



**GROUPE CONSULTATIF ACTUARIEL EUROPEEN**  
EUROPEAN ACTUARIAL CONSULTATIVE GROUP

SECRETARIAT, NAPIER HOUSE, 4 WORCESTER STREET  
OXFORD OX1 2AW, UK

TELEPHONE: (+44) 1865 268 218 FAX: (+44) 1865 268 233

E-MAIL: [groupe@gcactuaries.org](mailto:groupe@gcactuaries.org)

WEB: [www.gcactuaries.org](http://www.gcactuaries.org)

**Actuarial Methods and Assumptions**  
**used in the Valuation of**  
**Retirement Benefits in the EU and**  
**other European countries**

edited by

**David Collinson MA FIA**

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# ACTUARIAL METHODS AND ASSUMPTIONS USED IN THE VALUATION OF RETIREMENT BENEFITS IN THE EU AND OTHER EUROPEAN COUNTRIES

## 1 INTRODUCTION

- 1.1 This guide is designed to provide the reader with an overview of the work of actuaries involved in retirement benefits in the member states of the European Union (EU) and associated countries. It is hoped that it will be of assistance to all those concerned with the security of supplementary pension provision, particularly those involved in actuarial practice or pension policy development in Europe. The survey covers both normal practice and legal requirements.
- 1.2 The guide has been broken down into three main components. The first component sets out the overall background to actuarial involvement in retirement benefits and compares and contrasts the key differences between the actuarial calculations made in the countries covered. The second component, which forms Appendix 1 and contains the main body of information in the guide, describes the work of actuaries on a country by country basis. The third component, which forms Appendix 2, defines the various actuarial methods mentioned in the guide.
- 1.3 The guide has been written with the intention that it will be read by both actuaries and by non-actuaries. The author has therefore attempted to keep the level of undefined actuarial terminology to a minimum.
- 1.4 The practice of actuaries in retirement benefits not only varies between the different countries of Europe but also within each individual country. It is not the intention to give details on **all** the methods and techniques used by the actuaries in each country but rather to summarise and highlight the **main** features of actuarial practice. In doing so it is inevitable that in some places omissions have been made. It is intended that the guide will be updated from time to time. The Groupe Consultatif will therefore welcome any comments/suggestions from the reader on the contents of the guide.
- 1.5 Greece and Luxembourg have not been included in this edition due to lack of data.

## 2 GENERAL CONSIDERATIONS

2.1 To merely produce a list of the actuarial methods and assumptions used in each country would be at best misleading and would in the process ignore the many important factors affecting the actuary in his or her particular country. The methods and assumptions used by the actuary must be considered in the light of the environment within which he/she makes calculations and gives advice.

2.2 The first and perhaps foremost consideration is what constitutes “retirement provision”, and hence what actuaries are actually involved in valuing. It would be possible to argue that any savings or investments made by an individual for later life should be included under the above heading. This report concentrates on the actuarial involvement in the provision of retirement benefits by employers, groups of employers and professions for their employees/members, the so called “second pillar” of retirement provisions. This provision is usually designed to supplement and in some cases replace (“contracted out” pension schemes in the United Kingdom) the compulsory state pension arrangements. Within this definition the compulsory supplementary arrangements existing in France (AGIRC, ARRCO) have been included. The main benefits provided under this heading, and hence the subject of actuarial calculations, are as follows:

- A pension payable for life from the attainment of a specified retirement age.
- A pension payable to the widow/er (and/or other dependants) on the death of the employee/member, both when the employee/member dies whilst actively employed and when already retired.

These “core” benefits are found in almost every country, albeit in differing forms. More variable however are the various additional benefits that are provided, whether a pension is paid on disability and the degree to which lump sum benefits are provided in addition to, or instead of, pension benefits.

2.3 Figure 1 shows pictorially the main benefits provided and when their payment occurs.

2.4 The benefits to be paid may be calculated in a number of different ways. The different types of benefit structures are normally classified as follows:

- **Defined Benefit Plans**

Here the **benefits** to be paid are defined in advance. The definition may take several different forms, in particular it may define the benefits as follows:

- (a) The **absolute** level of the benefits may be defined in fixed monetary terms, perhaps dependent upon the number of years of service that the employee has achieved. These fixed benefits may also be indexed in line with, for example, a price index (ie a semi-dynamic pension plan).
- (b) The level of benefits may be defined in terms of the **salary** of the employee/member, usually also dependent on the years of service achieved. The definition may be based on the salary or earnings immediately (or over a specified period) prior to the commencement of benefit payments or on the salary throughout service. These different structures are denoted **final salary** arrangements and **career average** arrangements respectively.

- **Defined Contribution Plans**

Here the **contributions** are defined and the resulting benefits calculated according to the contributions made. The level of contributions may be defined in absolute terms or by reference to the salary/earnings of the employee. The resulting benefits may then be calculated by reference to the actual or notional investment earnings achieved on the contributions, or other factors.

Benefit structures may not always fit into these separate categories and can sometimes involve elements of both types of structure (eg the “points” method used in the compulsory benefit systems in France).

The actuarial involvement in “defined contribution” arrangements reflects to a large extent the actuarial involvement in normal life-assurance savings contracts, indeed in the majority of cases defined contribution plans may well be implemented using insurance contracts. Actuarial involvement in occupational retirement provision differs more markedly from involvement in life assurance for “defined-benefit” plans and in particular “salary-dependent” plans. This report therefore concentrates mainly upon the actuarial methods and assumptions appropriate to these types of arrangement.

The degree to which defined-benefit, salary - or price - dependent plans dominate occupational retirement provision (and hence the actuarial involvement) varies from country to country and may depend on the method used for financing/implementing the benefit arrangement and the size of the pension scheme. In most countries in Europe the last decade has seen an increase in the use of defined contribution plans.

Table 1 summarises the main types of arrangement prevalent in each country. In most countries however, a range of all the types of benefit structure are usually found.

2.5 The level of actuarial involvement in occupational retirement benefits understandably reflects the extent to which the occupational benefit system itself has been developed. This in turn reflects historical factors and the conditions existing in each country, in particular:

- **The level of state and compulsory benefit provision**

A comprehensive state pension scheme providing a high level of benefits, as, for example, is the case for Italy, limits the need for extensive private/occupational provision.

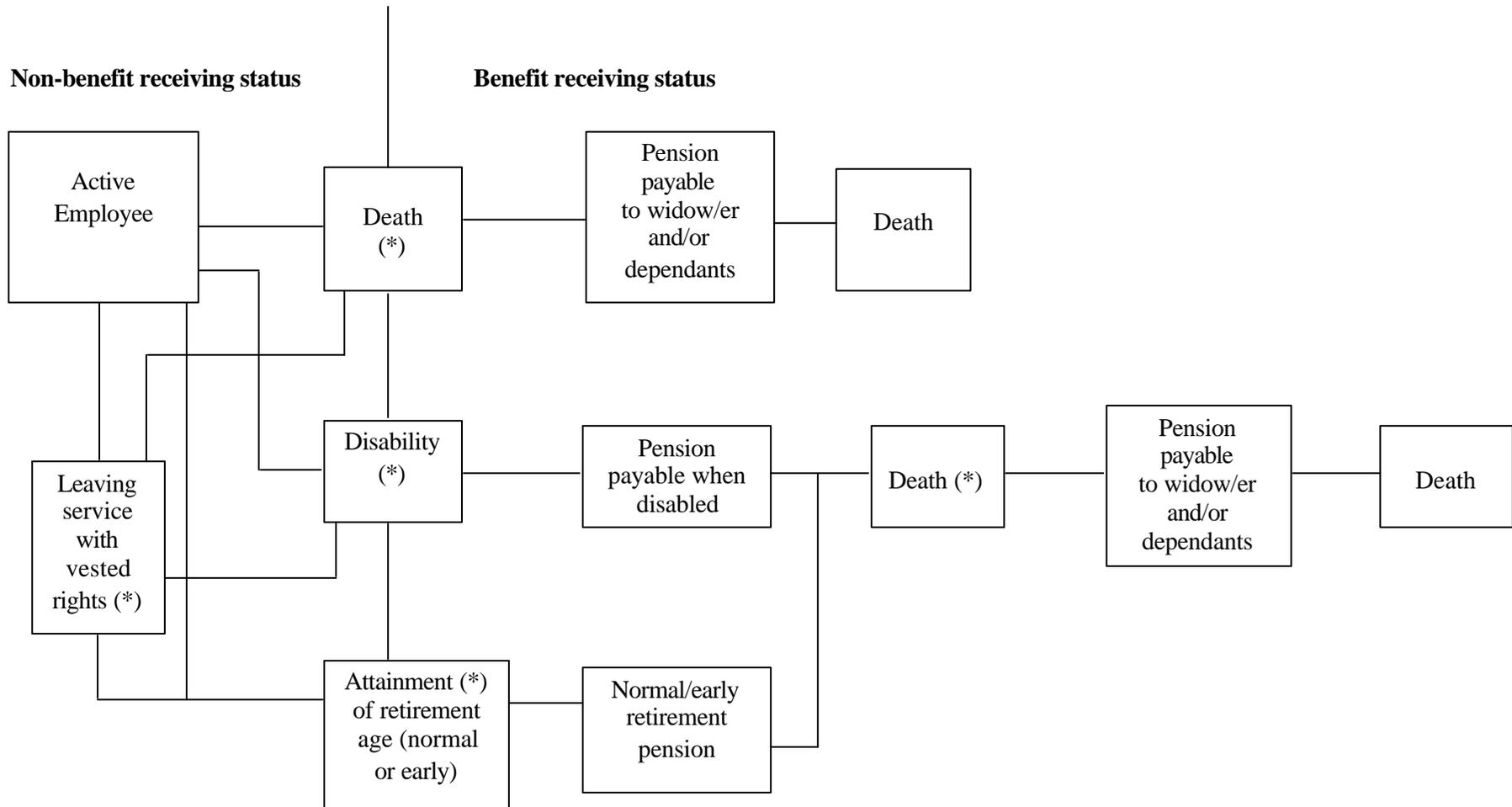
- **The taxation and supervisory framework**

The taxation treatment of occupational retirement benefits has played a major role in their development; of particular relevance is:

- (a) The taxation treatment of contributions made to an external institution providing retirement benefits. For the employer the important question is whether these contributions represent a tax-deductible expense, and if so, what restrictions are placed on their level. The employee is concerned as to whether these contributions represent taxable income at the time of their payment and how the benefits received are to be taxed.

Figure 1

MAIN BENEFITS PROVIDED FROM OCCUPATIONAL BENEFIT ARRANGEMENTS



At the changes in status marked by a (\*) a lump sum benefit may be payable.

**Table 1**

**MAIN TYPES OF BENEFIT ARRANGEMENTS**

Country	
Austria	Defined benefit plans (book reserving) and defined contribution plans (Pensionskassen). Defined contribution plans becoming more popular.
Belgium	Defined benefit plans (larger arrangements). Defined contribution plans gaining in popularity.
Cyprus	Defined benefit company schemes.
Czech Republic	Defined contribution plans under national legislation.
Denmark	Defined contribution plans.
Finland	Defined benefit plans.
France	Compulsory benefit arrangements — “ Points system” — Quasi defined contribution plan. Additional insured arrangements — Both defined contribution and final salary/career average defined benefit plans (neither type is prevalent).
Germany	Defined benefit plans. New legislation likely to cause a trend to defined contribution plans.
Iceland	Defined contribution plans based on a points system.
Ireland	Defined benefit plans. Defined contribution plans becoming more popular.
Italy	New plans are now defined contribution funded plans
The Netherlands	Defined benefit plans but defined contribution plans are now also being used.
Norway	Defined benefit plans.
Portugal	Defined benefit plans and defined contribution plans.

### MAIN TYPES OF BENEFIT ARRANGEMENTS

Country	
Slovenia	Defined benefit plans and defined contribution plans.
Spain	Defined contribution plans and defined benefit plans (defined contribution plans are becoming more popular).
Sweden	Defined benefit plans through ITP mandatory system (white collar employees).
Switzerland	Defined contribution plans and defined benefit plans.
United Kingdom	Defined benefit plans (defined contribution plans becoming more popular).

- (b) The tax-deductibility of the internal accumulation of book reserves held in respect of promises to pay retirement benefits.
- (c) The taxation treatment of investment income from funds built up to finance retirement benefits.

The extent to which the supervisory authorities have placed restrictions and requirements on the various vehicles for providing retirement benefits has also affected the extent and nature of their development.

### 3 SCOPE OF ACTUARIAL INVOLVEMENT

- 3.1 This report concentrates on the involvement of actuaries in occupational retirement provision where the benefits, as opposed to the contributions, are defined. Before looking at where and how actuaries are involved it is worth considering why there is a need for actuaries to be involved at all.
- 3.2 The promise to pay a defined retirement benefit commits the provider to the payment of amounts of money, the **timing** and **duration** of which are not fixed or certain, but dependent upon the beneficiary.

The definition of the benefits may also mean that the **amount** of the benefit is uncertain (eg if the benefit is defined by reference to final salary).

There may be a considerable delay between the promise to pay benefits being given and the actual payment of benefits. The need for actuarial involvement therefore arises from the requirement to have information on the benefits promised before they are actually paid. In particular the actuary is involved in:

- (a) projecting **when** benefit payments are to be made (demographic projection)
- (b) projecting the **level** of benefits to be paid (economic projection)

These projections involve the actuary in making **assumptions** about future events. Actuarial assumptions are discussed further in section 6.

- 3.3 The requirement of the actuary is not normally to project a series of probable cash flows arising from benefit payments (although this forms the main actuarial involvement in France).

In most countries of the EU the cost of providing the retirement benefits is to be met **before** the benefit payments are actually made (ie to “pre-fund” the benefits). This may be through allocations to a book reserve, the creation of a separate fund of assets to pay benefits or by taking out an insurance contract. The need to recognise and make provision for benefit payments in advance involves the actuary in placing a present value on the future commitment to pay benefits i.e. finding the amount that needs to be held now in order to meet an uncertain commitment in the future; this is done by discounting to a present value, the expected cash flows arising from this commitment.

The full present value of the total future benefits is not normally held (or allowed to be held) at the time when the pension promise is first granted. The “cost” of the pension promise is normally recognised gradually over the period during which the employer benefits from the services of the employee. This spreading of cost can be made in several different ways and thus involves the actuary in choosing the **method** to be used to “fund” the benefits.

The different actuarial methods commonly used are discussed further in Section 5 and are defined in Appendix 2.

### 3.4 Main actuarial calculations

The main calculations carried out by actuaries in respect of defined benefit occupational pension schemes are to determine:

- (a) The **annual cost** of providing the pension benefits; alternatively the required contribution to an external financing vehicle or allocation to a book reserve.

and

- (b) The **level** of liabilities that should be recognised at a specific point in time (the required reserves or technical provisions).

The two calculations are a function of the actuarial method used and usually form part of the same set of calculations.

For pension schemes where the **contributions** are defined the annual cost is already known. The actuary may then be involved in calculating the **benefits** that can be provided given a certain contribution (this represents setting a premium rate in the same manner as for a “normal” insurance savings contract). This calculation and the calculation (a) above are effectively the two sides of the same coin, with the unknown amount (either the contribution or the benefit) being determined from the known amount.

- 3.5 In the majority of Member States, actuaries do not enjoy a free choice of the calculation method and assumptions. The method and assumptions to be used can depend upon the vehicle with which the pension scheme is implemented and the purposes for which the calculations are being made. The restrictions can have an absolute nature (prescribing a single method and set of assumptions) or prescribe a minimum or maximum, either in the method and basis itself or in the ultimate result. These restrictions may be placed by a number of different bodies interested in the results of the calculations, most notably the following:

- (a) **Taxation authorities;**

who may wish to restrict the level of contributions to an external fund or allocations to a book reserve that can be treated as a tax deductible expense.

- (b) **Supervisory authorities;**

who may wish to ensure that the funding of a pension plan is sufficient to enable all benefits to be paid. This may involve placing minimum levels on the contributions paid to, and assets held in, an external fund or benefit providing institution.

- (c) **Accountancy bodies;**

who may wish to ensure that the cost of providing pension benefits is recognised according to accepted accounting principles.

These different aims can, and do, come into conflict when the actuary makes the calculations. Typically calculations for funding purposes (ie determining the contributions payable) and accounting purposes (ie determining the P&L and Balance sheet impact for the sponsoring employer) are different.

- 3.6 As mentioned above the financing vehicle used to provide the retirement benefits has an effect on the actuarial involvement. The main methods of providing retirement benefits are shown pictorially in figure 2. The structures A and B can be further complicated by the involvement of insurance as shown in figure 2a.

For each implementation method the main actuarial involvement is as follows:

#### A **Direct Pension Promise**

Here the benefits are promised and paid directly by the employer, without recourse to an external institution. The actuarial involvement is with the internal recognition of the cost of providing the pension benefits. This involves calculating the **liabilities** that should be shown as a book reserve in the company balance sheet and the **annual cost** to be recognised in the profit and loss account. The countries where this is used as a main financing vehicle are:

- Germany
- Luxembourg (use is declining)
- Austria (use is declining)
- France – IFC retirement indemnity payments
- Sweden – ITP plans
- Other countries – for unfunded non-qualified/approved plans.

Book reserving was also commonly employed in Italy, Spain and Portugal although its use is declining and is at a relatively low level in comparison with Germany. Book reserving in Spain has been outlawed and all companies have to externally fund their liabilities by 2002.

In the UK an unfunded approach has been used by some companies when providing benefits to senior employees in respect of earnings that lie above the maximum that can be taken into account under tax approved pension funds.

Book reserves are additionally found in the Netherlands to allow for unfunded past service liabilities. As from 1 January 2000 unfunded past service liabilities are no longer allowed to be unfunded, and the past service liabilities as at 31 December 1999 have to be financed over 10 years.

In Germany there has been some trend for companies to hold assets in funds (either directly or through special Contractual Trust Arrangements) to back the book reserved liabilities.

The greater use of accounting standards such as International Accounting Standard IAS19 has led to more complete recognition of unfunded or underfunded pension liabilities on the balance sheet of the sponsoring companies.

Where the sponsoring company takes out an insurance contract to indirectly finance the benefits (as shown in figure 2a) then the appropriate contribution under the insurance contract is to be determined, which is also the result of actuarial calculations. The resultant liabilities for the insurance company will then be recognised as a part of its technical provisions.

## B Externally Sponsored Institutions

For countries with a well developed system of supplementary or occupational retirement benefits this is (with the exception of Germany) the most common way of providing benefits. Contributions are paid by the employer (and/or employee) to the separate institution which then pays benefits to the employees/beneficiaries.

The actuarial involvement is in determining the level of **contributions** that should be paid to the institution and the value of the **liabilities** of that institution. The latter calculation usually involves consideration of the **funded status** of the institution ie comparing the value of the **assets** held by the institution with the value of the **liabilities** which, according to the actuarial method used, have been accrued up to the valuation date. The value placed on the assets may also be a result of actuarial calculations.

This route is a main vehicle for providing pension benefits in:

- United Kingdom — Pension funds
- Ireland — Pension funds
- Netherlands — Pension funds
- Finland — Pension funds for supplementary pension
- France — Compulsory benefit institutions (AGIRC and ARRCO etc)
- Belgium — Pension funds (ASBL/VZW)-for larger plans
- Portugal — Pension funds
- Spain — Pension funds
- Greece — Auxiliary funds
- Austria — Pension funds (mainly defined contribution) – use is growing
- Switzerland — Pension funds
- Cyprus — Pension funds
- Iceland — Pension funds

This method is additionally used in

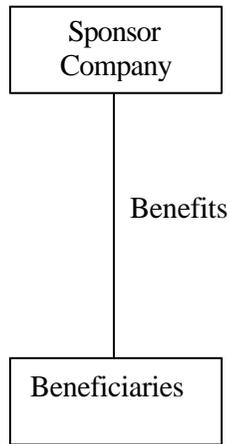
- Germany — Pensionskassen and Unterstützungskassen (support funds)
- Luxembourg — Pension funds
- Italy — Pension funds
- Denmark — Pension funds (defined contribution plans only)
- Slovenia — Pension funds (defined contribution, typically managed by insurance companies)
- Sweden — Pension funds/foundations.

Where the institution takes out an insurance contract to indirectly finance the benefits (as shown in figure 2a) then the appropriate contributions under the insurance contract are to be determined, which are also the result of actuarial calculations. The resultant liabilities for the insurance company will then be recognised as a part of its technical provisions.

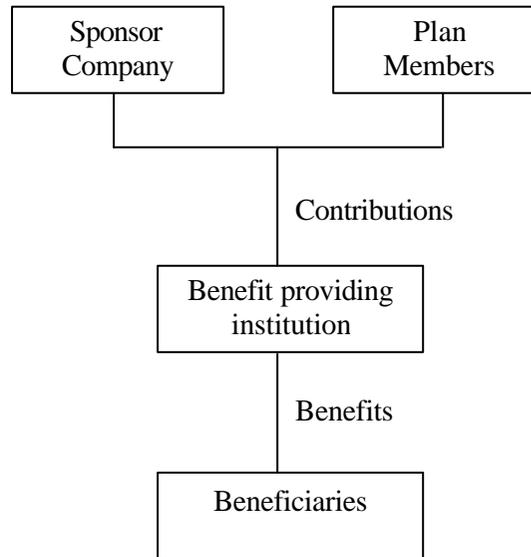
Figure 2

PENSION PLAN IMPLEMENTATION

A Direct Pension Promise (internal financing)



B Externally Sponsored Institutions



C Insurance

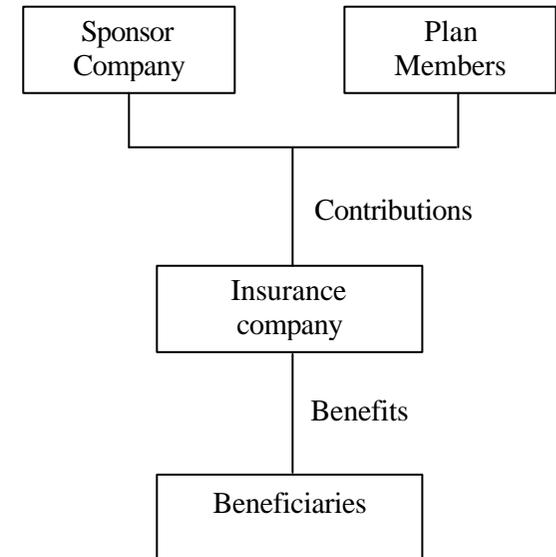
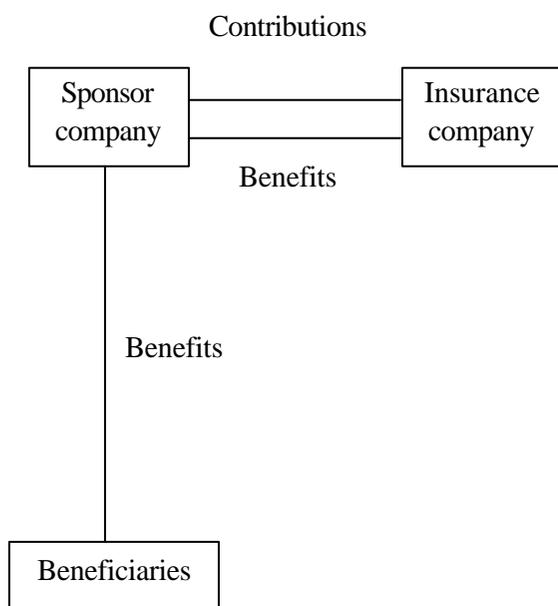


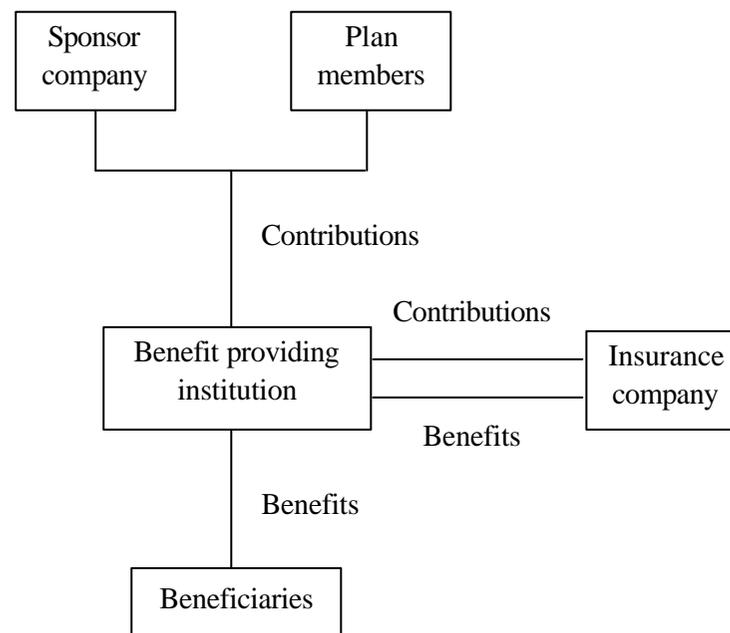
Figure 2a

PENSION PLAN IMPLEMENTATION – The use of insurance contracts to "reinsure" benefits

A Direct Pension Promise  
(internal financing)



B Externally Sponsored Institutions



## C Insurance

Here the benefits are provided by using insurance contracts taken out on the lives of the beneficiaries. Contributions are paid by the employer (and/or the employee) to the insurer and the benefits arising from the insurance contracts are paid by the insurer to the beneficiary. Actuarial calculations are required in determining the contributions to be paid to the insurance company, and the liabilities to be recognised as a part of the insurers' technical provisions. This structure is the one most commonly used when defined contribution plans are operated. The contracts are usually held on a fully allocated basis (ie a separate account is held for each individual member of the pension scheme). Of special interest is the use of group insurance contracts for the financing of defined benefit plans, particularly where non-allocated funding is allowed (as is the case for Belgium).

Insurance is used as a main vehicle for providing pension benefits in most of the member countries, although in some its use is mainly restricted to smaller pension schemes (Netherlands, Ireland, Germany, United Kingdom).

As already mentioned this report aims to concentrate on the actuarial methods and assumptions appropriate to occupational (or supplementary) retirement provision and not on actuarial involvement in insurance products. There is however a considerable degree of overlap and it would be impossible to consider the former without reference to the latter. The references to the actuarial methods used in life insurance products have been kept to a minimum and mentioned in more detail where they represent the main form of actuarial involvement (eg Denmark) or where special methods are used in respect of contracts held for retirement benefit purposes (eg Belgium).

3.7 The actual calculations undertaken by actuaries in each country are described in more detail in Appendix 1.

### 3.8 Further actuarial calculations

In all the member countries the actuarial involvement in retirement benefits does not cease with the calculation (and perhaps projection) of the overall annual cost and accrued liabilities. A non-exhaustive list of additional actuarial calculations is:

- Calculation of the amount of money to be paid when pension rights are transferred due to the individual movement of employees (individual transfer values) or on the sale (and purchase) of subsidiaries/sections and whole companies (bulk transfer values).
- Analysis of the demographic and economic experience of a pension scheme.
- Calculation of the retirement benefits payable, in particular:
  - (a) Calculation of early retirement reduction factors.
  - (b) Calculation of commutation factors for exchanging lump sum benefits for pension benefits and vice versa.

- 3.9 The payment of a “transfer value” from a pension fund or direct from the employer on the individual movement of an employee is only common practice in Ireland, the United Kingdom, Switzerland and the Netherlands. The payment is made when vested rights are to be transferred to the new employer.

In Ireland and the United Kingdom a minimum transfer value is prescribed by law as the present value of the deferred (or vested) pension otherwise payable. The actuary is given professional guidance (GN11) as to the principles on which the transfer value should be calculated.

In the Netherlands individual transfers are common. The amount transferred is usually the present value of the accrued, or vested, benefits calculated on a basis of 4% interest (with a market value adjustment) and using standard demographic assumptions. However, the market value adjustment will no longer be allowed after 2004.

- 3.10 In all the countries where a pension fund is used as the financing vehicle the actuary is required to monitor the experience of the pension fund either to determine the suitability of the assumptions or to demonstrate that a suitable safety margin exists in these assumptions.
- 3.11 The requirements as to who is able to make the main calculations mentioned in this section (in particular if an “actuary” is officially required) vary from country to country, and reflect to some extent the freedom of choice in the method and assumptions to be used. In the United Kingdom and Ireland, where perhaps the greatest freedom of choice regarding the actuarial method and assumptions exists the persons able to make the calculations are (almost) entirely restricted to members of the actuarial professional bodies. On the other hand in Germany, where the method and assumptions for the calculation of tax-allowable book reserves are fully specified, there is currently no requirement for these calculations to be carried out by a member of the actuarial professional body. In practice, however, the calculations are carried out in the vast majority of cases by the members of the appropriate professional body.

### **Asset liability modelling**

- 3.12 Over the 1990s the use of asset liability modelling to help determine the investment strategy for occupational pension funds increased significantly, particularly in countries such as the UK, Switzerland, Belgium and the Netherlands, and is in increasing use elsewhere. A variety of approaches and models are used to help those responsible for investment to determine the optimal strategy to be followed when considering a certain level of risk. This guide does not consider in any detail the approaches to asset liability modelling used in the different countries which could be a subject for a separate paper.

## **4 ACCOUNTING STANDARDS**

- 4.1 At the time the previous report was written the only countries to have fully developed accounting standards dealing with pension benefits were the UK and Ireland (SSAP24). In other countries accounting standards for pension liabilities were inferred by the more general accounting rules and regulations eg Germany and France and implemented via guidance from the accountancy bodies. This situation has changed dramatically over the last decade with the main driving factor being the implementation of the International Accounting Standard for pensions, IAS19 in 1998.
- 4.2 IAS19 has gained wide acceptance across Europe by companies for accounting for their pension costs. Indeed, the whole set of international accounting standards can now be used for local reporting purposes in many countries including Germany, France, Italy and Belgium.
- 4.3 The introduction of IAS19 has also influenced the development of country-specific accounting standards in particular, the introduction of FRS17 in the UK to replace the existing SSAP24, the introduction of RJ 271 in the Netherlands and the development of Swedish accounting standards for pensions.
- 4.4 The general trend has been towards accounting standards that reflect market conditions more closely.
- 4.5 Increasingly over the next decade companies will view pension liabilities and costs in the light of the new accounting standards which determine the impact on their profit and loss account and balance sheet. In table 2 we set out a detailed comparison of the requirements of US Accounting Standard FAS87, the International Accounting Standard IAS19, the new UK Accounting Standard FRS17 and the old UK Accounting Standard SSAP24.
- 4.6 The key aspects that are driving accounting for pension liabilities in Europe are as follows.
  1. A move to the sole use of the Projected Unit Method for determining benefit liabilities.
  2. The use of straight market values or market related values of assets rather than actuarially assessed or smoothed values.
  3. The use of best estimate assumptions for valuing the liability including best estimate assumptions for future salary growth, future pension increases and any other factors that affect the actual benefits that will be paid.
  4. The use of a discount rate that reflects the market yields on long dated, high quality corporate bonds (double A rated or above).

To the extent that the funding and technical provisions of pension funds and pension institutions differ from the requirements of accounting standards, employers will be required to recognise surpluses or deficits in respect of pension arrangements on their balance sheet that arise not solely due to the funding position of the scheme but also due to the difference between the actuarial approaches used for accounting purposes and those used for funding purposes.

