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Republic of Cyprus

Report to The Social Insurance Services
Ministry of Labour and Social Insurance

Peer review of the actuarial valuation of the Cyprus Social Security Scheme as at 31 December 2006

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Abbreviations and acronyms

FCAA	Fellow of the Cyprus Actuarial Association
FCIA	Fellow of the Canadian Institute of Actuaries
FIA	Fellow of the Institute of Actuaries (UK)
FSA	Fellow of the Society of Actuaries
Funding ratio	Ratio of end-of year reserve to annual expenditure (benefits and administration)
GAP	General average premium
GDP	Gross domestic product
IAA	International Actuarial Association
ILO	International Labour Office
ILO-FACTS	ILO International Financial and Actuarial Service
ISSA	International Social Security Association
MOLSI	Ministry of Labour and Social Insurance
OECD	Organization for Economic Cooperation and Development
PAYG	Pay-as-you-go cost rate (expenditure as % of insured earnings)
Reserve ratio	cf. “Funding ratio”
SECSOC	Social Security Department (ILO)
SID	Social Insurance Department, Cyprus
SIS	Social Insurance Scheme, Cyprus

Foreword

This report has been prepared in the framework of the trust-in-fund project agreement between the Social Insurance Services of the Ministry of Labour and Social Insurance (MOLSI) of Cyprus and the Social Security Department of the International Labour Office (ILO) entitled "Capacity building and Peer review for the Actuarial Valuation of the Cyprus Social Insurance Scheme as of 2006" (CYP/07/01/CYP). This project agreement is part of a long standing technical collaboration between the ILO and the Government of Cyprus which has existed since the start of the Social Insurance Scheme. Over time, the Social Insurance Department of the MOLSI has developed national capacities in the area of actuarial practice. Whilst the ILO conducted previous actuarial reviews, the actuarial valuation as of 2006 is primarily intended to be conducted by the Social Insurance Department with assistance from the ILO Social Security Department to validate the work done and to provide a formal peer review statement in line with international standards of practice. This is expected to contribute to the strengthening of the financial governance of the public social security system of Cyprus.

This report presents the results of a Peer Review of the actuarial valuation of the Cyprus Social Security Scheme as at 31 December 2006. It was undertaken by the International Financial and Actuarial Service of the Social Security Department, International Labour Office, at the request of the Social Insurance Department of Cyprus.

The Peer Review contains observations in an attempt to address the following:

- Has the work been completed in compliance with the relevant statutory requirements and professional standards of practice?

- Did the Actuary have access to the information required to perform the valuation, and were relevant tests and analysis on the data completed as might be expected?

- Were the actuarial methods and assumptions used in completing the report reasonable?

- Does the actuarial valuation communicate fairly the results of the work performed by the Actuary?

The peer review attempts to ensure the practice guidelines for social security actuarial practice as promulgated by the International Actuarial Association are met as much as possible. In particular, attention is paid to ensuring sufficient transparency in the actuarial report such that another actuary would be in a position to reasonably reproduce the work of the primary actuary who undertook the valuation.

The present report is limited to a technical peer review and it is not intended to review the current Social Insurance Scheme (SIS) design, administration or investment arrangements, except in so far as these aspects have an impact on the actuarial review.

The SIS provides pensions and lump sum benefits upon retirement, death or disability of participants, employment injury benefits, short-term benefits in case of sickness and maternity and unemployment benefits.

Actuarial valuations of public social security schemes play a central role in monitoring and evaluating public programmes such that peer reviews are becoming an increasingly

accepted procedure at the international level.[1] In countries where Governments invest in building up their own actuarial capacity, in-house actuarial valuations of their social security schemes take place often relying on the works of only a few actuaries. The ILO makes its demographic and financial projection models available through the advisory services of its International Financial and Actuarial Service (ILO-FACTS) located within the Social Security Department. In addition, it promotes and directly implements peer reviews of in-house and external actuarial reviews with a view to assisting in the development of national actuarial practice at the social security level as well as to strengthen public financial governance.

This peer review of the 2006 actuarial valuation of the SIS by the ILO-FACTS focuses on the most important issues, notably, the data, methodology and key actuarial assumptions as set out the 2006 valuation.

[1] This is particularly relevant in countries such as Canada where the triennial actuarial reports on the Canada Pension Plan prepared by the Chief Actuary of the Office of the Superintendent of Financial Institutions Canada are peer reviewed by an independent review panel. Similarly, the practice is established in the United Kingdom where peer reviews of the actuarial reports of the UK Government Actuary Department on the valuation of the UK National Insurance Fund are undertaken.

Acknowledgements

The Director General of the ILO designated the International Financial and Actuarial Service (ILO-FACTS) of the Social Security Department (SECSOC) to complete the peer review of the actuarial valuation of the Cyprus Social Security System. Mr. Pierre Plamondon, FSA, FCIA, Chief Actuary and Director of the Directorate on valuation, Statistics and Revision of the Quebec Pension Board in Canada, undertook the official peer reviewer of this report on behalf of the ILO. The actuarial valuation of the SIS under consideration had been undertaken by Mr Costas Stavrakis, FIA FCAA, Actuarial Adviser responsible for the in-house actuarial valuation report prepared for the Social Insurance Services of the Ministry of Labour and Social Insurance of Cyprus.

