Fundamentals of Actuarial Practice: Final Assessment

Final Assessment Overview

Scenario Background

You are an actuary for Risk-A-Verse Actuarial Consultants. Attaboy Insurance, a new insurance company specializing in health and life insurance for dogs, has hired you to analyze its proposed products. You completed some initial research before starting this assignment to get a better understanding of pet insurance in general. You learn that pet insurance is intended to mitigate the risk of incurring significant expense to treat ill or injured pets. The market for pet insurance is booming due to expensive medical techniques, new drugs and owners having higher expectations for their pets' health care and standard of living. The pet insurance market is not subject to regulations in this jurisdiction. Having looked at websites for various pet insurers, you particularly like Attaboy's advertising slogan: "Because dogs are family too!"

You agree to take on the assignment and Attaboy has provided you with the following information regarding its two products:

- Attaboy Basic, which provides health coverage.
- Attaboy Plus, which provides a lump sum death benefit of $250.

There are no surrender charges or cash values for either plan. The Attaboy Basic coverage pays veterinary costs if the dog becomes ill or is injured, and does not pay for preventive care (such as vaccinations and routine veterinary visits) or elective procedures (such as neutering). Attaboy Basic will pay 80 percent of veterinary fees after an annual deductible of $100. Attaboy Basic has an annual benefit payment limit of $2,000 and a lifetime benefit payment limit of $10,000. Attaboy Plus pays $250 when the covered dog dies. Coverage is per dog.

Each of Attaboy Basic and Attaboy Plus has a monthly premium. For Attaboy Basic, the premium changes on each policy anniversary and depends on the breed and current age of the dog. Coverage is guaranteed renewable on an annual basis. This means that Attaboy can't cancel the policy, but can change the premium schedule each year. For Attaboy Plus, premiums vary by issue age, but are level for the life of the dog and locked in at the time of sale. Both products have a waiting period of one week before coverage becomes effective.

The products are only issued to dogs from zero to ten years of age, but are renewable for the life of the dog. There is no underwriting and no limitation on issue for the products beyond age (i.e., no sales to dogs 11 years or older). Coverage is sold by veterinarians. Each veterinarian is compensated on a dollars per policy basis for Attaboy Basic coverage and a percent of premium for Attaboy Plus coverage.

Dogs can be categorized by breed. For this assignment, dogs are categorized into one of five breed types: Hound, Toy, Terrier, Other Purebred and NonPurebred. You must complete the following Tasks for Attaboy, Inc.

TASK 1

Attaboy Insurance had previously given you data supplied by veterinarians. This data included claim and demographic information for the past three years on dogs that are patients of the veterinarians who provided data. Attaboy just received an additional set of data, but there appear to be some data quality issues. You have been asked to assess the quality of the data.

Review the new data and document changes—such as corrections or deletions—that should be made. The data can be found in the downloaded Microsoft Excel spreadsheet *FA_assignment_spreadsheet_20200601.xls.* Worksheet tab "Task1" contains the data, and the Data Definitions tab contains useful information about the data.

IMPORTANT NOTE TO CANDIDATES
When you open the spreadsheet the first time you will be prompted to run a macro by clicking the "INITIALIZE SPREADSHEET" button. Running the macro generates a set of random numbers that provide different data sets that will be unique to each candidate. Thus, for several tasks, candidates will have different results.

List specific types of problems and your recommendation on the appropriate treatment for each. Do NOT provide a seriatim list of individual errors and corrections.

Because this data submission is a small part of the total data collected and the veterinarians who supplied data have limited incentive to participate, only consider contacting the veterinarian for clarifications if it is likely to be a simple conversation and the change easy to make.

Write an informal memo to your supervisor and document your findings and recommendations in the provided Word template.

