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The Robots Are Coming! Be among the FIRST Actuaries to Prepare for Them

By Dave Snell

I thought I was doing some cool stuff with machine learning and genetic algorithms. After all, I could make Robby the virtual robot move around and pick up soda cans. Then, earlier this year, my brother-in-law came to visit. I knew he was a robotics enthusiast so I took him to the FIRST (For Inspiration and Recognition of Science and Technology) Robotics Championship, which was held here in St. Louis (April 23-26). I was expecting a science project exhibit. I was wrong!

Overwhelming would be an understatement of my surprise! My only exposure to robotics lately has been indirect, since our niece was on a high school robotics team and was having fun with it. Now, she is going to a top engineering school on full scholarship. How? One factor was the robotics team experience.

Wait! What does this have to do with actuaries; and especially for Actuary of the Future (AOF) Section members? Robotics seems as far removed from the actuary of today as we do now from the actuaries years ago who sat on tall stools, wearing green visors, and spending the day cyphering in large ledger books with quill pens.

Robotics is a rapidly growing field of study, and many folks still think of it as only LEGO blocks with some small electric motors and remote control joysticks to make them move as instructed. However, it may be an area of opportunity for some actuaries ... some Actuaries of the Future!

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My Experience as an AOF Section Council Intern

By Bradford Conners

Throughout the past year, I've been very fortunate to have the opportunity to serve as a section council intern (SCI) for the Actuary of the Future (AOF) Section. Before learning about this internship opportunity, I was under the mistaken impression that the Society of Actuaries (SOA) existed simply to administer exams and offer certifications to actuaries. But after getting to witness some of the initiatives that the AOF Section takes to help young actuaries develop the tools necessary for a successful career—and realizing that the AOF is just one of 20 sections that SOA members can join—I now see the SOA in an entirely different light.

What made my experience as an SCI so valuable is that I was granted a lot of flexibility regarding what I wanted to work on. At Penn State, I am currently pursuing a dual degree in both actuarial science and broadcast journalism—a relatively rare combination that doesn't cross paths very often. However, as a member of the AOF council, I was able to participate in a project where I could utilize both of my skill sets as I co-conducted an interview that you'll find in this newsletter.

As a college student, I was very grateful that I had the chance to spend about an hour speaking to an actuary with highly extensive and diverse career experiences who has risen to a prominent role within his organization. To hear insight about the past, present and future of the industry from someone who has seen it evolve firsthand over the years is a learning opportunity that one simply cannot get from reading a textbook, and it was an experience made possible by being a part of the AOF Section Council.

Another project I worked on this year was to create a flier to market the AOF's networking bean bag toss event at the upcoming annual meeting. In addition, despite being the least experienced of the group in terms of real-world actuarial experience, we were able to pinpoint one area in which I—along with just about any other college student—may actually have the advantage over full-time workers: social media. I've made an effort to boost the AOF's presence on LinkedIn, and I hope that the next SCI(s) will take on a similar role in order to further increase interaction on the AOF's LinkedIn page.

Future AOF council interns may be involved in the same initiatives I was a part of, or their experience may be completely different from mine. That's the beauty of the internship; unlike a college class, there's no syllabus, no recurring assignments to hand in each week, and no grade on the line. You can make as much or as little of the internship as you wish, but if you try to make the most of it, I'm sure you'll find yourself with countless networking opportunities and a better understanding of the profession of which you are about to embark upon your career. ☆



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Yes, robotics currently entails a lot of mechanical work involving material selection, machining and assembly. Hobbyists (and engineers) can do that. It does not require a lot of actuarial skills. But the most impressive areas for advancement are in the control mechanisms—the machine learning.

Machine learning is a facet of artificial intelligence (AI), and it makes heavy use of the linear algebra, matrix mathematics, and calculus and statistics you spent so much time studying to prepare yourselves for actuarial exams. One hypothetical opportunity for the Actuary of the Future might be to build financial models that minimize the risk of a rescue robot getting caught in debris as it searches for the survivors of a building collapse ... or that try to minimize the liability of the robot inadvertently harming the victims while trying to save them. Then again, perhaps we will be asked to price “life” or “health” insurance products on these expensive robots. Designing control models might involve networking theory or particle swarm optimization or lots of other techniques that will require higher mathematical skills coupled with an awareness of risk management techniques.

What do actuaries have in common with robotics engineers? It’s like the photo I snapped shows: They both do math good!

We should not assume though that the robotics industry is going to come looking for actuaries to guide them. The FIRST Robotics Championship attracted many thousands of attendees who came to watch the top 400 teams from the United States and 16 other countries as they competed for the top prizes. This year they awarded over \$20 million in scholarships. This one event dwarfed the attendance at an SOA annual meeting many-fold; and FIRST involves over 350,000 students. Plus, there are several other robotics championship events besides FIRST. Some are even held in cities other than St. Louis!



Figure 1. FIRST Championship 2014, St. Louis, Missouri; many more attendees than an SOA annual meeting.



Figure 2. Not just INGENEERS, but actuaries do math good too!

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Check out the excitement and enthusiasm of the kids at FIRST at the following link:
<http://www.usfirst.org/roboticsprograms/frc/championship-event>.

See 2013 YouTube video of a match: <http://www.youtube.com/watch?v=Ca8N6vJnrcM&feature=youtu.be&t=2s>.

