



SOCIETY OF
ACTUARIES

EDUCATION &
RESEARCH SECTION

Expanding Horizons

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Expanding Horizons

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CHAIRPERSON'S CORNER

Section Activities

By Breanne Richins

It's an honor to serve as the chair of the Education and Research Section Council and to work with other dedicated actuaries on issues relevant to our common mission, which is to:

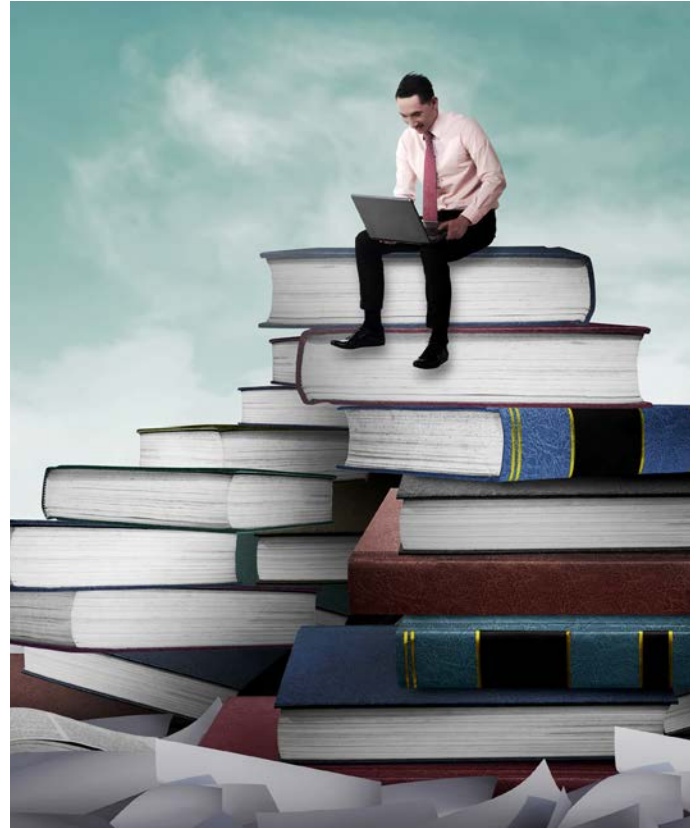
Facilitate expanding the knowledge base of the actuarial profession, promote ties between business actuaries, academic actuaries and actuarial educators, and seek ways to support and encourage actuarial education and research.

In line with our mission, we're excited to support the 2019 Actuarial Research Conference that will be held Aug. 14–17 at Indiana University–Purdue University Indianapolis (IUPUI) in Indianapolis. This event is jointly sponsored by Purdue University, IUPUI, Ball State University, Butler University, and University of Notre Dame. There will be presentations and discussions on a wide range of topics, and presenters include academics, industry experts and graduate students. Awards will be given for the best presentations among graduate students.

We are also pleased to announce that the 2020 Actuarial Research Conference will be hosted by the University of Nebraska-Lincoln.

Additionally, we will be sponsoring sessions at the major Society of Actuaries (SOA) meetings including the Life & Annuity Symposium, Health Meeting, and the 2019 SOA Annual Meeting & Exhibit.

If you have any questions about the section or any of the conferences/meetings, have an interest in actuarial education and/or



actuarial research, or would like to join us as a member or as an active friend of the council, please do not hesitate to contact me.

We hope that you enjoy this new format of the newsletter. We are also excited to launch the digital version of *Expanding Horizons* with this issue. It can be accessed through the section newsletter tab at <https://www.soa.org/sections/education-research/educ-research-newsletter/>. ■



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AT THE LECTERN

Letter From the Editor

By Colin M. Ramsay

I am pleased to present to you the May 2019 issue of *Expanding Horizons*. This issue is quite interesting in that we have an interview with Professor David Wilkie, an award-winning researcher and a pioneer of the use of stochastic investment models in actuarial practice.

In addition, we welcome Jay Vadiveloo's thought-provoking submission to the "The Art of Actuarial Practice" series. I met Jay at last year's Actuarial Research Conference (ARC) in London, Ontario, and we had an invigorating conversation spanning many topics. I was impressed by what Jay is doing at the Goldenson Center for Actuarial Science at the University of Connecticut and invited him to write this article. My hope is that Jay's innovative approach to actuarial education and research will provoke further discussion on the nature of research and creativity in our field.

There are also reviews of two nontraditional actuarial science books. Anthony Asher's review of *Loss Coverage: Why Insurance Works Better With Some Adverse Selection*, by Guy Thomas, and Brandon Horwitz's review of *Working Ethically in Finance: Clarifying Our Vocation*, by Anthony Asher. These books are quite unlike what we usually encounter in actuarial research and education. They are nontechnical and thought-provoking, and they grapple with some of the fundamental issues inherent in our profession. I invite you to read these books.

Of course, in August 2019 we have the 54th Actuarial Research Conference (ARC), and Jeff Beckley provides us with an enticing article on what we can expect in Indianapolis.

As you peruse this issue, I encourage you to send us your feedback on specific articles or on others that have appeared in recently published issues. You are also invited to send us articles on any aspect of actuarial education and/or actuarial research. Although *Expanding Horizons* is not a peer-reviewed scholarly publication, all articles are screened for relevance to the section's membership. ■



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LIVING to 100

SOCIETY OF ACTUARIES
INTERNATIONAL SYMPOSIUM

Jan. 13–15, 2020
Orlando, Florida

Save the Date

Mark your calendars for the 2020 Living to 100 Symposium, Jan. 13–15, 2020, in Orlando, Florida. Expert presenters will explore the latest longevity trends, share research results and discuss implications of a growing senior population. This prestigious event brings together thought leaders from around the world to share ideas and knowledge on increasing life spans. Registration and conference details will be available in summer 2019.



Participating Organizations

The following organizations have agreed to participate in this research endeavor with the Society of Actuaries as of August 2018. To view the current list, visit Livingto100.SOA.org.

