advisory groups and committees who always put their best effort and time to make their engagements a grand success; be it Global Conference of Actuaries, Seminars and Webinars, examination related activities, Advisory groups, task force or any other role as a stakeholder. I have always been encouraged and delighted to see the co-operation and support extended by many of our members as volunteers for implementation of any designed programs without which the profession would not have achieved the remarkable progress and growth.

The past two years were relatively challenging and turbulent in many respects. Implementation of new education 2019 curriculum, Mutual recognition arrangements, functional issues in COVID 19 situation, Platinum Jubilee celebrations & Coffee Table Book would write the history.

The foundation for new IAI website has been laid. We have constituted a group consisting of close to 30 enthusiastic recently qualified Actuaries who are writing the contents for the new web portal. The vendor agreements for this and other activities were made. It gives us pleasure when very senior members of the Profession give remarks like - 'Vibrant IAI'.

I am concerned about the fall in number of student members at the end of financial year 2020 resulting from Covid19 pandemic situation. All student members whose annual subscription lapsed in past were contacted and many members renewed their membership. Further, IAI modified the criterion for eligibility for entrance test to enable qualified members of other profession like IIB, ICAI etc to become the student members of Actuarial Profession without having to write ACET Examination.

Meeting members' expectations is not always an easy task. IAI kept close vigil during the Pandemic period. Be it issuance of CoP during lock-down, addressing questions of new members to the Profession through ACET examination timely dispatch of students' study material, addressing the exam related queries, etc. This is also an area which needs continued attention.

IAI examination team along with the Examination Advisory group is working hard to put the desired infrastructure in place to conduct the actuarial examination as scheduled during social distancing period.

VC system is in place and council and committee members may attend the meetings through it and it would qualify for the attendance.

Beyond Boundaries- IAI represented IAA seminar in Japan and South Africa. The link with IAA authorities was re- established. The professional relations were strengthened with IFoA, CAS, ASSA and SoA.

The Actuaries Day was celebrated on 21st August 2019 and 2020 as mark of respect to Late Sh. L S Vaidyanathan, the first Actuary of India. In 2020, Covid

did not mar the spirit and was celebrated on-line. First time in history of IAI.

I am pleased that IAI staff have shown utmost efficiency and professionalism each time, every time. My heartfelt appreciation to all staff members of IAI for their great support, hard work and dedication for making all programs of the Council a reality.

Few areas where we could pay more attention include, Research, Unemployment issues and recruitment of staff. The Actuarial Job Portal (AJP) was strengthened and it is getting good response from the employers and the actuarial students. Another development was creation of advisory group created for Actuarial Job Placements for exploring various opportunities for Unemployed members. The results would be seen in near future. The formation of the IAI Pandemic research group for continuous research on COVID 19 situations proved to be result oriented. The group produced a detailed report which was discussed at length and contributed to the cause of the Public Interest which is tag line of IAI. In order to develop and strengthen different areas of the profession, advisory group on Data Science and Analytics, advisory group on IFRS 17, advisory group on Banking, Finance & Investments and advisory group on Communication were created. More outcomes of these new groups shall follow in times ahead. We need to ensure the adequate staffing at IAI office and advisory roles in particular legal and IT.

During the last two years under my President ship, there were 10 Council meetings held deliberating various topics of importance. The 21st GCA also created a record in terms of revenue and surplus. The good expenses were made but the controls were also exercised.

I assure you all on my continued support, co-operation and association with the Profession in all future times to wherever possible with all humbleness and pride. We have more and more promising actuaries from young generation associated with the Institute as volunteers, therefore, I am confident on the growth of the profession to new heights. I thank all our members for their understanding, co-operation and support during my service as the President of IAI. I also would like to thank all stakeholder including Government and Regulators for all their support. Come, let's take the Actuarial profession to the future with renewed confidence, determination and dedication.

With best wishes to the new Council, I would like to sign off! for now with hope to see you face to face without mask soon.

CALL FOR ARTICLES

Institute of Actuaries of India

We invite articles from the members and non members with subject area being issues related to actuarial field, developments in the field and other related topics which are beneficial for the students of the institute.

The font size of the article ought to be 9.5. Also request you **to mark one or two sentences that represents gist of the article.** We will place it as **'break-out' box** as it will improve readability. Also it will be great help if you can suggest some **pictures that can be used with the article, just to make it attractive.** Articles should be original and not previously published. All the articles published in the magazine are guided by **EDITORIAL POLICY of the Institute.** The guidelines and cut-off date for submitting the articles are available at http://actuariesindia.org.in/subMenu.aspx?id=106&val=submit_article

From Chief Editor's Desk

Ms. Bhavna Verma

Six months of lockdown will be over soon. In these last few months, actuarial staff have gone through remote year end activity, increased reporting to company managements and the regulator, constant monitoring of the emerging direct and indirect impacts of Covid-19, deliberations on pricing and valuation assumptions and methodologies, critique of risk management frameworks and beyond. While the pandemic has well demonstrated that actuarial work can be executed from within the confines of our homes and from anywhere in the world, the next challenge for actuarial teams is to bring about more efficiencies in terms of team structures, work management, technology and processes to adopt this as a smooth and effective permanent work model. Besides BAU, new developments such as IFRS17 also need to be steered forward and I believe actuaries will be playing a larger role in the overall functioning of organizations they serve today for which some mindshare should be devoted.

This issue includes coverage of the many webinars conducted by the Institute in the last month or two. It is interesting that the virtual medium has paved the way for many more learning events to be held by the Institute. The current environment triggers several new chains of thought and decision points for actuaries operating in various core areas of work such as valuations in insurance or employee benefits, pricing, risk management and others. To strengthen the core, I think short focused brainstorming sessions may be facilitated for different specialists by the respective Advisory Groups or otherwise so emerging areas of

professional judgement in these uncertain times can be debated and applied.

Meanwhile, data science and Artificial Intelligence continue to be the buzzwords in the global actuarial space. I find it interesting that in some of the sophisticated actuarial markets such as the United States, the terms actuary and data scientist are now frequently used interchangeably.

The next issue will include detailed coverage of Actuaries Day celebrations on 21st August 2020. As in the previous two years, this day was celebrated with much enthusiasm by the Indian actuarial community, despite it being a virtual celebration this year.

I hope you enjoy reading this issue and look forward to your feedback.

Webinar on Pricing of Crop Insurance

Date: 26th June 2020; Friday Time: 16:00 - 17:30 IST

"Pricing of crop insurance" webinar started with the introductory address by Mayur Ankolekar and Sunil Sharma, President, IAI. Agriculture being the major contributor to the Indian economy and Indian crops being subject to vagaries of monsoon every year across the country, crop insurance assumes paramount importance. The webinar was a topical one in the current situation where we face unprecedented challenges from Covid 19 and natural phenomena like locust infestation of the fields across different parts of the country.

Mr. A V Karthikeyan, Appointed Actuary of Reliance General Insurance Company Limited started the webinar with a poll question to gauge the level of understanding of the attendees about the requirements for pricing of crop insurance. Currently pricing model parameters are largely based on crop yield and weather. Though burning cost method is increasingly used in practice, there is an imperative need to consider other factors that affect weather and crop yield itself. With regard to crop insurance, pricing assumes higher importance compared to reserving, contrary to popular belief that reserving is more important.

Introduction to PMFBY

He gave an introduction to PMFBY (Prime Ministers Fasal Bima Yojana) explaining the different stages of claims, different stakeholders, claim conditions and claims calculations. Various risks that are covered under PMFBY and the share of the risks among the stakeholders (central government, state governments, etc.), risk retention, risk transfer practices were also discussed in detail. Significant changes introduced in the scheme from the current period 2020-2021 were highlighted. These changes need to be borne in mind in future pricing.

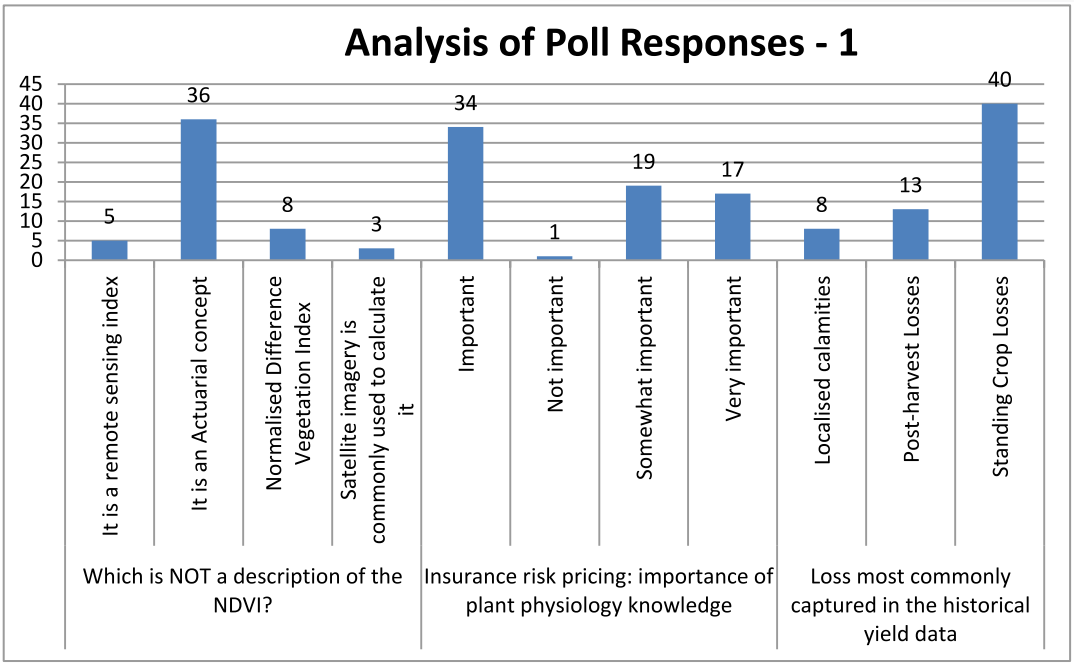
Various steps in calculating the premiums using burning cost method including data requirements and challenges in obtaining the same were elucidated in detail. Calculation of various threshold yields (according to the new changes in PMFBY) was illustrated with a numerical example to understand how these would impact pricing. While explaining the important step in the pricing process - de-trending, the need for the same, the situations in which de-trending is applicable, with use of a real life illustration was very insightful. Pictorial representation aided in understanding the effect of de-trending.

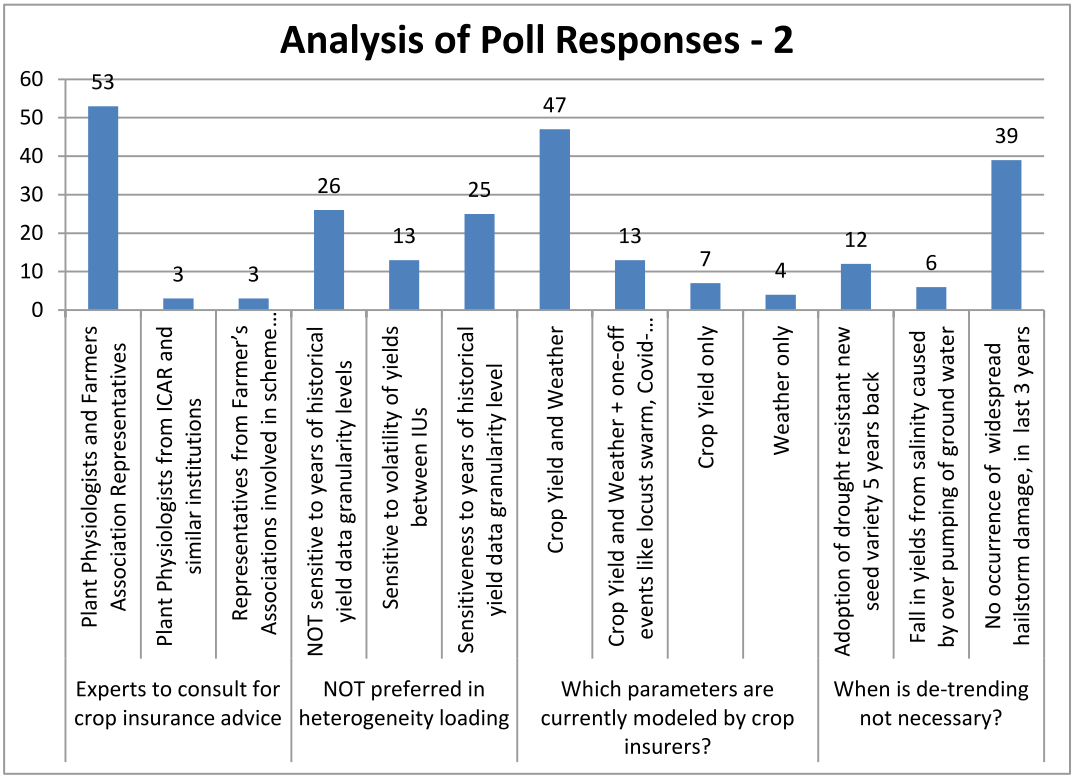
Challenges in the data for crop insurance pricing

The next issue that was taken up was the heterogeneity in the data. He emphasised the need for maintaining the homogeneity in the data when it comes to pricing, as experience varies very widely across regions due to different exposures to natural weather conditions, soil, practices of harvesting, etc. He also described various methods of heterogeneity loading and how to arrive at pure premium after choosing one of them. Numerical examples of simulation and credibility theory methods were helpful in understanding the importance of the loading required in pricing.