Enjoy the fun of applying the newer actuarial science applications to model robotic control mechanisms and robotic insurance situations. If you happen to meet my niece, please put in a good word for taking the MLC exam. I still hope she considers becoming an Actuary of the Future. ☆

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An Interview with Larry Moews, Chief Actuary & Chief Risk Officer of SCOR Americas

By Bradford Conners and Evan Borisenko



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Bradford: Larry, thanks for taking the time to speak with us today. Before we dive in to some of the hot risk topics of the day, we'd really like to hear a little about your background and experiences. To start, what are your responsibilities as the CRO of SCOR?

Larry: As a company, we are in the business to take risk, but we want to take the right risks, the right amount of these risks, and we want to get an appropriate return on these risks, so my role involves determining how we can best do that. That includes identifying risks, assuring that proper governance is in place, assuring that appropriate mitigation has occurred when necessary, proactively optimizing the value of our in force business including the use of retrocession, being as transparent as possible through risk dashboards so that senior leadership can make the best business decisions possible, dealing with regulators in the United States and Europe on risk and solvency issues, etc. Risk dashboards must be useful to help focus attention on the most important risk challenges. The worst thing you can have is a 50-75 page document in 6-point type with no margins, which may have "everything in the world" in it, but it doesn't crisply communicate key risk messages effectively in order that we can focus on taking corrective action where needed.

Bradford: That sounds like quite a challenging job. Can you discuss what your career path has been like and what experiences you've had that have led you to your current position?

Larry: I think my background is probably ideal because I believe that the most effective risk person is someone that has an extremely broad background. In my career, I've been able to do so many things that it's allowed me to really see the business from so many different perspectives. I would recommend to anybody who really wants to get into risk to get as much exposure as they can—jump around to as many different product lines (individual & group life, health, disability income, long-term care, auto, homeowners, commercial lines—ideally from a primary and

reinsurer perspective) and disciplines (actuarial, finance, ALM, strategy, distribution, investor relations, underwriting, I.T., operations, M&A, etc.) as possible. Depending upon the culture of the company, it is sometimes quite difficult to get some experience outside of the actuarial arena, but go for it if the opportunity is there. I would also say that I can't imagine being a chief risk officer in an insurance company—particularly a life insurance or reinsurance company—without an actuarial background. I just rely so much on these skills. I'm not saying that a non-actuary can't perform the CRO role, but I personally would find it quite difficult to be effective if I didn't have that broad and deep base of knowledge.

Evan: I can see how it could take a diverse background to really lead an effective risk management practice. You mentioned earlier that one of the challenges you face is balancing risk and return. What kind of strategy do you take to be able to do that?

Larry: There are four key stages that companies and individuals go through when it comes to risk management maturity and effectiveness. Many people initially think that risk management means "thou shalt not do"; the risk management police are coming down the hallway; everybody hide! Getting beyond that is stage one of basic traditional risk management. Enterprise risk management is stage two, where you look holistically at risk throughout the enterprise and not through the lens of individual business divisions or functions. We've now covered the easy part.

Then you move to what I call ERRM—Enterprise Risk and Return Management. If you're going to take on risk, you better get a proper return, and if you're going to get a good return on something, you better find out what risks you are assuming to get that return; you can't talk about one without the other as there is no "free lunch." Then you get to the ultimate stage four, which I call ERRO—Enterprise Risk and Return Optimization. That's where you really get into determining the best

mix of risks that provides the optimal rate of return to maximize the embedded value of the enterprise. This is easy to say but difficult to do, but ERRO is the “holy grail” or “efficient frontier” that we all should be striving to achieve. Do not think you ever fully reach this stage because you never do... always room for continuous improvement and further optimization!

Evan: What tools do you use to perform this analysis?

Larry: Our most important tool is our Group Internal Model that was developed for Solvency II. This model helps measure our various risk profiles on both a stand-alone basis and on a holistic basis reflecting the various correlations and dependencies among our various businesses.

Evan: It sounds like it’s a very sophisticated level of risk optimization that you have at SCOR, but how do you get the culture at SCOR to embed that risk philosophy, and how do you influence senior management to be on board with that kind of a vision?

Larry: It happens at the top. Our CEO is very much in tune to risk and return optimization; we even call our three-year strategic plan, “Optimal Dynamics” and our CEO personally chairs our Group ERM Committee. When he came to the company about 12 years ago, SCOR had some difficult financial issues to address in order to get the company back on track. This was the beginning of our very strong risk and return culture that clearly continues to this day. In our public disclosures, we state that we have only two corporate goals—a return goal and a solvency target. There’s no revenue goal although we certainly want to grow profitably with a high degree of discipline. Management is not forced into a situation where we have to write a particular piece of business to get rewarded. We’re a public company, so we want to see the stock price grow, our shareholders get rewarded, and all other stakeholder interests addressed, but it all starts with a strong risk & return mindset. In summary, there’s two



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overriding goals that shape the whole company—return and solvency—and that’s it!

