Ninth Annual Actuarial Case Competition

- Spring 2018 -

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Introduction

The Cal Actuarial League Ninth Annual Actuarial Case Competition is designed to provide participants with the opportunity to work with actuarial data to solve problems and present business solutions to professional actuaries. This case study is ideal for students who are interested in the actuarial profession and want to practice their communication skills. The scope of this competition encompasses various actuarial tracks. Specifically, the tracks included this year are:

- Health and Benefits
- Property and Casualty
- Retirement

Up to nine teams will be selected to participate in the final presentation round. Finalists will have the chance to present in front of a panel of actuaries from renowned consulting and insurance companies. Students have the opportunity to win prizes up to **$450**.

Timeline

Tuesday, February 13, 8:00 PM	**Kickoff | Info Session in 102 Wheeler**
Friday, February 16, 11:59 PM	**Registration Deadline** Case Competition Introduction and Questions released by e-mail
Saturday, March 10, 9:00 PM	**Solution Package Deadline**
Sunday, March 18, 11:59 PM	**Finalists Notified**
Wednesday, March 28, 11:59 PM	**Presentation Slides and Videos Deadline**
Sunday, April 8, 11:59 PM	**Presentation Revision Deadline**
Sunday, April 15, 10:00 AM	**Final Round & Networking Session**

Written by CAL Case Competition Team & Specified Sponsors

Instructions | Details

All teams must consist of **FOUR** students. All majors are welcome.
This case package contains three questions, each covering a different actuarial track:

- Page 7: Health
- Page 8: Property and Casualty
- Page 10: Retirement

Excel files associated with each question can be found in the zip file under corresponding file names and on the online Piazza forum.

piazza.com/berkeley/spring2018/cal2018

This Piazza forum serves a discussion board for participants, the case competition team, and question sponsors. If you have any questions, please check if someone has already asked on Piazza. You can post any question on Piazza, and hints will be given out if necessary. Please be aware that professionals will be able to see your questions.

Reasonable assumptions and additional data from outside sources may be required to solve certain parts of this case study. Therefore, please state and justify all your assumptions and references.

If you need clarifications regarding the case competition, please consult Piazza before contacting CALActuarialCaseComp@gmail.com. We will answer emails once a day in the evening. We will periodically release more information on Piazza to all contestants.

As competitors work to solve the case and post questions on Piazza, the case competition team will host intermittent workshops to address common concerns and pitfalls that the team has observed. These will be encapsulated on March 8 at the Case Competition Workshop.

A team must finish **all** three questions to qualify for the final round of presentations. In order to qualify as a track finalist, teams **must** be in the top three for the said track, and meet a specific point-threshold in the remaining tracks. **Each team is required to submit a written report and Excel files as well as a one-page explanation of work files via e-mail with all team members carbon-copied with subject title "[CAL] Ninth Annual Actuarial Case Competition – Team #" to CALActuarialCaseComp@gmail.com by Saturday, March 10, 9:00 PM**. It is important to note that tasks are provided as a **guide**, but reports should not take a question-answer approach and should instead consult the case holistically. Written reports should be submitted as a **PDF file** no more than **seven pages** in length. This page limit includes tables, graphs, and exhibits, and excludes the cover page, citations for data sources, and references. In addition, **Excel files** respective to each question should be submitted demonstrating data analysis accompanying the team's solutions in the written report.

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Up to nine teams will be selected to participate in the final round. All teams will be notified of their status in the competition by **Sunday, March 18, 11:59 PM**. Finalist teams will prepare a 15-minute presentation of their most important results for each track, in which all team members are required to present. Rehearsals for the presentations will be held before the final presentation. **Microsoft PowerPoint slides and videos** are due by **Wednesday, March 28, 11:59 PM.** The presentation revision deadline is **Sunday, April 8, 11:59 PM**. More details will be released privately to finalists.