The poll questions that were raised during the course of the webinar engaged the participants and made the webinar more interesting. These were not only intuitive but also made us understand the depth of the involvement and interaction of actuaries with other experts and professionals in pricing crop insurance. While the mathematical part of modelling may relate to actuaries, inputs and other parameters that need to be built into the pricing model require much deeper interactions and understanding across different stakeholders like plant physiologists from ICAR and other institutions, Representatives from Farmer's Associations involved in scheme advisory / awareness creations, and others. The poll questions and the responses from the participants are provided in the chart below.

The speaker also touched upon the possible impacts of Covid 19 such as labour migration, credit risk, economy setback, reinsurance risk, funding risks for PMFBY which are yet to be witnessed in the coming months. The webinar then concluded with closing remarks from the moderator with due thanks to all the organizers which made it very successful without any technological glitches.





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Webinar on Adapting to Trends in Life Insurance

Date: 1st July 2020; Wednesday **Time:** 10:00 - 12:00 IST

Presidential Address: Sunil Sharma, President, IAI

Keynote Address: K. Ganesh, Member (Life), IRDA

Moderator: Pritesh Chaubey, Chairperson, Advisory Group on Life Insurance

Speakers: Philip Jackson, Principal and Consulting Actuary, Milliman

Kshitij Sharma, Partner Risk Advisory Services, E&Y Actuarial Services LLP

Introduction

On 1st July 2020, IAI organized a Webinar titled "Adapting to Trends in Life Insurance" which was moderated by Mr. Pritesh Chaubey. The first half of the session was addressed by Mr. K.Ganesh who started with the possible long-term and short-term implications of Covid-19, which was then followed by Mr. Philip Jackson and Mr. Kshitij Sharma who discussed the changes in the life insurance trends with respect to product choice, interest rate risk, persistency risk, credit risk and the digital distribution channels.

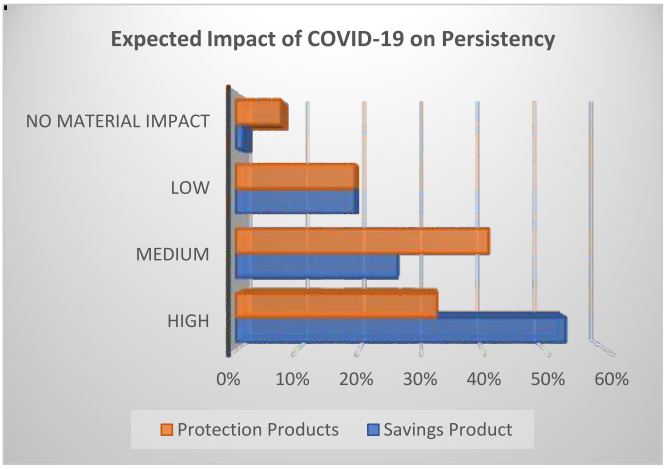
Insurance Business during Covid-19

The pandemic has urged a greater demand for protection business in both the life as well as health insurance sector. Covid-19 has made people re-assess their insurance needs and given the loss of income, reduced take-home salaries. Simultaneously, the volatility in stock market investments into savings products has become more challenging to the customers.

Even before COVID, life insurance companies have started focusing on the protection segment. Most of these companies have now filed for an increase in the premium rates for their term products as the reinsurers have increased their rates and with the uncertainty created by the pandemic the companies are compelled to re-assess their underwriting process to better manage the protection portfolio.

Social-distancing norms has increased the discomfort to customers of meeting distributors and therefore, digitization of insurance sales and services have become increasingly important and the Insurance companies have expedited their transition to digital platform on the onset of Covid-19 situation by moving their processes online in a quick time.

There is also a greater uncertainty regarding the persistency experience of the companies. As at March 2020, many insurers have either reported no change or better persistency ratios which can be mainly because of the extension in grace period or increased awareness in policyholders about their risk covers in current situation. However, it would take some more time to study the actual persistency and thus there is a need to monitor it on regular basis at least for some time.



Poll 1: Poll was conducted to understand the views of the audience on the impact of COVID-19 on the persistency of protection & savings products

The IRDAI has also permitted life insurance companies to offer short term health insurance policies as well. Covid-19 seems to be short term and this can help the companies making the business at least in short term and then retaining the business for long term. This is an opportunity for all life insurance companies.

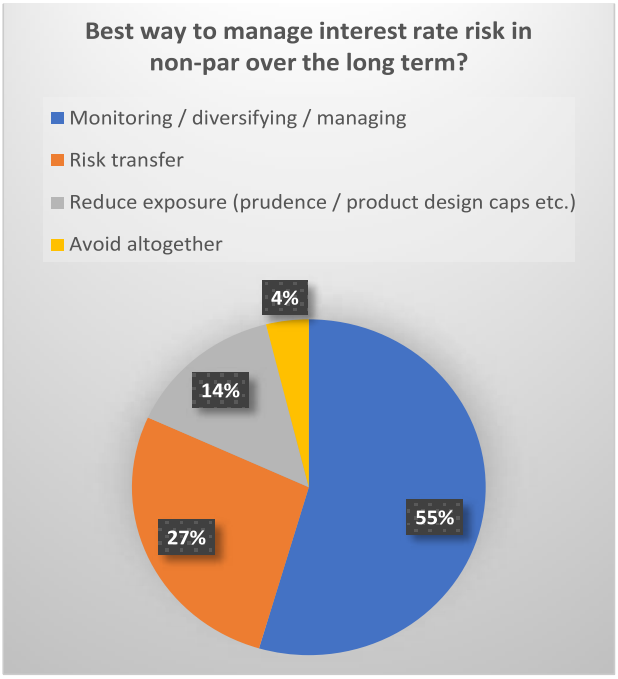
Impact on Product - Focus on Non-par

Non-Participating products have historically offered higher margin as compared to participating and unit-linked products particularly post 2010 when the margins

in ULIPs had fallen significantly. However, the fall in interest rates have forced the companies to think of ways to manage the guarantees offered in these non-par products either through internal monitoring of ALM, use of other risk transfer options like derivatives, altering the product designs or the last option which of course is to avoid such products altogether.

Currently the life insurers are looking into the diversifying their portfolio or trying to achieve a very large scale by selling huge volume of policies like in the case of LIC which is however not available to all the insurers. The option of maintaining a high solvency margin or buying long term bonds seems to have a high opportunity cost.

Risk transfer by using derivatives or Forward rate agreements or FRAs is a challenge to the companies given the Internal capacity of the companies and these derivatives can also bring secondary risks like credit risk or basis risk with them. Thus the companies need to consider the net benefit and the opportunity cost of using such risk transfer options.

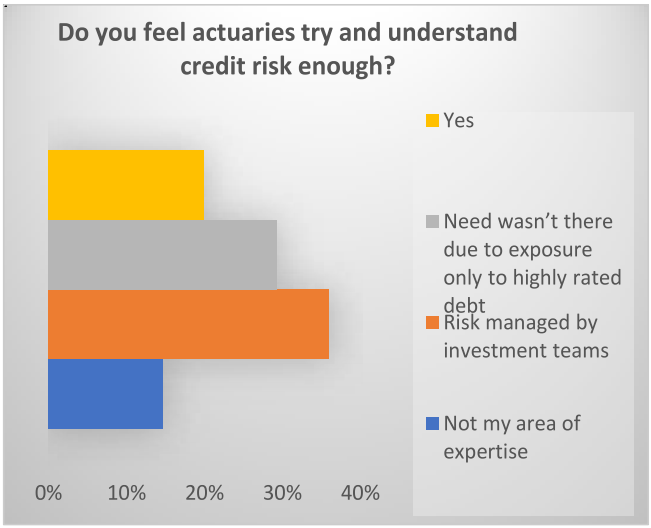


Poll 2: Poll was conducted to understand what the audience thinks is the best way to manage the interest rate risk

Some of the other possible mitigation measures to manage the non-participating portfolios can be altering the design of the products by including shorter premium paying term or introducing non-par umbrella products like universal life which might allow the companies to mitigate some of these guarantee risks. Companies also need to consider if there is any advantage in selling non-par products if their margins keep on diminishing disappear and with the possible introduction of risk-based capital regime in India, these products will not be that attractive.

As on date most of the life insurers have a significant exposure to Sovereign bonds. Private life insurers have 68% exposure to sovereign debt and 32% in corporate debt of which 28% in AAA rates bonds and only 2% in AA. Thus, actuaries should also consider the credit risk related to bonds investment by performing some own risk assessment based on the internal models given the prevailing trends of increase in credit and liquidity spread and the falling government yields and should consider the option of investing into corporate bonds of lower ratings as well and not just leave the investment decision to the insurer's investment team.

AT1 (additional tier bonds) issued by banks which have callable options of 5-year and 10-year appears to be an attractive investment choice to the companies who can have their own risk assessment of bonds using internal models just like banks and if the risk framework permits, they can go for these high risky bond to fetch better investment returns.



Poll 3: Poll was conducted to understand the views of the audience of the understanding of credit risk among actuaries.

Emerging trends in Life Insurance

There is an increased need to include more flexibility for ULIP if interest rates keep trending downward. Flexibility options like premium holidays might help to increase the sales and persistency of ULIP products.

The industry is also witnessing an increased use of bancassurance channel with a wide variety of savings as well as protection products being sold through this channel.

The increased demand for protection products and the emergence of digital platforms have forced for the need

to introduce new designs in protection products like longer term polices, return of premium. However, if the companies are writing long term products and using digital channels, lapses would be very important for the protection products as lapse profit is one of the key drivers of such pure risk products. Also moving to longer term products make the term products as a whole of life structure resulting in protection products being exposed to interest rate risk which in the current scenario might not be an attractive proposition.

The online platforms are currently mostly offering the pure-risk product. Companies need to consider can they also sell the complex savings products through this channel and if they can, will that destroy their other distribution channels which might not like such a move.

Insurers need to continuously focus on refining their systems and processes to suit this new digital environment wherein the first step can be the Insurer's website which should be simple and easy to use making the digital platform more understandable to policyholder/consumers. This e-process will be more authentic (since information is provided by policyholder) and cost effective and the companies should look to pass on this profit from reduced cost to the policyholders. One has to keep in mind that the increased use of digitization will also increase the exposure to cyber risks and thus systems should be tested for risk mitigation measures on a regular basis considering the sensitivity of the information insurance companies hold.

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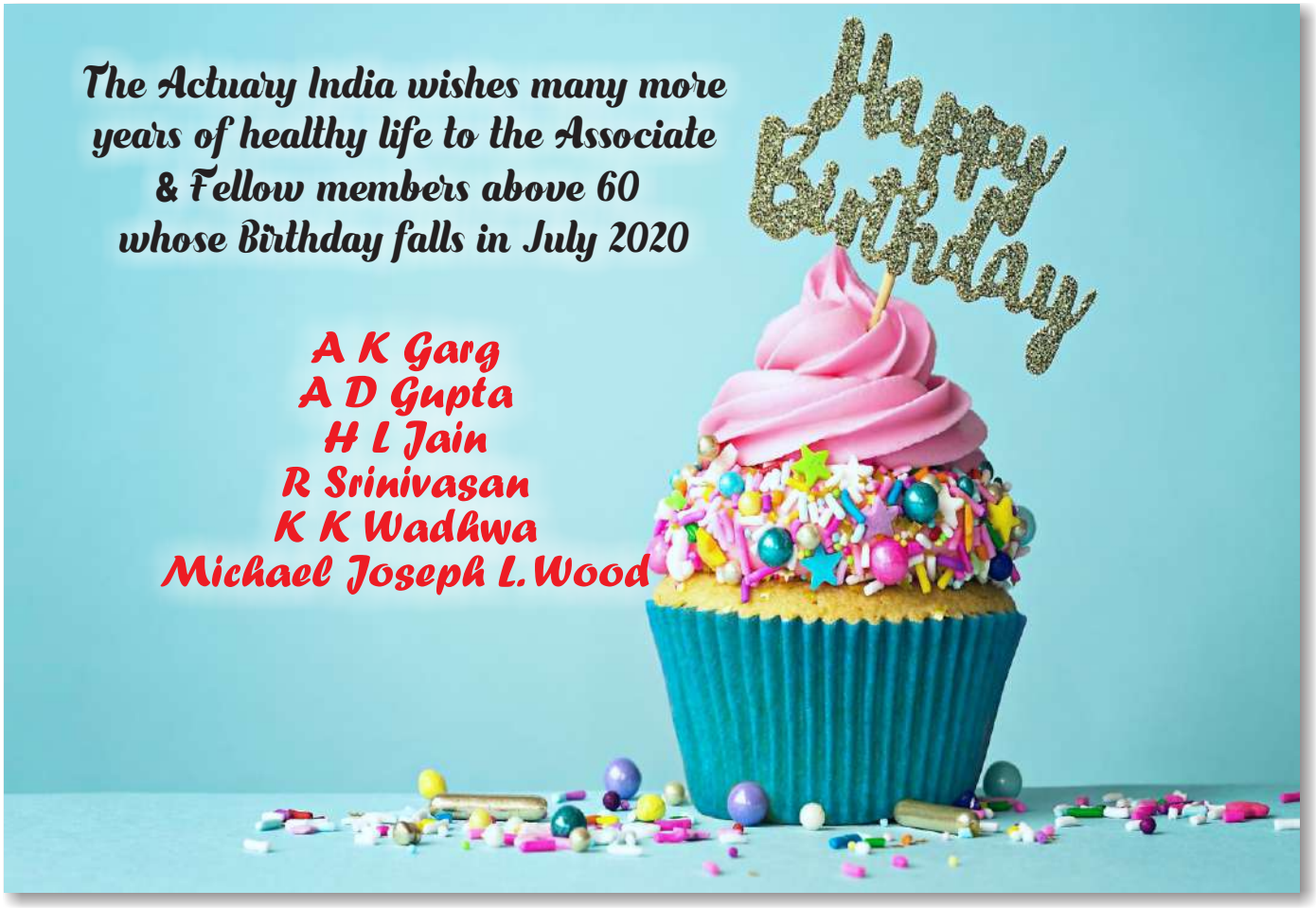

33rd India Fellowship Webinar (IFW)

Module 3 & 4

Date: 3rd July 2020; Friday Time: 9:30 - 13:00 IST

Module 3 - Technical

Sanket Kawatkar, Member, Professionalism, Ethics & Conduct Advisory Group, Institute of Actuaries of India (IAI) commenced the 33rd India Fellowship Webinar (IFW) module 3 with a welcome address.