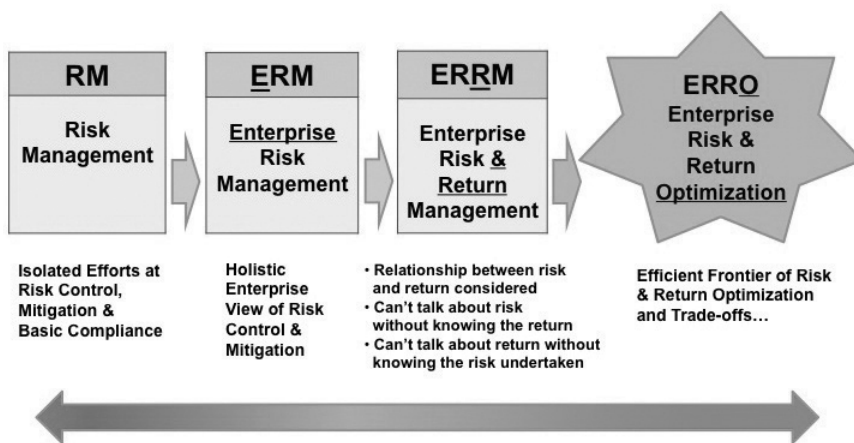
Evan: You’ve brought up how even within the Americas company, there’s a corporate role. How does the nature of SCOR, as a P&C and life company, as well as being such a global firm, affect your role as the CRO of the American unit?

Larry: I’m one of the few people in the company that actually has P&C and life experience and responsibility. When we acquired Transamerica Reinsurance and Generali U.S. to become the #1 player in life reinsurance in the U.S. and with growth on the P&C side as well, the chairman came to me and said he would like me to be the CRO of all the Americas from a holistic risk and return

ENTERPRISE RISK & RETURN OPTIMIZATION (ERRO) IS THE ‘HOLY GRAIL’ OR ‘EFFICIENT FRONTIER’ THAT WE ALL SHOULD BE STRIVING TO ACHIEVE.

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Evolution of a Risk & Return Culture...



perspective now that over 40 percent of our global business is in the Americas.

It is not that unusual that the P&C and life sides do not talk to each other on a regular basis. The clients on the P&C side are different from the clients on the life side, and the P&C clients tend to be more global while the life business is more national in scope (within each country). The whole reason we believe so strongly in the global P&C and life reinsurance structure has to do with the diversification of risk. A pure life reinsurer might have a more difficult time being capital efficient without covariance credits from uncorrelated P&C risks... and vice versa.

Evan: Regarding the acquisitions of Generali U.S. very recently and TransAmerica a few years back, to what extent did they affect you, and did you have any sort of input into the analysis that went into the acquisition or the integration of the parts since then?

Larry: I lived and breathed the acquisitions when they were happening; I was on the sell side of the equation when

I was part of Transamerica being acquired by SCOR, and I was on the buy side when SCOR was acquiring Generali U.S. last year. Risk plays a huge role in this because we run the business through our group internal model capital formulas to see how much capital we need to hold in the enterprise in total once we bring the acquired businesses and the corresponding set of risks into the company.

With acquisitions, we also evaluate their senior management very heavily as far as leadership, integrity, reputation, client relationships, technical skills and industry knowledge. We want them to remain with the team because the people are just as important as the ongoing business that's being purchased. We've been very fortunate in both cases that the senior team has for the most part stayed intact.

Evan: It seems that a lot of attention is being paid to the U.S. market; what effect does the market-consistent capital standard of Solvency II have on SCOR's ability to compete against other firms that are playing in the U.S. market?

Larry: The market consistent approach in Solvency II tends to penalize businesses with long-term guarantees... particularly long-term capital markets guarantees, whether it's fixed or variable annuities... but those are two product lines for which SCOR has no risk appetite. We're not looking for capital markets risk beyond what you would normally generate from cash flows in running the business. So for us, Solvency II hasn't been a game changer in the U.S.

Evan: Are there any other regulatory developments—such as Own-Risk Solvency Assessments or reinsurance collateral regulation changes in the United States—that are on your risk dashboard?

Larry: Yes, there are a lot of things in the regulatory arena today that appear on the dashboard in addition to just

regularly running the business. There is uncertainty today because the NAIC doesn't necessarily have agreement among all its commissioners on the approach it wants to take in many respects; for example, there's a question of when and if principle-based reserves will be implemented. Also, with outdated redundant statutory reserve requirements, the situation with life insurance captives is certainly a hot issue today. It's all reflected in our risk dashboard, and it's something that wouldn't have been there 10 years ago.

Evan: Is there anything that you're trying to do to either prepare or take some sort of preemptive measures in advance of impending regulations or events?

Larry: Absolutely. We're doing things so that no matter what scenario comes up, we'll be protected in the best way possible. We should be doing that on all risks—whether it's regulatory risk, economic risk, mortality risk, or even operational risk. For example, we have an office in New York on Water St., and I guess when the name is Water St., that should be a sign that there may be a significant risk there. And there certainly was—when Superstorm Sandy hit, we had seven feet of water in the lobby for a few weeks. That was an operational risk for us in that office; it was out of commission for a while, so it tested our remote capability to an extent we never expected, but we lived through it and further improved our business continuity plans.

Evan: What are some of the key elements to creating an effective risk dashboard, and what does SCOR do to accomplish them?

Larry: It's critical that dashboards are as transparent and measureable as possible. After all, being "chief transparency officer" might be the most critical part of being chief risk officer. You can put a whole bunch of subjective comments in there, but when you have the

tangible measures that support why you feel a risk is a red, yellow or green, I think that helps a lot. I tell my dashboard folks that I want to be tangible, crisp, and measureable—whether its risk limits by individual or the amount of exposure we have in any one building or geographical area. We do utilize heat maps, which really helps communicate to management what's happening.

