

**ACTUARIAL SOUNDNESS
OF THE
EGYPTIAN SOCIAL INSURANCE SCHEME
(Technical basis and pace of funding)
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INTRODUCTION

The Egyptian Social Insurance Scheme. For non-governmental workers. has continually been improved in scope and scale of benefits. Existing benefits have been improved and new benefits have been added. New groups of workers have been brought within the scope of the scheme. In making these improvements the scheme has been financially overburdened to a considerable extent for the following two reasons:

(1) When insurance benefits are enlarged or new benefits are added. the scheme is usually charged with the burden resulting from the deficiency of past contributions prior to the date when such benefits are increased or added.

(2) When applying insurance to new groups. The scheme usually becomes responsible for the burden which results when insured persons are of ages exceeding those at which the cost of benefits is equal to their contributions.

To cope with the financial burden arising out of this continual expansion of the scheme in both the abovementioned directions. And to make certain that the Social Insurance Organization (SIO) has the monetary capacity to meet the cost of benefits

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provided by different Acts. such Acts has to be examined at least have stipulated that the financial position of the SIO has to be examined at least Once every five years by a minimum of one actuarial expert.

To put this into practice. The actuarial expert has applied a mathematical reserve system. To make certain that the scheme is fully funded. But while the first investigation (June 30. 1963) resulted in a final surplus (LE 15.5 million surplus arising out of future contributions- 8.2 million deficit arising out of a deficiency of past contributions to meet new benefits and new membership). the second investigation (June 30. 1968) resulted in a net final deficit LE 8 million (the deficit arising out of past contributions amounted to LE 46.4 - the surplus arising out of future contributions and other factors amounted to LE 38.4). And the third investigation in December 31. 1972 resulted a deficit of LE 174.6 million (the mathematical reserves were 950.3 million whereas the reserves as they appeared in the budget were 775.7 million). The preliminary results of the fourth investigation (December 31. 1977) show a large deficit.

This increasing scale of deficit has prompted the preparation of this paper and has aroused my interest in the technical basis and estimation methods applied during the investigation work.

An understanding of these matters will be facilitated by a description of the background of the scheme and a summary of the third financial investigation results of December 31. 1972 which were finally declared in March 1977. ⁽¹⁾

(1) The fourth investigation was in December 31. 1977. But due to difficulties faced in data collecting and checking. Its final results were not declared until 1981.

THE SCHEME

HISTORICAL BACKGROUND

The early phases of the Egyptian Social Insurance Scheme date back to 26 December 1854 when legislation for the Civil Service employees and workers' civil pensions came into force.

As for workers in the non-governmental sector. They were subjected to a social insurance scheme in the form of compulsory savings with lump sum compensation in cases of invalidity and death. Under Law 419/1955. In 1958 the work injuries insurance was applied to all workers under Law 202/1958.

As from 1 August 1959. The Social Insurance Act 92/159 replaced Acts 419 and 202. The death and invalidity lump sum compensation was turned into a pension. The compulsory savings system became an old-age pension system as from 1 January 1962.

In March 1964. Social Insurance Law 63/1964 was issued comprising health insurance (graduated) and unemployment insurance as from 1 October. 1964.

On August 21. 1975 Law 79 replaced Social Insurance Law 63 for non-governmental workers (Public and Private Sector workers) and civil Pension legislation for government workers. As from 1 September. 1975. But this law has taken care to see that the SIO should manage the Scheme for non- government workers and another organization (the Insurance and Pensions General Organization) manages the Scheme for government employees.

COVERAGE:

As for workers in the non-government sector. The social insurance provisions are applied to all workers in Public Sector regardless of age. And to all workers in the Private Sector regularly affiliated to the employer and not under 18 years. The following is to be noted:

– Work injuries insurance is applied to industrial apprentices and students working in summer employment projects and those who are charged with work for some time after the end of their university study and those under 18 years working in the Private Sector.

– From unemployment insurance the following are excluded: members of the employer's family (close relatives) in personal enterprises. Partners who work for wages in their companies. Those who have reached the age of 60. Contracting workers and cargo workers.

FINANCING:

Apart from the invested reserves return and the state contribution specified at 1% of the annual wages. The employers' and employees' monthly contributions represent the basic source of financing and are specified as percentages of wages as follows:

– For unemployment insurance until August 31. 1975 and then for old-age, invalidity and death insurance:

	Employee	Employer
<u>Old-age, disability and death</u>	10%	15%
<u>Work injuries insurance</u>	-	3%
<u>Health insurance</u>	1%	4%
<u>Unemployment insurance</u>	-	2%

The following is to be noted:

The old-age, disability and death insurance contributions were at the rate of 8% and 14% for the employee and employer respectively at the date of the second financial investigation (June 1968) and were 9% and 15% respectively at the date of the third investigation (December 1972). Besides these contributions, every employer had to pay to the SIO, at the end of any employee's service before the old-age pensions came into force (at 1 January, 1962), an indemnity to finance the cost of that pension (calculated at a rate of 1/75 of the average monthly wage per each year).

When any insured person reaches the pension age (60 years), the old-age, Disability and death insurance ceases unless his service is extended by a decree or he continues to work or starts a new job so as to supplement the pension qualifying period.

The Health Insurance Organization (HIO) charges 1% of wages in return for the work injury benefits in kind and charges 4% in return for health insurance benefits in kind.

The public sector units meet the temporary disability cash benefits in cases of injury and sickness, and so their share in both work injuries and health insurance are reduced by 1% of wages (self-insurance). This can also be applied to the large private sector institutions with the approval of the Minister of Social Insurance.

The minimum wage liability to contributions and benefits is LE 20 monthly (it was 3.6 at the date of both second and third financial investigations and after the date it has been raised to LE 7.5 by Act 46/1974 and to LE 12 by Act 64/1974 then to LE 20 by Act 93/1980).

Law 79/1975 was issued fixing maximum insurance wages at LE 2500 annually.

