CAS Exams — Beyond the Preliminaries

By Leisha Cavallaro, ACAS

So, you're about to take your first CAS exam. Congrats! Now what? How are CAS exams different than the preliminary exams? Whether you are currently taking preliminary exams, on your last exam, or anywhere in between, the last thing you should be worried about is the logistics and processes for exam day. Here is some guidance for new CAS exam-takers, as well as a refresher for those who have already taken CAS exams.

Offerings

A hard reality with exams as you progress is that they are offered less and less often — meaning, if you do not pass, the time until you can retake is a bit longer than the preliminary exams. CAS exams are offered late April/early May (MAS-I, MAS-II, 5, 6, 7, 9) and late October (MAS-I, MAS-II, 5, 6, 8). You'll notice Exams 7, 8 and 9 are only offered once a year, which is why you'll often hear of candidates taking 7 before 6 (delaying their ACAS to avoid pushing back their FCAS an additional six months) or know of some people who always have one exam left, years later.

Register

CAS Exams registration isn't that different from SOA's registration, but make sure you register on the CAS website before the deadline, which is usually about one month prior to each sitting. I recommend putting a reminder on your calendar immediately after the previous sitting and registering early! Note that you will have to select an exam site while registering, so you'll want to research the site nearest you before registering.

Exam site

Many exam sites are property-casualty companies. Depending on your location, you may have some commute time — or maybe you're lucky like me and your employer hosts them! No matter the exam site, it will be very different than your Prometric experience. Each site has slightly different processes for things such as parking your car, directions to the room and checking in. The site coordinator will communicate with you leading up to your exam, but do not hesitate to ask questions if you have them.

Supplies

Although you were just getting used to the Prometric top-level, security clearance (and missing out on that Prometric pat down), you will need to make some preparations prior to exam day for CAS exams. Here is a list of things you must bring and a few optional items to bring, no matter where you take your CAS exam:

- Pencils/pens (for upper-level exams, blue or black pens; for MAS-I or MAS-II, a pencil to mark your Scantron).
- Two calculators — just in case one dies
- Your registration confirmation that has your candidate number on it.
- An approved photo ID.
- Optional: A self-addressed and postage-paid envelope. (I'll comment on the latter in the next section.)
- Optional: Quiet food (respect your neighbors) and a beverage. (I highly suggest a drink that has a seal to avoid spills on your exam material.)

The Risk Management of Data Science

By Layla Trummer, ACAS, Candidate Representative to the Candidate Liaison Committee

Actuaries have been using data science techniques for years. While the statistical methods are not new, there is now exponentially more computing power available. New technologies come with new risks. Thankfully, the theoretical concepts tested in actuarial exams have also prepared you to navigate the following data science pitfalls.

Biased data create biased algorithms

If a machine-learning algorithm is trained using biased data, it is going to produce biased results. For example, Reuters reported that Amazon recently scrapped a resumé screening tool because it discriminated against women. Based on resumés submitted to Amazon, the tool was reportedly less likely to recommend a resumé that included the word "women's" on it (e.g., "Women's Soccer Team").

An algorithm is expected to be more objective than a human. As it turns out, the algorithm is subject to the same influences that lead to biases as humans. There is a danger that by tending to the average, it results in underfitted models trained to pick the status quo.

Ask the right question and listen to the data

With so many datasets available, the issue at hand is less about finding the answer and more about asking the right questions. Consider the following story, taken from *Robot Vision* by Berthold K.P. Horn:

A Fairy Tale

Once upon a time there were two neighboring farmers, Jed and Ned. Each owned a horse, and the horses both liked to jump the fence between the two farms. Clearly the farmers needed some means to tell whose horse was whose.

So, Jed and Ned got together and agreed on a scheme for discriminating between the horses. Jed would cut a small notch in one ear of his horse. Not a big, painful notch, but one just big enough to be seen. Well, wouldn't you know it, the day after Jed cut the notch in horse's ear, Ned's horse got caught on the barbed wire fence and tore his ear the exact same way!