Ms Anne Drouin, ILO-FACTS, supervised the project and the finalization of the report.

Mr. Plamondon visited Cyprus in August 2007 to provide advisory services as the in-house actuarial valuation of the SIS was being planned. Subsequently, Mr Stavrakis completed the review and had a series of exchanges with Mr Plamondon and the ILO actuaries.

Mr Stavrakis received training on the ILO actuarial model in August 2007 and had subsequent discussions with Mr Plamondon. He visited ILO-FACTS in April 2008 and had further discussions with Ms Anne Drouin on future improvements which would strengthen the actuarial valuation of the SIS.

Executive summary

This report presents the results of a Peer Review of the actuarial valuation of the Cyprus Social Security Scheme as at 31 December 2006. It was undertaken by the International Financial and Actuarial Service of the Social Security Department, International Labour Office, at the request of the Social Insurance Department of Cyprus.

The Peer Review contains observations on the following matters:

- Has the work been completed in compliance with the relevant statutory requirements and professional standards of practice?
- Did the Actuary have access to the information required to perform the valuation, and were relevant tests and analysis on the data completed as might be expected?
- Were the actuarial methods and assumptions used in completing the report reasonable?
- Does the actuarial valuation fairly communicate the results of the work performed by the Actuary?

Statutory and professional requirements

The Cyprus Social Insurance law requires that an actuarial review of the Social Insurance Scheme be conducted at least every three years. However, the Minister of Labour and Social Insurance has the right to require more frequent actuarial reviews. The law does not contain a definition of "actuary".

The Peer review takes into account International Actuarial Association *Guidelines of Actuarial Practice for Social Security Programs*. and the *Internal guidelines for the actuarial analysis of a national social security pension scheme* published by the Social Security Department of the ILO.[2]

The actuarial valuation was undertaken by Mr. Costas Stavrakis, FIA, FCAA, actuarial advisor of the Social Insurance Department (SID) of Cyprus. The professional certification of Mr. Stavrakis, combined with his experience as a consulting actuary plus the training he has received from the ILO on the actuarial model used for the valuation make him qualified to undertake the actuarial valuation of the SIS.

Peer review of data collection and analysis

Scheme-specific data were extracted by the SID in the format used by the ILO in previous actuarial valuations of the scheme. Data on insured persons, wages, pensions in payment and accrued past credits were extracted by the statistical department of the SID from the administrative database of the organization. Checks were performed between data extracted from administrative files and financial statements to ensure consistency. The determination of demographic and macroeconomic assumptions relied on demographic

[2] http://www.ilo.org/gimi/gess/RessShowRessource.do?ressourceId=7958&longTitle=Internal+guidelines+for+the+actuarial+analysis+of+a+national+social+security+pension+scheme&author=ILO,+Financial,+Actuarial+and+Statistical+Branch&ressYear=1998.

data obtained from the Statistical Service of Cyprus and macroeconomic data obtained from the Ministry of Finance of Cyprus. Consistency checks were performed to ensure reliability of data.

Peer review of actuarial modelling methodology

The results presented in the 2006 valuation are based on a deterministic model of the SIS operations, which projects the annual number of contributors and beneficiaries, the annual contribution and investment income, benefits and administrative expenses, and the accumulation of the reserve fund at the end of each year.

The 54-year projection period is consistent with that used for partially funded public pension schemes elsewhere. Since the length of the projection period and the number of assumptions required mean that actual future experience will not develop precisely in accordance with the assumptions, sensitivity tests are performed using alternative assumptions.

The 2006 actuarial report does not contain a very detailed reconciliation of results with the last valuation. Some elements are identified, but a more detailed analysis would be useful.

Peer review of assumptions

Assumptions chosen by the Actuary are appropriate to the circumstances of the valuation.

General demographic assumptions

Future evolution of mortality assumptions is in line with projections used in the valuation of pension systems of OECD countries. Fertility assumption reflects recent trends. The migration assumption is significantly different from the one used in the last actuarial report. This reflects the recent experience in Cyprus and its public policies on immigration. Thus, the increase in projected net migration is justified. Given that migration is expected to become a key assumption in the next actuarial reviews, the model should be developed in order to more precisely reflect the movement of workers in and out of the pension system and its impact on the financial results of the valuation.

Economic assumptions

The macro-economic framework at the basis of the valuation reflects assumptions suggested by the Ministry of Finance of Cyprus. Assumptions retained in the report concerning GDP growth, labour productivity, labour force participation rates and inflation are reasonable.

The participation rates for women are assumed to increase significantly over the next 10 years and to stabilize thereafter. While increasing sharply in the short-term, female participation rates appear reasonable considering the need for consistency with other macroeconomic variables and the level already reached for males participation rates.