Opening Remarks: Sunil Sharma, President, IAI

This was followed by the presidential address from Sunil Sharma, President, IAI. Sunil touched upon the uncertainty that all companies are facing in the current difficult situation caused by novel coronavirus COVID-19. He emphasized that the actuarial profession should see this as an opportunity to use our skills to lead our respective companies and clients through these uncertain times.

He also reminded everyone that the actuarial profession in India depends on its members' support to thrive. He expressed his gratitude towards the time and efforts put in by the senior members and urged the newly qualified members to actively volunteer for various activities of the institute.

Case study 4: technical life insurance

Guide: Philip Jackson

Presenter: Surbhit Ahuja, Esha Goel, Sunny Aggarwal

The team started the discussion with asset-liability analysis to study the business impacts of the decline in the long-term interest rates in India. The underlying theme of the proposed analysis was to study the surplus of the company under different interest rate scenarios and to incorporate dynamic policyholder behavior in the analysis.

The team then covered the options, including valuation assumptions update, re-pricing, hedging, and investment strategy, that are available to manage the products with investment guarantees.

Case study 5: technical health insurance

Guide: Anuradha Sriram

Presenter: Sachin S C C Kumar, Padma R S, Vidhi Hiten Shah

The team enacted as the Appointed Actuary of a health insurance company who is preparing the Financial Condition Report (FCR) of the company. The team described the purpose of the FCR before delving deeper into the uncertainties around the financial condition due to the pandemic situation.

The team talked about the lack of credible data as a major challenge to price health insurance products in the current COVID-19 situation. They further added that the companies would have to re-think their sales and marketing strategies while the imminent impact would be on profitability because of higher claims and lower sales.

Case study 6: technical life insurance

Guide: Megha Garg

Presenter: Sagar V Deshmukh, Vidhi Mundhra, Zeel Manish Shah, Aditya R Malhotra

Following on from the previous case study, the last case study of the day focused on the impact of COVID-19 on sales and profitability of life insurance protection products. The team presented their views on the short-term, mid-term, and long-term mortality and persistency assumptions and the likely impact on the life insurance companies.

The team further discussed add-on riders, extending grace period, digitalization, etc., other than re-pricing, as measures to increase new business sales. They concluded the session stating that the COVID-19 situation may push companies to be more innovative in their approach.

Module 4 - Professionalism

K S Gopalakrishnan, Chairperson, Professionalism, Ethics & Conduct Advisory Group, IAI started the 33rd India Fellowship Webinar (IFW) module 4 on professionalism with a quick talk on how misconduct by any individual affects the profession as a whole.

Opening remarks: Subhendu Bal, Appointed Actuary, SBI Life Insurance Co. Ltd

The importance of professionalism was further stressed upon by Subhendu Bal, Appointed Actuary, SBI Life Insurance Co. Ltd. He also requested all members, including student members, to keep themselves updated on the professional standards and other regulations governing the actuarial profession in India.

Case study 7: Professionalism

Guide: Suresh Sindhi

Presenter: Neetika Manchanda, Suman Pahari, Mayank Saurabh

The team started by setting the context of the case study where an actuary working in a life insurance company learns about the increased credit risk on some debt investments of his company. His analysis shows that the company's solvency ratio will drop below the required level and his company will not have resources to infuse capital before the year-end Board meeting. The team then suggested possible courses of action that the actuary can take, such as timely communication to the Appointed Actuary and the Board, further analysis to confirm the findings, and seeking advice from peers.

The professional responsibility of the Appointed Actuary of the company was also touched upon, especially concerning Appointed Actuary regulations that bind the Appointed Actuary to ensure the solvency of the insurer at all times.

Case study 8: Professionalism

Guide: Johannes Gilliam Van Helsdingen

Presenter: Deepak Saini, Aditya Padhi, Mohit Goelin

The team presented an interesting scenario where the actuary, working in the sales & marketing department of a company, has a meeting scheduled with an actuarial student who recently joined the company. The actuarial student has had a recent unpleasant experience with a sales agent of the company following which the student is postulating about the sales mal-practices followed by the company.

The team discussed the case study with a focus on understanding the professional obligation of the actuary in question. The discussion started with a summary of the likely professional issues, and the regulations and standards relevant to the case study with an emphasis on the professional responsibility of the actuary to act in the public interest. The team also presented its views on the ideal sales insurance process and the impact of mis-selling on all stakeholders involved.

Case study 9: Professionalism

Guide: Yogita Arora

Presenter: Nikita Sharma, Alka Gupta, Arunima Sinha

The team discussed a situation in which a newly qualified actuary discovers major gaps in the pricing process followed by another actuary working in a different team. The newly qualified actuary has recently joined the company and has some pricing experience from his prior organization. He is now in a professional dilemma on whether to keep quiet about his findings or discuss with the pricing actuary as well as with the Appointed Actuary to whom he reports.

The team, while analyzing the situation, talked about the options available to resolve this dilemma. The consensus was to ensure compliance with IAI's framework to maintain high professional standards in all situations and when in doubt, one should seek consultation from IAI or other senior members. The discussion ended with an emphasis on maintaining confidentiality when sharing knowledge gained from the prior organization.

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Subhash Khanna is a Fellow member of the Institute of Actuaries of India.

1st TechTalk on Employee Benefits - Compensated Absences and Other Long Term Employee Benefits

Date: 9th July 2020; Thursday Time: 17:00 - 18:00 IST

Chair: Mr. Kulin Patel, PEBSS Advisory Group

Moderator: Ms. Neha Agarwala, Member, PEBSS Advisory Group

Speaker: Ms. Sapna Malhotra, Actuary and Founder, Mithras Consultants

Introduction

The Advisory Group on Pension, Employee benefits and Social Security (AGPEBSS) organized the 1st TechTalk on Employee Benefits on 9th July, 2020. Ms. Neha started the session by mentioning about research opportunities with AGPEBSS for student members covering topics like Implications of Social Security Code (SSC) on Funding of Gratuity Benefits and Making DC decumulation sustainable and greater value to members/subscribers in India. In continuation to it, Mr. Kulin Patel made his introductory remarks by describing how this TechTalk would help students and non-members to get a ground level understanding of the technical aspects of actuarial valuations and also how it is giving opportunities to members to come and present their ideas in front of a wide audience. The webinar continued with Ms. Sapna sharing her expert opinion on the topic of Compensated Absences and Other Long Term Employee Benefits which she started by asking a poll question on where would one go on holiday after the pandemic is over and maximum votes were for Goa.

Overview of Compensated Absences

Ms. Sapna started the technical session by the basic leave categories i.e. non-accumulating compensatory absences (do not carry forward and hence lapse) and accumulating short term and long term compensatory absences (can be carried forward and encashed). Actuarial Valuation is only required for long term leaves which can be can be classified as leaves that can only be availed e.g. Sick Leave, leaves that can be availed and encashed only at the time of exit and leaves that can be availed and encashed while in service as well as on exit e.g. Privilege Leave or Annual Leave.

Valuation Process

Ms. Sapna proceeded with the session by providing her insights on the valuation process of long term leave benefit with the use of Projected Unit Credit Method (PUCM). She explained what data is required from client and how important the role of actuarial teams is in conducting proper data and consistency checks. Going forward, the various actuarial assumptions considered in the valuation process were highlighted and emphasis was laid on the importance of leave availment rate. Through the next poll question it was concluded that the general range of leave availment rate is between 0% p.a. to 2% p.a. Subsequently the decrements that are considered in this process and the calculation of availment rate was discussed in depth. All these steps were summarised by a general illustration wherein the projected benefit obligation was calculated using the cashflow approach by considering various actuarial assumptions. Towards the end, the movement of liability from year(n) to year(n+1) was overviewed with regards to components like actuarial gains and losses, interest cost, etc. which further helped to understand how the liability is recognised in the balance sheet and how the expenses are recognised in the P&L account.

Practical Issues

In the recent times, actuaries have faced issues with incorporating complex leave policies in the excel model and also while calculating the availment rates as companies do not have past years' data. Additionally, due to the current pandemic situation, employers are also facing a lot of challenges with regards to leave benefit as employees are not using leaves because they are now working from home. This is an issue for the employer as the leave liability is increasing thereby increasing the provision in the balance sheet and expenses in P& L account. As a solution to this, many companies have come up with new strategies of altering their leave policy by not giving any new credit or reducing the maximum accumulation cap and so on so that the stress on the balance sheet due to this situation is reduced.

> **"We as actuaries should try and work closely with the company to help them understand the potential impact of the current scenario with regards to the leave liability so that the company is aware and prepared for the same."**

Concluding Remarks

The TechTalk was concluded by throwing light on various other long term benefits. These benefits are basically the rewards that employees receive as a recognition for their performance. Ms. Sapna talked through a number of benefits like cash based, share based and benefits payable depending on service rendered and how the valuation would be conducted for such benefits. The session was winded up by Ms. Sapna and other members of AGPEBSS answering questions asked by the audience. In this it was discussed how for maternity leave no valuation is required as it is a short term liability and also how current service cost can be calculated. They further answered questions on whether variable bonus is a part of gross salary and whether disclosures are required for compensated absences. Also ways of calculating the leave availment ratio were discussed in brief. The question and answer session gave the audience an overview of the entire TechTalk and helped them gain better technical understanding of the topic.

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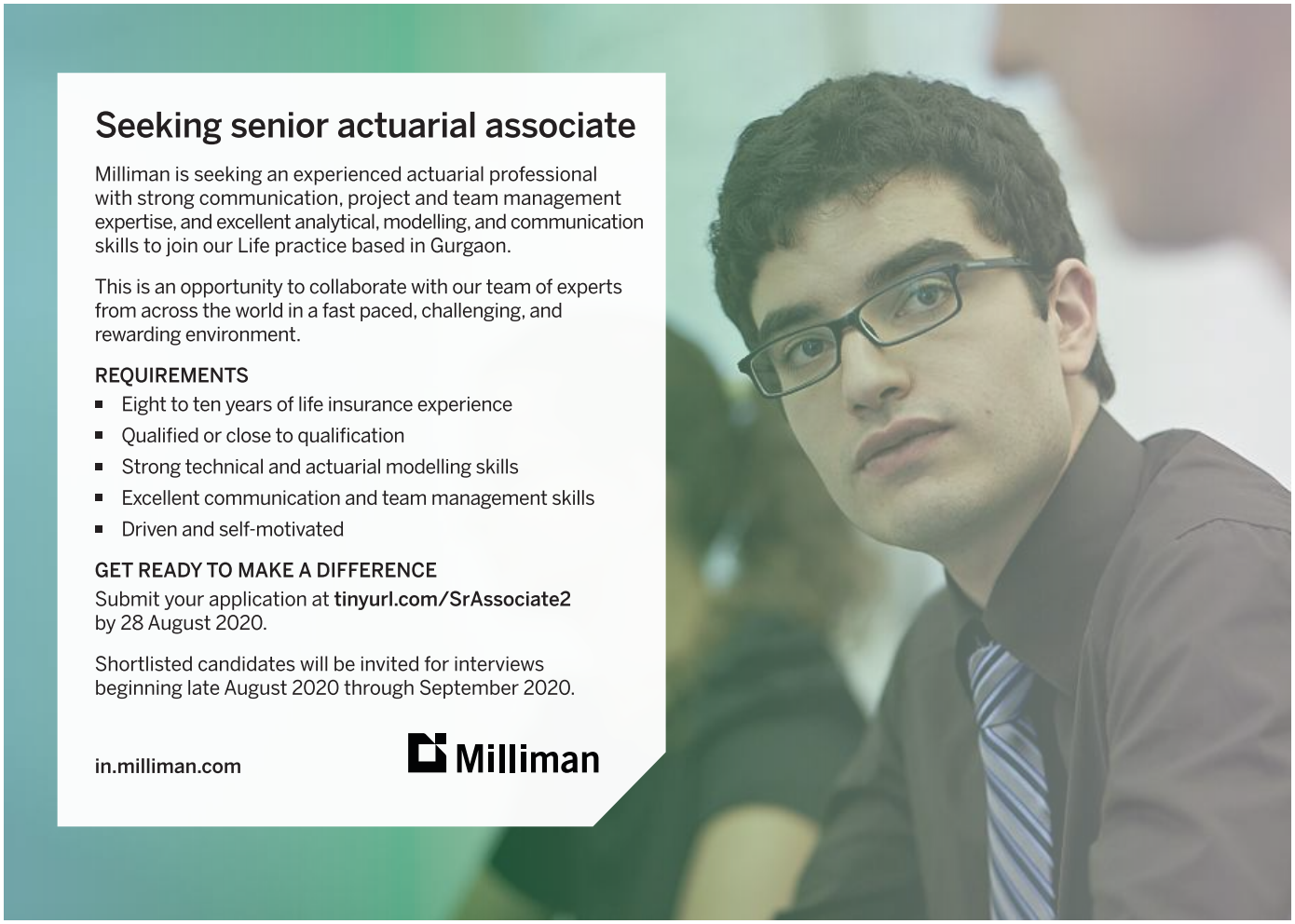
Vinayeta Ahuja is currently working with M/s. K.A.Pandit in the Employee Benefits team.



