



Newsletter

The Society of Actuaries in Ireland

February 1999

Welcome to the first newsletter of 1999. In this issue we have tried to catch up on the evening meetings held in late November and throughout December. There were a number of very interesting meetings held last year and the reports are a little longer than usual to try to capture both the content of the presentations and the subsequent discussions.

We have decided to extend the 'On the Move' section in 1999 to include both Fellows and students moving to new companies. Anyone who wants to be included in this section should send details of their move to Mary Butler in the Society's office. Congratulations to all the new qualifiers mentioned on page 8. I hope that they will all be able to attend the evening meeting and dinner on the 2nd March to celebrate their achievement.

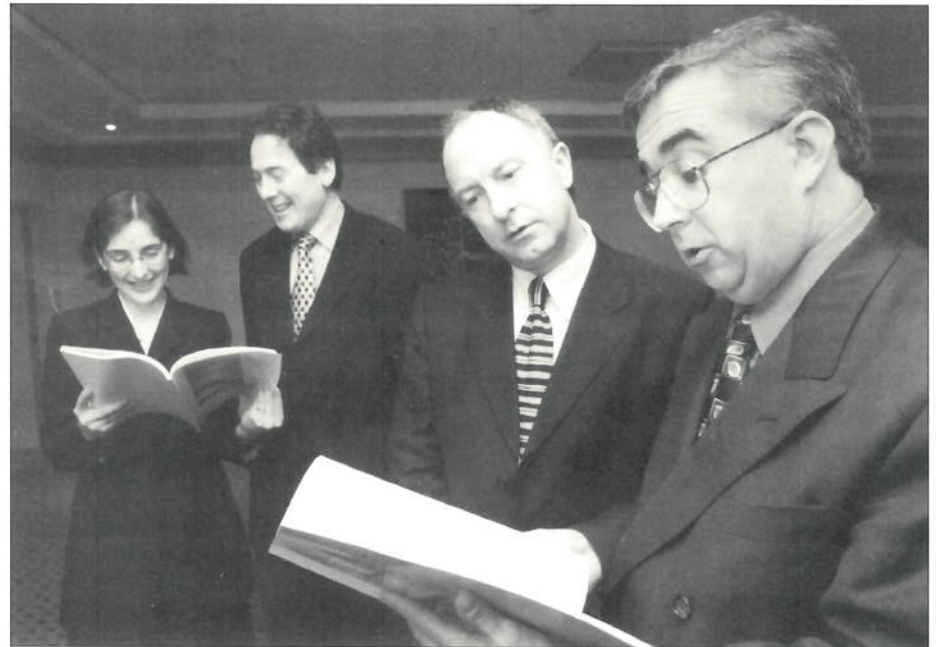
Michelle Roche/Frances O'Shea

(P.S. We would like to point out that the photograph of Tony Jeffery on Page 3 is totally unrelated to Frances' new position as Assistant Editor of the Newsletter.)

Evening Meetings

Following the circular issued in early January encouraging prompt reservations and payment for evening meetings, we have noticed a marked improvement in this area. I would therefore like to express my thanks to members of the Society for their positive response in this regard. Please keep up the good work!

Stephen Doyle



Launch of Joint Report

Last December, a joint Working Party, comprising representatives of the IAPF, the Irish Insurance Federation and the Society of Actuaries in Ireland, launched its report on the future financing of long term care in Ireland at a conference opened by the Minister for Social, Community and Family Affairs. Pictured above are speakers at the conference, **Aisling Kennedy, John Caslin, Paul O'Faherty** in conversation with Minister **Dermot Ahern**.

This issue includes the following reviews of recent **Evening Meetings:**

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Capital Management and Catastrophe Modelling

George Maher's feature double bill on the 10th November had all the usual suspects from the General Insurance world out in force.

The first of George's two Oscar nominated presentations was on "Capital Management". Developments in the non-life markets are requiring increased sophistication in the analysis of risk, capital and value. Notwithstanding that one expects a higher return from a higher risk strategy, George's assertion is that a volatile balance sheet destroys capital value. However, Dynamic Financial Analysis (DFA) is being used by insurers, reinsurers and captives to enhance their capital management.

DFA allows insurers to build complex models, capturing the interactions of assets and liabilities, and analyse the company's expected performance. Different strategies can be compared, and an asset / liability mix found to establish the optimal return for a given level of risk. The efficient frontier can be mapped by graphing the optimal return over various levels of risk.

