AN EXAMINATION OF THE MORTALITY CHARACTERISTICS OF THE EGYPTIAN INSURED POPULATION FROM 1975 - 1979

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ABSTRACT

Life assurance, as an applied division of economics, can play a major role in developing the Egyptian economy, because insurance companies-especially those of life branches- are considered major investors in the development plans with their accumulated funds.

In order to allow life assurance in Egypt to fulfil its role, new investment laws concerning this industry must be issued to give more benifits to the individuals, so they will decide to buy life policies in order to gain this suitable utility. The most important aspect of life assurance to do so, lies in the ability to charge the individuals appropriate premiums based on modern Egyptian experience not on foreign experience, i.e the A 1924-29 Ultimate Life Table, which is today out-of-date.

This research is undertaken to apply theoretical basis of demography and life assurance in finding an ideal life table suits the Egyptian market more than the A 1924-29 U.Table.

In this study, four approaches to find this ideal life table were done. The first was: to prove that the Egyptian crude mortality rates and their shapes are not similar to those based on the A 24-29 U.Table. The second was: to compare between these crude rates and those based on A 49-52 U.Table, we found that,they have nearly the same shape but their rates are slightly different. The third was: trying to find a mathematical formula related to Perks family of curves to fit and graduate

these Egyptian crude rates, but concerning this approach, Gompertz and Makeham graduations were not likely to prove suitable. The fourth was: using the A 49-52 U.Table as a standard table to graduate these Egyptian crude rates, also selecting from them the ideal graduated rates for the Egyptian market.

Finally, the research also includes a complete set of monetary tables based on the new ideal life table (sums assured, with profit), and interest rates varying between 4% and 9% .

CHAPTER ONE

INTRODUCTION

Life assurance, one of the largest and most important industries in the world, has wide-ranging social and economic objectives. Its first concern is with personal economic independence. It provides men and women with an institution through which they can systematically create financial security for their families and enterprises. It also serves the economy as an important channel through which capital is made available to business and industry. It is an industry that effects everyone, directly or indirectly. Thus, it is an important field of study that merits the thoughtful attention of all who would consider themselves knowledgable in business, economics, or finance.

1.1 Purpose Of The Study

An important aspect of the science of financial planning, lies in the ability to estimate the way in which contingent liabilities currently contracted, whether longer term, as in life assurance or pension business, or shorter term, as in motor, fire or marine insurance, are likely to emerge in the future as actual payments. This prediction is necessary to allow the individuals or the institution accepting the contract, by charging appropriate premiums and by prudent investment of the proceeds, to make adequate provision to meet these payments as they fall due. This planning does not deal with the contract affecting a single individual or risk. It takes one contract with another and

makes group predictions, as in all probability calculations, in order to ensure that in the long run,i.e. in the average, cash payments are adequately provided for.

The researcher aims in this study to make these group of predictions, i.e. to calculate up-to-date mortality rates based on the Egyptian experience, also to construct new life table, which will be related more closely to the Egyptian circumstances than the A 1924-29 U.Table.

1.2 Outline Of The Study

This research includes six chapters.

The first chapter is the introduction which includes the purpose of the study and the outline of the research.

The aim of chapter two is to indicate the nature of insurance generally and the development of life assurance in the world and in Egypt. Also, the chapter discusses the general economic basis of life assurance and its origin.

The researcher's aim in chapter three is to calculate and graduate the Egyptian crude mortality rates, which based on the experience of the Egyptian companies. The full procedure of calculating and graduating these crude rates will be represented in this chapter.

Chapter four includes a comprehensive analysis of the Egyptian mortality graduated rates obtained in chapter three.

The researcher's aim in chapter five is to construct monetary tables based on these new mortality rates (policies and sums assured; with and without profit). Also by calculating some net premiums based on these new mortality

tables and comparing them, also comparing them with those based on the A 24-29 U. and the A 49-52 U.Tables, as a result, the ideal Egyptian life table will be selected. Throughout this chapter the researcher presents his recommendations in this matter.

Chapter six summarises the conclusions of this study.

CHAPTER TWO

NATURE OF INSURANCE GENERALLY AND THE DEVELOPMENT OF THE INDUSTRY IN EGYPT

2.1 Introduction

From very early times,men engaged in trading by sea had been accustomed to limit their losses by ship-wreck,fire,and other marine hazards,by a system which had the effect of spreading the heavy losses of the few amongst the comparatively many who were engaged in the same description of venture. Thus was ex-changed the uncertain but crippling loss,for one certain but very much smaller loss,which could,therefore,be allowed for in advance and reckoned as a cost of trading.

The merchants whose ships reached their destinations safely contributed to reimburse their less fortunate brethren whose vessels and freights met with disaster, and so, instead of being obliged to risk,perhaps,a consider-able portion of his fortune on the safe passage of a ship, a trader was able, by certain payment-a mere fraction of the sum at stake-to exchange a nerve-racking anxiety regarding his precious cargo for the comfortable knowledge that ,whatever happened,his financial position would be secured.

No doubt he would desire that his venture should reach port safely,rather than that disaster should force him to call upon the fund for aid,but even at the worst, his position was immeasurably better with,than without, such protection.

The machinery for working such an indemnity fund, as it may be described,inevitably got into the hands of specialists,who made it their business to know the rate of loss experienced on different trade routes,to whom merchants paid their contributions,and on whom they claimed for losses sustained. In this manner, it may be conceived,marine insurance was born, to be followed, at a much later date,by life assurance,and, later still,by a whole host of different forms of insurance created by the complexity of business and social life,and the consequent obligations.

The principle underlying insurance is that,whatever the subject-matter may be,there is a certain likelihood that instead of the desired event happening it will fail,and pecuniary loss will ensue. The ship is expected to make port safely,but it may founder;a man is expected to live through out the year,but he may die; the house is expected to remain unburnt,but fire may destroy it;the workman is expected not to injure himself in his employment but he may do so. Examples might be multiplied indefinitely,and in each case there is a field for insurance.

The nature of insurance in general now having been explained,and the particular branch with which this work is concerned,that of life assurance will be described.

2.2 Life Assurance

Life insurance is a method of which a group of people may cooperate to even out the burden of loss resulting from the premature death or the disability

of members of the group. Also,and as a modern development,life insurance is a method of saving and investing money for future needs.

2.2.1 The Earliest Origins Of Life Assurance

Documents excavated have shown that there was a type of life assurance in the city of Milete in Asia Minor as long ago as 205 B.C. A citizen of the town for example paid 3600 drachmen towards a communal fund and in return received thirty drachmen per month for life. On the citizen's death any balance remaining reverted to the fund except for 150 drachmen which was paid to the next of kin for the funeral of the deceased member (Barneveld,H., 1951 , P 29).

While the above example refers to annuity business, the principle of basic life assurance also dates back very far indeed. Meher and Osler reported that the first evidence of personal insurance for which contributions were made dates back to the societies of ancient Greece, the Eionoi or Thiosoi , which were benevolent societies supported by contributions from members. They later developed into societies providing for the payment of burial expenses of members and for the immediate cash needs of their dependants (Meher, R.I & Osler, R.W. 1956 , P 648).

It is also known that life assurance dated back to the Roman Collegia and F.A.Jack has reported an extract from the Collegium Cultorum Dianae et Antinoi et Lanuvium of the year 136 A.D. which described a type of funeral insurance, and in 1912 Jack pointed out that

the Collegium Cultorum Dianae et Antinoi was clearly a mutual society for the purpose of insuring that on death a sufficient sum of money was available for a suitable funeral . These benefits were secured by means of making level payments and the analogy to the modern concept of life assurance was to that of paying premiums over a period of time to receive a sum assured or funeral benefit in the event of subsequent death (Jack, F.A. 1912, P.19-20).

Some of the Roman military societies provided for the payment of a sum of money in the event of a member dying within a defined period. They also provided, on survival till the end of that period, for the payment of a lump sum or the payment of an annuity till the death of the beneficiary, and these benefits are very similar to the concepts of term and endowment assurance being marketed at the present time (Trenerry, C.F. 1926 , P.219).

2.2.2 Development Of Life Assurance

2.2.2.1 England

The earliest life contracts were issued in the sixteenth century on the lives of mariners and were essentially of a short-term nature and covered particular voyages, in this regard they were more akin to accident insurance. In the sixteenth and seventeenth centuries, before setting out on a long journey, people often insured their lives for the benefit of their heirs or creditors. Raynes stated that (Raynes, H.E. 1960 , P.100):

" there is a record of a policy dated June 18,1583, registered in the Chamber Of Assurance in the Royal Exchange , this is probably the earliest life insurance policy of which we have a record. The policy was a term insurance for a period of twelve months for a sum assured of £383.68 on the life of William Gibbons and the single premium paid was £30.14". This and other early contracts were very different from the long-term contracts of today in that, the premiums were not calculated on any sound actuarial principles , but were more a matter of bargaining between the broker and the underwriter .

The first registered life office in England was the " Hand - in- Hand Society " which was established in 1696 by 100 incorportors (Meher , R.I & Osler, R.W. 1956, P.650).

The first office to open to the general public appears to have been " The Society Of Assurance For Widows And Orphans " , founded in 1699. Its object was to provide a death benefit of £ 500.00 on each member's death funded by a contribution of five shillings from each 2000 members . The society survived for twelve years but apparently never attained the required membership. It did ,however,pave the way for " The Amicable Society For a Perpetual Assurance Office " which was founded in 1706, operated on similar lines and received a charter from Queen Anne. At the outset the Society charged an annual premium of £ 6.40 for a death benefit which depended on the number of deaths amongst the Society's

members. Once firmly established ,' Amicable ' offered a death benefit that ranged between £ 100.00 and £ 300.00. The original concept of offering a death benefit equal to the fund available divided by the number of deaths was not insurance as is known today since the death benefit depended on the number of members dying in a particular year. In addition the premium was a fixed amount per £ 100.00 sum assured irrespective of the age of the person to be assured, whilst at inception the 'Amicable' apparently laid down no limits as to age at entry , they shortly afterwards stipulated that entrants had to be between the ages of twelve and forty five and be in good health. The 'Amicable' was eventually merged with the Norwich Union Life Society in 1866 (Cox, P.R & Storr-Best, R.H. 1962, P.8).

In the early eighteenth century several offices opened in England, among these was ' The Society For The Equitable Assurance On Lives And Survivorships' which was established in 1756 and became known as the 'Old Equitable '. The company still exists today and in this regard Meher and Osler commented as follows: " When Old Equitable issued its first policies in 1762 life insurance as we know it today was born , for the first time scientific principles were put into practice in that the premiums differed according to the age of the life assured at inception of the contract". The Society offered whole life assurances as well as temporary assurances for a period of one or more years (Cox, P.R & Storr-Best , R.H. 1962, P.11).

A fundamental difference to the contracts previously issued was that the assured could automatically renew his policy irrespective of the state of his health and the premium were level for the term of the contract.

The first table of premiums for the Society was calculated by James Dodson, a mathematician, who based them on the London Bills of Mortality for the years 1728 to 1750, a period when the death rate was very high, and this high death rate was mainly caused by the particularly severe weather of 1740-1, the high food prices, famine and fevers. From these tables Dodson derived the probability of a person dying at the different ages and hence he scientifically calculated his premiums. Not with standing the high death rates on which his calculations were based, the resulting life assurance premiums were so much less than those customarily charged for year to year assurances at the time, that his scheme was mainly attacked on the grounds that the premiums were too low and hence it would fail (Ogborn, M.E. 1962, P. 30-1).

The first scientific valuation of the Society was made in 1776 by William Morgan, the actuary of the company. Because the actual deaths experienced by the Society were less than those assumed in Dodson's rates, and also because carefully selected lives insured by a life assurance society do experience a lighter rate of mortality than that of the whole population, the premiums charged by Dodson were in fact found to be excessive. As a result

of the valuation, the premiums were reduced by one-tenth and a bonus equal to one-tenth of the premiums paid was distributed to the members either in cash or as a deduction from the next premiums due (Cox, P.R & Storr-Best, R.H. 1962, P.14).

In 1782 a new premium scale was adopted using Price's mortality table based on the death in Northhampton in the years 1735 to 1780. Using this table and calculating premium rates at a three per cent rate of interest, the resultant premiums were so far below those then in use by the Society that they were increased by fifteen per cent to prevent too sudden a reduction in the Society's income (Cox, P.R & Storr-Best, R.H. 1962, P.15).

Developments hereafter were rapid, in 1783 the Royal Exchange Assurance places its life business on a scientific basis and so did the Westminster and Pelican, established in 1792 and 1797 respectively (Cox, P.R & Storr-Best, R.H. 1962, P.16).

During the following fifty years a large number of life offices were founded in England.

2.2.2.2 United States Of America

The first organization in America for the purpose of providing benefits payable on the occurrence of death was ' The Presbyterian Ministers Fund ' founded in 1759. The fund granted survivorship annuities commencing on the death of the policyholder and payable for the life-time of the beneficiary. The annuity which could be purchased varied from £ 10.00 to £ 35.00 per annum,

and the annual premium was one-fifth of the annuity payable on death (Maclean, J.B. 1945, P. 507-8).

During the last fifteen years in the eighteenth century approximately thirty insurance companies were founded, and of these five had the power to issue life insurance policies. The Insurance Company Of North America, chartered in 1794, seems to have been only one that did, but it only issued six policies in five years (Maclean, J.B. 1945, P. 508).

The ' Pennsylvania Company For Insurance On Lives And Granting Annuities ' was established in 1809 and was the first commercial company to be organized in America for the sole purpose of issuing life policies and annuities. It was also the first company in America to operate on a scientific basis, requiring an application form, a medical examination and charging premiums that varied by age at entry (Maclean, J.B. 1945, P. 509).

The first American company to operate on a mutual basis was ' The Mutual Life Insurance Company Of New York' which was chartered in 1842 and commenced business in the following year. In its first five years of operation, it issued 4000 policies. In 1843 the ' New England Mutual ' was established and two years later the 'Mutual Benefit Of New Jersy' was founded. The subsequent development of life assurance was very rapid and by 1869 there were 110 active life offices in the United States (Maclean,J.B. 1945, P.512).

2.2.2.3. Other Countries

The first country in Europe to have commenced assurance operations appears to be Holland where the first life assurance company was founded in 1807. The life office, called the ' Hollandsche Societeit Van Levensver-Zekeringen', operated on scientific principles. The first life assurance company in France was founded in 1819 whilst in Italy the ' Compagnie Dis Assicurazioni Di Milano' was founded in 1826.

By 1850 assurance was being transacted in Germany, Austria, Switzerland, Canada and Australia but in other parts of Europe, Russia and Japan, Life assurance came a good deal later.

2.2.2.4. Egypt

The modern insurance in Egypt was not known until the second half of the nineteenth century when Italian and English companies started to transact insurance business as a service to their subjects living in Egypt.

At that time some difficulties affected the insurance market,these can be summarised as follows:

1. As an act of patriotism Egyptians refused to deal with the foreign companies.
2. The local per-capita income was too small to allow savings.
3. Some Egyptians regarded insurance as an act against the Islamic Religion.

The first and oldest Egyptian company was the 'National Insurance' which was established in 1900 to deal with fire insurance, in 1932 it started to deal with marine, motor insurance and established a new branch to

deal with life assurance.

The second oldest Egyptian company was 'Alexandria Insurance' which was established in 1928, and the third was ' Al-Shark Insurance Company ' which was established in 1939.

But in 1934 The Egyptian Bank established the largest local Egyptian insurance company which was and still is called ' Egypt Insurance Company '.

In 1956 the number of Egyptian companies increased to 11 compared with 113 foreign companies.

In 1961, the Government nationalised all the insurance companies. Moreover, the Government amalgamated all the insurance companies into three companies to deal with all kinds of insurance, and provided one company for re-insurance. But after the open door policy started in 1974, and during 1979-80, there were three private new companies (El-Delta, El-Mohandes and Suez Canal) established to deal with insurance generally.

2.3 Economic Basis Of Life Assurance

A human life is possessed of many values, most of them irreplaceable and not susceptible to measurement. Life assurance is concerned with the economic value of a human life, which is derived from its earning capacity. Life assurance is not oblivious to the other values associated with a human life; in fact, the life assurance transaction has strong moral and social overtones. Yet, the foundation of life assurance is the economic value of the human life. Since much economic value may arise out of either a family or a business relationship, it

seems advantageous to discuss the functions of life assurance under any headings because their list is endless , but we can say in brief wards that, life assurance has two crucial functions to perform. On the one hand it provides individuals with a way of protecting themselves and their families against unforeseen future disaster and of saving for the future, and on the other it gathers together all these individuals' small savings and invests them together to produce greater wealth. In the first instance this strategy benefits policyholders, but in the long run it also benefits the community as a whole (Gilchrist,C. 1979, P. 1).

In the light of the discussion so far,it can be said that, since economics has been defined as the 'science of wealth' and insurance, as an applied division of economics, has its fundemental mission the protection of wealth in a scientific risk-bearing manner against loss from defined hazards to which the wealth is exposed. If the hazards relate to property values-tangible values like land, structures on the land, equipment with in the structures, raw materials of manufacture, and finished goods-property and casualty insurance is used to insure the values. If the hazards relate to the human life values, life assurance, annuities, and health insurance are used to insure the values.

CHAPTER THREE

THE MORTALITY RATES APPLICABLE TO LIFE ASSURANCE IN EGYPT

3.1 Introduction

Life assurance policies are long term contracts which secure the payment of an agreed sum of money on death, or survival to some agreed future date. The person on whose life the assurance is contracted is referred to as the life assured. The probability of death occurring usually increases with the period that the contract has been in force, being largely dependent upon the attained age of the life assured. The premiums, being the amounts which the assured pays to the life office which accepts the contract, are usually level throughout the period of the contract, though in some cases the premium paying period may be restricted. An extreme case occurs when a single premium is paid at the outset. The premiums are determined at entry according to the age and health of the life assured and the period for which the assurance is required.

There are some other financial contracts, but the element of mortality distinguishes contract of life assurance from the other contracts. In the early development of life assurance, the mortality element was uncertain because there was little antecedent experience to which to refer. However in cause of time a whole range of mortality tables was produced and the basis of the continuing flow of new data from which mortality trends could be deduced.

3.2 Measures of mortality:

The purpose of measuring mortality is to enable inferences to be drawn about the frequency of death occuring within a specific population during a specific period of time. It is natural therefore, for the basic measure to be expressed in proportional terms as a rate of mortality - the number of deaths occurring per unit of population in a particular interval of time.

The researcher aims at this point to define two rates, the life table rate of mortality and the crude rate of mortality.

3.2.1 The life table rate of mortality:

If θ_x deaths occur between exact ages x and x + 1 among a group of p_x lives of exact age x who remain under observation until the attainment of exact age x + 1 or who would have so remained if they had not passed out of observation by death previously, then the probability of mortality of these lives before age x + 1 is $q_x = \frac{\theta_x}{p_x}$.