**Table 2 - Comparison of Pension Accounting Standards**

	<b>UK (current)</b>	<b>UK ( new)</b>	<b>International</b>	<b>US</b>
<b>Accounting Standard:</b>	<b>SSAP24</b>	<b>FRS17</b>	<b>IAS19</b>	<b>FAS87, FAS88, FAS106, FAS132</b>
Scope	<ul style="list-style-type: none"> <li>- Legal, contractual or implicit commitment</li> <li>- Funded or unfunded</li> <li>- Covers pensions and other post-retirement benefits</li> </ul>	<ul style="list-style-type: none"> <li>- Legal, contractual or implicit commitment</li> <li>- Funded or unfunded</li> <li>- Covers pension and other post-retirement benefits</li> </ul>	<ul style="list-style-type: none"> <li>- Legal, contractual or constructive commitment</li> <li>- Funded or unfunded</li> <li>- Covers all employee benefits, including short term employee benefits and termination benefits</li> </ul>	<ul style="list-style-type: none"> <li>- Legal, contractual or substantive commitment</li> <li>- Funded or unfunded</li> <li>- Covers pension benefits (FAS87, FAS88, FAS132) and other post-retirement benefits (FAS106, FAS132)</li> </ul>
General approach	<ul style="list-style-type: none"> <li>- Profit and Loss driven</li> <li>- Stable regular cost with smoothing of assumptions and asset values</li> <li>- Gradual recognition of other items</li> </ul>	<ul style="list-style-type: none"> <li>- Balance sheet driven</li> <li>- Market-based measurement</li> <li>- No smoothing</li> <li>- No spreading</li> </ul>	<ul style="list-style-type: none"> <li>- Balance sheet driven</li> <li>- Market based measurement</li> <li>- More emphasis than FAS87 on immediate recognition and less smoothing</li> </ul>	<ul style="list-style-type: none"> <li>- Balance sheet driven</li> <li>- Market based measurement</li> <li>- Some smoothing allowed</li> <li>- Gradual recognition of some items.</li> </ul>
Ownership of assumptions	Actuary	Employer on actuary's advice	Employer (actuarial advice recommended)	Employer
Measurement frequency	Triennial (at least)	Annual update but without annual valuations	Annual	Annual
Actuarial method	Unspecified	Projected Unit Method	Projected Unit Method	Projected Unit Method

**Table 2 - Comparison of Pension Accounting Standards**

	<b>UK (current)</b>	<b>UK (new)</b>	<b>International</b>	<b>US</b>
<b>Accounting Standard:</b>	<b>SSAP24</b>	<b>FRS17</b>	<b>IAS19</b>	<b>FAS87, FAS88, FAS106, FAS132</b>
Asset valuation	Actuarial value	Market value (no smoothing)	Market value (no smoothing)	Market value (smoothing over up to 5 years permitted)
Discount rate	Long-term estimate of scheme's investment return	Market yield on a high quality (AA or equivalent) corporate bond of similar term and currency as liabilities (for funded and unfunded liabilities)	Market yield on high quality corporate bonds (for funded and unfunded liabilities)	Settlement yield/market yield on high quality corporate bonds (for funded and unfunded liabilities)
Expected return on assets	N/A	<i>Bonds</i> - market yield <i>Equities</i> - long-term estimate of investment return	Long-term estimate of expected return from scheme's assets	Long-term estimate of expected return from scheme's assets
Discretionary benefit increases	Preference is to allow in advance for increases likely to be granted, otherwise recognise capital cost in full in P&L when granted	Allow in advance if 'constructive obligation', otherwise immediate recognition of capital cost in P&L when granted (subject to vesting)	Allow in advance if 'constructive obligation', otherwise immediate recognition of capital cost when granted (subject to vesting)	Only to be allowed in advance if substantive commitment, otherwise spread capital cost when granted

**Table 2 - Comparison of Pension Accounting Standards**

	<b>UK (current)</b>	<b>UK ( new)</b>	<b>International</b>	<b>US</b>
<b>Accounting Standard:</b>	<b>SSAP24</b>	<b>FRS17</b>	<b>IAS19</b>	<b>FAS87, FAS88, FAS106, FAS132</b>
Actuarial gains/losses	Spread over working lifetime (method unspecified), with some exceptions	Immediate recognition in balance sheet via statement of recognised gains and losses; no effect on P&L	Spread over working lifetime outside optional 10% corridor (straight line method), or faster	Spread over working lifetime outside optional 10% corridor (straight line method), or faster
Settlements/curtailments (including bulk transfers)	Not specified	Gains or losses recognised in P&L on occurrence of event	Gains or losses recognised in P&L on occurrence of event, but subject to some restrictions	Gains or losses recognised in P&L on occurrence of event (FAS88), with more restrictions than IAS19
Acquisitions	Asset or liability recognised immediately in the balance sheet under FRS17	Asset or liability recognised immediately in the balance sheet under FRS17	Asset or liability recognised immediately in the balance sheet under acquisition accounting rules	Asset or liability recognised immediately in the balance sheet under acquisition accounting rules
Balance sheet limitations	None	<ul style="list-style-type: none"> <li>- Pension asset limited to surplus recoverable by employer via contribution reduction and/or refund already agreed with Trustees</li> <li>- Pension liability may, in extreme circumstances, be limited (legal advice needed)</li> </ul>	Pre-payment limited to value of refunds of surplus/future contribution reductions plus unrecognised prior-service and transition costs	Minimum recognition of unfunded accrued liability
Implementation options	Prior year adjustment or amortise over working lifetime	Prior year adjustment	Recognise transition asset immediately and obligation over up to 5 years	Transition asset/obligation recognised over up to 15 years from 1989

## 5 ACTUARIAL METHODS

- 5.1 The actuarial methods considered in this report are the methods of “funding” retirement benefits (as stated in section 3). The term “funding method” is used to refer to the way of determining the **amount** and **timing** of contributions (to a separate institution, or to an internal book reserve) made to meet the cost of providing retirement benefits. As a consequence of this spreading of cost most methods also define a “fund” that should be held at a particular point in time.
- 5.2 All the methods used can be considered prospective in that they refer to future liabilities and future contributions. The calculations are always based on the details of the current population of the pension scheme but in projecting the benefit payments to be made the population development is also projected, which for some methods (pay-as-you-go and sometimes for current/projected unit methods with a control period) will involve the projection of future new entrants to the scheme.
- 5.3 Whatever the method used, the underlying objective is always the same: the contributions made need to be sufficient to ensure that the benefits promised can be paid when they fall due. Apart from this overriding objective, the aims of the various actuarial methods may differ considerably.

The first differentiation is to **when** the cost is met:

- **Pay-as-you-go method**

The cost of benefit provision is met when the actual payments themselves are made. Therefore in respect of a single individual no cost is allocated whilst he is expecting benefits, the cost of his/her pension (or other) benefits being met when they are paid (ie when he/she is in retirement).

Pay-as-you-go financing introduces the concept of using the contributions made in respect of one generation (current employees) to pay the benefits accrued by another (current pensioners). This cross-subsidisation means that the contribution rate is sensitive to the relative development of the active and retired populations and in addition to the development of real earnings in relation to pension benefits. An advantage of the method is that on the introduction of the pension scheme, contributions in respect of active employees can be used immediately to pay pension benefits to retired people who would have been members of the scheme during their working lives had it existed then. Under a “funded” pension scheme, contributions would be needed to build up both a fund for actives and to pay benefits to pensioners. This could potentially be very costly.

- **“Capitalisation” or “funded” methods**

The cost of benefit provision is met when the employer is still benefiting from the services of the employee (ie whilst he or she is active). The aim in respect of each individual is to have accrued an amount equal to the present value of all future benefit payments at the point in time that he/she leaves the services of the employer.

**Table 3 – Actuarial Funding Methods**

<i>Country</i>	<i>Financing Vehicle</i>	<i>Fund Methods (where applicable)</i>
Austria	Pension Fund and Book Reserves	Attained Age method and Individual Entry Age method (Projected Unit method sometimes used for pension funds).
Belgium	Pension Funds	Projected Unit method, Aggregate method, Current Unit method.
	Group insurance contracts (in conjunction with non-allocated funding)	Usually Aggregate method, in combination with individually allocated insurance premiums.
Cyprus	Pension Funds	Projected Unit method, Entry Age method, Attained Age method, Aggregate method,
Denmark	Pension Funds and Group insurance (all defined contributions)	Individually allocated level insurance premiums. Benefits and reserves calculated using Thiele's differential equation.
Finland	Pension Funds	Current Unit method.
France	Compulsory benefit systems	Pay-as-you-go method (on a multi-year approach).
Germany	Book Reserves	Individual Entry Age method but with the Projected Unit method becoming more popular for commercial accounting. Aggregate method also used.
Iceland	Pension Funds	Variation on Aggregate method.
Ireland	Pension Funds	Mainly Projected Unit method. Attained Age method also used.

**Table 3 – Actuarial Funding Methods**

<i>Country</i>	<i>Financing Vehicle</i>	<i>Funding Methods (where applicable)</i>
Netherlands	Pension Funds	Current Unit method for non reinsured funds. Projected Unit method also used. Reinsured funds use the Attained Age method. Projected Unit method to be used for accounting.
Norway	Pension Funds	Current Unit method and Level Annual Premium method.
Portugal	Pension Funds	Projected Unit method.
Spain	Pension Funds	Projected Unit and Entry Age method.
Sweden	Pension Foundations and Book Reserves	Variation on Entry Age method. Some international companies use Projected Unit method for accounting purposes.
Switzerland	Pension funds	Current Unit method (Entry Age method sometimes used).
United Kingdom	Pension fund	Mainly Projected Unit method. Attained Age, Entry Age and Aggregate methods also used, although their use is declining.

Funding therefore removes the element of cross-subsidisation that exists in a pay-as-you-go scheme but in doing so places a reliance on the level of investment return achieved (external funding) or the continued existence of the employer (internal funding-book reserving).

Capitalisation methods may be further broken down according to how the cost is met over the active service period:

- **“Fund-driven” methods**

where the aim is to maintain a certain level of “funding”, which then defines the contribution required. The following methods fall under this heading:

Current Unit method  
Projected Unit method

- **“Contribution-driven” methods**

where the aim is to define a certain level of contribution, which then defines the level of “fund” to be accrued by a specific point in time. The following methods fall under this heading:

Entry Age method  
Attained Age method  
Aggregate method

Each method may be characterised by two main criteria:

- (a) The **security** of the method. This relates to the required amount of the “fund” to be held at any one time in relation to the total liabilities.
- (b) The **stability** of the resultant annual cost. The stability of a method would normally be considered in terms of the conditions required to ensure that the annual cost as defined by the method remains relatively stable (when expressed as a percentage of salaries).

The details of all the methods mentioned above including their characteristics with reference to these two criteria are set out in Appendix 2.

- 5.4 The methods used in each country are set out in more detail in Appendix 1. Table 3 gives an overview as to the main funding methods used in each country. The table demonstrates that in most countries (especially where the use of pension funds is widespread) a range of methods are applied and it is not therefore possible to neatly allocate a single method to each country. Some general comments can however be made.

The **Pay-As-You-Go method** is the main stay of retirement provision in France, although its use is not restricted to this country. The **Current Unit method** is the most common way of funding for Dutch, Finnish, Norwegian and Swiss self-administered pension funds. In the United Kingdom, Ireland and Belgium (pension funds) the **Projected Unit method** is the most common choice; this method is however also used by Spanish, Portuguese and Dutch pension funds and where IAS19 is applied for commercial accounting purposes. The **Entry Age method** is always used for calculating tax deductible book reserves in Germany, but is again used elsewhere. Where insurance funding is popular the Level Annual Premium method is commonly used.

- 5.6 The different methods used in each country do not only represent the different philosophies of actuaries regarding the “funding” of pension schemes and the recognition of pension cost. The differences also reflect the historical development of retirement provision, the freedom of choice available to the actuary and correspondingly the restrictions placed upon the actuary by the actuarial, taxation, supervisory, accounting or other bodies.
- 5.7 In post-war France the repartition system enabled the complementary schemes to provide immediate pension benefits to the retired population whose pension rights (if any) under pre-war schemes had been rendered practically worthless by inflation. The subsequent rise in real earnings and the relative development of the active and retired populations enabled the real value of pension benefits to be maintained without unacceptably large increases in contribution rates.
- 5.8 Overall there is a general trend towards the use of the Projected Unit method for accounting purposes eg numerous large German companies use the Projected Unit method for commercial accounting purposes.
- 5.9 Where the actuary does not enjoy complete freedom in choosing the method to be used the restrictions imposed can take several different forms, as detailed below:

(i) **Absolute restriction:**

The method to be used is fully prescribed and leaves no freedom of choice for the actuary, eg:

- Calculations made to determine the tax allowable book reserves held in Germany **must** use the Individual Entry Age method, with a minimum entry age of 30 (see section on actuarial assumptions).

An absolute restriction may not be placed in theory but in practice restriction to a single method or range of methods may exist. This type of restriction is the one most commonly found for the funding of group insurance arrangements, whereby the insurance supervisory authority must approve all funding methods used but restricts its approval to a single method or range of methods, eg:

- Contributions to a Pensionskasse in Germany are usually restricted to those calculated according to the Individual or Annual Level Premium methods or Aggregate method.

- Spanish qualified pension funds should normally use the Projected Unit method or Entry Age method.
- Contributions under group insurance arrangements with allocated funding are restricted to the individual level annual (or recurrent single) premiums calculated according to the approved assurance tariffs (eg in Denmark, Belgium, Germany).

(ii) **Freedom of choice but with maximum and minimum restrictions:**

Here the actuary may be free to choose the actuarial method of funding but with restrictions on the maximum (usually applied by taxation authorities) or minimum (usually applied by supervisory authorities) contribution/funding levels. The nature of the restrictions, and the method by which it is defined have an effect on the funding method used in practice, eg:

- In the United Kingdom a **maximum** funding level is prescribed by the taxation authorities in terms of the standard fund under the Projected Unit method using specified assumptions, there is also a minimum funding requirement.
- In the Netherlands a minimum funding level is prescribed by the Supervisor as the present value of accrued benefits increased with a buffer for investment risks.
- The supervisory authorities in Belgium impose a minimum funding requirement for pension funds equal to the present value of accrued benefits (ie the standard fund under the Current Unit method). The individually calculated premiums under group insurance arrangements must exceed a specified minimum (described in appendix 1).
- The German accounting guidelines specify that the **minimum** value to be recognised as a pension liability in the commercial accounts of the sponsoring company is that calculated according to the German tax code (book reserved plans).

(iii) **Freedom of choice but with specific requirements or aims as to the resulting funding level and/or contribution**

Requirements placed by accountancy institutions usually fall into this category, eg:

- The German accounting regulations require that the method of calculating the pension liabilities to be recognised in the commercial accounts of the sponsoring company (book-reserved plans) should:
  - (a) take pensions in payment and deferred pensions at their full present value
  - (b) spread the cost of providing benefits for actives over the active service period

- The current accounting standard in the United Kingdom and Ireland (SSAP 24) require that:
  - (a) The cost of providing pensions should be spread in a systematic manner over the period during which the employer is benefiting from the services of the employee.
  - (b) The resultant regular annual cost should remain stable as a percentage of salaries.

The new standard FRS17 adopts a different approach.

- IAS19 – The accounting standard prescribes the use of the Projected Unit method, as do FRS17 (UK) and RJ271 (NL).

### 5.10 Group Insurances

The methods used to calculate the premiums payable under group insurance contracts taken out to directly or indirectly finance final salary type plans are also of relevance to this report. The methods used in Belgium and Germany have been briefly described in Appendix 1. Full information was not collected for the other member countries, but a common structure for this type of arrangement is:

- (i) Level annual premiums (or recurrent single premiums) are calculated for each individual based on their individual benefits and age at entry (benefits are not normally projected). The premiums relate to deferred annuity contracts.
- (ii) The level annual premium is reviewed at regular intervals (eg each year) to allow for increases in the plan benefits taking into account increases in the insurance benefits arising from profit participation.

- 5.11 Where a separate fund of assets is held to finance the pension liabilities (pension fund) the actuary will also be involved in placing a value on the assets so as to determine the funded status of the pension fund (the ratio of the assets to be recognised under the funding method to the value of the liabilities) and to directly (aggregate method) or indirectly (through amortisation of any surpluses or deficits) determine the contribution to be paid to the fund. The three main ways of valuing assets are set out in Appendix 2.

Table 4 below sets out (where relevant) the value usually placed on the assets of the pension funds.

**Table 4 – Valuation of assets**

<i>Country</i>	<i>Funding Vehicle</i>	<i>Valuation of assets</i>
Austria	Pensionskassen	Market value
Belgium	Pension Funds	Market value
Cyprus	Pension Funds	Market value
Denmark	Pension Funds	Book value (*)
Finland	Pension Funds	Book value (market value when less)

<i>Country</i>	<i>Funding Vehicle</i>	<i>Valuation of assets</i>
Germany	Pensionskassen	Book value (market value when less) but market value for IAS19 calculations
Iceland	Pension Funds	Adjusted book value
Ireland	Pension Funds	Discounted income value, alternatively average market value/market value
Netherlands	Pension Funds	Market value/Book value
Norway	Pension Funds	Market value (for accounting purposes)
Portugal	Pension Funds	Market value
Spain	Pension Funds	Market value
Sweden	Pension Funds	Book value for local statutory reports, market value for accounting purposes (IAS19)
United Kingdom	Pension Funds	Discounted income value, alternatively market value: Market value calculations are now prevalent.

(\*) Surplus calculations

5.12 The frequency with which actuarial calculations are made also varies between member countries. Table 5 below summarises the situation.

**Table 5 – Frequency of actuarial valuations**

<i>Country</i>	<i>Funding Vehicle</i>	<i>Frequene of actuarial valuations</i>
Austria	Book reserve/Pension Funds/Insurance	Annually
Belgium	Pension Funds Group insurance	Annually
Cyprus	Pension Funds	3-yearly but sometimes annually
Denmark	Pension Fund/Insurance	Annually
Finland	Pension Funds	2-yearly
Germany	Book reserves Pensionskassen	Annually 3-yearly but sometimes annually
Iceland	Pension Funds	Annually
Ireland	Pension Funds	3-yearly
Italy	Pension Funds	3-yearly
Luxembourg	Book reserves/Pension Funds	Annually
Netherlands	Pension Funds	Annually
Portugal	Pension Funds	Annually, sometimes 3-yearly
Spain	Pension Funds	Annually, sometimes 3-yearly
Switzerland	Pension Funds	Annually, sometimes 3-yearly
United Kingdom	Pension Funds	3-yearly

The extent to which benefits are included in the funding calculation, or are treated separately and charged on a “risk premium” basis varies.

In Germany **all** benefits are deemed to accrue and therefore a full multiple decrement table is used, with no benefits (other than orphan's benefits) being excluded from the funding calculation. This is also usually the case in the United Kingdom and Ireland when the entry age, aggregate and attained age methods are used.

The most common funding method in the United Kingdom is, however, the Projected Unit method. Under this method old age, dependant and disability pensions are deemed to accrue and therefore a full multiple decrement table is included in the funding calculations (except for smaller schemes where this may not be the case). Lump sum death benefits are commonly paid and are often not deemed to accrue. The cost of lump sum death benefits and that part of the dependants and disability pensions that are provided over and above the accrued benefits are therefore often charged on a "risk premium" basis. This is also the practice for pension funds in the Netherlands when allowing for dependants benefits that are calculated on a projected basis. Disability benefits are usually charged on a full risk premium basis where they are provided by Belgian pension funds.

## 6 ACTUARIAL ASSUMPTIONS

6.1 The actuarial assumptions required in the valuation of retirement benefits can be broken down into two main categories:

(i) **Economic assumptions**

Economic assumptions are required to project the **amount** of benefits that will be payable.

(ii) **Demographic assumptions**

Demographic assumptions are required to project **when** benefits will be payable.

In most cases the projected series of benefit payments are then **discounted** using a specified rate of interest to determine a present value, to reflect the fact that amounts held now to meet future liabilities can be invested (internally or externally) and attract additional income in the time before they are required to meet benefit payments.

### 6.2 Economic assumptions

A non-exhaustive list of the economic assumptions made by actuaries in valuing retirement benefits is as follows:

- Interest rate for discounting future cash flows
- Rate of price inflation
- Rate of increase in salaries
- Rate of increase in pensions in payment
- Rate of increase in pension benefits for deferred pensioners
- Rate of increase in state pension benefits
- Rate of increase in dividends/rental income from assets.

Their inclusion and level is dependent upon the actual benefits provided, the economic factors affecting the country/employer and the specific restrictions placed upon the actuary when making calculations.

6.3 In all cases (including the multi-year pay-as-you-go projection for France) a rate of interest for discounting is used. The interpretation of what it represents may however differ. Where corresponding assets do not **directly** exist (eg for a book reserved plan) or exist but are not considered to be valued as an integral part of the liability valuation then the discount rate represents an absolute discount rate.

In the United Kingdom and Ireland, where the assets held in a pension fund are sometimes valued as an integral part of valuing the liabilities and are valued by projecting the income and capital proceeds from these assets, then the discount rate is usually considered to represent the rate of interest to be earned on **new** investments made in the future.

6.4 The approach to choosing the economic assumptions fall into two main categories:

(i) **Interest rate only**

Here no assumptions as to future increases in benefits (due to salary increases or price inflation) are made, the calculations being based solely on the level of benefits calculated with reference to amounts valid as at the valuation date. Therefore the only **explicit** economic assumption made is the rate of interest to be used for discounting.

The use of only an interest rate assumption usually reflects restrictions placed upon the actuary by supervisory and taxation authorities. The interest rate used, however, is normally lower than the rate that would be chosen as a long term realistic rate of interest and may therefore be said to **implicitly** allow for future benefit increases (ie it represents a “net” rate of discounting).

Examples of this are:

- **Germany:** Calculations made according to the tax code for book reserved pension plans must use a “net” interest rate of 6% with no further economic assumptions. Calculations made for Pensionskassen use a “net” interest rate of eg 3.5%. It is noted however that a growing number of companies are applying accounting standards, IAS19 or FAS87 for accounting purposes.
- **Netherlands:** A “net” discount rate of 4% is the maximum allowable by the supervisory authorities (for pension funds). A salary increase assumption of up to 4% is allowed by the supervisory authorities but is rarely used in practice. Tax allowable book reserves have to be calculated according to the market interest rates available on a package of government bonds, no salary increase assumptions are to be made. It should be noted some funds apply a “full” set of economic assumptions, and that the new accounting standard in the Netherlands will require a full set of economic assumptions to be used.
- **Sweden:** A discount rate of 3.75% is specified as the rate to be used in book reserve calculations (before deducting allowance for tax and expenses). Insurance companies can use a maximum rate of 3.0% (again before deducting tax and expenses).

Where group insurance contracts are used and the contributions are calculated according to the insurance tariffs in operation a single net interest rate is (must be) used that complies with local requirements with regard to the setting of insurance company premiums, eg in Germany 3.25% in the Netherlands 3% (for new production from 1999).

(ii) **Full set of assumptions**

Here explicit assumptions are made for each of the factors affecting the level of benefits and a “gross” rate of interest is used. This is usually the approach where the actuary is given freedom to choose the assumptions used (possibly within limits). The situation is found for calculations relating to pension funds in:

- United Kingdom
- Ireland
- Netherlands (occasionally and for accounting under new standard)
- Portugal
- Spain

- Belgium (additionally for group insurance contracts using an equalisation fund)
- Cyprus
- Other countries if IAS19 is followed.

The assumptions in this case usually represent a best estimate of the long term development of interest earnings, salary and prices inflation, but the discount rate may be chosen by reference to market bond yields.

- 6.5 The economic assumptions used in each country are described in more detail in Appendix 1.
- 6.6 Table 6 sets out the main assumptions commonly used for funding calculations in each country when valuing a final-salary type pension plan. Where a full set of economic assumptions is used the absolute level of each individual assumption is not as important as the relative level of the assumptions. This is because the “net” discount rate is what affects the results of the calculation. The “net” discount rate reflects the combined effect of discounting a benefit payment at a certain gross discount rate whilst at the same time increasing the amount of that benefit at a certain rate. The table below compares the “net” discount rates used (for the same situation as Table 7).

**Table 6 – Typical net discount rates**

<i>Country</i>	<i>Net discount rate used when benefits increase in line with salaries %</i>	<i>Net discount rate used when benefits increase in line with price inflation %</i>
Austria (*)	6	6
Belgium (**)	2 to 3.5	3.5 to 4.5
Cyprus	2	4
Finland	3.5 to 4.25	3.5 to 4.25
Germany (*)	6	6
Iceland	3.5	2
Ireland	2 to 3	3 to 5
Italy	2	2
Netherlands (*)	4	4
Portugal	2	3 to 4
Spain	1 to 2	2 to 2.5
Sweden(*)	3.75	3.75
Switzerland	4	4
United Kingdom	2 to 3	3 to 4.5

(\*) Assumptions not the free choice of the actuary.

(\*\*) Assumptions may vary between those shown and the maximum 6%.

This table would indicate that given the same salary/inflation related benefits and the same method the German calculation would produce the lowest value, followed by Finland, Swiss and Dutch calculations. The value produced by the UK, Ireland, Italy, Belgium (see (\*\*) above) and Spain would be the highest calculations. This may not be the case in practice due to the different demographic assumptions used and the different financing methods that are applied, and within each country, assumptions at different ends of the ranges may be used.

**Table 7 – Typical Actuarial Assumptions**

<i>Country</i>	<i>Financing vehicle</i>	<i>Interest rate</i> %	<i>Price inflation</i> %	<i>Salary increases</i> %	<i>Pension Increases</i> %	<i>State pension benefit increases</i> %
Austria	Pension Funds	3.5 – 6.5	1.0 – 2.5	2.0 – 5.0	1.0 – 4.0	1.0 – 3.0
	Book Reserves	6.0	0	0	0	0
Belgium	Pension Funds	6.0	1.5 to 2.5	2.5 to 4.0	(*)	1.5 to 2.5
	Group insurance contract					
Cyprus	Pension Funds	6.5	2.5	4.5	4 - 4.5	4.5
Denmark	Not applicable (all defined contribution arrangements)					
Finland	Pension Funds	3.5 to 4.25(**)	0	0	0	0
Germany	Book reserved pension schemes	6.0	0	0	0	0
	Pensionskassen	3.5	0	0	0	0
	Best estimate calculations	5.0-7.5	1.5-2.5	2.0-3.5	1.0-2.5	0.5-3.0
Iceland	Pension Funds	3.5	0	0	0	0
Ireland	Pension Funds	7.0	3.0	5.0	(*)	4.0
Italy	Pension funds	4.0	2.0	2.0	1.6	2.0
Netherlands	Pension Funds	4.0	0	0	0	0
Portugal	Pension Funds	5.5	2.0	3.5	2.5	2.0
Slovenia	Pension Funds (net rates)	4.0	0	3	0	0
Spain	Pension Funds	4.0	1.5 to 2.0	2 to 3	(*)	1.5 to 2.0
Sweden	Pension Funds and Book Reserves	3.75	0	0	0	0
Switzerland	Pension Funds	4.0	0	0	0	0
United Kingdom	Pension Funds	6.5	3.0	4.5	(*)	3.0

(\*) Dependent on the pension increases to be granted (usually up to price inflation)

(\*\*) 4.25% is the maximum but it is decreasing annually to 3.5%

Note: For pension funds in Belgium assumptions lying between the minimum and “realistic” basis shown above are used.

6.7 The choice of economic assumptions is restricted in the same three ways as the method of funding.

(i) **Absolute restrictions:**

As described for Germany (tax code calculations for book reserves) and where insurance tariffs apply.

(ii) **Freedom of choice but with maximum and minimum restrictions:**

Belgium:

The supervisory authority specifies that the assets held in a pension fund must exceed present value of accrued liabilities calculated at an interest rate of 6%.

United Kingdom:

The taxation authorities specify a maximum funding level on a prescribed basis (see Appendix 1). A minimum funding level is also prescribed that considers the value of certain accrued benefits valued effectively, at market interest rates.

Spain:

Maximum net discount rate 4%. Other economic assumptions should be consistent with the discount rate used.

Netherlands

Freedom of choice with a minimum restriction of a net discount rate not more than 4%.

(iii) **Freedom of choice but with specific aims:**

United Kingdom and Ireland:

The commercial accounting standard SSAP24 requires that the actuarial assumptions made should, when taken together, represent a “best estimate” of future events.

6.8 The restrictions applied to the economic assumptions and the background to their choice are given in more detail in Appendix 1.

6.9 Unique to the United Kingdom and Ireland is the use of actuarial methods when valuing assets held in a pension fund. This implies the use of dividend/rental income increase assumption and also other assumptions including possible use of a model portfolio. This approach to valuing assets is however declining in use.

6.10 **Demographic assumptions**

Demographic assumptions are used to project the development of the population of the pension scheme and hence **when** the benefits to be provided will be paid. Figure 1 in section 2 showed the main categories of membership that exist in a typical pension scheme. The demographic assumptions project when a member is likely to progress between these various categories and how long he/she stays in each category.

6.11 The assumptions may be expressed in a continuous form (eg in Denmark and Finland), although the normal practice is to express them in a discrete form.

6.12 Table 8 shows a non-exhaustive list of demographic assumptions made for each country and indicates which ones are typically used in the valuation of future benefits for an active member.

The main points to be noted from the table are:

- In all cases a rate of mortality is included in the calculations.
- Where disability benefits are provided in Germany, Ireland, Denmark, Luxembourg, Spain and the United Kingdom it is normal practice to include a disability decrement and hence to value explicitly the disability benefits for an active member. In Belgium and Portugal disability benefits (when provided) are usually charged on a full “risk premium” basis. A single decrement table is therefore employed for actives.
- The inclusion of a withdrawal and early retirement decrement is normal practice for funding calculations in Ireland and the United Kingdom but they are also sometimes employed in Spain and Portugal. The German tax code allows for withdrawal/turnover on a flat rate basis by excluding all those plan members under age 30 and by specifying this age as the minimum entry age to be used in book reserve calculations. An explicit withdrawal assumption is allowed if it can be shown to be based on relevant employee experience. In German balance sheet calculations withdrawal assumptions are allowed to be made, and in actuarial valuations for take-over purposes a withdrawal assumption would normally be included (in conjunction with a lower minimum entry age).

The Belgian (minimum funding — pension funds) supervisory authorities forbid the use of a withdrawal assumption in funding calculations. This is also the case where contributions are calculated according to insurance tariff requirements.

- Dependants' benefits are valued in most countries using the collective method. The main exception to this is Belgium where the individual method is normally used. Orphan's benefits are not normally valued explicitly.
- The use of a salary scale to model promotional increases in pay is common practice in the United Kingdom and Ireland (this assumption is not shown in the table). A salary scale may also be used in Portugal.

6.13 The use of standard tables of mortality and disability is widespread. This is due to the use of standard tables being explicitly or implicitly specified by the relevant authorities or out of choice because the experience of the pension scheme does not justify the development of scheme specific tables.

In Belgium the standard mortality tables MR/FR and MK/FK are used almost in all calculations; the supervisory authorities require their use for minimum funding and insurance tariff calculations.

In Denmark tariffs are calculated on the standard G82 tables of mortality and disability.

**Table 8 – Typical demographic assumptions made for an active employee**

<i>Country</i>	<i>Mortality</i>	<i>Disability</i>	<i>Recovery from disability</i>	<i>Withdrawal</i>	<i>Early retirement</i>	<i>Normal retirement</i>	<i>Proportion married</i>	<i>Age difference with spouse</i>	<i>Number of orphans</i>	<i>Orphans' mortality</i>
Austria	X	X	—	—	Rarely	X	X	X	—	—
Belgium	X	X (*) (rarely)	—	—	—	X	—	—	—	—
Cyprus	X	—	—	—	—	X	X	X	—	—
Denmark	X	X	X	—	—	X	X	X	X	X
Finland	X	X	X	—	X	X	X	X	X	X
Germany	X	X	—	—	—	X	X	X	—	—
France	X	X	X	X	X	X	X	X	X	X
Iceland	X	X	—	—	—	X	X	X	X	X
Ireland	X	X	—	X	X	X	X	X	—	—
Italy	X	X	X	X	X	X	X	X	X	X
Netherlands	X	X (rarely)	X	—	—	X	X	X	—	—
Norway	X	X	—	—	—	X	X	X	—	—
Portugal	X	X	—	X (rarely)	X	X	X	X	X	X
Slovenia	X	X	—	—	—	X	—	—	—	—
Spain	X	X	—	X	—	X	X	X	—	—
Sweden	X	X	X	—	—	X	X	X	X	—
United Kingdom	X	X	—	X	X	X	X	X	—	—

(\*) “Risk premium” calculation only, for death and disability whilst active.