One of the key issues in using DFA is the definition of "risk". Both senior management and the owners of a company must understand what they mean by risk, and they must decide on how much risk they are willing to accept. Risk measures and tolerances vary significantly by company and generate different optimum strategies.

The definition of risk may include insolvency, having to recapitalise the company, a reduction in the S&P's rating or a reduction in the dividends. The level of risk that is run depends on the investment mix, the reinsurance program, the underwriting approach and the capital structure.

DFA models incorporate the capital constraints imposed by these risks. Once the model has been built, winning strategies can be investigated including reinsurance strategy, asset strategy and debt leverage strategy.

The presentation concluded with a case study of a captive owned by a multinational parent (a big oil company). The study covered capitalisation issues, investment strategy, reinsurance options and addressed the implications of taking on more of the parent's risks.

This topic is very complex, and a lively discussion raised more questions (especially by one General Insurance Senior Examiner who shall remain nameless) than solutions. The difficult questions took some time to answer - the impossible questions got no answer at all!

The second presentation covered "Catastrophe Modelling". Tremendous progress has been made with catastrophe models, but there is still some way to go. It must be remembered that the catastrophe models can only simulate possible scenarios - they do not give definitive answers.

Whilst catastrophe modelling may seem a nonessential luxury to some practitioners, they are regularly used by reinsurers (and increasingly by insurers) to analyse their risk accumulations.

Catastrophe perils vary by geographical location - from windstorms in Ireland to earthquakes in Japan. Each type of peril needs its own specialised model to simulate the potential scenarios. These models can only be as

good as our existing knowledge base (meteorologists, seismologists, etc.) and the underlying science. Complications include lack of historical data (100 years of data is fairly meaningless when we are modelling a one in a 100-year storm!), shifting populations, improved quality of buildings and changes in insurance coverage. Models give insights - they are not meant to be right.

The presentation included a few practical examples of what catastrophes look like. The quality of the hurricane images and winter storm photographs were only rivalled by the special effects in the Hollywood blockbuster Titanic.

George must be congratulated on giving two excellent presentations. Even tough questioning didn't manage to ruffle George's composure. This synopsis barely covers some of the issues raised in the presentations, but I'm sure that George will be more than willing to explain either topic in detail for the usual fee. ●

Martin Ryan



Tony Jeffery

The two papers presented at this evening's meeting were "Demographic Margins for Prudence" by Tony Jeffery and "Capital & Premium Guarantees on Protection Products" by John McDonald. This was a rare but interesting "compare and contrast" exercise. Tony Jeffery's paper was based on his experience in preparing previous papers on mortality and critical illness analysis as well as more general historical analysis. John McDonald's paper was based on mathematical modelling of health care risks.

Demographic Margins for Prudence and Capital and Premium Guarantees on Protection Products

Demographic Margins for Prudence

Tony Jeffery opened his presentation by explaining why he decided to write this paper. It started life as an attempt to answer the question "What is a prudent margin for demographic assumptions (particularly mortality) in a solvency valuation of a life company?" but has expanded beyond this. He went on to highlight the "Public Perception Principle". The Public Perception Principle states that it is best to act in matters of prudence in such a way that if something does go wrong the public would perceive ones action as reasonable even knowing that it proved wrong in practice. For instance how would the public view the collapse of a life assurance company in times of civil war or a flu epidemic? Would it be deemed acceptable? If not, reserves should be calculated in such a way as to be sufficient such that the life office survives these type of events.

Tony went on to specify the two types of risk that may affect the choice of margin for prudence.

- (a) Stochastic risk which can be reduced in aggregate and should be assessed for the office as a whole.
- (b) Inherent risk which is embedded in the nature of the cover offered and needs to be assessed separately for each type of risk.

Inherent variability can arise from two types of causes:

- (i) There may be that which affects an individual company only.
- (ii) There may be a change in general experience.

Possible company causes of inherent variability would include failures in the underwriting process (on an individual or company wide basis), new products reaching different sectors of the markets and exclusion wordings being legally unsound. However the threat to solvency tends to be small here because these threats are usually countered quickly. It is the effect of variations in general that are likely to be more significant.

Some likely causes of general inherent variability are reversal of mortality improvements, socio economic problems, dietary and environmental problems, new infections and use/misuse of drugs.

Tony pointed out two issues when considering the effect of general causes.