The condition that all the lives remain under observation until age x + 1 is of particular importance. If some of the lives were observed only until age x + t (where t < 1), we could not tell whether any deaths among them occurred between ages x + t and x + 1. This condition expresses a fundamental principle, namely that we must not include in p_x any lives among whom deaths may have occurred without our

knowledge, nor in θ_x deaths occurring among lives who were not included in p_x. The deaths included in θ_x and the lives included in p_x must correspond exactly.

3.2.2 The Crude rate of mortality:

This is an estimate of q_x obtained direct from observational data. And in general, because any data should be regarded as a sample from a larger 'universe' of experience and that accordingly any rates calculated therefrom will be subjected to sampling errors, the estimates q_x (denoted $\overset{o}{q}_x$) progress irregularly with age and a process of graduation is used to minimise any variational sampling errors and to ensure the regular progression of mortality with age which is known to be characteristic of human life.

3.3 Factors Affecting Mortality Rates:

The risk of dying varies with a number of factors, these factors can be described as follows:

a) Age

There is a relationship between the rate of mortality and age, as can be seen from the following table (3.1). Once the new born infant has survived the hazard of the first few days of life, mortality falls rapidly and during the childhood the risk is very small. In adolescence the impact and strain of industrial life brings a rise in mortality. These and other factors lead to a continuing increase in risk of death as age

advances. At later ages the wearing out of the human frame rather than inimical qualities of the environment becomes the main cause of mortality.

Table (3.1)

Egypt Rates of Mortality Per 1000 (1973)

Age group	Males	Females
0-	171.70	160.84
1 - 4	26.42	23.62
5 - 9	3.61	2.98
10 - 14	2.90	2.07
15 - 19	2.68	1.83
20 - 24	2.67	1.59
25 - 29	2.39	1.67
30 - 34	2.75	1.85
35 - 39	3.61	2.30
40 - 49	7.76	5.92
50 - 59	26.05	17.92
60 - 69	60.28	40.06
70 - 79	111.79	90.09
80 and over	222.82	189.1

Source: United Nations, Statistical Year-book 1976, and the Annual Report of the Egyptian Central Agency For Public Mobilisation And, Statistics 1979.

Generally speaking, the progression of mortality rates with age in the developed countries tend to take the form of J-shaped curves with rates maintained at low levels until advanced ages when there is a steep upward rise. Meanwhile,

in the less developed countries, the curve of variation of mortality with age is U-shaped, with high infant mortality and relatively high mortality in childhood, causing a slower fall in the left hand side of the curve than in developed countries, and generally a heavier adult mortality causing an earlier and slower rise in the right hand side of the curve (Benjamin, B. 1974, p.11).

b) Sex

It is already known that each sex has its own pattern of mortality rates. As can be seen from the previous table, the death rates for females are lower than those for males at all ages. We may say too that, in most countries we find males with mortality rates higher than females, and an explanation may be given for this in medical terms as follows (Benjamin, B. & Haycocks, H. 1970, p.8):

1. In infancy and early childhood, boys are generally more vulnerable to some birth hazards, to infection, and to injuries, these being the principle causes of death at these ages.
2. In early and middle adult life the principle causes of death are accidents and violence, tuberculosis, heart disease and cancer and the death rates are higher in men.
3. At more advanced ages the process of physical deterioration and the lessening resistance to disease associated with general wear and tear appear to proceed faster in men.

Though the mortality of males is usually higher, these are examples of particular age groups where the mortality of males is lower than that of females especially in developing countries. Life expectancy at birth is higher for males in India and Pakistan, and was so until 1967 in Sri-Lanka (Benjamin, B. & Haycocks, H. 1974, p.11).

c) Marital Status

Marital status has a direct influence on mortality for both sexes. Generally, the marital condition has some influence on mortality - arising partly from the selective force of marriage itself, and also because the contentment and happiness of married life (as well as the protection and discipline) are favourable to well-being. For women there are some risks arising from sexual expression, pregnancy and childbirth. For example, it has long been known that carcinoma of the breast, carpus uteri and ovary is commoner among single women while carcinoma of the cervix is commoner among married women and those that have been married.

As proof of the selective force of marriage it should be noted that married women's mortality is generally lighter than that of single women (except in advanced ages) and that an exceptional rise in marriage rates as after World War II, with many "marginal" marriages of spinsters who would not normally marry, tended to increase the mortality of married women as a whole (Benjamin, B. 1965, p.42).

d) Density of Population

It is a matter of common knowledge that country life is in general more healthy than life in the towns. King tried to obtain a measure of this influence by investigating separately the mortality of the county boroughs, urban districts and rural districts and of the county of London. For both sexes, the rural districts showed the lightest mortality in nearly all age groups, while the county boroughs or the county of London usually showed the heaviest mortality (Anderson, J. & Dow, J. 1964, p. 251).

e) Geographical District

Sub-divisions on these lines were first made by Watson in his investigation of the 1921 census data (Anderson, J. & Dow, J. 1964, p. 251). He chose eleven districts which, in the light of his wide experience of such matters, seemed likely to provide fairly homogenous data so far as geographical influences were concerned. The mortality of each district was investigated separately for county boroughs, urban districts and rural districts and, of course, for each sex separately, so that a considerable number of classes were segregated. The results showed a considerable degree of difference in the mortality rates experienced by the various districts.

f) Social And Economic Factors:

Since the human body is a complex organism in a continual reaction with the environment in which it exists, and it is a matter of some difficulty to isolate those features of the environment which may have a bearing either on the inception of the fatal chain of events or on the events themselves, especially when the events observed may only be those medically recognizable in a terminal phase. The illness leading to death may occur when the person is in a social environment quite different from that which perhaps in some subtle way, has predisposed him to the observed illness. Quite apart from those factors which affect mortality and which are clearly seen to operate from outside the human body, for example, injury, exposure, infection, there are others which covertly disturb bodily function or affect bodily wear and tear such as, standard of living, medical services, hospital establishments, housing conditions and many other factors. The following table (3.2) may be useful to explain some of these relationships.

Now having discussed the factors affecting the mortality rates in general, and according to the recent Egyptian data (assured lives and sums assured experiences), it is important to regret that the researcher could not find any analysed data to classify according to classes, marital status, geographical districts and socio-economic status. Also, it is not classified or sub-divided according to sex, as there is less than 15% of the total lives assured are females.

Table (3.2)

The Per-Capita per $, Population Per bed in Hospitals, population per Physician and Crude death rate in (1975)

The Country	Per Capita Per $	Population per bed	Population per physician	Crude Death rate per 1000
Kuwait	11431	240	883	5.3
Canada	6322	108	574	7.3
U.S.A.	6294	155	617	8.9
France	5710	97	678	10.5
Japan	3856	95	845	6.4
U.K.	3664	117	761	12.2
Israel	3232	178	351	7.3
Spain	2651	190	545	7.7
Iran	1006	650	2 752	15.6
Turkey	854	476	1 755	10.8
Algeria	803	387	4 942	15.4
Jordan	457	896	2 230	14.7
Morocco	440	739	11 143	15.7
Nigeria	415	1 168	1 168	22.7
Egypt	363	476	1 148	12.4
Pakistan	308	1 903	3 262	16.5
India	175	1 465	3 961	16.9
Ethiopia	91	3 277	11 143	25.8

Source: United Nations, Statistical Year Book 1978 and United Nations Demographic Year Book 1976.

3.4 The Life (Mortality) Table

The life (mortality) table of any group is a tabulation of the probabilities of living (dying) during the year at each age of this group which perhaps being the population of a country, the class of assured lives or the class of annuitant lives. In life assurance, when attention is paid to the duration for which a member has been within the group the table is called a 'Select' table, this terminology expresses the fact that at entry assured lives are 'select' in the sense that, they have, at that time, either undergone a medical examination or they have answered satisfactorily a searching medical questionnaire. The effect of this selection is that, during the first policy year the mortality of lives aged x is much lighter than the average mortality of all assured lives at the same attained age. This mortality advantage diminishes in significance as duration increases and after a relatively short period (it is nowadays common practice to use a 'select' period of one or two years) the practical effect is negligible. For durations over this select period, rates will be according to age only and referred to as the 'ultimate' rates to indicate that these rates are experienced beyond the select period, and this part of the table is referred to as an 'Ultimate' mortality table. Also, a mortality table in which no regard is paid to period of membership in the group, such as a population table, is called an 'Aggregate' table.

3.4.1 Types of Life (Mortality) Tables

There are two principle (but not different) types of

life (mortality) tables, depending on the origin of the data used in deriving the rates of mortality (Harper, F. & Workman, L.; 1970, p. 122):

1. Tables derived from population statistics. These are generally prepared by the National Office of Vital Statistics, based upon data collected during a regular census and registered deaths.
2. Tables derived from data on insured lives. These generally represent the pooled experience of a number of life insurance companies.

3.4.2 Construction of The Life (Mortality) Table

The life table can be built up as follows:

a) The scope of the investigation must be decided, i.e. the lives to be included, the period to be covered and the subdivisions of data to be made.

b) The data must be collected, analysed and tabulated in a form suitable for calculating what are known as the crude rates of mortality q^{o}_{x}, i.e. the rates obtained direct from the data without adjustment.

c) The crude rates of mortality must be graduated.

d) Finally, by starting with any suitable radix, applying successively the relations:

$$d_x = l_x \times q_x \quad , \qquad l_{x+1} = l_x - d_x$$

and tabulating the results in two columns (the first represents the age and the second contains the rates of mortality), the mortality table will be prepared, either

for calculation of some of the many functions involving probabilities of life and death, or of monetary functions such as premiums (Anderson, J. & Dow, J. 1964, p.7).

3.5 The Egyptian Mortality Rates

The standard table of mortality used in Egypt at the present time for life assurance calculations is the A 1924-29 U. table, which was derived from the experience of assured lives in England during the period 1924-29.

The researcher aims in this research to construct an up-to-date mortality rate based on the Egyptian experience, also to build or calculate new tables which will be related more closely to the Egyptian circumstances.

Second, to prove that, the A 1924-29 U. is today out-of-date, and does not fulfil the needs of the companies from such a table.

Third, to advise the life assurance companies in Egypt to use at least the A 1949-52 U. table with some modification, if they are not going to use the new tables.

3.6 The Period of Investigation

In this research, the period chosen by the researcher is five years, from 1-1-1975 to 31-12-1979, and the reasons for this choice are:

First, Egypt has adopted a new approach to its economic development strategy by encouraging foreign investors to join with national enterprises and with private Egyptian investors in establishing projects necessary for the further growth of the economy. This open door policy started in 1974, since that day life assurance started to play a new and active role in the Egyptian economy, and the five years period chosen for this research as a period of investigation may be considered as appropriate to these new conditions.

Second, in 1973 the conflict between the Arabs and Israel ended with October War. Egypt started from that time to find a peaceful solution for this long conflict and to reach a global settlement in the Middle East. The chosen period is therefore free of war casualties.

3.7 The Unit of Investigation

There are four different units which have been suggested for investigation of life office mortality (Anderson, J. & Dow, J., 1964, p.152):

a) Lives Each life assured is included in the investigation once only, i.e. one unit is included in the exposed to risk for each full year during which the life is under observation, and one unit to θ_x in the year of death. Clearly this method gives a true rate of mortality.

b) Policies. Each policy contributes one unit to the exposed to risk for each full year that it is in force, and one

unit to θ_x in the year of death. A life who is assured under more than one policy is therefore included more than once in the exposed to risk at the appropriate ages, and similarly at the age of death. By this method we obtain a rate of discontinuance of policies by death instead of a rate of mortality.

c) Sums Assured Each policy contributes to the exposed to risk for each full year that it is in force, and to θ_x at the age of death a number of units equal to the sum assured. This gives us a rate of claim or rate of payment of unit sum assured by death.

d) Sums at Risk Each policy contributes to the exposed to risk, and to the deaths a number of units equal to the sum at risk, i.e. the difference between the sum assured and the reserve value, sometimes called the death strain. This gives what we may call a rate of strain.

In view of data available in Egypt, the units of investigation are both of policies and sums assured.

In fact, there are wide discussions about using policies as a unit of investigation. In this respect, there are two cases to be considered (Anderson, J. & Dow, J. 1964, p. 153):

1. Two or more policies effected simultaneously. Clearly, there is no theoretical advantage in using policies instead of lives as the unit in this case. It is quite a simple matter to eliminate simultaneous duplicates effected with the same office and this is usually done.

It is more troublesome to eliminate the duplicates if two or more policies are effected simultaneously with different offices.

2. Two or more policies effected at different times. The generally accepted view in this matter is that, as the ultimate table is a combination of a series of select tables, the data should be a combination of the data which would be used if the selected tables were extended indefinitely, i.e. a unit should be included for each policy, except where two or more were effected at the same time.

There is, however, an overriding practical point that the exclusion of duplicates would be a complication in data collection that would not be acceptable unless there was a strong justification for it. The inclusion of duplicate lives in insurance data increases the sampling variance of the rates. This strengthens the need for graduation, the purpose of which is to remove this variance (Benjamin, B. & Haycocks, H. 1970, p.65).

The argument in favour of using the sum assured as the unit is that mortality rates depend on the size of the policy and that, in particular, lives holding very large policies experience on the average heavier mortality than assured lives as a whole. Evidence in favour of the last statement has been adduced in America.

Generally, if mortality depends on the sum assured to an

appreciable extent, separate tables should be constructed for different ranges of sums assured, otherwise the rates of mortality would only be applicable to an office having a similar distribution of sums assured to that of the whole experience, whereas in actual fact the distribution differs very considerably between one office and another (Anderson, J. & Dow, J., 1964, p. 155).

3.8 The Data Collected

The data had been collected from the only three companies in Egypt which were dealing with life assurance in the period of investigation (1-1-1975 to 31-12-1979).

The rate interval is the calendar year, i.e. the ages at which the policies in force are tabulated or classified have been intended to be the ages last birthday at 1 January of the years of censuses, and deaths too have been classified to the ages last birthday at 1 January previous to death.

Also, the data is distributed through separate ages from the age of 10 to the age of 64.

The data concerning deaths have been collected following these guide lines:

No policies will be included in the return of deaths unless at the time of death it would have qualified for inclusion in the

'in force'. Equally, no policy becoming a death claim will be omitted from the deaths if at the time of death it was qualified for inclusion in the 'in force' unless it will belong to one of the excluded categories of death claim such as:

1. Deaths from suicide when the sum assured is not paid.
2. Deaths from any cause excluded from cover by the terms of the policy, where the sum assured is not paid.
3. Deaths claims repudiated by reason of non-disclosure of essential information on the proposal form.
4. Deaths occurring after the policy has been removed from the 'in force' register as a lapse - whether a claim payment is made or not.

The assured lives experience is sub-divided into sections according to whether the policies were with or without profits, but it is not sub-divided into sections according to whether the policies were whole life or endowment assurance, whether they were effected with or without medical examination, and whether the policies were for males or females. The reasons for these are:

1. Endowment assurance represents about 95% of the life assurance business in Egypt.
2. Females are representing less than 15% of the life assured.
3. The medical examinations are not accurate enough to depend on.

At the same time, it is important to note that the researcher could not find any analysed data to construct the

selected mortality rates for Egypt. Meanwhile, he hopes that data will be available in the future to construct these rates.

3.9 The Formula Used

Indeed, there are two related formulaes we can use, the difference formula, and the census formula. From the point of view of practical convenience to the Egyptian data which is calculated from census only, the census formula will be used.

Now, let us explain the theory of the census formula as follows (Benjamin, B. & Pollard, J.; 1980, p.50-51):

For example, let $f(x + r,t)dr$ denote the number of lives between age $x + r$ and $x + r + dr$ at time t. Then $\int_0^1 f(x + r,t)dr$ will be the number of lives aged x last birthday at time t. Denote these by $p_x(t)$ so that

$$p_x(t) = \int_0^1 f(x+r,t)dr, \qquad (3.1)$$

Consider a period of investigation 0 to T and assume that E_x^c is required in respect of this period. At any time t the population at risk for the age interval x to $x + 1$ is that population such that if a member died at time t he would be included in θ_x, the deaths during 0 to T

at age x last birthday. Obviously this population is $p_x(t)$, the lives age x last birthday at time t. At time t each life in this population will contribute an element of risk time dt to E_x^c, and hence, the total risk time for age x to age x + 1 during the period 0 to T is

$$\int_0^T p_x(t)dt = \int_0^T \int_0^1 f(x+r,t)drdt) \qquad (3.2)$$

If the order of integration is first with respect to r, we will have

$$E_x^c = \int_0^T p_x(t)dt \qquad (3.3)$$

and if $p_x(t)$ is approximately linear in t over each calendar year it follows that

$$E_x^c = \frac{1}{2} p_x(o) + \sum_1^{T-1} p_x(t) + \frac{1}{2} p_x(T) \qquad (3.4)$$

where

$$E_x = E_x^c + \frac{1}{2} \theta_x \qquad (3.5)$$

and the rate of mortality at exact age x is then given by the expression $\frac{\theta_x}{E_x}$.

To obtain E_x^c when using the calendar year as the rate interval, for example consider an experience extending over a single calendar year. Let $p_x(o)$ be the number of lives of assumed age x on 1 January and $p_{x+t}(t)$ the number

of lives under review a fraction t of a year later who were of assumed age x on 1 January. $p_{x+t}(t)$ will consist of the survivors of $p_x(o)$ increased by new entrants and decreased by deaths and withdrawals. If we assume that, for $0 \leq t \leq 1$, $p_{x+t}(t)$ is a first degree function of t, formula (3) becomes

$$E_x^c = \int_o^1 (p_x(o) - tk)dt \qquad (3.6)$$

where k is constant. This integral reduces to $\frac{1}{2}(p_x(o)+p_{x+1}(1))$, where $p_{x+1}(1)$ is the number of lives of assumed age x + 1 at the end of the year, and we have

$$q_x^o = \frac{\theta_x}{\frac{1}{2}(p_x(o) + p_{x+1}(1) + \theta_x)} \qquad (3.7)$$

To apply this formula we need only know the number of lives at the beginning and end of the year classified according to age (in this thesis - last birthday), and the number of deaths classified according to age (last birthday) at the beginning of the year. The method can be extended to cover several calendar years, in which case the number of lives at the beginning of each year classified according to age (last birthday) will be required. Thus, for an investigation covering five years, the formula is

$$q_x^o = \frac{\theta_x}{\frac{1}{2}(\sum_{r=o}^{4} p_{x+r}^{(r)} + \sum_{r=1}^{5} p_{x+r}^{(r)} + \theta_x)} \qquad (3.8)$$

In other words E_x^c can be obtained approximately if the only data available are census according to age last birthday at each 1 January, since this formula is generally known as the census formula.