Actuarial Society of South Africa

Actuaries Institute Australia

American Academy of Actuaries

Canadian Institute of Actuaries

Conference of Consulting Actuaries

Employee Benefit Research Institute

International Longevity Centre–UK

Office of the Chief Actuary, Canada (within the Office of the Superintendent of Financial Institutions)

Pension Research Council and Boettner Center for Pensions and Retirement Research of the Wharton School

The Actuarial Society of Hong Kong

Investments and Wealth Institute

American Geriatric Society

International Actuarial Association

LOMA

LIMRA

Government Actuary's Department (UK)

The Institute of Actuaries of Japan

Women's Institute for a Secure Retirement (WISER)

Institute and Faculty of Actuaries

Visit LivingTo100.SOA.org for more information

DISTINGUISHED ACADEMIC ACTUARIES

An Interview With David Wilkie



A. D. Wilkie, CBE, FFA, FIA, FSS, FIMA, Hon D Sc, Hon D Math, is chairman of InQA Limited.

Note from David Wilkie: These comments should not be taken as a careful actuarial autobiography, but rather as random thoughts stimulated by the questions, which, as will be seen, are not always appropriate to me. I would need to ask myself a different set of questions, but for the present purpose everyone replying needs to be asked the same set.

Q: Tell us about your background. How did you enter the actuarial profession?

A: I became aware of the actuarial profession through two routes. First, I went to Rugby School, a traditional English “public” school. I specialized in mathematics and my maths master, H. P. Sparling, had a relative, Phil Sparling, who was an actuary (and still is, though he is quite elderly). H. P. recommend an actuarial career to his mathematical students.

Second, in my teens my parents took me and my brother on holiday to Rosemarkie, where they met J. B. Dow (and his

family), who was then Secretary of Standard Life, later General Manager (CEO in modern terminology) and later President and also Gold Medal recipient of the Faculty of Actuaries. So, my parents knew about actuaries too.

I was fortunate to get entry to Cambridge University when I was just 17 (in 1951), so I had a year available before going there, and I spent that year as an actuarial student (of the Faculty) at the Scottish Widows Fund in Edinburgh, starting on the actuarial examinations. I thus went to university with my eyes on an actuarial career, and could amuse myself at university, studying successively mathematics, economics and English in my three years—a very odd course, but interesting. Then I had two years of National Service, and during all these years I did more of the Faculty examinations, so when I went back to the Scottish Widows I was able to qualify quite quickly.

Then I realized that I knew rather little statistics, and since the Institute of Actuaries at that time had a specialized advanced statistics examination, I studied for it and passed it and the other necessary (lesser standard) examinations a year later, so I became an FIA as well as an FFA.

Q: Did you work in the insurance industry before entering academia? If yes, what prompted you to move into academia?

A: I spent my career working in insurance companies (Scottish Widows, Swiss Re and Standard Life) and then a consultancy (R. Watsons), and have never been formally employed by a university. But in the early 1980s, I was asked by Professor Jimmy Gray if I could teach at Heriot-Watt University part time, and he arranged with Standard Life that I could be seconded for two half days a week to the Actuarial Mathematics Department at Heriot-Watt. I gave lectures there in Financial Economics. This stopped when I moved from Edinburgh to Watsons in Reigate (south of London) in 1985, but I was honored by Heriot-Watt in being made a visiting professor.

When I reached an age when Watsons thought I should retire, but I did not, I approached my friends at Heriot-Watt, John McCutcheon and Howard Waters, to see if we could arrange something, so for a number of years I was a visiting professor and also a research consultant, visiting Edinburgh about one week per month, discussing some research and mainly supervising Ph.D. students.

Q: What challenges did you encounter upon entering the actuarial profession?

A: The first few years as an actuarial student, I learned how to do many calculations that are now done better by computer, calculating premium rates, surrender values, and so on. I also

studied for and passed the examinations. This was as any other student at the time.

However, as soon as I qualified, I was given a new job, to introduce Flexowriters into the office. These were electric typewriters controlled by “programs” on punched paper tape and used to produce policy documents and various record cards with the same data on them, thus reducing typing and transcription errors. These have long since been superseded by computer records. The next job was to learn how to write programs for the new electronic computer, a Ferranti Pegasus, which I took to as a duck to water. But I then went to Switzerland for a spell with Swiss Re in Zurich, then moved back to Standard Life, and continued with programming for the same (shared) computer. This was useful, because we used machine language, and I learned how operating systems, compilers and link editors had to work.

Later the office moved on to an IBM mainframe, on which Cobol and Fortran were available as well as machine language. I joined the British Computer Society, read *The Computer Journal*, and discovered a lot of mathematical things that could easily be done with computers, but were almost too much trouble to do clerically. This proved useful too.

Q: What motivated you to go into academia and/or research?

A: I had had no interest in doing research, as such, through a Ph.D. But I found myself on actuarial committees—first the Continuous Mortality Investigation (CMI) Committee (a joint committee of the Institute of Actuaries and the Faculty)—where we were faced with the desirability of producing new graduated life tables. Rodney Barnett, the then-secretary, had shown how one could minimize the value of chi-squared, but this, clerically, was very laborious. I saw how one could easily do it with a computer, and I wrote a program to that effect, using the Nelder-Mead Simplex method¹ to do the optimization. But then, remembering my statistics, I saw that maximizing the log likelihood might be a better option, and (if one assumed normality) was very similar. If one assumed a Poisson distribution of deaths, one got a different, but similar, result. In due course, along with John McCutcheon, then at Heriot-Watt, and David Forfar, who, with John, was also on the CMI Committee, a paper on graduation was produced.²

By then I had been moved from the computer department of Standard Life to become economics research manager, in charge of a new group of economists whose role was to advise the investment department on the general economic situation, and I found myself appointed to the Joint Investment Committee of the Institute and the Faculty, responsible mainly for the FT-Actuaries (later FTSE-Actuaries) indices. The Edinburgh side took on the fixed-interest indices. I could readily see how

to write the computer programs to do these indices, including calculating redemption yields on individual bonds and fitting a curve to these redemption yields (again using Nelder-Mead). The new indices, using my program, started in *The Financial Times* at the end of 1976.

Planning for financial savings, both personally and through institutions, will always remain part of a free economic society.

A short while after I had been appointed economics research manager of Standard Life, I met my friend Sydney Benjamin, whom I had first met when he was working for Ferranti Computers and I was learning how to program their Pegasus computer. I mentioned my new role and he said, “What is the point? It is all random anyway.” From him, I took this as a serious remark and first investigated the ideas of random walks and efficient markets, and then considered the implications for insurance company investment of these ideas.