1. It is reasonable to assume that only one scenario may occur. Should one happen then reserving must be carried out against the occurrence of a second.
2. The impact of any deterioration in mortality may be felt more by the population as a whole rather than just that of assured lives.

He then discussed his assessment of the extra margin required for each of these general causes of inherent variability. For instance, reversal of

improvements in mortality demand an allowance for deterioration of 2.5% p.a. Socio economic problems (e.g. Russia) could account for an increase of 25-40% in mortality.

A survey of Appointed Actuaries was carried out by Tillinghast. This showed that most Appointed Actuaries believed that 5% to 20% was a prudent margin to include in mortality rates.

Given the extra margins calculated for stochastic and inherent variance, Tony estimated that a margin of at least 20% was required. However he did not believe that the margins chosen by Appointed Actuaries were necessarily too low. Extra margins are taken in other assumptions and the solvency margin provides an extra buffer.

In closing his presentation Tony commented on critical illness experience. IC94 has proved to be heavy especially for males and accelerated critical illness. The decline in heart attacks has been more than compensated for by a rapid rise in heart surgery claims. He made the following recommendations:

- * Reduction proportion of IC94 used based on actual experience.
- * Maintenance of the current recommended margin of 35% for accelerated business.
- * Increasing the stand alone margin to 45%.
- * Increase the allowance for heart surgery for ages 50 plus. ●

continued overleaf

Demographic Margins for Prudence and Capital and Premiums Guarantees on Protection Products

continued from page 3

Capital & Premium Guarantees on Protection Products

John McDonald's presentation concerned the pricing of guarantees for health insurance products. This has arisen out of his work in the Healthcare Study Group Working Party. Experience under health care contracts has proven to be more volatile than on life business. There is considerable uncertainty around the correct level of reserves required to provide for this volatility and whether current premium rates reflect the true cost of guarantees. In addition there has not been much investigation into this subject in the past. John's paper builds on two papers; namely the Maturity Guarantees Working Party report and the Society of Actuaries in Ireland's Working Party report on Reserving for Critical Illness Guarantees.

The Healthcare Study Group Working Party has sought to answer the following questions :

- * What are the risks in writing health-care products?
- * What are the financial consequences?
- * What are the likely implications?

PHI has been the only contract examined at this stage. It is intended that critical illness will be examined within the next year or two.

A stochastic model of experience has been used to try to answer these questions as this was seen to be the most practical. The model developed by the HSGWP has not taken any account of volatility in investment returns or the use of reinsurance to diversify the risk.

There are two causes of experience volatility. As in Tony Jeffery's assess-

ment the first type is pure randomness which is inherent in any statistical process. This is excluded from the analysis. The second type of risk arises from "pricing error" e.g. inaccurate data, poor policy wording, secular changes, shocks and lack of understanding of risk factors. Some of these risks may be removed by diversification.

John described the methodology used to calculate the reserves and premiums required:

- * On a best estimate basis make assumptions regarding all parameters except inception rates and termination rates which are stochastic.
- * Using stochastic simulations, calculate reserves based on a 1% ruin probability (according to the model).
- * Place best estimate assumptions of PHI costs and reserves into a profit test and calculate a premium. The profit test will allow for the cost of capital.

John provided an example of a PHI policy sold to a 35 year old with expiry age of 65. A ruin probability of 1% was used. After 10 years from commencement, the capital required to support the contract was six times the reserve calculated on the premium basis.

The next phase is for a critical review to take place of the work done so far. In addition, sensitivity testing will take place and further factors (such as diversification) will be added to the model.

John concluded his presentation by mentioning some other issues that have arisen. For instance how "reviewable" non guaranteed PHI products really were and whether there should be higher reserves for these non guaranteed products. Also alternative pricing techniques could be examined (e.g. derivative pricing techniques).

Discussion

Given the volume of ideas and principles contained in each of these two papers it was natural that a lively discussion took place.

There was much discussion on the concept of having a dynamic risk discount rate incorporated in the model. There was a consensus of views that the risk discount rate would be related to the level of reserves calculated and ultimately the ruin probability.

The issue of future PHI inception and termination rates also arose. The inclusion of secular changes in these rates within the model was suggested.

The public perception principle suggested by Tony Jeffery was a cause of much discussion. Naturally on such a "woolly" principle there was likely to be a number of views on what is acceptable to the public. There were some suggestions that shocks were more acceptable than gradual trends. Also there tended to be action taken to correct a gradual deterioration in mortality rates (e.g. greater safety campaigns in light of road deaths). However sometimes a deterioration in mortality may not be arrested due to socio-economic circumstances (e.g. Russia).