The assumption that $p_{x+t}(t)$ is a first degree function implies that the net increase or decrease in the number of lives under review (i.e. the difference between the number of new entrants on the one hand and deaths and withdrawals on the other) is evenly spread over the calendar year. If there are no new entrants or withdrawals, the assumption implies an even distribution of deaths.

3.10 The Crude Mortality Rates

By using the census formula

$$q_x^o = \frac{\theta_x}{E_x^c + \frac{1}{2}\theta_x} \qquad (3.9)$$

where θ_x: the actual deaths between 1.1.1975 and 31.12.1979

$$E_x^c = \frac{1}{2}\left(\sum_{t=o}^{4} \underset{1.1.(75+t)}{p(x)} + \sum_{t=1}^{5} \underset{1.1.(75+t)}{p(x+1)}\right) \qquad (3.10)$$

Grouping the data in quinary age groups, tables (3.3), (3.4), (3.5) and (3.6) show the crude mortality rates of Egypt based on polices, sums assured without profit and policies, sums assured with profit successively.

From tables (3.3), (3.4), (3.5) and (3.6), we can see

Table (3.3)

The Crude Mortality Rates of Egypt

(policies; without profit)

Age group	Exposed to risk	Deaths	q_x^o
10 -	32033.5	23	0.000718
15 -	41212	34	0.000825
20 -	46002	42	0.000913
25 -	56642.5	55	0.000971
30 -	66545	72	0.001082
35 -	75676	98	0.001295
40 -	57494.5	137	0.002383
45 -	42064	194	0.004612
50 -	33568.5	243	0.007239
55 -	17859	206	0.011535
60 - less than 65	8109	168	0.020718
All ages	477206	1272	0.002666

Table 3.4

The Crude Mortality Rates of Egypt

(Sums Assured; Without profit)

Age group	Exposed to risk	Deaths	q_x^o
10 -	41980842	30268	0.000721
15 -	54047840	45292	0.000838
20 -	60327072	55862	0.000926
25 -	74392110	73276	0.000985
30 -	87525844	95666	0.001093
35 -	99525132	130078	0.001307
40 -	75687468	180970	0.002391
45 -	55312506	255710	0.004623
50 -	44150040	320176	0.007252
55 -	23455676	270822	0.011546
60 less than 65	10609050	219834	0.020721
All ages	627013580	1677954	0.002676

Table (3.5)

The Crude Mortality Rates of Egypt

(policies; with profits)

Age group	Exposed to risk	Deaths	q^{o}_{x}
10 -	14205	10	0.000704
15 -	16229.5	13	0.000801
20 -	18141	16	0.000882
25 -	23061	22	0.000954
30 -	29245.5	31	0.001060
35 -	32993	42	0.001273
40 -	24606	58	0.002357
45 -	18558	84	0.004526
50 -	8541.5	61	0.007142
55 -	2351.5	27	0.011482
60 less than 65	880	18	0.020454
All ages	188812	382	0.002023

Table (3.6)
The Crude Mortality Rates Of Egypt
(Sums Assured; With Profit)

Age group	Exposed to risk	Deaths	q^{o}_{x}
10 -	25313310	18100	0.000715
15 -	28920969	23512	0.000813
20 -	32363544	28934	0.000894
25 -	41186946	39622	0.000962
30 -	52232463	55940	0.001072
35 -	58991484	75746	0.001284
40 -	43970922	103992	0.002365
45 -	33200262	150662	0.004538
50 -	15289285	109426	0.007157
55 -	4218591	48496	0.011496
60 - less than 65	1585760	32456	0.020467
All ages	337273536	686886	0.002036

that the crude mortality rates based on policies and sums assured with profit are a little higher than those based on policies and sums assured without profit. In the meantime, the rates based on policies are close to those based on sums assured and the sums assured rates are a little higher for all age groups than the ones based on the policies.

The ratio of $\overset{o}{q}$ based on policies to $\overset{o}{q}$ based on sums assured in general is a little lower for age groups upto 40 than the age group above 40. The following tables (3.7) and (3.8) show this matter:

Table (3.7): Ratio of Crude Mortality Rates Based on policies to those Based on Sum Assured Without Profit

Age group	$\overset{o}{q}_x$		Ratio (1)/(2) %
	policies (1)	Sums Assured (2)	
10 -	0.001019	0.001030	98.93
40 - less than 65	0.005959	0.005963	99.93

Table (3.8): Ratio of Crude Mortality Rates Based on policies to those Based on Sums Assured with profit

Age group	$\overset{o}{q}_x$		Ratio (1)/(2) %
	policies (1)	Sums Assured (2)	
10 -	0.001001	0.001280	98.91
40 - less than 65	0.004514	0.004529	99.66

In view of this result we may say that the difference

between the sets of the crude mortality rates are very small in the older ages, i.e. $\overset{o}{q}$ based on policies and $\overset{o}{q}$ based on sums assured are very close to each other in the older ages.

3.11 Comparison of Actual and Expected Deaths by the A24-29 U. and A 49-52 U.

The standard table of mortality used in Egypt at the present time for life assurance calculation is the A 1924-29 U. table which was derived from the experience of assured lives during the period 1924-29.

The tables (3.9), (3.10), (3.11) and (3.12) show the comparison of actual and expected deaths by 1924-29U. and 1949-52 U. for both policies and sums assured without profit and with profit successively.

From these tables, it may be said that the percentage of A/E based on A49-52 U. table are higher than those based on A24-29 U. table, i.e. we can expect the Egyptian mortality tables will be very close to A49-52 U. table than A24-29 U. table.

We can summarize the above result in the following tables(3.13) and (3.14):

Table (3.9)

Comparison of Actual and Expected Deaths

by the A24-29 U. table and A49-52 U. table (policies, without profit)

Age group	Actual deaths	Expected deaths		100 A/E_1	100 A/E_2
		by the A24-29 U.	by the A49-52 U.		
	A	E_1	E_2		
10 -	23	57.02	35.56	40.34	64.68
15 -	34	106.33	45.75	31.98	74.32
20 -	42	128.81	51.06	32.61	82.26
25 -	56	158.60	64.57	35.31	86.73
30 -	72	194.31	80.52	37.05	89.42
35 -	98	281.51	115.78	34.81	84.64
40 -	137	297.82	140.86	46.00	97.26
45 -	194	314.64	188.03	61.66	103.18
50 -	243	378.15	266.53	64.26	91.17
55 -	206	317.35	239.31	64.91	86.08
60 -less than 65	168	239.34	178.72	70.19	94.00
All ages	1272	2473.88	1406.69	51.42	90.43

Table (3.10)

Comparison of Actual and Expected Deaths by the A24-29 U. table and A49-52 U. table (Sums Assured; Without profit)

Age group	Actual deaths A	Expected deaths by the A24-29 U. E_1	Expected deaths by the A49-52 U. E_2	100 A/E_1	100 A/E_2
10 -	30268	76405.13	46598.73	39.62	64.95
15 -	45292	143226.78	59993.10	31.62	75.50
20 -	55862	168915.80	66963.05	33.07	83.42
25 -	73276	208297.91	84807.01	35.18	86.40
30 -	95666	259076.50	106781.53	36.93	89.59
35 -	130078	381181.26	152273.45	34.12	85.42
40 -	180970	405684.83	185434.30	44.61	97.59
45 -	255710	429778.17	247246.90	59.50	103.42
50 -	320176	518762.97	350551.32	61.72	91.33
55 -	270822	436979.24	314306.06	61.98	86.17
60 - less than 65	219934	329304.91	233823.46	66.79	94.06
All ages	1677954	3357613.50	1848778.91	49.97	90.76

Table (3.11)

Comparison of Actual and Expected Deaths by the
A24-29 U. table and A49-52 U. table (policies; with profit)

Age group	Actual deaths	Expected deaths		100 A/E_1	100A/E_2
	A	by the 24-29 U. E_1	by the 49-52 U. E_2		
10 -	10	25.85	15.77	38.68	63.41
15 -	13	43.01	18.01	30.23	72.18
20 -	16	50.79	20.14	31.50	79.44
25 -	22	64.57	26.29	34.07	83.68
30 -	31	86.57	35.68	35.81	86.88
35 -	42	105.58	50.48	39.78	83.20
40 -	58	131.89	60.28	43.98	96.22
45 -	84	144.20	82.95	58.25	101.27
50 -	61	100.36	67.82	60.78	89.94
55 -	27	43.81	31.51	61.63	85.69
60 - less than 65	18	27.32	19.40	65.89	92.78
All ages	382	823.95	428.33	46.36	89.18

Table (3.12)

Comparison of Actual and Expected Deaths by

the A24-29 U. table and A49-52 U. table (Sums Assured;
with profit)

Age group	Actual deaths A	Expected deaths by the 24-29 U E_1	Expected deaths by the 49-52 U. E_2	100 A/E_1	100 A/E_2
10 -	18100	46070.22	28097.77	39.29	64.42
15 -	23512	76640.57	32102.28	30.68	73.24
20 -	28934	90617.92	35923.53	31.93	80.54
25 -	39622	115323.45	46953.12	34.36	84.39
30 -	55940	154608.09	63723.60	36.18	87.79
35 -	75746	225937.38	90256.97	33.53	83.92
40 -	103992	235684.14	107728.76	44.12	96.53
45 -	150662	257966.04	148405.17	58.40	101.52
50 -	109426	179549.10	121396.92	60.91	90.14
55 -	48496	78592.35	56529.12	61.71	85.79
60 - less than 65	32456	49222.00	34950.15	65.94	92.86
All ages	686886	1510311.26	766067.39	45.48	89.66

Table (3.13)

The percentage of Actual Deaths and the Expected Deaths by the A24-29 U. table for both policies and Sums Assured (without and with profit)

Age group	100 A/E			
	Policies		Sums Assured	
	without profit	with profit	Without profit	with profit
10 -	35.08	35.60	34.79	34.10
40 - less than 65	61.27	55.41	58.84	55.55
All ages	51.42	46.36	49.97	45.48

Table (3.14)

The percentage of Actual Deaths and the Expected Deaths by A49-52 U. table for both policies and sums Assured (with and without profit)

Age group	100 A/E			
	Policies		Sums Assured	
	Without profit	with profit	without profit	with profit
10 -	82.65	80.54	83.19	81.42
40 - less than 65	93.54	94.67	93.71	94.89
All ages	90.43	89.18	90.76	89.66

From the previous tables, we can see how much we do need to construct mortality rates based on our present experience and how near the crude Egyptian rates to the A49-52 U. rates than the A24-29 U. rates. Also, at this point, it will be useful to plot the Egyptian crude mortality rates against A24-29 U. rates and A49-52 U. rates to compare between their shapes.

From the following graphs, it is clear that the Egyptian's shapes are looking more similar to A49-52 U. shape than A24-29 U. shape, i.e. we can depend on A49-52 U. table as a base if we decide to graduate our new Egyptian crude rates by reference to a standard table.

3.12 Graduation

The problem of graduation arises in connection with the construction of mortality tables because a series of observed mortality rates will be found to contain irregularities which we can deal with them as random errors, underlying rates of mortality, and the adjustment procedure that reduces these random errors in the observed rates as well as smoothing them is known as graduation.

In other words, most mortality experience are samples from much larger experiences and at individual ages the deaths and the rates derived therefrom are thus subject to sampling error. These errors (deviations from the true underlying rates) may be assumed to be random and to fluctuate from age to age both in size and sign. It would be possible to calculate the confidence intervals for any specified probability level and to portray the progression of age rates of mortality not in linear form but as

Figure 3.1 Mortality Rates for A24-29 U.

Figure 3.2 Mortality Rates
for A49-52 U.

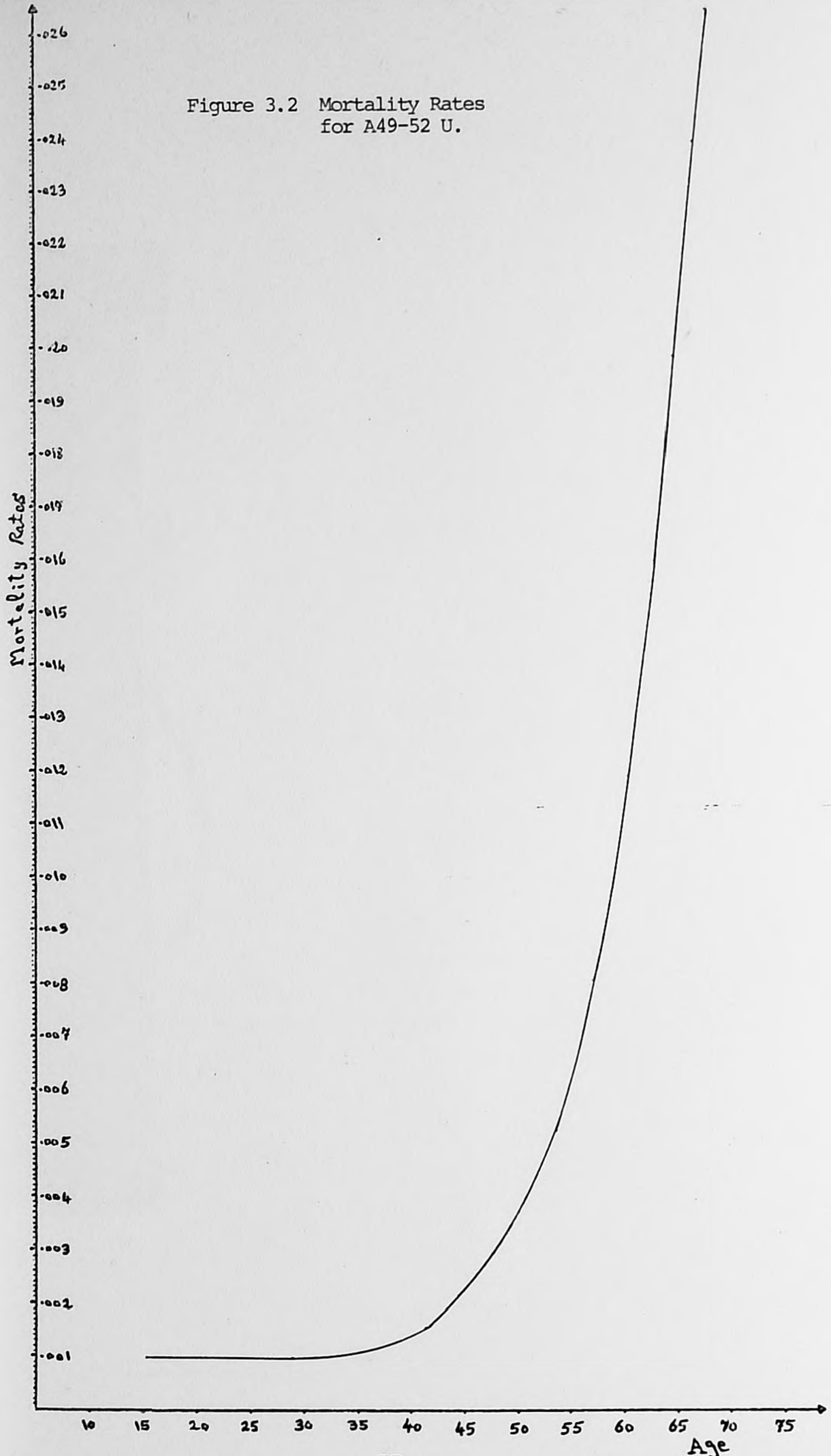


Figure 3.3 The Crude Mortality Rates of Egypt
(policies; without profit)

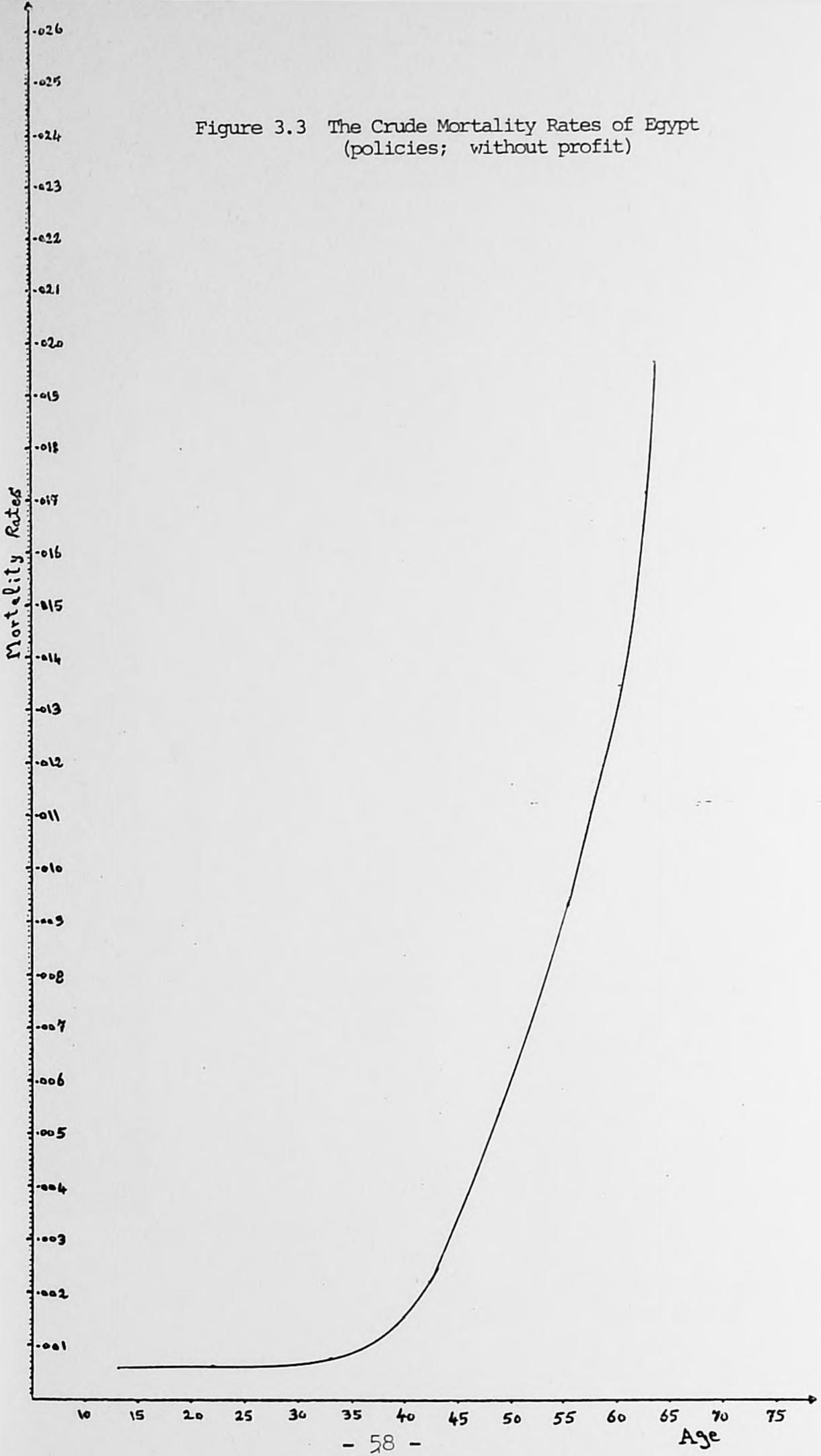


Figure 3.4 The Crude Mortality Rates of Egypt (policies; without profit) and Mortality Rates for A24-29 U.