If the employer does not pay the monthly contributions on time, he has to pay a default interest of 6% annually besides additional sums (10% of contributions per month with a maximum of 30%).

OLD-AGE, INVALIDITY AND DEATH INSURANCE

BENEFITS:

Old-age pension is granted to any insured person reaching the pension age (60 years in general) ⁽¹⁾, if the contribution period is more than 9 years. The pension is also granted if service is terminated by dismissal by a decree of the President of the Republic or because the appointment is rescinded. Providing that the contribution period is more than 14 years. The pension can be granted on the termination of service for reasons other than death or invalidity, if the contribution period exceeds 19 years; in this case the pension is reduced by certain percentages according to age at the date of entitlement to pension if under 55 years (less than 58 years at December 31, 1972).

No minimum contribution period is necessary (in general) for pensions in case of death or total invalidity or partial invalidity providing that the disabled person has no other job with the same employer.

(1) This age can be reduced for workers performing difficult or perilous jobs specified by a decree of the President of the Republic. According to a recommendation by the Minister of Insurance, in this case employers should be charged the cost arising from reducing that age.

The old-age pension is calculated at 1/45 of the average monthly wage during the last two years for each of the contribution years (the fraction was 1/50 at the date of the second financial investigation) with a maximum of 80% (1) (75% at second investigation) of the average monthly wage and a maximum of LE 166.67 monthly (LE 110 at third investigation) and a minimum of LE 12 monthly (3.6 on the date of second and third financial investigations).

Law 79 was issued to add a lump sum compensation that equals 15% of the average annual wage for each of the years exceeding the required period of qualifying for the maximum pension.

The permanent invalidity and death pensions are calculated at 1/45 of the average monthly wage during the last year (last 2 years at the date of the third investigation) for each of the contribution years to which 3 years are added or 50% of the said average monthly wage (40% at December 31. 1972). Since 1 September. 1975. an addition has been made to the resulting percentage amounting to half of the difference between it and the percentage of the maximum old-age pension (equaling 80%). The death pension is distributed among specified close relative dependents.

If the insured person's service comes to an end without his being qualified for any pension. He is entitled to a lump sum compensation provided that he has reached the normal pension age and certain other specified conditions stated in the Law.

The lump sum compensation is calculated at 15% (was 11%. 13% or 15% according to the reason for termination of

(1) Increased to 100% if the pension does not exceed LE 50 monthly.

service and the length of the contribution Period) of the average annual wage. During the last two years. for each year of contribution.

Pension is payable calculated as a percentage of the last annual wage in inverse proportion to the age of the insured person at the date of the termination of service; this increases to 100% in case of death without dependents.

On the death of any pensioner. a three-month' pension grant is paid to his dependents in addition to the calculated pension.

A grant of one-month's pension is paid for funeral expenses with a LE 50 minimum (5 at December 1972) when a pensioner dies.

WORK (INDUSTRIAL AND NOT INDUSTRIAL) INJURIES INSURANCE BENEFIT:

Work injury means injury as a result of an accident during employment or because of it. or as a result of any occupational diseases listed in a table annexed to the Law.

Any accident during travel to or from work is considered a work injury. Provided that travel is non-stop and without deviation from the normal route.

Moreover. an injury resulting from exhaustion is considered. Since 1 September. 1975 a work injury according to conditions and rules to be issued by a Ministerial decree.

No minimum contribution period is necessary for entitlement to treatment and medical care (benefits in kind) or cash benefits which include the following items:

1- Temporary invalidity compensation in case an injury which incapacitates the insured person. equal to

the monthly wage. This starts from the day following the injury and continues until return to work or until permanent invalidity is certain or death occurs whichever is earlier.

2- Travelling expenses. by ordinary travelling means from the insured person's residence to the place of treatment if it is outside the city in which he lives. and by special travelling means (within or without the city he lives) if the treating doctor so decides.

3- If the work injury results in total invalidity or death. a pension at the rate of 80% of the average monthly wage. During the last year.

4- If the injury results in partial invalidity to a degree of 35% or more. the insured person is entitled to a pension that equals the degree of invalidity multiplied by the total invalidity pension.

Since 1 September. 1975. the injury invalidity and death pensions can be in addition to the old-age. Invalidity and death insurance pensions provided that the total is within the limits of 100% of the average monthly wage. i.e. the injury invalidity or death pension is. in practice. Calculated at 100% on condition that it should not exceed LE 166.67 and should not be less than LE 12 monthly.

As from 1 September. 1975. the injury pension is increased by 5% every 5 years until the age of 60 if invalidity or death was the cause of the termination of service.

5- A lump sum compensation equal to the amount of the total invalidity pension of 4 years is granted to the insured person in the case of permanent invalidity less than 35% of total invalidity.

6- The additional benefits (additional compensation, death grant and funeral grant) in cases of death and invalidity due to work injury, are specified as their equivalents in old-age. Invalidity and death insurance increased by one half.

HEALTH INSURANCE BENEFITS:

To enjoy these insurance benefits, a sick person (who has an injury or an accident other than work injury) must have 3 consecutive contribution months or by intermittent contribution months.

For pregnancy cash benefits the contribution period should not be less than 10 months.

Apart from the medical services provided by the Health Insurance Organization (HIO) as in the case of work injury, the cash benefits include transportation costs to the place of medical treatment, and a wage compensation if sickness prevents the sick insured person from performing his work. This compensation is calculated at 75% of the daily wage for 90 days, and thereafter 85% with a minimum of LE 12 monthly. During the period of sickness or until permanent invalidity or death occurs on condition that this period should not exceed 180 days in the one calendar year.

In cases of leprosy, Tuberculosis, Mental disease or any specified chronic diseases, the compensation is calculated at a rate of 100%. Maternity leave compensation is paid at 75% of the daily wage.