TASK 2

Part A

Based on discussions with your actuarial assistant, Michelle Wolffguy, and your supervisor, your consulting firm has determined the base PMPM for Attaboy's first year of sales of Attaboy Basic. Michelle also has completed some modeling to determine the impact of the deductible and annual limits on Attaboy Basic as noted in the "Task2A" worksheet tab. This tab provides the structure for premium calculations and the following assumptions:

- Base year billed PMPM. Note this reflects gross estimated amounts billed to the customers by the veterinarians for the services performed and does not reflect the impact of the cost sharing in the benefit plan.
- Annual trend.
- Number of months of trend.
- Benefit plan, including coinsurance and PMPM value of deductible and annual limits in projection year dollars.
- Fixed expenses PMPM.
- Variable expenses as a percent of premium.
- Required profit as a percent of premium.
- Target loss ratio.

For this part of the task, provide a response to each of the following:

A1. Develop the manual base premium for the Attaboy Basic benefit plan given the target loss ratio. Show your calculations.
A2. In situations where the manual premium does not achieve the required profit as percent of premium, what are some actions that could be taken to increase the profit percent?
A3. Do you recommend any of these actions in this case? Support your recommendation.

Part B

You are to calculate premiums for the Attaboy Plus coverage. Attaboy is looking to target a 20 percent internal rate of return (IRR) on distributable earnings. Most assumptions needed are given in the "Task2B Assumps" worksheet tab. Here are a few clarifying notes:

- You should use the reserves determined by management as given in the "Task 2B Assumps" tab.
- Investment income is earned on average reserve and beginning of year surplus balances.
- Taxes are a flat percent of before-tax income (and negative taxes are possible – they will offset positive tax payments from other policies).

For this part of the task, provide a response to each of the following:

B1. Calculate the required premium for issue ages 0, 5 and 10. You may find the partially completed table in the worksheet tab "Task2B" helpful.

B2. How would the pattern of distributable earnings change if gross premium reserves were held instead of the given reserves? It is not necessary to calculate gross premium reserves to formulate your answer.

Using the provided Word template, include the informal memo to your colleagues covering your response to both Part A and Part B.

TASK 3

The analyses you have done to this point have assumed that all of the assumptions will be realized. To help Attaboy understand the risks associated with the assumptions, you are to do a sensitivity analysis.

Part A

For Attaboy Basic:

A1. Assume the premium you determined in Task 2A is charged. For each of the following assumptions, holding the others at their assumed value, determine the value at which the product is expected to lose money.
   a. Base year PMPM.
   b. Annual trend.
   c. Coinsurance percentage.
   d. PMPM value of deductible and annual limits.
A2. Which assumption is most critical? Explain.

Show your calculations.

Part B

For Attaboy Plus:

B1. Assume the premiums you determined in Task 2 are charged. For each of issue ages 0, 5 and 10 and for each of the following assumptions, holding the others at their assumed value, determine the value at which the IRR drops to 5 percent.
   a. Mortality rate at each age multiplied by the same constant.
   b. Lapse rate.
   c. Acquisition expense.
   d. Maintenance expense.
   e. Rate of return on reserve and target surplus.
B2. Is it appropriate to only vary these five assumptions one at a time, or should some be varied together? Explain why or why not. Do not do further numerical analyses.
B3. Is it appropriate for any of these five assumptions to vary by policy year? Explain why or why not. Do not do further numerical analyses.
B4. Which two assumptions are most critical? Explain.

Using the provided Word template, include your informal memo.

TASK 4

Attaboy Insurance has asked your firm to review the risks faced by this business and how they directly apply to Attaboy Basic and Attaboy Plus. Using the template below (adding rows as necessary) as a guide, create a high-level risk categorization and definition (RCD) tool to list the key risks that will impact the business. List three risk subcategories for each major risk category. For each major risk category, indicate which subcategory is the most important for mitigation. For each identified subcategory, make and justify an appropriate risk mitigation technique.

Major Risk Category	Risk Subcategory	Definition
Financial		
Strategic		
Insurance		
Operational		

Consider only risks that are relevant to the pet insurance products sold by Attaboy.

Listing non-relevant risks will be penalized.

Using the provided Word template, include your informal memo to the project lead. Include tables in your analysis.