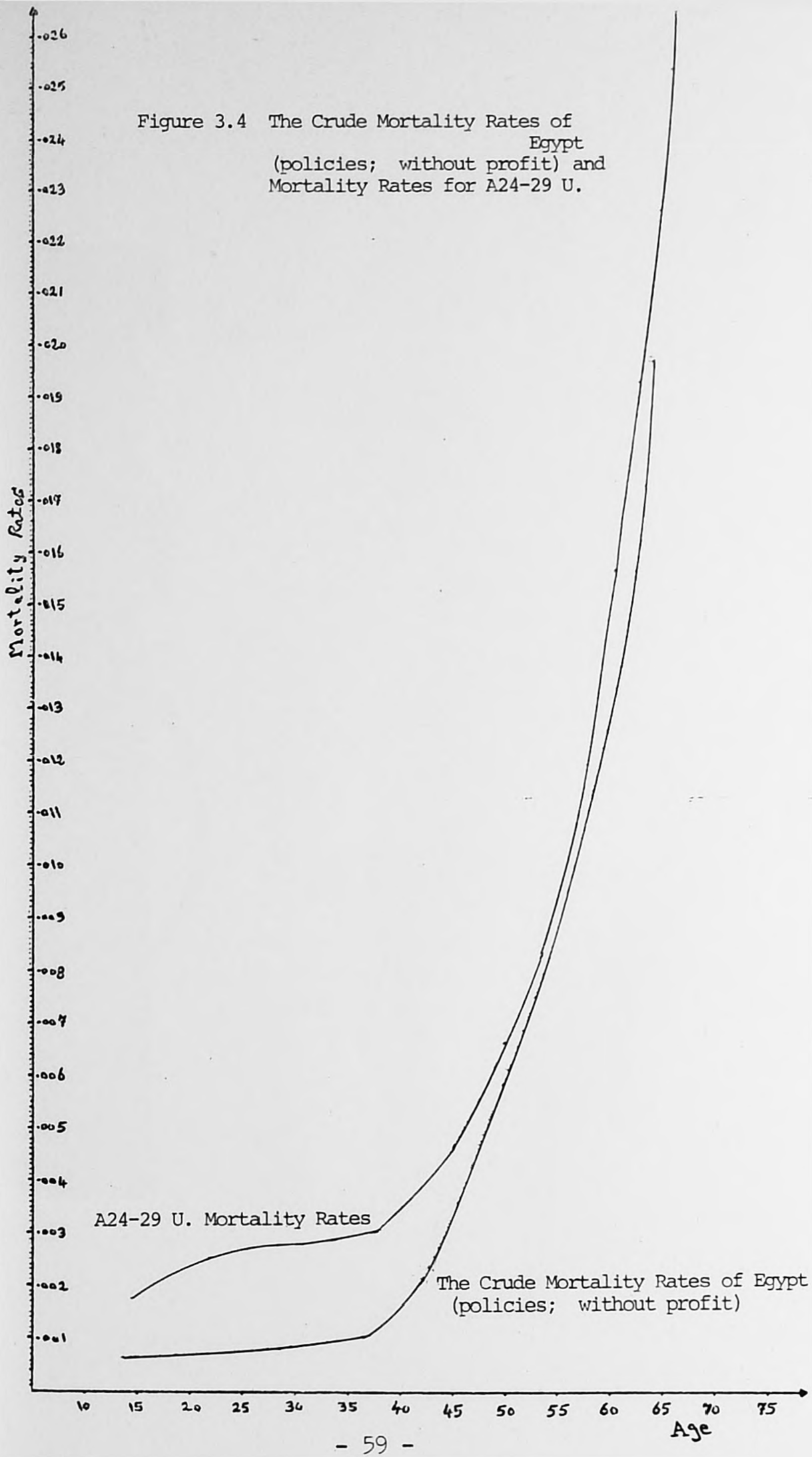
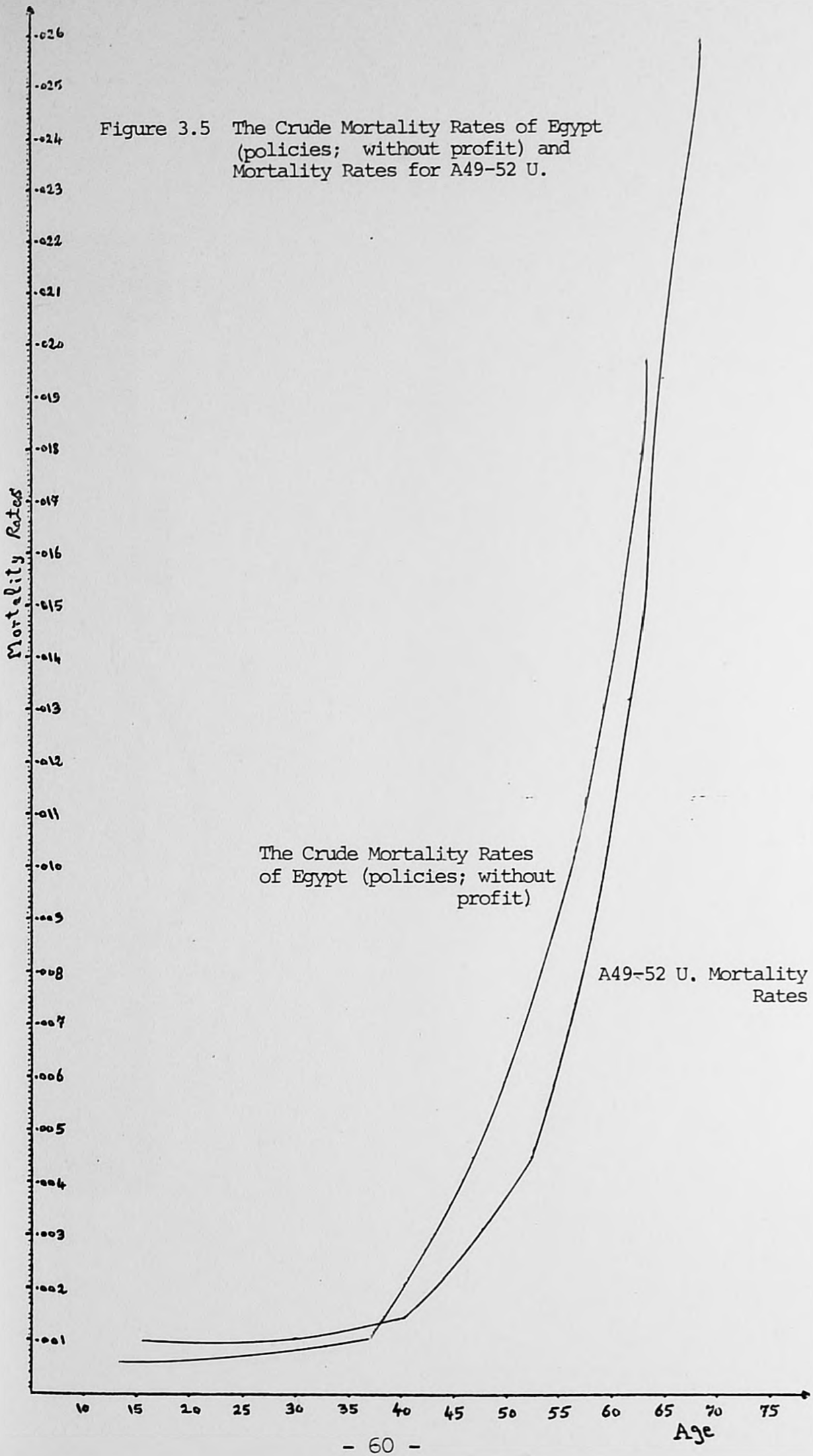


Figure 3.5 The Crude Mortality Rates of Egypt (policies; without profit) and Mortality Rates for A49-52 U.



3.6 The Crude Mortality Rates of Egypt

(Sums Assured; without profit)

Figure 3.7 The Crude Mortality Rates of Egypt
(Sums Assured; without profit)
and Mortality Rates for A24-29 U.

Figure 3.8 The Crude Mortality Rates of Egypt (Sums Assured; without profit) and Mortality Rates for A49-52 U.

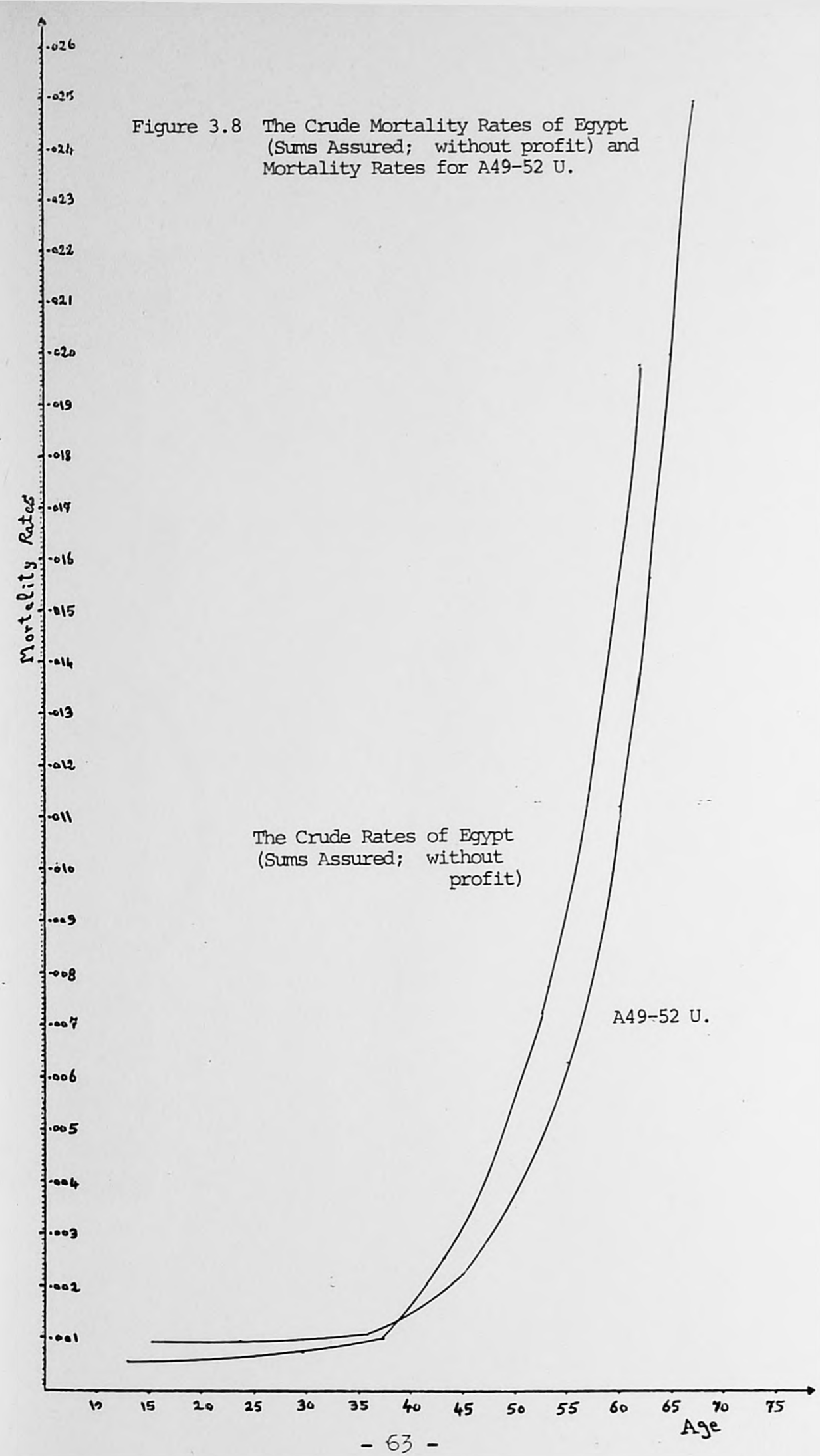


Figure 3.9 The Crude Mortality Rates of Egypt (policies; with profit)

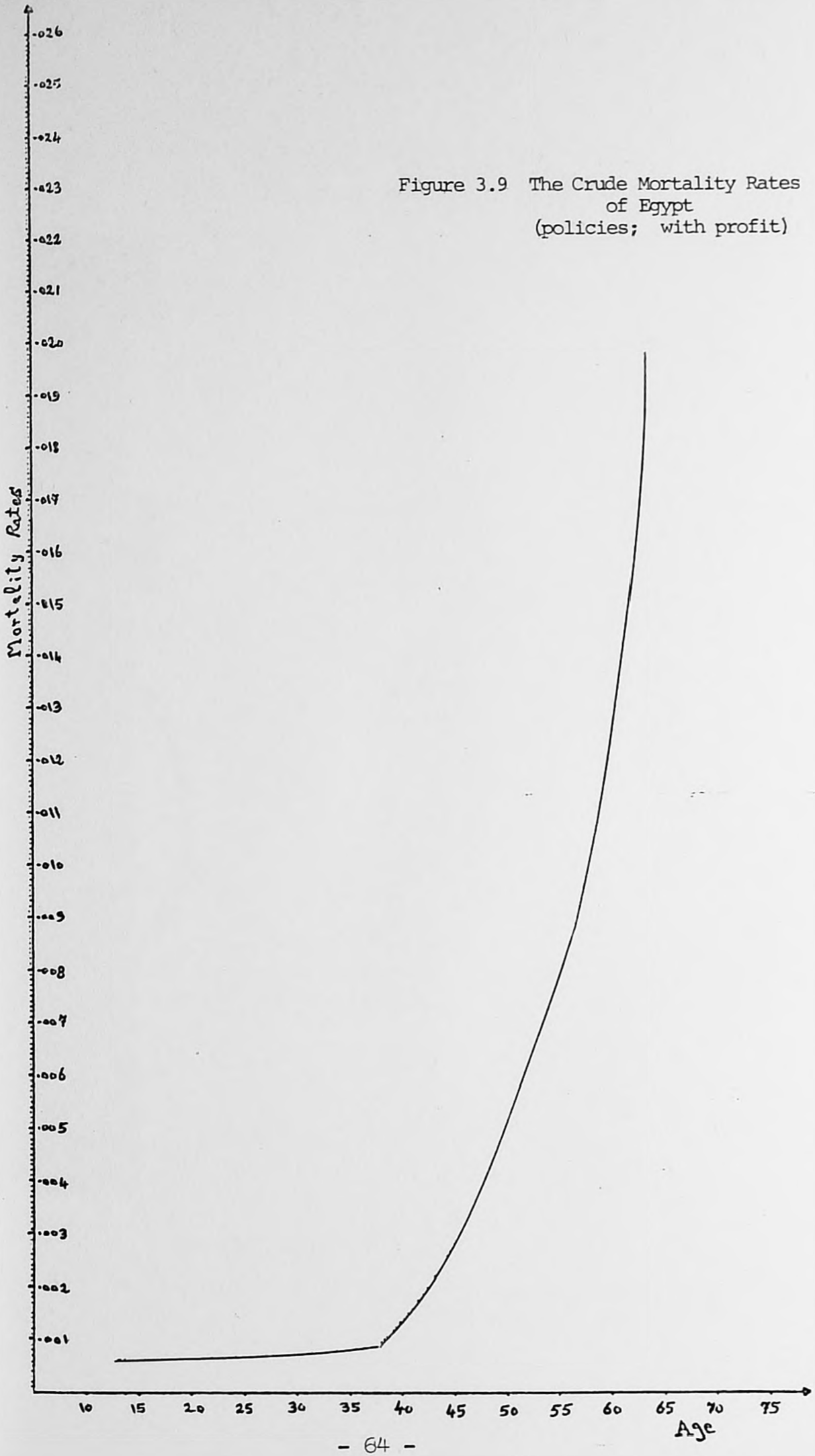


Figure 3.10 The Crude Mortality Rates of Egypt (policies; with profit) and Mortality Rates for A24-29 U.

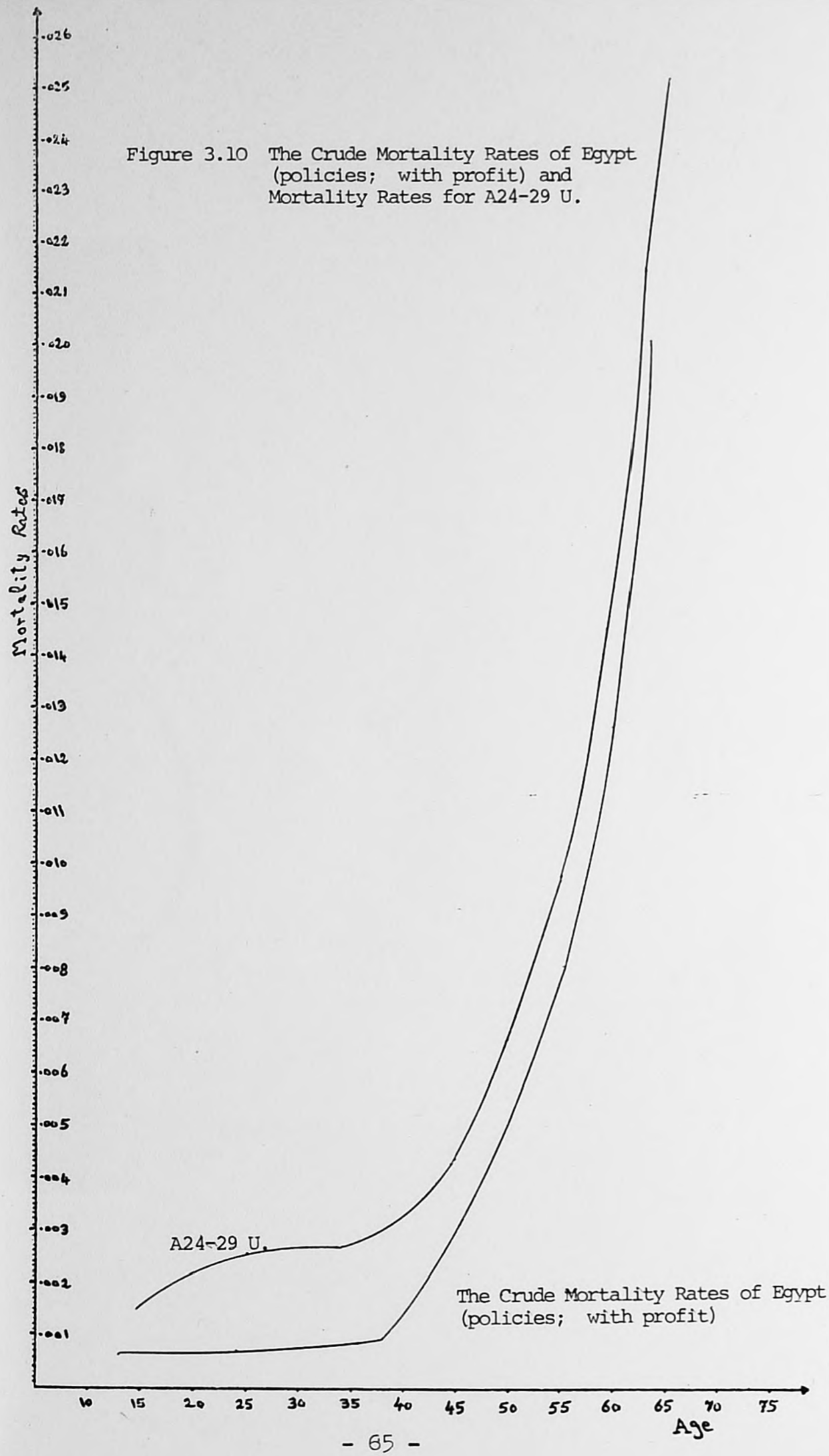


Figure 3.11 The Crude Mortality Rates of Egypt (policies; with profit) and Mortality Rates for A49-52 U.