UNEMPLOYMENT INSURANCE BENEFITS:

There are four qualifying conditions for unemployment compensation: the insured person should not have resigned from service, the termination of service should not have been because of a conviction for a felony or

ethical misdemeanor (otherwise the insured will be entitled to only half compensation). **the contribution period should not be less than 6 months with 3 consecutive months before each unemployment period and finally the insured person should have recorded his name in the unemployment record at the competent employment office and should have visited this office at regular periods.**

Unemployment compensation amounts to 60% (50% at December 31. 1972) of the contribution wage. Starting from the eighth day of unemployment until the date of reemployment or for a period of 16 weeks whichever is shorter. or for 28 weeks if the contribution period exceeds 24 contribution months (was 36 at December 31. 1972).

FINANCIAL INVESTIGATION RESULTS

Summary of data:

The following is a summary of the SIO data at the date of both the second and third investigations (June 30. 1968 and December 31. 1972).

	LE monthly wages or pensions			
	1968	1972	1968	1972
Public employees	701	964	12.738	18.132
Private employees	835	629	6.862	5.622
Pensioners	18	48	202	612
Beneficiaries	90	152	156	336

A remarkable increase in the number of the insured employees. in public and private sectors. Can be noted between the date of the fourth investigation (December 31.1977) and two years later (December 31.1979) as the

following figures show (in thousands):

	December 1977	December 1979
Public sector	1.268	1.403
Private sector	1.044	1.548

Also there was a remarkable increase in the average monthly wages between December 31. 1972 (third investigation) and December 31. 1977 (fourth investigation) and also between 1977 and 1979 as the following figures show (in LE):

	1968	1972	1977	1979
Public sector	18.2	19.2	27.6	35.5
Private sector	8.2	8.9	19.5	23.3

THE INVESTIGATION RESULTS:

Below is a summary of the results of the SIO financial position investigation on December 31. 1972 (in thousands):

Monthly wages Number or pensions Liabilities

	LE	LE	
- OAID insurance	1571	23.754	
Insured persons	48	612	639.337
Current pensioners	152	336	93.323
Current beneficiaries			41.732
Funeral and other grants			1.748
- Saving system reserves			35.576
- Work injury and health Insurance			16.056
- Unemployment insurance			72.142
- Further administration cost			<u>48.369</u>
Total of mathematical liabilities			950.282
Money reserves as appear in Budget			<u>775.660</u>
Deficit			174.616

This means that the deficit amounted to 18.4% of the mathematical liabilities. If we augment this deficit by the rate of interest guaranteed by the government (4.5% annually) from the third investigation date to the fourth investigation date (5years) it will rise to LE 217.6 million i.e. 22.9% of the mathematical liabilities which means that the scheme is practically only partially funded.

ANALYSIS OF THE DEFICIT (POINTS OF DISCUSSION):

The actuarial report states that the said deficiency was mainly in old-age. Invalidity and death (OAID) insurance due to the following factors.

1- The actuarial report states that "unemployment insurance liabilities depend on economic factors and changes which are not easily predictable. Hence, it has been excluded from the SIO estimation budget and the accumulated payments surplus until the day of estimation has been considered as a special reserve for this kind of insurance".

In fact. We consider that this special reserve is a hidden reserve due to the following reasons:

First: we can observe the rapid development of the accumulated reserves from more than LE 72 million at the date of the third investigation (December 31. 1972) to more than LE 128 million at December 31. 1975. than to more than 253 million at December 31. 1981 (including returns of investment by 4.5%) as the following table shows (LE thousands):

Period	Contributions	Benefits	Balance
Accumulated reserves			
1964:1975		0.433	128.808
1976	9.287	0.072	144.234
1977	11.071	0.083	162.207
1978	11.514	0.091	181.443
1979	14.226	0.125	204.243
1980	14.226 (1)	0.159	228.238
1981	14.226 (2)	0.193	253.173

It is worthy of note that the accumulated reserves until October 1981 are equivalent to the monthly wages of all the insured persons during a period of three months (according to the situation in 1980 the insureds' monthly wages were about L.E 85 m monthly).

(1) Estimated as (1979)

This means that the scheme is capable of awarding Unemployment benefits at the maximum rate (60% of the wages) even if we assume that the whole group of the insured will become unemployed and will qualify for unemployment compensation for more than 21 weeks (the maximum period admissible is 16 weeks rising to 28 weeks if the contribution period exceeds two years).

Second: the proportion of unemployment cases which qualify for benefits is very small (0.00276 max.)

Financial year	Insured No.	Cases	Rate of unemployment
1965\66	1.260.261	654	0.000519
1966\67	1.444.733	1394	0.000965
1967\68	1.536.526	4240	0.002760
1968\69	1.538.873	4196	0.002727
1969\70	1.548.941	3900	0.002524
1970\71	1.561.344	1988	0.001273
1972	1.571.466	1500	0.000955
1973	1.602.513	1118	0.000697
1974	1.753.450	811	0.000463
1975	1.865.160	841	0.000451
1976	2.000.000(1)	1000	0.000500
1977	2.312.000	1100	0.000476
1978	2.613.000	1225	0.000469
1979	2.951.000	2012	0.000682

In the light of the above and so long as the concept of unemployment insurance is restricted to a minor part of unemployment and in accordance with the development of unemployment insurance in Egypt and the effect of the qualifying conditions. We can conclude that the method of annual assessment is a suitable system for financing unemployment benefits especially in observance of the existence of the hidden reserves which we consider also one of the factors which eliminates the SIO financial investigation deficit.

(1) Estimated

2-Health insurance benefits borne by SIO appears in the burden of cash benefits which return for 1% only of the wages. Thus the said benefits reserve borne by the SIO amounted to LE 66.000 at the time of estimation (December 31. 1972).

In respect of work (industrial and non-industrial) injury insurance. the actuarial report considers the cash benefits borne by SIO as temporary insurance benefits i.e. the contributions received in one year equal the benefits paid out in the same year. so that the stated present value of the benefits for pensions and beneficiaries (as estimated at the date of investigation) shows no actuarial deficit.

