

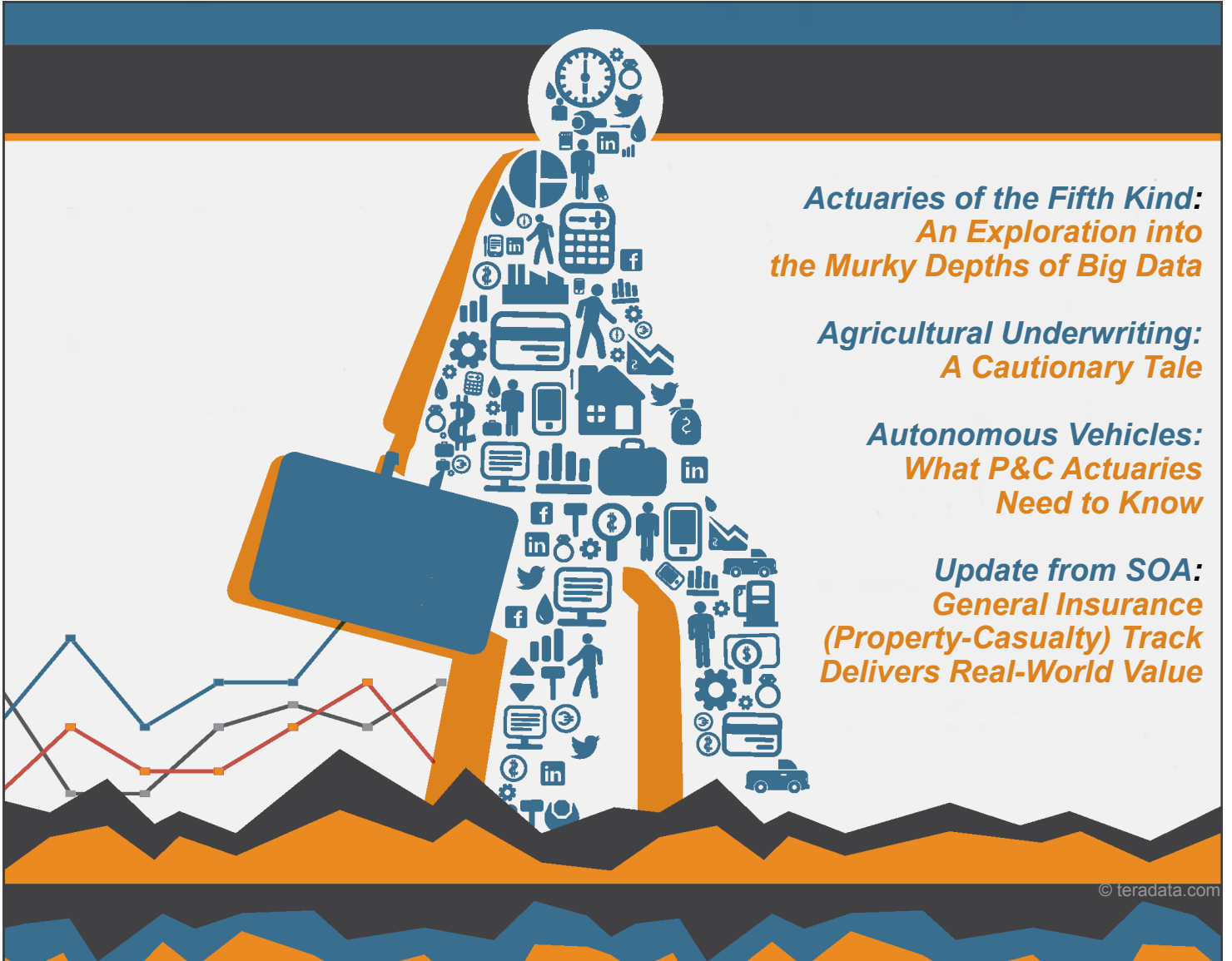


ACTUARIAL SOCIETY
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Hong Kong Actuaries

Actuarial Society of Hong Kong's Newsletter

AUTUMN
VOLUME
03
Oct 2015



*Actuaries of the Fifth Kind:
An Exploration into
the Murky Depths of Big Data*

*Agricultural Underwriting:
A Cautionary Tale*

*Autonomous Vehicles:
What P&C Actuaries
Need to Know*

*Update from SOA:
General Insurance
(Property-Casualty) Track
Delivers Real-World Value*

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Feature Articles Theme:

General Insurance

**Call for Articles or
Views for the
next issue of
Newsletter**

While all articles are welcome, we would especially like to receive articles for the Feature Articles and Knowledge Sharing sections. If you have written any inspiring articles or have read any interesting articles from other actuarial organization(s), please feel free to let us know. We will try to reprint the article(s) in our newsletter to share with our members. For the above issues, please e-mail your articles or views to Simon Lam by email at slam@munichre.com or ASHK Office by email at actuaries@biznetvigator.com.

Editor's Note

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Dear Readers,

Welcome to our Newsletter!

With appreciation of members' helpful opinions from the membership survey, this volume focuses on the issue of General Insurance.



In our Feature Articles, the impact of Big Data on actuaries is covered as a major trend of the market. Next, we shed light on the Pig Price Index Insurance in China targeted towards the Chinese agricultural sector which is one of the country's traditional economic drivers. We also take a look into the technological advancement in autonomous vehicles and how P&C actuaries can better prepare for this latest trend. Another topic would be the SOA's General Insurance (Property-Casualty) track, which aims to provide actuaries with real-world training. We hope that readers can keep abreast of the global general insurance trends.

In our Council Update, we are pleased to announce that ASHK will be hosting 2016 premier Life Section Colloquium of the IAA in Hong Kong on 25-27 April 2016 for over 300 professionals from Hong Kong and the region. Besides, a series of social events will be organized in the coming months - ASHK's Annual Dinner and Actuarial Circle in November and Annual General Meeting in December 2015. We hope all of you can benefit from these great networking opportunities to forge links with other fellow actuaries.

We are truly thankful to Colin Priest, David Menezes, Sasa Hu, Ling Tan and Stuart Klugman for their generous sharing in our Feature Articles section. Their invaluable insights are surely a new source of input for our development as professional actuaries.

Surely, I would like to express my sincere appreciation to everyone in ASHK Office for the indispensable contribution. We are also very glad that Sarah Hui is back in ASHK as full-time staff. It is only with the joint effort of everyone in the team that we continue to improve and better serve our ASHK members.

Happy reading and have a great autumn!

Best regards,
Simon Lam
EDITOR

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Below please find the update from the ASHK Council and its Committees:



The ASHK brings to members the premier Life Section Colloquium of the IAA in 2016, which will be held in Hong Kong from 25 to 27 April 2016. The overall theme of the conference, *Insurance Evolution: Change is the only Constant*, recognizes that the life insurance industry is continuing to evolve to meet the needs of its customers, and how the role of the actuary is changing and adapting within this. The Conference will feature noted speakers from insurance senior executives, representatives of global regulatory regimes, experts from academia and practitioners to cover a wide range of topics from Risk, capital and value; Products, markets, customers and distribution, and Data, analytics and technology.

Over 300 professionals from Hong Kong and the region are expected to participate in this flagship event of the IAA, and ASHK is proud to be the host in Hong Kong this year. More information on paper submission and registration can be found on www.actuaries.org/hongkong2016. For enquiries, please contact the Meeting Secretariat at iaa2016@icc.com.hk or (852) 2559 9973.

Non-Life Committee (Health Section) – Sam Yeung

ASHK Healthcare Seminar, 17 April 2015

The ASHK Health Seminar on 17 April 2015 recorded an exceptional turnout with more than 100 participants. The theme for this year – “Health insurance evolution in new paradigm” was particularly well received because the seminar opportunely took place immediately after the public consultation of Voluntary Health Insurance Scheme (VHIS). The participants were keen to learn about VHIS and other potential changes to the health insurance market.



