

**Internal guidelines for the actuarial analysis of  
a national social security pension scheme**

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**The International Financial and Actuarial Service  
ILO FACTS**

**Financial, Actuarial and Statistical Branch  
Social Security Department  
International Labour Office  
Geneva, May 1998**

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## 1. Introduction<sup>1</sup>

The ILO has been providing actuarial services to the social security systems in its member countries since the 1940s. The International Actuarial Service was established formally in the early 1970s. Since the biennium of 1998/1999, the Service has been called the International Financial and Actuarial Service, or *ILO FACTS*<sup>2</sup>. It is the oldest and only internationally operating non-profit actuarial consultancy unit with an exclusive focus on social security development issues. It has so far served social security institutions and governments in more than 70 countries.

Over time, the context, the scope and the methodology for actuarial analyses of national social security systems have changed. These Internal Guidelines (IG) summarise what the Service now regards as standard practice for actuarial analysis of social security pension schemes. They are meant to serve as checklists for staff members of ILO FACTS, as guidance for external collaborators and as information for client institutions and governments. They are also meant as the (social security specific) contribution of ILO FACTS to the current worldwide debate on standards of practice in the actuarial profession.

There are essentially three types of actuarial services that ILO FACTS provides to social security institutions and governments:

- Actuarial valuations (or studies), giving rise to actuarial reports;
- Actuarial assessments, giving rise to actuarial technical notes; and
- Actuarial audits<sup>3</sup>, giving rise to certificates of audit.

In addition, the Service provides tailor-made actuarial training for social security specialists and other services in relation to the setting up of national social budgets. These latter two services are not covered by these IG.

## 2. Actuarial valuations

Actuarial valuations are intended to review the present and expected future financial developments of existing or new social security schemes<sup>4</sup> with the possibility to include analyses of the financial effects of major structural reforms in the case of existing schemes.

### 2.1. Objectives of an actuarial valuation

<sup>1</sup> These IG have been established following an internal technical workshop of the SEC/FAS Branch of the ILO in Geneva in December 1997. Contributions were received from Anne Drouin, Lambert Gbossa, Denis Latulippe, Warren McGillivray, Jean-Paul Picard, John Woodall, Kenichi Hirose, Hiroshi Yamabana and Rüdiger Knop. The following people have served as a professional review committee: Pierre Plamondon (Régie des Rentes, Québec), Alvaro Castro Gutierrez (ISSA, Geneva) and Alejandro Bonilla Garcia (ILO Regional Office for Latin America and the Caribbean in Lima). The IG will be widely circulated to national social security institutions and national and international actuarial associations. Further comments are invited.

<sup>2</sup> Details of the services offered by ILO FACTS as well as of its mode of operation are described in the brochure “The International Financial and Actuarial Service of the ILO”, Geneva 1997 which is available through Ms. Karuna Pal (tel: 00 41 22 799 6624, fax: 00 41 22 799 7962 or pal@ilo.org).

<sup>3</sup> The term “audit” is a sensitive one. Under no circumstances should it be construed as a form of “ILO policing” of national social security actuaries (see also section 4.). Audits will basically be undertaken only where the actuarial valuation of a national scheme is undertaken by actuaries who are still undergoing training.

<sup>4</sup> Actuarial valuations of new schemes are often called “actuarial studies”.

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An actuarial valuation is a tool of financial governance and planning that is undertaken at the onset of the scheme and on a regular basis afterwards. Often, the national legislation stipulates that actuarial valuations/reviews must be performed at time intervals of not longer than 3 to 5 years in order to ensure a timely monitoring of the operations of the scheme. The central objective is to assist governments and the management of social security schemes to ensure the long-term financial, fiscal, economic and political viability of their social security scheme. Concretely, this general objective can be further broken down into sub-objectives.

Actuarial valuations of operating pension schemes should:

- (1) establish the *present financial status and likely future financial development* of a social security pension scheme;
- (2) assess, in view of (1), the *long term financial sustainability* of the scheme in relation to present contribution rates and the chosen or adequate financing system<sup>5</sup>;
- (3) identify the reasons for possible present or future financial disequilibria;
- (4) advise the government on *measures to ascertain the financial equilibrium* of its social security scheme in accordance with the definition of the actuarial equilibrium stipulated by national legislation or in accordance with an established practice in the country or in comparable international cases;
- (5) advise on/recommend possible *changes to the financing systems*; recommend a clear legal definition of the actuarial equilibrium<sup>6</sup> of the scheme if such definition is not (yet) clearly codified;
- (6) assess the *adequacy of the level of benefits provided* in the context of observed financial constraints; this implies comments and recommendations on the preferred and affordable future adjustment system;

Actuarial valuations of new schemes or of fundamentally revised schemes are undertaken to:

- (1) establish the likely future financial development of a planned or fundamentally reformed social security pension scheme;
- (2) advise on possible alternative financing systems and recommend a definition of the actuarial equilibrium for the scheme;
- (3) assess the long-term financial sustainability of the scheme in relation to politically acceptable contribution rates and different alternative financing systems, with due consideration of international experience in terms of politically sustainable levels of contributions;

<sup>4</sup> Sustainability might as well be placed in the context of international experience with respect to politically and financially sustainable levels of contributions. Sustainability considerations might also contain the calculation of the “implicit pension debt” at a given contribution rate (i.e. the comparison of the total present value of future benefits under present benefit conditions with the present value of future contribution and other incomes).

<sup>5</sup> The actuarial equilibrium essentially stipulates the minimum (and sometimes the maximum) level of reserves a pensions schemes has to maintain for a defined period of time (period of equilibrium). Under a collectively or individually fully funded scheme this definition is straightforward once the concrete definition of the meaning of full funding has been determined. Under pay-as-you-go (PAYG) financing, the level of the minimum contingency reserves has to be determined by risk assessment techniques. Under partial funding systems, i.e. usually scaled premium methods of financing, usually a minimum level of reserves as expressed in multiples of annual benefit expenditure (funding ratio  $k$ ) and the period after a valuation for which the scheme under realistic assumptions has to maintain that level of reserves. Alternatively, a series of consecutive periods with different funding ratios can be prescribed aiming, for example, at a final level of funding. Since there are no hard and fast actuarial rules on the level of reserves under the scaled premium system, economic, financial, fiscal and capital market criteria have to be developed and discussed with the responsible officials. The technical aspects of the above considerations are discussed elsewhere (cf. Drouin et al. (forthcoming) and Iyè (forthcoming)).

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- (4) assess the adequacy of the level of benefits provided to the insured population in the context of observed financial constraints;

## 2.2. Content of an actuarial report

The easiest way to list the core content of an actuarial valuation is by outlining the typical structure of the final output of an actuarial valuation, i.e. the actuarial report. These IG, however, are not cast in stone. There will always be good reasons to deviate from the proposed sequence of content.

Chapter headings are listed so as to provide a checklist of topics that should be addressed in the actuarial report which is undertaken on behalf of the ILO. The actuarial and mathematical methodology as well as the macro-economic reasoning which should be applied is not covered by these IG.<sup>7</sup>

A standard actuarial report should have the five main components as described in Table 1.