3- There has been considerable growth in the benefits of old-age. Invalidity and death insurance. Moreover. the application of these new benefits to the whole contribution period of insurance prior to and following the coming into force of the Acts comprising these new benefits without the collection of any contributions for this antecedent period. has resulted in a strain on the scheme which in turn caused a deficit in the money reserves held at the time of the actuarial examination.

for example. the burden resulting from the settlement of pensions at the rate of 1/45 instead of 1/50 for each contribution year and by 1/75 instead of 1/100 for each year of the previous period with a maximum of 80% instead of 75% of the last wage. Amounted to LE 59.8 m.

INVESTIGATION OF ADEQUACY OF NEW ENTRANT CONTRIBUTIONS

By applying the technical basis on which the financial position has been based. a study has been made of the cost of different insurance benefits with respect to each kind of insurance with exception of

unemployment insurance (for which a special account has been allotted). **The result of this study is shown below.**

1- Old-age. Invalidity and death insurance:

The following table shows the cost of the different benefits guaranteed by this insurance calculated as a percentage of the wage on the basis that the age at entry to insurance is 23 years for the public sector employees and 26 years for the private sector employees:

Benefits	Public Sector %	Private Sector %
Retirement pensions	16.617	15.721
Death in service pensions	4.541	4.232
Invalidity pensions	0.553	0.527
Additional insurance sum	0.681	0.702
Funeral expenses and death grant	0.213	0.202
Burden of early retirement pensions	0.300	
Administrative expenses	0.330	1.630
Reverse fluctuations reserves	0.500	0.750
	23.735	23.855

2- Work injuries insurance:

The following is the estimated cost of work injuries insurance benefits as a percentage of wages:

	Cost %
Wages compensation	0.570
Lump sum compensation	0.088
Additional insurance sum	0.133
Invalidity pensions	0.470
Death pensions	0.641
Medical cost paid to HIO	1.000
Administration expenses	0.089
	2.991

It has become clear that the rate of contributions. at the date of the third SIO financial investigation. was sufficient for covering the benefits provided that the

average age when starting OAID insurance coverage did not exceed 23 years for the public sector employee and 25 years for the private sector employee.

TECHNICAL BASES

The following are the technical bases. Upon which the SIO Liabilities has been estimated in December 31. 1972. Most of these bases are discussed in this section.

1- INSURED PERSONS MORTALITY RATES:

In order to deduce mortality rates among the insured persons a study has been made of the SIO experience during the period July 1st. 1968 to December 31. 1972. The deduced mortality rates (per 1000) were compared with the rates used in the previous investigation (June 30. 1968). The result of comparison was as follows:

Age	1972 rates	1968 rates
20	0.00142	0.00200
25	0.00142	0.00200
30	0.00155	0.00210
35	0.00217	0.00292
40	0.00328	0.00458
45	0.00638	0.00734
50	0.01206	0.01039
55	0.01886	0.01595
59	0.02445	0.02354

We can observe. From the above comparison. That there has been a general improvement in the mortality rates among insured employees under age 50. However. it has been decided that the mortality rates deduced during the experience from July 1968 to December 1972 are to be applied in the future without any further change.

2- RETIREMENT PENSIONERS' MORTALITY RATES:

During the second investigation (June 30, 1968) the British mortality table 24/29 was applied with a two years addition to ages. The rates deduced from the practical experience during the period from July 1st. 1968 to December 31, 1972 may be compared with the unadjusted British rates as below.

Age	Deduced rate	British table rate (unadjusted)	Ratio of deduced rates to British rates
60	0.0205	0.0197	1.041
61	0.0211	0.0218	0.968
62	0.0236	0.0239	0.987
63	0.0252	0.0263	0.958
64	0.0275	0.0289	0.952
65	0.0305	0.0319	0.956
66	0.0340	0.0352	0.964
67	0.0380	0.0391	0.968
68	0.0425	0.0434	0.979
69	0.0475	0.0481	0.988
70	0.0523	0.0533	0.985

The improvement in mortality rates among the group of pensioners is noticeable. but instead of applying the deduced rates. it was agreed to use the above British rates without any age adjustment. and this provided a hidden reserve.

it is clear that the SIO has sufficient experience from which to deduce reliable mortality and other rates. and there is every reason why experience-based rates should used.

A sound actuarial expert. E.M. Lee. states that the actuary "should note the important point that the establishment of the burden of pension costs requires actuarial calculations to be made on a realistic basis. If

excessive margins are included the contributions will be too high... "(An introduction to pension funds. G.B.. 1979. 6.18).

3- INVALIDITY PENSIONERS' MORTALITY RATES :

No study has been made to deduce mortality rates among invalidity pensioners. and it has been decided to apply the same basis as was applied earlier to retirement pensioners i.e. to use the British mortality table 24/29. At the same time a pensioner's age was considered to be 60 if it was actually less.

Here. we can also state. that applying unnecessarily heavy mortality rates can constitute a hidden reserve.

4- RETIREMENT RATES FOR HEALTH INVALIDITY:

The following are the rates deduced from the SIO actual experience of insured persons (during the period between July. 1968 and December. 1972) and these are compared with those used in the previous investigation (June 30. 1968) (per thousands).

Age	Deduced rates	Previous rates
20	0.06	---
25	0.12	---
30	0.20	0.05
35	0.30	0.30
40	0.30	0.6
45	0.50	1.16
50	1.00	2.17
55	1.80	4.20
59	2.90	6.70

However. it was decided to use the deduced rates without any change.

5- THE SALARY EXPERIENCE:

The scale of wages was studied by calculating the average wage at different ages at December 31, 1972 for employees in the public and private sectors separately.

The deduced actual average monthly wages for different ages were as follows: (relative to a LE 100 hypothetical monthly wage at the age of 20).