As inflation is under control in Cyprus, an assumption for a constant 2.0 per cent annual price inflation rate appears reasonable. This is related to the assumed rate of return of the Social Insurance Fund, which is assumed to follow the pattern of the interest rate on funds borrowed by the Government

Scheme-specific assumptions

The report shows certain improvements from the previous report. In the 2003 review, no data were available concerning the number of years of accumulated past service in the lower band. This data was available for the 2006 report. This represents a significant improvement. The valuation assumes that a certain proportion of inactive insured persons will eventually claim a pension under the scheme, a number of years of past service is associated to them, and they are taken into account in the determination of new pensioners and amounts of emerging pensions. In previous valuations, an arbitrary proportion had been considered in the valuation and there were few ways to confirm that this assumption was appropriate. In the 2006 valuation, data were more precise on persons having accumulated rights under the scheme and being entitled to claim benefits under the scheme. Now the model more adequately reflects this population and its characteristics and estimates more precisely the proportion of new old age pensioners that will emerge from the inactive insured persons. This represents another significant improvement.

The invalidity incidence rates by age and sex that are used for the valuation are based on old experience under the scheme. Even if the number of emerging invalidity pensions under the model may reflect the global experience under the scheme, there may be differences by age that are not reflected properly. It is recommended to analyse in more detail the experience on invalidity incidence under the scheme and to develop an updated table of invalidity incidence rates specific to the Cyprus SIS.

Peer review of the financial results

The actuarial valuation report presents appropriate demographic and financial results.

Cash flow projections

Financial projections are presented separately for the lower and the upper band, revealing the different maturity status of the two bands. The report defines periods of equilibrium adapted to each band. These different measures are appropriate given the different state of maturity of the two bands. According to those measures, the period of equilibrium extends until 2014 for the lower band and 2023 for the upper band. The report proposes a rule for determining future contribution rates based of these measures of periods of equilibrium. The rule appears appropriate.

Pay-as-you-go (PAYG) contribution rates

PAYG contribution rates for the lower band will increase from 8.5 per cent of insurable earnings in 2007 to 23.4 per cent in 2060. In the upper band, the PAYG rate will increase from 3.5 per cent in 2007 to 15.6 per cent in 2060. PAYG rates may be compared to the actual contribution rates allocated to each band for long-term benefits, which are 8.7 per cent in the lower band and 5.6 per cent in the upper band. The PAYG rate is projected to exceed the contribution rate of the lower band as soon as 2008, while the PAYG rate of the upper band will exceed the contribution of the upper band only in 2017.

Reserve ratios

The reserve ratio of the lower band falls from 1.7 in 2007 to 0 in 2020. In the upper band, the ratio decreases from 22.8 in 2007 to 0 in 2041.

General average premium

In the 2006 valuation, GAP has been calculated for the period 2007 to 2060. Since the PAYG rate of both bands does not appear to have reached stability in 2060, it may be

assumed that the theoretical GAP would be slightly higher than the GAP presented in the report. The GAP is estimated at 15.0 per cent in the lower band and 8.5 per cent in the upper band. This demonstrates the insufficiency of present contribution rates.

Peer review of sensitivity tests

The report has been improved, compared to previous reports, by the inclusion of three sensitivity tests. Separate results are presented using alternative labour force participation rates for women. Other tests are performed on different migration assumptions and other tests simulate the effect of different rates of return of the fund. These are pertinent tests considering the variability of certain variables and the political debate that may affect their future evolution (e.g. migration).

Recommendations and considerations for future modelling

Measurement of the effect of the minimum pension

The valuation of the Cyprus scheme is made separately for the lower and the upper band but there is no mechanical linking between the two blocks for the purpose of modelling programming. This may overestimate the effect of the minimum pension. However, it is considered that the present model structure does not unduly distort the results of the valuation.

Number of wage bands

The effect of the minimum pension could also have been improved by separating insured wages into more than three bands. This could represent a possible future improvement of the model.

Model improvement

The model has been improved concerning the anticipated increase in credits granted for education/training in the future.

Communication of results

The 2006 actuarial report is a very informative document. It includes much detail, an executive summary and useful tables and charts. It is well illustrated, notably concerning the cash flows between government and the SIS. It also includes a good analysis of the financial impact of contemplated changes to the scheme. Some elements would however require a higher degree of detail:

- The review of past experience should be more comprehensive. Additional financial, design and performance indicators could be presented.
- The reconciliation with the previous valuation should be presented in more detail.

Peer review conclusion statement

Appendix II provides the peer review statement of project actuary, Mr Pierre Plamondon, on behalf of the ILO.

1. Introduction

The 2006 actuarial valuation of the SIS includes the following principal results:

- Projected cash flows at the current contribution rate, annually to 2060.
- Projected pay-as-you-go contribution rates.
- Sensitivity tests illustrating the results which would be obtained under various changes in actuarial assumptions and scheme parameters.