Evan: A topic that seems to be really prominent in reinsurance discussions today is the role of capital markets in alternative risk transfer mechanisms. From reading SCOR's annual report, it seems that the company is trying to not just view it as competition, but also to use it as a retrocession tool and to try to help clients structure some of these transactions. What is your role in that process, and what is your view on the future of capital markets activity?

Larry: I think it's here to stay. Both P&C and life companies are looking at both capital markets and reinsurers to help provide certain solutions at a fair price. Some of them are using it to get economical rates, and some to spread out counterparty credit risk—both are valid reasons. We use cat bonds as innovative risk mitigation vehicles on both the life and P&C side. But you're right—on the other side of it, capital markets become a competitor for us in the traditional reinsurance market space, especially with P&C. There is clearly increasing convergence between reinsurance and capital markets which one could view as both a threat and an opportunity. I think this helps make us a better company overall.

Bradford: I've noticed that not as many actuarial students go right into reinsurance coming out of college as some of the other fields, but what advice would you give to actuaries who are new to the industry and want to work in reinsurance at some point in their career?

Larry: I think it's very beneficial for anyone to get experience in the reinsurance area. Not only is it kind of fun and you see the industry from a broader perspective, but you

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...THE MORE EXPERIENCE YOU HAVE SEEING DIFFERENT SIDES OF THE BUSINESS, THE SOMEWHAT MORE PREPARED YOU'LL BE FOR THOSE "BLACK SWANS" THAT JUST SUDDENLY POP UP FROM NOWHERE.

also get to see things that different companies are doing. For example, companies that might have the exact same underwriting standards and the exact same target market can have vastly different mortality. That was an eye-opener for me. You wouldn't get that knowledge if you just stayed in a primary company. I was somewhat naïve about it before I moved over to reinsurance, but now I certainly see the industry from a different holistic perspective.

Bradford: What would you say is the future of actuaries in non-traditional roles such as enterprise risk management?

Larry: I would disagree that ERM is a non-traditional role; I think it's becoming the heart and soul of a lot of insurance and reinsurance companies. You'll always have product development and valuation actuaries, but I think risk is just as important as either one of those. Like I said before, if you go into risk and just stay there, it wouldn't give you a broad enough base of knowledge to really be effective. One of the biggest problems with risk is that you

don't know what you don't know. You can be thinking things are really good—that you have a real good handle on everything—but then something will blow up, and you'll wonder why you didn't know about it earlier. But the more experience you have seeing different sides of the business, the somewhat more prepared you'll be for those "black swans" that just suddenly pop up from nowhere.

Evan: Larry, thanks so much again for speaking to us today. Your thoughts have been very insightful and we appreciate your willingness to share your knowledge and experience. Is there anything else you'd like to add before we wrap up?

Larry: It's important to make sure that risk is not considered as just a compliance function. Yes, there are certain compliance standards that you have to meet such as ORSA, but the whole reason you do enterprise risk and return is to make better business decisions to drive optimal business value. You're not doing it to look good or to put together fancy presentations; you're doing it to optimize the value of the business so everyone wins—clients, shareholders, employees, agency forces, regulators, rating agencies, society as a whole, etc. ☆

Update on Developments in Financial Reporting

By Aisling Metcalfe

Financial reporting affects all actuaries, even those not directly involved in valuation. Several large projects to update financial reporting frameworks are currently underway. This article is a high-level update on three of the main developments: principle-based reserving for U.S. statutory, Solvency II and the IFRS Insurance Contracts project. The Actuary of the Future Section, in conjunction with the Financial Reporting Section, plans to cover this topic in more detail in the near future.

IFRS FOR INSURANCE CONTRACTS

The International Accounting Standards Board (IASB) promulgates International Financial Reporting Standards (IFRS), which are the reporting basis used by most of the world. U.S. companies generally report under US GAAP (Generally Accepted Accounting Principles), governed by the Financial Accounting Standards Board (FASB). For several years the IASB has been engaged in a project to develop reporting standards for insurance contracts. They issued an exposure draft in 2010 and a re-exposure draft in 2013. The final standard (IFRS 4 Phase 2) is currently expected in 2015, and would come into effect three years later.

The IASB developed the proposals in the exposure draft jointly with the FASB, and it was expected that the FASB would revise the U.S. standards to be close to the new IFRS standard. However, in February 2014, following a comment period on the exposure draft, the FASB decided to limit its project to targeted improvements to the current U.S. standards; this means that the IASB and FASB's standards will not be as close as was originally expected. In the United States the IFRS standard will only apply to firms that report under IFRS, which means that most U.S. firms may have fewer adjustments, since the FASB's standards are likely to be much closer to existing US GAAP. The FASB began its discussion of improvements to the current U.S. standards for long-duration insurance contracts in August 2014. At that meeting the FASB decided to require that assumptions be updated annually, in the fourth quarter, with the effect of changing assumptions presented in net income. The assumptions will not include a provision for adverse

deviation. In addition the premium deficiency test will be eliminated.

Under the new IFRS standard certain contract components must be separated ('unbundled') from an insurance contract. Distinct investment components and embedded derivatives will be measured under the financial instruments standard, while the insurance component and non-distinct investment components will be measured under the insurance standard. The proposed IFRS insurance standard (for long-duration contracts) consists of four building blocks: expected future cash flows, time value of money, risk adjustment, and the contractual service margin.