The morning sessions comprised a timely and informative update from Mr. Chris Sun of the Food and Health Bureau on possible further enhancements for VHIS and the next steps; presentation by Mr. Sam Yeung from Munich Re about the ASHK’s comments on VHIS; and a comparative study between Hong Kong and Singapore by Mr. Samuel Tan, from Munich Re and on behalf of the Singapore Actuarial Society, about healthcare systems and healthcare reform in these twin cities.

After networking lunch, the afternoon sessions built on the evolution theme to prepare the audience for future market transformations. Dr. Christian Wards shared Bupa’s latest product and service innovations, while Dr. Rose Ong of AXA highlighted evolving medical technologies and identified the potential for health insurers to better meet growing population healthcare needs. Mr. Fred Choi of S. Yu & Partners leveraged his experience in analyzing industry aggregate medical claims data to illustrate the importance of quality data in managing health insurance business and preparing for VHIS implementation.

The preliminary feedback from seminar participants has been positive. The ASHK very much appreciates AXA Hong Kong’s sponsorship for this seminar. More photos can be found on the ASHK Newsletter Volume 2/2015 and website.

Membership & Publications Committee - Kevin Lee and Simon Lam

Membership Renewal

The membership renewal notice for the financial year 2015/2016 had been posted to all members in late September 2015.

Please return your signed *Compulsory Declaration* on personal data collection and usage, *CPD Declaration Form* (if applicable) as well as your updated *Membership Information*, together with the *Subscription Payment*, to ASHK office. You are encouraged to settle the subscription **no later than 15 November 2015** in order to avoid the surcharge that will be imposed on late submissions between 16 November and 31 December 2015.

Retired Members - Declaration

As the professional organization established by and for members, ASHK is pleased to offer discounted rate (an 80% reduction from the membership subscription) to members who have attained the age of 65 or above and are no longer in full-time employment. Eligible members are requested to submit a declaration form (available at the ASHK website) by email to: info@actuaries.org.hk. Declaration on the entitlement to the discounted rate must be made annually.

For enquiries on membership renewal or discounted rate applications, please contact ASHK Office at (852) 2147 9419 or email: info@actuaries.org.hk.



ASHK Actuarial Circle

Date: **Tuesday, 24 November 2015**
Time: **6:00 pm - 8:00 pm (to be confirmed)**
Venue: **Zentro Loft**
Shop No. 4010, Level P4, IFC Mall, 1 Finance Street, Central, Hong Kong

*Stay tuned, come and
enjoy our networking opportunity!*

Pension & Employee Benefits Committee - Billy Wong

The ASHK Pension Actuary Symposium on 15 September 2015 recorded a high turnout with almost 100 participants. This was the first pension symposium providing an opportunity for knowledge sharing and interaction among pension sponsors, pension providers, consultants and regulators.

ASHK Pension Actuary Symposium 2015



“Evolution of Retirement Saving System”

In line with our theme, we were glad to invite speakers to share the evolution on MPF system, pension market and professional standard in the symposium.

1. *Evolution on MPF System - by Dr. David Wong, BBS, JP, Chairman of MPFA*

Backward looking, MPF system grew to almost HK\$600 billion in 15 years. Several initiatives have been launched including Employee Choice Arrangement and fee disclosure platform. Forward looking, implementation of the default investment strategy ("DIS") and promoting eMPF administrative process will be the next focuses on MPF system.

2. *Evolution towards Ideal MPF - by Mr. Philip Tso from Towers Watson*

It is proposed that improvement of public engagement, delivering positive message, matching contributions & tax incentives are the actions to be taken for developing ideal MPF.

3. *Evolution on Traditional Retirement Saving Tool, Hedge Fund - by Mr. Scott Collison from Franklin Templeton Investments*

Hedge fund is introduced as an alternative to the traditional retirement saving tool, such as equity funds and mix asset funds which make up of over 70% of asset under Hong Kong pension market. The nature of diversification offering and downside protection benefit of hedge fund were discussed.



▲ Dr. David Wong, BBS, JP, Chairman of MPFA, gave us a keynote speech for the symposium.

▼ Almost 100 participants from pension sponsors, pension providers, consultants and regulators attended the symposium.



4. *Evolution on Actuarial Standard – by Mr. Jack Mak from ASHK Pension & Employee Benefits Committee*

There was a brief sharing on changes to actuarial standard (Profession Standard 2 "PS2") governing DB scheme funding valuation in Hong Kong. The key changes help to further highlight the risks attached to operation of a DB scheme.

5. *Evolution on MPF Market Size in 2035 - by Mr. Tak-Chi Wong from ASHK Pension & Employee Benefits Committee*

Aiming to provide an independent view towards MPF market size projection, the Committee members developed a projection model with three key assumptions on investment return, contribution increase rate and benefit payment rate. The result of projection shows that MPF market size in 2035 will grow to HK\$3.2 trillion, which is 5 times more than its size in 2014. And it is close to HK\$1 million average account balance per member.

6. Evolution on MPF Market Consolidation - Panel discussion

The panelists from pension sponsors, legal advisors and transaction dealers shared their opinions on the recent hottest topic – MPF consolidation. The discussion covered the pros & cons of consolidation, the hurdle involved and the future market trend. The Q&A section also provided a platform for the interaction between the panelists and participants.



▲ The pension symposium provided an opportunity for knowledge sharing and interaction among participants.

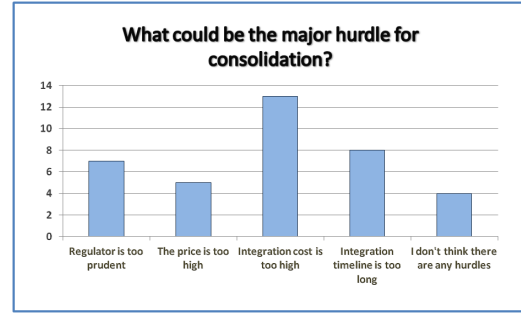
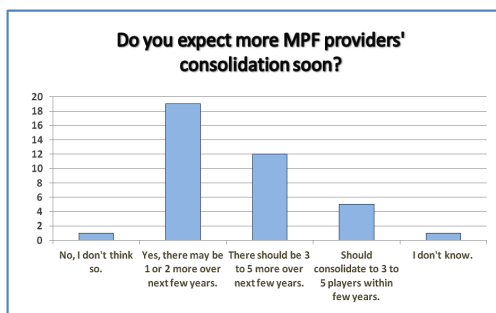
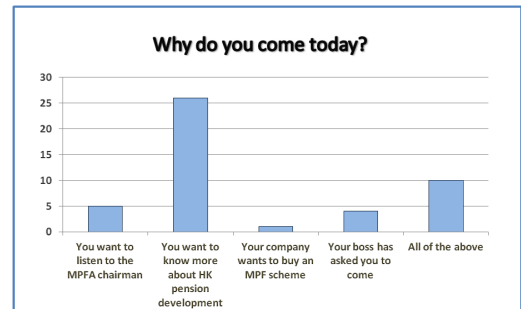
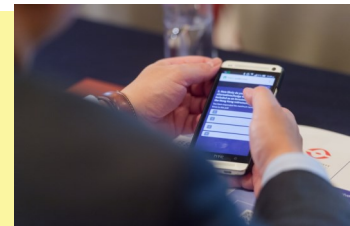
More photos can be found on the “Events Highlights” section of this issue and ASHK website!

7. Evolution on Post-Retirement Products - by Mr. Terence Chiu from Towers Watson

Booming MPF with greater deferred income and increasing burden on elderly support by government provide market opportunity of developing post-retirement products, with reference to different countries’ post-retirement products.

Polling for your view

During the symposium, ASHK conducted an interactive online survey with the participants. Here are some of the survey results.



The preliminary feedback from participants has been positive. The ASHK very much appreciates sponsorship from Franklin Templeton Investments and Towers Watson for this symposium.

Souvenir awards presented to our sponsors, Franklin Templeton Investments and Towers Watson.

IAA Life Section Colloquium 2016

25-27 April 2016

Hong Kong

Insurance Evolution: Change is the only Constant

The International Actuarial Association (IAA) and the Actuarial Society of Hong Kong (ASHK) invite you to attend the IAA Life Section Colloquium 2016 to be held on 25-27 April 2016 in Hong Kong at the Conrad Hotel.