IMPORTANT NOTE TO CANDIDATES
For the following two tasks, we have assumed that Attaboy has taken various actions that may not agree with your recommendations and may not in fact be the best choices. **You should not revise any of your work for Tasks 1-4 to match the assumed facts for Tasks 5-6. You should, however, use these new facts as you complete Tasks 5-6.**

TASK 5

Attaboy has now sold the two products for one year. Now, you are being asked to review the experience of Attaboy Basic. Another member of your team has already reviewed and cleaned the new data and provided you with a summarization.

On the "Task5" worksheet tab you will find the final age factors, breed factors, base PMPM and trend factor Attaboy used to price the current product. Because your work was an input to a larger process (which includes management, marketing and consultation with animal health experts), the final assumptions and rates may differ from your recommendations. Do not assume that because these numbers differ from your earlier work that your work was incorrect.

For this task, provide a response to each of the following:

- A. Review the experience and recommend changes with regard to the base PMPM.
- B. Review the experience and recommend changes with regard to the two current rating factors.
- C. Should any of the current rating variables be deleted or others added? Explain.
- D. Why is the ratio of the PMPM based on recent experience to the PMPM estimate used to derive the initial premium not appropriate to evaluate the trend assumption?

Using provided Word template, include the informal memo to your colleagues.

TASK 6

Attaboy Insurance's Management Team is considering a variety of modifications to the Attaboy Plus coverage. They are:

A. An accidental death rider that provides an additional $250 if the death is due to accident rather than illness or old age.
B. A separate coverage for high-value dogs (such as show dogs and racing dogs) where the benefit is $10,000.
C. A preferred risk class offered to dogs that pass a comprehensive health examination. Purchasers have the option of buying up to $1,000 in benefit.
D. Expansion of sales from veterinarian offices to large chain pet stores.

For this task, you should include an Executive Summary and associated Recommendation to Management as to which of the proposed modifications, if any, Attaboy Insurance should pursue. Discuss benefits and key potential risks associated with your recommendation.

Using the provided Word template, include your formal report for Attaboy Management.

After you have completed all tasks, submit a single Microsoft Word document containing all your work. Do not submit your spreadsheet.

Important Notes about Inserting Tables

If you need to insert an Excel table into your document, then you must follow the instructions below to copy and paste the table from Excel into your Word document.

Do:

- Ensure your table fits in the page margins by:
    - Selecting the table
    - Right-clicking on the table to view the pop-up menu
    - Hover your mouse over "Auto Fit"
    - Click "AutoFit to Window".

Do not:

- Paste as Picture
- Insert Object
- Use Word's "Insert, Table, Excel Spreadsheet" function, since this will not paste your table in the correct format.

Pasting a **table** as a picture or as an object will result in an automatic disqualification of your submission. (**Graphs** pasted as pictures are **not** affected by this requirement.)

Steps for pasting tables (for Windows versions of Word/Excel):

1. Copy the cells from your Excel spreadsheet. If you use the Copy command on the Home tab, do **not** select the option to "copy as picture".

2. In your Word document, turn on the "Show/Hide Paragraph Marks" feature.
3. In your Word document, right-click where you want to insert your table.
4. In the menu that pops up, under Paste Options, select any of the first four options:
    a. "Keep Source Formatting"
    b. "Use Destination Styles"
    c. "Link & Keep Source Formatting"
    d. "Link & Use Destination Styles"
5. If you have "Show/Hide Paragraph Marks" turned on, you should see small circles at the end of each cell in your table. This is how you can know whether or not you have pasted your table correctly.

Steps for pasting tables (for Mac versions of Word/Excel):

1. Copy the cells from your Excel spreadsheet. If you use the Copy command on the Home tab, do **not** select the option to "copy as picture".
2. In your Word document, turn on the "Show All Nonprinting Characters" feature.
3. In your Word document, right-click where you want to insert your table.
4. In the menu that pops up, click Paste (**not** Paste Special).
5. If you have "Show All Nonprinting Characters" turned on, you should see small circles at the end of each cell in your table. This is how you can know whether or not you have pasted your table correctly.

As You Complete Your Tasks…

Your name should not appear anywhere in your submission, or in the filename, or in any way identify you as the author. If you believe you should refer to yourself in the context of an answer, use "FAP Candidate" instead of your actual name.