Estimates of expected future cash flows for a contract or portfolio of contracts should be explicit, unbiased and probability-weighted. All inflows and outflows within the boundaries of existing contracts should be included. The cash flows are discounted to reflect the time value of money. The standard does not prescribe a method for determining the discount rate, but it should be consistent with the market rate for a financial instrument with cash flows similar to those of the insurance liability (e.g., in timing, currency and liquidity). The discount rate should exclude factors not relevant to the insurance liability, and should also reflect dependence on asset returns.

The risk adjustment is the compensation the insurer requires for bearing the uncertainty in the amount and timing of the contract's cash flows. It would take into account factors such as the availability of claims data and the length of the contract. The contractual service margin represents the unearned profit as service is provided. It arises when the present value of future cash outflows, plus risk adjustment, less cash inflows is less than zero, i.e., it removes day-one gains and releases them systematically over the life of the contract. A day-one loss would be recognized immediately.

The expected future cash flows, the discount rate and the risk adjustment are updated at each reporting cycle. The contractual service margin is also unlocked, though negative margin is not permitted.



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PRINCIPLE-BASED RESERVING (PBR)

Currently U.S. statutory reserves are calculated using a formulaic approach, prescribed by state regulations. The formulae do not always accurately reflect the risks and the true cost of the liabilities to an insurer, resulting in excessively conservative reserves for many products. In addition, the formulaic approach needs to be frequently updated as new product designs are introduced.

PBR aims to replace the formulaic approach with a risk-based approach that more closely reflects the actual risks of products. This should, in theory, produce reserves that are the “right size,” especially for more complex products. Under PBR, state laws will establish principles upon which reserves are to be based, rather than specific formulae. The details of reserving methods will be included in the Valuation Manual, which is established by the Standard Valuation Law (SVL). Companies will hold the higher of a reserve using prescribed factors and a reserve calculated using justified company experience, considering a wide range of future economic conditions. In addition, under the new system reserve assumptions will be adjusted as economic conditions change and as insurers accumulate credible experience. This is in contrast to the current system where reserve assumptions for some products are locked in at issue.

PBR will apply to new business only and will be phased in over three years, starting once the revisions to the SVL have been adopted by at least 42 states, representing 75 percent of total U.S. premium. Initially reserving methods will change only for life products, but the expectation is that PBR will be phased in for other products later.

SOLVENCY II

This is a European Union directive that aims to harmonize insurance regulation in the European Union and enhance consumer protection. The start date has been pushed back several times, and it is now expected to come into force in January 2016. Solvency II will apply to insurance and re-insurance companies that are based in the European Union, or which have subsidiaries or a parent based in the European Union. Solvency II con-

sists of three pillars: pillar 1 (quantitative basis), pillar 2 (qualitative requirements) and pillar 3 (reporting and disclosure).

Pillar 1 covers the technical provisions and the Solvency Capital Requirement (SCR). These can be calculated either using a standard model prescribed by the regulator, or using a company’s own internal model, which must be approved by the regulator. The technical provisions are based on best-estimate assumptions, plus a risk margin, and represent the amount a company would have to pay currently to transfer its obligations to a third party. The SCR is the capital required to ensure that the insurance company will be able to meet its obligations over the next 12 months with a probability of at least 99.5 percent. A Minimum Capital Requirement (MCR) must also be calculated; this is the threshold below which the regulator would intervene.

Pillar 2 sets standards for governance and risk management requirements. The main requirement is that companies must provide an Own Risk and Solvency Assessment (ORSA), which is an internal assessment of a company’s solvency and risk management processes. ORSA is intended to be an ongoing process that demonstrates that risk management is embedded in the company’s governance. The regulator may impose higher capital standards if it deems that the company’s assessment of risk-based capital is inadequate, or if it is dissatisfied with the company’s risk management.

Pillar 3 contains enhanced reporting and disclosure requirements, with the aim of demonstrating to the regulator that the analysis supporting the other two pillars is dependable. Public disclosures include a Solvency and Financial Condition Report and additional private disclosures to the regulator are required. Disclosures should follow the principles of proportionality and materiality.

CONCLUSION

This article was a brief overview of some of the upcoming developments in financial reporting, particularly the effect on U.S. companies. We hope to bring you more detailed coverage of this topic in 2015. ☆

Technology: How to Excel

By Jon Lim

My good friend and colleague approached me for my thoughts on developing technological skills to further advance one's career. And while it was not presented as the most intriguing topic initially, I'm continually reminded that the technological landscape of the insurance industry is evolving. Granted, one might argue that a working knowledge of Excel would suffice for most on-the-job requirements these days. However, in the long run, a continual investment into developing technological skills is crucial to avoid getting left in the dust.

As a relatively new entrant to the actuarial profession, I consider myself privileged to be able to simultaneously experience the technological revolution of the insurance industry, and indulge in the stories of actuaries past. For those of you out there who are or have struggled with the Life Contingencies exam, I'm fairly certain that you've at least once bemoaned the ridiculous number of formulas. I've once retorted: "Don't we have spreadsheets to figure out the nuisance calculations for us?"

