

Class: MSc Sem 4

Subject : Actuarial Practice 2

Chapter: Unit 4 Chapter 15

Chapter Name: Monitoring and Feedback

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1 Introduction

In this chapter we look at the **completion of the actuarial control cycle loop**: how to monitor experience in order to review the validity of models and assumptions.

Monitoring is also relevant to the **risk management control cycle**: reviewing the risks faced by a provider and the risk management strategy.

In reality, experience is never exactly as expected, models and assumptions are not borne out in practice and the decisions taken may not have been the best that could have been taken, with hindsight.

Experience investigations allow us to revise assumptions so that decisions remain as 'best' as possible, within the practical limitations imposed by the operation of the business. Monitoring of some aspects (investment performance, expenses, risks) has already been covered in earlier chapters.

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2 Reasons for monitoring experience

Monitoring the experience is a **fundamental** part of the **actuarial control cycle**. The actual experience of a provider should be monitored to check whether the **method** and **assumptions** adopted for financing the benefits continue to be appropriate and, if not, what **changes** should be made in order to achieve the desired level of profit.

The experience will be monitored so as to:

- **update the methods and assumptions** adopted so they reflect expected future experience more closely
- **monitor any trends** in experience, particularly adverse trends, so as to take corrective actions
- provide **information** to management and other key stakeholders.

3 Data required for modelling

The basic requirement is that there is a **reasonable volume of stable, consistent data**, from which future experience and trends can be deduced.

Consistent here means that, when comparing the experience of one group with another, the data used as a basis for the calculations for each group should be:

- in a similar form
- preferably extracted from the same source
- grouped according to the same criteria
- equal in terms of reliability.

The data ideally needs to be divided into **sufficiently homogeneous risk groups**, according to the relevant risk factors.

However, this ideal must be balanced against the **danger of creating data cells** that have too **little data** in them to be credible. For example, for benefit schemes with a small number of members, it may not be appropriate to carry out any analysis or at least the results should be recognized as being very crude.

This may also be true when events are **infrequent** and **volatile**.

3 Data required for modelling

In practice, the level of detail in the **classification of the data** depends upon the **volumes** of data available. The volume of data will not only indicate whether or not an analysis will produce meaningful results, but it will also indicate the extent to which data can be subdivided without leading to similar problems. For example, it may be necessary to group data on deaths into five-year age bands rather than single-year bands.

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4 Analysis process

Once the data have been grouped in an appropriate manner, the analysis can be performed. An analysis of any experience item could be performed, ie any item about which assumptions are made. The experience can then be compared with the assumption.

Statistical factors

Statistical factors include:

- **mortality** rates
- **morbidity** rates (inception and transition)
- **withdrawal** rates.

For statistical factors, such as mortality and withdrawal, this will involve the calculation, for each age band, of the number of deaths (or withdrawals) divided by the number exposed to risk of death (or withdrawal).

The results can then be compared with the **assumptions** adopted to determine whether there is a significant difference and also with other relevant standard tables to determine if they appear to be more appropriate.

4 Analysis process

Economic factors

Economic factors usually have the greatest impact on the result for a company or scheme but are also generally outside the management's control.

Economic factors include:

- interest rates and investment returns
- expense inflation
- salary growth.

Interest rates and investment returns

The main economic factors for a benefits scheme or insurance company are:

- interest rates
- investment returns of various sectors.

For these the analysis is simply a comparison between the **actual returns** and **those assumed**.

4 Analysis process

Economic factors

Therefore, these items are usually both the most **significant** and the **easiest** to compare. The calculation of the actual return may present some practical calculation difficulties, for example allowing accurately for:

- the **timing** of cashflows in or out
- the **investment income** received or accrued over the period being analyzed
- **investment expenses**
- **tax.**

The effect of the difference between actual and expected can be calculated by re-running the expected experience model using the actual economic experience items.

4 Analysis process

Economic factors

Expense inflation

The actual level of **expense inflation** would need to be determined by removing from the expense analysis any costs that were included only in the previous or current data, and by considering the change in unit costs rather than overall totals (in order to remove the impact on total expenses from volume changes).

4 Analysis process

Economic factors

Salary growth

Salaries increase in two ways:

1. general '**across the board**' inflation-related (or 'cost of living') increases
2. individual **promotional increases**.

When considering salary-related benefits, it would be common to make separate assumptions for each element. When analyzing experience, care must be taken to extract the elements separately.

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5 Use of the results

The results of an analysis of experience should not be used blindly. Consideration should be given to whether the **period** under investigation was typical and whether the experience is likely to be **representative of future experience**.

For example, the period under investigation may have been affected by abnormal events or by significant random fluctuations – many elements of experience are affected by economic cycles.

Economic variables such as **investment returns**, **salary levels** and **dividend yields** are not the only items of experience that are affected by economic cycles. For example, withdrawal rates on various savings and insurance products and claim rates on unemployment protection products are likely to be affected by economic activity.

When considering whether the past experience is likely to be representative of future experience, the actuary should attempt to separate the effects of:

- **trends** – a trend is a long-term underlying increase or decrease over time
- **cycles** – a cycle causes higher or lower values with a frequency of several years
- **random variation**.

5 Use of the results

It is also possible that there is a gradual change in the experience from period to period, as has been the case in the past with mortality rates. Before adopting the results of the investigation, it is therefore necessary to consider **the changes over time** and whether it is likely that any **past trends** will continue into the future.

If it had not been possible to split the analysis into **sufficiently homogeneous groups**, it is important to consider whether the individuals to whom the investigation related are relatively homogeneous with the individuals whose benefits will be affected by future experience.

Subject to the considerations, the results of the analysis may be adopted as **assumptions when calculating values**. However, depending upon the **purpose** of the assumptions, it may first be appropriate to make an **adjustment** in these assumptions to allow for **data** and **modelling risk**. This will allow for any uncertainty as to the validity of the results of the analysis.

6 Monitoring experience and control cycles

Monitoring of experience is fundamental to effective implementation of the **actuarial control cycle** or the **risk management control cycle**.

The environment in which a provider operates is constantly changing and monitoring the effect of past actions can help in revising its strategy for **risk management** and in reassessing the risks that it faces. The actuary will use the results of analyzing the experience and the surplus arising to reassess his or her view of the future experience affecting the provider. This may result in **changes to the assumptions** or **models** used for pricing or for setting contributions or provisions.

This is an **iterative process**. The actuary is trying to estimate how the provider will progress in the future, based on what has happened in the past. As time goes by, the actuary will have more information. The assumptions and models resulting from this should get closer to what will actually happen. However, the actuary cannot exactly predict the future even if he/she can make financial sense of it.

Although in a static world the assumptions should gradually coincide with reality, in the real world the ever-changing nature of actual experience will prevent the actuary's assumptions from getting really close to reality. Thus, the assumptions will normally need to **contain margins**.

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7 Summary of the monitoring process

Monitoring investigations typically involve the following stages:

- the division of data into suitable groups that are homogeneous by risk – need to consider:
 - the volume of data in each cell (its credibility)
 - the risk factors for the investigation (eg age, gender)
 - changes that have occurred that will reduce the relevance of old data
- identification of any past trends, cycles and anomalies and random variation in the past data
- using the results to revise models and assumptions used – need to consider:
 - the purpose, and hence the need for accuracy and margins for prudence
 - allowance for future trends
 - likely differences in future experience from past experience.

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