Age	Public sector	Private Sector
20	100	100
30	162	130
40	228	166
50	277	189
60	316	210

A table of hypothetical wages of employees according to different ages. as compared with a LE 100 hypothetical wage at the age of twenty. was prepared by using the following relationships :

The average wage at age x

$$\begin{aligned} \text{or} &= 100 + 8(x-20) \text{ for public employees} \\ &= 100+2.3(x-20) \text{ for private employees} \end{aligned}$$

Although the above relationships lead to scales of wages higher than the actual scales. There was a rapid increase of wages especially after the date at which the investigation results were declared (March. 1977). The actual average monthly contribution wage was as follows (in LE) for the employees in the public and private sectors:

	1975	1976	1977	1978	1979
Public sector	22.2	23.2	27.6	33.0	35.5
Private sector	16.0	16.3	19.5	21.3	23.3

We can observe that the public employees' average wage at December 1979 was 159.9% of that at 1975. i.e. the annual rate of increase was about 12%.

At the same time the private employees' average wage was raised by 145.6% during five years i.e. the annual increase was about 9.1%.

The scale of wages shown above may. However overcharge the fund in respect of the burden resulting from the previous contribution periods. Especially so long as the full funded system is applied.

EARLY RETIREMENT

Among the benefits guaranteed by OAID insurance there is the right to retire early optionally after 20 years contribution. In this case the pension is reduced by a percentage depending on the age at retirement.

A study to estimate the percentage appropriate recentage abatement as shown that the appropriate ratios are approximately three times the percentages stated in the Social Insurance Act 63/1964.

The financial effect of this discrepancy for insured persons who were in service at December 31. 1972 was not thought important because early retirement was not widespread at that time. However. a proportion of monthly contributions equal to 0.03% of monthly wages has been set aside to cope with the burden arising out of early retirement. This was done after studying the sufficiency of contributions with regard to employees in the public sector only no study was made of those in the private sector.

Further experience during the years after the date of the third investigation results were declared. shows that the fund

will be charged with a considerable financial burden in two ways:

1- Early retirement has become widespread at a level similar to that observed by IPO during the year 1978 (2200 cases i.e. about 8% of the total number of new pensioners) and in the year 1979 (5195 cases representing more than 15.5% of the total number of new pensioners).*

2- The percentage reductions stated in the new Law 79/1975 are much less than the previous rates stated in the Law 63/1964 (which were also much less than the experienced-based percentages). See below.

Percentage reduction

	Act 63/1964	Act 79/1975
Under 40	No pensions	20
40-	20	15
45-	15	10
50-	10	5
55-	5	—
58-	—	—

PERCENTAGE OF THOSE MARRIED AMONG THE INSURED PERSONS AND PENSIONERS

A statistical study of the marital condition of the insured persons and pensioners has been made. As a safeguard at each age the percentage married used for valuation purposes was higher than that actually observed in the experience.

Age	Percentage married (%) used for valuation purposes
20	6.5
25	30.0
30	80.0
35	90.0
40	95.0
45 and more	100.0

* The total number of new pensioners was 27500 in 1978 and 33400 in 1979 including both the OAID and work injury pensioners.

It is clear that the additions to the actual married proportions were substantial since we know from the declared national statistics that there are about 9% of the population over 45 who are not married.

RELATIONSHIP BETWEEN THE AGES OF INSURED PERSONS AND PENSIONERS AND THOSE OF THEIR WIVES

A study has been made to calculate. From actual experience. the average age of a wife for any specified age of husband. As a husband's age increases there is an increase in the difference between the ages of husband and wife. This can be seen from the following figures:

Husband's age Average age of wife Difference

Husband's age	Average age of wife	difference
20	19	-1
25	23	-2
30	25	-5
35	28	-7
40	33	-7
45	37	-8
50	40	-10
55	44	-11
60	48	-1

ANNUITY VALUES USED AS A BASIS FOR ESTIMATING THE VALUE OF CHILDREN'S PENSIONS:

First: with respect to the children of insured persons who are still in service:

By studying the differences between the ages of fathers and sons. it was possible to estimate the pension annuity values to be used in estimating the

value of pensions of children of insured persons who are still in service, As follows :

Father's age at the date when Son's pension was due	Annuity value
20	15.054
30	13.972
40	12.287
50	11.327
60	10.309

Second: with respect to children who are actually receiving pensions:

The same values as were used in June 30. 1968 were applied at the December 31. 1972 in investigation. with modifications for ages which exceed 25 years to take account to the death rates used for pensioners. Thus the annuity values for sons and daughters at different ages. Were as follows:

Age	Sons	Daughters
5	13.575	13.578
10	11.327	11.327
15	8.619	8.619
20	5.240	9.205
25	10.972	10.293
30	10.498	11.708
35	10.498	12.829
40	10.498	13.592
45	10.498	15.109

MINIMUM PENSIONS:

When preparing the actuarial monetary functions. the effect of the imposition of a minimum of death or validity pension has been taken into consideration. But we can observe that the burden of the minimum was increased after Act 79/1975 which raised the said minimum from 40% to 65% of the monthly wage during the last year of service.

However. the absolute minimum of LE 3.6 which was stated (at December 31. 1972) did not apply to public sector employees. As for private employees. a pension minimum could have a financial effect especially in the cases where there was no minimum wage exceeding the minimum pension. Since the minimum contribution wage has been raised to LE 7.5 monthly according to Act 46/1974 and to LE 12 by Act 64/1974. Then to LE 20 by Act 93/1980. the financial burden due to guaranteeing a minimum pension has so decreased that it was ignored when estimating liabilities.

It should be noted that the new developments affecting social insurance pensions has obviously raised the pension minimum (to LE 6 then to LE 9 then to LE 12 monthly). but this will not have any effect. not only because of the new minimum of the contribution wage. but also because the recent Law has stated that the Treasury should be charged with any burden resulting from Acts which raised the minimum pensions from time to time.