Call for papers and Registration

The overall theme of the conference,

Insurance Evolution: Change is the only Constant,

recognises that the life insurance industry is continuing to evolve to meet the needs of its customers, and how the role of the actuary is changing and adapting within this.

The Scientific Committee is starting the search for speakers to present at this prodigious event.

Would you like to be part of the programme?

Deadline for synopsis submission: 15 November 2015

Online registration is launched! Please visit our website to register online.

Registration Category	On/Before 15 January 2016 (HK Time)	After 15 January 2016 (HK Time)
IAA Section Member / ASHK Member	HK\$4,650 (US\$600)	HK\$5,600 (US\$720)
Non-member	HK\$5,600 (US\$720)	HK\$6,550 (US\$840)
Academic	HK\$3,200 (US\$410)	

Paper submission and registration:

<http://www.actuaries.org/hongkong2016/>



Platinum sponsor:



Media Partner:



Silver sponsors:



For enquiries and sponsorship opportunities, please contact the meeting secretariat at iaa2016@icc.com.hk or +852 2559 9973

Actuaries of the Fifth Kind

... an exploration into the murky depths of Big Data



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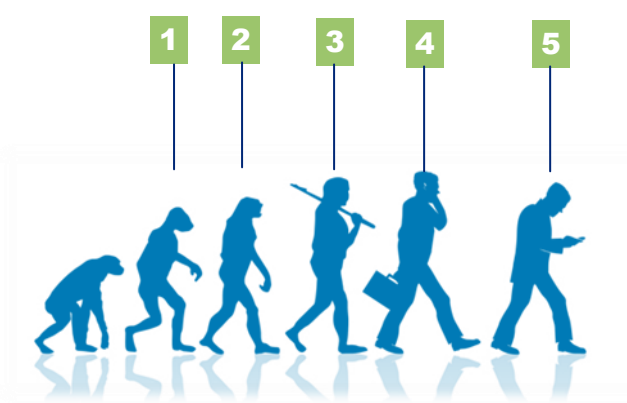
How many times have you heard the words "big data" and wondered what the fuss is about?

In this article, we provide an overview of some research that we have conducted as part of a wider working party of the Singapore Actuarial Society (SAS). Our goal was to develop a series of tangible examples that illustrate clearly how machine learning tools and techniques can be used to mine a large dataset and derive conclusions that historically would have proven intractable.

While our work is ongoing, it is clear that actuaries now stand at a crossroads. Either we evolve by fusing our in-depth product knowledge and classical statistical approach with the toolkit afforded by machine learning, or we sit-back while others enter our space; cause disruptions using these methods; and ultimately re-write the Insurance Rule-Book. Perhaps this sounds like hyperbola but we only need to look at the pervasive impact of Amazon's online sales model on the retail market in the US/UK or, more recently, Uber's influence in the taxi arena if we wish to perceive the stakes that are involved. The choice is ours...

The rise of the actuary

The following illustration provides a jocular view of key advancements in actuarial thinking:



- 1** 17th Century: Deterministic methods developed primarily for life insurance
- 2** Early 20th Century: Development of general insurance methods including credibility approaches
- 3** 1980s: Adoption of stochastic methods for pricing contingencies / derivatives
- 4** Early 21st century: Stochastic methods extended to support ERM and catastrophe modelling
- 5** **Today: Big Data and predictive analytics?**



Big what?

If the dictionary is a barometer of the extent to which terms have entered the public consciousness, "big data" officially made it in 2013 when it was inaugurated by the committee at Oxford University Press. While the term was recognized formally only two years ago, it has been in common parlance for several years and this reflects the sheer explosion in the level of data that is being captured and stored. For example, IBM¹ has suggested that 90% of all the world's data in 2013 was generated in the preceding two years. Looking forward, various sources forecast that data volumes will grow by 20-40% compound pa. These are staggering changes and a variety of factors are driving this:

- * Shifts in the types of companies that we interact with on a daily basis and the way they operate, e.g. we all use more internet-based companies like Facebook and Google who actively track users' data.
- * Changes in the way that everyday objects are manufactured – e.g. modern day cars have approximately 100 sensors to monitor fuel temperature, oil pressure, etc.
- * Significant changes in the cost, size and location of hardware used to store data.

Traditionally actuaries have had to be content with rating factors, which represent proxies for the true risk drivers. For example, we've often used age as a rating factor because conventional wisdom indicates that younger drivers are rash and drive quickly. Fast-forward to today and ask yourself: why be content with rating factors (e.g. age), when today's technology provides potential access to the true risk factors (e.g. speed)?

Case study: Predicting patient readmissions

The data

To explore machine learning methods in a tangible way we sought out a reasonable-sized public dataset on which to build a number of alternative predictive models. Our aim was to produce something that we could share – both findings and tools – such that other actuaries could replicate the results and therefore derive their own learnings.

Our selected base data related to hospital readmission rates for Diabetes and was sourced from the UCI Machine Learning Repository². Why Diabetes data? Well, it is estimated that there has been something like a 45% rise in global Diabetes rates over the period 1990 to 2013³. This means that Diabetes is a hot-topic in the medical field and by selecting a less conventional source of data, we hoped to illustrate the versatility of these methods.



The dataset contained ten years' of information straddling 100,000 hospital admissions. For each hospital admission, 50 different data factors were captured. Some of these data factors were categorical (e.g. gender), while others were numeric (e.g. weight). Of particular relevance, was the fact that some factors contained hundreds of different potential values, thereby introducing a high degree of dimensionality. Traditional actuarial techniques are time consuming, and frequently fail, when presented with such high dimensional data.

“

Our task was simple: develop a few models to decide which data factors provide the strongest indication of which patients would be readmitted to hospital within 30 days of treatment.

”

Notes:

¹ <http://www-01.ibm.com/software/data/bigdata/what-is-big-data.html>.

² Lichman, M. (2013). UCI Machine Learning Repository [<http://archive.ics.uci.edu/ml>]. Irvine, CA: University of California, School of Information and Computer Science.

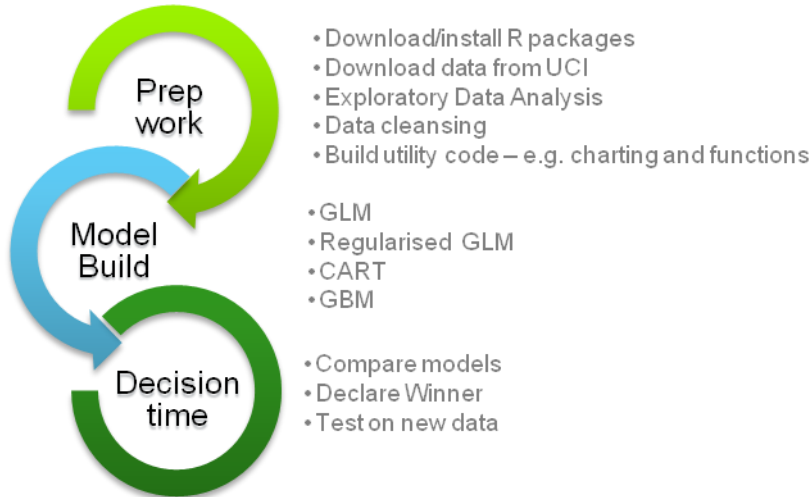
³ <http://www.nytimes.com/2015/06/08/health/research/global-diabetes-rates-are-rising-as-obesity-spreads.html>.

Tools used

We developed our solution using the open source programming language R⁴. In this way the code is freely distributable.

The modelling process

The following workflow was undertaken:



Treatment of data

The data was split into two sections, a "training" dataset was created to calibrate the parameters of the machine learning algorithms that we ran, with the remainder of the data (the "test" set) designed to assess if the resultant predictive models perform well. Some cleansing was necessary and treatment of censored data (e.g. deaths during the study) needed to be performed.

Selected machine learning algorithms and why?