It must be emphasized that these results are not predictions. They present the outcomes if all the assumptions were to come true in the future. The parameters involved (e.g., fertility rates, net migration rates, mortality rates, disability incidence rates, rates of labour force participation, retirement rates, rates of price increase, real rates of wage increase, real rates of return on investments) cannot be predicted accurately over the entire projection period. However, the estimates provide guidance to financing the SIS and to planning and management tasks. The sensitivity tests give indications of a range of possible actual outcomes. With respect to financing a scheme, of particular interest are the changes in the results of the current valuation compared to the previous valuation, and the reasons for the changes.

Sections 2 and 3 of this report deal with statutory requirements and professional standards of practice and data for the review. The actuarial methodology is considered in Sections 4. Sections 5 and 6 include comments on the assumptions and analysis of the results of the actuarial projections. Section 7 deals with communication of the results of the actuarial review, and the conclusions of the Peer Review are in Section 8.

2. Statutory and professional requirements

The Cyprus Social Insurance law requires that an actuarial review of the Social Insurance Scheme be conducted at least every three years. However, the Minister of Labour and Social Insurance has the right to require more frequent actuarial reviews. The law does not contain a definition of "actuary".

The International Actuarial Association has promulgated *Guidelines of Actuarial Practice for Social Security Programs*.[3] They cover scientific rigour, objectivity and the transparency, explicitness, simplicity and consistency of information provided in an actuarial report. The IAA Guidelines provide guidance specific to social security programmes, and they have been taken into account in the Peer Review of the 2006 valuation.

The valuation has also been reviewed taking into account the *Internal guidelines for the actuarial analysis of a national social security pension scheme* published by the Social Security Department of the ILO.[4] The Guidelines summarize what the Department regards as standard practice for actuarial analysis of social security pension schemes. They are

[3] IAA *Guidelines of Actuarial Practice for Social Security Programs*. Adopted by Council of the IAA 21 October 2002 – Effective 1 January 2003.

[4] http://www.ilo.org/gimi/gess/RessShowRessource.do?ressourceId=7958&longTitle=Internal+guidelines+for+the+actuarial+analysis+of+a+national+social+security+pension+scheme&author=ILO,+Financial,+Actuarial+and+Statistical+Branch&ressYear=1998.

meant to serve as checklists for staff members of the Department, as guidance for external collaborators and as information for client institutions and governments.

The actuarial valuation was undertaken by Mr. Costas Stavrakis, FIA, FCAA, actuarial advisor of the Social Insurance Department of Cyprus. The professional certification of Mr. Stavrakis, combined with his experience as a consulting actuary plus the training he has received from the ILO on the actuarial model used for the valuation make him qualified to undertake the actuarial valuation of the SIS.

3. Peer review of data collection and analysis

Historical data and various projections of possible future experience are used to develop assumptions for the projections. The data requirement normally include:

(A) Data on current and past status

- Covered population (by age/sex)
- Contributory earnings of contributors (by age/sex)
- Contributions paid
- Benefit expenditures (by type/number/amount paid)
- Administration expenses
- Assets (reserve fund)
- Investment returns

(B) Data for assumptions

- Demographic data
  - Mortality rates/future mortality improvement
  - Fertility rates
  - Migration rates
  - Family composition (structure of dependants)
  - Retirement rates
  - Disability rates/recovery rates
- Economic data
  - Labour force participation rates
  - Earnings statistics
  - Wage/price inflation
  - Investment policy and performance
  - National economic data

Scheme-specific data were extracted by the SID in the format used by the ILO in previous actuarial valuations of the scheme. Data on insured persons, wages, pensions in payment and accrued past credits were extracted by the statistical department of the SID from the administrative database of the organization. Checks were performed between data extracted from administrative files and financial statements to ensure consistency. The determination of demographic and macroeconomic assumptions relied on demographic data obtained from the Statistical Service of Cyprus and macroeconomic data obtained from the Ministry of Finance of Cyprus. Consistency checks were performed to ensure reliability of data.

4. Peer review of methodology

The results presented in the 2006 valuation are based on a deterministic model of the SIS operations, which projects the annual number of contributors and beneficiaries, the annual

contribution and investment income, benefits and administrative expenses, and the accumulation of the reserve fund at the end of each year.

The model starts with statistics by age and sex as of 31 December 2006 on (a) insured persons (i.e. contributors to the SIS) and their earnings, and (b) pensioners and the amounts of their pensions. Throughout the projection period, the model projects:

- the number and characteristics (e.g. age, sex) of insured persons, pensioners and other beneficiaries;
- the amount of contributions paid and benefits received; and
- projections of contribution income and benefit outgo are combined with projections of investment income and administration expenses to produce the amounts in the reserve fund.

The projections are based on demographic and economic assumptions, including demographic parameters such as fertility, mortality and migration, and economic parameters such as labour force participation rates, price inflation, wage escalation and investment returns.

The principal outputs from model are:

- projected demographic and financial results, including cash flows and the accumulated reserve fund; and
- Projected pay-as-you-go cost rates and reserve ratios.