Webinar on IFRS 17: Impact of IFRS 17 on Product Design and Pricing

Date: 16th July 2020; Thursday Time: 16:00 - 17:30 IST

Moderator: Ashish Ranjan, Member, Advisory Group on IFRS 17 (IND AS 117)

Welcome Address: Kunj Maheshwari, Chairperson, Advisory Group on IFRS 17 (IND AS 117)

Keynote Address: Sunil Sharma, President, IAI

Speakers: Dominic Clark, Principal & Consulting Actuary, Milliman

Jeremy Kent, Principal & Consulting Actuary, Milliman

Kshitij Sharma, Member, Advisory Group on IFRS 17 (IND AS 117)

Introduction & Objective

IFRS 17 is expected to be a paradigm shift in the way Insurance business is reported. The Institute of Actuaries of India is proactively conducting seminars on IFRS 17 since the initial standard was issued in May 2017. Further, insurers may be unsure of how their product pricing and design may change and it's also likely that companies will want to start thinking about how the products that they are selling or launching will look under the new accounting regime. To cover this aspect, the Advisory Group on IFRS 17 (IND AS 117) of IAI conducted its 1st Webinar on IFRS 17 titled ***"Impact of IFRS 17 on Product Design and Pricing"*** on July 16, 2020. The objective of this webinar was to present the analysis from a paper, including worked examples on few lines of business. Though this analysis was focused on European countries that have adopted Solvency II, however the webinar also included discussion of how the conclusions can be applied to Indian market.

Ashish Ranjan, started the session by introducing the speakers, which was followed by the welcome address of Kunj Maheshwari who gave a brief journey of IFRS 17 and set the context for the webinars. This was followed by presidential address of Sunil Sharma.

Dominic and Jeremy discussed the analysis along with worked examples from the European countries perspective. Kshitij then discussed the impact from India perspective.

Analysis of the Paper

The analysis covers one specific way to define and address the concern around likely impact on product design and pricing due to introduction of IFRS17. This was based on NBV methodology and the potential of IFRS 17 to constraint the distributable profit. A detailed quantitative analysis was done and a rule of thumb was proposed for identifying when IFRS 17 constraint may apply in specific product cases. The rule of thumb was

If a contract generates surplus on a Solvency II basis at outset (i.e. available capital > required capital), then the introduction of IFRS 17 may broadly be expected to constrain distributable profits and vice versa.

Rule of thumb (in one specific way as described in the webinar) for identifying when IFRS 17 constraint may apply on distributable profits:
If a contract generates surplus on a Solvency II basis at outset (i.e. available capital > required capital), then the introduction of IFRS 17 may broadly be expected to constrain distributable profits and vice versa.

The rule of thumb was illustrated with the help of examples of three lines of business viz Unit Linked, Term Assurance and Traditional Savings with profit sharing. A sensitivity was also performed to demonstrate the impact on distributable profits due to increase/decrease of required capital at outset.

Application of Rule of thumb to Indian Products.

In the Indian context, it was emphasized that the impact needs to be considered separately for accounting profit and shareholder value. While the shareholder value will very much depend on Regulatory solvency regime, the accounting profit will be impacted by factors such as level of attributable expenses & Risk Adjustment, expected investment return, choice of coverage units, onerousness of contracts etc.

This was further demonstrated for different types of products such as Term Assurance, Unit linked and traditional savings. The participating product was not considered as there are quite a few unknowns with respect to regulation around the definition and distribution of surplus.

The key takeaways from Indian perspective:

- Onerous contract testing to be incorporated as part of product pricing
- Level of attributable expenses key determinant of onerous contracts
- The product types with higher NB strain like Unit linked and protection products may see a positive impact on IFRS 17 accounting profit
- On the other hand, products with lower NB strain like traditional savings products may see a negative impact on IFRS17 accounting profit.
- Shareholder surplus emergence will most likely be delayed for contracts where IFRS17 fulfillment cashflows (BEL + RA + CSM) is greater than Statutory Reserve & Capital

Q&A

Toward the end of the webinar a few questions were answered by the speakers. The important takeaways from the QA session was that a minimum of two years' time is required for the minimal compliance implementation of IFRS 17 and as per the experience it generally takes more than what is expected. On another question about expanding the scope of this work it was responded that the intention is to expand the work particularly to cover the aspects which was ignored such as onerousness of contracts, discount rate, expenses etc.

The Webinar was concluded with Vote of Thanks from Ashish Ranjan on behalf of the Advisory Group on IFRS 17 (IND AS 117), IAI

Written by

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Webinar on Ayushman Bharat - Actuarial Perspective

Date: 24th July 2020; Friday Time: 16:00 - 17:30 IST

Moderator: Kamlesh Gupta, Member AGSDMI, IAI

Welcome Address: Bharat Venkatramani, Chairperson AGSDMI, IAI

Keynote Address: Sunil Sharma, President IAI

Speaker: Satya Sai Mudigonda , SeniorTech Actuarial Consultant and Hon. Professor, Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam

Introduction

Ayushman Bharat, a flagship scheme of Government of India, was launched as recommended by the National Health Policy 2017, to achieve the vision of Universal Health Coverage (UHC). Today, Ayushman Bharat is the world's largest health insurance scheme covering 50 crore members with the budget of INR 6400 crores for the year 2020. The webinar's objective was to understand the pricing perspective and the impact of COVID19 on this scheme.

Kamlesh Gupta started the session by commenting that the sheer size of the scheme and its possible impact is very astounding and the objective of the webinar will be a subject of interest for the actuaries. This was followed by the welcome address by Bharat Venkatramani and the keynote speech by Sunil Sharma. Satya Sai in his presentation discussed the background of Ayushman Bharat, opportunities and risks for Insurance Companies and Actuarial Profession, pricing framework, impact of the pandemic COVID 19 and the future of Ayushman Bharat.

Ayushman Bharat - Background

Ayushman Bharat covers 50 crore plus population of India, paid 1 crore plus claims, has 50% insurance penetration and 20,916 plus hospitals are empanelled.

Ayushman Bharat consists of the following 3 features:

1. Scheme structure: It is a Group Health insurance scheme with INR 5 lakhs floater cover. Its key stake holders are National Health Authority (NHA), State Health Authority (SHA), Families covered Hospitals, TPAs and Insurers. It is administered by a trust or Insurer or Hybrid Model. Premium contributions are done by State and Centre on a pre-agreed ratio.

2. Package Rate Structure: The scheme includes tertiary care with 2500+ procedures and surgeries with all the associated costs included in it.

3. Key Clauses: These include expense clause, loss cap clause, procedures related to new member enrolment, hospital empanelment portability, claims investigation and settlement, fraud prevention measures.

Opportunities and risks for Insurance Companies and Actuarial Profession

Insurance companies will get increased visibility and sizable amount of yearly premium. They will have access to line item data of claims which is useful for product development. Competitive advantage of early involvement can be achieved.

There is a risk of potential loss if scheme is mis-priced or claims are mis-managed or potential abuse or frauds occurs.

Given the sheer size of the scheme and the resulting impact it can have on the company's financials, it is a great opportunity for actuaries to showcase their expertise via the Actuarial control cycle - pricing, data analytics, and monitoring.

There is a risk involved if there is gap in ability to meet the demand of new skill sets related to data science, medical procedures and implementation of actuarial technique in non-traditional areas.

Pricing frame work for Ayushman Bharat

The pricing framework includes data, setting the assumptions, a model to develop baseline premium, computation of risk premiums and other considerations.

There is a huge data owned by NHA which can be made available based on need. The data is available line item wise and can be analysed in by eligibility of categories of families, their claims experience, procedures, hospitals and so on.

The product of Frequency and Severity will give the Baseline Risk Premium which requires multiple stages of adjustments.

The frequency is impacted by the following factors which need adjustments.

Count for exposed period and IBNR, claims seasonality, impact of hospital empanelment, change in private-public hospital mix, and change in packages.

The severity is impacted by the following factors which need adjustments.

Claim amount by IBNR, claims seasonality, change in private-public hospital mix, change in packages.

Further for each individual factor, the past and current trends are used to estimate the future trends. Ideally past three years data may be used for estimation. Month wise data is considered to predict annual trends. The best estimation method is not used. Instead a range of values are considered, with minimum, maximum and average. The average is a weighted average taking multiple aspects in to consideration.

Following interesting observations were made about the experience.

- Due to the nature of the scheme, IBNR are reported late hence an upward trend is estimated in the last few months
- Portability factor is important to predict future claims experience
- Number of hospital empanelment has direct correlation to the frequency of claims
- Public - private mix of hospitals affect the severity of claims
- Change in packaging is a continuous phenomenon hence require constant monitoring and adjustment.
- Some other key considerations to pricing are enrolment changes, change in loss sharing clause, emerging experience, fraud detection and prevention measures etc.
- There is complexity involved in leveraging the big data as it gives multiple views

The risk premium is calculated after adjusting all the above factors to the baseline premium. Which then gets adjusted for expenses of insurance companies.

Ayushman Bharat - COVOD19 impact

COVID19 impact on Ayushman Bharat will be ongoing till the pandemic continues. There has been a change in consumption package in the COVID19 scenario. There can be a spike in some packages once the pandemic is over but can return to the normalcy shortly. There may be a need to change the scope of claims investigations due to possible frauds.

To arrive at pricing the frequency can be adjusted for trends before and after COVID19 and future COVID19 experience expected. The severity can be adjusted for future COVID19 experience expected and the seasonality of the package consumption.

Future of Ayushman Bharat

It has created a great opportunity for insurance companies, hospitals, professional and actuarial experts. The insurance penetration levels has been raised from a negligible percentage to nearly 50%. A pilot is being planned by NHA where insurance companies are invited to participate to cover the people above the poverty line. Additional 50 crore people can get this benefit at affordable rates through this existing product infrastructure.

The Q&A session had a good response. Most of the questions were answered during the presentation. Few Q&A were as below

Q1. What is the Government doing for ensuring quality of care as the packaged rates are negotiated to the lowest levels?

A1. The rates are highly negotiated but considering the volumes there is an economy of scale

Q2. What is the experience of claim settlement viz actual to expected ratio. Secondly how many claims are rejected. Any study has been conducted?

A2. The claim rejection ratio is between 5-7% depending on a state

Q3. What is the approximate fraud risk percentage for the scheme?

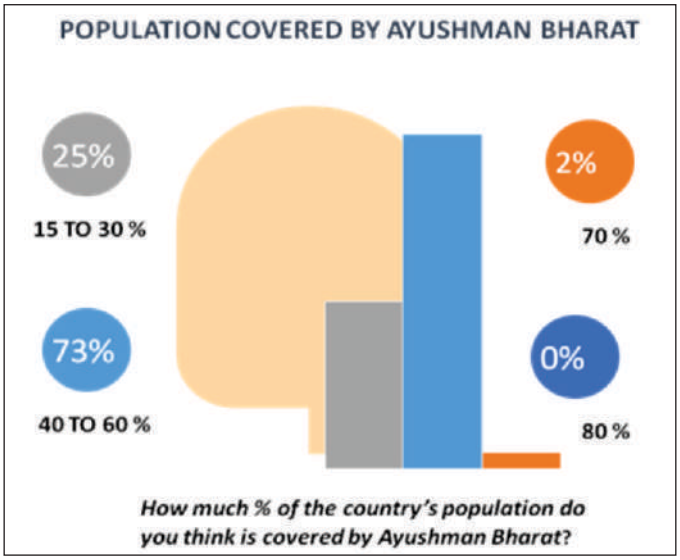
A3. Approximate fraud risk rage is between 10 to 35%. But with setting up of triggers for anomalies; efforts are made to minimise the frauds

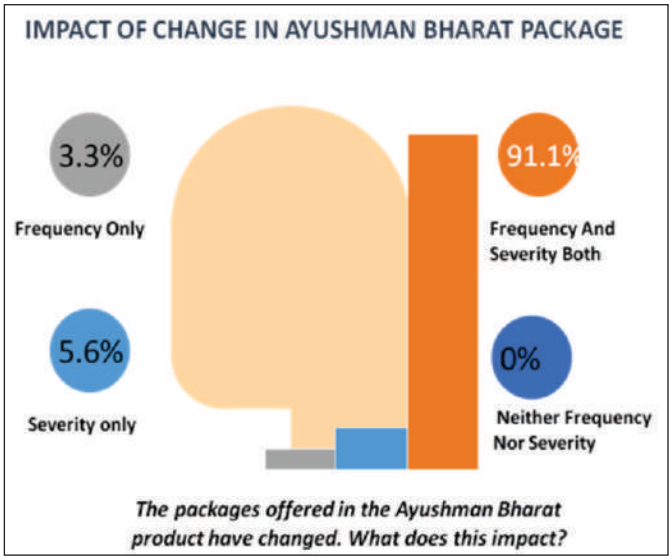
The webinar was concluded by Vote of Thanks from Kamlesh Gupta.

The organisers arranged for two online poll questions, to make the webinar interesting.

Q1. Approximately how much % of the country's population do you think is covered by Ayushman Bharat?
1. 15 - 30% 2. 40 - 60% 3. 70% 4. 80%

Q2. In 2020, the packages offered in Ayushman Bharat product have changed. What does this impact?
1. Frequency only 2. Severity only 3. Frequency and severity 4. Neither Frequency nor severity





Written by

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Deepa Pandit is a Associate member of IAI with over 30 years of experience in life insurance industry. Currently working as an Independent Consultant.

Obituary

Shri KP Narasimhan

Shri KP Narasimhan, one of very senior members of Indian Actuarial Profession passed away on 26th August, 2020. We are deeply saddened by the news about the demise of Shri KP Narasimhan. He served as President of Institute of Actuaries of India for two years from 1998–2000.