The final round will be held on **Sunday, April 15, 10:00 AM** in **VLSB 2060.** Each finalist team will present their solutions and have a 15-minute Q&A session with the judges. The panel of judges will consist of actuaries working in a diverse range of actuarial tracks and industries. All interested students are welcome to attend the final round. After the presentations, judges will provide feedback to the finalists and announce the winners. A **networking session with recruiters and alumni** will be held after the event. Please bring your resume to this networking session.

Judging | Prizes

We look for a clear understanding of the business problems described, evidence of strong analytical skills, and effective communication of results through the written reports and oral presentations. Since the case questions do not have a single correct solution, original ideas and creative thinking are especially valued.

Participants should also pay special attention to the style and visual content of all submissions. In this case competition, as in real life, style counts: the more professional your presentation is, the higher your chances of winning are.

All submissions should be the original work of the team members.

This year, we are proud to offer three awards for our finalists.

- **Best Health Solution & Presentation: $150 cash prize**
- **Best Property and Casualty Solution & Presentation: $150 cash prize**
- **Best Retirement Solution & Presentation: $150 cash prize**

Acknowledgements

We gratefully acknowledge our generous sponsors who have put in the hard work to help us design the questions. Our sponsors include:

Health & Benefits

Beam Dental
Jonny Jeng

Property & Casualty

CSAA Insurance Group
Eric Xu
Jessica Zhu
Annie Shen

Retirement

Aon
Donald Hsu

We would also like to thank our corporate sponsors
CSAA, **Aon, Mercer, Fidelity Investments**, **Esurance, and Oliver Wyman**.

CSAA Insurance Group is an AAA branded insurer. It offers auto, home, and other personal lines of insurance to AAA Members across the nation. With 2.3 million policies in place, CSAA Insurance Group is one of the nation's largest personal insurance providers.
https://csaa-insurance.aaa.com

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We also gratefully acknowledge the support of the Associated Students of the University of California.

Health & Benefits

You are a pricing actuary for BEAR Health Insurance Company. Rockwood-Leibowitz, a large benefits consulting firm, wants to offer BEAR Health's insurance products on its 2018 private exchange. In the interest of offering a diverse set of options to its clients, Rockwood-Leibowitz asks BEAR Health's product team to provide designs and pricing for standalone bronze, silver, gold, and platinum plans.

Task 1
Please list and describe the benefit components that make up a typical health insurance plan. What are the relationships between these components and the expected premium cost to the insured?

Task 2
Please explain to BEAR Health's product team what bronze/silver/gold/platinum plan are and how they are calculated.

Task 3
Given this definition & the assumed experience data, design a set of plans that conforms to the requirements of each metal tier and price the PEPM rates for each of them. Assume a 10% trend and 85% loss ratio. Make sure these plan designs are legal under the ACA.

Task 4
Rockwood-Leibowitz reveals to BEAR Health's product team that instead of a standalone plan, they now want to offer these plans as a multi-choice option for their clients. Please explain why the rates you submitted earlier are no longer adequate.

Task 5
Assuming that the 2016 Claims experience will act as a good proxy for the expected experience for Rockwood-Leibowitz's clients, what are some pricing strategies to completely mitigate the risk of adverse selection? Calculate exactly how much each plan's rates will change relative to what they would be if it were a single-plan offering. What does this imply about the relationship between plan choice and the overall rates to consumers?

Task 6
Rockwood-Leibowitz is set on offering plans of each metal tier as a multi-choice option for their clients. They mention that price will be the main determinant in the success of the product. Given this directive, would you like to make any edits to the original plan designs in order to minimize the rate loads without increasing the risk of adverse selection? Why or why not?

Property & Casualty

You are an actuarial analyst for Fort Baker Actuarial Consultants, based in San Francisco. AllProvince Fire and Casualty Insurance Company, a personal lines insurance company, has asked you to review their homeowners' insurance product in the state of Kansas. 3 years ago, your consulting firm helped them launch their product in Kansas effective January 1st, 2016.