About this time, Sydney produced the notorious (and unpublished) paper at the Institute of Actuaries on maturity guarantees in unit linked life assurance. He had used the empirical distribution of past annual returns on shares and done Monte Carlo simulation to estimate the distribution of the cost of these guarantees. A revised version of his paper appeared among the papers presented to the International Congress of Actuaries in Tokyo in 1976. I did not like using the empirical distribution from the past, because it meant that no future simulated observation could be outside the past range, bigger than the biggest so far, or smaller than the smallest so far, so I fitted a normal distribution to the same data, thus allowing infinite range, and used that in a similar paper for the same Congress. Both were published in the Transactions of that ICA.^{3,4}

In due course, this led to us both being appointed to the Maturity Guarantees Working Party (MGWP), which reported in 1980.^{5,6} It had been observed by one member of that working party that if the past data was an example of a random walk, then it was a very straight one, and this led us to the idea that share prices might best be modelled by treating the share dividend index as a random walk, and fitting an autoregressive model to dividend yield, thus getting a model for share prices. Alistair Stalker, then of Standard Life, described this as “a drunken stagger about a random walk.” In the long run, this model produced smaller fluctuations in simulated share prices than the pure

random walk model, so the guarantees might cost less, which was obviously an advantage to the relevant companies.

In the discussion of the MGWP paper at the Faculty, George Gwilt suggest that dividends might well be influenced by inflation. I took this to heart and included retail (consumer) prices in my further investigations. For the investments of an insurance company, fixed interest stocks, especially long-term ones, were also important, so I included in my data the yields on Consols, representing long-term rates, and Bank Rate, representing short-term ones. I used these because the data was available for a very long period from the 18th century.

A statistical development about this time that affected things was the publication in 1970 of Box & Jenkins' book *Time Series Analysis*,⁷ which became well known in the early 1970s. Sydney Benjamin organized lectures on the subject, and I studied the book thoroughly. Later I got Standard Life to commission some work by Gwilym Jenkins' firm on my data, and since it was in Lancaster, the town where I was brought up and where my mother still lived (my father had died in 1969), this was convenient. I did meet Gwilym Jenkins once, but he was quite ill by then and died not much later. My main contact was with Gordon Macleod, his second-in-command, and he produced the

first version of what I later adapted to become the first version of the Wilkie model.

The next challenge was in a working party of the Faculty chaired by A. P. (Tony) Limb on life office valuation methods. For this I developed what later became known as "the Wilkie model," which appeared in paper in 1984, presented a few weeks after the working part report, but not published till 1986.^{8,9} I have spent quite a lot of time since then updating, extending and revising that model, and I am still doing so along with a younger colleague, formerly a research student at Heriot Watt, Şule Şahin.¹⁰⁻¹⁶

One can see from this story that all my research was directed toward the practical problems of life offices, getting new usable mortality tables, getting usable fixed interest indices, and reserving allowing for the stochastic nature of investments. Little of it was motivated by research for the sake of research.

Although there are different topics in all this research, they are all connected by applying statistical or mathematical models to the data, and then optimizing the parameters by the same techniques (usually Nelder-Mead). I could do this more easily through my programming experience.



Q: Who was an influential person in your professional life, and why?

A: You can see that Sydney Benjamin, who sadly died in 1992, was a significant influence, especially on my research thinking.

Earlier than this, when I was in Standard Life in the 1960s, there was no staff canteen, so we went out for lunch. I often chose a tearoom a little along George Street in Edinburgh, above the Edinburgh Bookshop (long since disappeared), and I often found Ernest Bromfield there. He was then the secretary of Standard Life (second in command to J. B. Dow), and he seemed happy to chat to a much younger colleague, perhaps to find out what younger actuaries might be thinking. From him I learnt quite a lot about the problems of senior management (in so far as he could discuss them with me) and about their attitudes. Sadly, he died in 1969 while also serving as president of the Faculty of Actuaries.

Another influential person was Jimmy Gray, an actuary who had been teaching at St. Andrews University and was then appointed to be professor of the new Department of Actuarial Statistics at Heriot-Watt University in Edinburgh. As part of my research activities at Standard Life, I attended seminars at Heriot-Watt and got to know him and John McCutcheon particularly. It was Jimmy Gray who suggested that I might like to teach part time at Heriot-Watt and made arrangements with Standard Life for my secondment.

Another actuary who had influence in a similar way was John Martin, whom I had met on the Groupe Consultatif, the small body that coordinated the actuarial profession within the European Union and was their channel to the European Commission. He was one of the two representatives from the Institute of Actuaries, and I was one from the Faculty. John was senior partner at R. Watsons consulting actuaries in Reigate (a small town in Surrey, south of London), now part of Willis Towers Watson. He had at times wondered whether I would like to join a consultancy, and when I was considering a move away from Standard Life, I approached him and in due course joined Watsons and moved to Reigate. That reduced my contacts with Heriot-Watt, which I took up again many years later.

Yet another person who has had influence is my wife, Patricia Wilkie. She did an undergraduate degree at Edinburgh University when our children were big enough, though still young, and she followed this up with research at Edinburgh, Stirling & Glasgow, and St. George's Medical School in London. In the course of all this, she got a Ph.D. I did not learn about actuarial things from her, but I did learn a great deal about doing serious academic research—at a minor level, things like the overall structure, doing a literature search, referencing correctly—but

much more than this, and more than I could get from the interesting, but not always very professionally produced, actuarial papers. Each of us attended conferences that the other went to, so we both got to experience different types of conference arrangements. She has also been very supportive of my research, as I hope I have been of hers.

There is a place also for pure research, following up an idea that has sprung from the practical research, but that does not help directly with the solution.

Q: What is your personal philosophy with regard to teaching and/or research?

A: As noted, my research has been motivated by wishing to find ways of solving practical problems using the best available mathematical, statistical and actuarial tools for that.

A very good example of practical research is to be found in Ptolemy's *Almagest*, written circa 150 A.D. There is a section in Book I, about 10 pages in my English edition, in which he derives from first principles using Euclidian geometry and calculates what is in effect a table of sines of angles, at one-quarter degree intervals, accurate to about six decimal places. He derives what one can recognize as the familiar $\sin(A + B)$ and $\sin(A - B)$ formulae, $\cos(x)$ in terms of $\cos(2x)$, and the result that, if $x > y$ and both are small, $\sin(x) / \sin(y) < x / y$. In effect, he develops trigonometry about 500 years before it was invented in India, and he does this because he needs the numbers later on in his astronomical calculations. Incidentally, Ptolemy is nowadays regarded as all wrong because he assumed a stationary central earth, but he solved—very well, not perfectly—the rather hard problem of the motions of sun, moon, planets and stars as observed by someone fixed on the earth. He was a very good astronomer and mathematician.