He has been one of the pillars of the Actuarial Profession in India. Being Chairman of the KPN Committee Report on the Actuaries Bill 2002, he played an important role in setting up of Institute of Actuaries of India. A life so beautifully lived deserves to be beautifully remembered.

May his divine soul rest in peace.

2nd Webinar on Risk Management

Covid19 – Response to Basis and Operational Risk and Championing Them

Date: 31st July 2020; Friday Time: 16:00 - 17:30 IST

Welcome Address: Kailash Mittal, Chairperson, Advisory Group on Risk Management, IAI

Moderator: Ashish Ranjan, Member, Advisory Group on Risk Management, IAI

Keynote Address: Sunil Sharma, President, IAI

Speakers: Sanchit Maini, Chief Financial and Operational Risk Officer, Prudential Corporation Asia

Richard Marshall, Director Insurance Consulting and Technology, Willis Towers Watson, UK

Introduction

Repercussions of Covid19 are significant and it has affected our lives personally as well as professionally. Things which were not anticipated few months back are actually happening. This has changed the risk profile of the enterprises and it appears that these changes are here to stay for long. **Assessing risks is considered to be a forte of actuaries. It would be interesting to understand how actuaries view this changing risk profile by noting their response to Basis and Operational risks and what is the way forward.** With this background this webinar titled "Covid19 - Response to Basis and Operational Risk and Championing them" was organised by IAI on July 31,2020. This was the second webinar on Risk Management. First webinar had covered Business Risks. The next one is planned to share the findings from the ERM projects undertaken by IAI members.

Kailash Mittal started **the session by noting how the situation that was considered unprecedented in pre-pandemic era has suddenly become a new-normal situation and there is a need to understand actuaries' concerns along with their views on moving forward.** His opening remarks were followed by the Keynote address by Sunil Sharma. Sunil Sharma discussed the importance of actuaries to move into the position of Chief Risk Officer as their core competency puts them in a better position to understand the entire range of risks that the organisation is facing.

Sanchit unfolded different dimensions of Operational risk and parallelly gave examples of various measures implemented in his organisation. This helped the attendees to understand the practical viewpoint. Richard discussed Basis risk and how Covid19 affects the process of setting assumptions. He discussed various challenges set by Covid19 and how we can respond to it. Richard's focus was mainly on life insurance but the same principles are applicable to other lines of business.

Operational Risk

Looking at the history of pandemics over past 100 years, they have a tendency to come back periodically. Insurance industry is used to model the stress of pandemics. In the light of this pandemic various trends are emerging globally. Some examples are rising nationalism, technological divide due to US/ China tensions, lower/negative interest rates, risks related to data, cyber security, use of AI, income and wealth inequality etc.

There are various operational aspects impacted across the companies due to Covid19 such as:

- Employer health and safety which is the foremost for any organisation as it is a health crisis
- Business continuation and Resilience which is the biggest concern for any business in this environment
- Political and Cyber risks, data security
- claims reporting
- persistency which is a multidimensional risk
- culture and conduct, e.g. behavioural changes in agents/ employees, work from home culture
- customer services

Risk management response to various dimensions of Operational risks:

There is no perfect solution but there could be iterative improvements where one can learn from the past actions and bring refinements to move forward. Aim is to have an organisation which is resilient, responsive and reflexive. With this background, Sanchit discussed various measures applied in his organisation to reduce the impact of operational issues which could be a possible response of any organisation.

- Set up different teams to take updates on daily/ weekly basis. Team exclusively analysing financial impact of changes in the market.
- Set up dashboards capturing the major risk drivers, detailed risk metrics
- Dialogues with the regulators, rating agencies regarding performance of the organisation in view of changing risk profile
- Question every assumption in each of the risks that was valid in pre-pandemic era, dependencies, consider all the possibilities in light of changing circumstances, make required changes

Countries that have performed exceptionally well in this pandemic have taught us that It is the collective response of the society rather than the individual that drives outcomes. Same is true for organisations as well.

Risk Management has become a core function in this crisis. It has also identified areas like cyber security and various emerging risks where specialist talent is required. Crisis is still evolving and taking incremental actions collectively as an organisation is the way forward.

Basis Risk

In a simple demographic context, Basis risk arises when the population on which parameters and models are based is different from the population to which those models are applied. Basis risk triggers when the gap emerges between actual and expected experience and it widens. Two main areas are:

- Where Basis risk is allowed in the form of Margins for Adverse Deviations in GPV reserving, emergence of surplus depends upon the release of these margins.
- In pricing Basis risk is a concern as Covid19 has impacted purchasing decisions and potential risks of the target market and pricing should capture it appropriately.

Mortality/ Morbidity risk factors:

Covid19 effect can be incorporated in mortality rates by expressing change in mortality between years t to t+1 as

$$q_{x,t+1}^{Total} = (q_{x,t}^{Total} - q_{x,t}^{C19})\,(1 - i_{x,t+1}) * \theta_x + q_{x,t+1}^{C19}$$

Where $q_{x,t}^{C19}$: COVID-19 mortality (observed or anticipated) in year t

θ_x : select effect due to health disparity in COVID-19 deaths

Various studies are going on globally to understand the impact of Covid19 on Mortality/ Morbidity rates. One such study conducted by Open SAFELY Collaborative identified various risk factors such as Obesity, Diabetes, Kidney disease, Stroke and Respiratory disease. The study showed that these factors have a significant impact on the combined probability of getting and dying due to Covid19. Also, social deprivation turned out to have a residual impact. Based on this study an investigation was conducted on the population over 65 in the UK to understand the magnitude of select effect, i.e. θ_x. The conclusion was that there was a reduction between 0.1% to 0.25% in mortality from non-Covid causes, higher reduction being observed in highest deprivation groups. This suggested that θ_x was close to 1 in the above equation and hence could be ignored. Insured population is also expected to be healthier and less likely to experience mortality due to Covid19. Hence in mortality projection as the formula suggests, the normal improvement is applied to non-Covid mortality and some additional deaths next year due to Covid19.

Similar results were expected for hospitalisation.

Richard identified other contributing factors such as geographical, behavioural, socio-economic etc. Each of these factors are observed to vary as per the region, lockdown pattern, observed number of cases/ deaths, population density and should be incorporated in mortality projection formula. There is a need to consider longer term factors which might bring improvement or worsening of mortality. Improvement factors are expected to be different for insured and non-insured population and depend upon all the contributors to Basis risk. Future waves of Coronavirus and its mutations will also play a part in determination of longer term factors.

Mortality projection models are sensitive to the data in recent years and a spike in 2020 Covid19 mortality is likely to distort the projections. Hence it has to be used with caution.

Moving forward!

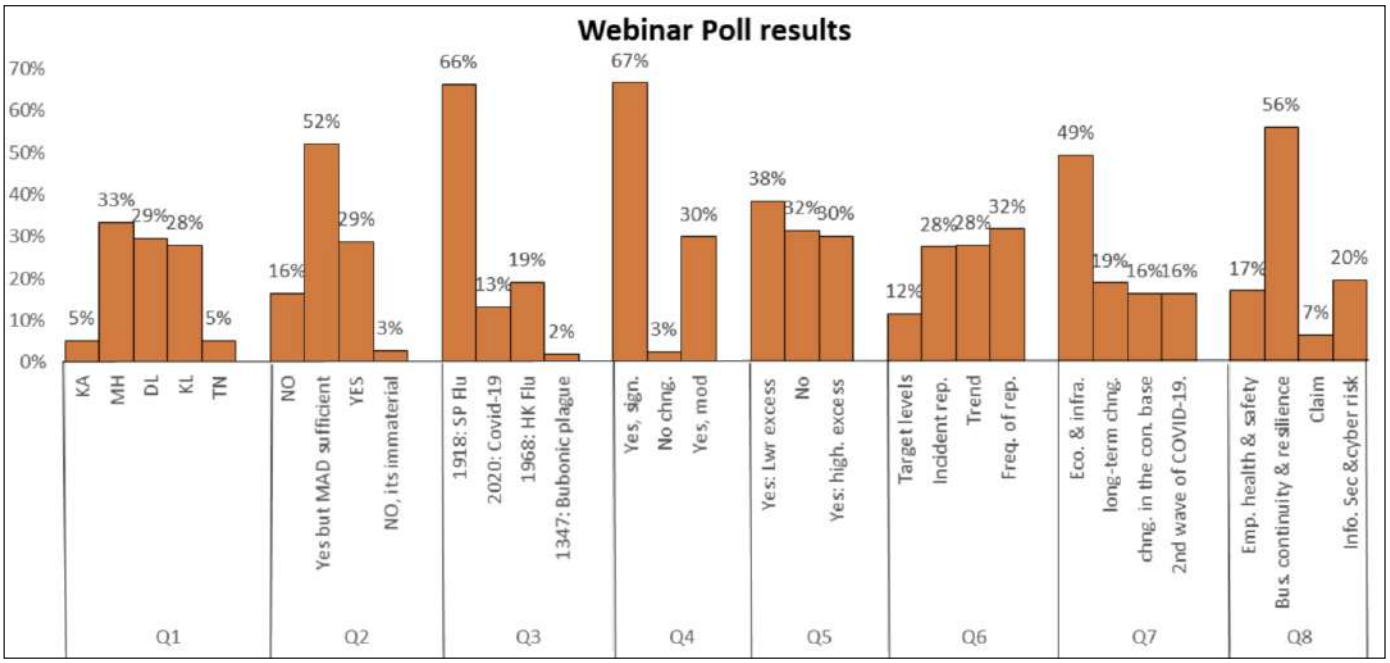
- Make changes in u/w procedures to incorporate anti-selection in view of Covid19
- More granular best estimate mortality/ morbidity assumption
- Update short term improvement assumption and develop a view for longer term
- Reassess Margins for Adverse Deviations

Presentations were followed by Q/A session. In this session presenters' views on changes in capital standards, term premium rates, impact of digital transformation and other changes were discussed. Webinar ended with vote of thanks by Ashish Ranjan.

Overall this webinar can be viewed as the need of the hour session and the panellists with their knowledge and experience gave full justice to the purpose of this webinar.

During the session there were some online polling questions which helped to understand the diversity of the audience and to keep it interactive.

1. Which of the following states/union territories do you think has seen the greatest behavioral changes over the past 4 months?
2. Does your organization consider basis risk when setting margins for adverse deviations (MAD)?
3. Which year was this photograph taken?
4. Do you believe risk management has gained in prominence in your organization?
5. Do you believe that COVID-19 will affect insured lives in India differently to the general population?
6. In designing an appropriate risk dashboard for COVID-19, the following aspects should be considered:
7. Which of the following do you think poses the biggest challenge for product pricing for the remainder of 2020?
8. Which operational area has been most impacted in your experience?



Written by

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Shilpa Mujumdar is working with Ranadey Professional Services heading Actuarial practice in insurance consulting area.

Webinar on IFRS 17 Implementation: Challenges and Solutions - Technological perspective

Date: 6th August 2020; Thursday Time: 16:00 - 17:30 IST

Moderator: Avdhesh Gupta, Member, Advisory Group On IFRS 17, IAI

Panelists: Peter Haslebacher, CEO, APACInsurTech

Angie NG, Head of Insurance Risk Solutions, Asia Pacific Risk & Finance Advisory, SAS Institute

Roger Chan, APAC Regional Technology Engagement Leader, Willis Towers Watson, Hong Kong

Justin Poon, Director, Insurance Consulting and Technology, Asia Pacific, Willis Towers Watson

Harrod Law, Senior Actuarial Consultant, Life Insurance, Hong Kong, FIS

Kay Song, Senior Actuarial Consultant, General Insurance, South Korea, FIS

Introduction

As IFRS17 standards are almost finalized by International Accounting Standards Board (IASB) in July 20, the Indian insurers are awaiting guidance from IRDAI and ICAI for implementation of these standards. With further delay in global timelines of implementation by one more year, effectively Jan 2023, the insurance companies are now relaxed from implementation perspective.

The technical interpretation of IFRS17 standards is one important aspect, however, availability of technological solutions and platforms to perform the calculations, needs equal involvement at this stage. It is important to understand the availability of technological solutions and the perspective of solution providers to plan our journey of implementation of these new accounting and reporting standards.

The IFRS17 Advisory Group of IAI organized this webinar by inviting technology solutions provider from across globe to share their perspective and experience on IFRS17 implementation projects, through the panel discussion moderated by Avdhesh Gupta. Kunj Maheshwari set the context of the session by talking about the importance of technological solutions for implementation of IFRS 17 standards.

Following were the topics discussed in the Panel discussion:

1. Top three challenges faced by technology solutions provider while implementing IFRS17 standards.

Angie NG shared her experiences by highlighting following as the key challenges: humogeneous data requirement at more granular level, building and providing technology solutions that could be tailored and configured basis different business needs and integrating stakeholder's views from different departments viz. actuarial, finance and IT to have end to end work flow.

Peter Haslebacher added that different people have different technical interpretations of standards which is causing additional challenge while implementation.

Harrod Law focused more on data governance, data strategy and data quality as an important aspect that should have been considered at initial stage of implementations.

Roger Chan, further added that the biggest challenge is collaboration between the finance, actuarial and IT departments. Collaboration is required to have *Business process efficiency* as there are multiple systems involved in this reporting.

Justine Poon & Kay Song shared their perspective from General insurance (GI) industry, that, due to smaller size of actuarial teams and lack of internal capabilities, the implementation is a bit challenging. The understanding of General Measurement Model (GMM) and non-availability of centralized data repository are the other two major challenges being faced by GI companies.

2. Volume of data required in IFRS17 reporting compared to IFRS4.

Harrod Law shared her opinion by stating that the data requirement in IFRS 17 has increased significantly compared to IFRS4, specifically for the calculation of subsequent measurements, basis of investment components, actual vs expected analysis etc. The data is required at much granular level and detail and hence,

she proposed to have focus on data governance.