- * Generalized Linear Model (GLM) – standard approach
- * Regularized GLM – penalizes overfitting
- * Decision tree – intuitive and an alternative
- * Gradient Boosting Machine (GBM) – fast approach to establish variable importance

GLMs are intuitive to build and have a clear functional form. Set against this, GLMs can fail to capture complexity in the data, selecting relevant rating variables often involves trial and error and take many weeks/months to achieve. Further, they can be prone to overfitting. Many of these pitfalls are avoided by the other methods above.

Results

Our analysis indicated that the GBM model performed best and identified two clear groups of patients:

Most likely to be readmitted (44%)	Least likely to be readmitted (10%)
<ol style="list-style-type: none"> 1. Nickname: "Frequent Flyer" 2. Number of inpatient visits >= 3 3. Number of emergency visits >= 2 	<ol style="list-style-type: none"> 1. Number of inpatient visits <= 1 2. Transferred to a different inpatient or rehabilitation facility 3. Admission type is emergency or urgent

Notes:
⁴ <https://www.r-project.org/>.

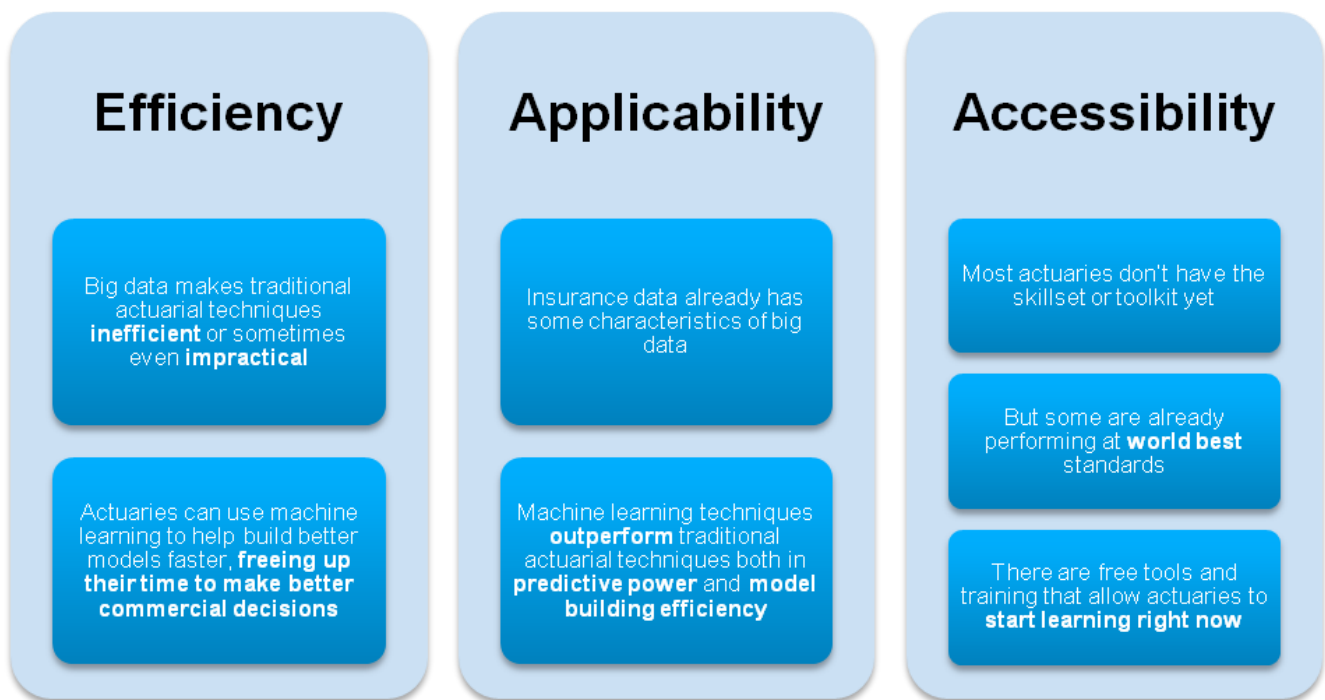
Some of the conclusions are obvious in hindsight. For example, frequency of previous visits. However, some conclusions are less obvious such as specific admission type being emergency or urgent. We can also see that the medical staff recording the data have a somewhat wry, but accurate sense of humor with frequent flyers proving to be good candidates for readmission...

Metrics – how did we determine the winning model?

There were a few different metrics to determine goodness of fit. These included "lift curves", Akaike Information Criterion (AIC) and Receiver Operator Curves (ROC). A full examination of these areas is beyond the scope of this article. What we can share is that the GBM model took less than 1% of the time to parameterize relative to a similar fitting GLM, which has to be beneficial.

Key takeaways

Machine learning offers benefits to actuaries in three key areas as outlined below:



SAS Big Data Working Party

The following actuaries collectively produced the research underpinning this article and deserve equal credit: Mudit Gupta (Chair), Colin Priest, David Menezes, Xavier Conort, Frankie Chan, Frank Devlin, Kate Chen and Clementine Vie.

Next steps

This article provides some insight into the processes that we followed and the conclusions that we inferred. We also mentioned that there is a desire to share our learnings directly. This is happening in Singapore late this September when we will be running a few workshops for members of the actuarial society there. We are engaging similarly with the ASHK Committee to see if it is feasible and popular to share our research here with ASHK members. So, if you're keen, please let ASHK know and keep watching this space!

Actuaries of the fifth kind?

In closing machine learning approaches have the capacity to increase our efficiency, tackle the ever increasing size of data sets that are being amassed; capture more complexities in the data and remove the impact of overfitting. However, to get there we'll need to think carefully about whether we want to step past this crossroads and embrace a future where we are "Actuaries of the Fifth Kind". ☺

Agricultural Underwriting: A Cautionary Tale



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This article explores the features and issues associated with Pig Price Index Insurance, a non-traditional agriculture product in the Chinese market that indemnifies pig farmers when the average pig:corn price ratio falls below a pre-specified threshold.

The need for cover

Economic growth has seen the demand for meat, in particular for pork, rises dramatically in China. In fact, pork prices have a strong influence on China's Consumer Price Index (CPI). A number of scares, including an epidemic in 2007 which led to the annual rate of increase in the CPI hitting a ten-year high¹, prompted the government to seek ways to protect farmers against losses, ensure continued supply and avoid price volatility. With corn as the primary feed for pigs, Pig Price Index Insurance was launched as an income protection solution that would protect farmers based on the relative prices of pig and corn.

On a weekly basis, the government publishes the national average pig price per kilogram, corn price per kilogram and the pig:corn price ratio². Although corn is not the only feed for pigs and there are regional differences in terms of pig and corn prices, as well as other factors impacting income and expenditure, such as labor costs, the pig:corn price ratio is often cited as the primary indicator of pig farmers' profitability. The pig farmers' breakeven point is considered to be a pig:corn price ratio of 6:1. The accepted relationship between the pig:corn ratio and losses to farmers is shown below in **Figure 1**.

Pig Farmers' Profitability	Pig:Corn Price Ratio
Breakeven	6:1
Small losses	between 5.5:1 and 6:1
Moderate losses	between 5:1 and 5.5:1
Heavy losses	below 5:1

Figure 1: The pig:corn price ratio for China, published centrally on a weekly basis, is taken as an indicator of approximate profitability for pig farmers. The ratio is used as a trigger for Pig Price Index Insurance; indemnification is triggered if the average ratio over the period of insurance falls below a specific threshold.

Source: <http://www.gov.cn>.

Despite recent reports of a spike in the price of pork in China, the pig:corn price ratio was below the breakeven point from mid-January 2014 to May 2015 (see **Figure 2**); farmers are estimated to have lost between 200-500 RMB per pig over this period³. As a result, and supplementing traditional agriculture insurance products that cover disease and accident, the government encouraged insurers to provide income protection products to farmers that raise pigs and which trigger when the average ratio over the insured period is below 6:1.

Notes:

¹ e.g. The Economist, 'Empire of the Pig', 2014.

² <http://www.gov.cn>.

³ <http://www.xinnong.net/zhu>.