There is a place also for pure research, following up an idea that has sprung from the practical research, but that does not help directly with the solution. A problem in, for example, risk theory is that there is quite a lot of interesting mathematics that can be done, and many researchers do it. But realistic insurance liabilities are so varied and complicated that tidy analytical mathematical solutions are not possible, and one must resort to simulations. There is a lot one could do to research the methodology of simulating, but this does not seem to appeal so much to academic researchers in the actuarial and statistical fields. Perhaps more research in this area should be done.



I have too little experience of undergraduate teaching to comment on teaching. My own experience is that I have always found mathematics, if clearly explained from a starting point that I know about, completely obvious. I may find an unfamiliar field unintelligible, but then I realize that I need to go back to the start and learn about it from the beginning, which I may or may not be inclined to do. I do not readily understand why someone should find any mathematics difficult, though I know that plenty do, so I think that I would not be good at teaching them.

Many different skills are needed in teaching and in research. I believe I am seen by some practicing actuaries as far too theoretical, yet I see myself as very practical. There are theoretical pure mathematicians; their work may be used by theoretical mathematical statisticians. I use their methods and results in my research, and I try to explain carefully all the steps I have taken. This may well be too complicated for the practicing actuary who just wished to use some tools, so it may require an intermediary to rewrite my papers, omitting the lengthy justifications, and giving only the results. It is like a chain; at each stage one person uses the ideas on his/her left and passes them on, suitably transformed, to the next person on the right.

Q: Thinking back on your career, what are your biggest accomplishments? Any disappointments? Any memories or moments that stand out above the rest?

A: Obviously the “Wilkie model” must come as the top achievement. It has become quite well known in actuarial circles, but

not among financial economists, which is rather a pity, because our latest papers show how the random walk models proposed by Nobel prize-winner Fama can be reconciled with the mean-reverting models proposed by Nobel prize-winner Schiller.¹⁷ It seems rather amusing that two academic financial economists holding totally opposite views could get Nobel prizes for economics in the same year.

However, I believe I have also contributed a bit to mortality table construction and multiple state models through my work with the CMI. I have also contributed a bit to investment index construction over the years. I remember ringing up Jack Plymen, then chairman of the FT-Actuaries Indices Committee, and suggesting what later became the “xd adjustment,” which records the actual income received on an index rather than the current “yield,” which may omit things like special dividends and, so, be misleading about the actual results. A small, but I think useful, addition.

Q: What might someone be surprised to know about you?

A: When I was at Cambridge, I joined the University Air Squadron and learned how to fly Chipmunks, small training planes. I then had to do two years of National Service, so I went into the RAF as a trainee pilot, training first on Provosts and then Vampires, early jet fighters, and ending up with my pilot’s “wings.” It is tremendously exciting flying a very powerful little airplane about the sky on one’s own. I am proud of having done this, because all my actuarial achievements have been based in my ability in mathematics and programming and are an obvious development of these skills. But I was hopeless at ballgames and most sports, though not too bad at swimming, and being able to do a more physical thing like flying fast airplanes was for me a special achievement.

Q: How do you see the future of actuarial science in your country?

A: I am rather out of touch now with what actuaries are doing either in life insurance or in pension funds, though in recent years they have made progress in general insurance, and the academic side has grown. The profession, in the U.K., has grown a lot in numbers in recent years, and also in several overseas countries. I don’t know whether there will be enough for them to do in the traditional fields. In the 19th century, friendly societies were an important part of actuarial work in the U.K., and they diminished in importance as pension funds grew. Planning for financial savings, both personally and through institutions, will always remain part of a free economic society, so I suppose that actuaries will always be needed by those institutions, whatever they are, and perhaps as expert personal financial advisers too.

Q: What would you advise someone considering entering the actuarial profession?

A: You need to be very competent at mathematics, but you only need to know a bit, not all of it, so a full pure maths degrees is not necessary. You need to know and understand a good bit of mathematical statistics, and to have a good understanding of programming and what it can do, and can't do, even if you don't do a lot of programming yourself. You also need a lot of good business common sense, and an ability to explain things simply and carefully to those who have less specialized knowledge than you have. Nothing in actuarial work is too difficult to explain to a willing and intelligent listener. If you have these abilities, you should enjoy actuarial work, and good luck to you.

I would also advise any student starting at university (of the right sort where this is possible) to include some arts course, music (many actuaries are musical), history, art, literature, another language—something to broaden your outlook. It might even be a non-central science course, like geology or botany. I had a curious academic progress at university, ending up with a degree in English. I am now sorry I had not learnt more mathematics at that time, but I am not at all sorry to have studied English literature at that level.

Q: As you know, actuarial education has become mainstream and is taught in many universities worldwide. As you reflect on your career, are there any closing comments (or advice) that you may want to pass on to current (especially younger) actuarial science faculty at large?

A: This gives me an opportunity to make two comments. First, I see far too many papers by academics, younger and older, who use total return models of investment, wholly ignoring tax and expenses. This may be because they have no practical experience of investment, personally or professionally. But for any personal investor or investment institution, the tax position is vitally important, and many things are done with tax in mind. Further, the expenses of buying and selling have to always be considered. Taxation depends on the country, the date, the institution or the individual, and is generally complicated, but to ignore it won't do. There is usually tax on income, perhaps at different rates on dividend income and bond interest, and often capital gains tax on sales. One should use models where taxation could be allowed for if needed, rather than those where it can't.

Second, in recent years a number of firms in the U.K. and the USA have been offering Economic Scenario Generators (ESGs), but the publication of papers on these has almost ground to a halt. I have understood that many of these were based originally on the Wilkie model, and on other published interest rate models, but I would be surprised and disappointed if the providers had not made improvements in these. Yet nothing is published. I appreciate that there are aspects of commercial confidentiality, but this is no way to advance in a scientific field, where any new ideas should be exposed to comment, criticism and possible improvement from knowledgeable others. I do not know how the clients, or the regulators, can assess the quality and reliability of these ESGs when there is so much secrecy about them. ■

