

Class: MSc Sem 4

Subject : Actuarial Practice 2

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Chapter: Unit 1 Chp 3

Chapter Name: Risks and Financial Products

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1 Risks and uncertainties

Overview

Where there is a delay between a benefit being promised and that benefit being provided, there will always be some **uncertainty**.



This uncertainty may relate to the level or the incidence of the **benefits**, or the **contributions / premiums** required to pay for those benefits.

Uncertainties with respect to the benefits are a concern for defined contribution schemes and life insurance products that are unit-linked.

1 Risks and uncertainties

Risks to the beneficiary

There is a risk that the beneficiary's circumstances will have changed and that:

- the **benefits will be less valuable** than required, or
- they will **not be received** at the required time.

In circumstances where there is no uncertainty about the level or incidence of the benefits or contributions, there may still be a risk that **inflation** has adversely affected the value of the amount.

Risks to the provider

The provider is exposed to the risk of **benefit payments** being **greater than expected**, or payments arising at an inopportune time such that the market value of assets is low.

1 Risks and uncertainties

Risks to the state

There may be a risk for the State that it is expected to **put right any losses** that the public incurs.

This is particularly relevant if the State provides **means-tested benefits**, for example a minimum income level in retirement.

If an individual believes that the minimum income level is sufficient for all their needs, they would be better advised to spend surplus funds on improving their immediate lifestyle. If the surplus funds were invested to provide a future income, this income might simply reduce the sum that the State would provide by exactly the same amount. The individual would forgo immediate consumption for no increase in income later.

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2 Benefit risks

Benefits that are known in advance

Risk of inadequate funds

Where the benefits are **pre-defined**, the greatest risk for a potential beneficiary is that there are **insufficient funds** available to provide the promised benefit.

This may be as a result of:

- **insufficient funds** having been set aside, ie underfunding
- the **insolvency** of a sponsor or provider of the benefits
- the holding of investments which are **not matched** to the liabilities
- a combination of these events.



Suggest reasons for underfunding in a benefit scheme.

2 Benefit risks

Benefits that are known in advance

Risk of illiquid assets

A separate risk is that the funds, although sufficient, are **not available** when they are required to finance the benefit. This illiquidity may arise when assets have been set aside to fund the benefits, but it is more likely to occur if no separate assets exist.

Illiquidity risk is usually mitigated by holding **sufficient cash**. However, in the case of a funded scheme, the cash in the form of income flows from the contributions and investments are sufficient enough to provide the necessary liquidity, as a result of which holding cash is not required.

The same fundamental applies for insurance companies where **premiums and investment income are enough to cover the claims outgo**. However, the risk of **new business volumes** being **lower** than expected still lures and the insurer may lack sufficient liquidity.

As for an unfunded benefit scheme, the risk of resources not being available to meet the benefit once it comes into payment exists mostly due to poor commercial performance.

2 Benefit risks

Benefits that are known in advance

Risk of benefit changes

There may be a further risk that a **benefit promise is changed or is changeable** within the terms of the contract.

In the case of non-State provision of benefits, legislation will usually **prevent a worsening of benefits** that relate to past periods, unless the beneficiary agrees to the change.

However, some types of contract, for example critical illness contracts, may have definitions of an insured event that are not guaranteed throughout the terms of the contract.

Critical illness products may allow flexibility to the insured, by providing cover over a wide range of illnesses. They may also limit the cover, in case of medical advancement, whereby a disease may no longer be rendered as life threatening.

2 Benefit risks

Benefits that are known in advance

Risk of failing to meet the beneficiaries' needs

Where funds are **sufficient and liquid**, and the level and incidence of benefits is exactly as promised, the beneficiaries are still exposed to the risk that these **promised benefits do not meet their needs**. This may be as a result of:

- a **failure to recognize** this when the benefit promise was made
- **inflation** eroding the value of the benefits where benefit is fixed in monetary terms
- **beneficiaries' circumstances changing** for instance he may be unable to work because of a disease or accident and the benefits he receives are insufficient in maintaining his standard of living

2 Benefit risks

Benefits that are not known in advance

Investment and expense risk

Where benefits are **not fully defined**, but are instead linked in some way to the funds available and investment conditions, there is further **uncertainty**, and hence **risk**, for the beneficiary that the **level of the benefits will be lower** than expected if:

- the **investment return is lower** than had been anticipated, or
- any **expense** charges deducted are higher than expected.

2 Benefit risks

Benefits that are not known in advance

Annuity risk

The level of the **benefits** will also be **reduced** if the **terms of purchase for any investment vehicles** are worse than had been anticipated.

For example, for a member of a defined contribution scheme, if an annuity were to be purchased to provide a retirement pension, the level of the pension would be dependent on the terms on which an annuity could be purchased at the retirement date.