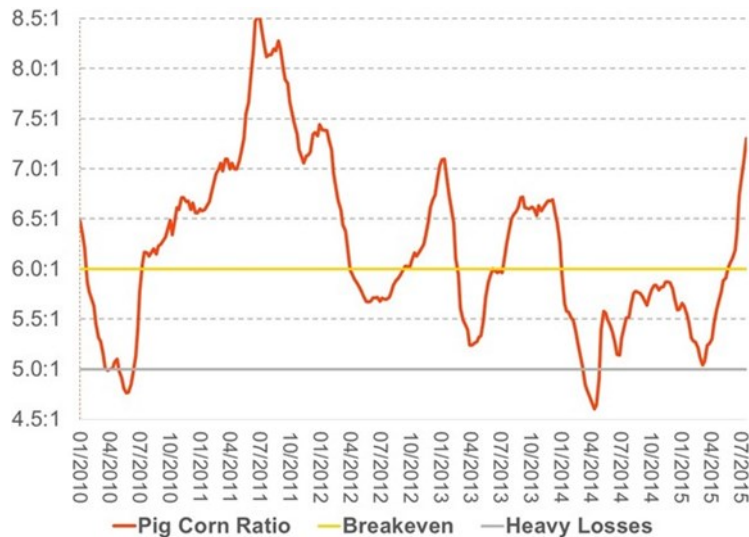


Figure 2: The national pig:corn price ratio index for China ranged from a high point of 8.5 to a low of 4.6 over the period shown, with the lowest value recorded in April 2014. To protect pig farmers' income, Pig Price Index Insurance triggers if the average value of the index over the insured period is below a specified threshold.

Source: <http://www.gov.cn>.

Behind the ratio

Taking a closer look at the last four years (see **Figure 3**), it is apparent that the corn price has remained relatively flat in comparison to the more volatile pig prices. Traditionally, pig prices follow an annual cyclical trend with higher prices in winter due to increased demand (also seen on the May 1 and October 1 public holidays). In addition to this annual short cycle, there was over this period also an underlying longer cycle that was also driven by factors of supply and demand:

- * Pig prices reached an historical high in 2011, peaking at over RMB20 per kg. Pig farmers substantially increased their stock of sowing pigs in that period to produce more fattening pigs.
- * As a result, the supply of fattening pigs increased over the next few years, causing the price of pig to gradually fall.
- * The consumption of pork then reduced due to a crackdown on corruption and a move away from pig to fish, dairy and egg for protein intake.
- * Due to the subsequent lack of profitability in 2014, pig farmers significantly reduced both the number of sowing pigs and fattening pigs. At present, the level of stock has fallen to a five-year low and the price of pig is again rising.

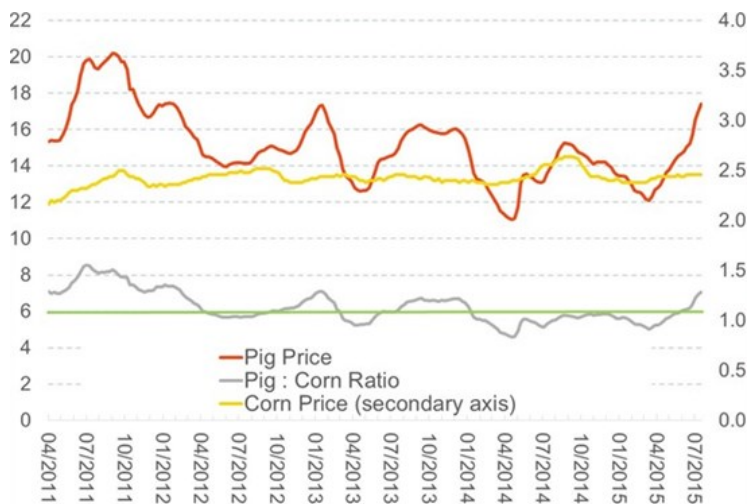


Figure 3: Development of the pig price, corn price and pig:corn ratio over the given four year period. While corn prices have remained relatively stable, pig prices are notably more volatile. The primary driver of fluctuations in the pig:corn ratio, pig prices have followed an annual short-term as well as a longer-term cyclical trend.

Source: <http://www.gov.cn>.

Workings of the insurance

There is no standardized wording for Pig Price Index Insurance and covers vary by insurer and province, although there are in general three types of cover known as A, B and C, A being the most common. With the high national importance of pork, most premiums are subsidized by the government by up to 80%, the government also sets some of the parameters regarding how the cover works, including approval of the trigger ratio, as well as influencing the rates.

General cover factors for Pig Price Index Insurance

- * PC(a): the average actual pig:corn price ratio, as published on the government website, over the insured period (commonly three months, six months or one year).
- * PC(t): the trigger point of the cover, which is also a pig:corn price ratio, usually 6:1.
- * C: agreed corn price per kg, usually the market price at policy inception.
- * KG: agreed weight per pig, on average approximately 150kg.
- * If C or KG are specified, the Sum Insured (SI) = PC(t) x C x KG. If not, there is an Agreed Sum Insured (SI) per pig.

The calculation of claim payout per pig varies by wording type (see **Figure 4**).

Wording Type	Payout per pig when PC(a) < PC(t)	
A	[PC(t) - PC(a)] x C x KG	
B	[PC(t) - PC(a)]	x C x KG
	PC(t)	
C	[PC(t) - PC(a)] x % of SI, % increases with [PC(t) - PC(a)]	

Figure 4: Calculation of the claim payout per pig for Pig Price Index Insurance according to three different wording types.

Source: PartnerRe.

To show how wording type impacts claim payment, let us consider a theoretical example whereby PC (t) = 6:1, C = 2.4, KG = 150, and for cover C the SI is RMB2100. In this example, the payout per pig for different values of the PC(a) ratio are as given in **Figure 5**.

Wording Type	A	B	C
SI (RMB)	2,160	2,160	2,100
Actual PC(a)	Payout per pig (RMB)		
6.0	-	-	-
5.8	72	12	14
5.6	144	24	28
5.4	216	36	42
5.2	288	48	56
5.0	360	60	70
4.5	540	90	140
4.0	720	120	280
3.5	900	150	560

Figure 5: Numerical example showing how the payout per pig varies between wording types for specific PC(a) values.

Source: PartnerRe.

In this example, wording A compensates an assumed ‘full loss’ suffered by the farmer when the pig:corn ratio falls below 6:1, whereas wordings B and C only compensate for part of the loss. The insurer of wording A would require a high enough premium rate to cover such claims.

Now approximating the performance of the product against pig:corn price statistics: Market experience indicates that premium rates for wording A have been recorded at between 2% and 4%, and the PC(a) ratio was 5.34 for H1⁴ 2014, 5.68 for H2 2014 and 5.72 for H2 2015. Covers based on wording A with a trigger point of 6:1 and an example premium rate of 3% would have easily attracted loss ratios exceeding 500% in this period. For policies issued in 2015 there was a subsequent reduction in the trigger ratio to values in the range of 5.4 and 5.6. With the reduction in supply of pig following low profitability in 2014, the PC(a) ratio is now back above 7:1 and the indication is that insurers have increased the trigger point back to the breakeven ratio.

The risks for re/insurers

From the above it is clear that the major driver of claims experience is the pig price. Protecting price fluctuation raises many questions and difficulties for re/insurers:

Is the risk insurable?

Traditional livestock insurances that protect against diseases, fire and natural perils, indemnify accidental losses. Pig Price Index Insurance losses do not however occur at random, but are linked to falling pig prices and follow a cycle of demand and supply.

Are the frequency and severity of expected losses assessable?

Traditional insurance models are not appropriate for price fluctuation covers, which are similar to a put option in finance. Such covers could therefore be better assessed via option pricing strategies.

Is the risk manageable?

In the medium term, it is possible for farmers to diversify into different types of livestock and feed and hence to minimize losses due to pig or corn price fluctuations. Collectively, pig farmers can also impact the medium-term pig price by either increasing or reducing supply, though there is a delay in effect (for example, it took more than 12 months for the pig:corn ratio to climb back above the breakeven level of 6:1 in 2015).