In Germany the “Richttafeln” from Dr Klaus Heubeck are specified by the tax authorities for tax allowable book reserve calculations, and are frequently used in calculations made for Pensionskassen.

In Spain the generational tables PEM/F-2000P and PERM/F 2000P are used. In the United Kingdom and Ireland the demographic assumptions are the choice of the actuary but need to be justified by the experience of the pension scheme in question or other similar schemes. Standard mortality tables based on the experience of insured annuitants are commonly used for mortality.

In the United Kingdom the taxation authorities specify a mortality basis for calculating the maximum funding level of a pension fund.

In the Netherlands the CBS produces mortality statistics every 5 years. The Actuarieel Genootschap produces standard tables based on those statistics, as do the insurance companies. The tables to be used are chosen by the Actuary.

- 6.14 The use of a single mortality rate at each age is the practice in Denmark and Portugal. In Belgium different mortality assumptions are applied to actives and pensioners. In Germany, Ireland, Luxembourg and the United Kingdom different mortality rates are usually assumed to apply to actives, pensioners and disability pensioners. It is normal practice to apply different assumptions to males and females, although this may be achieved by the application of an age rating or adjustment factor. The use of different assumptions for different groups of employees is common practice in the United Kingdom and Ireland.
- 6.15 Standard tables of withdrawals are not in common use. Where withdrawal assumptions are made these will normally be based on the experience of the pension scheme itself or on the experience of similar schemes.
- 6.16 The demographic assumptions used in each country and the factors affecting their choice are described in more detail in Appendix 1. Example sets of assumptions have been shown where these were made available.

## **7 REPORTING**

7.1 In the majority of cases the results of the actuarial calculations will be communicated by means of a formal report.

In Belgium a formal report will be provided to the employer and a report will additionally be produced for the employees. There are no guidelines as to the contents of the formal report but a full individual breakdown of results is normally included.

In Finland an annual formal report is provided to the pension fund signed by the appointed actuary.

In Denmark individual benefit statements are produced for the employees.

In Germany the professional body lays down guidelines as to the contents of the reports made in respect of book reserve calculations. One of these requirements is that an individual listing should be sent with the report. The supervisory authorities lay down guidelines as to the contents of the actuarial reports required in respect of Pensionskassen.

In the United Kingdom and Ireland formal actuarial reports are provided to the trustees of pension funds and must be made available to the members on request. The professional body lays down guidelines as to the contents of the report (GN9).

In Portugal formal reports are sent to the employer which conform to the guidelines set down by the insurance supervisory authority.

In the Netherlands a formal actuarial report will be sent to the Pension Foundation. Formal reports which are to be deposited with the supervisor must conform to the appropriate guidelines.

In order for Spanish qualified pension plans to receive approval, an initial detailed actuarial report must be submitted and the contents of the report are set down by the supervisory authorities. A formal actuarial report will be submitted following each subsequent valuation.

More details as to the guidelines for reporting in the case of Germany and the United Kingdom are shown in Appendix 1.

## 8 CONCLUSIONS

The assumptions and methods used by actuaries in the valuation of retirement benefits show considerable variation between the member countries of the EU. The main differences can be summarised as follows:

- The use of different funding methods.
- Different application of the same method, particularly in the choice of which benefits are to be funded, or to be charged on a year-to-year risk premium basis.
- The use of a single interest rate or the application of a complete set of economic assumptions to fully, or partly, model future benefit commitments.
- The use of demographic assumptions specific to each situation (including withdrawal decrements) or the use of standard, specified assumptions.
- The direct involvement of the actuary in the valuation of any assets held, or the use of a book or market value.

These differences in methods and assumptions do not only arise from different actuarial approaches, but reflect the different types and methods of retirement provision, the extent of their development and the extent to which taxation and supervisory authorities place restrictions on the method and/or basis to be used when making actuarial calculations.

Apart from France, advance funding methods dominate actuarial practice and the common aim is to have allowed for the full present value of future benefits by the point in time when the employer no longer benefits from the services of the the employee.

In all countries there has been a convergence of approaches when undertaking calculations for accounting purposes for multinational companies, particularly those which apply IAS19 or who are listed on the US stock exchanges and apply US GAAP (FAS87/88/106/112/132).

In the individual country sections shown in Appendix 1 the salient points have been brought out, but at the cost of a considerable degree of simplification of what in practice is usually a very complex situation.

### **Implications for EU convergence**

The implications of the different approaches to applying actuarial methods and assumptions in determining both the cost and funded status of pension plans and institutions for retirement provision across the EU are significant. At a basic level a statement that a pension plan is "fully funded" can mean very different things between the different countries of the EU. Under the recently proposed EU directive on pensions, pension plan members will receive very different levels of protection with regard to the extent to which their accrued benefits are matched by assets, dependent upon the country in which the pension plan is located and the type of pension plan that exists. If greater convergence and consistency of approach is desirable across the EU, the following questions need to be addressed.

- What funding approaches are acceptable? In this context it will need to be considered whether there should be a move to a standard measure of the funded status of the pension plan eg use of the Projected Unit method.
- The Asset Valuation methods need to be considered ie whether the use of a range of approaches to value the assets held in pension funds when determining the funded status is acceptable or whether there should be a move to eg market values.
- Economic assumptions, two issues need to be considered here. First, the whole approach to choosing economic assumptions and in particular whether a full set of actuarial economic assumptions should be mandated eg to cover discount rate, salary inflation, price inflation or whether it is acceptable for the single net interest approach to continue to be used. A second factor is the choice of these assumptions and in particular the fact that in some countries a discount rate is mandated by regulations/supervisory bodies whilst in others there is freedom for the actuary to choose the assumptions.
- Across the countries participating in the Euro it should be considered whether there is scope for harmonisation of some key assumptions eg a discount rate is certified by reference to corporate bond rates, price inflation and general salary inflation. Despite the past and expected future convergence of economies under the Euro there is still at present some significant differences in the expectations with regard to these items inherent in common actuarial practice between "Euro" countries.
- Demographic assumptions: where national tables are used, these may contain different allowances for long-term mortality and also contain different approaches to the estimation of future expected improvements in mortality. This factor can have a very significant impact on the valuation of pension liabilities and hence on the level of security provided in respect of mature pension funds.

These are just some of the considerations which will need to be addressed if it is desired to adopt a more uniform approach to the actuarial methods and assumptions required for the calculation of technical provision.

### **Postscript**

Although all of the individual country sections have been scrutinised by an actuary from the country in question, any errors or misinterpretation of the facts are the responsibility of the author. The author would like to acknowledge the contributions of the Pensions Committee of the Groupe Consultatif who provided the information upon which the guide is based.

## APPENDIX 1

This appendix summarises the main actuarial involvement in retirement benefits on a country by country basis. Each summary is divided into the following sections:

1. Actuarial involvement
2. Main actuarial calculations
3. Additional calculations
4. Actuarial methods
5. Actuarial assumptions — Economic assumptions  
— Demographic assumptions
6. Communication
7. Example assumptions

(7. is shown where applicable)

Information was received in respect of the following member countries:

- Austria — pages A-1 to A-6
- Belgium — pages B-1 to B-8
- Cyprus — pages CY-1 to CY-5
- Czech Republic — page CZ-1
- Denmark — page DK-1 to DK-5
- Finland — pages FIN –1 to FIN-4
- France — pages F-1 to F-5
- Germany — pages D-1 to D-11
- Iceland — pages IS-1 to IS-3
- Ireland — pages IRL-1 to IRL-9
- Italy — pages I-1 to I-7
- Latvia — pages LA-1 to LA-5
- Netherlands — pages NL-1 to NL-5
- Norway — pages N-1 to N-4
- Portugal — pages P-1 to P-3
- Slovenia — pages SL-1 to SL-6
- Spain — pages ES-1 to ES-3
- Sweden — pages S-1 to S-8
- Switzerland — pages CH-1 to CH-3
- United Kingdom — pages UK-1 to UK-9

# AUSTRIA

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Austria calculations are made by actuaries in respect of company-sponsored and industry-sponsored pension schemes which provide defined benefits and are financed using book reserves, pension funds and directly through insurance contracts.

The use of actuarial methods is a requirement of the taxation, supervisory and commercial accounting authorities (see section 4).

About half of the company pension plans are financed by book reserves, more than one third by pension funds and the rest by insurance contracts.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries:

### (a) **Calculation of the value of the accrued liabilities of a pension scheme financed by book reserves**

This calculation is made annually and is required for the following purposes:

- (i) To satisfy the taxation authorities as to the tax-restrictions stated by law for the book reserve being set up by the sponsoring company.
- (ii) To provide the company with a book reserve value to satisfy the commercial accounting requirements to recognise pension liabilities in accordance with legislation and accepted accounting principles.

The annual expense in respect of providing pension benefits is not calculated separately but is derived from the liability calculation (see section 4).

Insurance contracts may be taken out in conjunction with book reserve financing in the following two ways:

### (b) **Calculations of the liabilities and required contributions of a pension fund**

A pension fund may be set up as a single-employer or a multi-employer pension fund. In both cases pension funds are supervised by a government authority. This government authority also has to approve the compulsory and detailed actuarial business scheme. All actuarial calculations have to be carried out in accordance with the business scheme.

Calculations and valuations have to be carried out at least annually.

(c) **Insurance contracts**

The premiums payable under insurance contracts are calculated by actuaries. They have to be carried out according to the actuarial business scheme of the insurance company.

(d) **Calculations following International Accounting Standards**

For an increasing number of companies it is necessary or at least desirable to state the liabilities and cost of a pension plan according to IAS. In this case the method of valuation and the way to choose assumptions follow IAS and therefore will not be commented in detail in this report.

### **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations concerning company pension plans are also undertaken by actuaries:

(a) **Calculation of transfer values**

The transferability of pension rights by individuals in case of moving from one employer to another is set up by law. The minimum requirements for the transfer amount are stated differently for direct pension promises, pension funds and insurance contracts.

In case of a take-over or a merger there exist also minimum legal requirements.

(b) **Calculation of lump sums**

Calculations of lump sums paid instead of life annuities in the case of direct pension promises are undertaken by actuaries. Calculation of lump sums can either take place on their own or when changing a direct pension promise financed by book reserves into a defined contribution plan financed by a pension fund.

### **4 ACTUARIAL METHODS**

For the main types of actuarial calculations performed the following methods are employed:

(a) **Calculation of the value of the accrued liabilities of a pension scheme financed by book reserves**

(i) *Calculations for tax purposes*

The Austrian tax law specifies that the method to be used when calculating the accrued liabilities to be recognised with a tax-deductible book reserve is the attained age method using a discount rate of 6 % and no projection of salaries and benefit payments. The accrued liability is therefore the standard fund under this method, as described in Appendix 2.

As there was a change in tax regulations in 1988 yielding significantly higher tax deductible book reserves there is a 20-year period to amortise the difference caused by regulations. So the book reserves with regard to tax regulations is the accrued liability calculated by the attained age method reduced by the unamortised part of the difference that occurred when first applying the new tax regulations.

The annual pension expense to be shown in the taxation profit and loss account is the difference between the attained age reserves as at the beginning and end of the fiscal year (reduced as described above) plus the employers benefit payments during the year.

(ii) *Calculations for the commercial balance sheet of the sponsoring company/organisation*

For the purposes of recognising accrued pension liabilities in the commercial balance sheet in most cases the individual entry age method and in some cases the attained age method is used. Discount rates vary mostly between 3.5 % and 4.5 %, in some cases up to 6 %.

For groups of companies the projected unit credit method as stated in IAS 19 is used in an increasing number of cases.

The commercial accounting regulations place the following restrictions on the method to be used:

- (1) That it produces a liability consistent with a reasonable commercial view.
- (2) The method should be actuarially recognised.
- (3) Pensions in payment and deferred pensions should be taken at their full present value.
- (4) The cost of benefits for actives should be spread over the active service period.

(b) **Calculation of the liabilities, contributions and benefits of a pension fund**

As pension funds in Austria cover a wide variety of plans there is also a variety of actuarial methods involved in calculating liabilities and contributions.

(i) *Defined benefit plans*

(1) Attained age method

Most pension funds use the attained age method to calculate liabilities and contributions. The underlying assets are recognised at their market value smoothed by a contingency reserve (“Schwankungsrueckstellung”). This contingency reserve can range from a maximum of 20 % of assets to a minimum of –5 % of assets. The mechanism calculating the contingency reserve is described in details in the Austrian pension fund law (PKG).

(2) Individual entry age method

This method is not so commonly used to calculate annual contributions but is mostly used to calculate transfer amounts when changing an unfunded plan (direct pension promise financed by book reserves) into a plan financed by a pension fund. In some cases the calculated transfer amounts are increased by an initial contingency reserve.

(3) Projected unit credit method

Projected unit credit method is used mainly by pension funds set up by big companies that are members of a multinational group.

(ii) *Defined contribution plans*

There are several types of defined contribution plans. There is the simple type of accruing assets only with respect to contribution and returns on assets and calculating benefits by turning the accrued assets into a life-time annuity. But also the type of plans including a projection of contributions to calculate benefits in case of disability or death are very common. In most cases these risks are financed by deducting annually risk premiums from the contributions.

(c) **Calculation of the liabilities and contributions for insurance contracts**

Premiums for insurance contracts are always calculated on a fully allocated individual basis and must comply with the scheme of business of the insurer. Very often the attained age method is used.

## **5 ACTUARIAL ASSUMPTIONS**

### **Economic assumptions**

(a) **Assumptions for calculating book reserves**

(i) Tax-deductible book reserves

For calculations following the Austrian tax law for book reserved plans the following restrictions apply to the economic assumptions made:

- (1) The interest rate used must be 6%.
- (2) No future benefit increases may be funded in advance unless their absolute value is given in writing in the plan rules. Therefore no salary or pension increase assumptions are to be included.

(ii) Book reserves in the commercial balance sheet

The following requirements concerning the economic assumptions apply in respect of calculations made for the commercial accounting for pension schemes financed by book reserves:

- (1) A suitable interest rate is in the range 3.5% – 6%. An interest rate of 6% may only be used when calculating using the entry age method and when no turnover rates are employed. An interest rate of greater than 6% should only be used in conjunction with salary/pension increase assumptions (where appropriate).
- (2) Salary and pension increase assumptions can only be included when they are not already recognised by using a net interest rate.

**(b) Assumptions for calculations for pension funds**

(i) Expected return on assets

The expected return on assets is involved in calculating the contingency reserve and is the maximum assumption of return when calculating future benefits. It ranges from 6% to 8%.

(ii) Discount rate

The discount rate depends mainly on the benefit-increases stated in the plan (defined benefit) or intended to give on the long run (defined contribution). It ranges from 3.5% to 6.5%.

(iii) Salary increases

Salary increases are only involved when they are not recognised by using a net discount rate. They range from 2% to 5% and in some cases depend on age and/or years of service.

(iv) Benefit increases

Benefit increases are only involved when they are not recognised by using a net discount rate. They range from 1% to 4% depending on the plan.

## **Demographic assumptions**

The demographic assumptions used for the calculation can be chosen by the actuary. In 1999 a new set of biometric tables were published by the Austrian Association of Actuaries (AVÖ). There are different tables for the different methods of calculating the actuarial age of a person and different tables for “only white-collar employees” and for “mixed white-collar and blue-collar employees”. The probabilities depend on sex, age and year of birth. These tables are used in most cases when calculating book reserves and will be used for almost all pension fund calculations performed after 2001.

In some cases the tables published in 1989 are still used. They were published only for “mixed white-collar and blue-collar employees” and their probabilities depend only on sex and age.

Different mortality assumptions are used for actives, pensioners, disability pensioners and widows or widowers.

Turnover assumptions usually are not included.

Insurance premium tariffs are based on standard tables set down in the actuarial business schemes and include allowance for expenses.

## **6 COMMUNICATION OF RESULTS**

The results of book reserve calculations for both tax and commercial purposes usually are communicated via a formal actuarial report (“Gutachten”).

There are no restrictions of who may sign the report but the auditors of the companies have an obligation to satisfy themselves as to the correctness of the calculations. In practice the reports are normally signed by an actuarial consultant.

A formal actuarial report is required for the annual valuation of a pension fund. The report has to follow the regulations of the Austrian pension fund law (PKG). The actuarial part of the report has to be set up under the guidance of an actuary. In addition there has to be a detailed annual report of the auditing actuary following the requirements stated by the supervisory authority.

The communication of the results of insurance contract valuations underlies the regulations for insurance companies.

# BELGIUM

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Belgium calculations are required from actuaries in respect of company-sponsored pension schemes which provide defined benefits and are established using either a **group insurance contract** or a **self-administered pension fund**.

In both cases actuarial involvement is a requirement of the supervisory authorities.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries in Belgium.

### a. Group insurance arrangements

For defined benefit pension schemes, group insurance arrangements normally consist of a mixture of allocated and unallocated funding (via an equalisation fund or "Fonds de Financement"); for smaller schemes fully allocated funding is normally used.

The following calculations are required:

- (i) *Calculation of the premiums required on an individual basis for allocated funding.*

The premiums required will be calculated according to the group insurance tariff. This calculation involves calculations of the mathematical reserves and present value of future benefits, on an individual basis and according to the premium tariff.

- (ii) *Calculation of the global yearly cost/total required contribution.*

Due to the aggregate method being used (see section 4) this also implies the calculation of the total liabilities of the pension scheme and the mathematical reserves and bonus allocations of the existing insurances.

The amount allocated to (or from) the equalisation fund will then equal the difference between the total contribution calculated above and the sum of the individual premiums calculated according to the group insurance tariff in (i).

- (iii) *Calculation of the minimum premiums payable*

The individual premiums calculated under (i) have to be shown to exceed a minimum which is prescribed by the insurance authorities.

The above calculations are made annually. The results satisfy both the supervisory and taxation authorities. The annual pension cost shown in the sponsoring company's accounts is the total contribution made, as calculated in (ii).

## **b. Self-administered pension funds**

For pension schemes funded via self-administered pension funds the following calculations are required:

- (i) Calculation of the value of the accrued liabilities and assets of the pension scheme.
- (ii) Calculation of annual cost/required contribution payable to the pension fund in order for it to be able to meet its future liabilities.

The above calculations are normally carried out annually and on two different actuarial bases.

The calculation on the first basis (i) is carried out to establish that the pension fund satisfies the minimum funding requirements of the insurance supervisor. The actuarial method and assumptions to be used are specified by the supervisor.

The calculation on the second basis (ii) is made to establish the financial position of the pension fund and to determine the actual contributions to be paid.

This second calculation also satisfies the taxation authorities who do not place a maximum on the allowable contribution or funding level. The pension cost for the sponsoring company is the actual contribution made.

The second basis (ii) may vary between the minimum basis (i) and a basis which fully allows for future benefit increases (see section 5). In practice many pension funds are funded at a level that is close to the minimum.

## **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in Belgium.

- a.** An analysis of the experience of a pension scheme financed via a pension fund is carried out annually for the larger pension schemes. The analysis is used to analyse the surplus/deficits arising, and not to determine new demographic assumptions.

The experience of schemes under group insurance arrangements is not normally investigated separately.

- b.** Calculation of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits payable to the members.

When an employee leaves a company having a pension scheme, a check to determine if the vested rights are fully financed is made on an individual basis.

## 4 ACTUARIAL METHODS

For the main types of actuarial calculations performed the following methods are employed:

### a. Group insurance arrangements

#### (i) *Calculation of the individual premiums for allocated funding*

The individual premium is calculated according to the group insurance tariff. This normally specifies the individual premiums to be such that the following formula is satisfied.

$$\begin{array}{rcl} \text{Present value of future} & = & \text{Present value of} \\ \text{level annual premium} & & \text{future benefits} \quad - \quad \text{Value of current} \\ & & & & \text{mathematical reserve} \end{array}$$

This calculation is normally based on the benefits as at the valuation date without projection of salaries or other items (see section 5). The level annual premium is recalculated each year based on the new salary and pension information.

#### (ii) *Calculation of the global yearly cost/total required contribution*

The global yearly cost is usually calculated using the **aggregate method** as described in Appendix 2.

For the purposes of this calculation the assets of the pension scheme are taken to be the sum of the mathematical reserves of the individually allocated insurances and the reserve held in the equalisation fund.

The individual mathematical reserves are calculated according to the net premium method, to which is added the premium and profit sharing reserves.

The aim is to establish a contribution rate as a **level percentage of salary** (final salary pension schemes).

#### (iii) *Calculation of the minimum funding level*

See (b) (i)

### b. Self-administered pension funds

#### (i) *Calculation of minimum funding level*

The minimum funding level must be determined as the present value of accrued (unprojected) benefits. This corresponds to the standard fund under the **current unit method** as described in Appendix 2.

For active employees accrued benefits are taken to be the total benefits payable on retirement multiplied by the factor  $m/n$ , where  $m$  equals the number of years of service up to the valuation date and  $n$  represents the total number of years of service possible up until retirement.

(ii) *Calculation of the annual cost/required contribution for the pension scheme*

The two most common methods used for determining the required contribution rate are the **aggregate method** and **projected unit credit method**. These methods are described in Appendix 2.

Where the projected unit credit method is used the definition of accrued benefits is as described in (i) above also taking into account the legal rules (ie the Colla law). Surpluses or deficits may be corrected immediately or amortised, but the minimum funding level is always met.

The **assets** are normally taken at their **market value**.

It is normal to only fund for old age benefits, thereby employing a single decrement table. Where **disability** benefits are provided these will be allowed for fully on a "**risk premium**" basis. Once a disability pension is in payment the full present value of future payments will be held.

## 5 ACTUARIAL ASSUMPTIONS

### Economic assumptions

For calculations 2(a)(ii) (group insurance – global cost) and 2(b)(ii) (pension fund – required contribution) the economic assumptions are the choice of the actuary. They are usually made in consultation with the employer.

Under group insurance arrangements it is normal to commute all the benefits for a lump sum at retirement. This is reflected in the actuarial calculation of the global cost, and it is normally assumed that pension benefits are commuted according to the insurance tariff (maximum 3.75% interest). The other economic assumptions will reflect a "best estimate" and usually lie within the range shown in the table below (excluding the pension increase assumption).

Under the pension fund arrangements the economic assumptions for calculation 2(b)(ii) vary between the minimum allowed (see below) and a "best estimate" of future events, depending on the funding practice of the employer. In this case pension benefits may be valued assuming the entire benefit is not commuted and the pension increase assumption will reflect both the pension increase funded for and pension increase policy of the employer. The following table summarises the economic assumptions that would be made if the aim was to fully allow for future salary increases, and if pension increases were to reflect cost of living increases. The assumptions are those appropriate to a final salary defined benefit scheme.

<i>Assumptions</i>	<i>Typical value</i>
Rate of price inflation	2% (=P)
Rate of interest	6% to 8% (=P + 4% to 6%)
Rate of increase in salaries	4% (=P + 2%)
Rate of increase in pensions	2% (=P)
Rate of increase in social security benefits	2% (=P)

Calculations pursuant to 2(a)(i) (group insurance – individual premiums) are made using an interest rate of max. 3.75% (3.25% is used by the major insurance companies) with no further economic assumptions. The calculation bases for insurance tariffs must comply with the restrictions set down by the insurance supervisory authorities.

The minimum funding calculation 2(b)(i) and 2(a)(iii) must be carried out using an interest rate of 6% with no further economic assumptions. This interest rate is specified by the insurance authorities.

### **Demographic assumptions**

For calculations 2(a)(i) and 2(b)(ii) the demographic assumptions are the choice of the actuary. It is normal however, only to include **mortality decrements**, to use the prescribed standard tables for these decrements and to value spouses benefit on an individual basis.

The demographic assumptions to be used for calculations 2(a)(i), 2(a)(iii) and 2(b)(i) are specified by the insurance supervisory authorities, and are based on the same standard mortality tables in which the use of a withdrawal assumption is prohibited.

The final retirement age used is normally that given in the pension scheme rules.

The standard tables used for all calculations are MR (Males) or FR (Females) for pensions in payment. The same tables are generally used for expectants to pensions. However, the calculation 2(a)(i) are based on tables MK (males) and FK (females) or tables MR and FR depending on the allowance or not of death coverage.

An extract from these standard tables is shown at the end of this section.

The insurance tariff calculations include explicit allowance for expenses. In the total annual cost calculations 2(a)(ii) – group insurance – and 2(b)(ii) – pension funds, expenses are not usually explicitly allowed for but may be reflected in the use of a conservative rate of interest.

## **6 COMMUNICATION OF RESULTS**

The results of calculations made in respect of pension funds are usually communicated to the employer by means of a **formal report**. A report will also be provided for the employees. The formal report will contain an individual breakdown of the results of the calculations.

The reports are usually signed by an actuary which in this context means a member of the Association Royale des Actuaire Belges. Results of calculations made for group-insured schemes are also communicated using a formal report. The signatory is internally authorised by the insurance company, although they are usually actuaries. Allocated funding involves the production of individual benefit statements detailing accrued and projected benefits, premiums, mathematical reserves and accrued bonuses. Where unallocated funding is used an actuarial report is provided giving details of the calculation of the global yearly cost.

No guidelines exist as to the contents of these reports.

**7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS**

**a. Name: MR: mortality table used for males**

These mortality rates are applied to **expectants to benefits and to pensioners receiving benefits**. They are based on the Makeham law of mortality.

$$l_x = k \cdot s^x \text{ where } c = 1.101077536030, \quad g = 0.999733441115, \quad s = 0.999441703848, \\ k = 1000266.63$$

Where  $l_x$  is the number of survivors at age  $x$  of 1,000,000 births.

$X$	$Q_x$	$X$	$Q_x$
20	0.74239	70	23.07940
25	0.85716	75	36.75029
30	1.04194	80	58.47476
35	1.34179	85	92.59704
40	1.82510	90	145.22652
45	2.60819	95	223.99794
50	3.87242	100	336.43326
55	5.91674		
60	9.21670		
65	14.53476		

All rates shown are per 1000 lives.

**b. Name: FR: mortality table used for females**

These mortality rates are applied to **expectants to benefits and to pensioners receiving benefits**. They are based on the Makeham law of mortality.

$$l_x = k \cdot s^x \text{ where } c = 1.116792453830, \quad g = 0.999951440172, \quad s = 0.999669730966 \\ k = 1000048.56$$

where  $l_x$  is the number of survivors at age  $x$  of 1,000,000 births

$X$	$Q_x$	$X$	$Q_x$
20	0.38166	70	13.17763
25	0.41975	75	22.54412
30	0.48540	80	38.60414
35	0.60025	85	65.88058
40	0.80065	90	111.43881
45	1.14675	95	185.36400
50	1.74937	100	299.46385
55	2.79350		
60	4.60482		
65	7.74540		

All rates shown are per 1000 lives.

**c. Name: MK: mortality table used for males**

These mortality rates are applied to **expectants to benefits assuming that death coverage exists**. They are based on the Makeham law of mortality.

$$l_x = k \cdot s_x \text{ where } c = 1.103798111448 \quad g = 0.999549614043 \quad s = 0.999106875782 \quad k = 1000450.59$$

Where  $l_x$  is the number of survivors at age  $x$  of 1,000,000 births

$X$	$Q_x$	$X$	$Q_x$
20	1.22914	70	46.77080
25	1.44478	75	74.95466
30	1.79693	80	119.34456
35	2.37264	85	187.51878
40	3.31709	90	287.99297
45	4.86123	95	426.57823
50	7.38807	100	549.40559
55	11.51174		
60	18.23373		
65	29.14757		

All rates shown are per 1000 lives.

**d. Name: FK: mortality table used for females**

These mortality rates are applied to **expectants to benefits assuming that death coverage exists**. They are based on the Makeham law of mortality.

$$l_x = k \cdot s_x \text{ where } c = 1.118239062025, \quad g = 0.999902624311, \quad s = 0.99257048061$$

$$k = 1000097.39$$

where  $l_x$  is the number of survivors at age  $x$  for 1,000,000 births.

$X$	$Q_x$	$X$	$Q_x$
20	0.85023	70	29.06390
25	0.93049	75	49.73523
30	1.07144	80	84.82993
35	1.31795	85	143.11116
40	1.74739	90	236.23796
45	2.49969	95	375.39973
50	3.81096	100	561.16723
55	6.10236		
60	10.09562		
65	17.04027		

All rates shown are per 1000 lives.

**e. Name: HFR 68-72 (Belgian census 1968 – 1972)**

These mortality rates are applied to **pensioners** receiving benefits. They are based on the Makeham law of mortality.

$$l_x = k \cdot s^x \text{ where } c = 1.094846272306, \quad g = 0.999393260503, \quad s = 0.999587967271$$
$$k = 1000607$$

The rates are used in conjunction with an age rating of +2 years for males and - 2 years for females.

$X$	$Q_x$	$X$	$Q_x$
20	0.76438	70	32.59373
25	0.96621	75	50.56899
30	1.28375	80	78.17269
35	1.78298	85	119.98182
40	2.56796	90	181.94886
45	3.80143	95	270.71959
50	5.73891	100	391.28026
55	8.77912		
60	13.54301		
65	20.99084		

All rates shown are per 1000 lives.

# CYPRUS

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Cyprus calculations are required from actuaries in respect of government, semi government, local authority, and company-sponsored pension schemes, which provide defined benefits and are established through a pension fund which may or may not be insured. Actuarial involvement is required by the rules of each Plan and sometimes but not always by auditors, taxation, supervisory authorities and by the accounting profession as per IAS19.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries in Cyprus:

- a) Calculation of the value of the accrued liabilities and assets of the pension scheme.
- b) Calculation of the annual cost/required contribution (the standard contribution rate) and the recommended contribution which takes into consideration the assets of the fund, payable to the pension fund in order for it to be able to meet its future liabilities.

The above calculations are made triennially unless circumstances require more frequent attention. Some plans which were formed very early in or before 1980 asked for 10-yearly valuations or 5-yearly valuations. The situation is now different due to the Cyprus Association of Actuaries that advised its members to follow triennial reviews as standard unless circumstances warrant ad hoc valuations. In view of recent developments for the Cyprus Stock Exchange several pension funds requested annual valuations (Nov 2000). The calculations are made to meet the various requirements of the plan rules, and regulations of the taxation, supervisory and accounting authorities. In particular the actuary is required to:

- (i) Determine the current funding level of the pension scheme and recommend a future contribution rate. The funding level is the value of the assets in relation to the value of the accrued liabilities of the scheme in respect of past service.
- (ii) Make a statement declaring that the current funding level is such that the assets of the scheme are sufficient to meet the accrued liabilities and that this position will be maintained by the recommended contribution rate. This statement assumes that the scheme is continuing.
- (iii) The sponsoring company/organisation require calculations to be made for their accounts in accordance with the IAS19.
- (iv) The taxation authorities very rarely require a statement on the funding level of pension funds. This is requested when past years of service are recognised at the outset of pension funds. The taxation authorities do not ask for a particular methodology to be employed.

The actuary normally makes one set of calculations using the same actuarial basis and the same methodology for the purposes of all of the above.

### 3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES

Actuaries in Cyprus also undertake the following calculations:

- a) Calculation of transfer values in the case of bulk transfers arising from company takeovers/mergers.
- b) Analysis of the experience of the pensions scheme.
- c) For large schemes the economic and demographic experience of the pension scheme is investigated on each occasion that an actuarial valuation is made. The investigation is used to check the suitability of the actuarial assumptions made and perhaps provide a basis for deriving new actuarial assumptions. It is also used as a check on the calculation results. The need for an investigation arises from a professional requirement for the actuary to be satisfied as to the suitability of the assumptions made and for the actuary to provide a commentary on any significant variations in experience from the assumptions made at the previous valuation. For smaller schemes the experience of the scheme alone is not sufficient to determine suitable assumptions and regard is had to other schemes where the experience can be expected to be comparable.
- d) Cyprus does not have very large pension funds. The largest funded pension fund does not have more than 3000 members. Nevertheless the above exercise is carried out at each valuation.
- e) Calculations of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.