ENDNOTES

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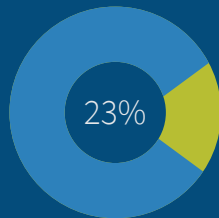
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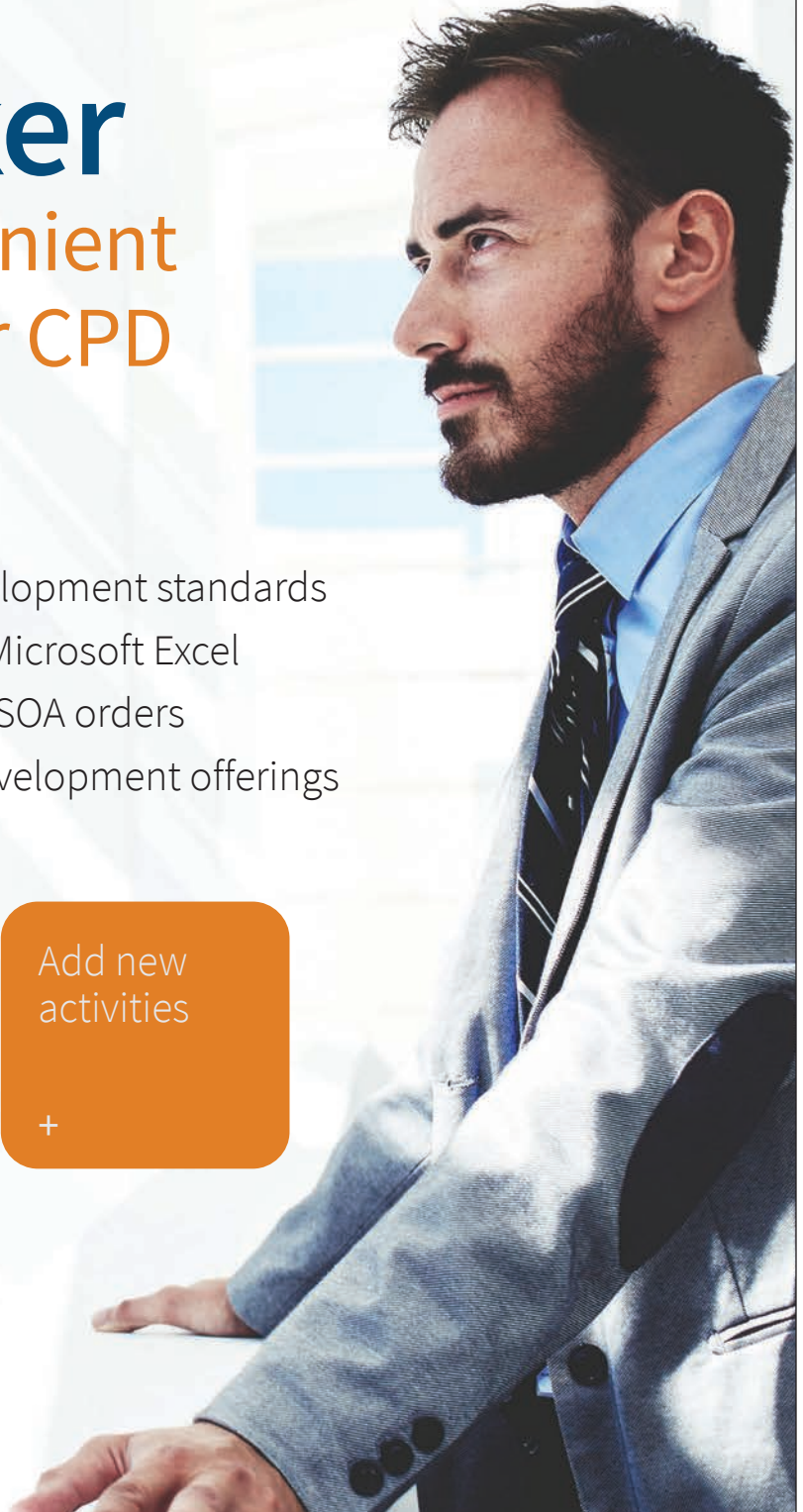
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THE ART OF ACTUARIAL SCIENCE

The Goldenson Center Perspective

By Jay Vadiveloo

In thinking about how I should frame this article, I decided it would be best to use my past 10 years of experience in managing the Goldenson Center as its basis. The Goldenson Center for Actuarial Science at the University of Connecticut has one simple mission: to engage in applied actuarial research that serves the needs of industry. While this may not be a profound mission statement on face value, if you break it down, it has several implications and built-in constraints:

- Applied actuarial research means the problems we have to solve at the Goldenson Center must come from industry and not be “dreamed up” in the ivory halls of academia. Also, applied actuarial research encompasses both traditional and nontraditional problems facing industry.
- Serving the needs of industry means that the solutions we come up with must be implementable and add value to a company. A more complex model, which is academically superior but does not necessarily add tangible, measurable value to a company’s current operations, does not fit into the Goldenson Center’s mission statement.

Given these self-imposed constraints on Goldenson Center research projects, we invariably have to go beyond traditional actuarial techniques and established theoretical models and develop our own novel approaches to problem-solving. However, while our mission statement has these built-in constraints, we have also provided a level of freedom and creativity that is unique to the Goldenson Center:

- Applied actuarial research projects undertaken by the Goldenson Center do not have to be published in academic journals. However, in order to generate industry interest in the work we do, we have published some of our research in trade journals and popular publications that are more widely read.
- In the process of coming up with implementable solutions, we have to create “new theories” or new modeling

techniques. These new techniques are never justified using academic criteria as long as they satisfy the second constraint imposed by the Goldenson Center mission statement.

Collectively, the constraints we work under as well as the freedom we allow ourselves in coming up with implementable client solutions are where the “art” of actuarial science applies for Goldenson Center projects. Let me try to illustrate this with an actual example of a project undertaken by the Goldenson Center. But, before I do this, it is important for the reader to understand that creative thinking does not magically happen in any organization, including the Goldenson Center. Unlike other academic research centers, all projects at the Goldenson Center are done exclusively by students and mainly graduate students. The only faculty member involved is me—and as more of a facilitator and guide. There are a couple of reasons for this:

- Students are readily accessible and eager to gain the real-life experience of working on Goldenson Center projects.
- Students are generally not constrained in their thinking, have excellent modeling skills, and are more open to challenging and modifying traditional, well-established actuarial models, particularly when they are made to focus on an implementable solution versus publishable research.



In order to stimulate creative and unconstrained thinking amongst team members in a project, I have tried to foster a spirit of entrepreneurship at the Goldenson Center in the following ways:

- Students work in teams and are given complete freedom in thinking.
- Team members have complete ownership of the project, from weekly client calls and meetings, formulating the problem, developing the modeling tools to come up with the solution, putting together the final report and supporting materials, and doing any final client presentations.
- Trust amongst team members and open sharing of ideas are strongly encouraged.
- Students are more motivated by the experience they obtain and the company exposure and visibility they receive.
- Students are treated equally: Each student receives a flat stipend independent of the number of hours spent or the different levels of responsibility of each team member.