Bruce Maxwell closed the meeting by thanking the two speakers and noted that the two presentations contained both interesting thoughts and warnings for the actuaries of the present and of the future.

Colin Murray.

The **New** Education Syllabus

This April sees the first set of exams being sat under the new education syllabus. For many students this will be the second time that the finishing line has moved - not necessarily further away, but certainly sideways. In order to address concerns that this move is being introduced in the interests of everyone but the students whom it actually affects, the Society invited Dr. Elisabeth Goodwin, Chief Education Officer with the Institute of Actuaries, to address Dublin students on January 14th last.

Before Dr. Goodwin addressed the gathering, Shane Whelan gave a short presentation outlining why the Society of Actuaries in Ireland is endorsing the changes being brought about by the Institute and Faculty. Across the globe, actuarial bodies are moving away from the traditional idea of looking inward and towards a new approach of concentrating on principles, rather than specifics, when educating their members. Thus, actuarial techniques taught in one country will be just as relevant on the other side of the world as they are at home. Also, it encourages everyone, both inside and outside the actuarial profession, to see actuaries as no longer being confined to insurance and its applications. The tools being taught today will better equip young actuaries for their entire working lifetime, and can be applied to a broad range of financial problems, outside the traditional arena. The society believes that the new syllabus brings our education strategy in line with these global aims, and will ensure that we do not get left behind.

Dr. Goodwin briefly recapped on the intentions of the Institute with regard to the new strategy, referring to the meeting that was held in Dublin a few years ago during the planning stage. She agreed with Shane's assessment that this was a necessary move that would keep Ireland and the UK at the forefront of the actuarial profession worldwide. The Institute, she told the meeting, is not trying to make it more difficult for students to qualify. Rather, the intention is that by concentrating on quality of material, as opposed to quantity, students will attempt the exams better prepared than in the past, and it is hoped that pass rates should rise and time to qualification fall. This is not, however, a process that involves students alone. It should be seen as a combined effort, involving students, tutors, examiners and employers. A code of practice is to be

issued to employers advising on how best to help their students get through the exams. Giving plenty of encouragement is one of the most important things that the sponsoring employer can do to this end.

At the end of these presentations, there was a lively discussion. Students were very interested in the transferability of their qualification to overseas bodies. Most international associations will admit fellows of the Institute (or Faculty) to their societies as full fellows, although perhaps after an adjustment period, with the notable exception of the Casualty Actuarial Society in the US. The possible introduction of additional subjects covering wider fields, such as banking and healthcare, was discussed. At the moment no further exams are planned, but these may be introduced in the future if there is demand for these skills.

A further concern was the situation regarding university students. The colleges said that they are willing to adapt as necessary to keep in line with the Institute's courses, and in fact the course in UCD has been extended to a four-year course as a result of the new syllabus. Exemptions may be granted retrospectively to any graduates who did stochastic processes as part of their degree.

Finally, it was asked what sets us apart. Why pay for an actuary, when a financial economist can do the same tasks? The answer is that we not only apply the skills, but we have a strict code of professionalism that gives us an edge. One wonders is that enough? ●

Fiona Daly

The Institute welcomes any comments or suggestions, from students and employers, with regard to the education process. These can be addressed to Dr. Goodwin, Shane Whelan or Fiona Daly.

Evening Meeting on Transfer Values

Joyce Brennan outlined the results of the recent survey on transfer value bases.

There was some evidence of a change in methodology from the last survey in 1996 to 1998. In 1996 people were mainly using the yield on Government stock to determine their basis while in 1998 some had started using the return on a balanced portfolio. In 1998 those using a single yield were mostly using 7% p.a. There was some divergence, however, in the rate of revaluation assumed.

It was noted that in 1996 the two outliers were at the higher end and that this was the same in 1998. (The outliers at the low end in 1996 were not there in the 1998 survey.) In 1996 there was a 25% variance in the transfer values (excluding the high outlier). The variance from low to high was 18% in 1998.

Joyce then raised some issues for consideration:

- The need to revisit the gaps in light of lower interest rates ?
- Special consideration for over 50's ?
- Is an equity adjustment justified ?
- Need for tighter guidelines ?
- Need for a minimum basis ?
- The danger of external prescription?
- Give more information to members especially as regards discretionary benefits?
- Funding standard

A debate on the case for and against having a prescribed basis then followed.