### 4 ACTUARIAL METHODS

For the main types of actuarial calculations performed the following methods are employed.

#### a) **Calculating the value of the accrued liabilities and assets of a pension scheme**

The accrued liabilities of a pension scheme are usually calculated as the present value of the accrued benefits. This corresponds to the standard fund for the projected unit credit and attained age funding methods. Because of IAS19 the most popular methodology employed is the PUC method.

The accrued benefits for actives are taken to be those benefits earned by the members in respect of years of service up to the date of the calculation. Where benefits are defined in terms of a benefit amount multiplied by the number of years of service, the accrued benefit is usually determined by substituting the actual years of service up to the calculation date in the benefit formula. Where benefits are not directly defined in terms of years of service then accrued benefits are usually taken to be the total benefits payable multiplied by the factor  $m/n$ , where  $m$  equals the number of years of service up to the valuation date and  $n$  represents the total number of years of service.

The entry age method is sometimes used and here the value of the liabilities will correspond to the standard fund as determined by that method.

The requirement to state that the funding level is sufficient to meet accrued liabilities and certain liabilities on discontinuance, usually precludes the use of the current unit method without the inclusion of at least partial allowance for future salary/pension increases (where appropriate).

The value priced on the assets is normally the present or discounted value of future income and capital proceeds from the assets held.

A market-value approach to valuing the assets is also used, usually with the use of an averaging period. Because of IAS19 the averaging period is more difficult to implement.

The historic cost approach is not used to value assets.

**b) Calculation of the annual cost/required contribution for the pension scheme**

The most common method used for determining the required contribution rate is the projected unit credit method. The attained age, entry age and aggregate methods are also sometimes used. The current unit method is never used.

The aim in most cases is to establish a contribution rate as a level percentage of salary. Where the projected unit credit method is used, "risk" benefits (eg where lump sum death payments are made and where the value of benefits paid on death and disability is in excess of the value of accrued pension benefits) are sometimes charged on a "risk premium" basis.

The final contribution rate that is recommended may be different from the standard contribution rate as determined by the method. This will be due to the amortisation of surpluses or deficits in the scheme, as revealed by the calculation or other factors.

Because of IAS19 the actuary is no longer free to choose the method of calculating the required contribution. The provision of IAS19 applies fully.

There are professional guidelines laid down by the Cyprus Association of Actuaries adopted from the IOA (UK) as to when each method may be unsuitable but the introduction of IAS19 in our opinion creates a conflict. The CAA advised its members to follow IAS19 fully but to indicate conflict with IAS19 in the report. Most funds in Cyprus are small so the PUC is not always suitable.

The annual cost arrived at (regular annual cost plus variations in cost) is the cost, which is charged to the sponsoring company's commercial accounts. This may differ from the contributions actually paid.

## **5 ACTUARIAL ASSUMPTIONS**

### **Economic assumptions**

The actuary in consultation with the trustees and/or employer chooses the economic assumptions used. The assumptions made are not subject to direct restrictions from the taxation or supervisory authorities. The actuary has, however, a professional responsibility to ensure that the assumptions represent an appropriate long-term view of future events.

The choice of assumptions in this case is the responsibility of the sponsoring company but will be based very much on advice by the actuary.

The following table summarises the economic assumptions usually made for a final salary type pension scheme:

Price inflation	=	2.5%
Interest rate	=	6.5% pa
General salary increases	=	4.5% pa (social insurance earnings increase)
Pension increases	=	4% or 4.5%

It is noted that not all pension funds apply pension increases, but those that offer pension increases follow the government pension fund rules and increase pension in line with general salary increases.

### **Demographic assumptions**

The actuary again chooses the demographic assumptions without any direct restrictions from the supervisory or taxation authorities. The actuary has a professional responsibility to ensure that the assumptions are appropriate. The choice of the actuary will be based on his general experience and for larger pension schemes may be based on the actual demographic experience of the membership of the scheme itself.

It is usual to use different mortality tables for actives, pensioners and ill-health/disability pensioners. Widows/ers may also be valued using different mortality assumptions from normal pensioners.

Standard tables of mortality are frequently used, in particular for pensioners', widow/ers' and deferred pensioners' mortality. The standard tables generally used are based on statistics gathered by life offices relating to the experience of assured lives and members of insured pension schemes. The mortality rates for pensioners in these tables include projection of improvements in mortality.

The final retirement age used is normally that given in the pension scheme rules.

For the purposes of applying demographic assumptions the population of the pension scheme is normally split into males and females, and (where appropriate) staff and workers.

Allowance for the administration expenses of the scheme will depend on whether the costs are charged directly to the scheme or are borne by the employer.

Orphans' pensions may be allowed for by a general factor applied to the widows'/ers' pensions.

## **6 COMMUNICATION OF RESULTS**

The results of the main actuarial calculations made (as described in section 2) may initially be sent to the employer/sponsoring company by way of a preliminary results letter. The results may then be discussed in a meeting where, for instance, the treatment of any surpluses or deficits may be decided. A formal actuarial report will in all cases be sent to the trustees of the pension fund. The signatory of the report must be a qualified actuary and the contents of the report must conform to the guidelines laid down by the Cyprus Association of Actuaries (adopted from Institute of Actuaries and Faculty of Actuaries - GN9). The main points of the guidelines are set out below:

- 1) The actuary should set out the purpose of the valuation, the benefits valued and a summary of the data used.
- 2) The actuary should give a summary of events occurring in the period since the previous valuation.
- 3) The actuary should describe the funding method being used, its objectives and its implications in terms of the stability of contribution rates and future funding levels.
- 4) The actuarial assumptions made should be set out.
- 5) The appropriateness of the investment policy of the pension fund should be commented on.
- 6) The future contribution rate should be recommended.
- 7) The current funding position should be given and commented on.

The formal report will be sent to the trustees of the pension scheme. Usually the report is made available to the labour unions upon request.

## **7 EXAMPLE ASSUMPTIONS**

A typical pension fund valuation will have the following assumptions:

Economic assumptions: as per above

Mortality before retirement: ignored

Withdrawal: ignored

Ill health: ignored

Retirement age: 60 for both men and women

Mortality after retirement: 60% A67-70 or a percentage of PA90

Salary scale: 2%-4% depending on the organisation

Marriage status at 60: 100%

Disability before retirement: ignored

The nature of the employers offering pension funds and the definition of the benefits justifies the assumptions used.

# THE CZECH REPUBLIC

- 1 The pension system in the Czech Republic is based on two pillars :
- the basic obligatory pension insurance (pay-as-you-go)
  - individual voluntary complementary pension insurance.

The voluntary complementary pension insurance consist of

- state-contributory supplementary pension insurance (fully funded)
- pension insurance of insurance companies.

The voluntary state-contributory supplementary pension insurance was introduced in late 1994. This insurance is based on the citizen/individual principle, not on the employment principle. 19 pension funds with **defined contribution plans** operate nowadays in the Czech Republic. A state contribution is provided to participants out of the state budget. A participant pays monthly premiums to the fund. Also, a third party (eg an employer) may pay premiums for the participant. Some limited tax deductibility of contributions is allowed. It is not part of a fund's duty to have an actuary.

It follows that in the Czech Republic there **does not exist** a so called “**second pillar**” in the sense of this Actuarial Methods and Assumptions Report. (Actuarial reserving approach for the 19 pension funds).

# DENMARK

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Denmark calculations are required from actuaries in respect of **defined contribution/money purchase** pension schemes which are financed through **insurance contracts** or **company-specific pension funds**. Actuarial involvement is a requirement of the insurance supervisory authorities.

The involvement of actuaries is therefore akin to actuarial involvement in the provision of "normal" insurance savings contracts.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries in Denmark:

- (a) **Calculation of the premium tariffs to be used by the insurance company/pension fund.**
- (b) **Calculation of the accrued assets and liabilities of the insurance company/pension fund.**

The tariffs that are allowed must be approved by the insurance supervisory authority, and are not altered very often in practice.

Pension funds effectively operate as captive insurance companies. The calculations that are required are the same as for a normal insurer selling pension-type savings contracts. Individually allocated funding is **always** used.

The calculation of the assets and accrued liabilities, as well as the distribution of the surplus arising, are required to be made annually for the formal report that has to be provided to the insurance supervisors.

The actuary will also calculate the taxation liability incurred by the insurance company/pension fund. The tax payable is 26% of the interest earned on "non-real" assets such as fixed bonds and 5% of the increase in market values of equities.

## 3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES

The following calculations are also undertaken by actuaries in Denmark:

- (a) Calculation of the surrender/policy value of the pension rights when an employee or group of employees terminates the pension contracts held.
- (b) Calculations pursuant to the annual report made for the insurance supervisor, namely bonus calculations, analysis of experience (both in terms of expenses and claims), solvency calculations etc.

- (c) Projection of potential benefits for insurance contract benefit statements.
- (d) Calculation of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.

#### 4 ACTUARIAL METHODS

The mathematical reserves to be held by the insurance company/pension fund are calculated according to **Thiele's differential equation**. The calculation is used for the distribution of surplus and for the calculation of the level of pension increases to be granted. This is the method prescribed by the insurance supervisory authorities.

Assets are normally valued at book value for the purposes of the surplus calculations mentioned above.

For the purposes of calculating the "real interest" taxation on fixed interest bonds the value taken is the discounted income value, where the discount rate is specified for each body in each year.

Premium tariffs are calculated in the "normal" manner for insurance contracts on an individual, allocated basis, i.e. equating the present value of future premiums to the present value of future benefits plus expenses at the date of entry.

#### 5 ACTUARIAL ASSUMPTIONS

##### *Economic assumptions*

The interest rate used by most insurance companies in premium tariff calculations has been 5% in the past. This interest rate was reduced in 1994 to 3% and in 1999 to 2%, but for new business only.

This rate, in conjunction with the tariff structure G82, is approved by the supervisory authorities.

The rate of interest used in Thiele's differential equation is the actual accrued rate of interest earned after tax.

When making projections of benefits for **individual benefit statements** the economic assumptions to be made are fixed by the consumer ombudsman as follows:

<b>Assumption</b>	<b>2000 %</b>
Rate of price inflation	2.0
Rate of increase in salaries	2.0
Rate of earnings on assets	
Bonds	6.0
Equities and property	7.0
Index linked bonds	2.5
Rate of increase in pensions	as determined by Thiele's differential equation from the above

### ***Demographic assumptions***

The demographic assumptions used in all calculations are usually chosen according to standard tables. The assumptions used have to be approved by the insurance supervisory authorities. The standard tables currently being used are the G82 tables, an extract from which is shown at the end of this section.

The following table summarises the demographic assumptions usually made for a typical pension scheme/insurance contract held for pension purposes:

<b><i>Class of Pension Scheme Member/Contract Holder</i></b>	<b><i>Active</i></b>	<b><i>Deferred Pensioner</i></b>	<b><i>Ill-health Pensioner</i></b>	<b><i>Pensioner</i></b>	<b><i>Widow/er Dependant</i></b>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	X	—	—	—
Recovery from disability	X	X	X	—	—
Withdrawal/turnover	—	—	—	—	—
Early retirement	—	—	—	—	—
Normal retirement	X	X	—	—	—
<b>Other Assumptions</b>					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	X	X	X	X	—
Orphans' mortality	X	X	X	X	—
Salary scale	—	—	—	—	—

The assumptions will normally be expressed in the continuous form, consistent with the use of Thiele's differential equation.

Select rates are not used. For the purposes of applying demographic assumptions the pension scheme members are usually split into males and females and possibly by category of employment; for certain group schemes the tariff used may be dependant upon the occupation of the scheme members.

An allowance for administration expenses is normally included in calculations.

Only one mortality rate is normally applied at each age, irrespective of the status of the member (pensioner, active, etc).

## 6 COMMUNICATION OF RESULTS

A formal actuarial report will not be sent to the client; the results of calculations usually being communicated by letters and meetings.

The insurance supervisory authorities require a detailed annual report for both insurance companies and pension funds. The contents of this report must conform to the guidelines set down by the supervisory authorities. This report is required to be signed by an actuary approved by the supervisory authorities (only one such actuary exists per insurance company/pension fund).

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

The following table shows sample forces of mortality and disability as taken from the G82 tables.

### Male rates

Age x	Force of mortality $\mu_x$	Force of disability $\mu_x^{ai}$
20	0.0009365	0.0004549
25	0.0011761	0.0005096
30	0.0015471	0.0006188
35	0.0021218	0.0008365
40	0.0030119	0.0012710
45	0.0043905	0.0021378
50	0.0065256	0.0038674
55	0.0098325	0.0073183
60	0.0149544	0.0142038
65	0.0228872	0.0279423
70	0.0351737	0.0553541
75	0.0542032	0.110048
80	0.0836764	0.219176
85	0.129325	0.436916
90	0.200026	0.871364
95	0.309530	1.73820
100	0.479130	3.46777

The above rates correspond to the Makeham law for mortality/disability as follows:

$$\mu_x = A + 10^{B+CX-10}$$

<i>Force of mortality</i>	<i>Force of disability</i>
A = 0.0005	A = 0.0004
B = 5.88	B = 4.54
C = 0.038	C = 0.06

The force of mortality for females is as for males but with an age rating of  $-4$  years. The female force of disability is taken to be 150% of the male force.

# FINLAND

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

The scope of this report is defined to include only the supplementary occupational pension schemes. In Finland, calculations are required from actuaries in respect of company-sponsored pension schemes which provide defined benefits and are established using either a group insurance contract or a self-administered pension fund.

There are two types of pension funds: industry-wide pension funds and pension foundations sponsored by one employer or one group. In this report both types are referred to as 'pension funds'.

In Finland, all insurance companies and pension funds have to have an appointed actuary. The appointed actuary has to be authorised by The Board of Actuarial Qualification.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main calculations undertaken by actuaries in Finland:

### a. Self-administered pension funds

The main calculation is the determination of the accrued liabilities and hence the technical provisions to be held. The change in technical provisions and other expenditure together with investment return determines the annual contribution level.

The calculation must be carried out at least every 2 years. In the intervening year an approximation is made. The calculation is usually performed on a single set of actuarial assumptions to satisfy both the supervisory and taxation authority.

### b. Group insurance contracts

The calculation of the liabilities and required premiums for a life insurance company are carried out.

Both pension funds and insurance contracts operate on an individually funded basis. Actuaries do not normally value the assets of pension funds as part of their calculations. For reporting purposes pension funds declare their assets at book value which equals the purchase value or the market value if it is less.

The basis for the calculations for an industry-wide pension fund has to be approved by the supervisory authority. For pension foundations the actuarial assumptions are set by the supervisory authority but where the actuary considers it necessary, he/she can apply for approval for a change to the basis. At the time of writing this report discussions had started in order to give more freedom for pension fund actuaries in choosing the actuarial assumptions.

The actuarial assumptions used in group insurance are the choice of the actuary.

### **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations for pension funds are also undertaken by actuaries:

- a. Calculation of the transfer value in the case of portfolio transfers arising from company take-overs/mergers and in the case of portfolio transfer to another pension fund or a life insurance company. These calculations are carried out infrequently and will usually equal the value of the accrued liabilities.
- b. Projections of the future development of the liabilities, pension expenditure and premiums. These projections serve also as a basis for a pension fund's investment plan. Also they are required if there is a possible need to modify the level of benefits.
- c. Calculations according to international standards (FAS, IAS etc) required for example by companies listed in international markets.

Due to the fact that the assumptions are set by the supervisory authority, analysis of the experience of the pension scheme is not regularly required. These analyses are needed by the actuary in the case of group insurance schemes.

### **4 ACTUARIAL METHODS**

- a. Pension funds

The liabilities must be determined as the present value of accrued (unprojected) benefits. This corresponds to the standard fund under the current unit method as described in Appendix 2.

For active employees, accrued benefits are taken to be total benefits payable on retirement multiplied by the factor  $m/n$  where  $m$  equals the number of years of service up to the valuation date and  $n$  represents the total number of years of service up until retirement. For US GAAP/FAS and IAS purposes different calculations are carried out according to the rules set by those standards.

- b. Group insurance contracts

Annual premiums are calculated according to the insurance tariff. This usually corresponds to the current unit method combined with the risk premium method. Technical provisions are usually calculated using the current unit method.

### **5 ACTUARIAL ASSUMPTIONS**

#### **Economic assumptions**

The supervisory authority has set the following restrictions with respect to the calculation of pension funds' liabilities.

- (i) The maximum discount rate to be used has recently been reduced from 4.25% to 3.5%. During the period of 1999 – 2013 the pension funds are allowed to move gradually to the stronger level of funding.

- (ii) No future benefit increases may be funded in advance explicitly. The conservatively chosen discount rate means however that implicitly there is some funding for future benefit increases. This situation may change in the near future.

Insurance tariffs and technical provisions are generally calculated using an interest rate of 3.5% without further economic assumptions. This is the maximum discount rate defined by the supervisory authority.

### **Demographic assumptions**

The demographic assumptions to be used in group insurance are the choice of the actuary and should represent a best estimate. In calculations for pension funds the demographic assumptions are based on the standard tables derived for the statutory pension scheme for private sector employees.

Different mortality rates are used for employees, pensioners and disability pensioners.

The following table summarises the demographic assumptions usually made:

<i>Class of Pension Scheme Member/Contract Holder</i>	<i>Active</i>	<i>Deferred</i>	<i>Disability</i>	<i>Widow/er</i>	<i>Dependant</i>
Mortality	X	X	X	X	X
Disability	X	X	-	-	-
Recovery from disability	X	X	X	-	-
Withdrawal/turnover	-	-	-	-	-
Early retirement	X	-	-	-	-
Normal retirement	X	X	-	-	-
Other assumptions					
Proportions married	X	X	X	X	-
Age difference with spouse	X	X	X	X	-
Number of orphans	X	X	X	X	-
Orphans' mortality	X	X	X	X	-
Salary scale	-	-	-	-	-

The assumptions will normally be expressed in the continuous form, consistent with the use of Thiele's differential equation.

Select rates are not used. For the purposes of applying demographic assumptions the pension scheme members are split into males and females. An allowance for administration expenses is normally included in calculations.

## **6 COMMUNICATION OF RESULTS**

The results of calculations made in respect of pension funds are reported annually to the pension fund via a formal report. The pension fund will provide the supervisory authority with its annual report. The report will contain a main breakdown of the results of the calculations. The form of the report is set by the supervisory authority. The reports are signed by the appointed actuary of the pension fund.

The results of calculations made for group-insured schemes are not reported separately from the overall life insurance portfolio of the life insurance company.

# FRANCE

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In France calculations are required from actuaries in respect of the many institutions forming the compulsory pension schemes (**AGIRC, ARRCO, etc**). There has been a change of status for the ARRCO and AGIRC regimes. Initially they were the second tier schemes that topped the social security base regime. But it had to be decided within the framework of EU pension legislation if they were closer to occupational pension plans or to base social security regimes. The latter seems to be the case since they are “assimilables à un régime de base bis”.

In addition calculations are made for companies or institutions providing supplementary defined benefit schemes. Moreover they are required for special types of supplementary defined contribution ("DC") schemes (Les régimes de la branche 26 Article L932-24 of Social security Code or Article L 441 of Insurance Code) that differ from regular DC plans.

The last Law Fabius adopted on February 7<sup>th</sup>, 2001 on PPESV and published on February 20<sup>th</sup> under number 2001-152 provides a new pension vehicle but since these PPESV are money purchase arrangements and benefits are paid at present as lump sums, unless a provision allowing payments as annuities is implemented, no pension actuarial calculations will be required. The project had included an option of having benefits paid as an annuity but for political reasons only a fractional payment option has been retained in the Law.

Since ARRCO and AGIRC operate on a “répartition” basis the actuarial methods differ for these regimes from those used for calculating liabilities and costs under Anglo-Saxon accounting standards i.e. FAS 87, FRS17, the international accounting standard ISA19 or retained by insurers or pension funds for pre-funded arrangements.

## 2 MAIN ACTUARIAL CALCULATIONS

The main calculations undertaken by French actuaries involve the projection of the **benefit payments** and **contributions** of the institutions providing retirement benefits. It must be noted that the calculations must take into account additional benefits in addition to pure pension benefits provided by these institutions (e.g. medical, risk and death benefits). The projections are adjusted annually if the economic or demographic situation has changed.

In addition actuaries elaborate on or certify both experience mortality tables (article A335-1 of French insurance Code) and disability tables (Article A 331-10 of French insurance Code).

### 3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES

The following calculations are also undertaken by actuaries in France:

Analysis of the experience of the benefit providing institutions. The development of all the factors contributing to the costs of the pension schemes (demographic factors, economic factors etc.) is investigated. The results of the investigation are used in the projection of costs and income mentioned in part 2.

Calculation of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also made by actuaries.

### 4 ACTUARIAL METHODS

- a. The actuarial methods used either for accounting purposes or by insurers for their defined benefits pension and end-of-career indemnities contracts are similar to those used in other countries.
- b. For accounting purposes, although there is no French GAAP, the French accounting authorities' recommendations favour funding methods retained by IAS19 or close to it.
- c. For insured arrangements the difference lies in the service period. Instead of discounting the pensions up to the life expectancy of the last surviving spouse, the actuary calculates the technical reserve based on both a regulatory or certified experience mortality and discount rate (taux technique). Once this reserve is calculated the funding methods vary from constant annual premiums in line with payroll increases to funding methods close to the projected unit credit pro-rated service method. As long as the insurer calculates the technical reserve at the date of retirement there is flexibility in the actuarial method used during the funding period.

We will describe two more specific French actuarial methods:

- Pay-as-you-go / répartition method
- DC plans falling under “branche 26” of insurance operations.

### 5 ACTUARIAL METHODS for Répartition<sup>1</sup> ARRCO and AGIRC schemes

The financing of the compulsory supplementary systems is based on the **pay-as-you-go** or **répartition** method. The répartition method as used in France is based on a multi-year approach. The basic aim of the method is to solve the following equation.

$$\begin{array}{rcccl} & \text{Value of expected} & & \text{Value of benefits} & & \text{Value of desired} \\ \text{Initial surplus} & + & \text{contributions in} & = & \text{paid in} & + & \text{surplus at} \\ & & \text{time 0 to } t & & \text{time 0 to } t & & \text{time } t \end{array}$$

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<sup>1</sup> This paragraph is an extract of a study in the book La Retraite en France written by Mrs Lance and Mr Amzallag and published in the seventies. Therefore the rates and percentages shown are not applicable today.

The projection period =  $t$  years, and normally has a value of up to 10 years for detailed projections.

The maintenance of a surplus and the projection over a longer time period introduces the concept of holding reserves, which are considered to serve the following three purposes:

- To act as a working balance so that timing differences between contribution income and benefit outgo can be smoothed.
- To allow regular improvement of benefits to be implemented independently of short term business cycles.
- To allow for the long term effect of changing rates of population growth.

The following shows how the above equation can be built up in practice (based on a very simplified one-year approach) for the “points-system” operated by the main supplementary institutions:

### Notation

$c$  = average contribution

$n$  = number of years service

$r$  = average pension

$q_a$  = average number of points (actives)

$f$  = management expense factor

$q_r$  = average number of points (pensioners)

$k$  = reversion factor

$s$  = reference salary

$A$  = number of actives

$p$  = value

$R$  = number of pensioners

The reference salary —  $s$  — determines the number of points purchased given a certain level of contribution. The value of a point —  $p$  — determines the pension to be paid given a certain number of points.

### Contribution income = Benefit Payments

$$A \cdot c \cdot (1 - f) = R \cdot r \cdot (1 + k) \quad (1)$$

$$\text{but } \frac{c}{s} = q_a \quad \text{and} \quad r = n q_r p$$

therefore substituting in (1) above gives

$$A \cdot q_a \cdot s \cdot (1 - f) = R \cdot n \cdot q_r \cdot p \cdot (1 + k) \quad (2)$$

One of the main objectives of the investigation is to discover the “**yield**” that can be provided. The yield is defined as the ratio:

$$\frac{\text{Value of point}}{\text{Referance salary}} = \frac{p}{s}$$

By rearrangement of equation (2) this ratio can be expressed as follows

$$\frac{p}{s} = \frac{1}{n} \cdot \frac{1-f}{1+k} \cdot \frac{q_a}{q_r} \cdot \frac{A}{R}$$

The first 2 components of the right hand side of this equation are considered to be quasi-constant and hence the key factor in the determination of the yield is the development of the relationships

$$\frac{q_a}{q_r} \text{ and } \frac{A}{R}$$

Actuaries will examine the durability of the “**yield**” under alternative economic and demographic scenarios, in particular the effect of different rates of growth of the active population will be considered.

The current rates of population growth are as follows:

Total population of France:	0.7% pa
Active employees in Industry and Commerce:	1.5%–2.0% pa
Active “Cadres”:	4.0%–5.0% pa

#### *Actuarial assumptions*

The actuary will make wide-ranging assumptions covering both the **economic** and **demographic** development of the pension schemes.

The development of the active and retired populations will be projected under various different assumptions regarding mortality, fertility, immigration and disability. Economic assumptions will be made regarding the development of salaries (although this effects both contributions and benefit payments) and the effect of different rates of discount in the first equation in section 5 will be considered.

For the large compulsory arrangements (viz. AGIRC and ARRCO) the projections are made separately for the many institutions that make up these arrangements. The projection for each institution takes into account the particular benefits provided by that institution, its current membership and its past experience.

Typically a rate of interest of approx. 7% would be used and salaries/benefits would be projected to increase in line with general inflation (3% – 4% per annum).

## **5 ACTUARIAL METHODS for schemes falling under “branche 26” Article L 441 of Insurance Code” or Article L932-24 of Social security Code regulation**

These group collective pension schemes operate on a “points” system. They can be implemented for populations equal to or larger than 1000. They must be run by insurance companies under Article L 441 of the Insurance Code having an agreement to operate in “branche 26” or by risk and retirement institutions which can either cover several industry branches or one specific population for which they have the sole agreement to operate under "Article L 932-24" of the Social Security Code.

These schemes are administered on a par basis between employers and employees. Pension benefits are granted in points or units. The level of “mutualisation” between actives and retirees is decided by the “partenaires sociaux” that signed the Collective Bargaining Agreement.

These schemes existed on a facultative basis for civil servants (PREFON) and for some non-employee professions. They have been implemented in some big companies but on a mandatory affiliation basis.

These schemes operate like pension funds with a segregated asset fund for both actives and retirees.

The funding level must at any given measurement date cover the pension liabilities.

In the liability side of the balance sheet a “Provision Technique Spéciale (PTS)” must be set up. It is financed by the contributions and at least 85% of annual surplus/deficit with a minimum of 3.5% of the PTS as at 1st January. The PTS must cover pension and running costs.  $PTS = PM + \text{Surplus non distributed}$ .

It must be noted that accounting is not on a market basis but based on historic costs. Therefore unrealised capital gains or capital losses are not recognised in the accounts.

The technical reserve “Provision Mathématique (PM)” of the scheme must be calculated with a 3.5% technical rate of discount and at any measurement date the ratio PTS/PM must be over 100%.

The scheme parameters point acquisition cost and service point value are set annually by the “partenaires sociaux” – employees and management in order to maintain a long term balance between pension obligations and funds accumulated.

Decisions are taken according to the plan funding level and the actuarial report which includes long-term projections of the scheme.

# GERMANY

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Germany calculations are made by actuaries in respect of company-sponsored and industry-sponsored pension schemes which provide defined benefits and are financed using **Book Reserves, Unterstützungskassen** (or "support funds"), **Pensionskassen** and directly through **insurance contracts**.

The use of actuarial methods is a requirement of the **taxation, supervisory, commercial** and international **accounting** authorities (see section 4).

By far the most common involvement is still with pension schemes financed using Book Reserves<sup>1</sup>.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries:

### a) **Calculation of the value of the accrued liabilities of a pension scheme financed by book reserves.**

This calculation is made annually and is required for the following purposes:

- 1) To satisfy the taxation authorities as to the tax-allowability of the book reserve being set up by the sponsoring company.
- 2) To provide the calculation basis for the contributions payable to the Pensions-Insolvency-Insurance (PSV).
- 3) To provide the company with a book reserve value to satisfy the commercial accounting requirements to recognise pension liabilities (BiRiLiG).

The annual expense in respect of providing pension benefits is not calculated separately but is derived from the liability calculation (see section 4).

Only one calculation is normally made for (1), (2) and (3) above, although occasionally the calculation for (3) may be made on a different basis to (1) and (2) (see section 5).

Insurance contracts may be taken out in conjunction with book reserve financing in the following two ways:

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<sup>1</sup> In 1998 the total funds of pension schemes in Germany amounted to DEM 561.1 billion and as distributed to the different funding vehicles as follows: book reserves DEM 318.2 billion, support funds DEM 44.2 billion, Pensionskassen DEM 125.2 billion and insurance contracts DEM 73.5 billion.

- **Direct Insurance;** the policyholder being the employer but the beneficiary being the employee.
- **Indirect Insurance;** the employer being both the policyholder and beneficiary.

The book reserve calculations are affected by the existence of direct insurance contracts (see section 4), but **not** by the existence of indirect insurance contracts.

Although indirect insurance contracts are usually taken out in connection with the provision of retirement benefits, they are not considered as distinct from the other assets of the employer.

#### **b) Calculations of the liabilities and required contributions of a Pensionskasse**

A Pensionskasse represents a captive insurance company of the company/organisation/industry wishing to provide its employees with retirement benefits. It is therefore subject to the supervision of the insurance authorities in Germany. Following the 3<sup>rd</sup> Life Directive there are two different types of Pensionskassen: those which are supervised in the same way as before the 3<sup>rd</sup> Life Directive came into force (so-called *regulated Pensionskassen*) and those having considerable economic importance (so-called *deregulated Pensionskassen*) that are subject to different supervision rules. Pensionskassen should appoint a **responsible actuary** (*Verantwortlicher Aktuar*).

The contributions to be paid to the Pensionskasse and the corresponding benefits guaranteed are calculated by the responsible actuary. For a regulated Pensionskasse the calculation principles are set down in the scheme of business (operating plan) submitted to the supervisory authorities for approval. A business/operating plan is submitted when the Pensionskasse is established, a new product is introduced or an existing product is changed. A deregulated Pensionskasse (as a life assurance undertaking) has to submit the actuarial principles of a new product when having started the business.

The supervisory authorities require that an actuarial valuation of the Pensionskasse (if regulated) is made every three years, although in practice the valuation is sometimes made annually as it is obligatory for a deregulated Pensionskasse.

This valuation involves the actuary in calculating the value of the accrued liabilities of the Pensionskasse and, depending on the method used, a recalculation of the required contributions. The object of the valuation is to demonstrate that the Pensionskasse is financially secure and that the future contributions payable will maintain this condition.

The valuation is carried out using the assumptions laid down in the operating plan and often in addition (though not required) on a realistic basis.

### **c) Calculation of the liabilities of an Unterstützungskasse**

This calculation is performed to meet the commercial accounting requirement that any deficit existing in the Unterstützungskasse should be recognised in the sponsoring company's commercial accounts (§ 249 HGB and Art. 28 EGHGB). It is only made for those benefits to be provided where the Unterstützungskasse has not taken out insurance. The deficit is calculated by reference to the market value of the assets. Whilst in principle the calculation is required every year, in practice it happens that the auditors do accept when it is made every 2-3 years with interim results calculated on an approximate basis.

The minimum tax-allowable contributions payable to an Unterstützungskasse are not calculated using actuarial methods but are set down in the German tax code (§ 4d EStG). Where, however, the Unterstützungskasse takes out insurance contracts with annual premiums then the contribution paid by the sponsoring company equals the insurance premiums payable. A description of the premium calculation is given in section 4.

### **d) Group insurance contracts**

The premiums payable under group insurance contracts are calculated by actuaries. The group insurance of pension liabilities occurs most often in the three forms mentioned above (direct and indirect insurance taken out by the employer and insurance taken out by an Unterstützungskasse).