Without any actuarial consultation or expertise, AllProvince implemented a +10% base rate-only rate change to their product, effective January 1st, 2017. Your company has been hired once again to propose rate action for the product effective January 1st, 2019. Note that all policies are 12-month term policies.

You have been provided policy-level characteristics for all policies written as of December 31st, 2017. You have also been provided loss data evaluated as of February 2018. Assume all losses occurring in 2017 have been reported.

AllProvince Management has the following concerns:

- Company management desires to increase their premium by another +10% effective January 1st, 2019.
- For credit score, the company expected a distribution of 50%-35%-15% for "High", "Medium", and "Low", but it was not realized in the data. The company asks you if this is a concern.
- For the proposed rate change, the company would like to minimize the maximum policyholder premium dislocation as much as possible, so as to avoid losing too many customers.

Analyze the data and present your recommended rate change plan. Policyholder impacts should be clearly stated and expected outcomes should be clearly communicated. Assumptions may be used as long as they are justified.

Task 1
Since data is limited, AllProvince would like to use data from both 2016 and 2017 for loss ratio analysis. How should the 2017/01/01 rate change be accounted for in your analysis?

Task 2
What is earned premium, and how is it different from written premium?

What are the different types of loss ratio? Considering the data available to you, what type of loss ratio will you use to analyze rate adequacy by segment? Support your proposal and prepare data for loss ratio analysis using the method of your choice.

Task 3
Using a loss ratio analysis, evaluate which rating variables, if any, need adjustment. Furthermore, evaluate if new variables should be added into the existing rating algorithm. Propose 2 to 3 revised and/or added rating factors, and their expected outcomes. Justify your selections from both an actuarial and business perspective.

Task 4
Given the proposed rating factors, calculate the base rate necessary to achieve +10% overall rate change. The revised base rate and the revised rating factors constitute the proposed rating algorithm.

With the proposed rating algorithm, calculate the policy-level premium dislocation relative to the current rating algorithm. Any assumptions should be stated clearly.

Task 5
Present your results and expected outcomes of the rate change, including any business concerns that the management may have.

Task 6
Explain and justify any non-rate recommendations for this product, and quantify their expected impacts if applicable.

Retirement

You are a college student nearing graduation and about to enter the workforce. You've received several offers which offer similar salary but different benefits. In particular, the retirement benefits are very different.

The retirement benefits offered by three potential employers are summarized in the Excel attachment "Retirement Data" on the "Retirement Plans" tab.

Task 1
Using the assumptions provided on the "Assumptions" tab, calculate the Age 65 lump sum value of each company's retirement benefit. All else equal, which company would you choose and why?

Task 2
While the results you just calculated may seem like a sizeable amount of money, it may be difficult to ascertain whether it is adequate for retirement. Determine how much money you would have each year of your retirement (assume level amounts each year) if you lived to your life expectancy (from Age 65). Compare this to your pay in your last year before retirement, and determine whether you would be able to maintain a similar standard of living and why.

Task 3
A reputable study shows that the average retiree needs 11 times their final pay to maintain the same quality of life after retirement.

1. How valuable does a Final Average Pay plan need to be to achieve this result (assume three-year average pay)?
2. How valuable does a Cash Balance plan need to be (i.e. what contribution percentage) to achieve this result?
3. What percentage of salary each year would you need to contribute each year to achieve this result purely from your contributions?

Task 4

The study referenced above is for the average employee. Analyze how the following assumptions impact each aspect of the retirement adequacy analysis. Provide sensitivity analysis where appropriate.

1. Current Age
2. Retirement Age
3. Current Pay
4. Mortality
5. Housing Costs
6. Suggest 3 more factors and provide the same analysis for each.

Task 5

Suggest three ways an employee can improve his or her retirement adequacy.

Task 6

Suggest three ways an employer can improve the retirement adequacy of its employees, without increasing cost.