Contents

1 Subject Information

The textbooks used in this subject are:

1. Main References (Textbook for Introduction to General Insurance Exam, SOA Exam)
   (a) Friedland, J., Fundamentals of general insurance actuarial analysis.
   (b) Grossi, P. and Kunreuther, H., Catastrophe Modeling: A New Approach to Managing Risk. Boston.
2. Additional References (Textbook for Exam 5 - Basic Techniques for Ratemaking and Estimating Claim Liabilities, CAS Exam)
   (a) Basic Ratemaking
   (b) Estimating Unpaid Claims Using Basic Techniques

Note: There will be changes in SOA exams too. Kindly refer to here. Some of the contents here will also be included in Exam Short Term Actuarial Mathematics.

2 Introduction to Insurance

2.1 What is insurance?

Insurance Organization is a mechanism for transferring risks and re-distributing losses and insurance is:

1. The promise to pay for a loss;
2. In exchange for a premium;
3. Based on the occurrence of an insurable event.

Insurable event needs to be *predictable to the insurer*, *random and undesirable for the insured* to avoid moral hazard. Thus, we can visualize insurance mechanism in this way: Policyholder pays premium to be entitled for the coverage over an insurable event, if the insurable event happens during the coverage period then policyholder/insured will be paid an amount for this loss.

This shows that insurance product is different with some other physical products such as notebook, chair and etc. Actuary has to price the insurance product before the *exact* cost is known to the company, hence, actuary can only obtain an estimated number based on various methods and his/her professional experiences. For the same reason, because the product is priced by using an estimated cost, thus company needs to set aside some amount of money as the reserves. This whole process is called **pricing** (or **ratemaking**) and **reserving**.

2.2 Life Insurance

The most commonly known insurance is life insurance. Life insurance covers the risk of death (or mortality), examples are:

1. Whole Life Insurance;
2. Term Insurance;
3. Investment Linked Insurance;
4. Group Insurance.

The characteristic of life insurance is that, the exposure period is usually long but claim settlement is faster. For general insurance, the exposure period is shorter and claim settlement could be longer period.

2.3 General Insurance

We discussed some examples of general insurance in this section.

General insurance are categorized by personal line and commercial line and the contracts are usually one year exposure. However, the claims settlement can be a long process, and thus, reserves are required. Another type of classification of general insurance is by its nature, long tail or short tail.

A **long tail** line of business is where the claim payments will usually taking a long time to settle, while **short tail** line of business will take a shorter time to settle. For example, fire insurance is short tail as usually insurer will be able to fully settle the claim; liability insurance is long tail as usually this type of claim takes longer time to close. Figure 1 shows the relation of claim incurred (as a percentage to ultimate loss) and development year.

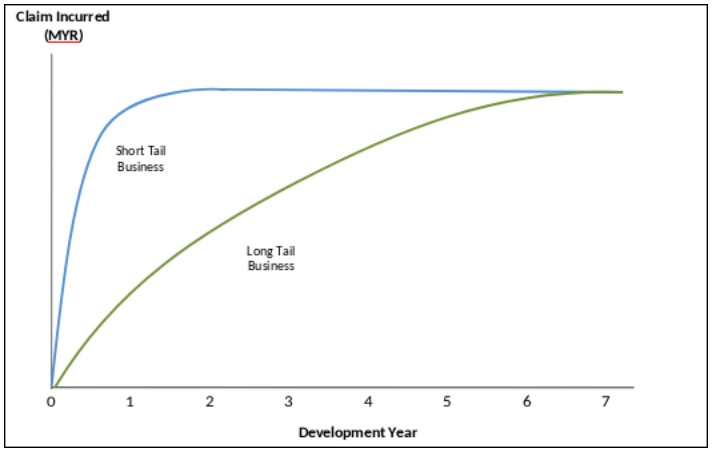

Figure 1: % Claim Incurred vs Development Year

Note: ***Development Year*** *can be viewed as "age" of a claim.*

2.3.1 Motor Insurance

Motor insurance products has three different types of cover: Third Party, Third Party Fire and Theft and Comprehensive. Figure 2 below illustrates the differences between different types of coverage.

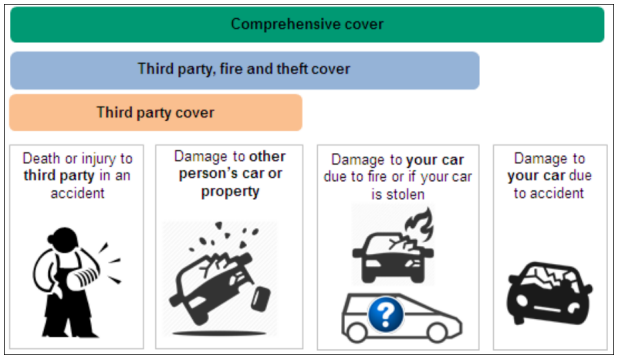

Figure 2: Taken from Bank Negara Malaysia website

Third Party product has two components, Bodily Injury (TPBI) and Damage to Others (TPPD), while Third Party Fire and Theft (TPFT) has extra component - Fire and Theft. Comprehensive product covers

Own Damage (OD) too.