## **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in Germany:

### **a) Valuation of pension liabilities according to international or foreign accounting standards (IAS19, FAS87/88/132, SSAP24)**

Large German companies as well as subsidiaries of multinational firms for group accounting purposes increasingly follow international or foreign accounting standards. Thus actuaries have to carry out those valuations for defined benefit schemes.

### **b) Calculation of a transfer value in the case of individual movement of employees**

The transfer of pension rights by individuals is not very common outside of the same group of companies. If the pension scheme is run as a book-reserve plan an inter-group individual transfer between sister companies would normally involve the transfer of the amount of the book reserve according to the German tax code or of the projected benefit obligation.

### **c) Calculation of transfer values in the case of bulk transfers arising from company take-overs/mergers**

The amount transferred in this case for a book reserve scheme will sometimes be the sum of the individual liabilities calculated according to the same method prescribed by the German tax code. It is, however, common practice to amend the assumptions in order to allow for future pension and salary increases or to recognise an adjustment to the projected benefit obligation.

#### **d) Analysis of the experience of the pension scheme**

An analysis of the demographic and economic experience of a **Pensionskasse** is required as part of the annual or triennial actuarial investigation. This is used to demonstrate that appropriate safety margins exist in the calculation of the contributions. In addition the solvency requirements have to be checked. In the case of a deregulated Pensionskasse the responsible actuary has to certify at the end of the balance sheet that the mathematical provision has been established according to the legal rules and specify in a report to the board of directors of the undertaking the underlying calculation bases and any additional assumptions for his certification.

The experience of pension schemes financed via book reserves and Unterstützungskassen is not normally subject to detailed actuarial investigation.

- e) Calculation of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.**

### **4 ACTUARIAL METHODS**

For the main types of actuarial calculations performed the following methods are employed:

- a) Calculation of the value of the accrued liabilities of a pension scheme financed by book reserves**

- (i) *Calculations for tax purposes*

The Germany tax code (in § 6a EStG) specifies that the method to be used when calculating the accrued liabilities to be recognised with a tax-deductible book reserve is the individual entry age method with a minimum entry age of 30. The accrued liability is therefore the standard fund under this method, as described in Appendix 2. A modified approach is used in the case of a transfer of funds caused by an individual movement of an employee.

The maximum annual pension expense to be shown in the taxation profit and loss account is the difference between the entry age reserves as at the beginning and end of the fiscal year. To this is added the benefit payments made in the year by the employer.

Where the employer elects not to make use of the full tax-deductible allocation available in a fiscal year then the outstanding amount is to be carried forward as a constant deficit. This results in the tax-allowable book reserve being less than the full entry age reserve by the amount of deficit brought forward. The deficit is to be allocated to individuals and can only be redressed when those individuals leave the company or start receiving benefits. It should be noted that the full allocation **must** be made for pension promises granted after 01.01.1987.

A consequence of the method of calculation of the annual expense is that changes in the accrued liabilities due to changes in the pension scheme benefits or the experience of the scheme are to be recognised immediately in the fiscal year in which they occur. In certain circumstances an increase may be spread over 3 years.

The book reserve is calculated individually on the net obligation if the pension scheme provides the deduction of benefits guaranteed from third parties (direct insurance contracts, Pensionskasse, Unterstützungskasse, social security, former employers).

(ii) *Calculations for the commercial balance sheet of the sponsoring company/organisation*

For the purposes of recognising accrued pension liabilities in the commercial balance sheet the individual entry age method is normally used. This is true for both book reserved pension schemes and Unterstützungskassen. Since § 292a HGB permits groups of companies to use international accounting standards an increasing number of German companies listed on foreign stock exchanges or running a multinational business are using either IAS or FAS figures for the commercial balance sheet.

The Commercial accounting regulations place the following restrictions on the **method** to be used:

- (1) It should produce liabilities consistent with a reasonable commercial view.
- (2) The method should be actuarially recognised.
- (3) Pensions in payment and deferred pensions should be taken at their full present value.
- (4) The cost of benefits for actives should be spread over the active service period.
- (5) The German tax code value represents a minimum requirement.

Requirement (1) is from legislation (§ 253 (1) HGB) whilst (2)-(5) are from the professional accounting regulations of auditors.

Although these restrictions allow some freedom of choice, the majority of smaller and medium size companies continue to use the values calculated for tax purposes in the commercial balance sheet.

- (iii) The contribution basis for the Pensions Insolvency Fund (PSV) is taken to be the full book reserve value calculated according to the German tax code, but only in respect of those members who have fulfilled the legal vesting requirements.

**b) Calculation of the liabilities and required contributions of a Pensionskasse**

As mentioned in section 2 a Pensionskasse is treated as a captive insurance company. The actuarial methods used are in principle those applicable to life assurance business. However due to the nature of the benefits being provided (in particular those that are salary related) and differences from "normal" insurance methods, their inclusion is warranted here.

The main methods used to calculate the contributions payable are as follows:

(1) *Individual premium method:*

A premium rate is calculated for each member of the Pensionskasse based on his or her benefits and age at entry. At each subsequent valuation the premium payable is adjusted to allow for benefit increases and profit participation.

$$\begin{array}{rcl} \text{Present value of future} & & \text{Present value} & & \text{Value of current} \\ & & = & & - \\ \text{level annual premium} & & \text{of future benefits} & & \text{mathematical} \\ & & & & \text{reserves} \end{array}$$

The calculation is based on benefit amounts valid as at the valuation date. The mathematical reserve is the net premium reserve based on the "old" premium and includes (where appropriate) allowance for bonus and profit share.

(2) *Average premium method:*

The premiums are calculated in the same manner as above but in taking the present value of future premiums an average factor is assumed and hence an average premium rate applicable to all members is used.

(3) *The aggregate method* as described in Appendix 2 is also used although less frequently than (1) or (2).

(4) In some cases no contributions are specified as the employer has taken over the obligation to fill up the assets to the total amount of the liabilities at the end of every financial year or the triennial reporting period ("Bilanzausgleichsverfahren").

**Surpluses** arising in the Pensionskasse are either refunded immediately to the sponsoring company, amortised so as to reduce future contributions payable or used to increase the benefits from the Pensionskasse. The latter is particularly the case where benefits need to be increased in line with salary/pension increases.

The **assets** are valued at the minimum of their historic cost and market values.

In many cases the contributions and liabilities are calculated on a net basis, ie excluding any expense assumptions. This is due to the expenses normally being met separately by the sponsoring companies/organisations. But an increasing number of employers have stopped guaranteeing the expenses of the Pensionskasse, thus administration costs other than investment costs have been taken into account for the calculations.

### **c) & d) Group insurance premium calculations**

Premiums for group insurance are always calculated on a fully allocated individual basis and must comply with the scheme of business of the insurer (which had to be approved by the supervisory authority before 1994). Where annual premiums are to be paid the insurer will apply a level annual premium as described for Pensionskassen in part (b)(1). Where benefits increase from year to year (eg in salary dependant pension schemes) the premiums in respect of each individual will be recalculated based on the new benefits, and outstanding term.

If the number of employees covered by the group contract is fairly large a separate profit and loss account will be made. Depending on the conditions agreed this may mean that there is no risk coverage needed and the group contract can be judged as a special investment only.

- e) The method of calculating transfer values for book reserved pension schemes has already been described in section 2.

## **5 ACTUARIAL ASSUMPTIONS**

### **Economic assumptions**

For calculations pursuant to the German tax code for book reserved plans the following restrictions apply to the economic assumptions made:

- (i) The interest rate used must be 6%.
- (ii) No future benefit increases may be funded in advance unless their absolute value is given in writing in the plan rules or by law<sup>2</sup>. Therefore no long-term salary increase assumptions are to be included and normally no pension increase assumptions as well.

The following requirements concerning the economic assumptions apply in respect of calculations made for the commercial accounting for pension schemes financed via book reserves and Unterstützungskassen:

- (i) A suitable interest rate is in the range 3%-6%. An interest rate of greater than 6% should only be used in conjunction with salary/pension increase assumptions (where appropriate).
- (ii) Salary and pension increase assumptions can only be included when they are not already allowed for in the interest rate assumption.

The majority of companies choose, however, to use 6% without salary/benefit increase assumptions.

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<sup>2</sup> Under the 1974 occupational pensions act in Germany, companies are obliged to increase pensions in payment triennially in line with price inflation, if they are running a profitable business. The law was amended in 1998 stating that the employer complies with the general legal rule if he takes over the obligation to increase the pensions in payment by at least 1% pa. This new rule is not applicable for pension benefits promised earlier than 01.01.1999.

For bulk transfer calculations the assumptions are often adjusted to fully or partially allow for future pension and salary increases. Where these are to be **fully** allowed for a typical set of assumptions would be

<i>Assumption</i>	<i>Typical value</i>
Interest rate	5.0%-7.5%
Salary increases	2.0%-3.5%
Social security increases	0.5%-3.0%
Pension increases	1.0%-2.5%

For **Pensionskassen** contributions and liabilities must be calculated using an interest rate of 3.5% with no further allowance for benefit increases unless these are guaranteed in absolute terms. For pension schemes of Pensionskassen introduced after July 1994 and not later than 1999 an interest rate of up to 4.0% might be used.

It is, however, common to carry out and publish a valuation on a second "realistic" basis. This is used to demonstrate the financial security of the Pensionskasse and to show that future increases to benefits (eg due to increases in earnings) can be met. The basis in this case would probably lie at the lower end of the range of assumptions shown above (especially the interest rate assumption).

Since 01.07.2000 insurance premiums are to be calculated using an interest rate of up to 3.25% with no further allowance for benefit increases unless these are guaranteed in absolute terms. The maximum interest allowed by the supervisory authorities has changed in the past from time to time varying between 3.0% and 4.0%.

### **Demographic assumptions**

The demographic assumptions used for the tax-calculations for book reserved plans have to be approved by the taxation authorities. The standard tables "Richttafeln" published by Dr Klaus Heubeck in 1982 are approved, and in practice were almost always used without modification until 1998 when he updated them and published the "Richttafeln 1998". The change from "Richttafeln" to "Richttafeln 1998" has to be spread over the years 1999 to 2001<sup>3</sup>.

Commercial accounting requirements in respect of the demographic assumptions to be used for calculations relating to book reserved pension plans and Unterstützungskasse are as follows:

- (i) Assumptions should be based on observed data and mathematical techniques. General tables are possible.
- (ii) Company specific turnover assumptions are allowed.
- (iii) The retirement age should have regard to the final retirement age in the rules and that commonly found in practice.

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<sup>3</sup> Some companies in the chemical industry do not use "Richttafeln 1998" but demographic assumptions developed by Dr K J Bode and Dr E Grabner in 1996 are used.

It is usual now, however, to use the "Richttafeln 1998". Modifications may be made in some cases, in particular company specific turnover rates could be included and the disability rates amended.

Different mortality assumptions are used for actives, pensioners and disability pensioners up until the attainment of normal retirement age.

The normal retirement age used is either that found in the plan rules or the flexible early retirement ages in the state pension scheme. The following table summarises the decrements used in the "Richttafeln 1998".

**Class of pension scheme member**

	<i>Active</i>	<i>Deferred pensioner</i>	<i>Ill health pensioner</i>	<i>Pensioner</i>	<i>Widow/er dependant</i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/ill health retirement	X	-	-	-	-
Recovery from disability	-	-	-	-	-
Withdrawal/turnover	-	-	-	-	-
Early retirement	-	-	-	-	-
Normal retirement	X	X	-	-	-
<b>Other Assumptions</b>					
Proportion married at death	X	X	X	X	-
Age difference with spouse	X	X	X	X	-
Number of orphans	-	-	-	-	-
Orphans' mortality	-	-	-	-	-
Salary scale	-	-	-	-	-

Select rates are not used. Different decrements are used for males and females.

The "Richttafeln 1998" were produced using a variety of sources, most notably the following:

- a) Statistics gathered by the Association of German Pension Insurers (VDR) concerning the experience of the state pension scheme, based on the years 1994-1996.

- b) Previous mortality tables (Sterbetafel 1994/96).
- c) General population statistics.
- d) Statistics gathered for the German statistical yearbook.

The rates were projected to allow for improvements in mortality and disability for the 20-30 years following 1996. The resultant rates were smoothed using a cubic spline function. No allowance for administration expenses is made.

For regulated **Pensionskassen** the demographic assumptions used must be submitted to the insurance supervisory authorities for approval. They are concerned to see that these assumptions contain a sufficient margin of safety. For deregulated Pensionskassen the responsible actuary has to make sure that the Pensionskasse using the demographic assumptions will be able to meet its liabilities at any time.

Standard tables are normally used, in particular the "Richttafeln 1998" or its predecessors with some modifications to allow for further improvements in pensioner mortality or other special situations.

Turnover assumptions are not normally included. As mentioned previously, the calculations are often performed without an assumption regarding administration expenses, although an assumption is included where these are met directly from the Pensionskasse. Insurance premium tariffs are based on standard tables set down by Deutsche Aktuarvereinigung (DAV)<sup>4</sup> and include allowance for expenses.

## 6 COMMUNICATION OF RESULTS

The results of book reserve calculations for both tax, commercial and insolvency fund contribution basis purposes are communicated via a formal actuarial report ("Gutachten").

There are no legal restrictions on who may sign the report but the auditors of the company have an obligation to satisfy themselves as to the correctness of the calculations. In practice the reports are normally signed by an actuarial consultant who will make clear if he is a full member of DAV and/or IVS (Institute of Actuarial Advisors for Retirement Provision which is now a subsection of DAV).

Guidelines as to the contents of the reports are given by the IVS. The main items to be included are:

- 1) A description of for whom the calculation has been performed, the type of pension arrangement, and the class of members.
- 2) A description of the pension benefits provided by the pension scheme.
- 3) A source of the data used for the valuation.
- 4) A description of the actuarial methods and assumptions used (including formulae).

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<sup>4</sup> DAV (German Association of Actuaries) set down the standard tables **DAV 1994 R** for annuities.

- 5) A summary of the results.
- 6) An individual listing showing the data used and the results of the calculations for each member valued.

The stated aim of the guidelines is to allow a third party to accurately check the results of the calculations.

A formal actuarial report is also required for the triennial valuation of a Pensionskasse. This is normally signed by an actuary.

The guidelines for this report are similar (but not identical) to those mentioned above. A further feature of this report is that the appropriateness of the actuarial assumptions needs to be demonstrated, as does the sufficiency of the current assets and future contributions to meet the benefits promised.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

The following table shows an extract of the demographic assumptions that make up the "Richttafeln 1998" from Dr Klaus Heubeck.

Age	q.g(x)	q.w(x)	q.aa(x)	q.i(x)	i(x)	y(x)	h(x)
20	0.626	1.803	0.623	57.290	0.117	20	0.045
30	0.746	1.477	0.602	43.545	0.714	29	0.495
40	1.673	4.345	1.075	40.248	2.544	38	0.754
50	4.361	10.586	2.627	39.677	7.126	47	0.823
60	11.345	21.664	6.569	27.556	54.43	57	0.873
70	28.931	38.293	0	28.931	0	67	0.888
80	72.349	82.858	0	72.349	0	76	0.842
90	166.403	172.795	0	166.403	0	84	0.605
100	314.546	307.880	0	314.546	0	89	0.280

The table above relates to **males** only. All rates are per 1,000 lives.

q.g(x)	=	rate of mortality - pensioners
q.w(x)	=	rate of mortality - widowers
q.aa(x)	=	rate of mortality - actives
q.i(x)	=	rate of mortality - disabled
i(x)	=	rate of disability
y(x)	=	age of spouse
h(x)	=	proportion married at death

# ICELAND

## **1 PENSION FUNDS IN ICELAND: LAW AND REGULATIONS**

In Iceland every employed and self-employed person is required by law to pay a minimum premium to a pension fund which has a license to operate as such. The employer is responsible for paying the premium which is in most cases 10% of the salary, 4% paid by the employee and 6% paid by the employer. In 1997 a law was implemented in which every aspect of the activity of pension funds was defined and certain minimum requirements were set as to the benefits payable by the funds to the members and their spouses and children. All the funds are on a defined contribution basis except some funds for employees of the government and some municipalities. These funds have the guarantee of the government and the respective municipalities that they will be able to pay the defined benefits. Other funds are mostly established on the basis of agreements between Employee Unions on one hand and Employers on the other.

## **2-3 ACTUARIAL CALCULATIONS**

A formal actuarial valuation of a pension fund is required every year. The valuation is based on assumptions set out in a regulation which also decides that the Félag íslenskra tryggingastærðfræðinga (Association of Icelandic Actuaries) shall perform the calculations of the various tables needed in this respect. This task has been performed by a task force appointed by the association.

The assets of the pension fund are taken at their book value with some adjustments. All bonds with fixed interest income are booked at the original rate of interest but equities are booked at the market value at the end of the accounting period but with possible averaging. Most bonds in Iceland are index linked and these bonds are valued on the basis of 3.5% rate of interest and this value is used in the actuarial valuation. Therefore the assets in the actuarial valuation differ from the assets in the accounts by the difference between the value of the fixed interest rate bonds valued at the original rate of interest and when valued at 3.5% pa.

There is usually no transfer of pension rights between pension funds until a person has gained the right to a pension ie retires. Then minor pension rights, that is rights for less than approximately 3 years premium payments, are transferred to the fund the pensioner last paid premiums to. Other funds however pay pensions directly to the pensioner.

A unique feature of the pension system in Iceland is the possibility for married couples to split the old-age pensions rights they have earned during the marriage between them. This split-up of pension rights will not change the liabilities of the pension funds involved and therefore the split-up shall be based on actuarially calculated values

Furthermore actuaries are expected to be involved in calculations of cross-border transfers of pension rights, that is where a citizen of a foreign country which is not a member of EEA, is moving back to his home country.

#### **4 ACTUARIAL METHODS**

The accrued liabilities of a pension fund are calculated as the present value of the accrued benefits. Each member of a fund earns each year pension rights that are directly proportional to the "Basic Salary" of the fund. (The Basic Salary is regulated monthly according to the change in the consumer price index.) These rights are converted into "points"(the salary of the member/Basic Salary). The rights are accrued over the service years of the member so at each time the number of points the member has earned defines his accrued pension benefits. The future pension rights are estimated for each active member of the fund on the basis of his past 3 years history of premium payments. The present value of the actuarial liabilities in respect of future benefits to each member are calculated as well as the present value of the estimated future premiums. From the sums of these present values the surplus or the deficit of the pension fund is derived as

Surplus/deficit = Assets + PV of premiums – PV of (Earned benefits + Future benefits +Future costs)

If the surplus/deficit is more than 10% of the liabilities, the Pension Fund is by required by law to make changes such as increasing or decreasing the benefits to the members. It is to be expected that the Pension Funds will make the necessary changes at a lower level than the surplus/deficit.

#### **5 ACTUARIAL ASSUMPTIONS**

##### **Economic assumptions**

The economic assumptions made in respect of the calculations of the liabilities of a pension fund must comply with the requirements of the Regulations. Accordingly the net real rate of discount to be used is 3.5% pa for funds which link the pensions to the consumer price index and 2% pa for those funds which link the pensions to salary levels. No further assumptions are made in respect of price inflation or salary inflation

##### **Demographic assumptions**

As previously mentioned the regulation requires that the Icelandic Actuarial Association sets out the various demographic assumptions on the basis of the most recent information on mortality, disability, proportion married or cohabiting and the probability of having a child. These probabilities are all age-dependent. The association has not yet prepared disability tables but the Danish Tables G82 with a 30% reduction in the disability probabilities are used. The mortality tables are based on the mortality of the Icelandic people in 1991-1995 graduated according to Gompertz-Makeham

The other probabilities are based on statistics for the Icelandic population at the end of 1997.

If the actuary is of the opinion that these assumptions do not apply to the members of a Pension Fund he or she can use a different set of assumptions but he/she is required also to calculate liabilities according to the standard assumptions.

## 6 COMMUNICATION OF RESULTS

The actuary presents the results of his/her calculations in a formal report to the Board of Directors of the Pension Fund. This report shall then be submitted to the Financial Supervision as well as the annual accounts and some other information. There is no description in the law or in the regulation on what information shall be included in the report. The Icelandic Actuarial Association may soon issue guidelines on the information to be included in the report.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

Rates are per 1,000 lives.

<i>Age</i>	<i>q<sub>x</sub></i> <i>(males)</i>	<i>q<sub>x</sub></i> <i>(females)</i>	<i>e<sub>x</sub> (m)</i>	<i>e<sub>x</sub> (f)</i>
20	0.80	0.25	57.24	61.41
30	0.96	0.40	47.69	51.58
40	1.52	0.86	38.18	41.84
50	3.48	2.22	28.91	32.34
60	9.76	6.25	20.28	23.33
70	27.96	18.09	12.90	15.30
80	75.32	52.38	7.36	8.82
90	182.34	147.16	3.83	4.37
100	391.04	377.96	1.89	1.95

Note:  $e_x$  is life expectancy at age  $x$

# IRELAND

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Ireland calculations are required from actuaries in respect of **company-sponsored** and **industry-sponsored** pension schemes which provide **defined benefits** and are established through a **pension fund** which may or may not be insured. Actuarial involvement is required by Irish Law (Irish Pensions Act 1990) and by the accounting profession.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries in Ireland.

- (a) Calculation of the value of the **accrued liabilities** and **assets** of the pension scheme.
- (b) Calculation of the **annual cost/required contribution** payable to the pension fund in order for it to be able to meet its future liabilities.

The above calculations are made triennially unless circumstances require more frequent attention. The calculations are made to meet the requirements of the regulatory authority (the Pensions Board) and the Revenue. In particular the actuary is required to:

- (i) Determine the current **funding level** of the pension scheme and recommend a future contribution rate. The funding level is the value of the assets in relation to the value of the accrued liabilities of the scheme in respect of past service.
- (ii) Make a statement declaring that the current funding level is such that the assets of the scheme are sufficient to meet the accrued liabilities and that this position will be maintained by the recommended contribution rate. This statement assumes that the scheme is continuing.
- (iii) The Pensions Board requires a statement that the assets in the pension fund are sufficient to meet certain liabilities in the event of the scheme being wound up. (This certificate is required at least every 3½ years).
- (iv) The sponsoring company/organisation require the calculations to be made for their commercial accounts (in accordance with the commercial accounting guidelines SSAP 24 or FAS 87 for companies with US parents).

One set of calculations using the same actuarial basis and method is normally made by the actuary for the purposes of (i), (ii) and (iv) although in some cases the accounting calculations under (iv) will be made using a different actuarial basis and method.

For (iii), the actuary will normally use assumptions appropriate for winding-up.

### **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in Ireland:

(a) **Calculation of a transfer value in the case of individual movement of employees**

The amount transferred varies from scheme to scheme but the usual intention is that the transfer value is the present value of the deferred (or vested) pension otherwise payable. This is the minimum payment decreed by law. Actuarial guidance note GN11 (ROI) lays down the principles on which transfer values are to be calculated. The Society of Actuaries in Ireland is currently preparing a revised guidance note which will set out a standard (minimum) basis.

(b) **Calculation of transfer values in the case of bulk transfers arising from company takeovers/mergers**

The amount transferred may vary between the sum of the individual transfer values described in (a) above, and the present value of accrued benefits (with full allowance for future salary and pension increases where appropriate). Allowance may or may not be made for the funding level (ie the level of the assets in relationship to the level of liabilities) of the pension fund.

(c) **Analysis of the experience of the pension scheme**

For large schemes the economic and demographic experience of the pension scheme is investigated on each occasion that an actuarial valuation is made. The investigation is used to check the suitability of the actuarial assumptions made and perhaps provide a basis for deriving new actuarial assumptions. It is also used as a check on the calculation results. The need for an investigation arises from a professional requirement for the actuary to be satisfied as to the suitability of the assumptions made and for the actuary to provide a commentary on any significant variations in experience from the assumptions made at the previous valuation. For smaller schemes the experience of the scheme alone is not sufficient to determine suitable assumptions and regard is had to other schemes where the experience can be expected to be comparable. The Society of Actuaries in Ireland is undertaking a study of the mortality experience of pensioners of Irish pension schemes.

(d) **Actuarial Factors**

Calculations of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.

(e) **Value of Directors' Pensions**

A company listed on the Irish Stock Exchange must disclose in its annual accounts the value of the pension entitlements earned during the year by its directors. These calculations are carried out by an actuary in accordance with Guidance Note GN11(ROI).

(f) **Value of Pension on Divorce**

The Family Law Acts require pensions to be taken into account on divorce or separation and provide for pension adjustment orders to be made. The Acts require the value of pensions for this purpose to be determined by an actuary, who undertakes his valuation following Guidance Note GN11A(ROI).

#### 4 **ACTUARIAL METHODS**

For the main types of actuarial calculations performed the following methods are employed.

(a) **Calculation of the value of the accrued liabilities and assets of a pension scheme**

The **accrued liabilities** of a pension scheme are usually calculated as the **present value** of the **accrued benefits**. This corresponds to the standard fund for the **projected unit credit** and **attained age funding methods** described in Appendix 2.

The accrued benefits for actives are taken to be those benefits earned by the members in respect of years of service up to the date of calculation. Where benefits are defined in terms of a benefit amount multiplied by the number of years of service then the accrued benefit is usually determined by substituting the actual years of service up to the calculation date in the benefit formula. Where benefits are not **directly** defined in terms of years of service then accrued benefits are usually taken to be the total benefits payable multiplied by the factor  $m/n$ , where  $m$  equals the number of years of service up to the valuation date and  $n$  represents the total number of years of service.

The value placed on the assets is either the **market-value**, usually with the use of an averaging period, or the **discounted value** of future income and capital proceeds from the assets held. The different methods for determining the future income levels are described in Appendix 2.

The **historic cost** approach is **not** used to value assets.

(b) **Calculation of the annual cost/required contribution for the pension scheme**

The most common method used for determining the required contribution rate is the **projected unit credit method**. The **attained age** and **aggregate methods** are sometimes used.

The aim in most cases is to establish a contribution rate as a **level percentage of salary**. In all cases the method used corresponds to the description in Appendix 2. Where the projected unit credit method is used, “risk” benefits (eg where lump sum death payments are made and where the value of benefits paid on death and disability is in excess of the value of accrued pension benefits) are sometimes charged on a “risk premium” basis (see Appendix 2).

The final contribution rate that is recommended may be different from the standard contribution rate as determined by the method. This will be due to the amortisation of surpluses or deficits in the scheme, as revealed by the calculation in (a), or other factors.

The actuary is free to choose the method of calculating the required contribution. Where, however, the results are used for the commercial accounting purposes of the sponsoring company the method has to comply with the commercial accounting regulation **SSAP 24**, which results in the following requirements:

- (i) The cost of providing pensions should be recognised by the employer on a **systematic basis** over the period during which he benefits from the employees’ services.
- (ii) The **regular annual cost** should, when expressed as a percentage of salary, be expected to remain relatively **level** over a period of time (or a final salary type pension scheme).
- (iii) **Surpluses** or **deficits** arising in the scheme should (with certain exceptions) be amortised in a systematic manner over the expected future service period of employees (variations from the regular cost).

The requirement that the cost remains stable as a percentage of salary precludes the use of some methods in certain circumstances, in particular the current unit method without a substantial control period.

The actuary follows the professional guidelines laid down by the Institute and the Faculty in Guidance Note GN17 as to when each method may be unsuitable.

The **annual cost** arrived at (regular annual cost plus variations in cost) is the cost which is charged to the sponsoring company’s commercial accounts. This may differ from the contributions actually paid.

The methods of calculating transfer values have already been described in section 3.

SSAP24 will be replaced by a new accounting standard FRS17 by 2003. The new standard will require:

- (i) The use of market value of assets
- (ii) A discounting rate based on high quality corporate bonds
- (iii) 'Best estimate' assumptions.
- (iv) Immediate recognition of gains/losses.

## 5 ACTUARIAL ASSUMPTIONS

### Economic assumptions

The economic assumptions used are chosen by the actuary in consultation with the trustees and/or employer. The assumptions made are not subject to direct restrictions from the taxation or supervisory authorities. The actuary has, however, a professional responsibility to ensure that the assumptions represent an appropriate long term view of future events.

Under commercial accounting guidelines (“SSAP 24”) the assumptions should together represent a “**best estimate**”. The choice of assumptions in this case is the responsibility of the sponsoring company but will be based very much on actuarial advice. The same set of assumptions is used for the calculations 4(a) and 4(b).

The following table summarises the economic assumptions usually made for a final salary type pension scheme:

<i>Assumption</i>	<i>Typical value</i>
Rate of price inflation	3% to 4% = $p$
Rate of interest	$p + 3\%$ to 5% p.a.
Rate of increase in salaries	$p + 1\%$ to 3% p.a.
Rate of increase in pensions	as defined in the scheme rules or alternatively as requested to be included by the employer/trustees
Rate of increase in social security benefits	$p + 0\%$ to 2% p.a.
Rate of increase in dividends/property income	$p + 0\%$ to 2% p.a.

In absolute terms a typical set of assumptions would be

price inflation	=	3% pa
interest rate	=	7% pa
salary increases	=	5% pa
social security benefit increases	=	4% pa
pension increases	=	3% pa
dividend increases	=	4% pa

The use of a control period may involve the inclusion of future salary and benefit increases only over a fixed period (usually 15–20 years).

For small schemes, the actuary will have regard to current market annuity rates in valuing liabilities for members close to retirement.

The **transfer value** calculation will normally be made by reference to the long term valuation assumptions used for the main actuarial calculations but adjusted to reflect the yield currently available on suitable fixed interest or index linked investments.

### **Demographic assumptions**

The demographic assumptions are again chosen by the actuary without any direct restrictions from the supervisory or taxation authorities. The actuary has a professional responsibility to ensure that the assumptions are appropriate. The choice of the actuary will be based on his general experience and for larger pension schemes may be based on the actual demographic experience of the membership of the scheme itself.

It is usual to use different mortality tables for actives, pensioners and ill-health/disability pensioners. Widows/ers may also be valued using different mortality assumptions from normal pensioners.

Standard tables of mortality are frequently used, in particular for pensioners' widows/ers' and deferred pensioners' mortality. The standard tables generally used are based on statistics gathered by life offices relating to the experience of assured lives and members of insured pension schemes. The mortality rates for pensioners in these tables include projection of improvements in mortality.

The final retirement age used is normally that given in the pensions scheme rules.

The following table summarises the demographic assumptions usually made for calculations relating to a larger pension scheme.

**Class of Pension Scheme Member**

	<i>Active</i>	<i>Deferred Pensioner</i>	<i>Ill health Pensioner</i>	<i>Pensioner</i>	<i>Widow/er Dependant</i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	—	—	—	—
Recovery from disability	—	—	—	—	—
Withdrawal/turnover	X	—	—	—	—
Early retirement	X	not normally	—	—	—
Normal retirement	X	X	—	—	—
<b>Other Assumptions</b>					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	—	—	—	—	—
Orphans' mortality	—	—	—	—	—
Salary scale	X	—	—	—	—

Select rates are not normally used.

For the purposes of applying demographic assumptions the population of the pension scheme is normally split into **males** and **females**, and (where appropriate) **staff** and **workers**.

Allowance for the **administration expenses** of the scheme will depend on whether the costs are charged directly to the scheme or are borne by the employer.

**Orphans'** pensions may be allowed for by a general factor applied to the widows/ers' pensions.

## 6 COMMUNICATION OF RESULTS

The results of the main actuarial calculations made (as described in section 2) may initially be sent to the employer/sponsoring company by way of a preliminary results letter. The results may then be discussed in a meeting where, for instance, the treatment of any surpluses or deficits may be decided. A **formal actuarial report** will in all cases be sent to the trustees of the pension fund. The signatory of the report must be a Fellow of the Society of Actuaries in Ireland who holds a pension scheme actuary practising certificate issued by the Society, and the contents of the report must conform to the guidelines laid down by the Society of Actuaries in Ireland in Guidance Note GN9 (ROI) . The main points of the guidelines are set out below.