Something else had to be devised, so Ned tied a big blue bow on the tail of his horse. But the next day, Jed's horse jumped the fence, ran into the field where Ned's horse was grazing, and chewed the bow right off the other horse's tail. Ate the whole bow!

Finally, Jed suggested, and Ned concurred, that they should pick a feature that was less apt to change. Height seemed like a good feature to use. But were the heights different? Well, each famer went and measured his horse, and do you know what? The brown horse was a full two inches taller than the white one!

The moral from the above story is (as stated by the author): "When you have difficulty in classification, do not look for ever more esoteric mathematical tricks; instead, find better features." When implementing analytics, the focus should be on listening to the data. Too often, data science is misused by massaging the data or overfitting a model until it confirms the desired answer.

Past CAS President Brian Brown has described actuaries as the original data scientists — from using credibility theory to incorporate data, to arriving at results that are not unfairly discriminatory, to considering outcomes that may not be present in historical data. Actuaries have a professional duty to ensure decisions are based on reliable data. You can embrace data science and avoid its pitfalls by approaching it with the same professionalism. 𝐟𝐟

Insurance Fraud Hall of Shame

By Elizabeth E. End, FCAS

A warning for any sensitive readers: Some of the cases reported about in this article have disturbing content.

It is astounding what some people will do to deceive and receive money from insurance companies. Who would . . .

• Use deer blood and pretend it is human blood to put onto automobiles at staged accident scenes to make them look more authentic and severe?

• Bribe a police officer to sign off on fake auto accidents?

• Hatch a plan to have people break into customers' homes and garages to damage their vehicles so that the customers will bring their cars in for repairs, giving the shop owner a chance to inflate the claims when the damages are submitted to insurance companies?

All of these actions were taken by one man who was convicted of insurance fraud and ordered to pay $1.8 million in restitution to 18 insurance companies. The Coalition Against Insurance Fraud highlights some of the worst of the worst in its annual "Insurance Fraud Hall of Shame" on its website www.insurancefraud.org.

While the Insurance Fraud Hall of Shame's reports can sometimes

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Miscellaneous

Your proctor is a CAS member who will guide you through the instructions, but just know the following:

- You will have time to label all your exam answer sheets prior to the exam (for MAS-I and MAS-II this is just your Scantron; for all others you will have CAS-specific lined paper for your written responses). This labeling includes your candidate number at the top of each lined page paper. The proctor most likely has your candidate number, but if they don't, you should have your exam registration with your candidate number listed.
- You will have a 15-minute reading period where you can rearrange pages or fold corners. There are a ton of strategies you can find on Actuarial Outpost.
- You can go to the restroom by asking your proctor, but your time will not be extended.
- You can leave when you're done as long as it is after two hours and before the last 15 minutes of the exam.
- After the timed portion of the exam, you will have the chance to arrange answer sheets in order.
- You can mail scrap paper and the exam booklet to yourself in a self-addressed postage paid envelope (letter-sized envelope). Your proctor will collect these and mail them to you after the exam — they usually arrive within three business days. For MAS exams, many people copy down their Scantron answers on scrap sheets or store them in their calculators for review later; a preliminary answer key will be released by the CAS a few days after the exam.

Grading and results

This isn't the focus of this article, but I wanted to provide a quick overview. MAS-I and MAS-II are multiple choice and there is a guessing penalty — keep that penalty in mind. The rest of the CAS exams are written exams so, despite the extensive hand cramps, you have the opportunity for partial credit! Grading is a meticulous process that I encourage you to read about it in the *Future Fellows* article from March 2017, "After the Exam: A Behind-the-Scenes Glimpse of the CAS Grading Process." Results are usually posted around eight weeks after your sitting; you will get the results in your CAS profile. If you fail, you will receive an exam subpart analysis a few weeks after results are released that tells you the range of success you had on each problem as well as how you performed compared to the average candidate on each question.