The pensions. as stated by Law. Should not exceed a maximum of 80% of the last average wage or a maximum of LE 100 or 110 whichever is the lower.

But while the effect of applying the maximum as a wage proportion has been taken into consideration when liabilities were estimated (this was done by adjusting actuarial functions). the effect arising out of the absolute maximum pension was ignored. The actuarial report states that the cases in which a pension exceeds such a limit is not a large number. At the same time the report states that this underestimation leads to a consolidation of pension reserves (in other words a "hidden reserve").

SAVING SYSTEM BASIS

The organization's liabilities in the saving system have been estimated at December 31, 1972 by

calculating the total sums paid under this system and their interest. These amounted to LE 37.6 m.

It is noteworthy that the saving system existing at the date of the third investigation was applied by Law 13/1975 which was later replaced by a new saving system covering only the insured persons whose monthly wage amounted to LE 30 or more (about 20% of the total workers at the date of introduction of the new system).

ADMINISTRATION EXPENSES

The SIO's statements during the last five years preceding the third investigation date. have shown that the organization's administration expenses amount to an average of 1% of wages.

As a safeguard 1.5% of wages has been set aside as a reserve for future administration expenses. By distributing these expenses according to the contributions of each kind of insurance. it has been possible to determine the reserves set aside for administration expenses in OAID insurance by 1% of total wages of the insured persons participating in the scheme. By dividing the expenses over the public and private sectors according to the ratio 2:3 then relating these expenses to the total wages in both sectors. the result was as follows:

- Public sector 0.33% of the wages
- Public sector 1.63% of the wages

It is noteworthy that there is a remarkable increase in the estimated reserve for administration. We know that administration expenses are always increasing. but the accounts of five years have shown that they amount to an average of 1% of wages. and since wages normally tend to increase (mention has been made on that there was a sharp increase of wages). we can conclude that there is no need to increase the administration expenses percentage by 50% and to set aside a reserve for future expenses according to such a high percentage.

THE RATE OF INTEREST

The rate of interest enters into Egyptian social insurance scheme calculations and is considered to be of prime importance to the finance of the scheme because money is accumulated over time against future liabilities. A 4.5% annual interest was applied during the third investigation at December 31. 1992.

It is noteworthy that this rate has been applied for more than twenty years without any change because SIO was obliged by the Law to invest its reserves. Since January 1961. in government loans at this rate.

The Egyptian Trade Union used to ask the government to raise the rate to be consonant with the rate of other government loans which was 12% at 1981. Later (since July 1, 1981) the rate of interest on the SIO government loans have been raised to 6% annually and the government has promised the Trade Unions to make a further increase.

The following table shows how much are the invested reserves in government loans during the years 1977-79 in LE:

	1977	1978	1979
Government Loans	1.481	1700.8	2189.9
Other loans and bank deposits	9.6	11.4	20.5

Mention has already been made that the rate of interest in the Egyptian scheme is of high importance on account of the accumulation of reserves as an outcome of the adoption of the system of capitalization. In the light of that, a new principle for investment of SIO reserves was proposed, by changing the present form of investment to direct investment in economic projects and assets in kind generally including projects of economic development. The administration of these investments was to be by the State with an obligation of guaranteeing a minimum return from these investments to be in equivalent with the lowest levels of locally prevalent returns (10%). The guarantee is in compensation for ensuring to the State the capacity of financing the projects of development and as a basis for its responsibility for the consolidation and success of the Social Insurance Scheme.

However, in all cases the increase in the rate of interest will lead to a considerable increase in the money accumulated against future liabilities. Furthermore, we can consider that the increase in the rate for government loans (which amounts to more than LE 2500m at December 1980) by 1.5% annually, is sufficient to meet all the third investigation deficit (which amounted to LE 174.6 m).

ESTIMATION METHOD (PACE OF FUNDING)

After determining the technical basis used in investigation work, the SIO actuarial staff have calculated the actuarial factors necessary and have prepared financial tables that show the Organization's liabilities for each kind of insurance.

Three tables of actuarial factors have been calculated (applying a 4.5% annual rate of interest and on the other technical basis used in the investigation) the first

of these concerns public sector employees. the second concerns private sector employees. and the third concerns pensioners and their beneficiaries.

The SIO liabilities were estimated on December 31. 1972 by calculating the difference between the present values of benefits in cases of retirement. invalidity and death and the present value of contributions borne by employers and insured employees. In addition the present value of pensions of pensioners beneficiaries` liabilities and of current beneficiaries at the time of investigation has been estimated.

As for work injuries and health insurance. the SIO liabilities for the insured persons have been estimated by calculating a reserve for current risks at the time of estimation. When the present value of liabilities towards health invalidity pensioners was estimated. the liabilities due to their beneficiaries in the case of the pensioner`s death. have been taken into consideration.

As mentioned before. Unemployment insurance funding has been set aside in a special account.

By applying the estimation method detailed in the previous paragraphs. the SIO liabilities in December 31. 1972 have been estimated as follows (LE thousands)

- Present value of benefits		2.083.944
- Present value future contributions	1.160.858	
- End-of-service compensations and previous employment premiums	<u>44.946</u>	1.205.804
- SIO LIABILITIES		878.140
- Unemployment special account		<u>72.142</u>
Total liabilities as shown on p. 12.		250.282

The unemployment contributions surplus has been set aside all a special account (Without adding interest) as a reserve without any attempt to calculate the supposed reserve. We previously discussed the SIO actuarial view which states that "unemployment insurance is characterized by a special nature and depends on economic conditions which makes it rates unpredictable by actuarial and statistical methods unlike Death and invalidity insurance".

At the end of that discussion we concluded that in view of the nature of unemployment insurance. Its qualifying conditions and its development in Egypt. The annual assessment method is suitable for financing its operation. This is specially true in view of the existence of large hidden reserves constituted by over-estimation of liabilities.