I believe the underlying mission and philosophy of the Goldenson Center is how the art of actuarial science naturally emerges in the work we do. Clearly the level of art varies by each individual project, but let me illustrate with an example where we may have broken the mold of traditional actuarial thinking in coming up with a solution.

NRSI that incorporates both economic and noneconomic factors to capture retirement readiness truly illustrates the art of the actuary.

NATIONAL RETIREMENT SUSTAINABILITY INDEX (NRSI)

This project was inspired by one of the board members of the Goldenson Center who felt that current national retirement readiness indices are developed purely from economic data. This means that in bad economic times, national retirement indices paint a dismal picture of the future retirement scene, and that makes it hard for the insurance and financial services industry to encourage individuals to plan for retirement. The challenge for the Goldenson Center was to incorporate other nonfinancial drivers of retirement readiness that could impact the measure of retirement preparedness. This raised several critical questions that we had to resolve using “out-of-the box” actuarial thinking.

- What noneconomic factors should be considered?
- How can these factors be quantified and incorporated into the retirement index?
- What external data sources are available to objectively quantify these noneconomic factors and ensure they are consistent?
- What reasonable approximations and proxies could be used to quantify these noneconomic factors?
- How do we handle noneconomic factors that impact the quality of retirement life but cannot be objectively quantified? This would include factors like social connectedness, a positive attitude to life, and so on.

This was one of the most challenging projects we had ever undertaken because we could not fall back on traditional actuarial principles and modeling techniques. We began by setting some axiomatic principles in our model design:

- We decided to focus on only four noneconomic factors that could be objectively quantified: state of health, level of adaptability, job satisfaction, and level of financial planning. All other noneconomic factors were excluded.
- The healthier the individual at retirement, the lower the future health care expenses at retirement and the greater the retirement sustainability.
- The more adaptable an individual, the greater the ability to generate additional income at retirement and the greater the retirement sustainability. Level of education was used as a proxy to measure individual adaptability.
- The greater the job satisfaction, the longer an individual is willing to work until retirement and the greater the retirement sustainability. The *Wall Street Journal* job rankings were used as a proxy to measure job satisfaction.
- The greater the level of financial planning, the greater the growth rate of retirement savings and the greater the level of retirement sustainability. A review of financial planning articles and publicly available financial data was used to estimate the additional asset growth rate attributable to financial planning.
- Since quantifying these noneconomic factors required judgment and approximations, wherever possible, conservative assumptions were used to determine the impact of these noneconomic factors on the NRSI.

Specifically, the student team had to come up with the following:

- Determine the appropriate public databases to project assets and liabilities at retirement in order to measure retirement readiness. The two main data sources were the Health and Retirement Study (HRS) and census data.
- Determine key actuarial estimates of mortality and morbidity as well as estimates of various economic factors, such as asset growth rates, annual living expenses before and during retirement, inflation rates, estimated age at retirement, and so on.
- Determine estimates of the various noneconomic drivers of retirement readiness and a reasonable and consistent approach to quantifying these drivers. One of the most challenging noneconomic factors to quantify was level of adaptability. We chose to associate level of adaptability with the potential of a retiree to earn part-time income during retirement and linked the level of part-time income with the level of education of the retiree. In this way, a relatively subjective noneconomic driver, such as level of adaptability could be measured and quantified in a logical and consistent manner.
- Develop an actuarial model in Excel/VBA to calculate the base and final NRSI separately for the working and retiree population using the underlying databases and modeling assumptions.

There are clearly too many details in the underlying model to mention in this article, but it is significant to note that there was sufficient complexity and enough of a theoretical framework in the NRSI construction that it became the basis of a Ph.D. dissertation for one of my students.

The implications of the NRSI are very significant:

- The NRSI was broken down into two components: (i) the baseline NRSI, which included just economic drivers, and (ii) the final NRSI, which incorporated both economic and noneconomic factors.

- While the baseline NRSI conforms to traditional retirement indices, which reflect the state of the economy, the final NRSI paints a different picture. The noneconomic factors provide a smoothing impact on retirement readiness because the final NRSI is less volatile than the baseline NRSI.
- While the state of the economy is beyond an individual's control, the noneconomic factors can be controlled and managed by an individual through education and training, healthy living and financially planning for retirement. In other words, retirement sustainability is not a manifest destiny and is within an individual's control independent of the state of the economy.

I hope this article does not leave the reader with the impression that everything we do at the Goldenson Center is an art. We do several traditional modeling projects at the Goldenson Center, such as pricing, predictive modeling, and developing individual financial planning models where students employ well-established actuarial mathematics principles to come up with a solution.

MY INSPIRATION

I would like to end with some parting words of inspiration. When I started my academic career at Syracuse University after I completed my Ph.D. at the University of California, Berkeley, the faculty member before me had cleared the office but left behind a single book—*Zen and the Art of Motorcycle Maintenance*, by Robert Pirsig. This book has been a source of inspiration for me and embodies the underlying philosophy of the Goldenson Center. The message I have captured from this book is that however mundane or complex a given activity, you have a choice to approach it as an artist and provide a truly creative solution. This is maybe the best definition of the “Actuarial Art.” Creative solutions do not apply only to nontraditional projects, such as the NRSI, but to any work we do as actuaries—both traditional and nontraditional. ■



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BOOK REVIEW

Guy Thomas' *Loss Coverage: Why Insurance Works Better With Some Adverse Selection*

By Anthony Asher

Actuaries and economists should listen to what author Guy Thomas is saying in *Loss Coverage*. An alternative title might be *A History of Exaggeration: Adverse Selection can Even be Beneficial*. In it, Thomas summarizes his points of difference as:

- a. Adverse selection in insurance is usually weaker than most commentaries suggest ...
- b. From a public-policy perspective, “weak” adverse selection in insurance is a good thing ...
- c. ... Some restrictions on risk classification are a good thing in some insurance markets ...¹

His characterisation of “most commentaries” is not a straw man. He quotes many actuaries, academics and industrial commentators, arguing that failure to distinguish among risks will lead to upward price spirals and failing insurance companies. Dire predictions about the effect on insurance markets of adverse selection because of limiting discrimination based on HIV, genetics and gender have proved largely baseless.