Final tips

Check Actuarial Outpost. It is a great resource for general questions. Make sure to have an exam strategy going in. Understanding how the papers are graded and how partial credit applies can work to your benefit! Reach out to the CLC (https://www.casact.org/newsletter/index.cfm?fa=feedback) if you have questions/feedback or if there is more you'd like to know on this topic. **f**f

The NAIC and SOA: What Really Happened?

By Nate Williams, Candidate Representative to the Candidate Liaison Committee

If you were like me, you were caught off-guard by the recent Society of Actuaries (SOA) announcement that their general insurance (GI) fellowship track had been accepted by the National Association of Insurance Commissioners (NAIC) as meeting the educational standards required of a qualified actuary. I remember when the SOA created the GI track and it failed to meet NAIC standards; however, I did not know what was being done to change that or how close the SOA was. The news of the approval left me with many questions — how long has this process been going on? Was this outcome expected and, if so, discussed at the time of the proposed CAS/SOA merger? What differentiates the content contained in the two exam structures? What is the basic knowledge I need to have to consider myself an actuary? After some digging, I was able to get answers to some of these questions.

What is a "qualified actuary?"

Essentially, a qualified actuary is an individual who can sign off on the reserves contained in a company's annual statement. The requirements for being considered a qualified actuary can be found in the instructions for the statement of actuarial opinion (SAO), which are produced by the NAIC and include education, experience and professionalism components. Under the current draft, education requirements can be satisfied by either having your FCAS, having your ACAS and passing Exam 7, or obtaining an FSA through the GI track while taking certain prescribed exams (for some fellowship requirements the SOA allows you to choose between multiple options). CAS Fellows and Associates who obtained their designations with previous versions of exams will have to verify they have credit for exams equivalent to the current CAS exam system. More details will be available on the CAS website.

How do the CAS/SOA meet the education standards of a qualified actuary?

The initial review of the SOA's GI track was done by an independent consultant who found that the program lacked necessary breadth and depth to meet minimum educational standards. But what exactly were those standards? Unlike when you get an exam question

The NAIC and SOA: What Really Happened?

wrong and you turn to the Examiner's Report to see what would have gotten you full credit, the SOA did not have the answer key to become a minimally qualified candidate. The standards are intended to be reviewed every 5-10 years, and in the aftermath of the GI track review, it was clear that this time the standards needed to be codified and written down.

Since the NAIC isn't an actuarial organization, should they be expected to determine the educational criteria required of a qualified actuary? That task was instead left to a committee of subject matter experts (SMEs) from major stakeholders — the CAS, SOA and American Academy of Actuaries (AAA). Committee members performed a job analysis for a qualified actuary. They developed over 90 knowledge statements covering the breadth of information a qualified actuary needs, from which the NAIC created educational standards identifying depth of knowledge required. These standards also identified what needed to be learned through basic education and what could be learned through experience or continuing education. From there, it was up to each actuarial organization to map how its exam structure satisfied each minimum basic education standard. These mappings have been kept confidential by each organization. Another group of SMEs evaluated each mapping and determined that, because the SOA had made significant changes to their curriculum since the initial review and during the development of these educational standards, they would require only a few additional changes to have the GI track receive NAIC approval. Similarly, with a few tweaks to certain exam syllabi, the current CAS qualifications (FCAS or ACAS + Exam 7) would continue to satisfy the NAIC requirements.

The NAIC standards have not been published yet because they are still in the final stages of being formally adopted. But you can get an idea of the content and level of detail from the sample entry below of one of the many knowledge statements taken from the current draft.

What do I need to know to be considered an actuary?

It seems that basic education has increasingly diverged between the CAS and SOA in the recent past. But if they both meet the NAIC standards for a qualified actuary, then perhaps there's more in common than we realize (or care to admit). The obvious point to make is that fellowship is required in the SOA to satisfy NAIC standards; in the CAS, we still have two full exams (8 and 9) past these requirements in order to obtain Fellowship. That's not to say a 1:1 relationship exists between the two curricula — the SOA inevitably has material in their exams beyond the NAIC standards just as the CAS does. But how much excess is there and how is it dispersed through their exam structure? Or, more broadly, why would either organization test any content beyond what's required of a qualified actuary in the path to fellowship instead of offering it as continuing education or even a separate certification?