1. The actuary should set out the purpose of the valuation, the benefits valued and a summary of the data used.
2. The actuary should give a summary of events occurring in the period since the previous valuation.
3. The actuary should describe the funding method being used, its objectives and its implications in terms of the stability of contribution rates and future funding levels.
4. The actuarial assumptions made should be set out.
5. The appropriateness of the investment policy of the pension fund should be commented on.
6. The future contribution rate should be recommended.
7. The discontinuance and ongoing funding position should be given and commented on.

The formal report will be sent to the trustees of the pension scheme but must be made available to the members/trade unions as defined in the Irish Pensions Act 1990.

## 7 **DEMOGRAPHIC ASSUMPTIONS**

The demographic assumptions typically adopted for a valuation would be:

Mortality in normal retirement:	PA(90) rated down between 2 and 4 years
Mortality in ill-health retirement:	Normal retirement mortality rated up 5 years
Mortality in deferment:	A67/70 rated down 2 years for males and 5 years for females
Proportions married:	90% (may be an age related scale)
Age difference between spouses:	Husband 3 years older than wife
Rates of withdrawal:	Depends on scheme's experience
Rates of ill-health retirement:	Appropriate multiple of mortality rates.

# ITALY

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Italy calculations are required from actuaries in respect of the various compulsory supplementary arrangements (FIPDAI, PREVINDAI, FPDAC, etc) and the additional non-compulsory arrangements. These additional arrangements are either book reserved or financed via a “cassa-di-previdenza” using either insurance (more usual) or a self-administered fund (less usual). The involvement in book reserved plans and “cassa-di-previdenza” is considered here.

## 2 MAIN ACTUARIAL CALCULATIONS

Actuaries calculate the level of contributions payable, the value of accrued liabilities and where applicable the value of any assets held. For book reserved plans the level of the appropriate book reserve to be held is to be calculated. Calculations for book reserved plans are repeated annually. In respect of pension funds a fixed rule regarding the frequency of calculations does not exist; calculations are usually repeated every three years.

In each case only one set of calculations is usually made to satisfy all interested parties.

## 3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES

The following calculations are also undertaken by actuaries in Italy

- (a) Calculation of transfer values in both individual and bulk movements of employees.
- (b) Analysis of the experience of the pension scheme.
- (c) Calculation of lump sum commutation factors early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.

## 4 ACTUARIAL METHODS

Pension plans financed directly by the employer (book-reserved plans) or those utilising a “cassa-di-previdenza” in conjunction with a self-administered pension fund adopt one of the following three funding approaches:

- (a) **“Pay-as-you-go”**
  - (b) **“Partial prefunding”**
- reserves held in respect of current pensioners only

(c) **Full prefunding**

- full reserving for all members in line with a standard actuarial full prefunding method. The most common method employed is the entry age method

The required contributions are determined by projecting the pension expense over a future period (usually 70 years, but in some cases also for less time in connection with the specificity of pension found object of analysis ). The pension expense (or contribution required) is then averaged over the projection period. Projections are generally based on one of the following two approaches:

(a) **“Cohort” method**

Entry age premiums are calculated for the cohort of expected new entrants aged  $x$  in year  $m$  ( $0 < m \leq M$ ). An average entry age premium is then derived over the period  $M$ ;

$$PV_x^{(m)} = \text{Present value of future benefits for the new entrants age } x \text{ in year } m$$

$$S_x^{(m)} = \text{Present value of future salaries for the new entrants age } x \text{ in year } m$$

The premium rate for members entering the plan at year  $m$ , aged  $x$  is then:

$$P_x^m = \frac{PV_x^{(m)}}{S_x^{(m)}}$$

The “cohort” premium rate for year “ $m$ ” is then

$$P^m = \frac{\sum_{x_0}^{PA} PV_x^{(m)}}{\sum_{x_0}^{PA-1} S_x^{(m)}}, x_0 = \text{youngest entry age} \quad PA = \text{normal retirement age}$$

The cohort premiums are then averaged over the projection period (the mean is weighted by the present value of salaries)

$$\text{Average future premium rate} = \frac{\sum_0^M v^m P^m \sum_{x_0}^{PA-1} S_x^{(m)}}{\sum_0^M v^m \sum_{x_0}^{PA-1} S_x^{(m)}}$$

(b) **“Years of management” method**

Under this method a premium rate is determined by comparing the total pension expense in respect of all the members of the pension plan with the total salaries paid out. The rate is determined as a weighted average over the projection period:

$$\text{Premium for year } m = P_m = \frac{\sum_{x_0} O_x^{(m)}}{\sum_{x_0}^{PA-1} S_x^{(m)}}$$

where  $O_x^{(m)}$  = Total benefits paid out to lives aged  $x$  in year  $m$  (pay-as-you-go financing)

or = present value of future benefits for **new** pensioners in year  $m$  aged  $x$  (partial prefunding)

$S_x^{(m)}$  = salaries paid out in year  $m$  to lives aged  $x$

The average premium rate for the projection period then simplifies to

$$G = \frac{\sum_0^M v^m P_m \sum_{x_0}^{PA-1} S_x^{(m)}}{\sum_0^M v^m \sum_{x_0}^{PA-1} S_x^{(m)}}$$

Pension plans implemented through a “cassa-di-previdenza” on an insured basis are usually defined contribution plans. Actuarial involvement is through the calculation of premium rates on a recurrent-single or level annual premium basis in respect of deferred annuity contracts.

The **assets** of a pension fund are usually valued at their book value, although properties may be revalued from time to time.

## 5 ACTUARIAL ASSUMPTIONS

### Economic assumptions

(a) **Book reserved plans**: see pension funds.

(b) (i) *Insured pension plans*

Insurance tariffs are usually based on an interest rate of 2,5%.

(ii) *Self-administered pension funds*

The actuarial assumptions represent the choice of the actuary. The assumptions made are not subject to direct restrictions from the relevant authorities and will be based on the pension funds' experience general economic indices, instruction of Welfare Ministry (Ministero del Lavoro e della Previdenza Sociale) and the new instruction of Italian Actuary Boards (Consiglio Nazionale degli Attuari and Consiglio dell'Ordine).

The following table summarises the economic assumptions usually made:

Assumption	Typical value
Rate of price inflation	1,8% - 2,2% = $p$
Rate of interest	$p + 1%$ to 3% p.a.
Rate of increase in salaries	$p$ p.a.
Rate of increase in pensions	80% * $p$ or a % of yield regarding the new pension funds (D. Lgs. 124/93) p.a.
Rate of increase in social security benefits	$p$
PIL (GDP)	$p + 1,5%$ to 3%

in **absolute** terms a typical set of assumptions would be

price inflation	= 2% p.a.
interest rate	= 4% p.a.
salary increases	= 2% p.a.
pension increases	= 1,6% p.a.
social security benefit increases	= 2% p.a.

The rate of price inflation is correlated to that used in official government projections. The rate of interest to be used will be determined from the average performance of the fund over the previous five years, but also from the advice of financial sector (if it exists) regarding the near future. The rate of salary increases chosen will reflect general inflation, and the increases arising from employees' share of productivity gains. There are also some pension found allows promotional increase.

### **Demographic assumptions**

(a) *Book reserving and pension funds*

The demographic assumptions used are chosen by the actuary without any direct restrictions from the relevant authorities. Where the membership of the fund is significant the assumptions will be based on the experience of the fund. For smaller populations standard tables will be used.

The standard tables commonly used are as follows:

- Technical bases of the National Institute of Social Welfare from 1978  
They contain the main demographic decrements on the experience of private sector employees.
  - recovery/mortality for disabled lives (selected rates) on the decade 1979–1980;
  - the mortality of widows/ers on the years 1979/80.
- Standard tables based on the experience of banking sector employees in the years 1976–1980  
These correspond to the technical bases used by INPS based on the Italian population mortality experience in the years 1990 - 1992. In addition to the technical bases above, the banking sector uses also some tables selected on the single pension plan's members.
- Standard tables of ISTAT (National Institute of Statistics)
  - Mortality rates are based on the experience in the years 1990–1992;

For particular areas, the standard tables commonly used are as follows:

- Rates of marriage and fertility are based on the experience of the Italian population in the years 1979–1980, in addition with the publications of National Institute of Social Welfare on this area
- Rates of disability are based on the experience of working sector and on technical bases of National Institute of Social Welfare on this area

These bases are currently adjusted to allow for improvements in mortality and other factors.

For the purposes of applying demographic assumptions the population of the pension scheme will be split into males and females and then further into blue-collar workers, white-collar staff and management.

The following table summarises the demographic assumptions usually made:

**Class of Pension Scheme Member**

	<i>Active</i>	<i>Deferred Pensioner</i>	<i>Ill health Pensioner</i>	<i>Pensioner</i>	<i>Widow/er Dependant</i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	X	—	—	—
Recovery from disability	X	X	X	—	—
Withdrawal/turnover	X	—	—	—	—
Early retirement	X	not normally	—	—	—
Normal retirement	X	X	—	—	—
<b>Other Assumptions</b>					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	X	X	X	X	—
Orphans' mortality	X	X	X	X	—
Salary scale	X	—	—	—	—
New entrants	X				

Select rate are not normally used. Contributions are usually calculated on a “net” basis; the expenses of the pension fund are allowed for separately.

## 6 COMMUNICATION OF RESULTS

The results of the main actuarial calculations are communicated by means of a formal actuarial report. The National Council of Actuaries plans to introduce guidelines as to contents of such reports, the main requirements being as follows:

- (i) Summary of the legislation (general e.g. COVIP and particular e.g Statute and Regulation of single pension found) relevant to the calculation.
- (ii) Summary of the data used including its most significant features and developments.
- (iii) Description of the actuarial method used including the methodology applied and its applicability/range of validity.
- (iv) Description of the demographic assumptions adopted including details of their sources.

- (v) Description of the economic assumptions adopted.

The assumptions made should, when taken together, reflect the particular situation of the fund and the expected development of the economy as a whole.

- (vi) The principal formulae used.
- (vii) Description of projections of assets and liabilities and the connected evolution of property
- (viii) A detailed description of the results containing enough information for their correct interpretation. In particular the reserves for actives should be split between those held for existing members and those held for future new entrants. A projection should be made of the development of the active and retired population, the reserves to be held, the income and the cash flows of the fund.

## 7 EXAMPLE ASSUMPTIONS

### Population mortality 1990–1992

Age	Rate of mortality $q_x$	
	Male	Female
0	0,00879	0,00691
5	0,00021	0,00018
10	0,00019	0,00012
15	0,00037	0,00019
20	0,00105	0,00031
25	0,00122	0,00033
30	0,00151	0,00050
35	0,00151	0,00060
40	0,00165	0,00084
45	0,00248	0,00129
50	0,00423	0,00213

Age	Rate of mortality $q_x$	
	Males	Females
55	0,00690	0,00328
60	0,01206	0,00527
65	0,01999	0,00850
70	0,03103	0,01460
75	0,04787	0,02554
80	0,07669	0,04774
85	0,12764	0,09134
90	0,19319	0,15970
95	0,28142	0,26823
100	0,39150	0,41824
105	0,54167	0,61538

# LATVIA

## 1 STATE SOCIAL INSURANCE SYSTEM IN LATVIA

Occupational pension benefits are not developed in Latvia. In this section the development of the social insurance system is described.

According to the Ministry of Welfare of the Republic of Latvia:

*Aim:* to establish a stable long-term viable social insurance system.

### Tasks

- Elaboration of a unified state policy in the field of social insurance and state social benefits.
- Monitoring and assessment of implementation of this policy.
- Co-ordination and harmonisation of the social security legislation in compliance with requirements of the European council and European Union.

### Tasks until the year 2001

- Establishment of an efficient social insurance financing policy.
- Improvement of the social insurance services and state social benefit system.
- Participation of the European integration process.
- Improvement of social insurance administration.

5 units are established to ensure functions to be effected by the Department.

### Pension unit

- Elaborates drafts of concepts, laws and other legislative acts in the field of pensions and accident-at-work insurance.
- Assesses and monitors pensions and accident-at-work insurance policy.
- Conducts operation of the State Social Insurance Agency on the issues of granting, recalculation and payment of pensions and insurance indemnities.
- Assesses conformity of the pension and accident-at-work insurance legislation with the international norms.
- Assesses and provides conclusions on draft legislative acts on issues under the competence of the Pension sector, elaborated by other structural units and other ministries.
- Provides explanations to institutions, organisations and individual persons on the issues of pension legislation and accident-at-work insurance application.

### **Unit of benefits**

- Prepares proposals for adoption of political decisions in the field of social insurance benefits and state social benefits.
- Elaborates drafts of concepts, laws and other legislative acts on the issues of social insurance benefits and state social benefits.
- Assesses conformity of social insurance benefits and state social benefits legislation with the requirements of international norms and effects their harmonisation.
- Assesses and provides conclusions on draft legislative acts elaborated by other structural units and other ministries.

### **Unit of economic analysis and forecasting**

- Provides assessment on social insurance and its financing policy.
- Elaborates economic quantification of draft laws and other normative documents.
- Performs analysis of the economic and demographic situations and prognosis of the social insurance system operation in relation with these factors.
- Assesses draft laws and normative documents in the context of social insurance, submitted by other state institutions.
- Summarises and analyses social statistics.

### **Revenue unit**

- Elaborates draft concepts, laws and normative acts on the issues of the financing of social insurance and contribution administration.
- Effects monitoring of elaboration of the social insurance special budget and state basic budget.
- Effects assessment of the social insurance financing policy.
- Co-operates with the Ministry of Finance and the State Revenue Service on the issues of social insurance financing and administration of compulsory contributions.
- Co-operates with the State Social Insurance Agency on issues of social insurance financing and accounting of contributions.

### **International agreement and relations unit**

- Prepares draft legislative acts for Latvia joining the international conventions.
- Elaborates bilateral draft laws in the field of social security.
- Prepares analysis of the national social security legislation, in order to determine its conformity with documents of the European Union, European Council, as well as the International Labour Organisation.
- Ensures preparation of information on the social security system and perspectives of its development for the needs of international institutions.

The operation of the Social Insurance department is closely related to the non-profit state joint stock company "State Social Insurance Agency", which is monitored by the department. The Social Insurance department ensures elaboration, monitoring and assessment of social policy, while the State Social Insurance Agency ensures administration of social services.

### **Most important laws, conceptions, agreements concluded**

Most important political resolutions which have determined the direction of the state social policy reform were adopted within the years 1995 – 1996.

#### **Laws**

"On state pensions"

"On state social insurance"

"On maternity and sickness insurance"

"On insurance against unemployment"

"On compulsory social insurance against accidents at work and occupational diseases"

"On social assistance"

"On private pension funds".

#### **Concepts**

Pension reform concept.

#### **Agreements in the field of social security**

1. Agreement between the Republic of Latvia and the USA on payment of pensions.
2. Agreement between government of the Republic of Latvia and government of the Republic of Lithuania on Cupertino in the field of social security.
3. Agreement on Cupertino in the field of social security between the Republic of Latvia and the Republic of Estonia.
4. Agreement between government of the Republic of Latvia and government of the Kingdom of Sweden on Medical Care for Temporary Visitors.
5. Agreement between the Republic of Latvia and the Ukraine on Cupertino in the field of social security.

#### **Most important publications**

- "The Social insurance system and state social benefits in Latvia. Statistical bulletin. 1995 – 1997."
- "The Social insurance system and state social benefits in Latvia. Statistical bulletin. 1995 – 1998."  
(<http://www.Im.gov.lv/>)

## 2 PENSION REFORM IN LATVIA

State social security reform started in 1995 foreseeing implementing of three pillar system. The history of the reform in legal framework is following.

- **1<sup>st</sup> level** Law on State Pensions (1996)
- **2<sup>nd</sup> level** Law on State Funded Pension (2000).
- **3<sup>rd</sup> level** Law on Private Pension Funds (1998)

## 3 PENSION REFORM TRANSITION PERIOD

Presently there are two laws – Law on state pensions and Law on state social insurance, that stipulates state social security rules.

Law on state pension states the formula:

$$P = K/G$$

P – annual pension

K =  $K_S + K_B$  – accumulated capital;  $K_S$  – average salary since 1996 times work time period till 1995 (incl);  $K_B$  – contributions since 1996

G – average life expectancy after retirement.

*State pensions are indexed every year.*

### ***1<sup>st</sup> level PAYG system***

- Social insurance tax presently is at 36.09% (employer – 27.07% employee – 9%; the transition from employer to employee is foreseen in coming years).
- Law on state pensions states the retirement age 62.

### ***2<sup>nd</sup> level State funded system***

- The law will come in force starting from 1 July 2001.
- Participants: obligatory – persons under age 30; voluntary – persons aged 30 to 49.
- On reaching pension age a person may receive pension in two ways: through state pension; through private life insurance company.

### **Split of the total social tax between PAYG and Funded scheme**

The law states that 10% from total social tax for the total social insurance tax will go to funded scheme.

*During transition period:*

- 1 July 2001 to 1 January 2007 – not less than 2%
- 1 January 2007 to 1 January 2008 – not less than 4%
- 1 January 2008 to 1 January 2009 – not less than 9%

### ***3<sup>rd</sup> level Private pension funds***

- Private pension funds and life insurance companies can operate on the third level.
- Type of pension fund – closed private pension fund (only employer can be the founder of such pension funds); open private pension fund (founders can be banks or life insurance companies).
- Retirement age 55
- Private pension fund can only accumulate supplementary pension capital. Policyholders can choose the payment in one of three ways: through state pension; through life insurance company or as lump sum.

# NETHERLANDS

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In the Netherlands calculations are required from actuaries in respect of company sponsored and industry sponsored pension schemes which provide defined benefits and are established through a **pension fund** or **group insurance** contract (smaller schemes). Pension funds may be invested on a **self-administered** basis or be fully **reinsured**. Self-administered funds are required to have an actuary appointed to the board of management. Actuarial involvement is a requirement of the supervisory authorities (PSW 1952).

The actuary performs annually a capital adequacy test to check whether technical provisions set up for pension liabilities can indeed be considered sufficient. The actuary will also check whether the financial strength of a pension fund is sufficient. By this is meant all the additional resources that are available in a pension fund to secure its pension liabilities.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main calculations undertaken by actuaries in the Netherlands:

### (a) **Self-administered pension funds**

- Calculation of the accrued liabilities (plus the reserve under the funding method, if different) and required contribution of the pension fund.
- Calculation of the required book reserve to be held in respect of unfunded past service liabilities existing at the introduction or amendment of a pension plan. As from 1 January 2000 unfunded past service liabilities are no longer allowed to be unfunded, and the unfunded past service liabilities as at 31 December 1999 have to be financed over 10 years.

The first calculation must be carried out annually (in addition to a full actuarial investigation and report). The first calculation is usually performed on a single basis to satisfy both the supervisory and taxation authorities. The book reserve calculation is calculated on a different basis; the rate of interest is prescribed each month by the tax authorities.

### (b) **Reinsured pension funds and group insurance contracts**

The actuary in the insurance company is required to calculate the premiums payable under the insurance contract. These will be according to the insurance tariff in operation. The resultant liabilities will form part of the insurers' technical provisions. A separate actuarial report is not required by the supervisory in respect of each individual insured scheme.

Both pension funds and insurance contracts are always operated on a full, individually allocated basis.

Actuaries do not normally value the **assets** of pension funds as a part of their calculations. For reporting purposes pension funds declare their assets at **market value** or **book value**.

### 3 **ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in the Netherlands:

(a) **Calculation of a transfer value in the case of individual movement of employees**

A nationwide transfer circuit of pension funds, insurance companies and employers exists which is known as the Circuit. Transfer values paid between the members of the circuit are calculated according to the standard mortality tables (see section 5) and equal the present value of accrued or vested rights calculated at 4% interest. An adjustment is agreed to allow for market interest rates although this is being phased out.

(b) **Calculation of transfer values in the case of bulk transfers arising from company takeovers/mergers**

(c) **Analysis of the experience of the pension scheme**

The analysis is required to be made for the annual report to the supervisor in conjunction with calculation 2(a).

(d) **Calculation of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits payable to the members of the pension scheme.**

### 4 **ACTUARIAL METHODS**

(a) **Self-administered pension funds**

These are usually funded according to one of the following methods.

- **Current unit method**, as described in Appendix 2.
- **Level annual premium method.** Benefits are funded by charging a level annual premium over the active service period on a non-projected basis. Each **increase** in total benefits (arising from salary increases etc) is charged over the **future service** period only on a level annual premium basis (equivalent to the non-projected entry age method but for increases in benefits the entry age is the date of increase).
- **Projected unit credit method**, as described in Appendix 2.

(b) **Reinsured pension funds and group insurance contracts**

Individual level annual premiums are calculated according to the insurance tariff. These premiums are reviewed each year to take account of bonus allocations and increases in benefits due to increases in salaries. This usually corresponds to the attained age method of funding on an unprojected basis. Alternatively recurrent single premiums may be payable (unit credit method).

## 5 ACTUARIAL ASSUMPTIONS

### **Economic assumptions**

The economic assumptions used for pension fund calculations are subject to the following restrictions from the taxation and supervisory authorities:

- (a) The valuation rate of interest should not exceed 4% (supervisory). The interest rate for direct insurance contracts should not exceed 3% (supervisory)
- (b) A salary/benefit increase assumption may be rarely used.
- (c) The valuation rate of interest used must not be less than 4% (taxation).

Restrictions (a) and (c) combine to imply that the interest rate used is 4%. In practice no additional assumption is usually made regarding future salary or benefit increases, the figure of 4% is taken to be real rate of return.

Whilst the majority of pension funds use the 4% assumption some are funded on a projected unit basis (see 4(a)) in which case a full set of “realistic” assumptions will be made. The following represents an example of a typical basis:

Interest rate: 6%

Salary increases: 3%

Price inflation: 2%

Pension increases: 2% (= Price inflation)

Insurance tariffs and reserves are generally calculated using an interest rate of 3% without further economic assumptions.

### **Demographic assumptions**

The demographic assumptions to be used are the choice of the actuary and should represent a best estimate. In practice the standard tables produced by the Dutch actuarial society are used for **all** calculations. These tables are based upon a 5-yearly census of the Dutch population, the most recent census period where tables are available is 1990-1995. An extract from these tables is shown in section 7.

The following table summarises the demographic assumptions made:

**Class of Pension Fund Member**

	<i>Active</i>	<i>Deferred Pensioner</i>	<i>Ill health Pensioner</i>	<i>Pensioner</i>	<i>Widow/er Dependant</i>
Decrements					
Mortality	X	X	X	X	X
Disability/Ill health retirement (*)	X	X	—	—	—
Recovery from disability (*)	X	X	X	—	—
Withdrawal/turnover	—	—	—	—	—
Early retirement	—	—	—	—	—
Normal retirement	X	X	—	—	—
Other Assumptions					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	—	—	—	—	—
Orphans' mortality	—	—	—	—	—
Salary scale	—	—	—	—	—

(\*) Disability benefits are very unusual.

Select rates are not used. Different mortality assumptions are made for males and females, otherwise the population of the pension scheme is not split into homogenous groups with differing assumptions.

**6 COMMUNICATION OF RESULTS**

The results of calculations made for pension funds are communicated by way of a formal report. Guidelines for who may sign a report are given by the “Actuarieel Genootschap” or Society of Actuaries. In general only actuaries with full member status may sign the reports but other persons are permitted provided that the supervisor raises no objections. The report to be submitted to the supervisor has to follow the certain guidelines, which have recently been revised.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

An extract of the standard tables GBV 1990-1995 and GBM 1990-1995 is shown below:

	<b>Male</b>	<b>Female</b>
20	0.00063	0.00027
25	0.00074	0.00034
30	0.00084	0.00049
35	0.00115	0.00072
40	0.00168	0.00109
45	0.00262	0.00169
50	0.00427	0.00265
55	0.00718	0.00420
60	0.01226	0.00667
65	0.02115	0.01062
70	0.03660	0.01695
75	0.05876	0.02944
80	0.09221	0.05551
85	0.14821	0.09594
90	0.23849	0.15727
95	0.37478	0.24720
100	0.55806	0.37200

# NORWAY

## **1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS**

In Norway calculations are required from actuaries in respect of defined benefit pension schemes which are financed through insurance contracts or self-administrated pension funds. Actuarial involvement is required by the supervisory authorities.

## **2 MAIN ACTUARIAL CALCULATIONS**

The following represent the main types of calculations, either insurance contracts or self-administrated pension funds, undertaken by actuaries in Norway:

- (a) Calculation of the insurance fund and the contingency fund of the pension scheme
- (b) Calculation of the premium and the premium tariffs of the pension scheme
- (c) Calculations for accounting purposes under the Norwegian accounting standard.

The calculation of the insurance fund, the contingency fund and the premiums are made annually, as well as the distribution of the surplus arising. They are required to be made annually for the formal report to the supervisory authority.

The premium tariffs must be approved by the supervisory authority, and are not altered very often in practice.

The Norwegian Accounting Standard for companies that sponsor occupational pension schemes is very similar to the US accounting standard FAS87.

## **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in Norway:

- (a) Calculation of the policy value of the pension rights when an employee or group of employees terminates the pension contracts.
- (b) Calculation of transfer values in the case of bulk transfers arising from company takeovers/mergers. The amount transferred includes the insurance fund and the contingency fund. The calculation of the contingency fund is undertaken by the actuary.
- (c) Calculations according to the annual report made for the supervisory authority; calculation of expenses, losses, income and funds, the distribution of accumulated profit to policyholders etc.

- (d) Actuaries are involved in analysing the demographic and economic experience of insurance contracts.
- (e) Calculations used for accounting purposes.

#### 4 ACTUARIAL METHODS

For the main types of actuarial calculations performed the following methods are employed.

- (a) **Level annual premium method.** Benefits are funded by charging a level annual premium over the active service period on a non-projected basis. Each increase in benefits (arising from salary increase etc) is charged over the future service period only on a level annual premium basis.
- (b) **Current unit method.** As described in Appendix 2. Benefits payable on death or disability are following the accrual method. Historically the use of the Current unit method is almost non-existent. Effective from January 1, 2001, the Current unit method replaces the Level annual premium method in the majority of the pension schemes.

Both insurance contracts and self-administrated pension funds are required to use the actuarial methods.

The calculations made for accounting standard purposes require adoption of the Projected Unit Credit Method.

#### 5 ACTUARIAL ASSUMPTIONS

##### **Economic assumptions**

The economic assumptions used for insurance contracts or self-administrated pension funds calculations have the following restrictions from the supervisory authority: the maximum rate of interest in premium calculations etc. is 4%. If the insurance contract or the self-administrated pension fund is established after 1993, the maximum rate of interest is 3%. No further assumptions are used regarding future salary/pension increase.

The accounting standard calculations require best estimate assumptions to be used and a discount rate that is based on bond yields.

##### **Demographic assumptions**

The demographic assumptions used in all calculations are usually chosen according to standard tables. The assumptions used have to be approved by the supervisory authorities. The standard tables currently being used are the IR73 tables (disability) and K63 tables (old age and death).

The following table summarises the demographic assumptions usually made for a typical insurance contract or self-administrated pension fund:

<i><b>Class of Pension Scheme Member</b></i>	<i><b>Active</b></i>	<i><b>Deferred Pensioner</b></i>	<i><b>Ill health Pensioner</b></i>	<i><b>Pensioner</b></i>	<i><b>Widow/er Dependant</b></i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	X	-	-	-
Recovery from disability	-	-	-	-	-
Withdrawal/turnover	-	-	-	-	-
Early retirement	-	-	-	-	-
Normal retirement	X	X	-	-	-
<b>Other assumptions</b>					
Proportion married	X	X	X	X	-
Age difference with spouse	X	X	X	X	-
Number of orphans	-	-	-	-	-
Average number of orphans	X	X	X	X	-
Average age of orphans	X	X	X	X	-
Orphans' mortality	-	-	-	-	-
Salary scale	-	-	-	-	-

For the purposes of applying demographic assumptions the pension scheme members are split into males and females.

The mortality rate is applied at each age, respective of the status of the member (pensioner, active, etc).

The disability rate is the probability of being disabled. The rate is select, depending on the age of disability.

An allowance for administration expenses is normally allowed for separately. The administration expenses depend on the number of members and pensioners, and the assets of the pension scheme.

## 6 COMMUNICATION

In accordance with the law (laid down by the Ministry of Finance on 1 June 1990), a balance sheet of the insurance contract or the self-administrated pension fund, will be reported to the clients.

The supervisory authorities require a detailed annual report for both insurance companies and self-administrated pension funds. The contents of this report must conform to the guidelines set down by the supervisory authorities. This report is required to be signed by the appointed actuary approved by the supervisory authorities.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

The following tables shows on example of demographic assumptions:

<i>Age</i>	<i>Rate of mortality – male active</i>	<i>Proportion Married – male active</i>	<i>Age difference with spouse</i>
20	0.0012	0.0347	1.02
25	0.00139	0.2965	1.395
30	0.0017	0.6440	1.77
35	0.0022	0.8712	2.145
40	0.00301	0.9041	2.52
45	0.00432	0.9198	2.895
50	0.00644	0.9250	3.27
55	0.00988	0.9198	3.645
60	0.01547	0.9041	4.02
65	0.0145	0.8780	4.395

# PORTUGAL

## **1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS**

In Portugal calculations are required from actuaries in respect of company-sponsored pension schemes which provide defined benefits and are established through a pension fund. Actuarial involvement is a requirement of the supervisory and taxation authorities.

## **2 MAIN ACTUARIAL CALCULATIONS**

The following represent the main types of calculations undertaken by actuaries in Portugal:

- a. Calculation of the value of the liabilities and assets of a pension scheme.
- b. Calculation of the annual cost/required contribution of a pension scheme.

The authorities require the above calculations to be made every 3 years. In practice valuations are commonly made more often (eg annually). Only one set of calculations is usually made to satisfy all the various requirements.

## **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in Portugal.

- a. Calculation of a transfer value in the case of individual movement of employees.
- b. Calculation of transfer value in the case of bulk transfers arising from company take-overs/mergers.
- c. Calculation of liabilities of the healthcare plans.
- d. Calculation of initial balance as a result of Mergers and Acquisitions.

The above calculations are only made very rarely and where made will usually equal the value of the accrued liabilities with an adjustment to allow for any shortfall in assets in the pension fund.

In addition actuaries are occasionally involved in calculating the benefits to be payable by the fund.

## **4 ACTUARIAL METHODS**

The most common method employed in Portugal is the Projected Unit method, as defined in Appendix 2. The aggregate, attained age and entry age methods are also sometimes used. The method used is the choice of the actuary (it is not necessary to seek approval by the taxation and supervisory authorities) except in relation to the preparation of the annual report for the TSP (supervisory authority) when the Current Unit method must be used.

Disability and widow/er's benefits on death-in-service are normally included in the funding calculation. However, they are sometimes allowed for on a "risk premium" basis. Post-retirement widow/er's benefits are normally included in the funding calculation.

The resultant contribution rate is normally expressed as a level percentage of payroll.

## 5 ACTUARIAL ASSUMPTIONS

### Economic assumptions

The economic assumptions made represent the choice of the actuary and are usually a "best estimate".

The following table summarises a typical set of long-term economic assumptions:

<i>Assumption</i>	<i>Typical value</i>
Rate of interest for discounting	5.5%
Rate of price inflation	2.0%
Rate of salary inflation	3.5%
Rate of pension increases	2.5%
Rate of increase in social security benefits	2.0%

### Demographic assumptions

The demographic assumptions represent the choice of the actuary.

The supervisory authorities permit the use of withdrawal/early retirement decrements and the standard mortality tables TV73/77 are specified as a suitable mortality basis.

Although TV73/77 is the most common mortality table adopted in practice, other standard tables (eg GkM 70) are also in use. No disability assumptions are specified, and in practice the EKV80 tables of disability are often used.