Angie supported Harrod by adding allocation of expenses at cohort level as an additional challenge.

Justine stated that the GI companies are uncertain about the models to be used viz. GMM or Premium Allocation Approach (PAA). Generally, the GI companies have exposure to GMM models and for that, the data requirements are high.

3. Increased need of collaboration between Actuarial and Finance department

Roger commented that there is a need to integrate the actuarial models with the finance accounting systems as the dependencies on actuarial calculations have increased in these new standards compared to IFRS4. He further highlighted that for ongoing maintenance of the systems and models, there is a need for effective collaboration and communication between departments.

Peter added that the collaboration with IT department is equally important for the successful implementation. Also, the success depends on the effectiveness of the change management process of the organization as well.

4. Technology solutions providing analytical insights to the companies

Angie proposed to identify new Key Performance Indicators (KPIs) and new management dashboards basis the new standards. The technology solutions have capabilities to provide such KPIs at aggregate as well as at cohort level.

5. IFRS17: Minimum regulatory compliance or an opportunity to transform the existing finance systems.

Peter suggested that the companies should follow a phased approach to implement these standards, specifically, small insurance companies those who can't afford to invest time, resources and money on financial transformation. The companies should initially focus on ensuring minimum compliance of regulatory submissions corresponds to these standards.

Roger shared his insights by calling this as an opportunity for companies to transform the company's strategic decisions like pricing, re-pricing, risk management and automated process dashboards.

6. Most complicated part of the system design.

Peter stated that the quality of existing actuarial models within the insurance company determines the complications involved in transformation. He also talked about the importance of quality of data available, consistency in data maintained over years by the companies etc.

Roger added that the Contractual Service Margin (CSM) engine, data storage and integration of systems of different dept. is difficult, however, designing a technology solution that will meet different management objectives, linkage with existing systems of the companies with minimal changes, leveraging existing systems and meeting different needs of the customers is relatively more critical. He further added that, the ongoing maintenance and upgradation of the models is also critical from the solution provider perspective. The technological solution should be capable of running at regular intervals with no outages and should be auditable.

Justine shared her opinion from GI company's perspective that due to limited actuarial capabilities and non-availability of enough actuarial resources in GI companies, the solution should have user friendly interface to be successful.

7. Impact of continuous evolution/changes in IFRS17 standards on technology solutions.

Harrod Law said the technology solutions should be flexible to adjust basis the ongoing changes in standards on ongoing basis.

Angie supported her argument by adding that the technology solutions should be comprehensive. IFRS17 is a principle based standard and is still evolving. The standard is still under continuous enhancements and hence the solutions should be capable of handling these changes.

8. In-house system development vs. relying on technology solutions providers.

Roger very specifically recommended not to have in-house system development as the insurance companies are not the subject matter experts in designing the systems, they may take unusual time and cost for development. In addition, the regulatory requirement will be to perform the activities on regular interval with hundreds of runs and within specific timelines. This would need reliance on stable and tested interface to ensure timely regulatory compliance.

He also suggested that, in case the small insurance companies are facing concerns of implementation cost, they should consider outsourcing IFRS17 reporting related activities to vendors. Harrod Law seconded the views shared by Roger.

From GI perspective, Kay Song shared her opinion that the PAA approach is majorly followed by GI companies, using the existing models available within the

companies. The insurer should assess the requirements and check whether the existing models could be used before taking any decisions related to technological investments.

9. Learnings and challenges faced from the recent experience of implementation.

Harrod Law shared her experience that due to pandemic situation there were some operational difficulties faced like language problems, no face-to-face interactions etc. while working remotely for different geographies.

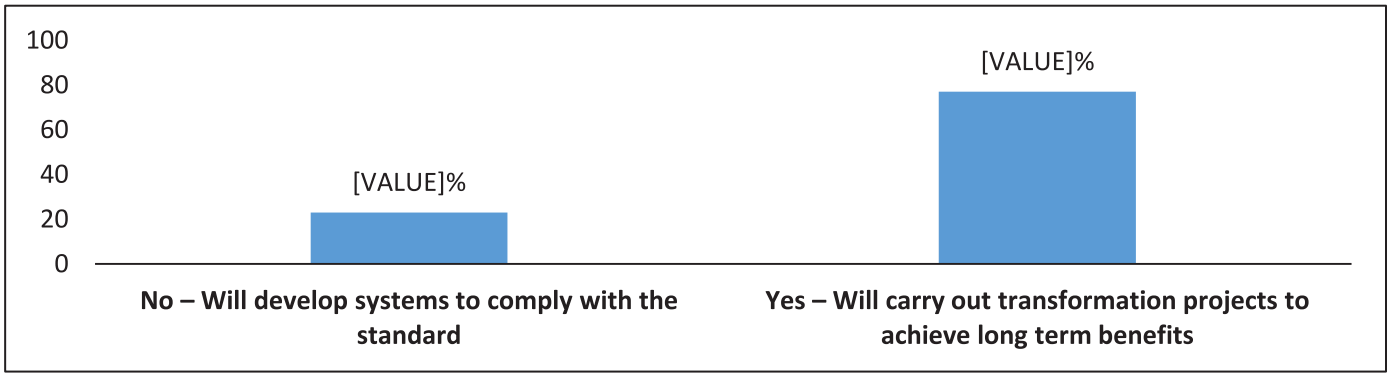
Angie added that the business requirements of different customers are different, which is very important to understand. The documentation of technical memos, accounting policies to be followed, availability of data, systems and processes etc. was critical.

Peter shared his experience that with deferral of the implementation date by IASB, the companies are now reluctant to prioritize the implementation of these standards. He proposed to not to defer the implementation process of these standards basis global timelines as these standards are not easy to implement.

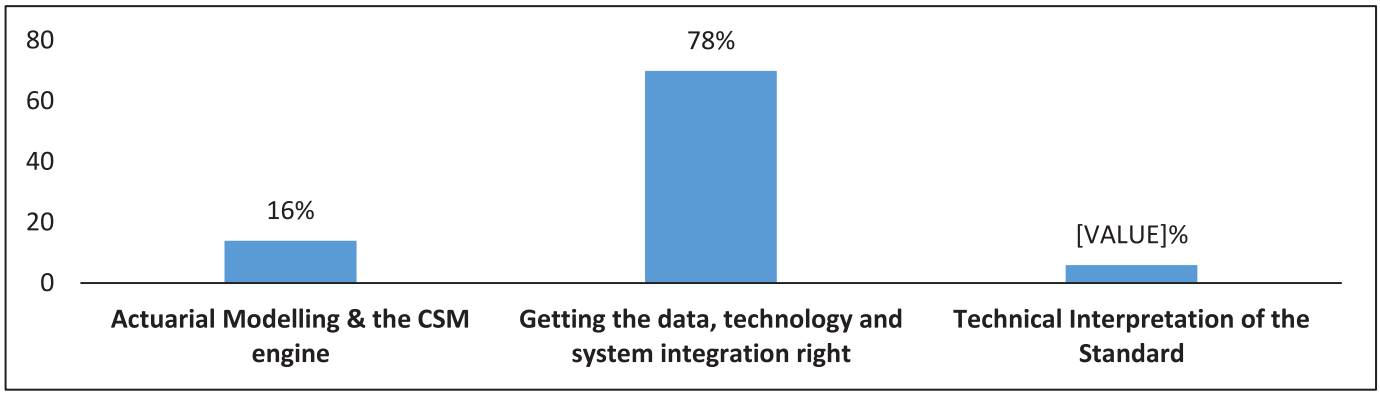
Roger shared his opinion that the communication was the key while implementing standards for clients. Different departments have different expectations and mindset and it's important to assess these expectations from the solutions provider perspective.

Following were the poll questions asked during the webinar along with the responses from the participants.

1. Do you think IFRS 17 implementation as an opportunity to overhaul and relook at your entire reporting landscape?



2. Which according to you in the most challenging area in IFRS 17 implementation



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Impact of Climate risk on Financial Institution

Abstract

Climate change is real, and the times are changing. The environment is crumbling at a pace beyond reproach. Theories are becoming a reality and the world requires collective action. Climate risk threatens to expose in a way that can be detrimental to humanity in an unprecedented reality, the financial institutions has been reluctant to take definitive steps towards making climate risk an essential threat and treat it accordingly. While steps have been towards countering risks, general awareness and concern is still a widespread issue. While the primary driver will always be money and maximising profits, in the industry, the environment shall also have to be looked upon as a fundamental cause inhibiting it, further facilitating action.

Left unmanaged, climate changes will reverse development progress and compromise the well-being of current and future generations.

Background

While the world was asleep, one fine day the global narrative changed. It was not a surprise to those who did know and cared, but given the minimal proportion, and the global setback, it indeed was a shock, that would modify the perspective and the way forward. The first climate change bankruptcy, as they call it, PG&E California utility got overwhelmed by the overwhelming rapid climatic changes as a prolonged drought dried out much of the state and decimated forests, dramatically increasing the risk of fire, in turn causing the utility damage that it could not recover from.

The restructuring resulting in the tightening of the climate risk policy across the globe is accelerated by the Paris Agreement, which sets clear aspirations to limit global warming to 1.5 or 2 degrees Celsius, and will affect all sectors and future investment patterns for global financial capital. The investors are confronted with a physical impact risk, which is linked to potential adverse impacts from climate change such as extreme weather, floods or droughts, and sea-level rise.

IMPACT OF CLIMATE RISK ON FINANCIAL INSTITUTIONS

The classification of risk falls into multiple brackets and is open to adoption by institutions to a certain extent, whereas climate risk unfolds multifold areas of concern. From consumer borrowing to capital decisions, climate risk needs to be incorporated everywhere. Since the very inception, borrowing has been directly proportional to the monetary standards of an individual with a unidimensional outlook. Financial institutions have been complacent, and as a result most climate drivers are not incorporated in such databases. Hence, without data there are no repercussions, neither is there any scope to interpret behaviour, and the entire system of assessing climate exposure gets complicated. Examples of such pertinent data include energy mix of utilities, cost of reserves for oil and gas upstream companies, supply chain information for industries, or precise collateral location for mortgages. In these cases, we rely on external borrower-level data, industry-level data , or expert judgment.

Contribution by the Actuarial Profession

Actuaries are not climate scientists. As a result, they would not be in a position to provide an opinion on the science of climate change and its future impacts. For this purpose, they will have to be guided by the majority view held by the climate scientist community. The actuarial profession should recognize climate change and its impact as a distinct possibility and use its expertise in quantifying these risks. The actuarial profession can make a valuable contribution to the current efforts to deal with climate change by setting up suitable indexes to monitor the future events that will permit them to increase the confidence level in their estimates of future costs. Many of the organisations that Actuaries support are concerned with climate risk and with how it will affect their business - for example general insurers, banks and investment managers. The index is intended to provide a useful measure of how the extremes of weather are changing in order to support assessment of the change in risk. To ensure that the index is easy to understand, the AACI(Australian Actuaries Climate Index) uses a simple aggregation method, and takes the simple average of each of the three component measures (once they have been standardised).

$$AACI = mean\,(HighTemp_{std} + Precip_{std} + SeaLevel_{std})$$

The index is provided at quarterly time periods and updated on a quarterly basis. The primary metric used is a five-year moving average, which smooths some of the volatility and weather cycle impacts from the measure.

Actuaries can perform statistical analysis of trends and attribution of insurance events and climate change, building on the work of Francis Zwiers and other statisticians in the field of extreme weather events and climate change.

THE GREEN ROAD AHEAD:

A joint initiative by Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA), shall lead to the formation of the Climate Financial Risk Forum, the aim of which is to help the financial sector manage the financial risks from climate change and support innovation for financial products and services in green finance. The forum will involve representatives from industry as well as technical experts and other stakeholders.

Another such initiative taken to solve the increasingly difficult issue of projection and valuation of companies and to tackle disclosure amongst institutions in the United States of America was the Climate Risk Disclosure Act. The Climate Risk Disclosure Act was reintroduced and passed by the House Financial Services Committee, this called for corporations to increase the level of disclosure in terms of Climate practices in corporations. This shall facilitate increased levels of transparency between the stakeholders and the corporations.

Climate change poses large challenges for the insurance industry but also introduces many new opportunities. The advancement of clean technologies and low carbon infrastructure offers new sources of premium growth by providing new insurance products such as renewable energy project insurance. Similarly, new products relating to public policy risk, including those to cover unforeseen withdrawals of environmental subsidies, can also provide revenue growth. Climate change also brings new investment opportunities in clean technologies, emerging carbon trading markets, and in 'green bonds' as well as in the financing of the de-carbonisation of our economy.

CONCLUSION

In a nutshell, environmental sciences and financial sciences need to amalgamate in a way that is fruitful for the future. Financial integration of climate change is not just a demand, it is currently a necessity in the global scenario. With that viewpoint, the cooperation and mechanism to move forward needs to be inculcated steadily into mainstream financial management. The stressed factors need to be induced in the right manner, with uniform control and responsibility across organizations. Sometimes the mere act of measuring and disclosing certain risks is all it takes to turn a company's creative energies toward effective ways of managing that risk.

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Low Interest Rate Environment: Opportunities to Insurers

Onset of a low interest rate environment is expected to exhibit a downward trend on actual returns generated from the book of investments, whilst increasing the asset liability mismatch for the life insurance companies having long term liabilities. The pressure would be even more for smaller and newer life insurance companies, as it will not only impact its business plan and the cash flow planning but also affect their spending as the allowances generated from the small in-force book could widen the expense gap and reduce the ability to price competitively. While it poses a threat, it embeds an opportunity to focus on right business with the use of cost-effective sophisticated technology in place to allow efficient spending of the expense budget. It can also open the floor for a better asset liability management with the pricing of right products coupled with use of structured investment or innovative reinsurance solutions. The insurer can measure its spending compared with its own size as a key driver to determine the level of sophistication needed. While the use of technology may reduce impacts to policyholder to some extent, it creates a sustainable business model for the growth of the insurance industry, where the theme is to maximize inclusion and offer services to customers at their fingertips.