The 54-year projection period is consistent with that used for partially funded public pension schemes elsewhere. Since the length of the projection period and the number of assumptions required mean that actual future experience will not develop precisely in accordance with the assumptions, sensitivity tests are performed using alternative assumptions.

Back-testing, whereby a model is validated by comparing output for years prior to the valuation date against historic values so that any necessary adjustments to the model can be made and discrepancies investigated and resolved is a useful procedure. Reconciliations are conducted of the results of the current actuarial review with those of the previous review, and the principal causes of changes in the results and their impact are identified. Detailed reconciliations serve as a check on the results of the actuarial review.

The 2006 actuarial report does not contain a very detailed reconciliation of results with the last valuation. Some elements are identified, but a more detailed analysis would be useful.

5. Peer review of assumptions

5.1. General comment on the demographic and economic framework

The process followed for the definition and adoption of the assumption framework. of the SIS actuarial valuation is of particular interest. Demographic assumptions were set independently by the Actuary in view of the nature of the SIS long-term perspective and profile of its insured population. The demographic assumptions used for the actuarial report were slightly different (more conservative) from those of the Ministry of Finance and of the EU Ageing Working Group. For macro-economic assumptions, the assumptions of the Actuary were reasonably aligned with the perspective of the Ministry of

Finance with minor adjustments to account for the modelling consistency checks. In this context, the margin for the SIS actuary when selecting the assumption framework may be limited. This matter is explicated in the 2006 actuarial valuation report.

However the alignment of the assumption framework with the perspective of other key parties provides the following advantages:

- It avoids sterile discussions on assumptions between government officials from various institutions, social partners and the Actuary such that it avoids undue doubts in the work of the Actuary when presenting the results of the valuation and discussing the financial impact of reform options; and

- It provides a source of readily available information for presenting financial results in line with the reporting requirements of the European Union.

Although the fact that the Actuary reasonably aligned his assumptions with those of external parties may cast doubts upon the independence and neutrality that should be the basis of an actuarial review, the conducted sensitivity tests on various assumptions as recommended by the Actuary alleviate the constraint raised in this respect. The actuarial report includes such sensitivity tests.

5.2. Demographic assumptions

Mortality rates

Mortality rates are based on a long-term assumption on life expectancy of 82.5 and 87.5 years respectively for males and females representing an increase of approximately three (3) years compared to the last valuation. This important increase is however reasonable, considering figures used in the actuarial valuation of social security schemes of most OECD countries, as shown in Table 1.

For future actuarial valuations, it is advised to undertake a past mortality experience analysis in order to review the SIS scheme experience over a sufficiently long past period. It may result in highlighting a longer life expectancy for the insured population as is often found in other countries where social insurance is not providing a full coverage of the population, namely in working ages.

Table 1. Illustrative projected life expectancy at birth for selected countries, 2000-2030 (years of life)

	2000	2010	2020	2030
Men				
Japan	77,7	78,6	79,4	80,1
United Kingdom	75,5	78,2	80,1	81,3
Québec	76,3	79,4	80,6	81,5
Finland	74,1	76,9	78,8	80,2
France	75,4	77,9	80,1	82,1
Sweden	77,3	79,2	80,8	82,0
Switzerland	77,2	79,8	81,9	83,3
Italy	76,4	77,9	79,6	81,4
United States	74,0	75,5	76,6	77,6
Women				
Japan	84,6	85,9	87,1	87,9
United Kingdom	80,2	82,1	83,8	84,9
Québec	81,9	83,8	84,7	85,3
Finland	81,0	83,1	84,2	85,4
France	82,9	84,9	86,6	88,2
Sweden	82,0	83,3	84,3	85,1
Switzerland	82,8	85,0	86,7	87,8
Italy	82,7	84,4	86,2	88,1
United States	79,4	79,9	80,7	81,6

Source: ISSA, Conference of the Committee of Social Security Actuaries and Statisticians, Helsinki, 2007.

Migration

Level of net migration. The migration assumption is significantly different to that in the last actuarial report reflecting the recent experience in Cyprus and its public policies on migration. Thus the increase in projected net migration is justified.

Migration movements. The ILO demographic model (ILO-POP) calculates net migration figures that are transferred to the economic module which, in turn, feeds the pension module. Thus the movement of migrants in and out of the country does not affect pension projections. This movement could be simulated by the use of the "leaving" sheet in the male and female files of ILO-PENS and a sensitivity test could have been performed on that. Given that migration is expected to become a key assumption in subsequent actuarial reviews, the model should be developed to reflect more precisely the movement of workers in and out of the pension system and its impact on the financial results of the valuation.

Fertility

The total fertility rate has decreased sharply over the last 20 years in Cyprus. It was 2.42 in 1990 and decreased continuously to 1.42 in 2005. The 2006 valuation assumes a total fertility rate of 1.39 in 2006, increasing gradually to 1.5 in 2022 and remaining constant at this level for the rest of the projection period. This assumption is reasonable.