The contribution to theory is the concept of “loss coverage,” which is a measure of the extent to which potentially insurable losses are actually compensated by insurance. The second part of the book is devoted to defining it and exploring its mathematics. These more technical chapters demonstrate how some adverse selection increases loss coverage—depending on the price elasticity of both high and low risks—and how industry agreements or a regulator might induce optimal loss coverage under differing circumstances. He also deals with partial risk

classification, where prices only partly reflect underlying differences in risk.

Part III returns to Thomas’ points of difference. It opens with a taxonomy of objections to risk classification. Of the 10 objections given, two are perhaps the most powerful. First, the unfairness to individuals of statistical discrimination, which may confuse causation and correlation, or effectively differentiate on socially objectionable grounds. Second, the perverse incentives that can arise for individuals to avoid obtaining genetic and other useful information in order to avoid higher insurance premiums or being refused insurance.

He defines “informational adverse selection” as that arising from unavoidable informational asymmetries and suggests that what little effect it has on insurance markets is probably positive in increasing loss coverage. “Competitive adverse selection,” on the other hand, arises when some companies begin to discriminate on new grounds and requires their competitors to follow suit or be left with only the highest risks. The argument is that agreements or regulations that prevent competitive adverse selection create greater social welfare.

The political chapters are critical of industry and professional lobbying against regulations that might prevent unfair discrimination or increase loss coverage. He gives examples of emotive and exaggerated prognostications of huge losses from adverse selection related to HIV, genetic testing and gender-neutral pricing. He suggests that the actuarial profession has bought into industry prejudices, and that much lobbying in favor of



“freedom to underwrite” is based on an ideological agenda that wishes to undermine redistributive social security systems.

The ideological debate can be explained as a species of class warfare but also as a clash of values between the political left (and its concern for equality of living standards and addressing individual needs) and the political right (and its concern for liberty and just deserts). I think that the book would have benefited from more discussion of these issues, as in the work of Jonathan Haidt.² On the issue of just deserts, it seems to me that the industry is muddling actuarial equity (equality of premiums and benefits) with desert. One cannot be held accountable for one's genes, in the same way one might be charged more for choosing to smoke, drink or climb dangerous mountains. In its desire to be free from regulation, there are those in the industry who fail to see the potential benefits of relatively benign restrictions on underwriting. In any event, as Thomas points out, underwriting can involve an invasion of privacy that I would see as a restriction on individuals' freedoms.

Thomas' criticisms extend to economic models of adverse selection, such as Rothschild-Stiglitz, in which constructs such as differentially priced deductibles and restrictions on cover for low risks do not reconcile well with insurance practice. He also takes issue with orthodox concepts of efficiency in risk classification, and suggests that loss coverage offers a better definition of efficiency. To my mind, efficiency depends on the costs of insurance—the lower the cost of underwriting, and the less risk classification, the greater the efficiency.

There is also a question (raised by Thomas in Chapter 3) of whether insurance is best understood as providing reassurance in the actual present state or probabilistic compensation of losses in some possible future state. There may well be a trade-off, but this does not detract from Thomas' three points of difference.

My own early experience of what is termed “advantageous selection” led me to come to an understanding like Thomas'. In the '70s “bush war” in what became Zimbabwe, we loaded term insurances higher than whole life and endowment policies because of potential adverse selection, only to find the experience of the latter was worse. Policyholders informed enough to take the higher coverage offered by term insurance were also more able to avoid falling casualty. I also found that policies exercised using guaranteed insurability benefit options experienced much lower mortality than our ultimate rates. They provided the sales force with the excuse to visit and sell policies, and this swamped the occasional higher-risk individual obtaining an advantage. Other factors frequently swamp price in the purchasing decision, and value

for money is often more related to costs other than the pure premium.

While he describes himself as an outsider—both an academic and actuary—Thomas' criticisms of the actuarial profession are those of someone deeply embedded in its methodology and values. As Chesterton³ might have it, he loves the profession, and the book is an attempt to heal its shortcomings. His disagreements with positive economics are those that every actuary must have: We cannot accept that the realism of assumptions is irrelevant, nor that scientific understanding has no normative implications.⁴

The cartoon on the cover belies the more serious subject matter and careful argument. It does, however, tie in with the teacher's concern to make points as clear as possible as in his toy examples to illustrate the points. The mix of simple and rigorous does mean that readers should read the chapter summaries before getting into the meat of each chapter.

I appreciate the academic desire to address the questions rigorously. I also like the relatively unusual combination of the personal and political together with the technical, and I applaud the desire to persuade readers to see things more clearly. These are all to be welcomed if we are to avoid economic reductionism and be open to expanding our understanding.

Thomas quotes U.K. academic John Kay's regrets at once feeling used by conference sponsors. He felt he was inveigled into debating (and therefore inadvertently affirming) the alleged “crisis in social security” that has been used to justify a reduction in the redistributive elements of pensions systems. In reading the book, I too felt some regrets at not having responded more actively to some of the issues raised—as well you may ... ■



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ENDNOTES

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- 2 Haidt, Jonathan. 2012. *The Righteous Mind: Why Good People are Divided by Politics and Religion*. New York: Vintage.
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BOOK REVIEW

Anthony Asher's *Working Ethically in Finance: Clarifying our Vocation*

By Brandon Horwitz

I had the privilege of being taught by Anthony Asher when I studied at WITS University (South Africa), although I must admit that it often felt anything but a privilege at the time! His lectures typically appeared to consist of assigning us apparently random tasks or problems to solve, often with unclear or limited directions and short timescales to completion. While always engaging, his lectures were often challenging and involved reading material and concepts we didn't find in our textbooks, and rarely, if ever, were the answers obvious (or, in fact, unique).

Little did I realize that this approach was built on something other than a lack of care and preparation for our education, but rather a genuine desire to prepare us for something we would all face after graduation—real life, our careers and, if we were lucky, embarking on the path to finding our vocation.

I owe many things to Asher, including my penchant for Peter Drucker quotes, especially the famous “What gets measured gets managed.” This is probably why I identify with *Working Ethically in Finance*'s opening chapter's question attributed to Drucker (quoting St. Augustine): “What do I want to be remembered for?” ... and Drucker's subsequent comment that “If you have an answer before you are 25 years old, you have not understood the question, while if you cannot answer it by the time you are 50, you have wasted your life.”