Few key areas of focus to reenergize this vibrant insurance industry during this low interest rate environment can be as follows:

New Business: Securing new business is challenging from the desired level of guarantees in the product by potential policyholders but the sense of not having adequate insurance cover amongst individuals could be an opportunity for Insurers to focus more on cost-effective and innovative products. For example, introduction of term assurance products with return of premium with the guaranteed option to convert to a health insurance plan at maturity without any underwriting can provide customers a sense of security in terms of their long-term health and protection.

ALM: A fair understanding of the cash flows and any changes in the expected cash flow pattern would be important as that will not only help to manage the liquidity needs but also provide opportunity to diversify the business. Various scenario testing can be done to identify cash flows that can allow natural hedging to market risk and the ones that require hedging strategies for the residual risks.

Reinsurance: It is a key tool to transfer and manage mortality risk. Insurers can look at more innovative and structured arrangements with better outcomes. Some examples could be reinsurance arrangements with pool of reinsurers via a special purpose vehicle where region wise insurance risks are pooled amongst Insurers and thereby the insurance industry as a whole can be benefited from the reduction in reinsurance premium which can result in the reduction in insurance premiums to customers. This needs collaboration amongst Insurers and use of advanced technology to create a sophisticated platform for common use.

Partnerships: Selling insurance in a way that not only increases the penetration rate but also be cost-effective should be explored. Partnerships with entities having established infrastructure could be beneficial. It could be any entity and not just restricted to banks or financial institutions. It could even be chain of schools and colleges, trusts or not-for-profit organisations (e.g. mandatory inclusion of risk coverage at minimal price).

Technology: In the coming decades technology is expected to bring in breathtaking changes. It is as important to remain attuned to these changes. Insurers have to deploy new technology in order to sell their products effectively and manage their business efficiently. Achieving a cost breakeven within a timeframe after introducing new technology would be of utmost importance as the technology space is changing rapidly. So, early adoption together with achieving required volume need to be focused.

Regulation: It is well known that under the current solvency framework a very low interest rate environment can put extreme pressure on companies' solvency positions. It is of the utmost importance that confidence in the ability of Insurers to meet their obligations be maintained. The regulator can play a lead role together with the actuarial institutes to help Insurers in overcoming this situation. Such practices are prevalent in other insurance markets as well.

In ***conclusion*** while the low interest rate poses significant challenges, it comes with bundle of opportunities. The perspective of the Insurers and

their commitments to the business will determine the shape of the industry in the decades to come. By keeping the focus on these areas, Insurers can set the ground for the next level of growth- where threats are dealt with as opportunities.

The details mentioned in this article are the independent view of the writer of this article and not that of his employers.

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UPCOMING WEBINARS

S.No.	Webinar	Date	CPD
1	2nd Webinar on Life Insurance	13 August, 2020	1.5 hrs in Life Indurance
2	3rd Webinar on Pension - 17th CIRB Module 1 - Exempt Provident Fund Actuarial Valuations- Overview of industry opinions and way forward presented by Special Task Force	18 August, 2020	1.5 hrs in Pension, Employee Benefits and Social Security
3	3rd Webinar on Pension, Employee Benefits and Social Security - 17th CIRB Module 2 - To Annuity and beyond...	19 August, 2020	1.5 hrs in Pension, Employee Benefits and Social Security
4	2nd Webinar on Health Care Insurance	27 August, 2020	1.5 hrs in Health Care Insurance
5	2nd Webinar on Banking, Finance & Investment	5 September, 2020	1.5 hrs in Banking, Finance & Investment
6	3rd Webinar on Pension, Employee Benefits and Social Security - 17th CIRB Module 3 - Latest trends and impacts on ESOP design and valuations	10 September, 2020	1.5 hrs in Pension, Employee Benefits and Social Security
7	3rd Webinar on Pension, Employee Benefits and Social Security - 17th CIRB Module 4 - Pensions in a low to very low interest rate environment	11 September, 2020	1.5 hrs in Pension, Employee Benefits and Social Security
8	Tech Talk	12 September, 2020	No CPD
9	3rd Webinar on Health Care Insurance	23 September, 2020	1.5 hrs in Health Care Insurance
10	6th Webinar on Data Science & Analytics	3 October, 2020	1.5 hrs in Any Area of practice
11	Tech Talk	10 October, 2020	No CPD
12	4th Webinar on Health Care Insurance - Data Science and Health Insurance	29 October, 2020	1.5 hrs in Health Care Insurance
13	Tech Talk	7 November, 2020	No CPD
14	3rd Webinar on Banking, Finance & Investment	5 December, 2020	1.5 hrs in Banking, Finance & Investment
15	Tech Talk	12 December, 2020	No CPD

"PROBABLE MAXIMUM LOSS" - Estimation and Challenges: A way forward

The term "probable maximum loss (PML)" is one of the most widely used terms particularly in property insurance underwriting during late 1960s and early 1970s. One of the important challenges in this context is there is no well defined definition of PML. Among the actuaries there were wide differences in the use of this term. We also witnessed difference in the usage and interpretation between the underwriter and insurers. No two of their definitions fully agree. In the absence of a clear and well defined meaning, the term can be a true invitation to confusion. All these confusions were put to rest in the aftermath of the seminal paper by Margaret E Wilkinson (1969). When the extreme value theory was developed in 1970s, one can see a reasonable degree of convergence between some of the distributions used under extreme value theory and PML. In spite of all these, there are significant challenges in estimating PML and different method gives different values. In this paper an attempt is made to bring together all the concepts and try to evolve a workable definition for PML. We also attempted to estimate PML under various definitions and compare them to see which one is most acceptable one.

This paper is organized in four sections. While section 1 deals with definition of PML, section II deals with various methodology used in estimating PML. Section III gives actual use of these methodology and arrive at various estimates of PML. Section IV gives conclusions and challenges in estimating the same.

Section I : Definition of PML

PML was originally used in property insurance and later in liability insurance. Towards the mid 1970s this was widely used in risk management. In addition to risk management, a workable definition of PML would enable a general insurance company to articulate its risk tolerance in her business in general and in the property and liability classes of business in particular. The issue is whether this should signify 'probable maximum loss' or 'maximum possible loss'. Accordingly we witnessed two definitions, viz., "the probable maximum loss for a property is that proportion of total value of the property which will equal or exceed in a stated proportion of all cases, the amount of loss from a specified peril or group of perils". The other definition was "the probable maximum loss under a given insurance contract is that proportion of the limit of liability which will equal or exceed, in a stated proportion of all cases, the amount of any loss covered by a contract. McGuinness combined these two definitions and gave a single one, as " The PML for a specified financial interest is that proportion of the total value of the interest which will equal or exceed, in a stated proportion of all cases, the amount of any financial loss to the interest from a specified event or group of events". [McGuinness] These two definitions could be interpreted as "the probable maximum loss under a given insurance contract is that proportion [100 (m+k)%] of the limit of liability which with probability P is greater than or equal to any loss covered by the contract, where m is the mean or "expected" proportion of loss.

When the CAS discussed this topic in a number of fora, a group of underwriters gave the following observation: ' It is neither foreseeable nor possible loss—rather, it is the maximum loss which probably will happen when and if the peril insured against actually occurs".

On the basis of the above, PML depends on the estimates of the likelihood that losses of various sizes will occur, the amount of losses and associated probabilities that the insured is willing to accept, the amount of losses and associated probabilities that the underwriter is not willing to accept.

Its primary uses is in the quantitative part of underwriting or risk selection. Here it is used as the basis for attempting to secure an adequate spread of risk, by limiting the amount of an insurer's liability to absorb that loss from a single occurrence. It is used very little and with extreme imprecision in connection with catastrophic exposures that give rise to losses to several insured properties at the same time.

The immediate purpose of determining the PML for any specific property or risk is to provide a basis for selecting the maximum amount of insurance that an insurer should retain on the risk for its own account. This amount is commonly called the insurer's "net retention." PML is a tool to be used in achieving a particular result - the retention - not an end in itself. Parallel to determining the company's own retention or exposure to loss on a particular risk, the maximum amount to which an insurer wishes to expose its treaty reinsurers on the same risk is also based on the underwriter's assessment of the PML.

In turn, the purpose, of setting underwriting retentions is to stabilize an insurer's experience so

that one or more large individual losses will not adversely affect its over-ah underwriting result by more than a specified amount during any one year. The ultimate objective for determining the PML of an individual risk is therefore to help stabilize the over-all claim results of a portfolio or group of risks during each year or other accounting period. Most insurers set a goal each year of a specific monetary amount of claims. This may be done explicitly, or it may be done implicitly by stating a target premium volume and a target loss ratio.

All these definitions require four pieces of information, viz.,

a. The first datum required for the property definition is the value of the property.
b. The second required datum is a proportion of that value. These are definite, measurable quantities. The first can be expressed as a monetary amount, and the second either as a monetary amount or as a percentage of value.
c. The third required datum is the peril or group of perils that is being considered. Since there are apt to be considerably different PML's for the different major perils, it is usually wise to determine these PML's separately and then to select the largest for use. For the insurance definition, the amount of insurance is needed instead of the value of the property, and the second needed datum differs correspondingly.
d. The fourth datum is the major essential which is missing from existing definitions of PML.

Unless we state in specific numerical terms the degree of probability which we desire, PML cannot have a clear or precise meaning. This probability must be factually based and should be measured as accurately as possible, not just pulled from the air or based on unaided judgment. The probability should also be selected on the basis of factual criteria that suitably link it to the objective underlying its selection: a definite degree of stability in underwriting results.

It is also worth noting that the probability pertinent to PML involves only one tail - the upper end - of the relative frequency distribution of claims. With respect to PML we are only interested in adverse fluctuations, those above the PML value. This differs from most ratemaking situations, in which both upward and downward fluctuations about the mean or some other statistic could be considered.

In another type of argument, PML could be linked to the claim amount which will just avoid the ruin probability. The ruin probability is based on the reserves, premium income and claim distribution. When the claim is just less than the total net reserves, a company is said to avoid the ruin process. PML is the maximum loss which one could think in a portfolio. An important distinction must be kept in mind. While PML is a demand determined value, ruin probability reserve is a supply determined value. Hence one cannot compare these two, however one can link the causal factors.

Section II: METHODOLOGY

In estimating PML, "order statistics" has been used extensively, the basic properties of this are explained below.

Let X1 X2 ... Xn denote a random sample for a population with continuous cumulative distribution function Fx. Since Fx is continuous, the probability that any two sample values being equal is zero. Hence there exists a unique ordered arrangement. Let $X_{(1)}$ is the smallest number and all the other values in the sample are in the increasing order.

Therefore,

$X_1 < X_2 < X_3 \ldots < X_n$

For $1 \le r \le n$, $X_{(r)}$ is called the rth order statistic.

The beauty of order statistic is that it is distribution free. "If an inference is distribution free, assumptions reporting the underlying population are not necessary. The distribution free inference is based on a random variable which has a distribution independent of the underlying population's distribution". (M.E. Wilkinson page 197)

PML is the maximum loss we can have/expect. Hence in this sample X_n is the first approximate value of PML.

Regarding the other estimate of PML, let us assume that the cumulative distribution function of X_n is given by

$$F_{x_{(n)}}(x) = F_x^n(x)$$

$$f_{x_n}(x) = n\, f_x(x)\, F_x^{n-1}(x)$$ where fx is the density function.

$$E(X_{(n)}^k) = \int_{-\infty}^{\infty} x^k f_{x_{(n)}}(x)\, dx$$

$$= \int_{-\infty}^{\infty} n\, x^k f_x(x) F_x^{n-1}(x)\, dx \qquad \text{----------(1)}$$

By using Taylor series and applying Schwartz's inequality conditions, we can derive

$$E(X_{(n)}) \le \left[\int_0^1 (n^2 u^{2n-2} - 2nu^{n-1} + 1)du\right]^{1/2}$$

Hence,

$$E\left(X_{(n)}\right) \le \frac{n-1}{(2n-1)^{1/2}}$$

If mean and variance of the population are μ and σ^2, then

$$E\left(X_{(n)}\right) \leq \mu + \frac{(n-1)\sigma}{(2n-1)^{1/2}} \qquad \text{----------(2)}$$

Equation (2) is distribution free and we need the information of mean and variance of the population, not its sample distribution. Once we have the sample values, we can always work out the mean and standard deviation without knowing the frequency distribution of the sample.

Looking into this from another angle, we see that there is a limitation in the above technique, as if the loss is unbounded, then X_n cannot predict this PML value. In such circumstance, one has to use quantiles and estimate the boundary values.

A quantile is a real number which divides the area under the probability function into two parts. Let pth quantile be k_p (for 0≤ p≤1), then k_p is the solution to the equation

$$F_{(x)}(k_p) = \mathrm{p}$$

It can be shown that rth order statistic is a consistent estimator of the pth quartile where $\frac{r}{n} = \mathrm{p}$.

We can deduce from the equation that r = np if np is an integer. This gives the point estimate of k_p.