5.3. Economic assumptions

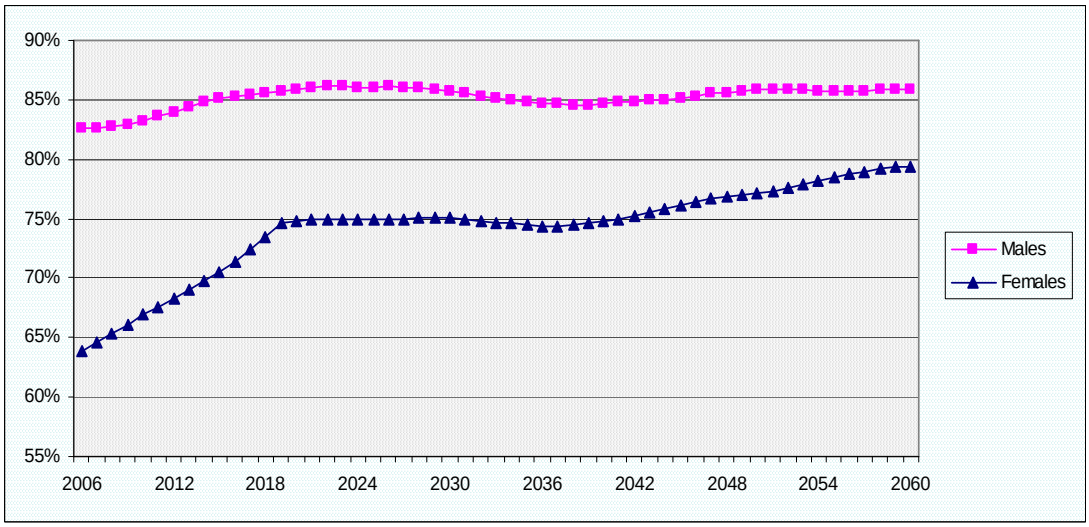
Cyprus' economy is characterized by nearly full employment and moderate growth. Forecasting a macro-economic framework is thus quite straightforward. The macro-economic framework at the basis of the valuation reflects assumptions suggested by the Ministry of Finance. Assumptions retained in the report, one concerning GDP growth, labour productivity, labour force participation rates and inflation are reasonable.

Table 2. Projected changes in GDP growth rates, productivity and employment, 2007-2060

Period	Annual real GDP growth	Annual increase of productivity per worker	Annual increase of the number of workers
2007-2010	4.2%	1.5%	2.7%
2011-2020	3.6%	1.9%	1.7%
2021-2030	2.7%	2.1%	0.6%
2031-2040	2.5%	2.1%	0.4%
2041-2050	2.2%	2.1%	0.1%
2051-2060	2.0%	2.3%	-0.3%

Future evolution of the labour force participation rates, especially for women, reveals a degree of uncertainty. Thus, it is appropriate that a sensitivity test has been performed on that assumption. The participation rates for women are assumed to increase significantly over the next 10 years and to stabilize thereafter. While increasing sharply in the short-term, female participation rates appear reasonable considering the need for consistency with other macroeconomic variables and the level already reached for males participation rates.

Figure 1. Projected labour force participation rates (2006 to 2060)



As inflation is under control in Cyprus, an assumption for a constant 2.0 per cent annual price inflation rate appears reasonable. This is related to the assumed rate of return of the Social Insurance Fund, which is assumed to follow the pattern of the interest rate on funds borrowed by the Government. The interest rate assumption is equivalent to the *repo* rate of the Cyprus Central Bank less 0.5 per cent-points up to the year 2007. Effective 2007, the interest rate has been assumed equivalent to the marginal lending facility rate of the European Central Bank less 0.25-points. This assumption is appropriate.

Table 3. Inflation rate, increase of nominal average wage and interest rate for selected years

Year	Inflation rate	Annual nominal increase of the average wage	Rate of return of the Social Insurance Fund
2007	2.0%	3.5%	4.5%
2008	2.0%	3.3%	4.5%
2009	2.0%	3.5%	4.5%
2010	2.0%	3.7%	4.5%
2020	2.0%	4.4%	4.5%
2030	2.0%	4.0%	4.5%
2040	2.0%	4.1%	4.5%
2050	2.0%	4.2%	4.5%
2060	2.0%	4.2%	4.5%

5.4. Scheme-specific assumptions

Past service in the lower band

In the 2003 review, no data were available concerning the number of years of accumulated pas service in the lower band. However, these data were available for the 2006 report and represent a significant improvement compared to previous valuations.

Number of inactive insured persons

Statistics of the Cyprus Social Insurance Department show that a significant number of persons have contributed to the scheme in the past, but are not current contributors. They are called “inactive” insured persons. The valuation assumes that a certain proportion of them will eventually claim a pension under the scheme, a number of years of past service are associated to them, and they are taken into account in the determination of new pensioners and amounts of emerging pensions.

This population of inactive insured persons has a significant effect on the financial projections. In previous valuations, an arbitrary proportion was considered but there were few ways to confirm that this assumption was appropriate.