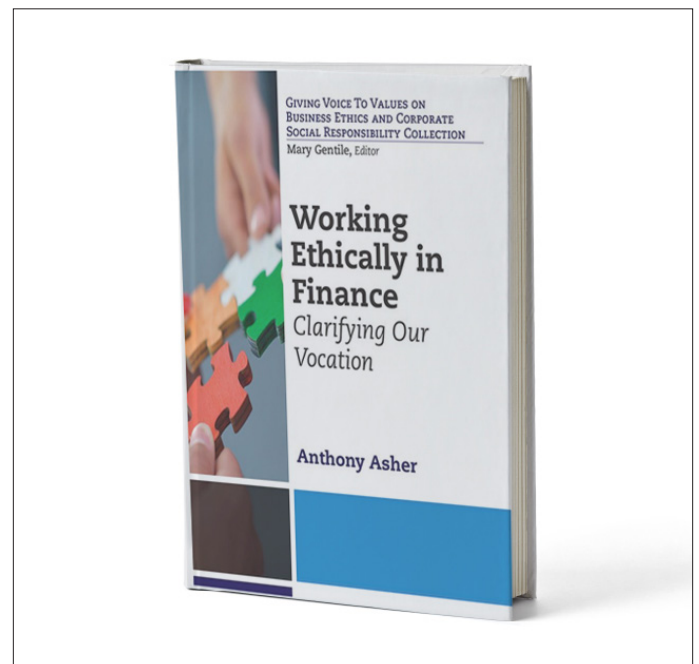
Interestingly, I had my (first?) existential career crisis in my late 20s and nearly left financial services, quitting my job in investment banking/asset management to reflect on my purpose. My soul-searching concluded that my vocation remained

in financial services, perfectly summed up by Asher's comment that: “Our modern world could not have been built without the bankers and investment managers who have helped mobilize capital, and many more people would have ended their lives in poverty without insurance and pension arrangements.”

I agree with his views that banking, investment management and insurance institutions have been built and maintained by “people who have done good work throughout their lives” and while they (we?) are not heroes, they are “professionals who are working out their vocations—virtuously.”

“Many more people would have ended their lives in poverty without insurance and pension arrangements.”

This book is a tour de force of philosophy, economics and common sense, with practical applications to all of us who work in financial services. The writing style is concise and clear, and he succeeds in introducing a broad range of concepts from history, economics, philosophy and psychology, with an ample bibliography offering more. I also especially like the neat



summaries at the end of each brief chapter that help consolidate the ideas.

There are sections on justice and injustice, with personal examples of where Asher has seen this in his career and lessons that clearly apply to today and may even, if we embrace them, help mitigate (if not prevent) the next big market crash or scandal.

Asher also draws on his Christian faith not to preach but, with pride and thoughtful consideration, teach the lessons we can learn from a tradition that prizes community and mutual responsibility. As a practicing Jew myself, I recognize many of the ideas and commend Asher's courage to make us aware of how drawing on our faith in the workplace can help us find and achieve our vocations, and have a positive influence on the world around us. Having said that, this is a book for those of all faiths and none, because Asher has humility in his writing and

does not suggest that any one faith or school of thought has a monopoly on wisdom, ethics or virtue.

We all face daily choices between virtue over vice in our search for vocation, and this excellent book helps equip us with knowledge and skills to choose wisely.

Asher taught the precept of Francis Bacon, who said: "I hold every man a debtor to his profession." I, like many South African actuaries, am indebted to Asher for the lessons he taught us at WITS, and for this excellent book. ■



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EDUCATION/RESEARCH MEETINGS

The 54th ARC in 2019 in Indianapolis

By Jeff Beckley

The next Actuarial Research Conference (ARC) will be held in Indianapolis on Aug. 14–17. The 54th ARC will be hosted by five universities in Indiana: Purdue University, Indiana University–Purdue University Indianapolis (IUPUI), Ball State University, Butler University and University of Notre Dame.

The conference will be located on the IUPUI campus in downtown Indianapolis. The campus is a 10-minute bus (or Uber) ride from Indianapolis International Airport, which makes air travel convenient. Additionally, Indianapolis is also within easy driving distance of most of the Midwestern United States and central Canada.

Registration for the conference is now open. Attendees can register and find information on accommodations on the official

ARC website.¹ Graduate students and faculty who want to present at the 2019 ARC can also register on the ARC website. Submission deadline for presenters is May 31.²

The conference will kick off on Wednesday, Aug. 14, with an evening reception at the Skyline Club on the 36th floor of the OneAmerica Tower. The Skyline Club offers a panoramic view of Indianapolis. A late-afternoon poster session will be held on Aug. 15, and conference participants will enjoy an entertaining evening banquet on Aug. 16 at Dallara IndyCar Factory. Dallara manufactures the chassis for IndyCar race cars. There is a large interactive exhibit at the banquet location, including the opportunity to experience full-car IndyCar racing simulators.

KEYNOTE SPEAKERS

We are very pleased to have Andrew Cairns, Jan Vecer and Anya Prince as keynote speakers for the 2019 ARC. To learn more about these keynotes, please visit the official ARC website.³

INVITED SESSIONS

In addition to the keynote speakers, the 2019 ARC will host five invited sessions:

- **Update on Actuarial Education.** The Society of Actuaries, Casualty Actuarial Society and Canadian Institute of Actuaries will provide an update on actuarial education and credentialing for each organization.



- **Actuarial Society Sponsored Research.** The Society of Actuaries, Casualty Actuarial Society, Canadian Institute of Actuaries, American Academy of Actuaries and the Institute and Faculty of Actuaries will provide a description of the research being supported by each organization and inform attendees how to get involved with actuarial society sponsored research.
- **Actuarial Professionalism.** This session will be an interactive discussion of professionalism as it applies to academic



actuaries. Attendees will earn 1.8 hours of Professionalism CPD credit.

- **Industry–Academic Cooperation.** Presenters from industry and academia will have an interactive discussion of ways to involve academic actuaries in the research needs of industry to the benefit of both industry and academia. This session will include a discussion of data science research needs by industry.
- **Catastrophe Modeling and Insurance.** “Cat” modeling and insurance is increasingly important in today’s world. This is especially true with the increasing volatility of weather-related events driven by climate change.

We look forward to seeing you at the 2019 ARC for a great conference and a fun visit to Indianapolis! ■



Jeff Beckley, FSA, MAAA, is the director of the actuarial science program at Purdue University. He can be reached at jbeckley@purdue.edu.

ENDNOTES

- 1 <https://www.math.purdue.edu/calendar/conferences/arc19/index.html>
- 2 https://www.math.purdue.edu/calendar/conferences/arc19/call_presentations_posters.html
- 3 https://www.math.purdue.edu/calendar/conferences/arc19/keynote_speakers.html



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