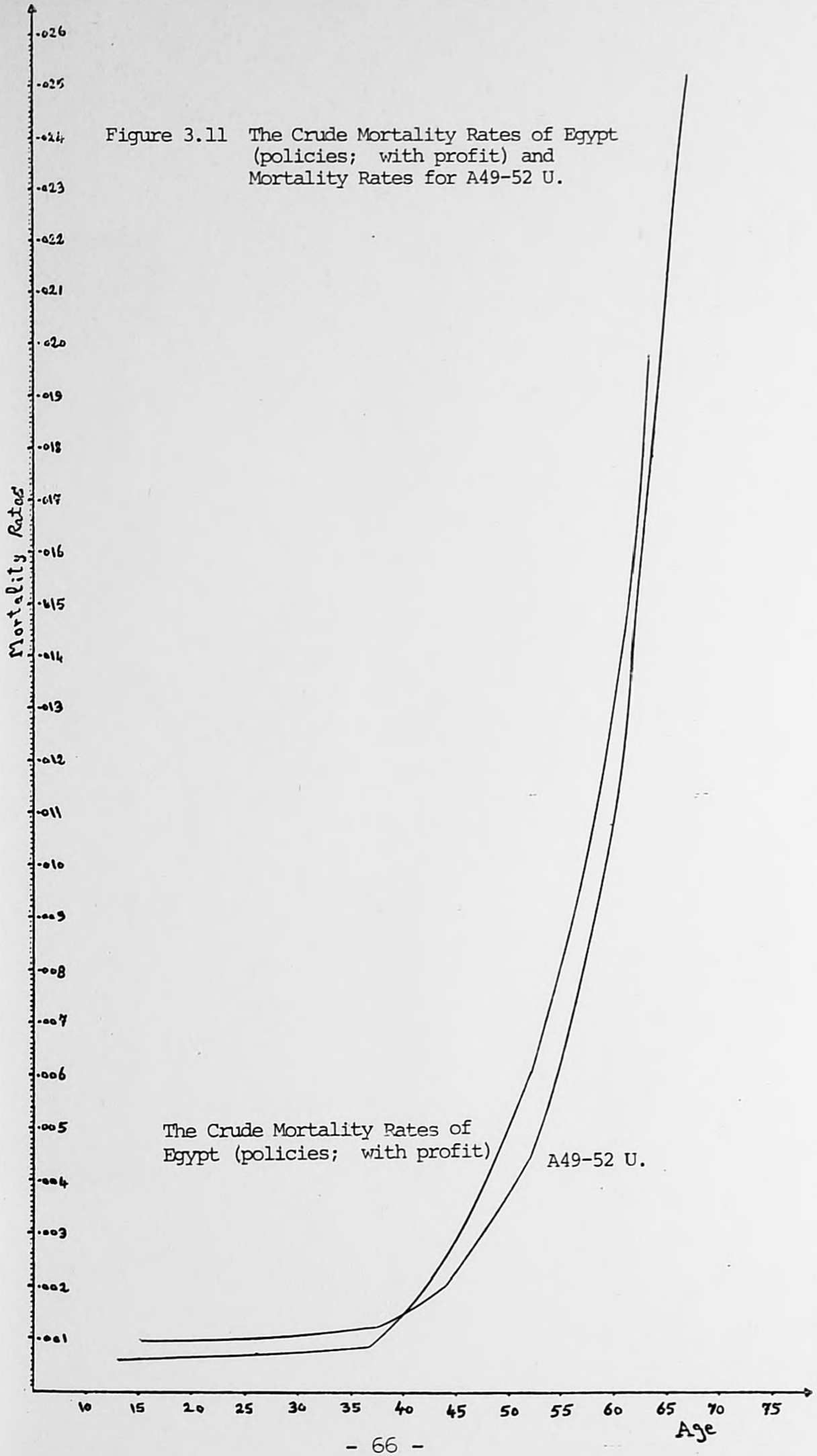


Figure 3.12 The Crude Mortality of Egypt
(Sums Assured; with profit)

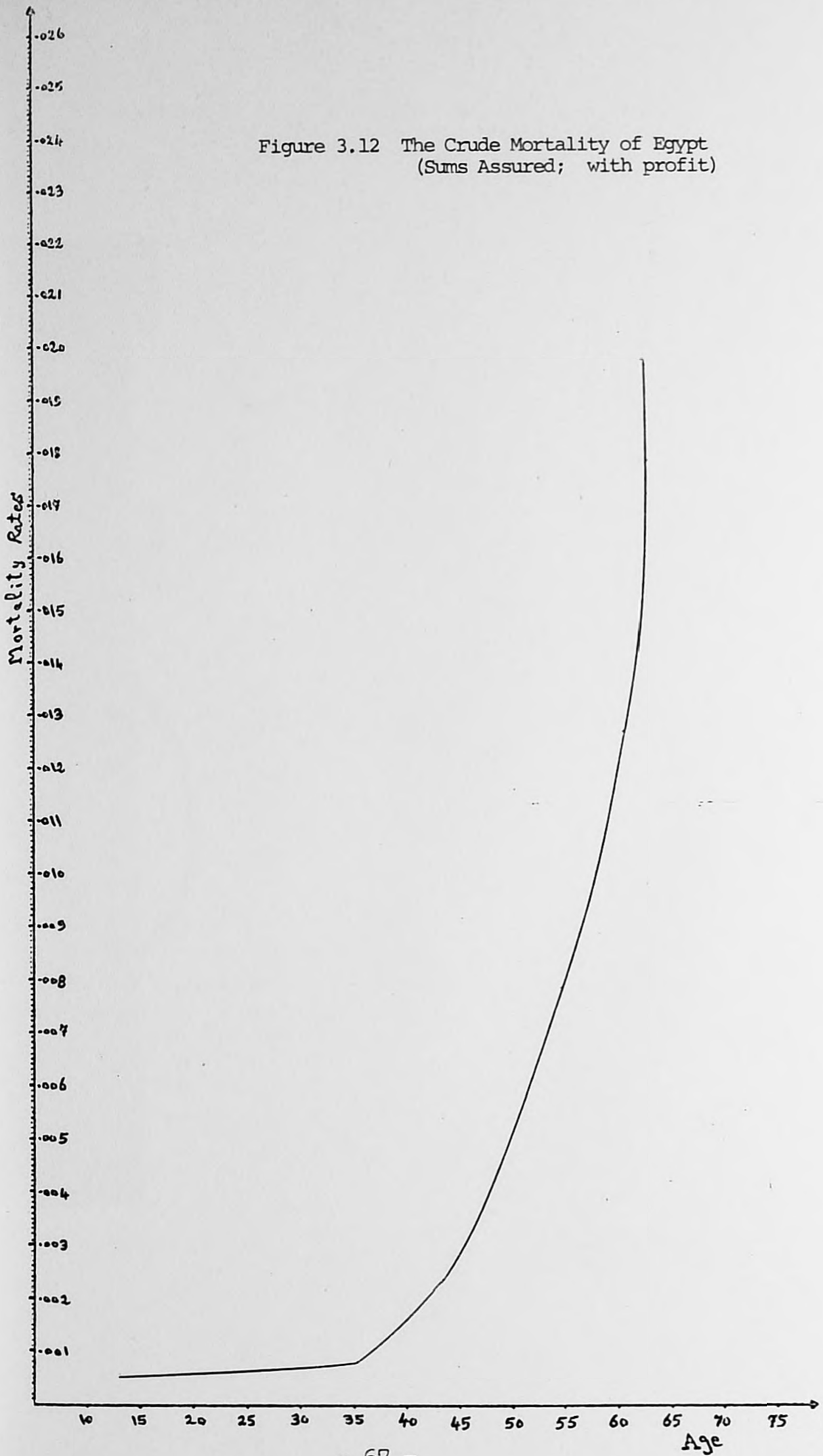


Figure 3.13 The Crude Mortality Rates of Egypt (Sums Assured; with profit) and Mortality Rates for A24-29 U.

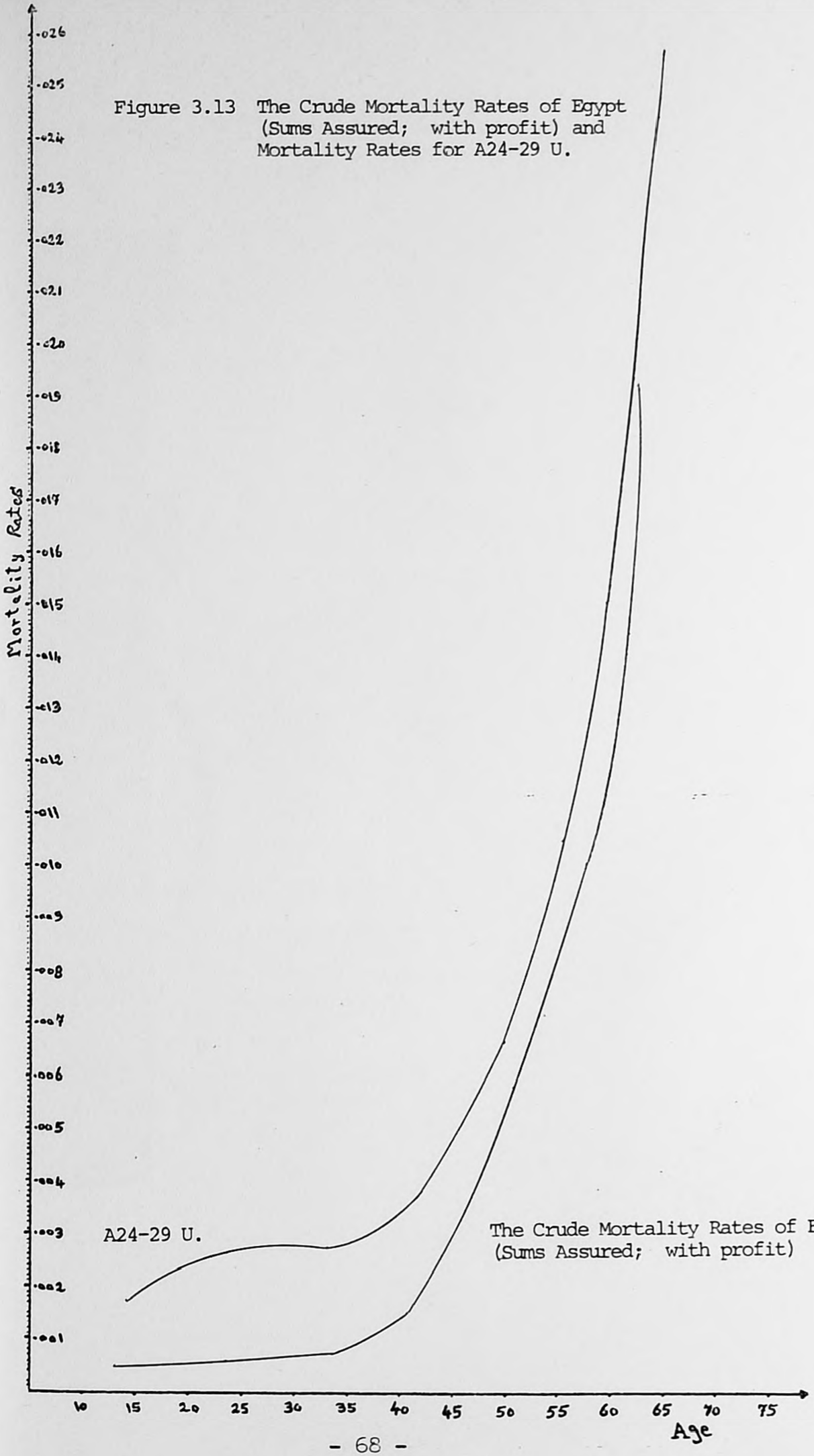
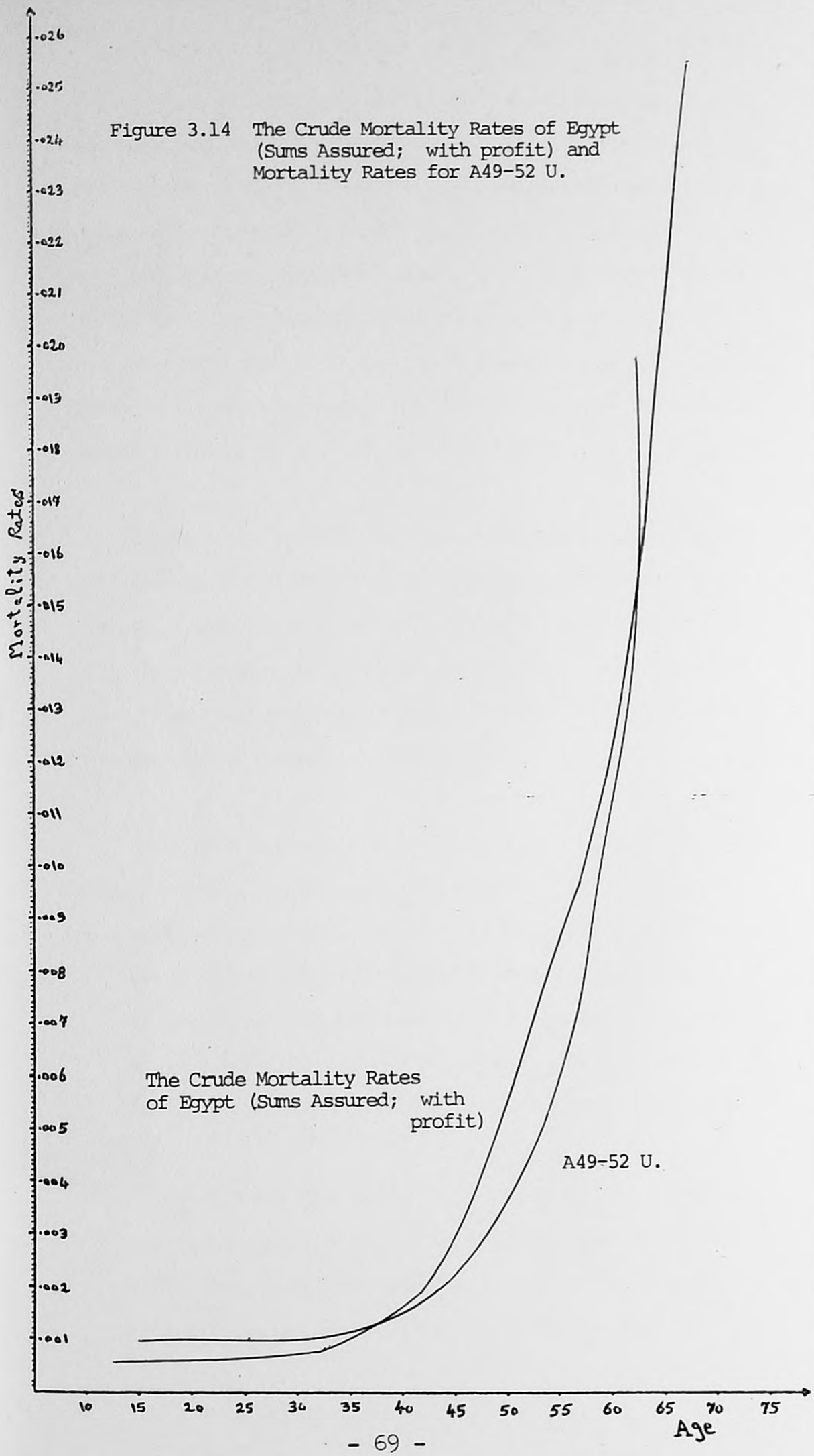


Figure 3.14 The Crude Mortality Rates of Egypt (Sums Assured; with profit) and Mortality Rates for A49-52 U.



a band, i.e. an area between two lines connecting respectively the upper and lower bounds of the confidence intervals. These could not be of any practical value to actuarial calculations which require the application at any age of a specific rate of mortality and not a range of rates. It is necessary, therefore, to estimate within the confidence interval the true rate at each age. In doing so we can obtain some help from the observed rates at neighbouring ages. This is what is meant by graduation (Benjamin, B. & Haycocks, H. 1970, p.32-33).

In the course of time the term 'graduation' has been both extended and narrowed in its application, according to the particular interests of different writers. Our concern is mainly with the principles and methods of adjusting a set of observed rates to provide a suitable basis for actuarial calculations (Benjamin, B. & Pollard, J. 1980, p.239).

Generally, there are three main types of graduation processes (Benjamin, B. & Pollard, J., 1980, p.30):

1. The graphical method, in which a hyperthetical curve is drawn, by inspection, through the area bounded by the confidence intervals. There is clearly, and may rightly be, an element of subjective judgement. Use is made of experience as to what a curve of death rates should look like.
2. Finite difference methods, which depend on the principle that the standard error of the weighted mean of two or more independent (or imperfectly correlated) random errors is less than the sum of the correspondingly weighted

individual standard errors. This is the well-known process of moving averages employed extensively in time series analysis.

3. Curve fitting methods which are based on the assumption that the underlying values have a particular mathematical form, the parameters of which may be estimated from the observed values.

3.13 The Preliminary Tests for A Gompertz of Makeham Graduation (Benjamin, B. & Pollard, H.; 1980, p.299):

The first important contribution towards finding a mathematical formula or a 'law of mortality' (as it was then called) was made by Benjamin Gompertz (1825), who argued on physiological grounds that the intensity of mortality gained equal proportions in equal intervals of age. The force of mortality μ_x would then be represented by the formula Bc^x.