One thing to keep in mind is that being a qualified actuary is closely tied to reserving, and that there are other areas of practice within the actuarial field. But we must continually evaluate our path to Fellowship to ensure that it is meeting the needs of the times. Consider, for example, if we had ACAS after MAS-II and separate FCAS tracks in ratemaking, reserving and predictive analytics. Or perhaps we do away with ACAS altogether and only have one designation after Exam 7, with post-FCAS specialty tracks offered through iCAS. We can't be afraid to ask these questions of ourselves and must embrace change when needed in order to stay relevant.

What would your ideal FCAS look like? If you filled out the first annual CAS Candidate Survey sent out over the summer, you may have seen a related question or two asking about the value of obtaining an FCAS after achieving your ACAS. Hopefully, you took advantage of the opportunity to voice your opinion about this and other topics; if not, don't worry! It's the first *annual* survey, and there will be smaller, more focused "Hot Topics" surveys coming out soon, too. In the meantime, you can always send your thoughts to the Candidate Liaison Committee through our online form on the CAS website, and we'll make sure your views get brought up in future conversations. **f**f

Domain	Domain Subcategory	Knowledge Statement Number	Knowledge Statement	Basic Educational Standard	Rationale for Basic Educational Standard for an Appointed Actuary (AA)	Assessment Guidance for Basic Education Syllabus and Readings
Policy Form/ Coverage, Underwriting, Marketing	Form/ Coverage	B2	Claims experience immpact from deductibles, limits, treatment of loss adjustment expenses and exclusions to coverage	Apply/ Analyze	The AA should understand and analyze the impact of deductibles, limits, exclusions to coverage and treatment of loss adjustment expenses.	Within the basic education process, the actuary should be able to: a. Assess the impace of deductibles, limits, treament of loss adjustment expenses and exclusions to coverage on claim emergence and development. b. Understand LAE contract terms (ALAE/ULAE vs DCC/ A&O).

The Sharing Economy and Insurance: Peer-to-Peer (P2P) Insurance

By Celeste Bremen, ACAS

From Uber to Airbnb, eBay to Kickstarter, the sharing economy is where individuals share assets or services with one another directly or through other means such as the internet or an app. The sharing economy has grown more and more in the past few years as technology has made connecting with others easier than ever. But what about a long-standing and somewhat conservative industry like insurance? Many of us may see in our own jobs, from the potential for autonomous vehicles in auto to the use of drones to take pictures of buildings in property pricing, that our industry is far from immune to changes in technology. To learn how the sharing economy affects us as actuaries, we can look at peer-to-peer (P2P) insurance.

What is P2P insurance and how is it different from traditional insurance?

P2P insurance is similar to traditional insurance in the sense that a company receives premiums from a large number of insureds, pools premiums from similar risks, and uses them to pay a company's claims, operating costs and reinsurance. If claims exceed the premiums collected, then the company uses reinsurance and accumulated premium to pay these claims. When there is premium left over, rather than becoming profit as it would with a traditional insurance company, these funds are distributed back to policyholders or, in some cases, donated to charities or other non-profit organizations. P2P insurers pride themselves on using the latest technology — apps and streamlined claims and quote processes — to keep their costs as low as possible in order to offer their customers lower premiums.

How does P2P insurance leverage technology?

P2P insurers take advantage of technology not only to keep costs, and thus premiums, low, but also to facilitate the quote and claims-paying process. They make it easy to receive a quote online in minutes and use apps to allow insureds to submit a claim. The insured can take a picture of the damage and submit any additional information online or even take a video to explain what happened. Another common claimed advantage for P2P companies is that, because they only keep a fixed percentage of premiums for themselves, they prioritize paying claims out to insureds and paying them quickly.

Real-world example — how does it work?