In the present valuation as of 2006, data were more precise concerning insured persons having accumulated rights under the scheme and being entitled to claim benefits. Now the model more adequately reflects this population and its characteristics and estimates more precisely the proportion of new old age pensioners who will emerge from the inactive insured persons. This represents another significant improvement.

Invalidity incidence

The invalidity incidence rates by age and sex used for the valuation are based on past experience as observed in the context of the scheme. Even if the number of emerging invalidity pensions coming from the model may reflect the global experience of the scheme, there may be differences by age that are not properly reflected.

It is recommended to analyse in more detail the past experience on invalidity incidence under the scheme and to develop an updated table of invalidity incidence rates specific to the SIS if there is statistical relevance in using past data.

Data time series were analysed. This study should be possible given the relatively small size of the scheme. Alternatively, a comparative analysis with the experience and legal provisions of other countries' social security schemes could be investigated. This implies referring to countries where the definition of ordinary invalidity and administrative procedures are relatively similar to those applicable in Cyprus. If the comparative analysis would conclude that the incidence rates of the another country could be a useful reference, then the SIS would be in a position to determine a loading factor series statistically relevant for its own age and sex pattern of incidence rates. This would improve the robustness of the selected assumptions.

6. Analysis of results

The principal outputs from the model are:

- projected demographic and financial results, including cash flows and the accumulated reserve fund; and

- projections of the
  - pay-as-you-go contribution rates, and
  - reserve ratios (end-of year reserve divided by annual expenditure for following year).

6.1 Cash flow projections

Financial projections are presented separately for the lower and the upper band, revealing the different maturity status of the two bands. The report defines periods of equilibrium adapted to each band, as follows:

- For the lower band: the number of years during which the ratio of the reserve to the annual expenditure is at least equal to 1.0.

- For the upper band: the number of years during which the ratio of the reserve to the annual expenditure is at least equal to 9.0.

These different measures are appropriate given the different state of maturity of the two bands. According to those measures, the period of equilibrium extends until 2014 for the lower band and 2023 for the upper band. The report proposes a rule for determining future contribution rates based of these measures of periods of equilibrium. The rule appears appropriate. However the report should insist on the importance of inserting such a rule in the social insurance legislation in order to avoid political interference in the determination of future contribution rates.

6.2 Pay-as-you-go cost rates

PAYG cost rates for the lower band are projected to increase from 8.5 per cent of insurable earnings in 2007 to 23.4 per cent in 2060. In the upper band, the PAYG rate will increase from 3.5 per cent in 2007 to 15.6 per cent in 2060. PAYG rates may be compared to the actual contribution rates allocated to each band for long-term benefits, which are 8.7 per cent in the lower band and 5.6 per cent in the upper band. The PAYG rate is projected to exceed the contribution rate of the lower band as soon as 2008, while the PAYG rate of the upper band will exceed the contribution of the upper band only in 2017.

6.3 Reserve ratios (Funding ratios)

The reserve ratio is the ratio of reserve fund at the end of the year divided by the benefit and administration expenditures in the year. The ratio indicates the number of years of outgo at the current annual level of benefit payments and administration expenses which could be paid by the reserve fund. The reserve ratio of the lower band falls from 1.7 in 2007 to 0 in 2020. In the upper band, the ratio decreases from 22.8 in 2007 to 0 in 2041.

6.4 General average premium (GAP)

The GAP is the long-term level contribution rate required to finance a scheme. It is a theoretical constant rate which could be applied indefinitely. The GAP financial system is rarely applied in practice. It is used to compare the costs of different benefit packages or the effect of alternative assumptions. In the 2006 report, GAP has been defined up to year 2060. Since the PAYG rate of both bands does not appear to have reached stability in 2060, it may be assumed that the theoretical GAP would be slightly higher than the GAP presented in the report. The GAP is estimated at 15.0 per cent in the lower band and 8.5 per cent in the upper band. This shows the insufficiency of present contribution rates.

7. Sensitivity tests

The report has been improved, compared to previous reports, by the inclusion of three sensitivity tests depicting the impact of alternative scenarios for the labour force participation rates of women, different migration assumptions and different rates of return on the fund. These are relevant tests considering the inherent uncertainty and variability of cost factors as well as the public policies that may affect the future evolution of certain cost factors such as migration which bears a direct impact on the insured membership of the SIS.

The sensitivity tests conducted in the context of the actuarial valuation indicate a high degree of sensitivity of the above variables.

8. Modelling considerations

8.1 Measurement of the effect of the minimum pension

The valuation of the Cyprus scheme is made separately for the lower and the upper band but there is no mechanical linking between the two blocks for the purpose of modelling programming. This causes a problem when estimating the effect of the minimum pension on the scheme.

The minimum pension is paid to an individual if the total of their pension paid from both the lower and the upper band is lower than a certain threshold. The present actuarial model only takes account of this rule through the implicit assumption that the majority of beneficiaries receiving the minimum pension refer to those having solely cumulated contributions in the lower band such that the minimum pension is calculated only for that band. This assumption is based on observed statistics although it is known that there is a limited number of beneficiaries receiving the minimum pension who have previously contributed in both the lower and upper bands. This implies an underestimation of the number of projected recipients of the minimum pension.