Imagine the following scenario: If Mr. A was driving and hit into Mr. B's car. Given that Mr. A purchased Comprehensive product and Mr. B purchased Third Party product. There are two possible scenarios:

1. It was Mr. A's fault - Mr. A can file a claim to his insurer for his car damage (OD), Mr. B's car's damage (TPPD) and possibly Mr. B's injury;
2. It was Mr. B's fault - Mr. B can file a claim to his insurer for Mr. A's car damage (TPPD) only.

We can view the above three types of covers as combination of TPBI, TPPD, TPFT and OD. Note that TPBI is also called as Act cover, which is the minimum cover corresponding to the requirements of the Road Transport Act 1987. You could read more information from PIAM website.

We shall briefly introduce other common general insurance products in later parts.

2.3.2 Engineering

Engineering Insurance provides economic safeguard to the risks faced by the ongoing construction project, installation project, and machines and equipment in project operation. The coverage period is the same as construction period and hence the claims are long tail.

2.3.3 Fire

Fire Insurance protects policyholder's home, furniture and belongings against loss/damage by natural disasters. There could be other product named as **Homeowner Insurance** that has other coverage and at the same time also includes fire insurance. This type of claims are usually short tail.

2.3.4 Workmen Compensation

Workmen Compensation Insurance is paid by employer to provide medical care,salary replacement or death benefits to an employee, if he/she is injured or killed on the job. This type of claims are usually long tail as policies written today may have payouts for many decades.

2.3.5 Medical and Personal Accident

Medical Insurance covers medical costs, the details vary widely depending on the product and insurer. Medical insurance claim is a long tail business. **Personal Accident** covers the events of death, injuries or disablement arising from accident. Personal accident claim is usually short tail.

2.4 Operation of General Insurers

2.4.1 Underwriting

After agent/broker brought in the businesses, underwriter will look into the policy and risk profile before deciding whether or not to accept the risk. Underwriters will maintain the policy/premium data in database.

2.4.2 Claim

There are two different status for any claim in insurance company:

1. **Open Claim** - Claim that is still active and not fully settled;
2. **Closed Claim** - Claim that has been fully settled and closed by claim department.

There few different claim amount recorded in a general insurance company.

1. **Paid Claim** - Amount paid to insured;
2. **Case Reserves** - Loss amount recorded in system but remains unpaid;
3. **Incurred Claim** - Paid + Case Reserves;
4. **Ultimate Claim** - How much is needed to close the claim.

Figure 3 shows the processes of a claim, from accident to when the claim is closed. Yellow color represents internal processes.

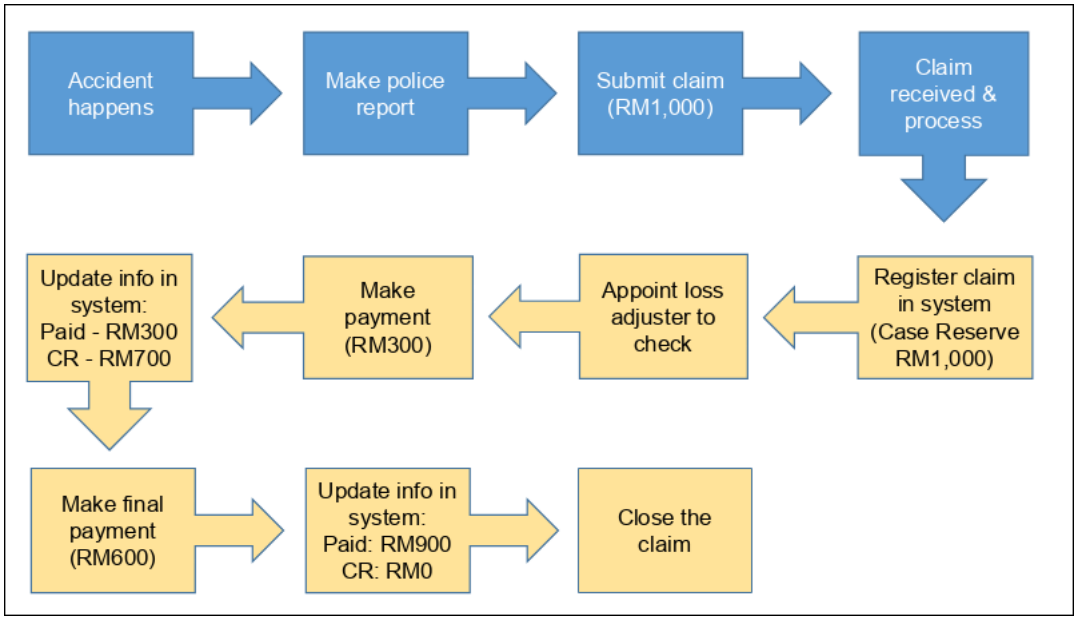

Figure 3: Claim Process

We look at Figure 3 in slightly more detail and to illustrate some terminology:

1. From accident happened to claim registration, the claim is **Incurred But Not Reported**;
2. Then, Case Reserves=RM1,000 and Paid Claim = RM0;
3. One payment was made, which cost RM300, hence Case Reserves=RM700;
4. Final payment of RM600 was made (i.e. claim will be closed after this payment), so Case Reserves=RM0 (This means that the **Claim Development** is -RM100);

Thus, we know that the ultimate amount for any claim consists of the few components below:

- Incurred But Not Reported Claim (IBNYR);
- Claim Development (IBNER);
- Case Reserves;
- Paid Claim,

where IBNYR and IBNER are Incurred But Not Yet Reported and Incurred But Not Enough Reported, respectively.