At the same time we can use a considerable part of this reserve to eliminate the deficit arising out of the SIO financial investigation.

The SIO actuarial experts adopt the system of capitalization for old age. Invalidity and death insurance. they review social insurance schemes without presuming their continued application to new generations of insured persons. but assuming only that if these schemes are destined to continue. this Will be on the basis of the present group of the insured existing on the date of the actuarial investigation.

It is noteworthy that this traditional view was influenced by the rise and development of private insurance. However. in the light of the fact that the social insurance schemes are obligatory ones of a public character. it was necessary to presume their continuance and expansion to both present and future insured persons and the actuaries of many advanced

schemes were concerned to stress the equivalence of the sources and liabilities of their schemes for the categories of the insured who are to be involved in them in the near or distant future. Many social insurance schemes. (as In U.S.A.. France and U.K.) adopt a pay-as-you-go system.

In U.S.A.. For example. The social security fund balances. are minimal. approximating only to six months' benefit. Enough to provide for a smooth flow of money to beneficiaries and pensioners. The American Insurance professors M.R. Greene and J.S. Trieschmann state that "Social Security is essentially a pay-as-you-go system. With current taxes nearly matching current outlays... Being dependent on tax revenues. Social Security does not need large reserves. as might be true of private insurance. In fact. to accumulate actuarial reserves in a manner similar to a life insurer would be a practical impossibility for a system as large as the old-age. Survivors. Disability and health insurance. The agency can be expected to continue indefinitely and has as its essential security the power to taxation of the federal government. OASDHI is said to be in actuarial balance if the present value of future benefits is equal to the present value of expected taxes" (Risk and Insurance. Fifth edition. 1981. P. 440).

In the U.K.. not only the national insurance scheme is a "pay-as-you-go" system. But there are some occupational pension schemes in the public sector which are "pay-as-you-go" .A pensions English authority. Sue Ward. Mentions one of the important advantages of this system when she states that it is easier for a "pay-as-you-go" scheme to pay pension increases to compensate for inflation.

Generally. the recent concept of social insurance schemes has prevailed and developed. and actuaries

have recently started to give up the system of capitalization and to adopt the methods of partial financing or assessment and processes of equilibrium leading to realization of equivalence between resources and liabilities within a limited range of future years. This new concept Should be adopted by Egyptian SIO not only to overcome any deficit and to make the insured persons and pensioners sure of the financial soundness of the scheme. but also to eliminate the increase of contribution rates in a rapid manner (1) above the monetary capacities of both employees and employer.

CONCLUSIONS

The actuarial investigations of the Egyptian social insurance scheme. for non-government Workers. have revealed increasing deficits.

The analysis of the technical bases and the estimation methods of the income and liabilities. shows that there are some factors which tend to increase the actuarial deficite for example the increasing rate of the average monthly wage during recent years which can charge the scheme with an added burden resulting from the effect on the previous contribution periods. Also the fund will be charged with a considerable financial burden due to the increased incidence of early retirement since the percentage reduction of pensions has become less than the appropriate rate. Partly there is the burden resulting from the new minimum of pensions. Conversely. There are many factors to augment the actuarial balance of the scheme.

(1) Contribution rates increased from 12% of wages in April 1956 to 35% thereof in January 1972 and if we add to this the premiums of the supplementary saving system started on 1.7.1965 it will appear that the total amount borne by employers and employees has attained 381/3 of wages in November 1972.

These factors include the following:

1- There is a hidden reserve due to the surplus that used to accumulate owing to the fact the contributions for unemployment insurance exceeded the sums sufficient for meeting the liabilities.

2- Some rates which were applied during the financial position investigations (for example mortality and invalidity rates and the percentage of those married). Were Somewhat heavy. And excessive margins were included. Hence the concluded liabilities are comparatively too large.

3- There is an additional hidden reserve due to the relative increase of this administration expenses reserve. While the actuarial investigation set aside This reserve buy calculating it as a percentage of wages (which means that it will increase with the increase of wages). the rate of administration expense applied was raised to 1.5% as compared with 1% which was estimated from the SIO statements during the last five years preceding the investigation as the actual cost.

4-The rate of interest. Guaranteed by the government. has been raised to 6% instead of 4. 5% used during the investigation. It is clear that this factor is of prime importance because money accmulated against future liabilities over time accordingly the new rate of interest can be considered sufficient to ensure the monetary soundness of the SIO even if we assume that the organization will continue applying the same method of funding.

5- If the SIO actuaries tried to accumulate "actuarial reserves" in a manner similar to a private life insurer. This would be a practical impossibility for a scheme as large as the social insurance scheme. The organization

can be expected To continue indefinitely and has as its essential security. the power of the government and the contributions collected by law Thus social insurance schemes are essentially appropriate for "pay-as-you-go" schemes. But in view of the conditions of economic development in Egypt as a developing country. the SIO actuaries should adopt a system of partial funding and should determine the contribution levels with participation of economists. Sociologists and politicians to prevent the rates from becoming oppressive to the insured persons or obstructive to the growth of industry or the attraction of foreign and domestic capital. At the same time they should ensure that the actuarial balance of the scheme provides equality of the present value of future benefits with the present value of the expected contributions in respect often present and future insured persons (open fund) Alternatively the actuaries can adopt the system of assessment at intervals which should be of a length to afford the maximum possible role for social insurance as a means for compulsory saving. In both ways the actuarial balance can be ensured.