One possible way to improve the reliability of projections of the number of minimum pension beneficiaries would be to adjust the financial projections of the lower band by a factor reflecting the above situation. Another more time-consuming option, would be to restructure the actuarial model to project at the same time pensions in the lower and the upper band and to compare, in each case, arising pensions with the level of the minimum pension. However, it will probably be more appropriate to consider this second option if the Cyprus scheme's pension formula is eventually redefined and combines the two bands.

The peer review however concludes that the present model methodology does not distort the results of the valuation in a significant manner in relation to the above.

8.2 Number of wage bands

The effect of the minimum pension could also have been improved by separating insured wages into more than three bands. This could represent a possible future improvement of the model. The Actuary should remain posted on the forthcoming developments of the ILO generic model that should improve the tools used for wage distribution and bring more precision in this aspect of the valuation.

8.3 Other modelling improvements

The model has been improved for the anticipated increase of credits granted for education/training in the future.

Future improvements are encouraged to introduce additional past scheme experience analysis for multi-decrement tables used in the actuarial valuation.

9. Communication of results

The 2006 actuarial report is a very informative document. It includes much detail, an executive summary and useful tables and charts. It is well illustrated, notably concerning the cash flows between government and the SIS. It also includes a good analysis and the financial impact of contemplated changes to the scheme. Some elements would however require a higher degree of detail:

- The review of past experience should be more comprehensive. Additional financial, design and performance indicators could be presented. Appendix I to this report presents examples of indicators that could improve the presentation of past experience.
- The reconciliation with the previous valuation should be presented in more detail. Notably, the significantly lower mortality rates used in the present valuation (compared to the previous report) should be identified as a factor explaining differences in long-term expenditure.

Appendix I References for indicators of the past performance analysis of a social security scheme

Table A1.1 Financial performance indicators

Indicator	2002-03	2006-07	Assessment
Expenditure as % of insured earnings (PAYG cost rate)	6.9 %	6.3 %	The fast increase in the number of insured persons and insured earnings has benefited to the finances of the scheme and thus serving to decrease the PAYG rate. Can be compared to the contribution rate of 10 %. Contributions collected in excess of the actual PAYG rate serve to increase the Fund's reserve.
Investment income as % of insured earnings	7.8 %	9.5 %	Investment income is making an increasing contribution to overall revenues. This is however a volatile factor which must be reviewed in relation to the overall investment market.
Last 3-year nominal yield on reserve	5.7 %	6.8 %	Nominal return above expectations. It is important to identify the reasons underlying this result.
Last 3-year real yield on reserve	4.8 %	4.2 %	Real return also above expectations as the actual rate of inflation has been observed to be in line with the assumed level of inflation.
Administrative expenses as % of insured earnings	1.3 %	1.1 %	This is an acceptable level and variation given the small size of the scheme and in relation to other countries' experiences.
Reserve ratio as ratio of annual expenditure	20.8	22.5	The improvement arises from the combined effect of higher-than-expected investment returns and contribution revenues.
Expenditure as % of GDP	2.2 %	2.3 %	Gradual increase anticipated due to maturing of the scheme.
Reserves as % of GDP	40 %	52 %	National Insurance Fund growing at a much faster pace than economy due to favourable investment performance. This result should be interpreted with care in view of short- and medium-term fluctuations whose control is beyond the social security investment managers.

Table A1.2 Design-related performance indicators

Indicator	2002-03	2006-07	Assessment
Ratio of ceiling on insured earnings to average insured earnings	3.5	2.8	The relative value of the ceiling as decreased and measures should be envisaged to restore its value in real terms as intended in the law. Despite this result, the ceiling covers a significant percentage of the total earnings of the SIS insured population.
Minimum pension as % of average insured earnings	13.9 %	11.2 %	The relative value of the minimum pension has decreased and is found to be at a relatively low level in relation to international standards. This is resulting from the lack of measure to index the minimum pension having not been increased since 1999.

Tale A1.3 Scheme-specific performance indicators

Indicator	2002-03	2006-07	Assessment
Average old-age pension as % of average insured earnings	39 %	33 %	This decrease follows the lack of indexation of existing pensions-in-payment and the new pensions at relatively lower levels due to revised pension provisions.
Number of active insured persons as % of employed population	63 %	61 %	This is less than 100% due to the legal definition of insured persons excluding civil servants (representing 10 % of the employed population) and compliance to enforce the registration of all legally covered workers.
Number of contributors per pensioners	10.8	11.1	Despite the increase in the number of pensioners, the ratio remained stable over past four years due to significant increase of the insured population.

Appendix II Peer review conclusion statement

The financial projections of the Cyprus Social Insurance Scheme rely on sufficient and reliable data and appropriate methods and assumptions. The actuarial report accurately projects the financial status of the scheme.

On behalf of the ILO :

Pierre Plamondon, FSA, FCIA