A development of Gompertz's law was subsequently made by Makeham (1860), who adapted the formula

$$\mu_x \text{ or } q_x = A + Bc^x \qquad (3.11)$$

Makeham introduced the constant A as well as the exponentially increasing component of the force of mortality to reflect the division of causes of death into two kinds, those due to the chance and those due to deterioration.

When Gompertz's law holds

$$- \log(- \log p_x) = - \log(- \log(1-q_x) = \log \frac{\log c}{B(c-1)} - x\log c \quad (3.12)$$

And the graph of this function is a straight line, i.e. if the points suggest a straight line fit, estimates of c and B can be obtained by sketching the line and noting its slope and y - intercept:

$$\hat{c} = \exp(- \text{slope}) \quad (3.13)$$

$$\hat{B} = \frac{\log\hat{c}}{(\hat{c}-1)} \exp(- \text{intercept}) \quad (3.14)$$

Graduated survival (or mortality) rates can then be calculated by means of the formula

$$\hat{p}_x = 1-\hat{q}_x = \exp\left[- \frac{\hat{B}(\hat{c}-1)}{\log \hat{c}} \hat{c}^x \right] \quad (3.15)$$

It is also helpful to include confidence limits in the diagram. If we denote the approximate 95 per cent upper and lower limits of q_x by q_x^U and q_x^L

$$\text{i.e. } q_x^U = q_x^o + \frac{2\sqrt{\theta_x}}{E_x} \quad (3.16)$$

$$\text{and } q_x^L = q_x^o - \frac{2\sqrt{\theta_x}}{E_x} \quad (3.17)$$

and the limits of $- \log\left[- \log (1-q_x)\right]$ for inclusion in the diagram are

$$\left.\begin{aligned} & - \log\left[- \log(1-q_x^U)\right] \\ \text{and} \quad & - \log\left[- \log(1-q_x^L)\right] \end{aligned}\right\} \quad (3.18)$$

In the same time, the constant A in a Makeham graduation is always small and positive. At the higher ages it is swamped by the exponential term Bc^x. If, after a preliminary examination of the values $\left\{- \log \left[-\log (1-q_x^{U}) \right] \right\}$, an attempt at a Makeham graduation appears justified, estimates of the constants A,B and C can be obtained by the following graphical approach:

1. Draw a smooth curve to graduate the values $\left\{ - \log \left[- \log (1-q_x^{o}) \right] \right\}$.
2. Draw a line representing the asymptotic straight line.
3. Estimate B and c from the straight line, using equations (3.13) and (3.14).
4. Note the height Y_G of the straight line and the height Y_M of the graduating curve at a representative younger age in the experience, and compute the following estimate of A:

$$A = \exp (- Y_M) - \exp (- Y_G) \qquad (3.19$$

Graduated survival rates can then be calculated, using the formula

$$1 - \overset{o}{q}_x = \overset{o}{p}_x = \exp \left[- A - \frac{\hat{B}(\hat{c}-1)}{\log \hat{c}} \hat{c}^x \right] \qquad (3.20)$$

Now, we begin by plotting in the following four figures (3.15), (3.16), (3.17) and (3.18) the values $- \log \left[- \log (1-\overset{o}{q}_x) \right]$. Also a series of straight lines are drawn connecting consecutive pairs of upper limit points and another series are drawn connecting the lower limit points,

Table (3.15)

The values $-\log\left[-\log(1-q^{o}_{x})\right]$ and their Confidence Limits (Policies; Without Profit)

Age group	Exposed to risk	Deaths	q^{o}_{x}	q^{U}_{x}	q^{L}_{x}	$-\log\left[-\log(1-q^{o}_{x})\right]$		
						q^{o}_{x}	q^{U}_{x}	q^{L}_{x}
10 -	32033.5	23	0.000718	0.001017	0.000419	3.51	3.35	3.74
15 -	41212	34	0.000825	0.001108	0.000542	3.45	3.32	3.63
20 -	46002	42	0.000913	0.001195	0.000631	3.40	3.28	3.56
25 -	56642.5	55	0.000971	0.001233	0.000709	3.37	3.27	3.51
30 -	66545	72	0.001082	0.001337	0.000827	3.33	3.24	3.44
35 -	75676	98	0.001295	0.001557	0.001033	3.25	3.17	3.35
40 -	57494.5	137	0.002383	0.002790	0.001976	2.98	2.92	3.07
45 -	42064	194	0.004612	0.005274	0.003950	2.70	2.64	2.76
50 -	33568.5	243	0.007239	0.008168	0.006310	2.50	2.44	2.56
55 -	17859	206	0.0011535	0.013142	0.009928	2.30	2.24	2.36
60 - 64	8109	168	0.020718	0.023914	0.017521	2.04	1.98	2.11
All ages	477206	1272	0.002666	-	-	-	-	-

Table (3.16)

The values $-\log\left[-\log(1-q^{o}_{x})\right]$ and their Confidence Limits (Sums Assured; Without Profit)

Age group	Exposed to risk	Deaths	q^{o}_{x}	q^{U}_{x}	q^{L}_{x}	$-\log\left[-\log(1-q^{o}_{x})\right]$		
						q^{o}_{x}	q^{U}_{x}	q^{L}_{x}
10 -	41980842	30268	0.000721	0.000729	0.000713	3.51	3.47	3.56
15 -	54047840	45292	.000838	0.000846	0.000830	3.44	3.41	3.49
20 -	60327072	55862	.000926	0.000934	0.000918	3.40	3.38	3.42
25 -	74392110	73276	.000985	0.000992	0.000978	3.38	3.34	3.41
30 -	87525844	95666	.001093	0.001100	0.001086	3.32	3.30	3.36
35 -	99525132	130078	.001307	0.001314	0.001299	3.25	3.23	3.27
40 -	75687468	180970	.002391	0.002402	0.002380	2.95	2.92	2.99
45 -	55312506	255710	.004623	0.004641	0.004605	2.74	2.69	2.82
50 -	44150040	320176	.007252	0.007278	0.007226	2.52	2.49	2.56
55 -	23455676	270822	.011546	0.011590	0.011502	2.30	2.23	2.37
60 - 64	10609050	219834	.020721	0.020809	0.020633	2.02	2.01	2.07
All ages	627013580	1677954	0.002676	-	-	-	-	-

Table (3.17)

The Values - log $\left[-\log(1-q^{o}_{x})\right]$ and Their Confidence Limits (Policies; With Profit)

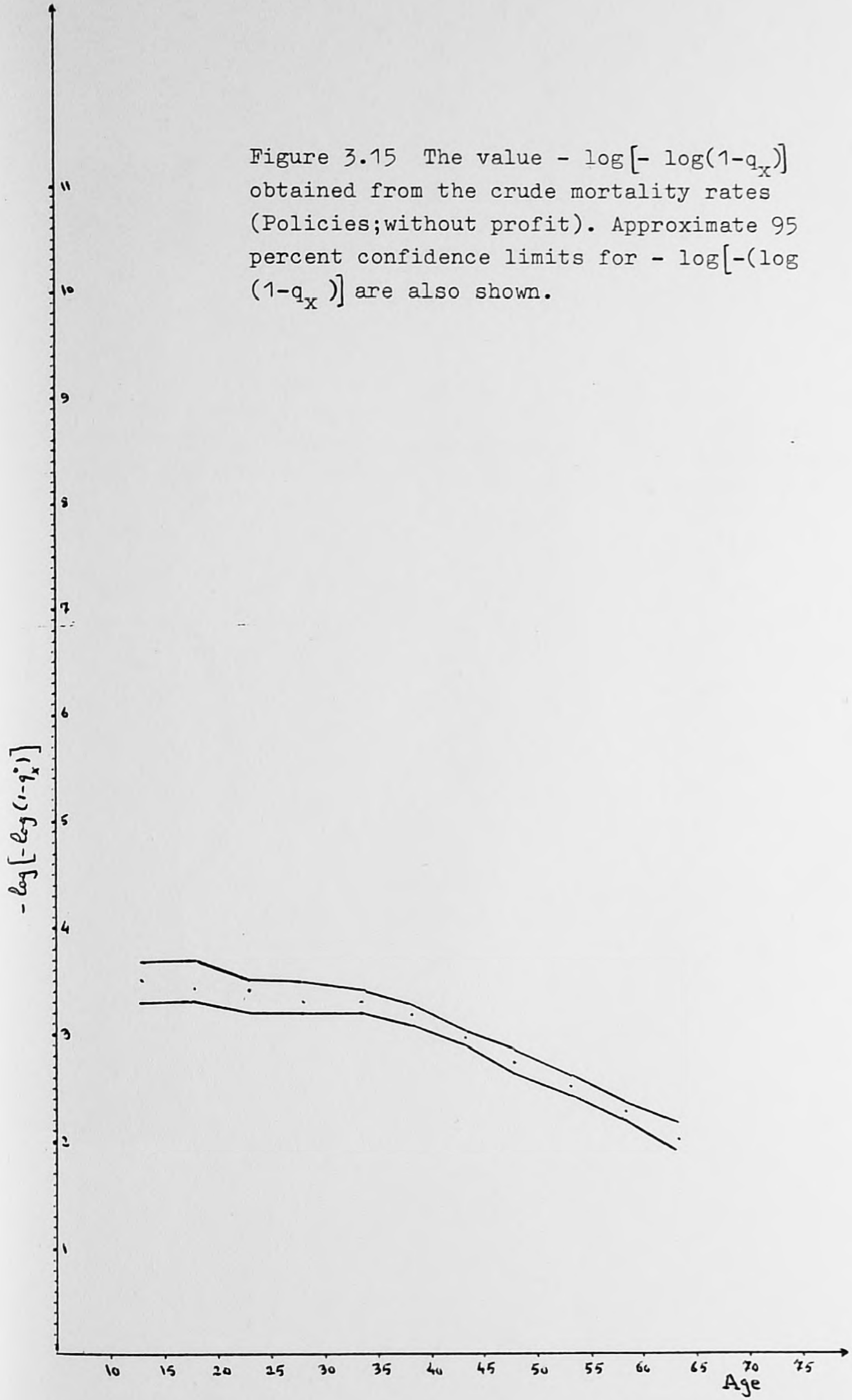
Age group	Exposed to risk	Deaths	q^{o}_{x}	q^{U}_{x}	q^{L}_{x}	$-\log\left[-\log(1-q^{o}_{x})\right]$		
						q^{o}_{x}	q^{U}_{x}	q^{L}_{x}
10 -	14205	10	0.000704	0.001149	.000259	3.51	3.30	3.95
15 -	16229.5	13	0.000801	0.001245	.000357	3.46	3.27	3.81
20 -	18141	16	0.000882	0.001322	.000441	3.42	3.24	3.72
25 -	23061	22	0.000954	.001361	.000547	3.38	3.23	3.62
30 -	29245.5	31	0.001060	.001441	.000679	3.34	3.20	3.53
35 -	32993	42	0.001273	.001666	.000880	3.26	3.14	3.42
40 -	24606	58	0.002357	.002976	.001738	2.99	2.89	3.12
45 -	18558	84	0.004526	.005514	.003538	2.71	2.62	2.81
50 -	8541.5	61	0.007142	.008971	.005313	2.51	2.41	2.64
55 -	2351.5	27	0.011482	.015901	.007063	2.30	2.16	2.57
60-64	880	18	0.020454	.030096	.010812	2.05	1.49	2.33
All ages	188812	382	0.002023	-	-	-	-	-

Table (3.18)

The Values - $\log\left[-\log(1-q^{o}_{x})\right]$ and Their Confidence Limits (Sums Assured; With Profit)

Age group	Exposed to risk	Deaths	q^{o}_{x}	q^{U}_{x}	q^{L}_{x}	$-\log\left[-\log(1-q^{o}_{x})\right]$		
						q^{o}_{x}	q^{U}_{x}	q^{L}_{x}
10 -	25313310	18100	0.000715	.000725	.000704	3.51	3.49	3.53
15 -	28920969	23512	0.000813	.000824	.000802	3.46	3.44	3.49
20 -	32363544	28934	0.000894	.000905	.000883	3.41	3.40	3.44
25 -	41186946	39622	0.000962	.000972	.000952	3.38	3.35	3.41
30 -	52232463	55940	0.001071	.001080	.001062	3.35	3.32	3.38
35 -	58991484	75746	0.001284	.001293	.001275	3.27	3.24	3.31
40 -	43970922	103992	0.002365	.002380	.002350	2.99	2.92	3.12
45 -	33200262	150662	0.004538	.004561	.004515	2.75	2.70	2.83
50 -	15289285	109426	0.007157	.007200	.007114	2.59	2.50	2.63
55 -	4218591	48496	0.011496	.011600	.011392	2.30	2.27	2.39
60 - 64	1585760	32456	0.020467	.020694	.020240	2.05	2.02	2.10
All ages	337273536	686886	0.002036	-	-	-	-	-

Figure 3.15 The value - log[- log(1-q_x)] obtained from the crude mortality rates (Policies;without profit). Approximate 95 percent confidence limits for - log[-(log (1-q_x)] are also shown.



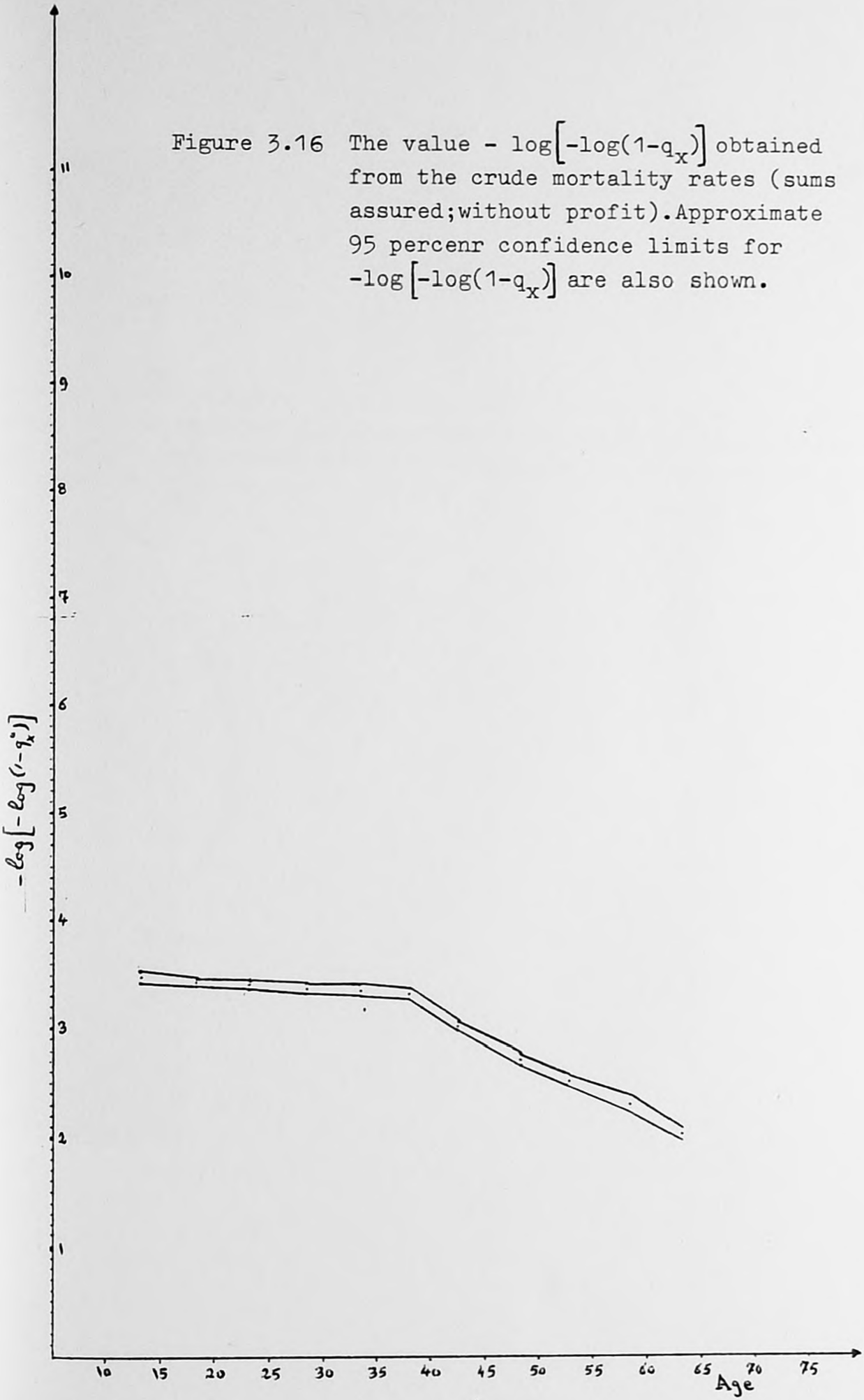
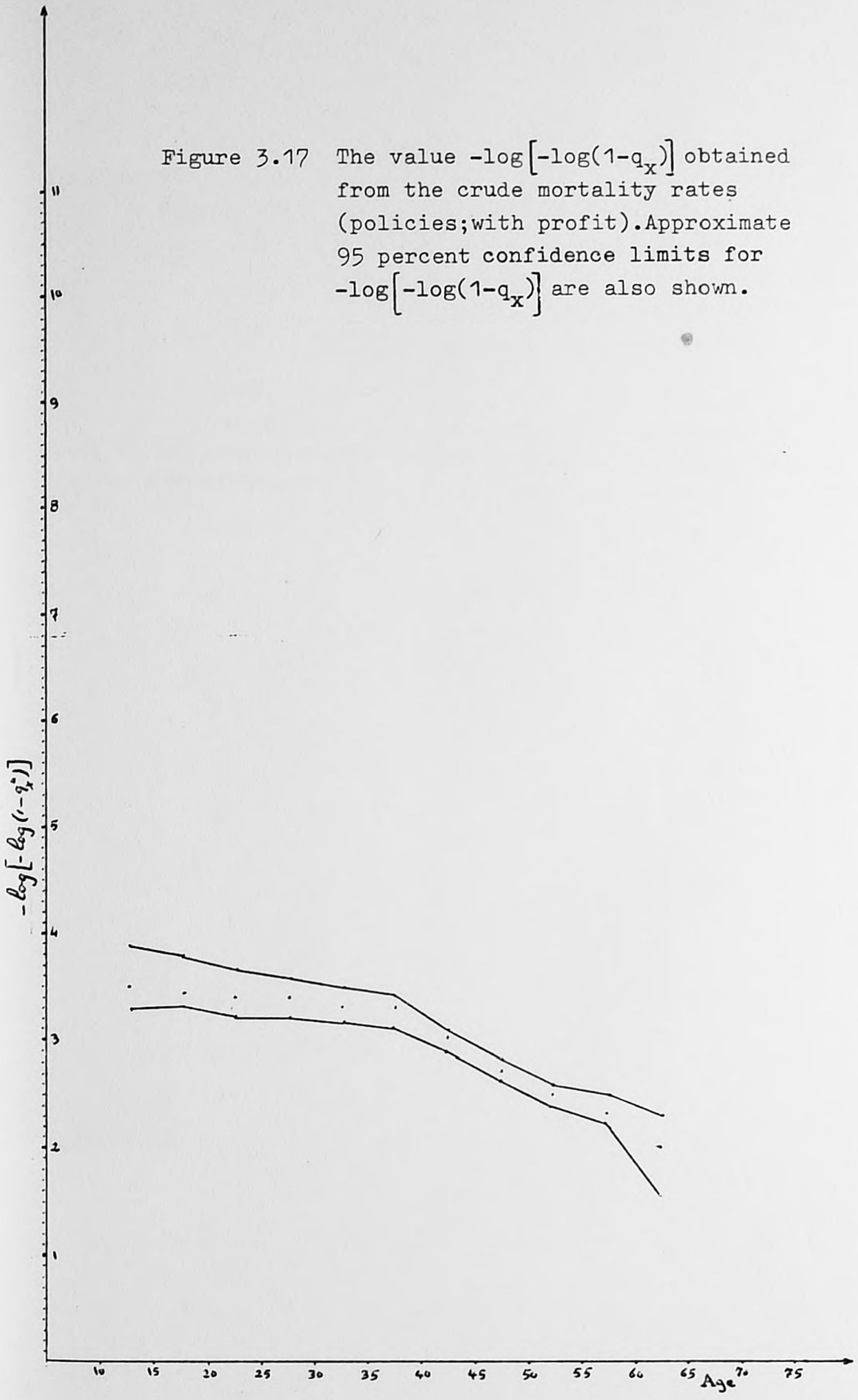


Figure 3.16 The value - $\log\left[-\log(1-q_x)\right]$ obtained from the crude mortality rates (sums assured;without profit).Approximate 95 percenr confidence limits for $-\log\left[-\log(1-q_x)\right]$ are also shown.