The government also takes a number of measures that can help to stabilize the ratio, such as putting pork into cold storage to reduce supply and maintain price levels. The impact of this on the ratio is however also delayed and unquantifiable. Furthermore, although the corn price has appeared relatively stable in past years, it is uncertain as to whether this is representative of the future.

Can the risk be diversified?

Some covers refer to the national ratio, while others refer to a province level ratio. If the cover refers to a province ratio, there may be a limited diversification benefit for insurers writing across provinces. However, provincial ratios have historically followed a similar trend to the national ratio.

Improving the long-term viability of the product

Given the issues discussed, more could be done to improve the long-term viability of this product. Insurers can seek to limit their exposure by arranging Quota Share or Stop Loss reinsurance treaties, but for a more sustainable solution for all concerned and to continue to achieve the goal of protecting farmers, the following points should be considered:

- * Working together with the government on adjusting the product's features and premium rates.
 - * The 6:1 breakeven point, for example, is too high as a policy trigger given the frequency at which the ratio falls below it.
 - * In addition, wordings such as B and C are preferable to wording A, which compensates the assumed full loss to the farmer without farmers taking any share of the risk.
 - * Introducing a loss cap if the product is to be sold widely, as this is a systemic risk that requires careful risk management and adequate capitalization.
- * Hedging the risk in the financial markets as insurers are effectively selling a put option to farmers. This would rely on a mature commodity trading market. There has been recent news regarding pilot commodity trading products that have been designed and submitted for approval by PICC Dalian in China, whereby the insurer sells commodity price protection products to farmers and at the same time hedges the risk via futures⁵.

For more information, visit www.partnerre.com/risk-solutions. 

Notes:

⁴ H1, first half year; H2, second half year.

⁵ <http://www.xw.sinoins.com>.

Autonomous Vehicles: What P&C Actuaries Need to Know



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(This article first appeared in the June 2015 edition of the CAS Newsletter Future Fellows and is reprinted with permission.)

Have you ever imagined that one day, you will be riding a self-driving vehicle like Johnny Cab from the movie Total Recall, or the fancy robot cars from Minority Report? These scenes might still seem unrealistic today; however, with the exponentially developing technology, these vehicles are becoming reality in the near future — and not just in sci-fi movies.

What they are

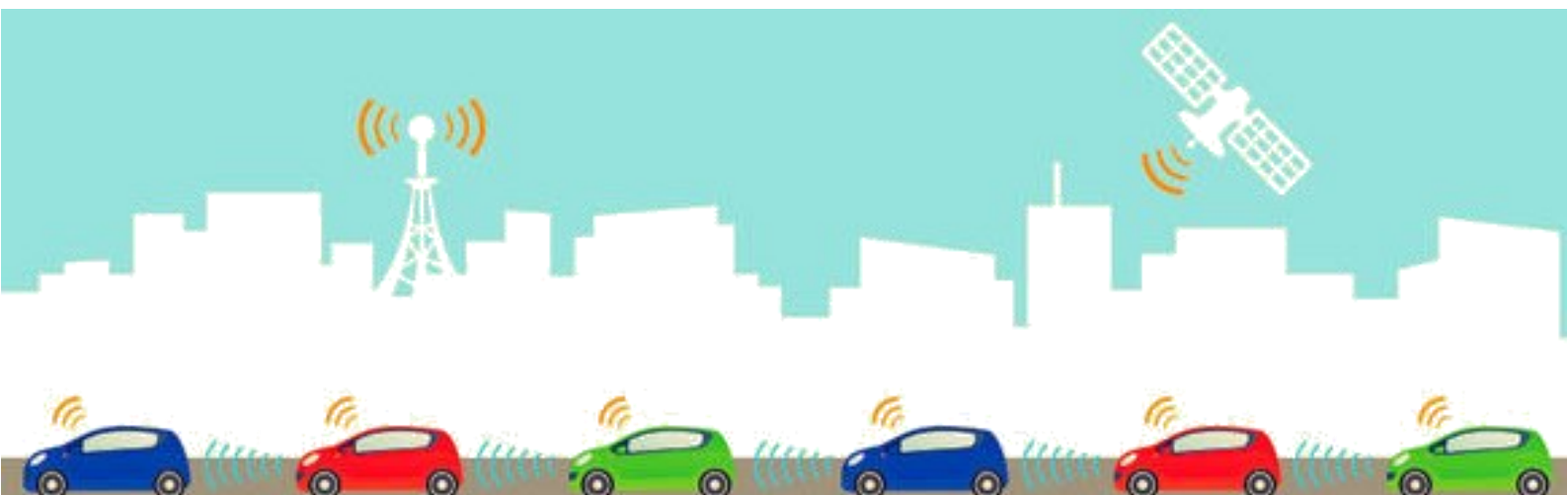
Autonomous vehicles are also called automated vehicles or driverless vehicles. As the name implies, the vehicle can drive by itself from an origin point to a destination point without active control or monitoring of a human driver.

How it works

An autonomous vehicle will sense the surrounding environment through technology such as radar, GPS, LIDAR (combination of light and radar to create 3-D images of surroundings), V2V/V2I (allows vehicle to communicate with other vehicles or infrastructure). It interprets the collected information through the control system to identify traffic signals, nearby obstacles and navigating paths. It is capable of responding to unexpected events and resuming to normal driving mode after the incident.

Trend in the industry

The industry is slowly adapting to the emergence of autonomous vehicles. Stakeholders are reacting to the onset at different pace. KPMG's preliminary survey results indicated that many insurers are not prepared for the arrival of autonomous vehicles. To be specific, almost three-quarters of the surveyed insurers showed significant lack of preparedness. On the other side, more and more consumers are talking about self-driving vehicles, and almost half of the surveyed consumers showed strong interest in the new vehicles. Meanwhile, many auto manufacturers, as well as new entrants are already developing driverless vehicles: Audi, Cadillac and Ford have launched adaptive cruise control; BMW and Volvo have launched speed adaption; Tesla and Mobileye will launch driverless auto pilot in 2016; and Google has launched a 100% autonomously driven vehicle. From the regulatory side, 12 U.S. states have either passed or introduced bills related to self-driving vehicles. The U.K. has passed legislation in 2013 for public road-testing and, in 2014, the U.N. also agreed to allow self-driving vehicles on roads as long as the driver is present and self-driving can be switched off.



In 2013 the National Highway Traffic Safety Administration (NHTSA) established five levels of automation:

Level 0: No-Automation. (Driver is in complete control of the vehicle)

Level 1: Function-specific Automation. (Electronic stability control, pre-charged brakes or cruise control)

Level 2: Combined Function Automation. (Adaptive cruise control with lane centering)

Level 3: Limited Self-Driving Automation. (Drivers can cede safety-critical functions; only expected to be available for occasional control)

Level 4: Full Self-Driving Automation.

Today, the industry is still at Level 2. But with the advancement of technology, strong demand of consumers and impacts from nontraditional companies, it would not be a surprise to see fully automated vehicles available on the market in 10 years.

Social benefits and drawbacks

There are reasons why consumers and automanufacturers are pursuing autonomous vehicles aggressively. In the current state, many automated functions are already geared toward the vehicle's safety features. It's not hard to imagine that, at the final level of automation, safety will be the top benefit among all other advantages.

Safety improvement will result in accident reduction by eliminating or reducing human error. For example, the autonomous system can react more quickly than a human to avoid accidents: The vehicle will not get tired, will follow all traffic signals and will not incur traffic violations. Yet the other benefits are also very attractive: reduced transportation costs (shortened commute time and traffic congestion with V2V technology, enhanced highway capacity with better operation of vehicles, more car-pooling, less need for traffic police and physical signage), removal of restriction on occupants' states (under-age, elderly, blind, intoxicated or impaired), improved parking capacity and increased fuel efficiency. The CAS Automated Vehicles Task Force released a report last fall that interprets common causes of accidents, such as those above, through the lens of automated vehicle technology.