Annuity terms may worsen due to factors such as falling bond yields as annuities are usually backed with bonds and increasing longevity.

Annuity risk can be mitigated by switching the assets of a retirement pension fund into those that underlie the annuity as retirement approaches.



Can you suggest further risks in the above example and how can they be mitigated

2 Benefit risks

Benefits that are not known in advance

Risk of inadequate benefits

There is a risk that either **inflation** or a failure to recognize benefit needs when planning provision leads to benefits that do not meet the **beneficiaries' true needs**, and they consequently suffer a lower-than-expected standard of living.

Inflation risk

Inflation risk for a pension product exists both **before** and **after** retirement. Before retirement, the risk of **past contributions** reducing in real terms relative to earnings when returns on investments are below the earnings inflation. Post retirement, the risk of **purchasing power** of the pension amount being reduced exists, if it does not rise as quickly as the price inflation. There is also inflation risk for **the provider**.

For example: For non-life insurance policies there is the risk that the payment on an insured event occurring is much higher than was anticipated when the policy was written. This could happen when inflationary increases in the value of the insured property are higher than general inflation, or when the courts award higher than anticipated levels of compensation for insured events.

2 Benefit risks

General benefit risks

Whether benefits are defined or not, there are some **general factors** that create uncertainty around the benefits to be received. These are:

- default by sponsor / provider at a time when the funds held are insufficient
- default by sponsor / provider when funds held include loans to the sponsor / provider
- failure by sponsor / provider to pay contributions / premiums in a timely manner
- takeover of the sponsor / provider by an organization unwilling to continue to meet benefit promises
- decision by the sponsor / provider that future benefits will be reduced
- inadequate communication by the sponsor / provider with beneficiaries
- general economic mismanagement by a sponsor / provider of assets and liabilities may also lead to a risk of a benefit shortfall.

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3 Contribution/premium risks

Contribution/premiums that are known in advance

Risks of unaffordable premiums/contributions

If the contributions / premiums are pre-defined, there is a risk that the **payer will be unable to afford them**.

There is a particular risk if the **payer** and the **beneficiary** are **not the same person**, for example in the case of a company sponsored benefit scheme providing pension payments for employees.

The reason for specified premiums not being paid are:

- The payer is unable to afford the premium amounts due to poor financial position
- The payer's immediate cashflow position is poor and assets cannot be liquified on an immediate basis to meet the payments
- Contributions / premiums that are defined in real terms will create a risk that the inflationary factor to which they are linked increases at a rate greater than that anticipated.
- If contributions are fixed in monetary terms, there is the risk that the resultant benefits are unable to provide for an expected standard of living.

3 Contribution/premium risks

Contribution/premiums that are not known in advance

Uncertain level of future contributions/premiums

If benefits, rather than contributions / premiums, are defined, it will not be possible to be certain about the **level of contributions required** until all benefits have been provided, and no future liabilities exist.

These issues are relevant to **a sponsored benefit scheme** where the sponsor (usually the employer) is not the beneficiary.

The cost of providing the cover is only known once all the benefits have been paid in full. When funds are set aside in advance of the benefits being provided, the contributions are payments towards the estimated cost of the benefits.

3 Contribution/premium risks

Contribution/premiums that are not known in advance

Uncertain level of future contributions/premiums

The overall level of the contributions required will depend on:

- the **amount of the promised benefit**
- the probability of individuals being eligible to **accrue** the benefits
- the probability of individuals being eligible to **receive** the benefits
- the effect of **inflation** on the level, or the real level, of the benefits
- the **investment return** achieved on the contributions (net of tax and expenses, if appropriate).

To the extent that liquid funds are not set aside in advance of benefits being provided, the above factors will also lead to uncertainty about the incidence of contributions.

3 Contribution/premium risks

Contribution/premiums that are not known in advance

Risk of insufficient assets

Other uncertainties relating to the incidence of contributions result from the extent to which the **value of any funds** set aside **does not equal the value of funds** that are expected to be required to cover future benefit payments.

For example, if it is thought that the funds set aside will not be sufficient to meet the benefits for which they were intended, additional funds will be required. In theory, these additional contributions could be provided at any point in time before the benefits need to be provided. However, in practice there may be either legislative or self-imposed constraints on the timing of these contributions or the sponsor may become insolvent before the additional funds are provided.

One legislative approach is to require that the **values of assets and liabilities are regularly assessed** and compared, with corrective action being required if the assets are not sufficient.

Furthermore, in some countries a **minimum capital requirement** must be held in addition to the value of the liabilities.

3 Contribution/premium risks

Contribution/premiums that are not known in advance

Liquidity risk

Any requirement to make good any **shortfall** by payment of extra contributions clearly creates a **risk that the sponsor / provider has insufficient liquid funds** to do so. If re-assessments are frequent, changes in contributions are likely to be of a manageable size.