Figure 3.17 The value $-\log\left[-\log(1-q_x)\right]$ obtained from the crude mortality rates (policies;with profit).Approximate 95 percent confidence limits for $-\log\left[-\log(1-q_x)\right]$ are also shown.



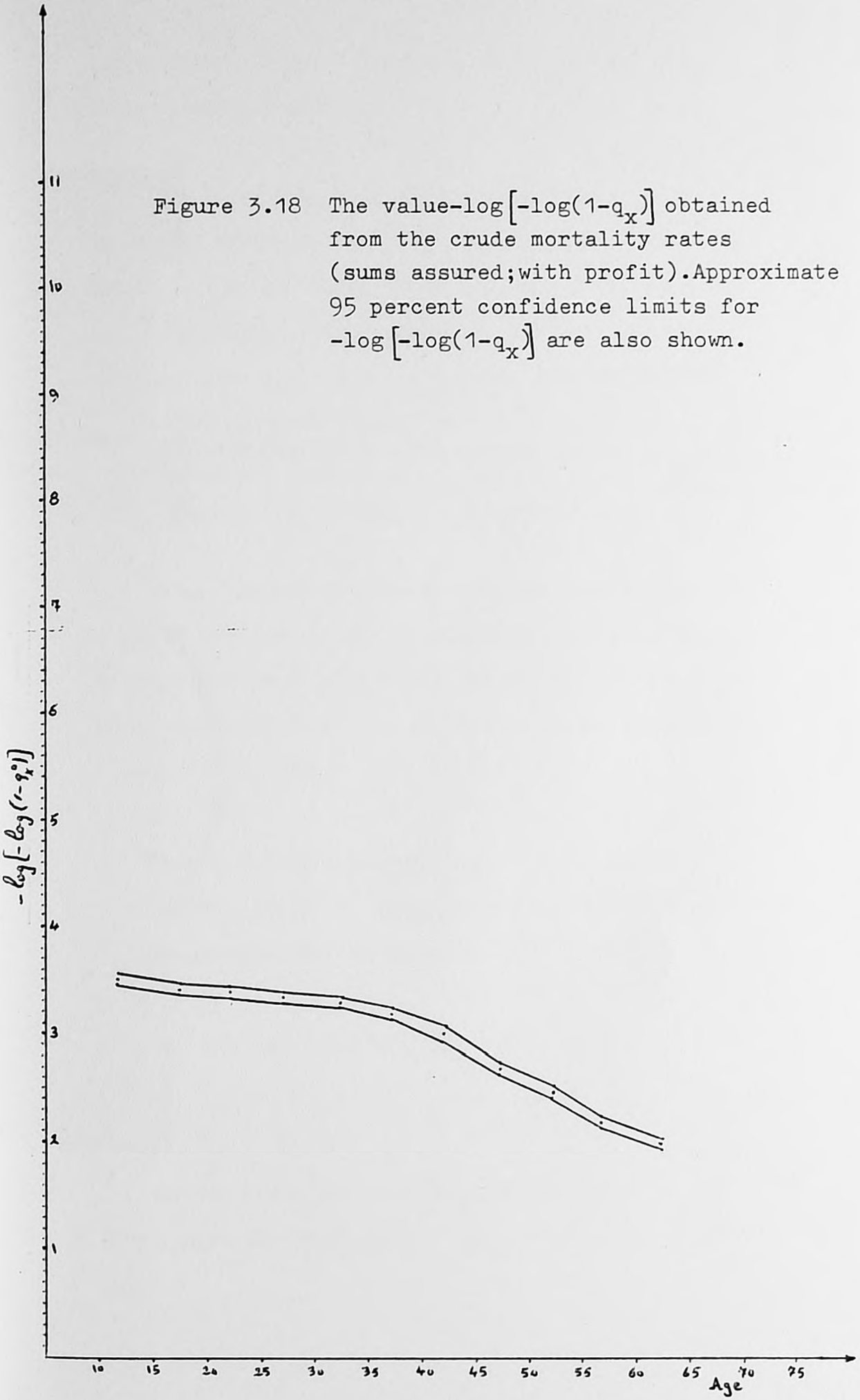


Figure 3.18 The value-$\log\left[-\log(1-q_x)\right]$ obtained from the crude mortality rates (sums assured;with profit).Approximate 95 percent confidence limits for $-\log\left[-\log(1-q_x)\right]$ are also shown.

tables (3.15), (3.16), (3.17) and (3.18) are calculating these values successfully.

It is very clear from the previous figures that we cannot fit reasonable straight lines inside the confidence limits on the four graphs (3.15), (3.16), (3.17) and (3.18), i.e. Gompertz or Makeham graduations are not likely to prove in those cases and we must try another approach or method to graduate our crude rates.

3.14 Graduation by Reference to a Standard Table

Where the data are scanty, but are known to come from an experience similar to that for which a standard (graduated) table already exists, it may be possible to use this standard table as a 'base curve' for graduating the new data (Benjamin, B. & Haycocks, H. 1970, p.308).

This method of graduation depends on establishing a relationship between q^1_x (the rate derived from the data) and q^s_x (the rate is obtained from the standard table).

The simplest formulae which might be used:

$$q^1_x = a\, q^s_x + b \text{ (if } b = 0 \text{ this becomes } q^1_x/q^s_x = \text{constant}). \quad (3.21)$$

For obtaining the constants a and b:
if we assume for every age that $q^1_x = a\, q^s_x + b$, it follows that

$$
\left.
\begin{aligned}
E_x q^1_x &= a\, E_x q^s_x + b E_x \\
\Sigma\, E_x\, q^1_x &= a \Sigma E_x q^s_x + b\, \Sigma E_x \\
\text{and}\quad \Sigma^2\, E_x\, q^1_x &= a\, \Sigma^2 E_x\, q^s_x + b\, \Sigma^2\, E_x
\end{aligned}
\right\} \qquad (3.22)
$$

$E_x q^1_x$ is merely the actual deaths observed at age x, while $E_x q^s_x$ is the expected deaths according to the standard table.

When the data are grouped and E_x is not available for individual ages the expected deaths are usually calculated by using q_x for the central age of the group. The slight error thus introduced is not a serious matter when the data are scanty and sampling errors are therefore considerable (Benjamin, B. & Haycocks, H. ; 1970, p.309).

The above method of graduation which is particularly valuable when the data are scanty will be used to graduate the Egyptian mortality rates.

Meanwhile, we can consider the A 1949-52 Ultimate as a reasonable standard table, since we already proved that in our comparisons.

By using the above mentioned method, we can say that:

$$
q^1_x \text{ (graduated)} = a\, q^s_x \text{ (the A49-52U)} + b \qquad (3.23)
$$

where a and b are constants.

Table (3.19)

Graduated Mortality Rates (policies, without profit)

Age	q_x	Age	q_x
10	0.000905	30	0.000953
11	0.000905	31	0.000972
12	0.000905	32	0.000991
13	0.000905	33	0.001020
14	0.000905	34	0.001058
15	0.000905	35	0.001105
16	0.000905	36	0.001172
17	0.000905	37	0.001248
18	0.000905	38	0.001353
19	0.000905	39	0.001477
20	0.000905	40	0.001638
21	0.000905	41	0.001829
22	0.000905	42	0.002048
23	0.000915	43	0.002314
24	0.000915	44	0.002628
25	0.000915	45	0.002990
26	0.000925	46	0.003390
27	0.000925	47	0.003846
28	0.000934	48	0.004360
29	0.000944	49	0.004932

Table (3.19)
continued

Age	q_x
50	0.005550
51	0.006235
52	0.006987
53	0.007815
54	0.008710
55	0.009700
56	0.010775
57	0.011956
58	0.013250
59	0.014668
60	0.016220
61	0.017923
62	0.019800
63	0.021854
64	0.024110

Table (3.20)

Graduated Mortality Rates (Sums Assured; Without Profit)

Age	q_x	Age	q_x
10	0.000920	30	0.000967
11	0.000920	31	0.000985
12	0.000920	32	0.001003
13	0.000920	33	0.001031
14	0.000920	34	0.001068
15	0.000920	35	0.001142
16	0.000920	36	0.001179
17	0.000920	37	0.001253
18	0.000920	38	0.001354
19	0.000920	39	0.001474
20	0.000920	40	0.001631
21	0.000920	41	0.001816
22	0.000920	42	0.002028
23	0.000930	43	0.002286
24	0.000930	44	0.002591
25	0.000930	45	0.002941
26	0.000939	46	0.003329
27	0.000939	47	0.003772
28	0.000948	48	0.004270
29	0.000957	49	0.004824

Table (3.20)
Continued

Age	q_x
50	0.005424
51	0.006088
52	0.006818
53	0.007620
54	0.008488
55	0.009448
56	0.010491
57	0.011635
58	0.012890
59	0.014265
60	0.015769
61	0.017421
62	0.019239
63	0.021233
64	0.023420

Table (3.21)

Graduated Mortality Rates (policies; with profit)

Age	q_x	Age	q_x
10	0.000881	30	0.000930
11	0.000881	31	0.000950
12	0.000881	32	0.000970
13	0.000881	33	0.000999
14	0.000881	34	0.001039
15	0.000881	35	0.001088
16	0.000881	36	0.001157
17	0.000881	37	0.001236
18	0.000881	38	0.001344
19	0.000881	39	0.001472
20	0.000881	40	0.001639
21	0.000881	41	0.001836
22	0.000881	42	0.002063
23	0.000891	43	0.002338
24	0.000891	44	0.002663
25	0.000891	45	0.003038
26	0.000901	46	0.003451
27	0.000901	47	0.003924
28	0.000911	48	0.004455
29	0.000920	49	0.005046

cont...

Table (3.21)
continued

Age	q_x
50	0.005686
51	0.006395
52	0.007173
53	0.008030
54	0.008956
55	0.009980
56	0.011092
57	0.012313
58	0.013653
59	0.015120
60	0.016725
61	0.018487
62	0.020427
63	0.022554
64	0.024888

Table (3.22)

Graduated Mortality Rates (Sums Assured: with profit)

Age	q_x	Age	q_x
10	0.000876	30	0.000931
11	0.000876	31	0.000952
12	0.000876	32	0.000974
13	0.000876	33	0.001006
14	0.000876	34	0.001050
15	0.000876	35	0.001104
16	0.000876	36	0.00118
17	0.000876	37	0.001267
18	0.000876	38	0.001386
19	0.000876	39	0.001527
20	0.000876	40	0.001711
21	0.000876	41	0.001928
22	0.000876	42	0.002177
23	0.000887	43	0.002481
24	0.000887	44	0.002839
25	0.000887	45	0.003251
26	0.000898	46	0.003706
27	0.000898	47	0.004226
28	0.000909	48	0.004812
29	0.000920	49	0.005462

cont..

Table (3.22)

Continued

Age	q_x
50	0.006167
51	0.006947
52	0.007804
53	0.008747
54	0.009766
55	0.010894
56	0.012119
57	0.013463
58	0.014537
59	0.016653
60	0.018320
61	0.020260
62	0.022396
63	0.024738
64	0.027801

So, by using the equation (3.23), we can obtain a and b as follows:

$$q^{1}_{x}(\text{graduated}) = 0.951784\ q^{s}_{x}(\text{the A49-52U}) - .000151$$

(policies without profit)

$$q^{1}_{x}(\text{graduated}) = 0.996278\ q^{s}_{x}(\text{the A49-52U}) - .000262$$

(Sums Assured: without profit)

$$q^{1}_{x}(\text{graduated}) = 0.984697\ q^{s}_{x}(\text{the A49-52U}) - .000212$$

(Policies; With Profit)

$$q^{1}_{x}(\text{graduated}) = 1.084115\ q^{s}_{x}(\text{the A49-52U}) - .000327$$

(Sums Assured; With Profit)

Tables (3.19), (3.20), (3.21) and (3.22) show the graduated mortality rates of Egypt based on policies, sums assured without profit and policies, sums assured with profit successively.

3.15 Test of Graduation

Once the graduation has been made, the task is not completed because the graduation must be tested as to its acceptability and validity.

We can consider the tests of graduation under the following two measurements:

a) Test of Smoothness

We will not discuss the tests of smoothness since, the graduation has been made by reference to a standard table (A49-52) which is smooth, the results are satisfactory as far as smoothness is concerned.

b) Tests for Adherence to Data

The tests for adherence to data, may be summarized as follows (Benjamin, B. & Haycocks, H., 1970, p.199):

1. The smallness of the individual values of the totals in the columns showing the deviations $\Sigma(A - E)$ and the accumulated deviation $\Sigma\Sigma(A - E)$. The smallness of the deviations and accumulated deviations are necessary for a good graduation; each of them may be very small indeed without giving any indication that the adherence to sample data is too close. The test can give evidence of departure from the data but it gives insufficient undergraduation (i.e. the graduation is too close to the facts).
2. The number of changes of sign of the deviation and the accumulated deviations. It is difficult to say how many changes of sign are to be expected or how many are to be regarded as satisfactory. The problem often arises of how far the number of changes can differ from the number of non-changes before we may regard the graduation as suspect.
3. Comparison of each deviation with the standard error, both age by age and in suitable age groups. In this respect, we can say that the deviation should not exceed twice the standard error ($\sqrt{E_x q_x p_x}$), or at any rate, three times the standard error. The deviations should bear reasonable ratios to the standard errors, although here again small ratios are insufficient evidence of undergraduation.
4. Comparison of each deviation with its approximate probable error. We may take the probable error as roughly

$\frac{2}{3}$ (standard error) and from the definition of probable error we should expect roughly half the observed deviations to fall short of this value and the rest to exceed it. In theory this test reveals undergraduation as well as overgraduation (i.e. distortion), but it is rather insensitive.

5. Comparison of the total of the deviations, irrespective of sign, with four-fifths of the total of the standard error. Evidence of undergraduation is obtained in this case more reliably than by (4), but the mere addition of deviation irrespective of sign is not satisfactory. What is required is a means of finding a combined probability that the observed deviations as a set, would arise from random sampling. One such means is the χ^2 test. Hence to test the graduation there are two tests to be considered: Firstly, the deviation, the deviation changes sign and the accumulated deviation test and secondly, the χ^2 test.