The case for was argued by Rodney Smythe.

He pointed out that variances continue between actuaries. This could harm the image of the profession.

He noted that in the UK actuaries have generally adopted the MFR basis.

He also noted that there was probably a common basis in use by most firms which is akin to having a prescribed

basis and removes an individual actuary's judgement.

He noted that external pressure might lead to external prescription.

He also noted that while members did not have to take a transfer value they are increasingly being used now in Family Law Act cases.

The case against was put forward by Paul Dillon.

He stated that while it may seem a good idea now the future should be considered and felt that prescription would lead to the minimum basis being used by all. He felt that the member being at the 'mercy' of the regulators was worse than being at the 'mercy' of a strong actuarial profession.

He also felt that the differences in transfer values were close (when viewed as a difference in discount rate) and considering the long term, represented an acceptable actuarial variation. The outliers in the Survey were at the higher end which was not a concern.

He felt that the UK prescribed basis (MFR) was reactive (after Maxwell) and that the MFR was not robust and this was a disadvantage of prescription.

Paul also raised some current issues:

- (i) Pre-1991 benefit provision and revaluation on pre-1991 benefit is a bigger issue than the TV basis.
- (ii) Low interest rates - should gaps be maintained ?
- (iii) Prescription could give solvency standard problems and harm the image of the profession.

He summarised that the options available were:

Individual judgement : Status quo
Communal judgement : Sustainable
External : UK Option

Some of the comments from the floor are summarised below:

GN11 states that actuaries should

have regard to fixed interest stocks where as in the UK it is equities for the MFR basis. In practice, most transfer values are taken to Managed Funds and should regard be had to this ?

It was noted that the transfer value is only an option and was like switching from defined benefit to defined contribution. There was a need to get the risk balance right between the employer and the employee.

One commentator felt the closeness of the results was remarkable - was this herd instinct? - and questioned whether the common answer was too low.

Regular survey might lead to convergence over time and it is planned to carry out a regular survey.

It was questioned whether a scheme should compensate a member leaving for taking a risk.

It was noted that on wind-up consent is not an issue and it was questioned whether a prescribed basis was appropriate in this scenario.

It was felt that there was growing public and Government interest in transfer values. Their level was also increasing and with the possible extension of revaluation to pre-1991 service this would increase further. They also impacted on Family Law Act calculations, Greenbury and the Minimum Funding Standard. All the public would see is differences in amounts. If the status quo is maintained the Society might lose control. The Society should lead on this issue and see what could be done. One possibility is to have legislation by reference to the Guidance Note.

It was questioned whether the current degree of variance is acceptable to the Society considering we already have a Guidance Note.

It was noted that the original Guidance Note mirrored UK guidance but since then the UK situation has changed and interest rates have fallen significantly. ●

Sean O'Donovan

Irish Financial Markets



An Actuarial Retrospective

Presented to The Society of Actuaries in Ireland by
Shane Whelan on 25th November 1998

In 1998, two Nobel Prize winners lost their winnings on the Stock Market. You see in August last, there was a significant fall in global equity markets. This in turn caused the \$3.6 billion bailout of a certain hedge fund by a few Swiss bankers and their friends. The irony was not just the unfortunate name chosen for the fund, Long-Term Capital Management (which had a four year life-span), but that the founders included Merton and Scholes, who were awarded their Nobel prize for - wait for it - the pricing of financial risk!

The above events could perhaps be described as a minor disaster for the investment community. Shane then pointed to 4 years of the 20th century (1923, 1938, 1953 and 1974), and posed the question "What do these years have in common?" The answer is that those were years in which each branch of actuarial science experienced a major disaster. Actuaries from each discipline can use similar techniques to try to predict the likelihood of such events happening in the future. The purpose of this paper is to look into these methods. Ultimately, if these events can be predicted, perhaps they can be avoided, or at least their effects reduced.

Shane chose an analysis of Irish stock market returns to illustrate his techniques. He posed the question "What is the probability that the Irish Stock market will fall by more than 50% in one month?" He had two data sets; daily closing prices over a 10 year period, and monthly closing prices over a 65 year period.