<i>Class of Pension Scheme Member/Contract Holder</i>	<i>Active</i>	<i>Deferred</i>	<i>Disability</i>	<i>Widow/er</i>	<i>Dependant</i>
<i>Decrement</i>					
Mortality	X	X	X	X	X
Disability/Ill-health retirement	X	X			
Recovery from disability	-	-	-	-	-
Withdrawal/Turnover	X	-	-	-	-
Early retirement	X	-	-	-	-
Normal retirement	X	X	-	-	-
<i>Other assumptions</i>					
Proportion married	X	X	X	X	-
Age difference with spouse	X	X	X	X	-
Number of orphans	X	X	X	X	-
Salary scale	X	-	-	-	-

Select rates are not used .

The final retirement age used is normally the normal retirement age for social security (65 years) or that given in the pension scheme rules.

For the purposes of applying demographic assumptions the population of the pension scheme is often split into males and females and sometimes according to class of employment. Only one set of mortality assumptions is generally used for actives, pensioners and deferred pensioners.

## **6 COMMUNICATION OF RESULTS**

The results of the calculations are usually communicated to the Financial or Personnel Director of the sponsoring company in the form of a formal report. The formal report is always signed by a qualified actuary. The report needs to include a description of the actuarial assumptions used, the method employed and a breakdown of the results of the calculations. Guidelines for the report are laid down by the supervisory authority.

# SLOVENIA

## 1 INTRODUCTION

A legislation basis for tax-favoured voluntary pension schemes in Slovenia has been established at the beginning of year 2000. At the same time, the old age State pension (pay-as-you-go funding method) has been reduced from about 85% down to 72% of the employee's net-salary. Compulsory fully-funded schemes in Slovenia only apply to a few occupations defined by the government. Up to now, few employees and employers have joined pension schemes. Therefore, it is still early to make any conclusions about any credible experience and performance.

In the following sections, only those schemes that meet criteria for the tax incentives are considered. Generally, they are financed through contributions from both the employer and the employees. Contributions paid by employers are considered as tax deductible expenses while the contributions of employees are exempt from income tax. The highest contribution subject to the tax incentives is defined as a percentage of employee's gross salary. In addition, it should not exceed certain fixed amount. To acquire tax incentives, a pension scheme must be certified by an appointed actuary and by the government authorities. All benefits including the old age pension are taxable as an income of the beneficiary.

In its most general form, a pension scheme can provide three types of benefits. The old age pension and early retirement pension are pure savings arrangements. To this basic scheme one can attach a disability benefit and/or widow (er) and orphan's pensions for which a separate risk premium is paid. Similarly, the reserves are also calculated and held separately for each of the products. A more detailed description of standard arrangements and corresponding actuarial methods and assumptions is given in Sections 4 and 5.

## 2 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Slovenia calculations are required from actuaries in respect to institutions providing voluntary pension schemes, which comprise of: insurance companies and insurance companies specialising in providing retirement benefits. Actuarial involvement is a requirement of insurance supervisory authority. Each insurance company has to have at least one appointed actuary approved by government authorities. A minimal requirement for his/her appointment is that he/she has successfully passed required subjects on a post-graduate course. The twelve required subjects are related to all aspects of actuarial involvement: general insurance, actuarial mathematics, statistics, accounting, finance, investments, economics, law and other related fields.

Each pension scheme has to be approved by an appointed actuary who must to give a positive opinion regarding the solvency of the managing company in order for the company to receive permission for managing that scheme. Essentially, the actuary has to show whether premiums and reserves are formed according to regulations as prescribed by law, and that liabilities are to be met in this way. For this purpose, all the necessary information and data has to be supplied to the actuary by the managing company. The detailed results and conclusions of the actuarial investigations and analyses are set out in the annual actuarial report sent to the insurance supervisory authorities and the management board of the company.

## **2 MAIN ACTUARIAL CALCULATIONS**

The main actuarial calculations related to old-age pensions contain:

- calculation of liabilities during savings period,
- allocation of annual surplus among members of schemes,
- calculation of surrender and transfer values,
- calculation of pensions,
- calculation of liabilities regarding annuities,
- expense analysis,
- calculation of cash flows and solvency consideration.

Expense analysis, long term cash flow studies, and solvency calculations are of particular importance as there is no past experience with pension schemes in Slovenia. There are no other similar significant business-lines in the insurance industry. In this respect, a realistic estimate of all parameters influencing the business (particularly expenses) is carefully studied under various scenarios that may be likely to appear.

## **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The rest of actuarial engagement is oriented mainly towards calculations of premiums and liabilities in pure risk-products such as disability plans or widow(er) and orphan's pension. If provided, the surrender value is calculated in addition. The transfer value is normally equal to the surrender value.

Due to lack of real life experience for the pension funds, the actuaries are waiting for first reliable data to appear to enable comparison with the assumptions that are being made.

Some insurance contracts are linked to general economic indices (salaries, consumer price index, etc) that are also followed and predicted by actuaries in order to obtain reliable estimates of liabilities.

The state of the portfolio, its dynamics and future expectations will then be included in the annual actuarial report and a general conclusion about the solvency and other important facts will be drawn.

## 4 ACTUARIAL METHODS

### **Old age pension**

During the in-service period, the old-age pension plan consists of savings with a minimal guaranteed interest rate. The interest rate is tied to the average return rate of government bonds. The accounts are allocated individually to each insured person. The net surplus of earnings on assets is annually allocated to individual accounts after deduction of management fee. If the achieved investment return is not sufficient to cover the guaranteed interest rate, the institution which manages the fund should contribute the missing amount into the fund from its own capital. Liabilities equal the guaranteed value by definition. In case of death of an insured person during the in-service period the surrender value (usually 99% of value on the account) is paid to the beneficiary.

The valuation of assets in insurance companies complies with General Accounting Standards in Slovenia. Most assets (shares, property, etc.) are valued at book value or purchase price corrected for price inflation. If the value obtained in this way is higher than the market value, the latter is used instead.

The old age pension is calculated by equating the present value of paid annuities together with expenses to the value of the account at the date of retirement. The ratio between the value of the account and an annuity is guaranteed at the day of entry as a function of sex and age of insured person. Usually, the insurance company can alter these ratios if average life expectancy in Slovenia prolongs over certain margins. Normally, annuities are linked to consumer price index. The mathematical reserve of an annuitant equals the present value of future annuities plus expenses.

Company expenses are covered by the front end loading of each premium and by the management fee. The deductibles are limited by legislation and cannot be increased during an insurance period. Actuaries perform expense analyses and long-term profit testing to reach decisions about reliable deductibles and possible discounts.

### **Disability benefit**

More freedom is left by legislation to define disability benefits. The same holds for widow(er) and orphan's pension. Hence, various types of benefit are present in the market. Some companies don't offer these benefits, some others are still developing them. Here only the most common types are discussed.

The disability benefits are paid in the form of annuities up to a certain age usually 60. The annuity is defined either as a fixed amount or as a percentage of final salary. The premium and the benefits are tied to the consumer price index. The level of risk premium is calculated at the date of entry by equating the present value of future premiums to the present value of future benefits plus expenses. Multidecrement rates are used, and are calculated from pure mortality rates, disability rates and probabilities of a normal retirement. The tariff rates primarily depend on the chosen benefit level, age at entry, and sex of the insured person. The mathematical reserves of an active employee equal the present value of future gross-benefits less the present value of future premiums. For benefits linked to the final salary, the current salary of the insured person is used in the calculation of mathematical reserves. The surrender value is provided as a percentage of the mathematical reserves (progressive method). The mathematical reserves of a beneficiary are calculated in a similar way to the old age pension, except that the disability benefit is paid out only up to a limited age. For disabled persons somewhat higher mortality rates might also be implemented. They depend upon person's age and duration of his/her disability.

### **Widow/er and Orphan's Pension**

In principle, the level risk premium and the mathematical reserves for widow/er and orphan's pension are determined in a similar manner as the disability benefit. The decrement rates used in construction of multidecrement tables are mortality rates and age dependent probability for a normal retirement. Usually, the death benefit is defined as a lump sum that is fixed at the day of entry either in a fixed amount or as a factor of final salary. If the insured person dies whilst active, the lump sum will be used to buy a life annuity for widow(er) or a temporary life-annuity for orphans.

## **5 ACTUARIAL ASSUMPTIONS**

In Slovenia actuaries have freedom to estimate all of the parameters used in the calculations.

### ***Economic assumptions***

The consumer price index is eliminated from all economic indices (i.e. real indices are used). It has proven to be more reliable due to a relatively high and variable price inflation in Slovenia (about 8%) and the experienced fact that real earnings on investments as well as other real economic indices are almost independent on the level of price inflation. For instance, interest rates on government bonds are linked to price inflation.

The discount rate ranges around 4% by most insurance companies.

The guaranteed net return rate on assets is typically 50% (40% minimum required) of the average return rate of government bonds. Due to this match of the guaranteed interest rate, the government bonds represent the bulk of portfolio investments. Currently, they provide about 5% real returns. In this respect the achieved investment return is expected to be about 6%.

A real average-salary growth is assumed to be about 3% pa. The average growth lies slightly below 4% in recent 10 years. During this period the same growth was recorded also for GDP. Since the economy had already recovered from a considerable fall in the beginning of 90's the growth is expected to be more modest in the future.

A career salary growth is expressed in the form of age-dependent salaries relative to the salary of an 18-year-old person. Regarding the tables, one expects an increase of about a factor of 3.5 in salaries over 40 years of employment. Possible dependencies on education, profession and current position are not considered yet.

<b>Assumption\Benefit</b>	<b>Old age pension</b>	<b>Disability</b>	<b>Widow/er or Orphan's Pension</b>
<b>Price inflation</b> (approx 8%)	Projections only	-	-
<b>Discount rate – inflation</b> (approx 4%)	+	+	+
<b>Average salary growth – inflation</b> (approx. 3%)	Projections only	+ (if linked to final salary)	+ (if linked to final salary)
<b>Career salary growth</b> (approx 3.4 times over 40 years)	Projections only	+ (if linked to final salary)	+ (if linked to final salary)
<b>Guaranteed net rate of earnings on assets - inflation</b> (2.5 %)	+	-	-
<b>Rate of earnings on assets–inflation</b> (6%)	Projections only	-	-

**Table:** Economic assumptions that are used for each of the benefit types. A ‘+’ indicates that the corresponding assumption is implemented.

### ***Demographic assumptions***

Demographic parameters are usually derived and used within insurance companies as there are no widely accepted standard tables available on a public basis. Therefore, differences between companies can be considerable in this respect. This holds particularly for new products such as the disability benefits where availability of general population data is limited. In such cases, actuaries either directly implement foreign tables (German and others) or combine them with available data of Slovenian population. In addition the definition of permanent disability has also been changed with the new legislation making the use of past experience less reliable. Broadly, the disability is defined as a permanent inability to perform ones own or similar occupation. The practice shows that a recovery from the disability is very seldom. Therefore, a recovery is not foreseen in the premium calculation. Some companies have also implemented higher mortality rates of disabled persons by combining relative increase of mortality used by foreign markets and standard mortality tables used in Slovenia.

Mortality rates are usually derived by combining past experience of insurance companies and mortality of Slovenian population. Most often applied annuity tables are ‘Sterbetafeln 1987 R’.

Decrements\State	Active	Disabled	Pensioner	Widow or Orphans
Mortality of active employee	DIS,WID	WID	(WID)	-
Mortality of disabled person	-	DIS	-	-
Mortality of annuitant	-	-	OAP	WID
Disability	DIS	-	-	-
Recovery from disability	-	-	-	-
Early retirement	DIS,WID	-	-	-
Normal retirement	DIS,WID	-	-	-
Withdrawal	-	-	-	-

**Table:** Decrements from a given state (active, disabled,..) used in premium and reserve calculations in each of products separately. The following notation is used: OAP=Old Age Pension, DIS=Disability benefit, WID=Widow/er and Orphan's Pension.

## 6 COMMUNICATION OF RESULTS

A report signed by an appointed actuary is sent to the insurance supervisory authorities annually. The content of the report is set by the supervisory authorities. Annual results, solvency status, other future projections and analysis are communicated via an detailed actuarial report also to the management board of the company that is obliged to respect the conclusions in an appropriate way.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTION

Age	qx
20	0.00159
25	0.00159
30	0.00172
35	0.00223
40	0.00353
45	0.00528
50	0.00794
55	0.01312
60	0.02033
65	0.03081
70	0.04517
75	0.06875
80	0.10725
85	0.15828
90	0.22794

**Table:** Age specific mortality rates of Slovene male population in 1995 as published by the statistical office.

# SPAIN

## **1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS**

In Spain, actuarial calculations are required for occupational defined benefit plans that are established on either a qualified or non-qualified basis. Qualified plans are established under the law “Ley de Planes y Fondos de Pensiones”, 8 June 1987, and are to be financed by using a self-administered external pension fund. Actuarial involvement is a requirement of that law. The methods and assumptions to be used for qualified plans are governed by a regulation issued on 21 July 1990 (Orden da 21 de julio de 1990 sobre nomas actuariales aplicables a los planes de pensiones).

Non qualified pension plans will be required to be externally financed by making use of insurance arrangements. Additions to book reserves are no longer tax-deductible. The internal financing system will be banned in November 2002. Insurance policies require actuarial calculations with respect to contributions and mathematical reserves.

When the employer uses book reserves the accounting rules state that the amounts allocated should be based on actuarial calculations. There are as yet no precise rules on the method or assumptions to be used in these cases, or on the frequency of the valuations.

## **2–3 ACTUARIAL CALCULATIONS**

A formal actuarial valuation of a qualified plan is required at least every three years.

The valuation ensures continued “qualified” status and therefore serves both taxation and supervisory purposes. The valuation will involve calculation of the past-service liabilities, and the required future contribution rates.

The assets of the pension fund are taken at their market value.

Although there is no legal requirement to do so, the book reserve liabilities of non-qualified internally financed pension plans are generally recalculated on an annual basis. Recognition of the full liabilities of a non-qualified pension plan is a requirement of Accounting Guidance Regulations (1990). Where full recognition was not made in the past, the deficit existing on the end of the fiscal year following 30 June 1990 must be amortised over 7 years in respect of pensioners and 15 years in respect of actives.

Actuaries commonly perform various other calculations relating to employee transfers, benefit levels etc.

## 4 ACTUARIAL METHODS

Qualified plans must follow an actuarially recognised capitalisation funding method. The funding must be on an individual, fully allocated basis. The two methods approved by the 21 July 1990 regulation are the Individual Entry Age method and the Projected Unit Credit method, as described in appendix 2. The Projected Unit Credit method has been more commonly adopted, but other methods are starting to grow in popularity.

Under qualified plans, surpluses or deficits are amortised over the future working lifetime of the employees; however, in the case of book reserved plans most of the surpluses or deficits which appear after 31 December 1989 must be recognised immediately.

A qualified pension plan must also hold a solvency margin which is equal to 4% of the past-service liabilities plus 0.3% of death and disability lump sums (subject to a minimum solvency margin of 37.5 million pesetas).

## 5 ACTUARIAL ASSUMPTIONS

### **Economic assumptions**

The economic assumptions made in respect of calculations for a qualified pension plan must comply with the requirements of the 21 July 1990 regulation. This places an upper limit on the net rate of discount to be used of 4% pa and requires that the assumptions concerning economic factors affecting the benefits (e.g. salary inflation, price inflation) should be appropriate when considered in conjunction with the choice of discount rate.

A typical set of assumptions would be:

Interest rate	=	4%
Salary increases	=	2%–3%
Price inflation	=	1.5%–2%

The assumptions used are the choice of the actuary. Calculations for non-qualified plans may consider less conservative assumptions, although the actuary should justify their use.

### **Demographic assumptions**

The regulation from 21 July 1990 places the following restrictions on the demographic assumptions in respect of qualified plan calculations:

- (a) The tables of mortality and disability used must be based on a local or foreign experience ending, no later than 20 years prior to the valuation date and must have been graduated using recognised actuarial techniques. The generation tables PEM/F-2000 P (existing plan at 1 November 2000) and PERM/F 2000 P (new plans) are acceptable.

- (b) If tables are used that are based on the actual experience of the pension plan population, then the observation period for the construction of the table must be within the preceding 20 years prior to the valuation and the table must be back-tested against the current population statistics for a period comprising the 4 last years and not exceeding the last 10 years.

Multiple decrement tables are not yet commonly used. When a decrement other than mortality is used it will usually be for disability. Turnover assumptions are only made occasionally. Projections of salaries rarely use a salary scale to separate the effects of inflation from the other components and to allocate age by age changes in salaries due to promotion.

# SWEDEN

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

The main company-sponsored pension schemes in Sweden are results of agreements between employers' federations and unions. The schemes are countrywide with only a few administrators, the administrator is normally pointed out in the plan document, and can be an insurance company or a friendly society.

Since 1995 the workers pension plan is a straight defined contribution plan. The employee may choose among a number of insurance companies to invest his/her premium (defined contribution). The actuarial involvement in these schemes is restricted to the actuarial work within the insurance companies.

The white collar pension schemes are mixed with the main part as defined benefit. The defined contribution part of the plan is similar to the workers plan described above. The defined retirement pension may be financed through insurance contracts or book-reserves combined with insolvency insurance and/or an external pension fund. The schemes also cover disability and spouse pension and these are normally insured. The actuarial involvement due to the insured parts of the plans is mainly restricted to the actuarial work within the insurance companies. For the book-reserved part, the actuarial work is required for the commercial accounts, taxation purposes and for the insolvency insurance.

## 2 MAIN ACTUARIAL CALCULATIONS

The main actuarial calculations due to retirement pension schemes in Sweden are divided into two categories described below.

### a. Calculation of the present value of the accrued benefits financed by book-reserve

The pension financed by book-reserves needs to be combined with either insolvency insurance or an external fund ("pensionstiftelse") due to tax purposes and requirements in the plan document. The present value of the accrued benefits is therefore required, not only for the commercial account and tax purposes, but also for the insolvency insurance contract. One valuation is normally enough for all three purposes. The annual pension cost is derived from the pension liabilities and payments.

Actuarial methods are also used in the vesting (accruing) formula. The vesting formula is not dependent on whether the employer finances the pension through insurance or book-reserve. The employee accrues his/her pension in the same way no matter of his/her employer's financing method. The employer may, or can be forced to, change from book-reserve to insurance for future accruing and/or already accrued pension.

**b. Calculations of the premium tariffs, reserves and allocation of surplus within the insurance company or friendly society**

The actuarial assumptions used to set the premiums and the reserve and the method used to allocate the surplus to the policyholders/beneficiaries must be reported to the insurance supervisory authority.

For friendly societies, the supervisory authority must approve the assumptions.

For the defined contribution parts of the plans, the benefit, reserve and allocated surplus are calculated individually. For the defined benefit retirement and spouse pension, the premium and the reserve are calculated on individual basis. The surplus is allocated on a collective basis (normally the accrued benefit increases in line with inflation both before and after retirement age). For the larger plans, the premium for covering disability pension is calculated on a collective basis, as a percentage of salary. For smaller plans this premium is calculated individually with respect to the persons age.

**3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

Some additional calculations are also undertaken by Swedish actuaries, for example

**a. Valuation of the obligations and costs according to international accounting standard**

Swedish accounting standards differ significantly from international standards in the pensions field. Many Swedish companies need to value their liabilities and pension cost in accordance with US GAAP, UK GAAP or IAS in an alternative annual report. The main reasons are requests from a foreign stock exchange, where the company is listed, or a foreign parent company.

**b. Valuation of liabilities and costs for business combinations, mergers and acquisitions**

In the case of business combinations in Sweden, the pension schemes of the company involved are not often changed since the main pension schemes are countrywide. Still the liabilities and annual costs need to be analysed in a business combination since they normally are an essential part of the profit and loss account and the balance sheet in the case of book-reserved schemes. Some companies' ask for a revaluation according to an international accounting standard, especially if there is a foreign company involved.

### **c. Forecasts and projections**

For most Swedish companies the pension cost (liabilities in case of book-reserves) are an essential part of the profit and loss account and the balance sheet (in the case of book-reserved schemes). Due to the construction of the defined benefit pension schemes, with small target benefits for salary under the social security ceiling (7,5 base-amounts) and fairly large benefits above the Social Security ceiling, salary increases (especially above the social security ceiling) have a significant impact on costs. Therefore many companies are interested in forecasts with different salary projections.

### **d. Matching assets and liabilities**

Within the insurance companies the actuaries become more and more involved in matching assets and liabilities. There are also requirements from the insurance supervisory authority that the insurance companies should match their assets and liabilities. There are also companies who combine book-reserve with an external fund who need the maturity of their book-reserved liability for matching purposes.

## **4 ACTUARIAL METHODS**

As mentioned above the main pension schemes in Sweden are countrywide. The defined benefit retirement pension may be financed through insurance or book-reserve.

### **a. Calculating the accrual and the liabilities of a defined benefit retirement pension financed through book-reserve**

The normal accruing method used is the level annual premium method (Aggregate method in appendix 2). The contribution, “technical premium”, is individually calculated and depends on accrued benefits, salary and age. Since the plans are nationwide the employee bring his/her service time with earlier employers into the new employment. The target benefits are increased due to the past service but reduced with the benefits accrued with former employers. The accrual is always based on the actual salary, thus no salary projection.

The annual level premium method is used to set the company’s “technical premium”, in respect of the already accrued pension, the target pensions (based on actual salary) and the employee’s age (sex-neutral assumptions as described under 5.b). This technical premium is also set with respect to the administrating insurance company’s assumptions used in their premium tariffs. Thereafter the accrued pension is derived from the target pension, the technical premium and the premium tariffs.

The liability is based on the accrued pension and the economic and demographic assumptions with respect to the person’s age and sex. This liability is valid for the commercial accounts, tax-deduction and insolvency insurance.

The maximum annual pension cost, to put into the company's profit and loss account, is then derived from the liability at the end of the year minus the liability at the beginning of the year plus the benefit payments. A general interest rate, thus not company-specific, is then applied to the average liability to set the interest cost. The service cost is derived from the annual cost minus the interest cost. Note that the service cost is not the same as the technical premium; these are derived from different tariffs, different assumptions.

The service cost is normally tax-deductible if the book-reserve is combined with insolvency insurance or an external fund. These requirements are also written in the plan document for the main pension schemes.

If the assumptions are changed during the year, the companies have to recognise the gain or loss due to this change immediately. Actuaries are normally not involved in valuing the plan assets.

**b. Calculation of insured defined retirement – spouse – and disability - benefits**

The retirement and spouse pension are normally accrued according to the flat level premium method, the same method as when the retirement pension is book-reserved as mentioned above. The premium is calculated individually with respect to the member's accrued benefit, target benefit and age. The insurance company allocates an individually calculated reserve from the entry to the plan, or from the date when the person start accruing pension.

The premium due to cover the disability risk is equalised as a percentage of the salary, not depending on the person's age or sex. The insurance company allocates an individual reserve, with respect to the benefit, age and sex, in the case of disability. In the case of disability the insurance company also takes over the accrual of the retirement and spouse pension, even when the company uses the book-reserve method for the retirement pension.

Priority one of the surplus-distribution is to increase the accrued benefits with inflation, both before the retirement age (this lowers the company's future premiums) and after. Note that, since the accrual of the benefits should be the same irrespective of the financing method, the companies who use the book-reserve method are forced to increase the accrued benefits in line with the insurance company. In the case where the surplus allows for extra distribution, the insurance companies reallocate the surplus to the sponsoring companies (for the first time in year 2000). The sponsoring company is in a legal sense the policyholder.

**c. Calculation of insured defined contribution retirement benefits**

The defined contribution can, as mentioned above, be invested in a number of different insurance companies, traditional insurance or unit linked. In some pension schemes the employee may (or is forced to) choose a friendly society.

In the case of traditional insurance the insurance company or the friendly society calculates a benefit with respect to earlier accrual, the defined contribution, the individual's age and the economic and demographic assumptions. In company sponsored pension schemes the insurers are not allowed to provide different benefits for males and females.

Both the premiums and the reserves are calculated with a prospective method, the aggregate method (flat level premium method) in Appendix 2. Thiele's differential equation is normally used for allocating the surplus to the beneficiaries; no surplus is reallocated to the sponsoring companies.

## **5 ACTUARIAL ASSUMPTIONS**

### **Economic assumptions**

For the parts of the pension scheme that are insured the insurance company, or friendly society, determine the discount rate. The guidelines from the insurance supervisory authority limit this freedom up to the highest allowable discount rate, which for the moment is 3.0% with no guaranties for future benefit increases. This limit is in practice applied both for setting premiums and reserves at insurance companies and has in practice become the interest used.

This highest allowable discount rate should be reduced due to the tax of the return on assets (0.55%) and due to administration cost.

There are no guidelines for friendly societies. Some of the larger societies follow the guidelines set out for the insurance companies.

The insurance supervisory authority assigns the discount rate that should be used also for book-reserved pensions. This rate is for the moment 3.75% and should be reduced for assumptions of tax on return and administration cost. This rate is applicable for calculating the book-reserve. There are exceptions (mainly one exception where the discount rate of 4% is used) from this assigned discount rate depending on the status of the pension scheme.

The valuation with the assigned discount rate is used for tax purposes, in the commercial account and for the insolvency insurance.

The economic assumptions, as well as the demographic assumptions, used for the accrual of the pension are identical with the assumptions used at the insurance company or friendly society that administer the plan.

There are no assumptions for turnover, future salary increases, social security increases or pension increases. The benefits of the pension schemes are normally not dependent on the level of the pension from the social security but on the ceiling of the social security which increases in line with inflation.

## **Demographic assumptions**

The demographic assumptions for the insured parts of the pensions scheme vary between the insurance companies and the friendly societies. For the demographic assumptions and the assumption of administration cost there are no formal restrictions. The demographic assumptions should be reported to the supervisory authority.

For friendly societies the supervisory authority must approve the demographic assumptions.

The defined benefit parts of the largest pension plan within the private sector, the ITP-plan, is administered by one insurance company, SPP. The demographic assumptions used by SPP are to be regarded as Swedish standard. These are for example assumptions of force of mortality, force of disability, recovery from disability, age difference with spouse, number of orphans.

The premiums are calculated with sex-neutral assumptions, thus the accrual of the benefits is sex-neutral. The reserves could be calculated with sex-neutral or sex-dependent assumptions.

Employees hired with companies who finance the retirement pension through book-reserves accrue their pension according to identical assumptions as if it was insured. This is a function of the plan documents, not a legal restriction. The accrual is not dependent on the company's financial method. Once the accrued benefit is calculated the book-reserve is calculated with sex-dependent assumptions.

The insurance supervisory authority assigns the standard tables that should be used for book-reserved pension. The demographic assumptions equals the demographic assumptions used by SPP. These assumptions are valid for the commercial account, tax-purposes and insolvency insurance.

The following table summarises the demographic assumptions usually made for calculations relating to pension schemes, book-reserved or insured.

<i>Class of Pension Scheme Member</i>	<i>Active</i>	<i>Deferred Pensioner</i>	<i>Ill health Pensioner</i>	<i>Pensioner</i>	<i>Widow/er Dependant</i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	—	—	—	—
Recovery from disability	X	—	X	—	—
Withdrawal/turnover	—	—	—	—	—
Early retirement	—	—	—	—	—
Normal retirement	X	X	X	—	—
<b>Other Assumptions</b>					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	X	X	X	X	—
Orphans' mortality	—	—	—	—	—
Salary scale	—	—	—	—	—

For the accrual of the pension the assumptions are normally not split into males and females. When valuing the book-reserve, or when the insurer sets its reserve, different assumptions are normally used for males and females. There might also be different assumptions used for staff and workers.

## 6 COMMUNICATION OF RESULTS

The client-companies, with book-reserved liabilities, will annually be informed of the liability for the commercial statement, tax purposes and for the insolvency insurance. This is not a formal actuarial report and does not need to be signed by an actuary.

The insurance supervisory authorities require formal actuarial reports from the insurance companies and from the friendly societies, signed by the appointed actuary.

The contents of the reports for the insurance companies need to follow the guidelines from the supervisory authorities. The legal requirements are not very detailed. The supervisory authorities require a report every three months and a more detailed report for the year end.

The larger friendly societies, those that offer retirement pension, need to report annually, even if the legal requirements states every fifth year. The contents are quite specified in the legal requirements.

## 7 EXAMPLE DEMOGRAPHIC ASSUMPTIONS

The following table shows a sample of force of mortality, force of disability and expected remaining lifetime. These are taken from a table that is to be regarded as Swedish standard tables for pension accounting, assigned by the insurance supervisory authority 1997 (FFFS 1997:2). They have also been used by SPP since January 1994. The tables relate to the assumptions for males. The force of mortality and disability are per 1,000 males.

<i>Age</i>	<i>Force of mortality</i>	<i>Force of disability</i>	<i>expected remaining lifetime</i>
20	0.1208	4.0015	60.0
30	0.3384	7.8942	50.1
40	0.9480	23.4964	40.4
50	2.6554	86.8511	30.9
60	7.4381	353.5485	22.1
70	20.8345	N/A	14.4
80	58.3589	N/A	8.3
90	163.4672	N/A	4.2
100	457.8823	N/A	1.8

# SWITZERLAND

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In Switzerland actuarial review is required for all **company-sponsored** pension funds. The review applies both to **defined benefit** and to **defined contribution** plans established through a **pension fund** which may or may not be insured. Actuarial involvement is required by the taxation and supervisory authorities and by the accounting profession.

## 2 MAIN ACTUARIAL CALCULATIONS

The calculation of the value of the **accrued liabilities** of the pension fund is the main actuarial calculation. This approach is based on the going concern approach.

The calculations are performed periodically (typically on a triennial basis) and for large funds on an annual basis. The calculations are made to meet the various requirements of the supervisory authorities and of the fund trustees. In particular, the actuary is required to determine if the current **funding level** of the pension fund is sufficient to meet the obligations. The actuary certifies that the pension fund is able to pay the benefits as defined in the rules. Should that not be the case the actuary recommends to the Board of the fund appropriate future actions: if the board does not follow the recommendations, the actuary informs the supervisory authority.

## 3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES

The following calculations are also undertaken by actuaries in the Switzerland:

### (a) Calculation (or review of calculation) of a transfer value in the case of individual movement of employees

The amount transferred is defined in the plan rules, but as a minimum corresponds to the present value of the accrued benefit.

### (b) Calculation of transfer values in the case of transfers related to company take-overs/mergers

The amount transferred will normally be the sum of the individual transfer values increased by a “fair” share of the surplus (if applicable).

### (c) Calculations related to plan changes

If the nature and type of plan benefits were modified, the actuary would determine if the proposed change is fair to all beneficiaries and if the proposed change is financially possible.

**(d) Analysis of the experience of the pension scheme**

For large funds, the economic and demographic experience of the pension funds when an actuarial valuation is performed.

**4 ACTUARIAL METHODS**

For the main types of actuarial calculations performed the following methods are employed.

**(a) Calculation of the value of the accrued liabilities of a pension fund**

The **accrued liabilities** of a pension fund are usually calculated as the **present value** of the **accrued benefits based on current remuneration levels**.

The exact formula used will depend on the plan rules. The accrued benefits for actives are taken to be those benefits earned by the members in respect of years of service up to the date of the calculation.

The **entry age method** is also sometimes used.

**(b) Annual contribution**

The annual contribution will typically be defined in the rules. The actuary when he performs the periodical valuation will check that this contribution level is appropriate.

If this is not the case the actuary will recommend the suitable contribution to finance future benefits.

**5 ACTUARIAL ASSUMPTIONS**

The actuarial assumptions in Switzerland would normally be used by all members of the actuarial profession. These assumptions would not vary over time.

The typical set would be the following

Discount rate	4%
Salary increase	0%
Pension increase	0%
Employee turnover	0%

It should be stressed that these assumptions are not a legal requirement, but are fixed by “convention”. In recent years we see more and more pension funds adopting assumptions based on market conditions (“**best estimate**” approach) and including future salary escalation. This trend is influenced by the international accounting standards.

The **transfer value** calculation will be made according to the rate defined in the rules and will be within the range required by law (3.5% - 4.5%) for the discount rate. No reference to the long-term escalation of salaries or pensions would be made.