The common practice will not look at the claim component in such detailed breakdown. In fact, most of the time we use IBNR to represent both INBYR and IBNER.

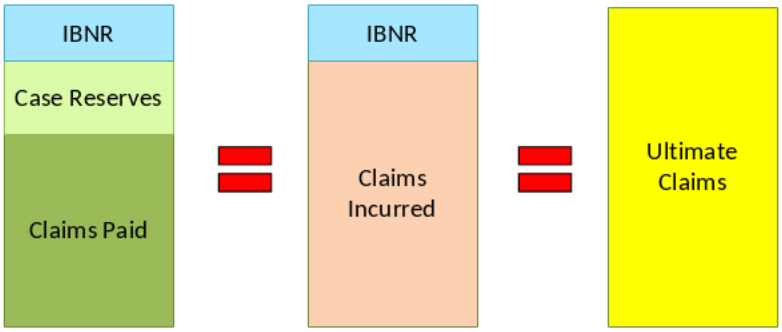

Figure 4: Component of Ultimate Claims

2.4.3 Reinsurance

Insurers (cedent) will choose to cede out some of the risks that they have written, of course they will have to pass some of the premium received to reinsurer as well. Below are some basic types of reinsurance:

1. **Treaty** - covers the specified share of all the insurance policies issued by cedent;
   (a) **Proportional Treaty** - Prorated share (e.g. reinsurer will share 10% of loss while at the same time cedent will pass 10% of premium to reinsurer), two common types - Quota Share and Surplus;
   (b) **Non-Proportional Treaty** - Only covers losses above a specific amount;
2. **Facultative** - covers only a specific risk,

2.4.4 Database

Two types of data are available, internal and external. Example of external data are economic data, geo-demographic data and etc. There are few common types of internal data available, for example:

1. Premium Data - Information of a *policy*, such as policyholder's name, location, type of cover and etc;
2. Claims Data - Information of a *claim*, such as date of loss, claim amount, type of incident and etc;
3. Accounting Data - Information that is *not policy/claim specific*, such as rental, CEO's salary and etc.

3 Some Basic Insurance Ratios

We introduce some basic insurance ratios in this section. These will helpful for analyzing portfolio's performance.

1. Frequency
   - Frequency $= \frac{\text{No. of Claims}}{\text{No. of Exposures}}$;
   - Defined as how many claims per exposure;
   - To measure occurrence or identify trends in claim occurrence.
2. Severity

- Severity $= \frac{\text{Total Loss}}{\text{No. of Claims}}$;
- Defined as how much is the loss per claim;
- We can further define **Reported Severity** and **Paid Severity**, by using either reported claims or paid claims;
- To identify loss trends.

3. Pure Premium, $\bar{L}$
   - Pure Premium $= \frac{\text{Total Loss}}{\text{No. of Exposure}} = \text{Severity} \times \text{Frequency}$;
   - It is also "average loss";
   - ALAE and/or ULAE may be included
   - To identify overall loss trend.
4. Average Premium
   - Average Premium $= \frac{\text{Total Premium}}{\text{No. of Exposures}}$;
   - Both premium and exposure must be on the same basis, that is, written, earned or in-forced;
   - To identify changes in business mix.
5. Loss Ratio
   - Loss Ratio $= \frac{\text{Total Loss}}{\text{Total Premium}} = \text{Pure Premium} \times \text{Average Premium}$;
   - Can also define **Ultimate Loss Ratio**, which is $\frac{\text{Total Ultimate Loss}}{\text{Total Premium}}$;
   - To check the adequacy of rates.
6. Loss Adjustment Expense Ratio
   - LAE Ratio $= \frac{\text{Total LAE}}{\text{Total Losses}}$;
   - Monitor cost associated with claim settlement procedures.
7. Underwriting Expense Ratio
   - UW Expense Ratio $= \frac{\text{Total UW Expense}}{\text{Total Premium}}$;
   - Monitor underwriting costs
8. Operating Expense Ratio
   - Operating Expense Ratio $= \frac{\text{LAE}}{\text{Earned Premium}}$;
   - Monitor operating expenses and review overall profitability.
9. Combined Ratio
   - Combined Ratio = Loss Ratio + Operating Expense Ratio;
   - Similar to Operating Expense Ratio, review overall profitability.