Once upon a time, actuaries had to perform their life reserve calculations on paper. By hand. With a calculator. Oh yeah, and this was just 20 years ago. Two decades later, spreadsheets are now widespread among actuaries. As most of you are also aware, "Excel skills" are ubiquitous to actuarial job postings. What this means for anyone who wants to get or stay in the actuarial industry today, is that technological skills have become a prerequisite.

Specifically, insurance companies tend to look for the following technological skills in their actuaries:

- The Microsoft Office suite of products, including Excel, PowerPoint and Word;
- The Visual Basic (VB) language and the creation of VB macros;
- The SQL language and its associated MS Access user interface;

- Other advanced data processing software such as R, MATLAB and SAS.

Life actuaries might encounter GGY's AXIS software during the course of their career, while P&C actuaries may be more familiar with Aon's ReMetrica. Both AXIS and ReMetrica provide insurance companies with a one-stop solution to all their insurance needs. Pricing/ratemaking functions, as well as reserving/valuation methodologies, are self-contained within the program, and actuaries involved in the capital modeling process will be pleased with the stochastic modeling capabilities of both software sets. Additionally, both AXIS and ReMetrica allow the end user to extend the functionality based on individual requirements through C++ and/or VBA.

Common to all actuaries is the use of VB macros in the course of daily actuarial work. Apart from the convenience they offer by automating repetitive tasks, macros also grant actuaries the ability to create dynamic spreadsheets. Regardless of the actuarial track chosen, it's immediately clear that technological skills are necessary for career advancement.

If you're an actuarial student with the fortune of still being a university student, get online and take those Excel and SQL lessons now. Literally right now. Come back and finish reading the rest of this article later.

But what major technological paradigm shift can we expect in the next two decades? And more importantly, how can we prepare for it? When I hear stories about how actuaries performed calculations manually in the past, I can't help but wonder how many of those surviving actuaries (no pun intended) expected that fully automated spreadsheets would be realized within their lifetimes. This exponential explosion of technological advancement is even more pronounced for us actuaries of the future.

Start by putting your ear to the ground and stay aware of the latest actuarial trends. Have you read about the



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... BY RECOGNIZING THAT TODAY'S FRINGE TECHNOLOGICAL METHODS WILL BECOME TOMORROW'S DE FACTO STANDARD, WE CAN INVEST OUR TIME WISELY TO DEVELOP OUR TECHNOLOGICAL SKILLS.

auto insurance industry's gravitation toward usage-based insurance (UBI) lately? Or what about the push toward a uniform global standard of capital solvency? Each of these trends presents a unique technological challenge that if developed upon, might become commonplace in the future. In this case, UBI calls for actuaries with large database manipulation skills, as well as familiarity with advanced statistical software capable of handling terabytes of data.

The next step would be to examine the proposed technological solutions that accompany these actuarial

trends, and invest some time to immerse yourself in it. This is not always straightforward because of proprietary technology, but when there's a will, there's a way. As earlier mentioned, big data management has garnered some media attention recently, and looks set to become a novel technological standard in the near future. A prudent actuary might decide to prepare for this transition.

As actuaries, we are painfully aware of the statistical limitations that accompany our estimates, especially when it comes to predicting the future. However, it would be foolish to adopt a reactive approach to the evolution of technology. Rather, by recognizing that today's fringe technological methods will become tomorrow's de facto standard, we can invest our time wisely to develop our technological skills.

Or not. Perhaps in 20 years, we'll have solved the limitation of mortality and life actuaries will be out of jobs. ☆



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Excel Corner

By Shirley Ai Yan Wu

The “Problem Solving and Excel Best Practice” webcast sponsored by the Actuary of Future Section on July 22 was a great success! Special thanks to our two speakers, Nick Komissarov and Aisling Metcalfe, for sharing their expertise on Excel spreadsheet building and documentation best practice. Inspired by all the great questions and feedback from the audience, we will be starting an “Excel Corner” to share tips and tricks on Excel spreadsheet and macro development relevant to the actuarial career.

To begin, we will recap the best practices for spreadsheet building advised by Nick in the webcast.

- Objective and procedure clearly stated
- Version control and history
- Clearly labeled inputs
- Named ranges
- Inputs and outputs clearly separated
- Clear formatting
- No hardcoded values on the calculation tab
- Output consistency checks.

These are great tips that will be proven useful in any spreadsheet building exercise.

In this first article, I will share some tips on performing **Value Search** using Excel, as feedback from the webcast reflected a great interest in this topic. In particular, I will explain **VLOOKUP/HLOOKUP** vs. **INDEX & MATCH** vs. **OFFSET & MATCH**.

Most actuarial models involve dealing with large data, such as looking up the mortality rates for some specific issue characteristics from a collection of mortality rates. One very common and easy function to use is **VLOOKUP/HLOOKUP**—I still remember getting first exposure to this function when I was a co-op and thought it is a very cool function! The syntax is as follows:

VLOOKUP(lookup_value, table_array, col_index_num, range_lookup)

HLOOKUP(lookup_value, table_array, row_index_num, range_lookup)

VLOOKUP involves two steps:

- 1) It locates the position (row number) of a key, lookup_value, within the first column of a specified table, the table_array.
- 2) It returns a data point from the same table that is in the row position returned from 1) but from a user-specified column, col_index_num.

Tip: You can think of it as searching for a key downwards within first column of a table, then moves to the right by some columns specified by the user.

range_lookup is an optional Boolean to specify whether an exact match is needed, and the default value is FALSE, meaning it will look for the next largest value that is less than *lookup_value* if no exact match is found.