Excess contributions required

A further risk that may result from **excessive contributions** is that the sponsor / provider itself may become **insolvent**. This may affect a beneficiary's total income more than the loss of insecure benefit promises. There may be a balance to be struck if the employer is the sponsor of the benefits.

For instance, a high contribution rate required from the employer to fund the pension scheme, may in turn be detrimental for the employee, as this onerous expectation from the employer, may render him insolvent and the employee jobless.

3 Contribution/premium risks

Contribution/premiums that are not known in advance

Takeover risk

There is also the risk that if the **sponsor / provider is taken over by a third party**, the new owner may not be willing to continue to sponsor / provide the benefits.

Cost of guarantees

If contributions / premiums are pre-defined but there is a **minimum guarantee** applying to the level of benefits, the sponsor / provider will incur extra costs, which will arise if those guarantees ever apply. To reduce the extent of these risks for a sponsor / provider, who meets the balance of the cost, the **cost of any guarantees** should be taken into account in setting the defined contributions and the investment strategy.

This may be the case for a defined benefit scheme. The additional risk of not knowing in advance about which element of a defined benefit or defined contribution will apply also exists.

3 Contribution/premium risks

General contribution risks

Whether contributions / premiums are defined or not, there are a number of other factors that may lead to uncertainty in the contributions / premiums required. These are:

- loss of funds due to **fraud or misappropriation**
- incorrect **benefit payments**
- inappropriate **advice**
- **administrative costs**, especially resulting from compliance with changes in legislation
- decisions by parties to whom **power has been delegated**
- **finances or removal of tax** status resulting from non-compliance with legislative requirements
- changes to **tax rates or status**.

3 Contribution/premium risks

General contribution risks

Inappropriate advice

Inappropriate advice may result from:

- incompetence or insufficient experience of the advisor
- lack of integrity of the advisor, perhaps due to sales related payments
- the use of an unsuitable model or parameters
- errors in the data relating to the beneficiaries
- State-encouraged but inappropriate actions
- over-complicated products.

An example of the risks of inappropriate advice arose in the UK in relation to the mis-selling of personal pension policies to individuals who had better provision through an employer-sponsored arrangement.

3 Contribution/premium risks

General contribution risks

Guarantees

Any **guarantees** provided by the sponsor / provider reduce uncertainties for the beneficiaries. However, they lead to an uncertainty for the sponsor / provider because of the **risk of the guarantees biting and causing an increase in costs**.

The benefits of guarantees and the costs of meeting them is an important feedback loop into the actuarial control cycle.

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4 Overall security

Security

The overall **security of benefits** is related to all of the factors that affect the uncertainty of benefits, contributions and investment returns.

The security is affected to the extent that a **need for extra contributions**, for whatever reason, is not met immediately.

If any of the risks affecting the overall security do materialize, then the security of the benefits can be preserved by means of additional contributions. Risk relating to calculating contributions also exist where contributions may be underestimated or overestimated.

4 Overall security

Investment risk

Investment risk exposure depends on the **nature of the product**. The provider is exposed to investment risk in a defined benefit scheme and without profit life insurance policy, and the beneficiary is exposed to this risk in case of a defined contribution scheme.

Investment risks for a financial product are:

- uncertainty over the **level** and incidence of **investment income**
- uncertainty over the **level** and incidence of **capital gains**
- **reinvestment risk** arising from mismatching assets and liabilities
- **default risk**
- **investment returns** being lower than expected
- benefits not being appreciated due to **poor investment returns**
- **liquidity risk**
- lack of **diversification**
- changes in the **taxation** of investment income and gains
- **investment expenses**.

4 Overall security

Model, parameter and data risk

There may also be risks to overall security that result from **errors** in determining the **contribution / premium** requirements.

Such errors may be a result of:

- the use of an unsuitable model
- the use of unsuitable parameters
- errors in any data used to determine parameters for the models
- errors in the data relating to the beneficiaries.

These errors may result in appropriate advice, such as discrepancies in the contribution rates of the scheme, thus impacting the schemes security. Similarly if the premium rate for insurance products is too low, then the solvency of the company is put to risk.

4 Overall security

Strength of the sponsor/provider promise

The strength of the promise by the sponsor / provider and the impact of the **asset allocation** on the ability to meet promises made in adverse circumstances should be communicated to the beneficiaries.

The **ability** and **willingness** to pay the due diligence of the benefits as they mature is known as sponsor covenant. It is a source of credit risk which is difficult to quantify.

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Business risks for financial product providers

Mortality and longevity risk

These risks can be taken under the headings of **insurance** and **underwriting risks**.

These are the risks that **assumptions** made about the **future mortality of lives** taking out new products, or with existing contracts, are not borne out in practice.

Longevity risk is the risk of people living up to longer ages than expected, i.e. lower mortality rates.