One of the most well-known P2P insurers in the U.S., Lemonade, provides homeowners and renters insurance in over 20 states. People can receive a quote online and once they buy a policy, they select a charity to which any leftover premiums will be donated. Insureds that choose the same charity are pooled together and their premiums are used to pay claims. In the event of a claim, the insured can submit all of the loss event details through the app. Lemonade then runs algorithms to determine if the claim can be approved instantly and paid to the insured's bank account. If not, the claim is sent to a human claims handler.

Lemonade may be one of the biggest P2P insurers in the U.S., but there are many others that operate worldwide. Friendsurance was launched in Germany in 2010, partially in an attempt to diminish insurance fraud. Friendsurance customers can select an insurance product offered by an insurance company through a partnership with Friendsurance and connect with other insureds who have a similar insurance need. These insureds are then placed in a pool and part of their premiums go to the insurer, another part goes to Friendsurance and the rest go in a cashback fund. Friendsurance indemnifies insureds for any small claims and the insurance company pays larger claims. As insureds submit larger claims covered by the main insurance company, the cashback fund decreases. At the end of the year, whatever money remaining in the fund is distributed back to insureds. Thus, customers are incentivized only to submit claims when truly necessary. By handling small claims directly, Friendsurance also decreases costs for the main insurance provider and consequently allows insureds to also pay lower premiums.

P2P insurance shows us that even a more than 300-year-old industry like insurance can be transformed by the sharing economy and changes to technology. How disruptive this trend will be remains to be seen, but it shows us that we should always expect changes to our industry.

Exams IRL: MAS-II

By Laura Hemmer, FCAS

Have you ever been studying for an exam and thought, "Why am I learning this stuff? When am I ever going to use any of it?" If so, you are in luck! This is the second in a series of articles examining how content from CAS exams are used in real life.

This issue we're focusing on Modern Actuarial Statistics-II (MAS-II). This is the exam candidates are probably least familiar with, as it has only been offered twice so far and has had about 100 takers total. It replaced the CAS Exam 4 requirement, which most candidates fulfilled via the old SOA Exam C. MAS-II does not have exactly the same material as Exam 4/C, however. The CAS took the opportunity with the exam change to update the syllabus to reflect more current (and more advanced) statistical methods, thereby helping the exam program keep pace with the rapidly evolving insurance environment.

For an actuary's everyday life, the usefulness of the subjects covered on this exam will be most evident to actuaries who fit and design predictive models. In the last issue of *Future Fellows*, Nate Willilams explained very well* how the MAS-I syllabus prepares an actuary for predictive modeling. MAS-II builds on this idea, but instead of focusing on time series and extended linear models, it covers Markov Chain Monte Carlo and linear mixed models, to name a couple of the central items on the exam. Giving the actuary exposure to more topics in predictive modeling particularly helps in diagnosing issues in their models. Understanding how concepts like regularization, bagging, boosting and basic feature engineering/selection affect the performance of a learning model can help the actuary figure out problems they encounter when training a model. MAS-II introduces several tools that can be used to help implement these concepts. The exam also familiarizes the actuary with R output, which continues to grow in popularity in day-to-day actuarial work.

But what about other actuaries — those who might not be fitting models themselves? As I was reviewing the syllabus to write this article, a quote from *Harry Potter and the Chamber of Secrets* occurred to me. Near the end of the book, Mr. Weasley says to Ginny, "Never trust anything that can think for itself if you can't see where it keeps its brain." A similar idea is true for insurance models — actuaries cannot be content to let a model be a black box. While we can rely on the work of other actuaries (with documentation of course — remember your ASOPs!), merely running an existing model program and getting a result is not good enough. We must be able "to understand a model and to evaluate the resulting goodness of fit," which is a direct quote from the MAS-II syllabus.