Tip: Your data **MUST** be sorted in ascending order if you use approximate match, because the function stops searching as soon as it finds the next largest value that is less than the key. This also means if you know there will be an exact match in the data, you can enhance the calculation speed with using approximate match on sorted data. If the *range_lookup* is TRUE but an exact match is not found, the function returns an “#N/A” error.

The V in **VLOOKUP** stands for vertical. A similar function, **HLOOKUP** (H for horizontal) is available if the goal is to return a data point that is in the same column of the *lookup_value*, i.e., searching left to right in first row then moves downward by a specified row number.

There are limitations to the **LOOKUP** functions:

- 1) The column/row reference that you specify is static: If you insert or delete columns/rows that affect the table array input of a **LOOKUP** formula, you **MUST** go back to change the column/row reference to accommodate for the shifted position. This can cause inefficiency in model building when you have multiple formulas pointing to the same table array.
- 2) The function only allows for a uni-directional search: **VLOOKUP** always searches in the leftmost column



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of a table then moves to the right to find the data point. It doesn't allow you to do a search in the middle of a table array then move left/right. Similarly, for **HLOOKUP** you can only search in first row then move down.

One alternative to the **LOOKUP** functions is the combination of **INDEX** and **MATCH**.

INDEX(array, row_num, column_num)

MATCH(lookup_value, lookup_array, match_type)

INDEX returns a value in a specified row and column of a table array. **MATCH** is similar to step 1 in the **LOOKUP** functions, i.e., finds the position of a lookup_value within a specified lookup_array. The *match_type* is an optional Boolean and is similar to the *range_lookup* indicator in the **LOOKUP** functions.

Tip: if you leave *row_num* as zero in the **INDEX** function, it will return the whole column of the array, and similarly for leaving *column_num* as zero if you want an entire row. To do so, you must select a horizontal (vertical) range for the row (column) output from **INDEX**, enter the formula, then press CONTROL+SHIFT+F9.

When **INDEX** and **MATCH** are used together, it is more powerful and flexible than the **LOOKUP** functions. First of all, it solves the problem of performing only a uni-directional search within a specified table, because now you can feed in different arrays for **INDEX** and **MATCH**. You can use **MATCH** to locate the position within any column of a table then using **INDEX** to find the value from a different column of a table, similarly for search within rows. At this point, you should also recognize that **INDEX** and **MATCH** together can perform both **VLOOKUP** and **HLOOKUP** functions. Additionally, using the **MATCH** function to locate the column and row positions allows for dynamic reference in data searching, instead of knowing the exact row/column to look for. Of course you can set up the

LOOKUP functions with **MATCH** to achieve similar results. Last but not least, the **INDEX & MATCH** combination is proven to have faster processing speed than the **LOOKUP** functions, especially when you are dealing with huge data. The **LOOKUP** functions have to evaluate an entire large data table, whereas **INDEX & MATCH** functions only need to evaluate what you take as the input.

Another option for value search is to use the **OFFSET** function.

OFFSET(reference, rows, cols, height, width)

The function returns the value that is located in a specified number of rows and columns away from the reference value. Height and width are optional inputs and allow the user to further specify the number of rows and columns to be returned.

OFFSET can also be used with **MATCH** to achieve dynamic referencing. However, be mindful that the **OFFSET function** is a volatile function and slows down spreadsheet recalculations.

Tip: Excel supports the concept of a volatile function, that is, one whose value cannot be assumed to be the same from one moment to the next even if none of its arguments (if it takes any) have changed. Excel re-evaluates cells that contain volatile functions, together with all dependents, every time that it recalculates. For this reason, too much reliance on volatile functions can make recalculation times slow.

Reference: [http://msdn.microsoft.com/en-us/library/office/bb687891\(v=office.15\).aspx](http://msdn.microsoft.com/en-us/library/office/bb687891(v=office.15).aspx)

Since **OFFSET** is volatile, I suggest using **INDEX** if you are dealing with a complex Excel model to enhance the processing speed.

Hope you find the tips and explanations useful! For future issues, please feel free to send in requests for any Excel-related questions to aywushirley@gmail.com. ☆

Freshman Year of the Real World

By Steven Chin

Every new chapter in our lives leads to an exciting adventure. Yet, sometimes we forget all the little unexpected events that occurred along the way. In my lifetime, I have heard many TED talks and public speakers reference the cliché, “The only thing that is constant is change.” My curiosity drove me to ask myself: What does this really mean and how is this applicable to my own life?

The Greek philosopher Heraclitus of Ephesus coined the phrase above along with many other views of change and flow. His view on nature being in a perpetual state of change proves insightful with his comparison of life to a river. The peaks and troughs, pits and swirls, are all parts of the ride. Go with the flow and enjoy the ride.

Bringing this school of thought to modern day, most educated students go through 12 years of education through their local school districts and predetermined school borders. From there, these students proceed through four years of undergraduate college education. From this point, most students will split into joining the working world or pursuing higher education. Actuaries generally join the working world, continue to take business-line-specific exams, and hope to join the upper ranks of credentialed actuaries.

Today, I stand in the position of celebrating my one-year anniversary with Aon Hewitt in the retirement and financial management practice. I enjoy where I am in my career and I hope to keep learning and gain new experiences. However, to get to this point it was a struggle to find balance in my life, which most fresh college graduates go through.