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APPENDIX 1: Statistical data of insured persons and pensions at December 31st. 1972:

TABLE (1): Public Sector Employees in Service:

Age	L.E. monthly			Age	L.E. monthly				
	No.	wages			No.	wages			
16	5	752	36	265	39	26	118	596	555
17	9	053	58	024	40	24	138	563	917
18	12	162	105	168	41	22	441	547	598
19	15	652	154	125	42	23	383	563	917
20	18	858	194	016	43	20	366	522	213
21	22	441	237	534	44	18	480	475	068
22	25	269	281	052	45	18	009	476	897
23	28	381	331	823	46	16	218	447	870
24	32	435	397	099	47	15	652	429	737
25	37	432	489	574	48	14	426	400	726
26	39	507	558	477	49	13	955	303	473
27	40	638	603	808	50	13	955	398	912
28	37	149	583	863	51	11	692	340	889
29	36	018	583	863	52	11	692	330	009
30	33	755	569	357	53	9	429	277	425
31	34	227	609	248	54	8	486	252	040
32	33	567	623	754	55	8	391	250	227
33	30	832	600	182	56	7	166	208	522
34	31	115	618	314	57	6	694	201	269
35	30	455	609	248	58	5	846	175	884
36	30	545	636	447	59	3	583	101	541
37	27	532	601	995	60 or	3	772	105	168
38	26	212	589	302	over				
					total	942	880	18132	395

TABLE (2): Private Sector Employees in Service at December 31st 1972:

L.E. monthly					L.E. monthly				
Age	No.	wages			Age	No.	wages		
16	5	430	29	544	45	14	641	156	258
17	9	142	32	040	46	12	863	145	488
15	11	709	41	034	47	12	992	143	834
18	12	581	44	091	48	12	677	140	354
22	12	344	43	259	49	13	364	144	761
25	14	211	49	802	50	11	831	130	036
28	15	013	62	179	51	10	066	109	842
32	16	206	77	448	52	10	727	123	033
37	18	163	98	372	53	8	417	98	213
39	20	171	130	134	54	7	840	89	920
40	16	854	116	789	55	8	616	93	334
37	17	771	134	470	56	6	313	66	373
36	17	213	143	957	57	6	056	68	499
33	17	541	157	780	58	5	184	59	043
34	15	609	149	192	59	5	043	55	427
33	15	969	155	170	60	4	151	47	940
30	16	662	165	884	61	3	060	33	150
31	16	816	170	096	62	2	926	31	960
30	17	521	178	630	63	2	034	21	382
30	17	515	178	565	64	1	854	20	823
27	17	720	184	892	65	2	714	27	235
26	17	310	180	608	66	1	399	15	262
38	18	118	193	371	67	1	328	14	068
39	18	875	193	195	68	1	803	20	534
40	17	541	181	620	69	1	886	19	831
41	15	115	158	918	70 or	2	232	22	406
42	16	289	175	154	over				
43	14	108	148	328					
44	14	050	148	840	total	628	584	5 621	188

TABLE (3): Current Work Injury Invalidation Pensions:

Invalidity Degree	Cases		L.E. Monthly Pensions	
Total		192	2	368
Partial	5	052	25	398
	5	277	27	766

TABLE (4): Current Death Pensions:

Work Injury Insurance OAID Insurance

Beneficiaries

	L.E. Monthly				L.E. Monthly			
	Cases		pensions		Cases		pensions	
Widows	4	270	23	173	31	949	144	057
Sons	6	326	11	793	42	472	59	572
Daughters	6	013	11	156	42	009	60	357
Fathers	1	438	2	237	3	852	3	356
Mothers	2	832	5	403	9	762	13	485
Brothers		50		53		128		279
Sisters		104		185		542		893
	21	033	54	000	130	714	282	199

TABLE (5): Current Retirement Pensions:

Type of Retirement	Cases L.E. Monthly Pensions			
Old-age retirement	39	410	560	995
Invalidity retirement	3	160	22	855
	42	570	583	850

Appendix 2: Some of the third investigation technical Base:

TABLE (1): Mortality and health Invalidity rates (per thousand):

Mortality		Invalidity		Mortality		Invalidity	
Age	Rate	Rate	Age	Rate	Rate	Rate	
16	001.42	000.04	38	002.77	000.30		
17	001.42	000.04	39	003.13	000.30		
18	001.42	000.05	40	003.28	000.30		
19	001.42	000.05	41	003.38	000.30		
20	001.42	000.06	42	003.79	000.35		
21	001.42	000.08	43	004.52	000.40		
22	001.42	000.11	44	005.55	000.45		
23	001.42	000.11	45	006.38	000.50		
24	001.42	000.12	46	007.03	000.60		
25	001.42	000.12	47	007.95	000.70		
26	001.43	000.15	48	009.15	000.80		
27	001.45	000.17	49	010.62	000.90		
28	001.48	000.17	50	012.06	001.00		
29	001.54	000.17	51	013.32	001.10		
30	001.55	000.20	52	014.63	001.20		
31	001.58	000.20	53	016.00	001.40		
32	001.61	000.20	54	017.43	001.60		
33	001.77	000.25	55	018.86	001.80		
34	001.99	000.25	56	020.24	002.00		
35	002.17	000.30	57	021.64	002.00		
36	002.29	000.30	58	023.04	002.60		
37	002.50	000.30	59	024.45	002.90		

**TABLE (2): The Hypothetical wages of employees
According to different ages as compared with
A L.E. 100 hypothetical pay at the age of twenty:**

Age	Public Sector	Private Sector	Age	Public Sector	Private Sector
20	100	100.0	41	268	194.5
21	108	104.5	42	276	199.0
22	116	109.0	43	284	203.5
23	124	113.5	44	292	208.0
24	132	118.0	45	300	212.5
25	140	122.5	46	308	217.0
26	148	127.0	47	316	221.5
27	156	131.5	48	324	226.0
28	164	136.0	49	332	230.5
29	172	140.5	50	340	235.0
30	180	145.0	51	348	239.5
31	188	149.5	52	356	244.0
32	196	154.0	53	364	248.5
33	204	158.5	54	372	253.0
34	212	163.0	55	380	257.5
35	220	167.5	56	388	262.0
36	228	172.0	57	396	266.5
37	236	176.5	58	404	271.0
38	244	181.0	59	412	275.5
39	252	185.5	60	420	280.0
40	260	190.0			