**Table 1. Standard content of an actuarial report**

|    |  |
|----|--|
| 1. | Executive summary  |
| 2. | Economic, demographic and governance context   |
| 3. | Analysis of the present situation and performance <ul style="list-style-type: none"><li>– Description of legal provisions</li><li>– The present financial status</li><li>– Benefit experience</li></ul>  |
| 4. | Actuarial projections <ul style="list-style-type: none"><li>– Methodology</li><li>– Data base and assumptions</li><li>– Results of <i>status quo</i> projections</li><li>– Sensitivity tests</li><li>– Results of projections under alternative legal provisions and reform proposals (<i>if applicable</i>)</li></ul> |
| 5. | Conclusions and recommendations  |
|    | Annexes  |
|    | I. Main legal provisions and observations in respect of ILO legal instruments  |
|    | II. Financial statements (detailed)  |
|    | III. Data base   |
|    | IV. Methodology (detailed)   |

### 2.2.1. Executive summary

This section should summarise the findings and recommendations of the valuation following the structure as outlined under Section 2.1 (“Objectives of an actuarial valuation”). It should be borne in mind that most national decision makers will only read this section. It should, therefore, be a concise and generally understandable guide to suggested policy actions.

<sup>6</sup> cf. Drouin et al. (forthcoming ILO publication): *Actuarial Practice in social security*; Iyer (forthcoming ISSA publication): *Actuarial mathematics in social security*, first draft available; and Scholz et al. (forthcoming ILO publication): *Social Budgeting*. A further list of other technical publications is provided in Annex 2.

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## 2.2.2. *Economic, demographic and governance context*

This section should describe the context in which the scheme operates. Relevant aspects include:

- (1) the present macro-economic performance, such as inflation and increasing unemployment which have an impact on the scheme, and expected future economic developments;
- (2) the present situation and performance of relevant economic and financial institutions, such as the status of government finances, the efficiency of tax collection mechanisms, the performance of capital markets, commercial banks and investment funds, etc.;
- (3) the recent and expected future development of general demographic trends, including the development of fertility, migration, mortality and life expectancy as well as changes in the labour force;
- (4) the development of social security at the national level and its possible development in view of longer term social policy trends;
- (5) the governance of the social security system.

The main body of the report might just summarise the main findings of the actuarial valuation whereas specific detailed observations may be placed in an annex.

## 2.2.3. *Analysis of the present situation and performance*

### 2.2.3.1. *Description of legal provisions*

This section should describe the main features of the scheme with respect to the legal provisions governing coverage, benefits and financing and, in particular, its sources and the pension financing method. Amendments to the legal provisions that have been enacted since the previous actuarial valuation must be identified. Their detailed description should be attached to the actuarial report in the form of an annex.

The mandate of ILO FACTS stems from the mandate of the organization, thus the ILO technical advisory services have to fulfill their ultimate purpose, that of enabling member states to ratify relevant ILO conventions. This is the fundamental difference between ILO FACTS and any other private sector actuarial consulting firm. Thus, an ILO actuarial valuation must contain observations as to the level of benefits compared to prescribed levels in ILO Convention No. 102 or to other relevant ILO standards. Legal assistance may be sought from the Planning, Development and Standards Branch (SEC/PDN).

This section could be complemented by an annex which would provide the list of ILO social security conventions that have been ratified by the concerned country, and it should include comments on the compliance of the legal benefit provisions in relation to ILO conventions on social security. The main ones include the Minimum Standards of Social Security Convention, 1952 (No. 102) and the Invalidity, Old-age and Survivors' Benefits Convention, 1967 (No. 128). Other ILO conventions on social security include Conventions No. 3, 12, 17, 18, 19, 23, 24, 25, 35, 36, 37, 38, 39, 40, 42, 44, 48, 67, 68, 69, 95, 103, 118, 121, 130, 131, 134, 157, 167, 168 and 176.<sup>8</sup> Even in the case of a country that has not ratified any ILO convention, comments would be due on the relationship of benefits level provided in relation to minimum level prescribed by the "base" Convention No. 102.

### 2.2.3.2. *The present financial status and analysis of benefit experience*

<sup>7</sup> cf. ILO (1992): *ILO conventions and recommendations on social security*, Social Security Department, Geneva, 26 p.

cf. Hagemeyer, K. and J. Perret (1997): *Minimum level of old-age benefits as required by ILO Conventions 102 and 128*, Geneva, 4 p.

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This section should contain a detailed analysis of the recent past experience of the social security scheme (preferably up to the 10 years immediately preceding the valuation, but no less than 3 to 5 years). In particular, this study should cover the annual financial statements on income and expenditure (by benefit type), the balance sheets, and the past investment performance, along with comments on the adequacy of the investment policy such as on the potential desirability of using different investment vehicles in the private and public sectors. Relevant material (such as a summary of the statement of income and expenditure and the balance sheets) could be placed in an annex. This section should also contain a description of the financial developments since the last valuation. An analysis should be provided which explains the deviation of the projected developments from real developments since the last valuation (after an appropriate reconciliation of the initial data base).

The analysis of benefit experience should describe the past development of key performance indicators relevant to the insured population and to the different benefit branches of the scheme such as:

- the social insurance coverage ratio;
- the catchment ratio;
- the demographic ratio; and
- the average benefit replacement ratio.

The technical definitions of these indicators are provided in Annex 3. Their analysis should account for the stage of maturity of the scheme. *Inter alia*, observations should be made on the *de facto* observed average retirement age, the level of the ceiling on insurable earnings (if applicable), the relationship between the *de jure* level of the replacement rate and the *de facto* level of the replacement rate for old-age pensions, along with explanations on the possible discrepancies which may likely be linked to the past practice for the adjustment of benefits in payment.

In the event of marked differences between the actually observed demographic ratios and financial ratios versus their projected values as per any prior actuarial valuation, they should receive specific technical comments.

#### 2.2.4. Actuarial projections

##### 2.2.4.1. Methodology

This section should describe in brief and non-technical terms the main procedures used to project the income and expenditure components of a social security scheme. Further technical details, which might be of relevance to the reader, are discussed under Section 2.3 (“Methodological requirements”). It should set out, as a basic principle, that the methodology used to analyze and simulate the national social security system may only be undertaken with a view to the development of the country as a whole, *i.e.* its population and its economy. Regardless of the model used, reference should be made to a source of information that provides a full description of the model, such as the technical guide on the ILO pension model.

##### 2.2.4.2. Data base and assumptions

This section should summarize the content, the quality and the origin of the statistical data as well as the determination basis for demographic and economic assumptions used for the projections. The main elements of the data base should be documented in the form of a statistical annex to the actuarial report. In particular, the actuarial projections have to be placed methodologically within the context of :

- the general demographic development;
- the macro-economic environment;
- parameters describing the scheme’s present and likely future governance; and

- 
- scheme-specific data describing the financial situation and system-demographics of the scheme in the past and at a given valuation date.

Only a brief summary of the essential data might be described in the main body of the actuarial report. The origins of the statistical data used may require additional comments focussing on its quality and reliability, in particular on estimates or assumptions used in lieu of statistical data when the latter is not available.

Key assumptions determining the demographic and financial projection of the scheme must be clearly stated and their potential impact should be discussed. Such key assumptions should refer to the future demographic development of the scheme, the future development of economic determinants and the future development of critical scheme governance parameters (such as the catchment factor, the coverage rate and the contribution collection rate).