Every coin comes with two sides. Autonomous vehicles also bring along some hurdles that we need to cross, such as software reliability, susceptibility under severe weather conditions, transition periods with different levels of automation vehicles on the road, loss of driver-related jobs and so on.

Implications for insurance industry and actuaries

As safety increases, accident frequency will dramatically decrease, but the severity of claims is likely to increase, as does the replacement cost of parts. As a combined effect, overall insurance cost is expected to decrease. This effect will be more significant for personal auto than for commercial auto, where automation is expected to be available at a faster pace for the former. At the same time, products liability will play a bigger role than ever before as most of the accidents can be attributed to malfunction of vehicle. When an accident occurs, liability will be harder to define and could be attributed to the software company that runs the system, the automaker who built the car, the car owner or operator, even the government if the infrastructure is transmitting faulty information. With the shift of accident liability from the car owner to the manufacturers of autonomous vehicles, new insurance structures will likely emerge. Pricing considerations and underwriting criteria will also shift from driver characteristics to vehicle characteristics and operating systems.

As an actuary, the primary responsibility has not changed: to charge a rate that is not inadequate, not excessive, and not unfairly discriminatory. But the mechanism to associate the insured and risk with a rate will change as we are facing an evolving and complex relationship between vehicle and driver. We need to take proactive actions to understand and influence the regulatory environment that will impact future liability. The CAS Automated Vehicles Task Force is one example of actuaries contributing to the issue with their unique perspective. Through actuarial analyses and research, the task force aims to provide decision-makers with the information needed to ensure the product is brought to market as safely and efficiently as possible. As an organization, we need to communicate issues related to autonomous vehicles in our organization such that companies can develop long-term business strategy to adapt the changes. We also need to collaborate with automakers, regulators and other insurance companies to create testing and risk management plans in order to effectively manage autonomous vehicle risks.



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SOA's General Insurance (Property-Casualty) Track Delivers Real-World Value



Stuart Klugman
FSA, CERA, PhD
Senior Staff Fellow, Education
Society of Actuaries
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Expanding globalization and economic development continues to bring new, complex business challenges.

Whether it's growth in car ownership, climate change, or rising threats of cyber risk, those and other factors are driving a more layered, yet exciting general insurance (property-casualty) market. Along with that growing trend comes a greater need for actuaries with expertise in the General Insurance (Property-Casualty) insurance field.

The SOA's General Insurance track to Fellowship consists of the most up-to-date information in the field provides candidates with real-world training.

Prepares actuaries for global challenges

When the SOA decided to add the General Insurance (Property-Casualty) track to its current outstanding lineup of specialty tracks, it had a few primary goals.

One was to create a comprehensive program that would prepare today's candidates for actuarial excellence in the real world of insurance in a global environment. Equally critical for the SOA was its dedication to deploying the same process and methodologies for track creation that it has used successfully in the past, to ensure topmost rigor and quality. At the same time, the SOA was committed to ensuring that the General Insurance (Property-Casualty) track is unique - with the latest study materials and education and assessment methods - to prepare actuaries for today's property-casualty challenges.

These goals meant the SOA's General Insurance (Property-Casualty) track required the same detailed planning and collaborative efforts of experienced actuaries that went into its existing Individual Life Insurance and Annuities, Group and Health, Retirement Benefits, Corporate Finance and ERM, and Quantitative Finance and Investment tracks. The first examination under the General Insurance (Property-Casualty) track was given in fall of 2013 and all four track-specific examinations have already been offered at least three times.

The SOA's General Insurance track to Fellowship was designed to have broad international appeal while meeting U.S. qualification standards, as about half of current candidates are outside the U.S. and Canada.

Rigor and depth of experience

To assure quality, the SOA created curriculum and examination committees that balance property-casualty insurance expertise with expertise in designing curricula. All question writers undergo the SOA's training program before they begin. All Fellowship examination questions they submit are evaluated and modified as needed to ensure that candidates are tested at a high cognitive level.

Question writers who are experienced general insurance actuaries sign off on all questions and review all grading of examinations. When creating questions, there are multiple review layers by actuaries with increasing levels of expertise. As the process unfolds, the SOA often will bring in new experts to provide additional feedback.

As with all SOA tracks, model solutions point to what is being tested, how candidates performed, and alternative answers and sources of partial credit. There are regular and in-depth curriculum reviews as well.



Practical modules for real-world results

Unique to the SOA are practical modules built into the pathway, which allow candidates to apply the information learned in textbooks and demonstrate their understanding of the material. For example, the Applications of Statistical Techniques Module provides both hands-on experience analyzing a variety of data sets and also teaches candidates to use the R statistical package. The added benefit of modules is that candidates can move through them at their own pace.

Latest Topics and Methods

As for sources of curriculum materials for the General Insurance (Property-Casualty) track, given the SOA's goal of preparing candidates for general insurance/property-casualty challenges of today, it commissioned two brand new books in this field.

For the new SOA textbook, *Fundamentals of General Insurance Actuarial Analysis*, the SOA worked with Jacque Friedland, FSA, FCAS, FCIA, MAAA, a well-known, highly-respected expert and author in the property-casualty field and ACTEX Publications to write and publish this industry-leading textbook. The book combines ratemaking and reserving into a single volume, providing comprehensive coverage of the topics and a great resource for students.


Another new textbook, *General Insurance Financial Reporting*, is the required reading for the Financial and Regulatory Environment Examination, and also provides fresh, leading-edge material for students.

Other key SOA General Insurance (Property-Casualty) track differentiators include more coverage of global topics, the use of e-learning, which promotes communication skills and learning in the latest statistical techniques, and updated materials on key areas such as Asset Liability Matching, reinsurance pricing and credibility with shifting risk parameters.

The SOA's General Insurance (Property-Casualty) actuaries have access to continuing professional development (CPD) courses, seminars, sessions and research, as well as volunteer opportunities with the SOA, similar to members from other practice areas.

First General Insurance (Property-Casualty) FSAs

Since the first examination in 2013, the SOA is now starting to see students completing the credentialing process. There are two actuaries who have completed the track so far this year, with another likely to finish in December. So far, today there are about 100 professionals in the track pipeline.

For more information and to be part of the SOA general insurance (property-casualty) community, visit www.SOA.org/general-ins. 

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Membership Update

New Members

Fellow

Delvin Duo-Duo Cai	Towers Watson	Fellow [FCAS (2009)]
Chua See Ju	Towers Watson Singapore	Fellow [FIA (2005)]
Ha Chin Kean	Swiss Re	Fellow [FIAA (2004)]
Horace Yin-Yuen Ho	AIA International	Fellow [FSA (2013)]
Yiu Chun Kan	AIA International	Fellow [FSA (2014)]

Student

Clayton Ka-Yeung Cheung	KPMG	Student (IFoA)
Ying Chiu Yin	Assicurazioni Generali S.p.A.	Student (IFoA)

Reinstated Members

Fellow

Devadeep Gupta	HSBC	Fellow [FIA (2013)]
Lawrence Chi-Ho Lee	Hong Kong Life Insurance Ltd	Fellow [FSA (2006)]
Jeremy Wall	JPWall Consulting Partners	Fellow [FIAA (2002)]

Associate

Clement Chak-Wang Fung	SCOR Global Life	Associate [ASA (2007)]
Kevin Yan-Wing Ng	Cosmos Services Co.	Associate [AIAA (2013)]

Aaron Cheung
Lulu Gao
Leo Lau
Grace Luk
Sally Shing
Billy Wong
Yanum Venkatrathnam



Actuaries on the move

Upcoming Events

Date	Event
21 Oct 2015	IAAust Examination, Hong Kong
30 Oct 2015	SOA APC, Hong Kong
3-5 Nov 2015	SOA FAC, Bangkok
3-6 Nov 2015	19 th AAC, Bangkok
7 Nov 2015	IAA Fund Meeting, Bangkok
10 Nov 2015	IAAust Examination, Hong Kong
12 Nov 2015	ASHK Annual Dinner
13 Nov 2015	ASHK Appointed Actuaries Symposium
18 Nov 2015	ASHK Presentation Skills Workshop I for Actuaries <i>(presented by Kelly Services)</i>
19 Nov 2015	IAAust Insights Event, Hong Kong
23 Nov 2015	SOA APC, Shanghai
24 Nov 2015	ASHK Actuarial Circle
Nov/Dec 2015 (tbc)	ASHK Evening Talk
9 Dec 2015	ASHK Presentation Skills Workshop II for Actuaries <i>(presented by Kelly Services)</i>
10 Dec 2015	Actuarial Consulting Congress of Asia (ACCA) ERM Webcast <i>(presented in cooperation with SOA)</i>
14 Dec 2015	ASHK AGM
26 Feb 2016	ASHK Healthcare Seminar
3-4 Mar 2016	IFoA Asia Conference, Kuala Lumpur
25-27 Apr 2016	IAA Life Section Colloquium, Hong Kong
Apr 2016 (tbc)	SOA APC, Hong Kong and Beijing



Market Update

The Mandatory Provident Fund Schemes Authority has recently approved the revised Guidelines on Election for Transfer of Accrued Benefits (Guidelines IV.3).