Shane's first two models were random walk models. The first is a random walk with a Normal error term. This is known as a Brownian Motion model. The sec-

ond is a random walk using an error term from a family of distributions known as "stable distributions". His third model attempts not to model the complete market, but rather to model the negative tail of the distribution, with which he is primarily concerned.

The Brownian motion model is the basis for the Black Scholes equation (used widely in the pricing of derivatives), though it has been appreciated since the 1920's that the fit is quite poor. A chi-square test on Shane's data emphatically rejected this error term, as expected. Graphing the data illustrates at least part of the problem - it has thicker tails than the Normal. At this stage, Shane referred to the problem of even measuring the standard deviation of the data - he graphed sample estimates of standard deviation based on rolling 90 and 180 day returns over the 10 years. The graph goes all over the place. The standard deviation must be estimated to use Black-Scholes to price an option!

For his second model, Shane introduced his audience to the family of "Stable Distributions". These have two attractive properties; they are thick-tailed, and these tails are invariant under convolution (addition). These families have four parameters, each of which is nicely intuitive; location, dispersion, skewness and tail-thickness. From observing that the data was not skew, and by using a straightforward transformation to give zero location and unit dispersion, it was possible to reduce the problem to that of estimating one parameter, the tail-thickness. A sample estimate of this statistic indicated it had a value of 1.7 for the 10 year's of data. However, Lucy (1994) estimated it at 1.5, and the 64 year

monthly data suggest a value of 1.3. Because different data sets were giving different parameter estimates and the additive property did not hold, Shane rejected these distributions.

For his final attempt, Shane used the Frechet distribution to model samples of the most extreme negative (and positive) returns. If the returns come from either stable distributions, regularly varying distributions, Student-t distributions or ARCH processes, then their extreme values should fit a Frechet distribution. Again using a sample estimate (the Hill estimator) of the tail index parameter of the distribution, Shane attempted to get consistent estimates from his two different data sets. It appears that for daily returns, the tail of a Student-t distribution can reasonably approximate the left tail. However for monthly capital returns, the tail of a stable distribution better approximates the left tail, which is more thick-tailed.

Finally, to answer the question! Using a stable distribution with a tail-index of 1.5 (the Holtsmark distribution), the probability of a 50% fall in the Irish market in any one month is of the order of 1 in 1000, i.e. once in every 80 years or so. Shane did point out that it is the methodology that interests him, rather than the answer, at this stage of his work. The size of the tail-index is definitely a matter of conjecture as yet, and is clearly pivotal to the answer.

It was indeed an evening when the presenter got his hands dirty, and discussed real statistics. Shane's paper illustrates the early stage of development of financial economics. But the long and lively discussion which ensued showed that there is a healthy interest in such subjects and their developing techniques. I would strongly recommend that anyone who is currently practising, or interested in practising, statistical modelling should get his or her hands on Shane's paper. Each re-reading of the paper will bring its own incremental rewards. ●

Ger Bradley

On the Move

Brendan Kennedy has joined **Canada Life Assurance (Ireland) Ltd.** from Howard Johnson & Co.

Derek Bain has moved to **Ernst & Young** in London from Guardian PMPA.

Christine Murphy has gone to **Old Mutual** in Cape Town from Delany Bacon & Woodrow.

Suzanne Macaulay has joined **Scottish Amicable International** from Eagle Star.

Maeve Sherry has gone to **Tillinghast Towers Perrin** in Australia from Scottish Mutual International.

Kathy Murphy has joined **Howard Johnson & Co.** from IPT.

Catherine McGrath has set up **Act on IT Consulting** and is working with Friends First.

Scheme Actuaries

Have you got your practising certificate yet?

If not, apply now, as it will be a statutory requirement on **1st April 1999.**

New Qualifiers

Rosemary Burke

Irish Life

Keith Burns

Watson Wyatt Partners

Olive Gaughan

Canada Life

John Gregan

Hibernian Insurance Co.

Declan Lavelle

Norwich Union

Catherine McGrath

Friends First

Clara McInerney

African Life

Garrett Murtagh

Mercer Limited

Senan O'Loughlin

Hibernian Insurance Co.

Emer Reid

Mercer Limited

David Roberts

Lifetime Assurance



Wanted

An actuary or student with a knowledge of website design and development. The Society is currently developing its own website and seeks to fill out the virtual committee of two volunteers.

The limited number of places will be filled on a first-come-first-served basis, so do not delay - 'phone Shane Whelan at (01) 661 2422 today.



Society of Actuaries in Ireland

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