The structure of a standard data base for the actuarial valuation of a social security scheme is outlined in Table 2, and further technical details are provided in Annex 1.

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**Table 2. Standard structure of a data base for an actuarial valuation**

|    |   |
|----|---|
| 1. | General demographic and labour force context and assumptions  |
| 2. | Economic data and assumptions   |
| 3. | Governance data and assumptions   |
| 4. | Scheme-specific data as of the valuation date   |
| 5. | Checklist of statistical data and assumptions on:   |
| –  | Demography: population, mortality, fertility, migration and family composition (structure of dependents)                          |
| –  | Employment and labour force   |
| –  | Economy and government expenditure: gross domestic product (GDP), consumer price index (CPI), GDP deflator, interest rates, wages |
| –  | Social insurance: accounts, contributors and contributions, expenditure components  |

#### 2.2.4.3. Results of status quo projections

*Status quo* projection results are the central basis to the actuarial analysis. They usually display eleven standard descriptors for the demographic and financial development of a scheme, of which the two last ones are facultative (see Table 3).<sup>9</sup>

#### 2.2.4.4. Sensitivity testing of status quo results<sup>10</sup>

The reliability of models used to produce demographic and financial projections is always limited. All variables entering into the projections of future revenue and expenditure components of a social security scheme are stochastic, in principle. However, the models generally used are based, in strictly mathematical terms, on a deterministic approach which produces results that represent only one set of results out of a continuum set of possible outcomes. This is mainly because stochastic models would require the build-up of probability distributions for central results, whose construction is most likely difficult, complex and time-consuming, and their interpretation may be too difficult for the “end-users” of the actuarial report. Hence, the degree of reliability of the projection results based on a deterministic approach has to be assessed by sensitivity testing which can be regarded as a substitute for stochastic modelling.

Sensitivity testing should be used to assess the reliability of our modelling results and it should be applied to the *status quo* projections. It should not extend to model alternative legal provisions, which are covered under a subsequent section, as this would only lead to a multiplication of test runs that would add very little to the quality of the overall analyses.

Sensitivity tests should thus be employed to alert our clients to the relative importance of different determinants for the future financial development of their social security scheme. The most critical parameters, and in many ways the most uncertain, are usually economic growth and governance or compliance. At least, alternative economic growth paths and more optimistic and pessimistic compliance parameters should be tested by scenario analyses.

**Table 3. Standard set of actuarial descriptors**

<sup>8</sup> Further details on the technical definitions of the descriptors are provided in Annex 3.

<sup>9</sup> In some actuarial reports, these projections are also referred to as “projections under constant (or present) legislation”.

1. Demographic projections of the number of active insured persons and beneficiaries including the corresponding relative demographic ratios.
2. Financial projections of total insurable earnings and benefit expenditure, both in current and constant monetary terms;
3. Projected average insurable earnings and average benefits including the corresponding relative average replacement ratios;
4. Projected PAYG cost rates;
5. Projected total expenditure expressed as a percentage of GDP<sup>11</sup>, including its breakdown by benefit branch.
6. The general average premium (GAP) for the full projection period.
7. Projected levels of the reserve according to the present legal levels of the contribution rate and to the recommended levels.
8. Projected funding ratios which reflect the level of reserve in terms of annual benefit expenditure.
9. Projected levels of the reserve and contribution rates on the basis of an alternative financing method.
10. (*facultative*) The capitalisation ratio (or full funding ratio) which reflects the level of the reserve in relation to the amount of reserves that would be necessary to fund all benefits-in-payment and the accrued benefits of the insured population.
11. (*facultative*) Required government subsidies (other than for the payment of its contribution to the scheme as an employer) in absolute terms and as a ratio to total expenditure and/or total insurable earnings<sup>12</sup>

The most significant results should be illustrated through graphs, a sample set of which is provided in Annex 2. This section may be completed by a reconciliation of the projected long-term development of the PAYG premium or the GAP of the present valuation with the results of the last valuation.

#### 2.2.4.5. Valuation of modified legal provisions and reform proposals

The modelling of alternative legal provisions require modifications of the mathematical mapping of the *status quo* provisions. Also, these modifications usually include modifications of governance parameters and of behaviour assumptions, such as the pattern of entry into retirement which should be interrelated with the resulting development of the labour force and the economy. These adjustments to the modelling assumptions must be explained in detail.

The modelling results based on a *ceteris paribus* set of assumptions should be compared to the corresponding *status quo* scenario results using some of the key indicators as listed under Table 4. The *status quo* scenario should serve as the benchmark for the assessment of the impact of proposed modifications and reforms. The impact of reforms should thus be measured by the relative deviation of the financial development of a scheme caused by potential reforms or minor modifications from an expected “normal”, *i.e. status quo*, development.

#### 2.2.5. Conclusions and recommendations

This section derives, from the findings and observations of the valuation, a set of action measures which are recommended to preserve or establish the financial equilibrium of the scheme in the future.

<sup>10</sup> This is possible only if an adequate forecast of GDP has been performed.

<sup>11</sup> The calculation of required government subsidies could be necessary, for example, in the case of a reformed scheme which includes transition costs to be met by the Government.

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The emphasis should be placed on the explanation and discussion of the pros and cons of specific recommendations, as the executive summary only lists these recommendations. This section should also provide comments on the reliability of the quantitative results and the underlying data base and it should alert the reader to necessary follow-up action, such as the improvement of the statistical data base, necessary modifications of the accounting frame and/or of investment management, etc.

The recommendations should, if necessary and if no other ILO report specifically deals with policy recommendations, contain observations as to how the benefit levels of the scheme compare to ILO conventions and recommendations and should - if applicable - advise on how these levels can be reached.

### 2.3. Methodological requirements

Actuarial valuations and actuarial assessments as well as, to some extent, actuarial audits require mathematical models. This section sets out ILO FACTS' minimum requirements for the models used for actuarial work undertaken on behalf of the ILO. Preferably, the actual standard version of the set of ILO models for pensions, the general population, the labour force and the economy should be used. The choice of the pension model to be used should depend on the nature of the terms of reference for the actuarial assignment. In case of a routine periodical actuarial valuation of an unmodified mature scheme, a relatively simple projection model may be used instead of the extended version of the present ILO pension model. However, in the case of a major reform or for the preliminary study of a newly introduced pension scheme, the extended pension model should be used.

External consultants who use their own software for making pension projections must meet the minimum methodological requirements listed in Table 4.