As more and more actuarial work involves predictive modeling, actuaries must be ready to participate in the conversation of modeling, even if it isn't in their exact job descriptions. I often sit in staff meetings where we discuss the variables used, the way a certain model will work and how well the model performs. These types of discussions will likely become even more important in the future and fit perfectly with the learning objectives of MAS-II, which also contain the directive that "candidates should focus on understanding the design choices made in modeling, the output from those [statistical software] packages, and how that output was interpreted."

Some of the other concepts on the MAS-II Exam are used more broadly in the actuarial field, such as credibility, which is covered in depth in the exam. Considering the credibility of data is second nature as we analyze trends and other metrics. Extending credibility weighting into modeling is an important advancement in actuarial statistics.

I hope this article has given a little insight into the purpose and utility of MAS-II. In the next issue, we will discuss Exam 5-Basic Techniques for Ratemaking and Estimating Claim Liabilities. **f**f

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Insurance Fraud Hall of Shame

be amusing, unfortunately, many of them are tragic. There are many cases of arson where firefighters end up injured or dead while fighting fires. Worse, there are stories of people knowingly setting their houses ablaze and sometimes intentionally trapping their relatives inside. One mother removed the washer, dryer, furnace and hot water heater from her home in the days ahead of the fire, but she left her children in the house to perish. These sobering instances of insurance fraud demonstrate that there are no limits to what some people will do to get money from an insurance company.

Although most instances of insurance fraud are smaller in scale than those highlighted in the Hall of Shame, any type of insurance fraud hurts all insurance customers. The Coalition Against Insurance Fraud estimates that at least $80 billion is stolen each year. That money from insurers is ultimately coming from their customers' premiums. Reducing and eliminating insurance fraud would result in less costly insurance for everyone. There tends to be too much tolerance for insurance fraud, and the Coalition Against Insurance Fraud is working to change that. They provide tips to help people recognize when they might be being scammed — there is even a "Report Fraud" button on the website.

Social media and the ever-growing presence of cameras and video-taking spectators has helped insurance fraud investigators understand what really happened for some of these fraudulent claims. One man's bogus car accident was recorded by the passenger of a passing car on a parallel road, and the video has gone viral on YouTube with over 8.7 million views. The insurance fraud perpetrator was driving a Bugatti Veyron (one of only 300 made) worth $1 million and insured for $2.2 million. When he filed his insurance claim, he said a pelican swooped in front of him and made him drive into a swamp next to the road. After the car hit the water, instead of turning the engine off, he let it continue to run. The engine sucked in salt water for fifteen minutes, flooding the engine and ruining the car. He said he had not turned it off because he was too busy swatting mosquitos at the time. The video footage shows the car veering off the road into the water with no pelicans in sight, and it undoubtedly was one of the reasons the perpetrator pleaded guilty to insurance fraud and was sentenced to time in prison.

All insurance professionals should be aware and concerned by insurance fraud. Some actuaries may be directly combatting fraud by building predictive models to better identify possibly fraudulent claims. Those who are not directly working on it can do their part by raising awareness of it and its cost burden for law-abiding insurance customers. The Insurance Fraud Hall of Shame is one way to get the conversation started. ff

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Candidate Liaison Committee Mission

The Candidate Liaison Committee communicates with CAS candidates, collectively and individually, who are taking CAS examinations. The committee informs candidates as to appropriate courses of action available to them. Through periodic communication, this committee informs candidates of results of examination administrations, actions taken on complaints received regarding examination questions and reasons for syllabus and examination changes being implemented. Communication encompasses existing policies and procedures as well as changes being considered. The committee should advise the CAS and its committees of the interests of the candidates regarding matters that come before the CAS and its committees. Candidates may contact the Candidate Liaison Committee at the CAS office address. The Casualty Actuarial Society is not responsible for statements or opinions expressed in the articles, discussions or letters printed in *Future Fellows*.

FUTURE (CAS) FELLOWS

FUTURE CAS FELLOWS

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CAS Student Central is a free membership program, offering exclusive benefits to help university students successfully pursue a career as a property-casualty actuary. To learn more about CAS Student Central and the resources provided, visit CASstudentcentral.org.

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