The demographic assumptions would usually be based on one of the existing actuarial tables, such as EVK, VZ or KL which are respectively the tables of the Federal Pension Fund, the Zürich Pension Fund and the actuarial tables of the life insurance companies.

## **6 COMMUNICATION OF RESULTS**

The results of the main actuarial calculations made are discussed in a meeting. Eventually a **formal actuarial report** will be issued with the final recommendations to the trustees of the pension fund. The signatory of the report must be a qualified actuary and the contents of the report must confirm to the guidelines laid down by the Chamber of Consulting Actuaries and the Association of Swiss Actuaries.

# UNITED KINGDOM

## 1 ACTUARIAL INVOLVEMENT IN RETIREMENT BENEFITS

In the United Kingdom calculations are required from actuaries in respect of **company-sponsored** and **industry-sponsored** pension schemes which provide **defined benefits** and are established through a **pension fund** which may or may not be insured. Actuarial involvement is required by the taxation and supervisory authorities and by the accounting profession.

## 2 MAIN ACTUARIAL CALCULATIONS

The following represent the main types of calculations undertaken by actuaries in the United Kingdom:

- (a) Calculation of the value of the **actuarial liabilities** and **assets** of the pension scheme.

Actuarial Guidance Note GN26 defines the actuarial liability as the value, using actuarial methods and assumptions, placed on the obligations of a pension fund for outgoings, including expenses expected to fall on the fund after the date to which the calculations relate. It includes the present value of future instalments of pensions in payment and related contingent benefits, the present value of future payments in respect of deferred pensioners and a provision for all other members (referred to as active members). The method of calculating the Actuarial Liability in respect of existing pensioners and deferred pensioners is common to all funding methods. The provision for active members is defined by the specific funding method used.

- (b) Calculation of the **annual cost/required contribution** payable to the pension fund in order for it to be able to meet its future liabilities.

The above calculations are usually made triennially unless circumstances require more frequent attention. The calculations are made to meet the various requirements of the taxation, supervisory and accounting authorities. In particular the actuary is required to:

- (i) Assess the scheme's funding level (ratio of assets to actuarial liabilities) and advise on the contributions needed to achieve and maintain the desired funding level. This assessment and ensuing advice and actuarial statement for the trustees report are based on the assumption that the scheme and sponsor will remain 'going concerns' and are subject to minimum regulatory requirements.
- (ii) Make a statement regarding the adequacy of the scheme's assets to satisfy the Minimum Funding Requirement (MFR), and that, if the scheme is ongoing, the contribution rate recommended will continue to satisfy the MFR in future years. This statement is required for regulatory purposes using methods and principles set out in legislation.

- (iii) Make a statement regarding the adequacy of the scheme's assets to meet its liabilities if the scheme was to be discontinued with immediate effect, ie if the employer stopped contributing to it and accrual of future benefits ceased.
- (iv) For schemes that are contracted out of the State Earnings Related Pension Scheme (SERPS) the supervisory authority requires a statement (every three years) that the benefits of the scheme satisfy a statutory minimum standard and that the assets and future expected contributions are adequate to ensure that the pension fund continues to be able to meet certain liabilities.
- (v) The sponsoring company/organisation require the calculations to be made for their commercial accounts (in accordance with the commercial accounting guidelines).
- (vi) The taxation authorities require a statement that the scheme's assets are not greater than 105% of the value of its liabilities, both assessed using a method and basis as set down by the taxation authorities.

### **3 ADDITIONAL CALCULATIONS MADE BY ACTUARIES**

The following calculations are also undertaken by actuaries in the United Kingdom:

(a) **Calculation of a transfer value in the case of individual movement of employees.**

The amount transferred varies from scheme to scheme but the usual intention is that the transfer value is the present value of the deferred (or vested) pension otherwise payable. A minimum value (equal to the MFR) is prescribed by law. Actuarial guidance note GN11 lays down the principles on which transfer values are to be calculated.

(b) **Calculation of transfer values in the case of bulk transfers arising from company takeovers/mergers**

The amount transferred is driven by commercial considerations and may vary between the sum of the individual transfer values described in (a) above, and the present value of accrued benefits (with full allowance for future salary and pension increases where appropriate and with allowance for members to leave early, die or retire before normal pension age). Allowance may or may not be made for any surplus or deficit in the pension fund.

(c) **Analysis of the experience of the pension scheme**

For large schemes the economic and demographic experience of the pension scheme is normally investigated on each occasion that an actuarial valuation is made. The investigation is used to check the suitability of the actuarial assumptions made and perhaps provide a basis for deriving new actuarial assumptions. It is also used as a check on the calculated results. The need for an investigation arises from a professional requirement for the actuary to be satisfied as to the suitability of the assumptions made and for the actuary to provide a commentary on any significant variations in experience from the assumptions made at the previous valuation. For smaller schemes the experience of the scheme alone is not sufficient to determine suitable assumptions and regard is had to other schemes where the experience can be expected to be comparable.

- (d) Calculations of lump sum commutation factors, early retirement pension reduction factors and general calculations relating to the level of benefits are also undertaken by actuaries.

#### 4 ACTUARIAL METHODS

Actuarial Guidance Note GN26 gives a full description of the methods currently in use. For the main types of actuarial calculations performed the following methods are employed.

(a) **Calculation of the value of the actuarial liabilities and assets of a pension scheme**

The **actuarial liabilities** of a pension scheme are usually calculated as the **present value** of the **past service benefits**. This corresponds to the standard fund for the **projected unit** and **attained age funding methods** described in appendix 2. This is also the method prescribed by the taxation authorities for determining the maximum funding level mentioned in 2(vi).

The past service benefits for actives are taken to be those benefits earned by the members in respect of years of service up to the date of the calculation. Where benefits are defined in terms of a benefit amount multiplied by the number of years of service then the accrued benefit is usually determined by substituting the actual years of service up to the calculation date in the benefit formula. Where benefits are not **directly** defined in terms of years of service then past service benefits are usually taken to be the total benefits payable multiplied by the factor  $m/n$ , where  $m$  equals the number of years of service up to the valuation date and  $n$  represents the total number of years of service.

The **entry age method** is sometimes used and here the actuarial liabilities will correspond to the value of the total service benefits (past as well as future) less the value of the expected future contributions.

Due to the minimum early leaver benefits prescribed in UK legislation, the Current Unit Method in its pure form (ie without any allowance for future salaries) is not used. GN26 redefines this method to require increases in benefit up to the assumed date of retirement or death in line with the statutory requirement to preserve benefits for early leavers.

The value placed on the assets is normally the **discounted value** of future income and capital proceeds from the assets held. The different methods for determining the future income levels are described in appendix 2. This is also the method prescribed by the taxation authorities for determining the maximum funding level mentioned in 2(vi).

A **market-value** approach to valuing the assets is increasingly becoming common with the discount rate for valuing liabilities determined on a consistent basis.

The **historic cost** approach is **not** used to value assets.

(b) **Calculation of the annual cost/required contribution for the pension scheme**

The most common method used for determining the required contribution rate is the **Projected Unit Method**. The **Attained Age**, **Entry Age** and **Aggregate Methods** are also sometimes used. Where the pension scheme is fully insured a common method is the **Current Unit Method** with the use of a control period and with minimum salary and pension increases as described above.

The aim in most cases is to establish a contribution rate as a **level percentage of salary**. In all cases the methods used correspond to the description in appendix 2. Where the Projected Unit Method is used, “risk” benefits (e.g. where lump sum death payments are made and where the value of benefits paid on death and disability is in excess of the value of accrued pension benefits) are sometimes charged on a “risk premium” basis (see appendix 2).

The final contribution rate that is recommended may be different from the standard contribution rate as determined by the method. This will be due to the amortisation of surpluses or deficits in the scheme, as revealed by the comparison of the assets and actuarial liabilities.

The actuary is free to choose the method of calculating the required contribution.

## 5 ACCOUNTING COST

Where, however, the results are used for the commercial accounting purposes of the sponsoring company the method has to comply with the commercial accounting regulation **SSAP 24**, which results in the following requirements:

- (i) The cost of providing pensions should be recognised by the employer on a **systematic basis** over the period during which he benefits from the employees’ services.
- (ii) The **regular annual cost** should, when expressed as a percentage of salary, be expected to remain relatively **stable** over a period of time (for a final salary type pension scheme).
- (iii) **Surpluses** or **deficits** arising in the scheme should (with certain exceptions) be amortised in a systematic manner over the expected future service period of employees (variations from the regular cost).

There are professional guidelines laid down by the Institute and the Faculty to assist with deciding suitable methods (GN17).

The **annual cost** arrived at (regular annual cost plus variations in cost) is the cost which is charged to the sponsoring company’s commercial accounts. This may differ from the contributions actually paid, the differences being allowed to accumulate as prepayments or provisions in the company's balance sheet.

The accounting standard SSAP24 will be replaced by 2003 with a new accounting standard FRS17. The key features of the new standard are that it will:

- require assets to be valued at market value;
- require liabilities to be valued using the Projected Unit Method
- require a surplus/deficit to be shown as a pension asset/liability in the Company's accounts;
- will not allow any amortisation or smoothing.
- Require the discount rate to be chosen by reference to high quality corporate bond yields.

## 5 ACTUARIAL ASSUMPTIONS

### Economic assumptions

The economic assumptions used are chosen by the actuary in consultation with the trustees and/or employer. The assumptions made are not subject to direct restrictions except for the interaction of the statutory minimum and maximum requirements, or if it is desired to align accounting cost with funding cost. The actuary has, however, a professional responsibility to ensure that the assumptions represent an appropriate long term view of future events.

Under commercial accounting guidelines (“SSAP 24”) the assumptions should together represent a “**best estimate**”. The choice of assumptions in this case is the responsibility of the sponsoring company but will be based very much on actuarial advice. The same set of assumptions is normally used for assessing the funding level and the contribution rate. Proposals under FRED20 make the actuary responsible for the assumptions and give a much greater degree of prescription.

The following table summarises the economic assumptions usually made for a final salary type pension scheme:

Assumption	Typical value
Rate of price inflation	2% to 2½% = p
Rate of interest	p + 2½% to 4% p.a.
Rate of increase in salaries	p + 1% to 2% p.a.
Rate of increase in pensions	as defined in the scheme rules subject to a statutory minimum(*), but higher if pre-funding for discretionary pension increases in addition.
Rate of increase in social security benefits	p
Rate of increase in dividends/property income	p + -1% to 2½% p.a.

\* All pension rights earned after April 1997 have to be increased in payment at the rate of inflation each year subject to a maximum of 5%.

In **absolute** terms a typical set of assumptions might be:

price inflation	= 2.5% pa
interest rate	= 6.5% pa
salary increases	= 4.0% pa
pension increases (excluding discretionary increases)	= 2.25% pa

The **transfer value** calculation will normally be made by reference to the long term valuation assumptions used for the main actuarial calculations but adjusted to reflect the yield currently available on suitable fixed interest or index linked investments, subject to a minimum of the MFR value. In practice, the majority of Schemes have simply adopted the minimum funding requirement basis (or a very similar but more generous basis) for the calculation of transfer values.

The basis for calculating the **maximum funding level** is specified by the taxation authorities and generally produces a reserve considerably higher than that produced by the use of typical funding assumptions.

### **Demographic assumptions**

The demographic assumptions (rates of mortality, early retirement and early leavers from service) are again chosen by the actuary without any direct restrictions from the supervisory or taxation authorities. The actuary has a professional responsibility to ensure that the assumptions are appropriate. His choice will be based on his general experience and for larger pension schemes he will most probably have the benefit of actual demographic experience of the membership of the scheme itself.

For the purposes of the MFR and maximum funding calculation assumptions are tightly controlled by legislation.

It is usual to use different mortality tables for actives, pensioners and ill-health/disability pensioners. Widows/ers may also be valued using different mortality assumptions from normal pensioners.

Standard tables of mortality are frequently used, in particular for pensioners', widow/ers' and deferred pensioners' mortality. For the MFR, a standard mortality assumption is prescribed for all except very large schemes (where pensioner mortality must be based on scheme experience). The standard tables generally used are based on statistics gathered by life offices relating to the experience of assured lives and members of insured pension schemes. The mortality rates for pensioners in these tables include projection of improvements in mortality.

The final retirement age used is normally that given in the pension scheme rules, except for the MFR where the legislation requires that the calculation should assume that members will retire at the earliest age at which they can draw the whole of their pension as of right without any reduction for early payment.

The following table summarises the demographic assumptions usually made for calculations relating to a larger pension scheme.

**Class of Pension Scheme Member**

	<i>Active</i>	<i>Deferred Pensioner</i>	<i>Ill health Pensioner</i>	<i>Pensioner</i>	<i>Widow/er Dependant</i>
<b>Decrements</b>					
Mortality	X	X	X	X	X
Disability/Ill health retirement	X	—	—	—	—
Recovery from disability	—	—	—	—	—
Withdrawal/turnover	X	—	—	—	—
Early retirement	X	not normally	—	—	—
Normal retirement	X	X	—	—	—
New entrants	X	X	X	X	X
<b>Other Assumptions</b>					
Proportion married	X	X	X	X	—
Age difference with spouse	X	X	X	X	—
Number of orphans	—	—	—	—	—
Orphans' mortality	—	—	—	—	—
Promotional salary scale	X	—	—	—	—

Actuarial methods which involve the use of control periods require, for schemes open to new entrants, an assumption regarding the number of new entrants to the active membership each year and their age and average salaries. The Projected Unit Method, in its most common form (ie without a control period) implicitly assumes that new members will join the scheme with demographic characteristics such as to maintain the age profile of the scheme.

For the purposes of applying demographic assumptions the population of the pension scheme is normally split into **males** and **females**, and (where appropriate) **staff** and **workers**.

Allowance for the **administration expenses** of the scheme will depend on whether the costs are charged directly to the scheme or are borne by the employer. In general, no explicit allowance is made for expenses connected with discontinuance but for the MFR valuation a statutory allowance needs to be made according to a specified formula.

**Orphans'** pensions may be allowed for by a general factor applied to the widows'/ers' pensions.

## 6 COMMUNICATION OF RESULTS

The results of the main actuarial calculations made (as described in section 2) may initially be sent to the employer/sponsoring company by way of a preliminary results letter. The main assumptions may have been agreed following an earlier discussion. The results may then be discussed in a meeting where, for instance, the treatment of any surpluses or deficits may be decided. A **formal actuarial report** will in all cases be sent to the trustees of the pension fund. The signatory of the report must be a qualified actuary formally appointed by the trustee as the 'Scheme Actuary' and the contents of the report must conform to statutory reporting deadlines and guidelines laid down by the Institute of Actuaries and Faculty of Actuaries (GN9). The main requirements of GN9 are set out below:

- (1) The actuary should set out the purpose of the valuation, the benefits valued and a summary of the data used.
- (2) The actuary should give a summary of events occurring in the period since the previous valuation.
- (3) The actuary should describe the funding method being used, its objectives and its implications in terms of the stability of contribution rates and future funding levels.
- (4) The actuarial assumptions made should be set out.
- (5) The appropriateness of the investment policy of the pension fund should be commented on.
- (6) The future contribution rate should be recommended.
- (7) The current funding position should be given and commented on.
- (8) The discontinuance funding position should also be given and commented on.

The formal report will be sent to the trustees of the pension scheme who must send copies to the employer and make it available to the members on request. An MFR Certificate must be issued within a prescribed period (this is usually attached to the valuation report). The agreed pattern of future contributions must be laid out in a Schedule of Contributions which must be prepared and certified by the Scheme Actuary within a prescribed period. A statement from the actuary must be included in the annual report which the trustees are required to make to members of the scheme.

The Schedule of Contributions must be recertified annually by the Scheme Actuary. If the contributions shown on the Schedule are no longer adequate when it is recertified, the Schedule must be amended or a new MFR valuation must be carried out.

In the United Kingdom a qualified actuary generally means a Fellow of the Institute of Actuaries, London or a Fellow of the Faculty of Actuaries, Edinburgh.

## 7 EXAMPLE ASSUMPTIONS

The example set of assumptions shown for Ireland would serve as a suitable example for the United Kingdom, with the exception that rate of pre-vesting increases in deferment would reflect legal revaluation requirements.

An extract from the tables '92 Series' which are the latest in the series of published tables for **pensioner mortality** is shown below:

<i>Age</i>	<i>Male Rate of Mortality</i>	<i>Female Rate of Mortality</i>
20	0.259	0.155
25	0.254	0.155
30	0.254	0.165
35	0.272	0.200
40	0.338	0.291
45	0.525	0.505
50	1.002	0.969
55	2.112	1.924
60	4.507	3.784
65	9.755	7.570
70	19.893	14.458
75	37.903	26.254
80	67.176	45.221
85	110.456	73.762
90	168.313	113.795
95	237.841	165.925
100	312.593	228.692

Rates are shown per 1,000 lives, and the base rates (which reflected mortality of insured pensioners around 1992) have been projected to the year 2000 in accordance with projection factors recommended in the published tables to allow for future improvements. There is some evidence that actual mortality improvements have been better than those assumed and, to that extent the above rates may overstate the rate of pensioner mortality currently being experienced (in 2000).

## APPENDIX 2

### DESCRIPTION OF ACTUARIAL METHODS

#### 1 INTRODUCTION

- 1.1 The aim of this appendix is to define the actuarial methods used by the actuaries working in the countries of the European Union when making calculations relating to private retirement provision.
- 1.2 The appendix concentrates on the **methods** of establishing an **ongoing cost** of providing retirement benefits and placing a value on both the **liabilities** already accrued and the **assets** held. As such it concentrates on the various methods of “**funding**” retirement liabilities. The general principles of each method are given rather than a detailed description of the complexities of applying each method in practice.
- 1.3 The methods relate in general to defined-benefit retirement provision and in particular pension plans where the benefits are dependent upon the salary of the employees concerned.
- 1.4 The appendix has been structured along the following lines:
- Section 2** Defines the terminology used in the appendix.
- Section 3** Sets out the details of each of the main funding methods used. For each method the following points are included:
- Name of the funding method
  - The aims of the method
  - A written description of the method
  - The main countries where the method is used
- Section 4** Sets out briefly the main methods used in valuing assets.
- Section 5** Sets out the main characteristics of each funding method.
- 1.5 The appendix is written to complement the report “Actuarial methods and assumptions used in valuing retirement benefits in the EU”. It aims, in particular, to define the actuarial terms used in the report.

## 2 NOTATION AND DEFINITIONS

### 2.1 Present Value = $PV_x$

The term present value is used with the following definitions:

#### 2.1.1 Present value of pension benefits in payment for life aged $x$

$$PV_x = \sum_{t=0}^{\text{max. age} - x} ({}_tP_x) \times (V^t) \times (B_{x+t})$$

${}_tP_x$  = probability of survival in benefit paying category to age  $x + t$  for life aged  $x$

$V^t$  = a discounting factor involving the annual rate of interest raised to a power dependant upon  $t$

$B_{x+t}$  = the benefits payable at age  $x + t$  (possibly involving a benefit increase assumption raised to a power dependant upon  $t$ )

#### 2.1.2 Present value of expectations to benefits for life aged $x$

$$PV_t = \sum_{t=0}^{\text{max. age} - x} ({}_tP_x) \times (q_{x+t}) \times (V^t) \quad (\text{Valben}_{x+t})$$

${}_tP_x$  = probability of survival in expectation to benefit category to age  $x + t$  for life aged  $x$

$V^t$  = defined as above

$q_{x+t}$  = probability of benefits becoming payable at age  $x + t$

$\text{Valben}_{x+t}$  = present value of benefits becoming payable at age  $x + t$   
 i.e.  $PV_{x+t}$  for pension type benefits  
 $B_{x+t}$  for lump sum type benefits

#### 2.1.3 Present value of future contributions for a life age $x$

$$PV_t = \sum_{t=0}^{\text{max. age} - x} ({}_tP_x) \times (V^t) \times (\text{Cont}_{x+t})$$

${}_tP_x$  = probability of survival in contribution paying category to age  $x + t$  for life aged  $x$

$V^t$  = defined as above

$\text{Cont}_{x+t}$  = the contribution payable at age  $x + t$  (possibly involving a contribution increase assumption raised to a power dependant upon  $t$ )

## 2.2 Accrued benefits

2.2.1 The **accrued benefits** are those benefits that are deemed to have been allocated in respect of service prior to the date of calculation. This almost always corresponds with the benefits available on leaving service ("vested benefits") once the vesting requirements have been met.

### 2.2.2 Pensioners and deferred pensioners

All of the benefits are deemed to be accrued for pensioners and deferred pensioners.

### 2.2.3 Actives

The accrued benefits are usually calculated in one of two ways.

(i) By reference to the pension formula:

Where the pension formula defines benefits in terms of years of service, the accrued benefits are equal to the benefits defined by the formula but using only years of service up to the valuation date.

(ii) By ratio of total benefits:

Here the accrued benefits are equal to the total available benefits multiplied by the ratio of number of years of service up to the valuation date to total years of service possible until benefits commence payment.

#### *Example*

Pension promise: Retirement pension of 1% of salary per year of service.  
Maximum 30 years of service.  
Retirement age 65.

Personal details: Age at entry: 25  
Current age: 35  
Salary: 10,000 p.a.

Accrued benefit method: (i) = years of past service \* 1% \* salary  
= (35 - 25) \* 0.01 \* 10,000  
= 1,000 p.a.

Accrued benefit method: (ii) =  $\frac{\text{years of past service}}{\text{total possible service to age 65}}$  \* Pension benefit at age 65  
=  $\frac{35 - 25}{65 - 25} * 1\% * 30 \text{ years} * 10,000$   
= 750 p.a.

### 2.3 “Risk” or unfunded benefits

These may be defined as those benefits which are paid over and above the benefits which are deemed to have been accrued and/or vested. They are usually benefits whose payment is dependant upon a certain incident occurring e.g. disability or death, and are usually only defined for actives.

The most common types of benefits treated as “risk benefits” are as follows:

- Lump sum payments made upon death whilst active.
- That part of widow’s/er’s and disability benefits paid over and above the benefits that have been deemed to have accrued e.g. where benefits are based on projected service to normal retirement age.

### 2.4 Standard fund and standard contribution

#### 2.4.1 *Standard fund*

This is the amount of the liabilities to be recognised (and hence the theoretical value of the “fund” that should be held) as at the valuation date, according to the actuarial method used.

#### 2.4.2 *Standard contribution*

This is the amount of contribution required as derived by the actuarial method used. It assumes that the “fund” held equals the standard fund.

In this context the “fund” may be taken to be the value of assets held in a pension fund, the reserves under an insurance contract or the level of any book reserves held.

The contribution derived may be defined in terms of an **absolute amount** or in terms of **percentage of salary**.

The former is more common for pension arrangements where benefits are defined in terms of an absolute, or cash amount and where the standard contribution is redetermined each year. The latter definition is usually used in respect of salary related pension benefits where the standard contribution is determined at intervals longer than one year in duration (e.g. in the United Kingdom).

Contributions are only normally deemed to be payable in respect of those members accruing benefits i.e. “active” members of the pension scheme.

### 3 ACTUARIAL METHODS

#### 3.1 Pay-as-you-go funding

##### 3.1.1 Aims

To establish a contribution rate so that over the time span under consideration the contribution income of the pension scheme will equal the benefit and expense outgo of the pension scheme.

##### 3.1.2 Description

The standard contribution rate is calculated as follows:

$$\text{Standard contribution} = \text{Benefit payment} + \text{Expense outgo}$$

Where the method is applied over a period of years the following formula is to be solved

$$\text{Present value of contribution} = \text{Present value of benefit payments and expenses}$$

The present value being taken over the time period over which the projection is being made.

##### 3.1.3 Main areas of use

**France** for the funding of the compulsory pension arrangements.

#### 3.2 Current unit method

##### 3.2.1 Aims

To maintain a fund equal to the value of accrued benefits, by reference to their amount as at the calculation date.

##### 3.2.2 Description

The **standard fund** is equal to the present value of unprojected accrued benefits.

The **standard contribution** is determined as the sum of the following:

- The present value of unprojected benefits accruing in the year following the valuation date.
- The present value of the increase in benefits deemed to already have accrued at the beginning of the year.

Benefits payable on death or disability (“Risk benefits”) are usually allowed for in one of the following two ways:

- **Accrual method (attribution)**

Risk benefits are deemed to accrue in the same manner as other benefits.

- **Risk premium method**

Risk benefits do not form part of the accrued benefits, but are charged for as they arise. The value of risk benefits expected to fall due in the year following the valuation date is thus added to the standard contribution.

The current unit method as described above may be modified by the use of a **control period**. The standard contribution is then defined as the level contribution required to be paid over the control period to meet the value of benefits accruing over the control period, including increases in benefits already accrued at the valuation date. For final salary schemes the standard contribution required would normally be expressed as a level percentage of salary.

### 3.2.3 *Main areas of use*

- Belgium: Pension funds, minimum funding
- Netherlands: Pension funds
- Switzerland: Pension funds

## 3.3 **Projected unit method**

### 3.3.1 *Aims*

To maintain a fund equal to the value of accrued benefits, by reference to their **projected** amount at date of payment.

### 3.3.2 *Description*

The **standard fund** is equal to the present value of projected accrued benefits.

The **standard contribution** is the present value of benefits which will accrue in the year following the valuation date, by reference to their projected amount.

“**Risk benefits**” may be allowed for on an accrual basis or a risk premium basis, as described for the current unit method.

The projected unit method may also be used in conjunction with a **control period** as described for the current unit method.

Accrued and accruing benefits may be **partially projected**. This may be allowed for by only projecting benefits over a limited time period or by allowing for only a certain proportion of the future expected increases.

### 3.3.3 *Main areas of use*

- United Kingdom: Pension funds
- Ireland: Pension funds
- Belgium: Pension funds
- Spain: Pension funds
- Portugal: Pension funds

### 3.4 **Attained age method**

#### 3.4.1 *Aims*

To establish for the active members of the pension scheme a level future contribution rate such that future contributions will finance future accruals of benefits.

#### 3.4.2 *Description*

The **standard fund** is equal to the present value of accrued benefits.

The **standard contribution** is found by solving the following equation:

$$\begin{array}{l} \text{Present value of} \\ \text{future contributions} \end{array} = \begin{array}{l} \text{Present value of benefits accruing} \\ \text{after the valuation date} \end{array}$$

The calculation will normally be made by reference to **projected** benefits. Contributions are deemed to be payable only in respect of those members still accruing benefits (i.e. active members).

Where benefits are projected and are salary dependant then contributions will normally be projected to increase in line with salaries (i.e. "level" implies level as a percentage of salary when a projected basis is used).

- United Kingdom: Pension funds
- Ireland: Pension funds
- The Netherlands: Insured pension funds

### 3.5 **Entry age method**

#### 3.5.1 *Aims*

To establish the level contribution rate that, when payable over the active lifetime of the employee, is sufficient to finance the benefits being provided.

#### 3.5.2 *Description*

The **standard fund** is equal to the present value of **total** future benefits **minus** the present value of future **standard** contributions.

The **standard contribution** is found by solving the following equation:

$$\begin{array}{l} \text{Present value of future} \\ \text{contributions at entry} \end{array} = \begin{array}{l} \text{Present value of future} \\ \text{benefits at entry} \end{array}$$

The calculation will normally be made by reference to projected benefits. Contributions are deemed to be payable only in respect of active members. Where benefits are projected and are salary dependant then contributions will normally be projected to increase in line with salaries (i.e. "level" implies level as a percentage of salary when a projected basis is used).

The method has the following two main variations:

- **Individual entry age method:**

Here a separate standard contribution rate is determined for each individual based on his or her particular age at entry.

- **Normal entry age method:**

Here the standard contribution rate is determined by reference to a fictive member entering at the “**normal**” entry age. This standard contribution rate so derived will then be applied to whole of the active membership. The “normal” entry age is to be chosen by the actuary and may be determined by reference to the experience of the actual membership. A range of “normal” entry ages may be used.

### 3.5.4 *Main areas of use*

**Germany:** Book reserved pension plans (individual entry age method — unprojected)

**United Kingdom:** Occasionally used for pension funds (normal entry age method — projected)

**Spain:** Pension funds

## 3.6 **Aggregate method**

### 3.6.1 *Aims*

To establish for the active members of the pension scheme a level future contribution rate such that the existing fund plus the future contributions will be sufficient to finance all future benefits.

### 3.6.2 *Description*

There does not exist a standard fund and contribution as such, the level of the contribution being defined by the following equation:

$$\begin{array}{r} \text{Value of existing} \\ \text{fund} \end{array} + \begin{array}{r} \text{Present value of future} \\ \text{contributions} \end{array} = \begin{array}{r} \text{Present value of} \\ \text{all future benefits} \end{array}$$

The calculation will normally be made by reference to projected benefits. Contributions are deemed to be payable only in respect of active members. Where benefits are projected and salary dependant then contributions will normally be projected to increase in line with salaries (i.e. “level” implies level as a percentage of salary when a projected basis is used).

### 3.6.3 *Main areas of use*

- United Kingdom: Pension funds (occasionally)
- Ireland: Pension funds (occasionally)

## 4 VALUATION OF ASSETS

4.1 Assets held by a pension scheme are normally valued according to one of the following three methods:

### 4.1.1 Historic Cost

The assets are valued at their purchase price. It is usual to take as a maximum the current market value of the asset.

This method is used in the following countries

- German: Pensionskassen
- Netherlands: Pension funds

### 4.1.2 Market value

The assets are valued at their market value as at the date of the valuation, where the market values are quoted on a bid/offer basis the **middle market value** is usually used.

An **average** market value may be used, which would value each asset according to its average market value over a specific time span. Alternatively the market values of the assets may be adjusted to allow for movements in the market as a whole.

The method is used in the following countries

- United Kingdom: Pension funds
- Ireland: Pension funds
- Belgium: Pension funds
- Netherlands: Pension funds
- Portugal: Pension funds

### 4.1.3 Discounted income value

The value placed on the assets is the present value of the expected future income and capital proceeds from the assets held. This might be done **individually** for the assets held or a **model portfolio** may be assumed with a market value equal to the market value of the actual assets held.

For investments with variable proceeds (e.g. equities, property) this will involve assumptions as to the future development of the dividend/rental income.

The method is used in the following countries

- United Kingdom: Pension funds
- Ireland: Pension funds

## 5 CHARACTERISTICS OF THE FUNDING METHOD

### 5.1 Security

The “security” associated with a particular method may be described in terms of the required amount of the standard fund to be held at any one time in relation to the liabilities. The funding methods are listed below in order of ascending security.

Lowest security	1. Pay-as-you-go
	2. Current unit method
	3. Projected unit method/attained age method (projected)
Highest security	4. Entry age method (projected)

The last two placings may change dependant upon the particular benefits and assumptions.

### 5.2 Stability

The stability of the funding method relates to the conditions required to ensure that the annual cost as determined by the method remains relatively stable. Here the conditions for stability are discussed for a pension plan providing final-salary-type benefits dependant upon years of service. Stability is interpreted to mean a stable cost when expressed as a percentage of salaries.

#### 5.2.1 *Pay-as-you-go*

A stable contribution rate can only be achieved if the total pension payments remain stable as a percentage of total salaries. This implies a constant ratio of actives to pensioners and in turn that the salary structure of the active population remains stable in relation to structure of the retired population.

#### 5.2.2 *Current unit method*

The contribution rate will remain stable if the age (and sex) structure of the membership of the scheme remains constant and the average past service at each age remains constant.

#### 5.2.3 *Projected unit method*

The contribution rate will remain stable if the age (and sex) structure of the membership of the scheme remains constant.

#### 5.2.4 *Attained age method*

A stable contribution rate will be achieved if the scheme is closed to new entrants. New entrants younger than the average age of the current membership will tend to reduce the required contribution rate.

#### 5.2.5 *Entry age method*

A stable contribution rate will be achieved if new entrants to the scheme have on average an entry age equal to the “normal” entry age used in the method. (Where the individual entry age is used the average age at entry of the membership should remain stable.)