**Table 4. Minimum methodological requirements for the application of an external pension model in the context of an ILO actuarial assignment**

1. The model must be based on standard actuarial mathematics for social insurance schemes<sup>12</sup>.
2. The model must use as a starting point the general population, deriving from it sequential steps to the labour force, the legally covered population and the contributing population. Exceptions from this general rule might be made in the case of small schemes covering only a fraction of the economically active population.
3. The development of the contributing population has to be linked to total employment and wage assumptions that, in turn, have to be linked explicitly to the assumptions on macro-economic growth and the wage share of GDP (with the same possible exception as under 2).
4. The model must use a cohort approach using the flow method for generating future generations of pensioners and insured persons on a single age basis; *i.e.* it has to permit:
  - the identification of each new generation of pensioners; and
  - the recording of the average period of past pension credits and the average past insurable earnings of each cohort of insured persons.
5. When calculating new pensions, the distribution of past pension credits and past reference insurable earnings should be taken into account otherwise the distributive effects of alternative pension formulae may not be tested. If distributions are not statistically available then adequate assumptions around estimated averages may be used, but they have to be identified clearly.
6. The projection period must be made until the time when the scheme reaches a near-maturity state, *i.e.* normally at least for 85 to 100 years which should imply that in the final projection year the cohort of the newborns in the first projection year will have virtually all been deceased. Nonetheless, new or young schemes should have their projections for at least 65 to 70 years which corresponds to the time necessary for the cohort entering the labour force during the first projection year to have “grown out” of the “pensioner force”. For more mature schemes, a shorter projection period might be adopted. In any case, the minimum length of the projection period must be set according to the period of equilibrium used in the definition of the actuarial equilibrium stipulated by national law.
7. The model must be in a form which permits its transfer to the relevant government institution or social security institution, in combination with a user’s manual if the terms of reference of the project include a training component.

### 3. Actuarial assessments (or consultancies)

Actuarial assessments, usually the results of emergency missions, such as, for example, when the Service is called to assess the financial situation of a social security scheme which faces obvious liquidity problems. These missions normally cannot result in a full actuarial valuation. The output of such missions is normally a technical note to the government containing the following:

- (1) An analysis of the present financial situation, and of the past three to five-year development resulting in:
  - (a) the identification of the dimension of the present cash flow problem;
  - (b) an analysis of the past benefit experience;
  - (c) The identification of the probable reasons for the financial problem, e.g. a governance problem with respect to contribution collection, an excessive administrative cost, a bad investment performance, a failure to increase the contribution rates in time, levels of benefits that are too high, too many persons retiring early, etc.
  - (d) The financial projections for the medium-term future:
    - under *status quo* conditions,
    - a package of emergency measures.

<sup>12</sup> *cf.* Drouin et al. (forthcoming); Iyer (ISSA) (forthcoming); and Thullen (1974).

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- (2) A concrete set of recommendations should be formulated on how to balance the scheme's income and expenditure within a very short period of time. These should contain a statement to the effect that a fully fledged actuarial review should be undertaken within a certain period of time.

The financial projections should normally be for a short-term projection period and follow a budgetary disaggregation approach, i.e. should follow a similar breakdown of revenue and expenditure components commonly used for the budget of the scheme. The projection methodology may consist of abbreviated actuarial methods; for example, the number of pensioners may be projected by applying some kind of pensioner ratios to the total population, which may be referred to as the so-called "stock method". Such pensioner ratios might be increased according to past trends in the coverage ratio but allowing for a time-lag. Average pensions might be calculated on global assumptions regarding the relative average replacement ratio, i.e. the ratio of average pensions to average insurable earnings.

## 4. Actuarial audits

This is a new activity which might in future become more frequent once the actuarial training activities, which we envisage, and the setting up of actuarial/quantitative units begin to bear fruit. This activity basically consists of providing the government and/or the social security institution with a second opinion on an actuarial valuation undertaken by its own internal actuarial/quantitative unit. As already mentioned, auditing is a sensitive task. The Service sees it primarily as a support function for ILO-trained national social security actuaries, or actuaries using the ILO methodology. The Service will always inform the actuaries who undertook the initial valuation of the audit request. The Service might also liaise with the actuaries of the organization during the auditing by way of discussing draft auditing reports. In particular, the objectives of an actuarial audit might include:

- (1) to establish whether the valuation report follows established ILO procedure and includes, if necessary, comments on any deviation;
- (2) to comment in full detail on the assumptions made for the valuation and to what extent they appear reasonable, based on our experience in general or in the particular country;
- (3) to examine the projection methodology applied. If no ILO model was used, then it might be necessary to use back-of-the-envelope calculations in order to ascertain that the results provided in the valuation are at least in the right order of magnitude; our own abbreviated model (for example, the pension module in the Social Budget Model, if its projection period can be made compatible with the projection periods of the audited valuation) may be used.

The certificate of audit should conclude with an overall statement of endorsement or a detailed list of recommendations for the modification of the report under scrutiny. In view of the professionally sensitive nature of this activity, the ILO will provide it free of charge.

## 5. Language and specimen reports

The language of actuarial reports should be understood by every social security expert and every decision maker specializing in social policy. Only standard terms of social security financing should be used. A glossary of standard technical terms is provided in Annex 3.

It is recommended that actuarial reports, which are considered as models for the present state-of-the-art of actuarial techniques in social security, be consulted. References listed in Annex 4 might serve as examples.

## 6. Responsibilities and qualifications of actuarial experts

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## and advising staff

### 6.1. Responsibilities

The responsibility for the first draft version of the actuarial report rests with the SEC/FAS staff actuary who is undertaking and/or supervising the assignment. The SEC/FAS staff actuary may use an external actuarial consultant to undertake the valuation and to establish the first draft report. For each actuarial valuation, advice should be sought from an economic adviser (generally from SEC/FAS or an ILO Multi-Disciplinary Team (MDT)) in order to review the economic assumptions, and from a legal and/or policy adviser (usually from SEC/PDN or the International Labour Standards Department) to review the observations and recommendations relating to the ILO conventions and recommendations. The reviewers should be named in the introduction to the actuarial report which should use the following suggested format:

*The Director General of the ILO appointed [Ms./Mr. X] to undertake this actuarial valuation. The valuation was supervised/reviewed by [Ms./Mr.Y] of the ILO International Financial Actuarial Service. Economic assumptions were reviewed by [Ms./Mr. Z] and the legal recommendations and observations by [Ms./Mr. XYZ].*

In addition, the institution and the names of the support persons providing the data frame and the certified financial statements should be mentioned. If assumptions have been agreed upon with national counterparts, then their names and/or their institutional affiliation should also be mentioned. The technical responsibility should thus be clearly established.

The ultimate responsibility for all technical questions for an actuarial analysis, including reports, technical notes and certificates of audit, remains with the Chief of SEC/FAS Branch, while the responsibility for non-quantitative policy recommendations in the final report, if any, is shared with the relevant MDT and ILO area office, as well as with SEC/PDN and the Director of the Social Security Department.

### 6.2. Qualifications

Minimum professional prerequisites must be met by experts and staff members who undertake actuarial valuations of social security schemes on behalf of the ILO. Actuarial valuations must be undertaken by qualified social security actuaries. An internationally recognized definition of a social security actuary does not yet exist; ILO FACTS has thus adopted its own preliminary definition.

For the ILO FACTS, a qualified social security actuary should at least meet one of the following criteria:

- (1) be a member of a national actuarial society in any of the ILO member countries, with at least five years of experience in actuarial work in social security; or
- (2) be a member of a national actuarial society, or be a qualified mathematician, statistician or economist who has undergone an ILO recognized and/or organized training programme in actuarial techniques of social security or have proven his/her knowledge of the subject in the form of a series of examinations; or
- (3) be a qualified mathematician, statistician or economist, whose formal qualifications are not necessarily of an actuarial nature, with at least five years of actuarial work in a senior position with a social security institution or a supervising ministry in one of the ILO member states, and who is, in the opinion of the Chief of SEC/FAS Branch, competent to undertake actuarial valuations according to the standards developed in these IG.