The first few months of the working world felt like a juggling act between working during the day, seeing friends and family, studying in the early mornings, pretending I understand fitness at Lifetime Fitness, watching my favorite weekly TV shows, and squeezing in some sleep. Beyond these first few months, I decided to join the homeowner world and purchased a condo, with my girlfriend moving in as well. My friends felt this was a big enough plate of stress for five years versus one year in my time.

Between the days I graduated from the University of Illinois to my one-year working anniversary, so many changes and unexpected events occurred; yet I never really reflected on them until now. I have been living each day the Heraclitus way of going with the flow and enjoying this wonderful ride. Time really feels like it has gone by faster. Weddings one week ago feel like months ago, but I always cherish moments like those to the fullest. In school, I always wanted weeks to go by faster. Now, I want weeks to go by slower so I have more time to study and to meet my project deadlines. In the end, there’s nothing I can do but just enjoy the ride and hope it’s a good one.

As a final remark, here are my tips to entry-level actuaries:

Work

1. Make sure to take notes before and after a project.
2. Take a few minutes to always review your work.
3. Ask how long a project will take and, if appropriate, how much time to bill.
4. Learn from your mistakes and what could have been improved.
5. Take the time to meet your colleagues and learn who they are.

Financial

1. Create a budget of your income and expenses.
2. Make sure to pay off school and car loans first with higher interest rates.
3. Start saving for retirement like contributing to an employer 401(k).
4. Take advantage of credit cards with reward points.
5. Set monthly and annual goals in how much you want to save.

General

1. Spend at least three hours per week doing something you love.
2. Reach out to a friend/family member once per week to catch up.
3. Try to limit the number of times you eat out per week.
4. Give back to the community once per year.
5. Celebrate every short-term goal to keep you motivated for your long-term goals. ☆



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On Leadership

By Shirley Ai Yan Wu



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As a young actuary myself, I still have a long way to becoming a good leader. However, I have learned many lessons about leadership from working with other great leaders and getting involved in leadership roles myself. “Leadership cannot be taught; it can only be learned.” I am very delighted to share what I have learned with my fellow young actuaries, and I hope you all learn something new from me!

I still remember that leadership was one of the evaluation criteria in my co-op performance review. I always wondered about the need of that criterion for young (super young) co-ops who likely don’t have the chance to “lead” others when they are still learning what an actuary does. My perspective changed when one of my co-op managers gave me an “excellent” rating on leadership and commented, “You were able to lead by example. You have established a role model for your colleagues to look up to.” I found it a unique yet intriguing view on what leadership means. Leadership does not have to involve direct leading of other people; it can be indirect influ-

ence on the people you work with. This is particularly important for young actuaries who would normally begin their career with a focus on technical expertise training. Whether it is demonstrating the ability to manage conflicting priorities, taking initiative, or being able to speak in front of a big audience, you are setting up a wonderful example for your colleagues to follow and thus influence the dynamics of your workplace. Hence, leadership starts with striving to always do your best.

After about a year into my first full-time job, I was given the chance to manage a co-op student. It was exciting but also overwhelming to be on the other side of the table. Concluding from my previous co-op experience, I decided that I would take the following actions in my first-ever leadership opportunity:

1. Explained the daily functions of the department. This was particularly important to give the student a big picture of her role. When I was a co-op, I was thankful that my managers always described how the tasks we performed would fit into the operations of the company.
2. Had a goal-setting session with the student. The student was there both to help me and to learn new knowledge and skills, so it was essential to establish a mutual understanding of what to expect in the upcoming months. I felt very appreciative that my managers listened to what I wanted in my co-op terms.
3. Scheduled weekly status meetings to keep track of progress in development and discuss any issues. This was proven to be helpful because sometimes I might not have time to answer the student’s questions immediately, and it was good to establish the meetings in advance to make sure all questions got answered and nothing fell behind.
4. Provided feedback to the student, once in middle of the term and again at the end of the term. I was grateful for all the constructive criticism, which was great motivation and helped me improve in the right directions as I continue in my actuarial career.



Managing a co-op was a great first experience on managing another person. I learned how to delegate work to someone else effectively. It was about learning what the student was capable of doing, being able to “let go” of the work, and also spending the time reviewing the work. All three points are essential for successful delegation of tasks. You can’t just delegate work blindly; rather you need to establish what the students already know and what gaps need to be filled before delegating the work. Then, many times it is about getting over that feeling of “I can do this faster myself.” You should always try to let go of tasks that you already know how to do but can help others develop. Also, don’t micro-manage but rather give the student the opportunity to take initiative to ask questions. However, you should also make sure you know the timeline of that task to avoid any delays. Finally, reviewing work carefully in the end not only avoids mistakes

but also gives you a chance to build your own rules of thumb for detecting errors in the long run.

Finally, I would like to share with you an important lesson I learned from leading a pricing project: Always plan ahead! Come up with a list of to-do’s and timelines ahead of time to make sure you and your team stay on track. Also, planning doesn’t work without regular progress review. It is important to identify weakness in any area early in the project.

To conclude, I would like to invite you to the Actuary of the Future Section’s webcast on leadership scheduled for mid-November. In the webcast, you will learn more insights on becoming a leader from someone in a management role! Stay tuned for updates on the SOA website! ☆



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