However, it is desirable to have an interval estimate of k_p. We have to find two numbers r and s, r < s such that

$$P\left[X_{(r)} < k_p < X_{(s)}\right] = 1 - \alpha \quad \text{such that} \quad 0 < \alpha < 1$$

Since $F_{(x)}$ is an increasing function, as states earlier, by using, integration by parts, we can prove that

$$P\left[X_{(r)} < k_p < X_{(s)}\right] = \sum_{i=r}^{s-1} \binom{n}{i} p^i (1-p)^{n-i}$$

For any p, $X_{(r)} < K_p$ if and only if at least r of the sample values are less than K_p. Since the sample values are independent, n sample values are nothing but n independent trials of Bernoulli variable with parameter p. In estimating various possible values of PML we use the same methodology, as suggested by Wilkinson. For the sake of comparison purposes, we have used the same notations. However, on a careful perusal of the literature under PML estimation, earlier to the publication of this paper there was not a single agreed approach. Wilkinson's paper addressed the estimation issues and give a concise approach.

Section III: DATA AND ESTIMATION of PML

To estimate PML, we need actual data of claims. In the absence of actual claims data, we have generated 200 sample points using random number generator. We used a lower limit of ₹10,000 and upper limit of ₹10,00,000. Wherever the number generated is less than 10,000, we ignored that number and replaced by one where we got more than ₹10,000. In this process, we have selected 200 sample points and the following table gives the salient features of the sample.

Table1: Sample Claims Data

(in ₹)

Variable	Minimum	Maximum	Mean	Standard deviation
Claim amount (x)	**17,867**	**5,88,796**	**3,20,707**	**49,867**

On the basis of above exercise, we got six (6) measures of PML, which are estimated as follows:

(a) X_n as an estimate of PML:

Out of 200 sample values of claims the maximum value of the sample is given by X_{200} which is ₹5,88,796. This we take as PML (1).

(b) $E(X_{200})$ as an estimate of PML:

To find $E(X_{200})$ we need F_x^{-1} Let us assume that the sample follows a lognormal distribution, then mean is given by

$$e^{\mu + \frac{1}{2}\sigma^2} \quad \text{and variance is} \quad [e^{\sigma^2} - 1](e^{2\mu+\sigma^2})$$

Respective normal distribution has a mean of 13.017839 and standard deviation of 0.12436.

$$E(x_n) = \Lambda_x^{-1}\left[\frac{n}{n+1}\right]$$
$$= e^{[\sigma Z^{-1}]\left(\frac{n}{n+1}\right) + \mu]}$$

where Λ_x is lognormal distribution, Z is the standard normal distribution μ and σ are the mean and SD of normal distribution respectively.

This gives the PML estimate of ₹6,01,750 -------(PML 2).

c) Upper bound of an interval around $E(x_n)$ using $Var(x_n)$ as an estimate of PML:

We can choose k such that $E(x_n) + k[Var\,(x_n)]^{1/2}$ gives a reasonable estimate of acceptable risk. As explained above,

$$Var\,(x_n) = \frac{n}{(n+1)^2(n+2)} \left\{f_x\left[F_x^{-1}\left(\frac{n}{n+1}\right)\right]\right\}^{-2}$$

Accordingly,

$$Var\,(x_n) = \frac{200}{(201)^2(202)}\ [\lambda_x(6,01,750)]^{-2}$$

where λ_x is the density function as given below.

$$\lambda_x = \frac{1}{x\,\sigma(2\pi)^{1/2}}\, e^{-\frac{1}{2}\sigma^2[\ln x - \mu]^2}$$

This gives $[Var\,(x_n)]^{1/2}$ as 87,021.

Assuming k=1, then the PML estimate is 6,88,771 ------ (PML 3) .

If the value of k>1, impact of risk is very high and this dilutes the importance of underwriting. Hence, as a preventive measure, it is assumed k=1.

d) Distribution free upper bound of $E(x_n)$ as an estimate of PML:

200 sample claim points produce a mean of ₹3,20,707 and SD of 49867. Hence,

$$E(X_{200}) \leq 325650 + \frac{199}{(399)^{1/2}}\,(49867)$$
$$\leq 822448$$

as we earlier proved that

$$E\left(X_{(n)}\right) \leq \mu + \frac{(n-1)\sigma}{(2n-1)^{1/2}}$$

Hence the fourth estimate of PML is ₹8,17,505.....(PML 4).

One must recognise a serious limitation of this method. As n increases, PML estimate by this method increases. This is contrary to the efficiency feature of any parameter, because as sample size increases, the parameter estimated there from approaches long term trend value and does not explode.

e) k_p as an estimate of PML:

If we decide 95% quantile could be used as PML estimate, then 0.95 × 200 = 190 and
the PML $X_{(190)}$ = 5,72,921.....(PML 5)

f) Distribution-free upper bound of k_p as an estimate of PML:

Based on the sample claim data, 95% quartile is ₹393674 as an estimate of PML. We need a confidence interval for this estimate where 'a' is the lower limit, 'b' is the upper limit and α = 10%, hence

$$P\left[X_{(a)} < k_p < X_{(b)}\right] = \sum_{i=a}^{b-1} \binom{n}{i} p^i (1-p)^{n-i} = 0.9$$

where, n= 200, p= 0.95

In finding the interval, we should consider the values of 'a' & 'b' such that (b-a) is minimum.

By calculating various intervals, we observed

$$P\left[X_{(156)} < k_{0.95} < X_{(197)}\right] = 0.886$$

As this value is close to 0.9, we have selected this interval. Hence, we estimated a as 156 band b as 198. Hence,

$X_{(198)}$ is treated as the upper bound of k_p .

$\therefore$ PML of $X_{(197)} = 5,82,634 \ldots\ldots\ldots\ldots\ldots\ldots PML\ (6).$

Section: IV: Conclusions and way forward

Based on the above analysis, we got six measures of PML, as listed below:

Table: Summary estimates of PML

Method	PML estimate (₹)
1. X(200)	5,88,796
2. E(X(200))	6,01,750
3. E(X(200) + 2[Var(X(200)]1/2	6,88,771
4. Upper bound for E{X(200)}	8,17,505
5. X(200) as an estimate of k p	5,72,921
6. Upper bound for k p	5,82,634

In the above estimates, one derived in items 4 and 6 are distribution free. As explained earlier, the efficiency of item 4 is high doubtful in view of the contradictory nature with the sample size. The theoretical properties of estimates 2 and 3 are very robust and to some extent of item 6. The estimate derived under item 3 is close to the mean of the Frechet distribution which is a prominent one under Extreme Value Theory. Under extreme value theory three probability distributions are very prominent, viz., Weibull, Gumbell and Frechet. Of the three, Frechet distributions has a number of stability features and usually this is preferred over the other two. It is very interesting that the estimate under method 3 is very close of the mean of the Frechet distribution.

As per Extreme Value Theory, if the underlying loss distribution follows log-normal distribution, then the posterior distribution is Gumbel Distribution. On the other hand if the underlying loss distribution follows any of the distributions, viz., F, Log-Gamma, t, Burr, or Pareto, then the posterior distribution is Fretchet distribution. When the values fluctuates widely, both the mean and variance will change, but the ratio will not change significantly between one interval to another. But the in the extreme value theory one has to accommodate situations where the ratio of mean to variance will change drastically. Fretchet distribution is more suited to handle such circumstances than Gumbell. Moreover some variables may take negative values in the extreme situations which cannot be accommodated under log-normal distribution. Because of these reasons Fretchet is more suitable for both extreme value theory and PML.

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Hong Kong Insurance Business Statistics: Q1 2020

The Insurance Authority released provisional statistics of the Hong Kong insurance industry for the first quarter of 2020 in May, indicating a growth of total gross premiums by 10.9% to $165 billion over the corresponding period in 2019.

Total revenue premiums of in-force long-term business were $146.7 billion in the first quarter of 2020 (increased by 11%), mainly comprising $124.4 billion of Individual Life and Annuity Non-Linked business, $6.4 billion of Individual Life and Annuity Linked business, and $13.9 billion of Retirement Scheme business. On the other hand, new office premiums (excluding Retirement Scheme business) of long-term business were $35.1 billion (decreased by 27.5%). New office premiums in respect of policies issued to Mainland visitors were $5.4 billion (decreased by 57.7%), constituting 15.5% of total individual business. Restrictions imposed on cross-boundary passenger traffic to contain the COVID-19 outbreak caused premiums to contract by 27% on a quarterly basis. Critical illness, whole life and medical products continued to dominate as before, representing 48%, 37% and 4% of new policies taken out by Mainland visitors respectively. About 98% of policies were settled at regular intervals, i.e. non-single premiums.

The gross and net premiums of general insurance business in the first quarter of 2020 were $18.3 billion (increased by 10.1%) and $12.2 billion (increased by 7.4%) respectively. The overall underwriting profit rose from $44 million to $329 million, propelled by better performance of direct business and a significant turnaround in reinsurance inward business.

Introduction of amendment bills to strengthen Hong Kong's position as a global risk management centre and regional insurance hub

The Insurance (Amendment) Bill 2020 provides for a bespoke, streamlined regulatory framework for the issuance of insurance-linked securities (ILS) through the formation of special purpose insurers (SPIs). ILS are alternative risk-management tools for transferring insurance risk to the capital markets.

"The Central Government has announced support for Mainland insurers to issue catastrophe bonds in Hong Kong1," said Dr Moses Cheng, Chairman of the Insurance Authority. "The proposed legislative amendments will pave way for Hong Kong to become the preferred domicile for ILS, in particular catastrophe bonds. This will facilitate insurers to better capture business opportunities, and more importantly, extend the capacity of the insurance industry; thus enhancing its sustainable development."

The bill also seeks to expand the scope of insurable risks of captive insurers set up in Hong Kong, helping the industry capitalise on business opportunities arising from the Belt and Road Initiative.

Preferential treatment for the Hong Kong insurance industry to 30 June 2021 from China Banking and Insurance Regulatory Commission

On 23 June 2020, the China Banking and Insurance Regulatory Commission (CBIRC) announced an extension of the preferential treatment accorded to Hong Kong under the "China Risk Oriented Solvency System" for another year to 30 June 2021, allowing Mainland insurers who cede businesses to qualified local professional reinsurers to enjoy lower capital requirements.

The CBIRC said that continuation of the preferential treatment would help to strengthen mutual trust in insurance supervision while increasing market efficiency and enhancing supervisory effectiveness, which are conducive to global diversification of insurance risks in the Mainland and promoting joint development of the insurance market with Hong Kong.

The Insurance Authority pointed out that introduction of the preferential treatment has fostered a close and stable collaborative relationship between the insurance sectors in Hong Kong and the Mainland, laying a solid foundation for Hong Kong to sustain its active participation and support in both the Belt and Road Initiative and the Guangdong-Hong Kong-Macao Greater Bay Area development.

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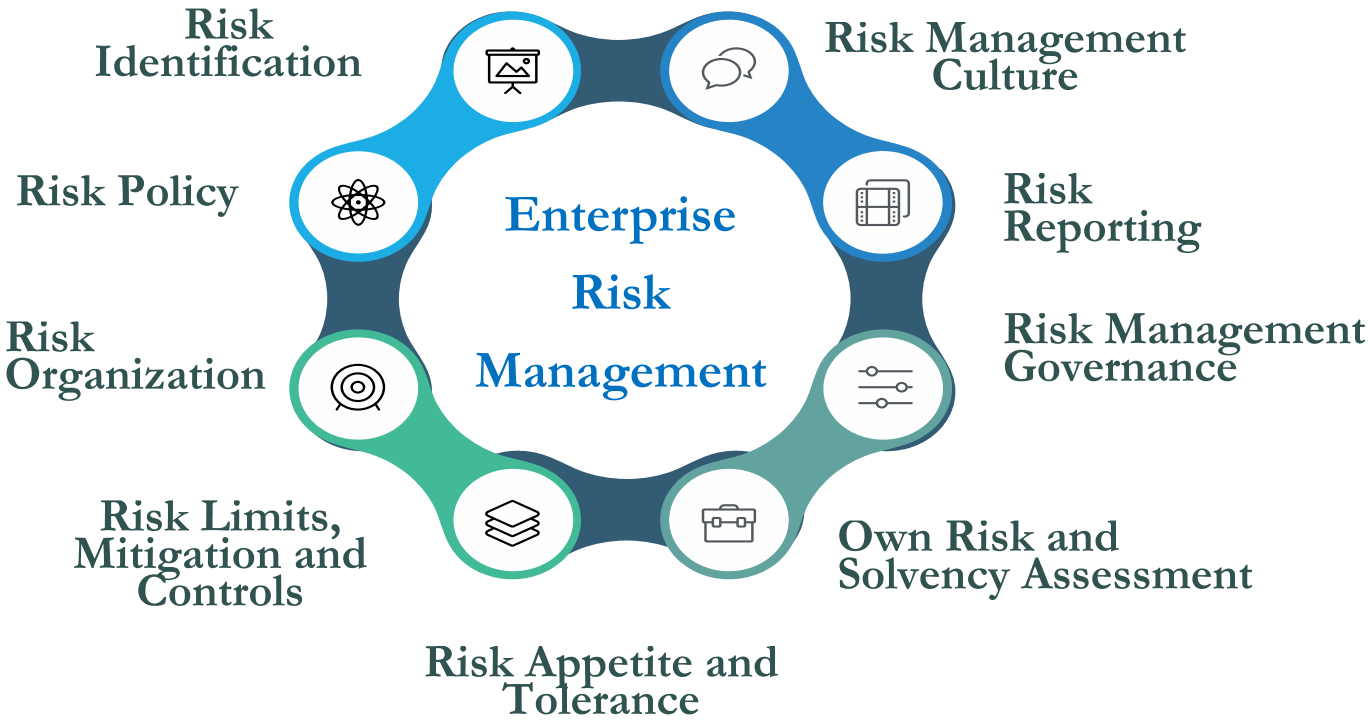
Consultants & Actuaries

"You don't have to believe in coincidences because they happen every day. The trick is to be able to discern when something is more than coincidence." We believe that Risk Management needs to lift up from risk control to risk intelligence which can identify potential business growth opportunities.



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