ILO FACTS keeps a register of social security actuaries who have either served as experts for the Service or who have registered as potential experts and who satisfy the above criteria. With the consent of the registered actuaries, their profiles would be made available on request to other

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international institutions, such as the World Health Organization, the United Nations, the International Bank for Reconstruction and Development (IBRD, World Bank) and the European Union, or to national social security institutions and ministries in charge of social security.

## **7. Transfer of technology**

At the request of the client government and/or client institutions, the ILO's set of computer-based social security models will be transferred to the client scheme free-of-charge as part of an actuarial valuation. National staff will be trained on request, but training activities would normally require additional financing.

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# Annex 1 – Structure and commentary on the standard data and assumption base for the actuarial valuation of a social security scheme

This annex provides advice on the importance and on the sources of information for the collection of data and the build-up of assumptions for an actuarial analysis. The data requirements are also summarized in the form of a data checklist.<sup>14</sup>

The forecast of a social security scheme must be consistent with the modelling of the overall socio-economic environment of the country. Key demographic and economic assumptions related to the general population, economic growth, the labour market and wages have to be developed. Other assumptions of relevance to the scheme are also needed, such as the expected investment return on the reserve of the scheme and behavioural assumptions on the enforcement of contribution payments, the pattern of entry into retirement, the pattern and basis for indexing benefits and the ceiling on insurable earnings.

Possible interrelationships between these assumptions, especially the economic ones, have to be properly taken into account to ensure their consistency. For instance, the assumption on the development of wages must be defined with reference to the ones on economic growth as well as on employment and unemployment. The selection of these assumptions must take into account the recent experience of the country, to the extent that information is available and applicable, but in recognition of the nature of the long term pensions. The assumptions must be chosen to reflect the expected long term trends rather than to give undue weight to recent experience.

## A1.1. Socio-economic modelling database and assumptions

### A1.1.1. Demography and labour force

The demographic structure of a statutory pension scheme with a wide population coverage is determined to a large extent by the assumed future demographic structure of the total population. Data on the actual age and sex composition of the population is thus one of the most important determinants for an actuarial analysis. A valuation requires a forecast of the general population structure driven by assumptions on mortality, fertility and migration, and a forecast of the labour force which is derived from the application of labour force participation rates to the general population.

Often, the assumptions required to derive forecast of the general population and the labour force are regarded as political, and are therefore handled by the national statistical office. Hence, if official population and labour force forecasts are available at the national level, they should be used in order to avoid an unnecessary debate but only if they are considered to be reasonable and realistic for the purpose of the actuarial valuation. Nevertheless, the ILO actuarial analysis may be used to offer alternative demographic and labour scenarios.

In the event that there is no available national forecast of the general population, nor national assumptions on the future development of fertility, mortality and migration, then the United Nations (UN) projections<sup>15</sup> applicable to the country may be used; otherwise, assumptions from countries with a similar demographic

<sup>13</sup> Draft guidelines on the collection of data for an actuarial valuation are available in ILO FACTS: *cf.* Drouin, A. (1997): *Guidelines for the collection of social security data required for ILO actuarial valuations - Draft*, SEC/FAS Branch, Social Security Department, International Labour Office, Geneva.

<sup>14</sup> *cf.* United Nations (1995): *World population prospects, the 1994 revision*, Department for Economics and Social Information and Policy Analysis, Population Division, New York, 886 p.

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structure may be used with respect to these indices in order to allow the development of a general population forecast using the UN projection methodology<sup>16/17</sup>.

With respect to labour force participation rates, an ILO forecast exists for client countries, although more refinements would be required around the retirement ages.

There are other demographic factors from the general population that bear an impact on the future development of a statutory pension scheme. *Inter alia*, the vital family statistics that describe the marriage behaviour and provide statistical information on the family structure are necessary for the projections of survivors' benefits. However, adjustments must be applied to reflect the provisions of the scheme, e.g. the number of children may include those whose attained age is higher than the maximum legal age allowed for the receipt of an orphan benefit. Most of this data can be obtained from the national statistical office but, in case it is not available, one might refer to available standard regional profiles.

Most of the other behavioural and biometric parameters necessary for the demographic projections of a pension scheme are scheme-specific, in particular the retirement behaviour among the insured population, and these parameters are covered under section A1.4.

### A1.1.2. Economy

Macro-economic data of past experience should be collected for a minimum of 10 years although longer time-series are preferable. Historical data series are usually available from the annual yearbook on national statistics (produced by the national statistical office and/or the ministry responsible for finance and planning). There are also a number of international institutions that publish annual yearbooks of economic statistics however, much of the required information is often not compiled at all and one has to resort to alternative ways to obtain the information.

The key economic data to be collected include the following:

- gross domestic product by sector;
- employment by sector;
- unemployment;
- labour and capital income shares of GDP;
- national average wage for the economy and by sector and its relation to insurable earnings under the scheme;
- price indices; and
- nominal interest rates.

One of the core economic variables for pension projections is real economic growth which should be based on the national development plan, if available, or on the basis of our own assumptions based on a careful assessment of past economic developments. However, forecasting economic growth is a difficult exercise in economics and one is therefore advised to resort to alternative scenarios, one of which, if available, should reflect an official government forecast. Economic growth, together with assumptions on the development of labour productivity, implicitly determines the global level of employment. Furthermore, economic growth and the assumed labour income share of GDP determine the average wage of employees. Equally, inflation rates may have to be assumed independently in order to avoid having to forecast the national financial and monetary policy, and projected interest rates must be consistently determined with the assumption on economic growth and inflation.

A long-term macro-economic frame must be developed for the entire period of projections for pensions which may extend for as long as 80 years into the future. The relevance of such a long-term perspective on the economic development of a country must be assessed solely in the context of long-term pension projections.

<sup>15</sup> cf. United Nations (1990): *Projection methods for integrating population variables into development planning*, Volume I - Methods for comprehensive planning, Module One - Conceptual issues and methods for preparing demographic projections, Department of International Economic and Social Affairs, New York, 255 p.

<sup>16</sup> A computer-based model version of the UN methodology is available in the ILO FACTS.

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Finally, the opinion of the responsible ministries for labour and social affairs and for economics and finance should be sought.

## A1.2. Social insurance modelling database and assumptions

### A1.2.1. Governance of the scheme

Information on governance is mostly of a legal nature as it mainly refers to the legal provisions of the scheme, i.e. the relevant law and regulations on social security. The interpretation of legal matters should represent the first step in getting acquainted with the scheme. The second step, the practical application of these legal provisions, must be clearly understood, i.e. an exact description must be obtained on how the benefit formulae and the qualifying conditions for the different categories of benefits provided under the scheme are applied. Indications as to how the benefit formula is expected to be modified in future are also needed. Other parameters describing the administrative practice governing the scheme include the following<sup>17</sup>:

- The social insurance “coverage ratio” reflects the ratio of the number of covered persons to the potential number of persons that should be covered according to the legal provisions.;
- The “contributor ratio” reflects the ratio of the active insured persons (persons with at least one contribution paid in a given period) to the total labour force;
- The “catchment ratio” reflects the relationship between the average insurable earnings of a social security scheme and the level of the national average wage in the economy, if available;
- The “contribution collection ratio” reflects the relationship between the actual amount of contribution income received in a given year and the corresponding expected amount; and
- The “density factor” reflects the ratio of the average period of actually paid contributions during a financial year to the potential maximum number of contributions during the same financial year.