Mortality risk is the risk of a large number of people dying earlier than expected.

Underestimating mortality rates has adverse effects on the profitability of term assurance business and overestimating mortality rates adversely affects the profitability from annuity products. This might be due to a change in the long-term mortality rate, a change in the rate of mortality improvement, a one-off shock such as a pandemic, or even random variation.

Mortality pre-retirement is a risk for pension scheme providers, as it reduces the level of pension contributions expected and longevity post retirement is a risk as the number of pension payments being made will increase.

5

Business risks for financial product providers

Morbidity risk

The risk of **actual morbidity experience** for the existing and new customers varying from the assumptions made.

As with mortality experience, differences between the actual and assumed morbidity experience could be due to changes such as the **duration of illness**, the **rate of incidence of illness** or a **one-off pandemic shock**.

In a product providing protection, where benefits are payable throughout the duration of the illness, the rate of incidence of the illness and its duration both need to be considered.

The duration of the claim is generally modelled through claim termination.

Mis-estimation of ill health retirement is also a risk for pension scheme providers, and it depends on the relative generosity of the benefits provided.

5

Business risks for financial product providers

General insurance claims risk

There is a risk that **claim volumes** or **claim amounts** may be significantly different to those expected.

As for general insurer, their **longevity, mortality and morbidity equivalent risk** is the uncertainty with respect to the claim frequency as well as the claim amount of the contracts sold.

The risk of assumptions with respect to claim rates and claim amounts for both existing and future business being correct exists.

The risk might be due to climate change, once in a blue-moon natural events, changes in customer behaviour etc.

5

Business risks for financial product providers

Expense risk

A product provider's expenses can be expressed in **terms of unit costs**: the cost per new plan written, the cost per in-force policy and the cost of each claim paid.

Unit costs comprise expenses as the numerator and a volume measure as the denominator. Lapses and business volumes written affect the denominator and so expense, persistency and new business volume risks are interlinked.

Fixed costs need to be spread over a small number of contracts due to a low volume of new or retained business, resulting in higher premiums for the customer. Thus, expense risk is partially related to exposure risk.

Expenses comprise **variable costs**, directly related to business activity volumes, and **fixed costs** that are independent of business volume. Variable costs can generally be managed easily by expansion or contraction of operational areas. Fixed costs are less tractable and are where expense risk usually arises. Expenses could also differ from the level expected, for example, due to an unplanned budget overrun.

5

Business risks for financial product providers

Persistency or renewal risk

Whether **lapses** are a source of surplus or deficit depends on the funds notionally held against a particular policy compared to any surrender value paid. If the lapse rate is different from that assumed, **surplus** or **deficit** will result.

An insurance company where the timing of policyholders withdrawing their policies is when the amount of premiums less expenses accrued in respect of that policy is negative or is less than the surrender value payable. This is a major risk especially during the **early durations of any contract**, before any initial expenses have been recouped, and the number of premium payments received is small.

Similar withdrawal risk may exist for a benefit scheme relating to the number of members leaving the scheme depending on the benefits offered.

Increased lapses will always adversely affect expense unit costs.

The risk of **selective withdrawal** also exists, where lives with better than average experience in terms of mortality withdraw, leaving behind a group of policies with worse than average experience.

5

Business risks for financial product providers

Volume and mix of business risk

Writing new business **requires capital** to support the additional risks taken on and thus the available capital places an upper limit on new business volumes.

When a company sells a greater number of policies than it expected, it faces **solvency issues** arising from **new business strain**. The administrative team may also struggle with handling and managing very high new business volumes, leading to operational and reputational issues.

Volumes of new policies directly affect expense unit costs and so link to **expense risk**.

If the company sells lower than expected number of policies, then the risk of being unable to meet the fixed expenses exists.

All products carry risks, so a different volume and mix of business to that anticipated affects all other risk areas.



Explain how mix of business risk arises for an insurance company.

5

Business risks for financial product providers

Option and guarantee risk

If a financial product or scheme provider has offered **options** or **guarantees**, then it will be exposed to further risks:

- The risk of **options becoming valuable to the beneficiaries** as a result of which they are exercised or that the guarantee bites, thus increasing the **cost** to the provider. This is normally driven by other sources of risk such as market risk.
- The risk of large number of policyholders opting for an **in-the-money option** than had been assumed.
- By providing options and guarantees, the provider is likely to be required by **regulation** to hold more capital to cover the extra risk. Thus, a risk of higher-than-expected capital strain exists.

5

Business risks for financial product providers***Reinsurance risk***

Using a counterparty in this way generates credit (default) risk, but there may also be business risk relating to uncertainties arising from:

- inadequate appreciation of the scale of the risks assumed and hence of the (re)insurance needs
- limited availability or prohibitive cost of the desired (re)insurance
- failure to comprehend the coverage / limits of a (re)insurance arrangement.

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