The Appendix to Annex C to Guidelines IV.3 contains a list of approved trustees and MPF schemes ("the List") for scheme members to elect for the purposes of MPF accounts consolidation. As a result of the change of the name of an approved trustee and two MPF schemes, the List and paragraph 7 of Guidelines IV.3 have been amended to reflect the changes which take effect on 1 September 2015 and the effective date of the revised Guidelines. Details of the change of name are set out in the tables below:

(i) Change of name of an approved trustee

Previous name	New name
AXA China Region Trustees Limited	Principal Trust Company (Hong Kong) Limited

(ii) Change of name of two MPF schemes

Previous name	New name
AXA MPF - Smart Plan	Principal MPF - Smart Plan
AXA MPF - Simple Plan	Principal MPF - Simple Plan

Copies of the revised Guidelines can be downloaded from the Authority's website at www.mpfa.org.hk. 



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Shangri-La Hotel, Bangkok



19th AAC Website: <http://www.actuariesasia.org/>

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 Philip Chau

Hong Kong
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Business Consultant
 Philip Chau

Hong Kong
 Up to HKD1 million

Reporting into the CFO, you would be analyzing the numbers provided by the actuarial team to develop long/short term strategies to grow the business. You will need to have minimum 10 years of experience with strong ALM/ Capital/ Investment background.

Head of Economic Capital, Asia
 Rhoda Rivera

Hong Kong
 Up to HKD1.4 million

One of our highly reputable key clients is looking for an experienced actuary with strong Economic Capital or Solvency II background to head their established EC team. You must have at least 10 years' life actuarial experience with strong communication skills and influential skills. Excellent leadership skills also a pre-requisite.

Health Pricing Actuary, Regional
 Rhoda Rivera

Hong Kong
 Up to HKD1.2 million

One of the industry segment leaders in Asia is looking for an experienced actuary, with Accident & Health subject matter expertise to join their newly regional pricing team. You must have at least 10 years' pricing or product development in A&H/L&H experience with strong communication skills and stakeholder management skills

Regional Actuary
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Hong Kong
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Pricing Actuary
 Toby Weston

Hong Kong
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Global reinsurance brand seeks actuary to join their greater China team based out of Hong Kong, this role involves pricing of both treaty and facultative work and working closely with underwriters and clients to optimize reinsurance structures through a combination of DFA, technical pricing and cat modelling.

Meet the Team



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Events Highlights

Joint Regional Seminar 2015 (Beijing), 15-16 July 2015



Mr. He Jiangang, China Association of Actuaries;
Mr. Tony Cheng, RGA;
Ms. Veronica Wang, Royal Capital of the Country
Garden Holdings and
Mr. George Zhang, Metlife

Joint Regional Seminar 2015 (Hong Kong), 17 July 2015



Mr. Louis Lee, SCOR Re

Mr. Louis Lee, SCOR Re and
Ms. Ka-Man Wong,
ASHK President-Elect

Mr. Prashant Agarwal, AIA

Mr. Greg Solomon, Willis Re



Mr. Paul Melody,
Towers Watson



Mr. Foong Sai Cheong, ASHK Life
Committee Chairperson;
Ms. Melissa Wong, AIA;
Mr. Yew-Wei Chai, Prudential;
Ms. Ada Tong, Cooper Tong Ltd and
Mr. Kin-Chung Chan, HealthMutual Group
and Actuarial Insourcing Services



Mr. Mark Saunders, AIA;
Mr. Foong Sai Cheong, AIA;
Mr. Tony Cheng, RGA;
Mr. Paul Carrett, Prudential
and Mr. Roddy Anderson



Mr. Foong Sai Cheong and
Mr. Roddy Anderson

Events Highlights

Joint Regional Seminar 2015 (Taipei), 20-21 July 2015



Mr. Kin-Chung Chan, HealthMutual Group and Actuarial Insourcing Services



Mr. Wing Wong, Milliman



Mr. Louis Heng, SCOR Re



Joint Regional Seminar 2015 (Kuala Lumpur), 22-23 July 2015



Mr. Low Shih-Nin, RGA; Mr. Heng Zee Wang, AIA; Ms. Caryn Chua, Institute and Faculty of Actuaries



Mr. Paul Carrett, Prudential; Mr. Greg Solomon, Willis Re; Ms. Janice Cowley and Mr. Louis Heng, SCOR Re



Mr. Wan Saifulrizal Wan Ismail, Actuarial Society of Malaysia and Mr. Paul Carrett, Prudential

ASHK Evening Talk - "Highlights of the Gen Re Dread Disease Experience Study 2008 -2012", 17 August 2015



Dr. Wolfgang Droste, General Reinsurance AG



Mr. Simon Lam, ASHK Membership & Publications Committee Co-Chairperson and Dr. Wolfgang Droste, General Reinsurance AG

Events Highlights

ASHK Professionalism Course - "Ethical Challenges Including Whistleblowing", 7 September 2015



Mr. Billy Wong,
ASHK Immediate Past President



Mr. Roddy Anderson,
ASHK Professional Matters
Committee Member



Mr. Peter Duran, ASHK Professional
Matters Committee Chairperson



ASHK Pension Actuary Symposium 2015, 15 September 2015



Dr. David Wong, BBS, JP,
Chairman of MPFA



Dr. David Wong, BBS, JP and
Mr. Billy Wong, ASHK Immediate Past
President & Pension & Employee
Benefits Committee Chairperson



Mr. Stuart Leckie, OBE, JP, Stirling Finance Ltd;
Mr. Roger Steel, Sun Life Financial;
Mr. Martin Tam, Baker & Mckenzie; Mr. Peter Chung, Manulife;
Mr. Pierre Chu, Goldman Sachs and Mr. Douglas Chan, Deloitte China



Mr. Philip Tso,
Towers Watson



Mr. Scott Collison,
Franklin Templeton
Investments



Mr. Jack Mak,
ASHK Pension &
Employee Benefits
Committee Member



Mr. Tak-Chi Wong,
ASHK Pension &
Employee Benefits
Committee Member



Mr. Terence Chiu,
Towers Watson

Events Highlights

ASHK Professional Development Committee Workshop, 18 September & 25 September 2015



The University of Hong Kong Session



City University of Hong Kong Session

ASHK Evening Talk - "Fixed Income ETFs & Investment View Outlook", 23 September 2015



Mr. Shan Park, BlackRock



Ms. Ecaterina Bigos, BlackRock



Mr. Brian Lee, Blackrock

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We welcome members' contribution to the "Hong Kong Actuaries" Newsletter, especially, the Feature Articles and Knowledge Sharing sections. If you have written any inspiring articles or have read any interesting articles from other actuarial organization(s), please feel free to let us know. We will try to reprint the article(s) in our newsletter to share with our members.

For the above issues, please e-mail your articles or views to Simon Lam by email at slam@munichre.com or ASHK Office by email at actuaries@biznetvigator.com. Publication of contributions will be at editor's discretion.