The main sources of this information usually come from both the general labour market database and the scheme-specific data as discussed under sections A1.1, A1.2 and A1.4, respectively. As the forecast of these parameters implies a view on the future effectiveness of the social security administration, the underlying assumptions should be discussed with the management of the scheme. The basis used to develop assumptions should be clearly explained, and the potential impact of improved administration measures on the short, medium and long-term financial status of the scheme should be illustrated through sensitivity tests. Such sensitivity results should also be produced in case of a disagreement with the management of the scheme on the selection of assumptions.

### A1.2.2. Scheme-specific information

Parallel with the forecasts of the general population, the labour force and the economy, the financial situation of the scheme is consistently projected through the projections of its total income - stemming from its contribution income, its investment and other income - and of its total expenditure - arising from the payment of benefits and administrative expenses. The key determinants for these parameters are listed in Table 5.

The build-up of scheme-specific assumptions should not only be based on the past experience data of the scheme but also on the future outlook, which relies on judgment to a large extent. In any case, assumptions should not unduly only reflect the past.

Also, the analysis of scheme-specific past experience should include a consolidation of the disaggregated information with global expenditure and income figures as published in the annual financial statements of the scheme, including its budget (income and expenditure statement), balance sheet and cash flow statement.

In the case of newly introduced schemes where there may not be any past experience to be relied upon for building up scheme-specific assumptions, it may be advisable to organize succinct surveys with the help of national officials. The last recourse, wherever surveys cannot be organized, should be to use the adjusted data from other social security schemes with similar characteristics.

<sup>17</sup> Such parameters can be disaggregated on a sex and age-specific basis.

With respect to the projection of short-term benefits, it is usual that only a medium-term forecast be developed, while a long-term forecast should only be provided for the purpose of providing a global picture of the scheme finances along with long-term pension projections. This should be explicitly mentioned in the actuarial report.

**Table 5. Key determinants for the projection of investment and contribution income and benefit expenditure under a social security scheme**

| Investment income  | Contribution income   | Benefit expenditure  |
|--|---|--|
| Initial amount of reserve at valuation date.   | Initial distribution of the number of insured persons (by age and sex) and, in future, including active contributors and inactives, including their grouping by income class and by sector (public / private). This is mainly affected by the macro-economic and governance assumptions.                    |  |
| Investment policy: asset mix; and qualitative and quantitative constraints on the selection of investments.                        | Initial distribution of insurable earnings (by age and sex) and, in future, including the breakdown as per the grouping of insured wage earners according to different income classes and by sector (public / private). This is mainly affected by the macro-economic and governance assumptions.           |  |
|  | Initial distribution of past credits - related to accumulated service or contributions - (by age and sex) and, in future, which is affected by the assumed density factor.  |  |
| Expected rate of return on investments which is in turn affected by the development of capital markets and the economy in general. | <u>Governance factors</u><br>- Assumed density factors (by age and sex) reflecting the expected average period of actually paid contributions in a year to the potential full period; and<br>- Contribution collection rate reflecting the actual to expected amounts of contributions paid.                | Initial distribution of the number of pensioners and the average pension amounts (by age and sex) for each benefit branch and their projected future numbers and average pensions on the basis of other scheme-specific determinants.  |
|  | <u>Decrements:</u><br>- Pattern of entry into retirement (by age and sex) in relation to the grouping of insured persons by their past credits and insurable earnings profile;<br>- Rates of entry into invalidity, work and non-work related, (by age and sex); and<br>- Mortality rates (by age and sex). |  |
|  | Assumed pattern of entry and re-entry into the scheme of the insured population.  | <u>Family structure for survivors' benefits</u> (by age and sex of the deceased insured person);<br>- Proportion of married insured persons with an eligible spouse for survivors' benefits;<br>- Average age difference between spouses;<br>- Average number of eligible orphans; and<br>- Average age of eligible orphans. |
|  | Indexation mechanism for the adjustment of fixed benefit parameters, pensions-in-payment and the ceiling on insurable earnings. If no legal mechanism exists, then an assumption has to be made with respect to the periodicity and the basis of future <i>ad hoc</i> adjustments.                          |  |

### A1.3. Checklists of data and assumptions

Checklists are provided to establish the standard frame for the data collection as required for the application of the ILO Pension Model to a specific social security scheme, including modules on the general population, the labour force, the economy and wages. The data should be collected in the form of data series covering a past period of at least three observation years, including the year of the valuation date.

There are two data and assumptions checklists: Table 6 refers to the socio-economic parameters and Table 7 refers to the social insurance parameters.

**Table 6. Checklist of socio-economic data and assumptions required for the application of the ILO Pension model**

|   |
|---|
| <p><b>Demography</b></p> <ul style="list-style-type: none"> <li>– Number of persons in the general population and any official government forecast for future years (by single age 0-100 and sex)</li> <li>– Mortality rates and projected mortality changes, e.g. expected annual rates of mortality improvement, (by single age 0-100 and sex)</li> <li>– Fertility rates and projected total fertility rates (by single age of female 15-50)</li> <li>– Net international migration (by age and sex)</li> </ul>  |
| <p><b>Employment and labour force data(*)</b></p> <ul style="list-style-type: none"> <li>– Number of persons in labour force and any official Government forecast for future years (by age and sex)</li> <li>– Labour force participation rates and projected values (by age and sex)</li> <li>– Number of employed persons and projected numbers (by age, sex and main economic sector)</li> <li>– Number of self-employed persons and projected numbers (by age, sex and main economic sector)</li> <li>– Number of unemployed persons and projected numbers (by age and sex)</li> </ul> <p><i>* Projected figures should be provided if available. Otherwise assumptions have to be built.</i></p>             |
| <p><b>Economy and Government expenditure(**)</b></p> <ul style="list-style-type: none"> <li>– Gross domestic product (GDP) in current and constant prices (by main economic sector)</li> <li>– Forecast of economic growth rates, if possible till the end of projection period and on the basis of the Government medium-term plan), (by main economic sector)</li> <li>– Consumer price indices (CPI) on a monthly basis</li> <li>– Interest rates in nominal terms</li> <li>– Average monthly earnings and wages in the economy and by economic sector</li> <li>– Primary income distribution</li> </ul> <p><i>** The required data should be obtained for an observation period of at least 10 years.</i></p> |

**Table 7. Checklist of social insurance data and assumptions required for the application of the ILO Pension model(a)**

|   |
|---|
| <p><b>Financial statements (b)</b></p> <ul style="list-style-type: none"> <li>– Income and expenditure statements (annual institutional budgets)</li> <li>– Balance sheets</li> <li>– Cash flow statements and other accounting reports</li> </ul> <p><i>In particular, detailed information must be collected on administrative expenses and other expenditure components</i></p>  |
| <p><b>Contribution income (c)</b></p> <ul style="list-style-type: none"> <li>– Number of insured persons split between active contributors and inactive insured persons (by age, sex, occupational category - if applicable - and other relevant breakdown).</li> <li>– Number of insured dependent spouses and children per contributor (by age and sex of the insured person), in case of benefit coverage extended to the dependents of the insured person</li> <li>– Number of new entrants and re-entrants joining the insured population (by age, sex, occupational category - if applicable - and other relevant breakdown)</li> <li>– Average insurable earnings (by age and sex)</li> <li>– Ceiling on insurable earnings and the basis for its adjustment</li> <li>– Density of contribution payments by active contributors on an annual basis (by age and sex, occupational category - if applicable - and other relevant breakdown)</li> <li>– Contribution collection rate</li> </ul>   |
| <p><b>Other income items</b></p> <ul style="list-style-type: none"> <li>– Amount of reserve at beginning and end of fiscal year</li> <li>– Annual rates of return on investments (by investment category and other relevant breakdown)</li> <li>– Investment policy including constraints of a qualitative and quantitative nature</li> </ul>   |
| <p><b>Long-term benefit expenditure (c)</b></p> <ul style="list-style-type: none"> <li>– Number and average individual amount of old age pensions, including relevant data on possible disaggregations of individual pensions paid (by age and sex)</li> <li>– <i>Ditto</i> for non-work related invalidity pensions split between full and partial invalidity pensions, if applicable</li> <li>– <i>Ditto</i> for survivorship pensions, from non-work related deaths, split between widows, widowers, orphans and other eligible dependents</li> <li>– Minimum pension level</li> <li>– Number of minimum pensions granted (by age, sex and benefit branch), <i>facultative</i></li> <li>– Information related to the observed pattern of entry into retirement, if available</li> <li>– Observed invalidity incidence rates and termination rates, if available</li> <li>– Observed mortality rates among the insured and pensioners' populations, if available</li> <li>– Total benefit expenditure by type of benefits under the long-term benefit branch</li> </ul> |

.... Table 7 continued on next page

**Table 7. (Cont'd.) Checklist of social insurance data and assumptions required for the application of the ILO Pension Model**

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**Workmen compensation benefit expenditure** if applicable (c)

- Number and average individual amount of work-related injury invalidity pensions split between full and partial work-related injury invalidity pensions, if applicable, including relevant data on possible disaggregations of individual pensions paid (by age and sex)
- *Ditto* for survivorship pensions from work related deaths split between widows, widowers, orphans and other eligible dependents
- Observed work injury invalidity incidence rates and termination rates, if available
- Total benefit expenditure by type of benefits under the workmen's compensation benefit branch

**Short-term benefit expenditure** if applicable (c)

- Number of sickness days per year and per insured person (by age and sex)
- Number of work days per year
- Average daily sickness benefit per insured person (by age and sex)
- Number of maternity benefit cases per 1000 women in active ages 15-50
- Average number of maternity days per maternity case
- Average maternity benefit per day
- Other short-term benefits, e.g. temporary allowances: number and average amounts
- Total benefit expenditure by type of benefits under the sickness benefit branch, the maternity benefit branch and other short-term benefits

**Other social insurance benefit expenditure** if applicable (c)

- Number and average amounts of social assistance pensions whether financed or only administered by the social security scheme
- Number of recipients and average amounts of social assistance supplements to pensions (by age and sex)

*A clear distinction should be made between social assistance payments financed by the State budget as opposed to social benefits financed by the social security scheme.*

**Notes:**

- (a) In addition to the above required database, information on the specific legal provisions, such as benefit formulae and eligibility conditions must be collected. This should include planned future changes to the benefit provisions.
- (b) Reconciliation of the information contained in financial statements and the data collected on a disaggregated basis, usually through the information system department, should be sought.
- (c) Figures should be provided for the annual average and as of the valuation date.

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## **Annex 2 – Illustrative graphical representations**

### **A2.1. Database and assumptions**

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## Annex 3 – Glossary of technical terminology

The descriptions for the following technical terms reflect the definitions of the ILO publication on the Cost of Social Security and the accepted terminology used in international practice. These are suggested definitions which are not meant to be exhaustive. It is strongly recommended that actuarial advisors working in the context of ILO assignments attempt to speak the same language, which would contribute to the conceptual continuity of ILO actuarial work and facilitate the understanding of readers of ILO actuarial reports.

### Accounting charges

This is a term normally used in the context of private pensions. An accounting charge is a cost allocation that relates to the services provided to the insured persons during an accounting period. These services normally are reflected as charges in the income and expenditure statement.

### Active insured persons *(active contributors; contributing population)*

Individuals on whose behalf at least one contribution payment has been paid to the scheme during a given financial year.

### Actuarial equilibrium

This is usually defined in the law of a social security scheme and it can take several forms although it should essentially stipulate the minimum level, and sometimes the maximum level, of the reserve that has to be maintained over a definite period of time. This definition should be straightforward for collectively or individually fully funded schemes (i.e. at each point in time the total amount of reserves has to be identical to the present value of all accrued benefit rights and benefits in payment) whereas

- (a) for a scheme operated on a PAYG approach, the level of the minimum contingency reserve has to be set on the basis of risk assessment techniques, and
- (b) under partial funding systems, such as those based on the scaled premium method of financing, the definition should encompass information on the minimum level of the reserve (expressed as a multiple of the next annual benefit expenditure, i.e. a funding ratio) and the period over which this actuarial equilibrium has to be achieved or maintained. Alternatively, a series of targeted funding ratios, applicable over consecutive periods of time, can be prescribed with the aim of reaching a specified final level of funding.

### Old Age

This usually refers to the average age of a cohort of insured persons or beneficiaries as of valuation date. It is defined in the ILO models as the year of valuation minus year of birth. *For example: if the valuation date is as of 31.12.1997 and the pensioner was born on 15.7.1927, then the pensioner's age as of valuation date would be 70 (1997-1927) (in this case - i.e. if the valuation date is the end of the year - it corresponds to the "age-at-last-birthday concept").*

### Benefit formula

The mathematical formula (which usually takes the number of insurance years, the individual earning history, general flat rate components, etc. into account) which is used to calculate the pension of an individual applying for a pension.

### Catchment ratio

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The ratio of the average insurable earnings of a social security scheme (in a given period) to the average wage of the total economy (in that same period).

## Ceiling on insurable earnings

The maximum amount of insurable earnings that is subject to contributions to the scheme. This usually (but not always) also reflects the maximum amount on which pension benefits are calculated.

## Contribution collection ratio

The ratio of the amount of contributions actually collected to the amount of contributions that should be paid, if all contributors and financiers (employers, employees, self-employed persons and government) would fully comply with their legal obligation to pay contributions (i.e. would pay all contributions due).

## Coverage ratio - legal/administrative *(registration ratio, insured ratio)*

The ratio of the number of covered persons to the potential number of persons that should be covered according to the legal provisions. Please note that this is a special definition for a pensionsystem. In case of health benefits, the group of covered persons usually includes dependents who enjoy benefit entitlements without contributing.

## Contributor ratio

The ratio of the active insured persons (persons with a least one contribution paid in a given period) to the total labour force.

## Defined benefit pension scheme

A benefit of a defined amount, which may depend on the number of contribution or insurance years and the amount of earnings during that period, is guaranteed to each insured person who meets certain entitlement conditions at pension age or in the event of invalidity or death of the breadwinner. Benefits are paid out of pooled funds which mainly consist of contributions and investment income. The investment risk is borne by the scheme. The level of the contribution rate is not fixed; it may vary over time according to the objective and method of financing selected for the scheme, i.e. on a PAYG basis, or through partial funding or through full funding.

## Defined contribution pension scheme *(individually funded system)*

Benefits depend exclusively on the amount of contributions accumulated in an individual account. There is no collective pooling of funds and there is no firm benefit commitment by the scheme other than providing, at the time of retirement, for the refund of the accumulated amount of contributions plus interest to each insured person usually with the possibility of converting this lump sum into a life annuity the level of which is determined by market conditions. Such life annuities are generally in the form of a fixed level amount which often is not adjusted for inflation. Insured persons normally bear the full investment risk unless the scheme would offer a benefit guarantee to protect its insured persons against adverse investment conditions (then the scheme or an external guarantor - usually the government - must cover the whole cost of such benefit guarantees).

## Demographic ratio

The ratio of the number of beneficiaries/pensioners to the number of active insured persons.

## Density factor

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This factor reflects the ratio of the average number of contributions actually paid during a financial year to the potential maximum number of contributions during the same financial year.

## Dependency ratio and system dependency ratio

The (general demographic) dependency ratio refers to the general population; it is the number of persons older than an age considered as a normal retirement age (age over 60 [or 65]) to the number of persons of working-age 15 to “normal retirement age minus 1 year” (59 or 64). The system dependency ratio refers to the populations of pensioners and active insured persons under the social security scheme; it is the number of pensioners (or the number of old age pensioners) to the number of active contributors.

## Eligibility conditions

The set of conditions which stipulate if and when a person is eligible for a pension. These conditions are laid down in the special security law or ancillary regulations.

## Financial system

*(actuarial cost method)*

This is an expression often used to refer to the selected method of financing long-term pensions under a defined benefit scheme (PAYG, partial funding or full funding). Such methods mainly differ through the timing of contributions payments for the purpose of financing present and/or future pension obligations.

## Full funding ratio

*(capitalization ratio)*

The ratio of the total amount of reserves to the total amount of liabilities. The former is obtained from the actual amount of reserve while the latter reflects the present value of all future benefits to pensioners and accrued benefit rights of the insured population.

## Full funding system

*(terminal funding system)*

Full funding is a financial system under which at each point in time the amount of reserves under a social security scheme is always equal to the total amount of accrued benefit liabilities (i.e. the present values of benefit entitlements accumulated up to that point in time by insured persons and actual pensioners).

## General average premium system (GAP system)

This financial system is based on a theoretically constant level of the contribution rate applicable indefinitely. It is calculated by equating the present value of projected future contributions of actual insured persons and all future new entrants plus the value of existing reserves, to the present value of projected future benefits and administration expenses for existing and future insured persons and beneficiaries. Assumptions regarding mortality, invalidity, wages, interest and other factors are necessary and, as they are likely to change in the course of time it is necessary in practice to reassess the GAP contribution rates.

## Implicit pension debt

This is a concept which is used by some members of the profession to recognize that a scheme i.e. the government (as it normally acts as the financial guarantor of the scheme), is indebted to insured persons and pensioners who have accrued benefit rights under the legal provisions of the scheme. Such financial liabilities of the government may, for example, be assessed as the present value of all benefits in payment and of all future benefits minus the present value of all present and future contributions minus the actual level of reserves.

## Insurable earnings

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The earnings received for services rendered to an employer and which are subject to the payment of contributions to the social security scheme. Insurable earnings generally include the base salary and may or may not include additional compensation components awarded to an insured person.

## Insured persons (Registered persons, actually covered persons)

This refers to the group of persons who are registered under the social security scheme.

## Investment committee

An investment committee is often responsible for the design and monitoring of investment practices and for the development policies and investment practices of the social security scheme.

## Investment portfolio

The composition of assets owned by the social security scheme.

## Minimum pension

The minimum amount of pension that is granted to any pensioner of different benefit categories, regardless of a lower individual pension entitlement as calculated on the basis of the benefit formula.

## National average wage

The national average wage reflects the average amount of earnings received by workers of all sectors in the economy (see also the “wage share at GDP”).

## New entrants of a year

Persons who for the first time registered with the scheme in it.

## Past service credits

The average number of past contributions which have been paid by or on behalf of an insured person of a defined group of insured persons (for example, a cohort with the same birth year).

## PAYG cost rate

This reflects the contribution rate that would have to be charged if the scheme were financed on a pure assessment (or PAYG) basis.

## PAYG system *(pure assessment system)*

Contribution rates are set to balance income and expenditure in each financial year or over a few years. A comparatively small contingency reserve is usually built up simultaneously to face possible short-term random fluctuations of benefit expenditure. Such a financial system is particularly suitable for short-term benefits such as sickness, maternity and funeral benefits, including medical care.

## (Average) replacement ratio *(financial ratio)*

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This is the ratio of the average pension (including pensioners of all ages and from all benefit types or individual categories of benefits) to the average amount of insurable earnings.

## Re-entrants

Persons paying contribution to a scheme after a break in contribution payments of at least one year.

## Scaled premium system<sup>19</sup>

The scaled premium system is normally applied for financing long-term benefits, i.e. pensions. Scaled premium systems are systems of partial funding. In their most generic definition, all systems of contribution rates which are increased throughout the life-cycle of a pension scheme on a step-by-step basis (where the duration of the individual “steps” are called the periods of equilibrium). In a more narrow definition (the *Thullen scaled premium (TSP)*<sup>20</sup>), the contribution rate is calculated for a defined period of years, i.e. the period of equilibrium (which often ranges from 10 to 25 years), with the objective of equating at the end of the period of equilibrium: the income from contributions and the investment income and the expenditure on benefits and administration.

The TSP scaled premium contribution rate must be recalculated for each subsequent period of equilibrium. As the necessary assumptions regarding mortality, invalidity, wages, interest and other factors are likely to change in course of time, it is necessary, in practice, to reassess the scaled premium contribution rates even during the period of equilibrium.

## System of assessment of constituent capitals

This financial system is mainly used for financing the long-term pension benefits of employment injury schemes, for which it is appropriate to ensure that the contributions received in a year are sufficient to provide for the capital values (i.e. present values) of pensions awarded in the same year. This method is particularly useful for schemes in countries with little and unstable industrial employment, and where it is advisable to provide for future resources to pay for long-term disability benefits stemming from an industrial accident or a disease at the time they occur.

## Wage share in GDP

The ratio of the total amount of “remunerations paid to employees by resident employers” (SNA definition) in a given year to the total amount of GDP. Remunerations include wages, all types of non-wage cash benefits, as well as social security contributions.

<sup>18</sup> This system was considered by the Actuarial Subcommittee of the ILO Committee of Social Security Experts to be particularly suitable for financing social security pension schemes in developing countries.

*cf.* International Labour Office (1964): *Meeting of the Actuarial Subcommittee of the Committee of Social Security Experts*, CSSE/ACT.14.1964.

<sup>19</sup> Named after the late Peter Thullen, former Chief Actuary of the ILO.

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