3.15 <u>The Deviation, The Deviation Changes Sign and The Accumulated Deviation Test</u>:

Tables (3.23), (3.24), (3.25) and (3.26) show the deviation and accumulated deviation. In column (8) the deviation is shown on the left if it is negative and on the right if it is positive. The sum of the actual deaths (column (3)), are nearly equal to the sum of the expected deaths (column (7)). And the figures in column (9) (also its totals), which represent the

Table (3.23)

Calculation of The Deviation And Accumulated Deviation for Experience Based on Policies; Without Profit

Age group	Exposed to risk	Actual deaths	$10^4 xq_x$ graduated	$\Delta(4)$	$\Delta^2(4)$	Expected deaths $E_x xq_x$	Deviation: Actual -Expected (3)-(7)		Accumulated Deviation $\Sigma(8)$		Approximate Standard Error $\sqrt{(7)}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)
							−	+	−	+	
10 -	32033.5	23	9.05	0		28.99	5.99				5.38
15 -	41212	34	9.05		0.05	37.30	3.30		9.29		6.11
				0.05							
20 -	46002	42	9.10		0.15	41.86		.14	9.15		6.47
				0.20							
25 -	56642.5	55	9.30		0.56	52.68		2.32	6.83		7.26
				0.76							
30 -	66545	72	10.06		2.19	66.94		5.06	1.77		8.18
				2.96							
35 -	75676	98	13.01		5.85	98.45	.45		2.22		9.92
				8.80							
40 -	57494.5	137	21.81		10.42	126.78		10.22		8	11.26
				19.22							
45 -	42064	194	41.03		13.76	173.72		20.28		28.28	13.18
				32.98							
50 -	33568.5	243	74.01		20.04	249.62	6.62			21.66	15.80
				52.02							
55 -	17859	206	126.03		30.22	226.13	20.13			1.53	15.04
				82.24							
60 - less than 65	8109	168	208.27			169.66	1.66		.13		13.03
	477206	1272	-	-		1272.13	-38.15	+38.02	-35.38	+59.47	111.63

Table (3.24)

Calculation of The Deviation And Accumulated Deviation for Experience Based on Sums Assured; without profit (Exposed to risk and deaths are measured in units of E £ 1315)

Age group	Exposed to risk	Actual deaths	$10^4 xq_x$ graduated	$\Delta(4)$	$\Delta^2(4)$	Expected deaths $E_x xq_x$	Deviation: Actual -Expected (3)-(7)		Accumulated Deviation $\Sigma(8)$		Approximate Standard Error $\sqrt{(7)}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)
							−	+	−	+	
10 -	31924.59	23.02	9.20			29.37	6.35		6.35		5.42
				0							
15 -	41101.02	34.44	9.20		0.05	37.81	3.37		9.72		6.15
				0.05							
20 -	45876.10	42.48	9.25		0.14	42.47	.01		9.73		6.52
				0.19							
25 -	56571.95	55.72	9.44		0.59	53.40		2.32	7.41		7.31
				0.78							
30 -	66559.58	72.75	10.22		2.34	68.02		4.72	2.69		8.25
				3.12							
35 -	75684.51	98.92	13.34		6.02	101.72	2.8		5.49		10.09
				9.14							
40 -	57557.01	137.62	22.48		10.33	129.39		8.23		2.74	11.37
				19.47							
45 -	42062.74	194.46	41.95		12.77	176.45		18.01		20.75	13.28
				32.24							
50 -	33574.17	243.48	74.19		18.20	249.09	5.61			15.14	15.78
				50.44							
55 -	17837.02	205.95	124.63		33.29	219.27	13.32			1.82	14.81
				83.73							
60 - less than 65	8067.72	167.17	208.36			168.10	.93			.89	12.97
	476816.41	1276.01				1275.09	-32.39	+33.28	-41.39	+41.34	111.95

Table (3.25)

Calculation of The Deviation And Accumulated Deviation for Experience Based on Policies, with profit

Age group	Exposed to to risk	Actual deaths	$10^4 xq_x$ graduated	$\Delta(4)$	$\Delta^2(4)$	Expected deaths	Deviation: Actual - Expected (3)-(7)		Accumulated Deviation $\Sigma(8)$		Approximate Standard Error $\sqrt{(7)}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)
10 -	14205	10	8.81			12.51	2.51	+	2.51	+	3.54
				0							
15 -	16229.5	13	8.81		0.05	14.30	1.30		3.81		3.78
				0.05							
20 -	18141	16	8.86		0.15	16.07	0.07		3.88		4.01
				0.20							
25 -	23061	22	9.06		0.59	20.89		1.11	2.77		4.57
				0.79							
30 -	29245.5	31	9.85		2.26	28.81		2.19	0.58		5.37
				3.05							
35 -	32993	42	12.9		7.04	42.56	0.56		1.14		6.52
				10.09							
40 -	24606	58	22.01		9.80	54.16		3.84		2.7	7.36
				19.89							
45 -	18558	84	41.90		14.23	77.76		6.24		8.94	8.82
				34.12							
50 -	8541.5	61	76.02		19.69	64.93	3.93			5.01	8.06
				53.81							
55 -	2351.5	27	129.83		31.27	30.53	3.53			1.48	5.53
				85.08							
60 - less than 65	880	18	214.91			18.91	0.91			0.57	4.35
	188812	382	-	-	-	381.43	-12.81	+13.38	-14.69	+18.7	61.91

Table (3.26)

Calculation of the Deviation and Accumulated Deviation for Experience Based on Sums Assured; with profit
(Exposed to risk and deaths are measured in units of E £ 1790)

Age group	Exposed to risk	Actual deaths	$10^4 xq_x$ graduated	$\Delta(4)$	$\Delta^2(4)$	Expected deaths	Deviation: Actual - Expected (3)-(7)		Accumulated Deviation $\Sigma(8)$		Approximate Standard Error $\sqrt{(7)}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)
							−	+	−	+	
10 -	14141.51	10.11	8.76			12.39	2.28		2.28		3.52
				0							
15 -	16156.97	13.14	8.76		0.11	14.15	1.01		3.29		3.76
				0.11							
20 -	18080.19	16.16	8.87		0.0	15.94		0.22	3.07		3.99
				0.11							
25 -	23009.47	22.14	8.98		0.65	20.67		1.29	1.77		4.55
				0.76							
30 -	29180.15	31.25	9.74		2.9	28.42		2.83		1.06	5.33
				3.66							
35 -	32956.14	42.32	13.4		6.5	44.16	1.84			0.42	6.65
				10.16							
40 -	24564.76	58.10	23.56		8.54	57.87		0.23		0.65	7.61
				18.70							
45 -	18547.63	84.17	42.26		12.79	78.38		5.80		6.45	8.85
				31.49							
50 -	8541.50	61.13	73.75		22.67	62.99	1.86			4.59	7.94
				54.16							
55 -	2356.75	27.09	127.91		41.89	30.15	3.06			1.53	5.49
				96.05							
60 - less than 65	885.90	18.13	223.96			19.84	1.71		0.18		4.45
	188420.97	383.74	-	-		384.96	-11.76	+10.37	-10.59	+14.17	62.14

difference between the total actual deaths up to that age and the total corresponding expected deaths are not large. It is very important at this point to note that, at the age group 45 - less than 50 in tables (3.23) and (3.24) the deviation is larger than expected, but it is less than twice the standard error for both of these groups. However, from the researcher's point of view these results would be acceptable but the researcher must bear in mind this fact when selecting the ideal table out of the four new tables.

To test the graduation for mortality rates based on sums assured without and with profit, exposed to risk and deaths measured in units of E.£* 1315 and E.£ 1790 consecutively, and the following table shows that:

Detail	E.£	Units	Factor (E.£)
1. Without Profit			
- Exposed to risk	627013580	477206	1313.93
Actual deaths	1677954	1272	1319.15
2. With Profit			
Exposed to risk	337273536	188812	1786.29
Actual deaths	686886	382	1798.13

* E.£ = Egyptian pound

3.17 χ^2 Test

To combine deviations by straightforward addition is clearly unsatisfactory since positive and negative items will tend to cancel out. Test (5) mentioned previously avoids this difficulty

by ignoring signs. Another obvious way is to square the deviations before adding. Furthermore, before we can calculate probabilities we need to express the deviations in terms of their standard errors. It would seem logical therefore to divide each deviation by its standard error before squaring and adding, thus arriving at a function

$$\Sigma \quad \frac{(\theta_x - E_x q_x)^2}{E_x p_x q_x} \qquad (3.24)$$

or more generally

$$\Sigma \left\{ \frac{\text{actual value - expected value}}{\text{standard error}} \right\}^2$$

This function is known as χ^2 (Benjamin, B. & Haycocks, H. 1970, p.200).

By using χ^2 table, we accept or reject the graduation. In this respect, we can say, if the critical probability is less than 0.001 or greater than 0.999 the hypothesis (i.e. the graduation under test) would be rejected; in the first case because it leads to too small a probability of data (i.e. the graduation is too far from the facts), and in the second instance because the data are apparently undergraduated (i.e. the graduation is too close to the facts) (Seal, H.L., 1943, p.9).

In many instances the χ^2 test has tended to become the central test (Beard, R.E., 1951, p.417), so that this test will be used to examine the graduation

Table (3.27)

Calculation of χ^2 for Experience Based on policies; without profit

Age group (1)	Exposed to risk E_x (2)	Actual deaths A (3)	Expected deaths E (4)	Deviation A-E (5)	(standard error)^2 $E_x\, q_x\, p_x$ (6)	$(A-E)^2$ (7)	χ^2 (8) = (7)/(6)
10 -	32033.5	23	28.99	-5.99	28.96	35.88	1.2390
15 -	41212	34	37.30	-3.30	37.26	10.89	.2922
20 -	46002	42	41.86	.14	41.82	.02	.0005
25 -	56642.5	55	52.68	2.32	52.63	5.38	.1022
30 -	66545	72	66.94	5.06	66.88	25.60	.3828
35 -	75676	98	98.45	-0.45	98.33	.20	.0020
40 -	57494.5	137	126.78	10.22	126.50	104.45	.8257
45 -	42064	194	173.72	20.28	173.01	411.28	2.3772
50 -	33568.5	243	249.62	-6.62	247.76	43.82	.1769
55 -	17859	206	226.13	-20.13	223.27	405.22	1.8149
60 - less than 65	8109	168	169.66	-1.66	166.11	2.76	.0166
Total	477206	1272	1272.13	-0.13			7.1855

Table (3.28)

Calculation of χ^2 for Experience Based on Sums Assured; Without Profit

Age group (1)	Exposed to risk E_x (2)	Actual deaths A (3)	Expected deaths E (4)	Deviation A-E (5)	(standard error)^2 (6) $E_x q_x p_x$	$(A-E)^2$ (7)	χ^2 (8) = (7)/(6)
10 -	31924.59	23.02	29.37	-6.35	29.34	40.32	1.3742
15 -	41101.02	34.44	37.81	-3.37	37.79	11.36	0.3006
20 -	45876.10	42.48	42.47	-0.01	42.40	.00	0.0000
25 -	56571.95	55.72	53.40	2.32	53.35	5.38	0.1008
30 -	66559.58	72.75	68.02	4.72	67.95	22.28	0.3279
35 -	75684.51	98.92	101.72	-2.80	100.83	7.84	0.0778
40 -	57557.01	137.62	129.39	8.23	129.10	67.73	-5246
45 -	42062.74	194.46	176.45	18.01	175.71	324.36	1.8460
50 -	33574.17	243.48	249.09	-5.61	247.24	31.47	0.1273
55 -	17837.02	205.95	219.27	-13.32	219.53	177.42	0.8082
60 - less than 65	8067.72	167.17	168.10	-0.93	164.60	0.86	0.0052
Total	476816.41	1276.01	1275.09	.92			5.4926

Table (3.29)

Calculation of χ^2 for Experience Based on policies; with profit

Age group (1)	Exposed to risk E_x (2)	Actual deaths A (3)	Expected deaths E (4)	Deviation A-E (5)	(standard error)^2 $E_x q_x p_x$ (6)	$(A-E)^2$ (7)	χ^2 (8) = (7)/(6)
10 -	14205	10	12.51	-2.51	12.50	6.3001	0.5040
15 -	16229.5	13	14.30	-1.30	14.29	1.69	0.1183
20 -	18141	16	16.07	-0.07	16.06	.0049	0.0003
25 -	23061	22	20.89	1.11	20.87	1.2321	0.0590
30 -	29245.5	31	28.81	2.19	28.87	4.7961	0.1666
35 -	32993	42	42.56	-0.56	42.51	.3136	0.0074
40 -	24606	58	54.16	3.84	54.04	14.7456	0.2729
45 -	18558	84	77.76	6.24	77.43	38.9376	0.5029
50 -	8541.5	61	64.93	-3.93	64.44	15.4449	0.2397
55 -	2351.5	27	30.53	-3.53	30.13	12.4609	0.4136
60 - less than 65	880	18	18.91	-0.91	18.51	.8281	0.0447
Total	188812	382	381.43	+0.57			2.3294

Table (3.30)

Calculation of χ^2 for Experience Based on Sums Assured; With Profit

Age group	Exposed to risk E_x	Actual deaths A	Expected deaths E	Deviation A-E	(standard error)^2	$(A-E)^2$	χ^2
(1)	(2)	(3)	(4)	(5)	(6) $E_x q_x p_x$	(7)	(8) = (7)/(6)
10 -	14141.51	10.11	12.39	-2.28	12.38	5.20	0.4200
15 -	16156.97	13.14	14.15	-1.01	14.14	1.02	0.0721
20 -	18080.19	16.16	15.94	0.22	16.02	0.05	0.0031
25 -	23009.47	22.14	20.67	1.29	20.64	1.66	0.0804
30 -	29180.15	31.25	28.42	2.83	28.39	8.01	0.2821
35 -	32956.14	42.32	44.16	-1.84	44.10	3.39	0.0769
40 -	24564.76	58.10	57.87	0.23	57.73	0.05	0.0009
45 -	18547.63	84.17	78.38	5.80	78.05	33.64	0.4310
50 -	8541.50	61.13	62.99	-1.86	62.53	3.46	0.0553
55 -	2356.75	27.09	30.15	-3.06	29.75	9.36	0.3146
60 - less than 65	885.90	18.13	19.84	-1.71	19.40	2.92	0.1505
Total	188420.97	383.74	384.96	-1.39			1.8869

Table (3.27) shows the calculation of χ^2 to test the graduation of the mortality rates based on policies; without profit.

By reference to χ^2 table (White, J. & Yeats, A. & Skipworth,G. 1974, p.22)

where f = 9, the observed value of 7.1855 is bracketed $\chi^2 = 5.8988$ and $\chi^2 = 8.3428$

i.e. 0.500 < probability value < 0.750

Hence, the graduation should be considered reasonable according to the probability obtained.

Table (3.28) shows the calculation of χ^2 to test the graduation of the mortality rates based on sums assured; without profit.

By reference to χ^2 table (White, J. & Yeats, A. & Skipworth,G., 1974, p.22) where f = g, the observed value of 5.4926 is bracketed by $\chi^2 = 4.16816$ and $\chi^2 = 5.8988$.

i.e. 0.750 < probability value < 0.900.

Hence, the graduation should be considered reasonable according to the probability obtained.

Table (3.29) shows the calculation of χ^2 to test the graduation of the mortality rates based on policies; with profit,

By reference to χ^2 table (White, J. & Yeats, A. & Skipworth,G.

1974, p.22) where f = 9, the observed value of 2.3294 is bracketed by χ^2 = 2.0879 and χ^2 = 2.7004.

i.e. 0.975 < probability value < 0.990

Hence, the graduation should be considered reasonable according to the probability obtained.

Table (3.30) shows the calculation of χ^2 to test the graduation of the mortality rates based on sums assured; with profit.

By reference to χ^2 table (White, J. & Yeats, A. & Skipworth, G., 1974, p22) where f = 9, the observed value of 1.8869 is bracketed by χ^2 = 1.7349 and χ^2 = 2.0879.

i.e. 0.990 <probability value < 0.995

Hence, the graduation should be considered reasonable according to the probability obtained.

CHAPTER FOUR

ANALYSIS OF THE EGYPTIAN MORTALITY RATES

4.1 Introduction

The researcher concluded the previous chapter by presenting the mortality rates based on the Egyptian experience for both policies and sums assured (without and with profit), and in an attempt to uncover the shape of the curves for both of these rates, graphs were drawn as shown in figures (4.1), (4.2), (4.3) and (4.4).

From both these figures, we may say that mortality curves take the form of J-shape, it remains flat up from the ages of 10 to 25, then it reveals a slow rise from the ages of 25 to 40, finally starting from the age of 45 onwards a sharp rise is witnessed in these curves.

4.2 Comparison Between Mortality Rates Based On Policies And Sums Assured (Without Profit)

Table (4.1) shows the ratio of mortality rates based on policies (without profit) to the ones based on sums assured (without profit) . From the ages of 10 to 38 the mortality rates based on sums assured are higher than the ones based on policies and vice versa over age 38. Figures (4.5) and (4.6) show the mortality rates for both policies and sums assured (without profit). From these figures, we can say that both of them nearly take the same shape.

4.3 Comparison Between Mortality Rates Based On Policies And Sums Assured (With Profit)

Table (4.2) shows the ratio of mortality rates based on policies (with profit) to the ones based on sums assured (with profit). From the ages of 10 to 29 the mortality rates based on policies are higher than the ones based on sums assured and vice versa over age 29. Figures (4.7) and (4.8) show the mortality rates for both policies and sums assured (with profit). From these figures, we can say too that both of them nearly take the same shape.

4.4 Comparison Between Mortality Rates Based On Policies (Without Profit) And Policies (With Profit)

Table (4.3) shows the ratio of mortality rates based on policies (without profit) to the ones based on policies (with profit). From the ages of 10 to 39 the mortality rates based on policies (without profit) are higher than the ones based on policies (with profit) and vice versa over age 39. Figures (4.9) and (4.10) show the mortality rates for both policies (without profit) and policies (with profit). From these figures, we can say that both of them nearly take the same shape.

4.5 Comparison Between Mortality Rates Based On Sums Assured (Without Profit) and Sums Assured (With Profit)

Table (4.4) shows the ratio of mortality rates based on sums assured (without profit) to the ones based on sums assured (with profit). From the ages of 10 to 35 the mortality rates based on sums assured

Table (4.1)
Ratio Of Mortality Rates Based On Policies To The Ones Based On Sums Assured (Without Profit)

Age	q_x		Ratio(1/2)
	Policies (1)	Sums Assured (2)	%
10	0.000905	0.000920	98.37
15	0.000905	0.000920	98.37
20	0.000905	0.000920	98.37
25	0.000915	0.000930	98.39
30	0.000953	0.000967	98.55
35	0.001105	0.001142	96.76
40	0.001638	0.001631	100.42
45	0.002990	0.002941	100.67
50	0.005550	0.005424	102.32
55	0.009700	0.009448	102.67
60	0.016220	0.015769	102.86

Table (4.2)
Ratio Of Mortality Rates Based On Policies To The Ones Based On Sums Assured (With Profit)

Age	q_x		Ratio(1/2)
	Policies (1)	Sums Assured (2)	%
10	0.000881	0.000876	100.57
15	0.000881	0.000876	100.57
20	0.000881	0.000876	100.57
25	0.000891	0.000887	100.45
30	0.000930	0.000931	99.89
35	0.001088	0.001104	98.55
40	0.001639	0.001711	95.79
45	0.003038	0.003251	93.45
50	0.005686	0.006167	92.20
55	0.009980	0.010894	91.61
60	0.016725	0.018320	91.29

Table (4.3)
Ratio Of Mortality Rates Based On Policies
(Without Profit) To The Ones Based On
Policies (With Profit)

Age	q_x		Ratio(1/2)
	Policies Without Profit (1)	Policies With Profit (2)	%
10	0.000905	0.000881	102.72
15	0.000905	0.000881	102.72
20	0.000905	0.000881	102.72
25	0.000915	0.000891	102.69
30	0.000953	0.000930	102.47
35	0.001105	0.001088	101.56
40	0.001638	0.001639	99.94
45	0.002990	0.003038	98.42
50	0.005550	0.005686	97.61
55	0.009700	0.009980	97.19
60	0.016220	0.016725	96.98

Table (4.4)
Ratio Of Mortality Rates Based On Sums Assured (Without Profit) To The Ones Based On Sums Assured (With Profit)

Age	q_x		Ratio(1/2)
	Sums Assured Without (1)	Sums Assured With (2)	%
10	0.000920	0.000876	105.02
15	0.000920	0.000876	105.02
20	0.000920	0.000876	105.02
25	0.000930	0.000887	104.85
30	0.000967	0.000931	103.87
35	0.001142	0.001104	103.44
40	0.001631	0.001711	95.32
45	0.002941	0.003251	90.46
50	0.005424	0.006167	87.95
55	0.009448	0.010894	86.73
60	0.015769	0.018320	86.08

(without profit) are higher than those based on sums assured (with profit) and vice versa over age 35. Figures (4.11) and (4.12) show the mortality rates for both sums assured (without profit) and sums assured (with profit). From these figures,we can say that both of them nearly take the same shape.

4.6 Comparison Between Expected Deaths By The New Tables And The A 24-29 U.

Tables (4.5), (4.6), (4.7) and (4.8) show the expected deaths by the new tables and A 24-29 U.Table.

In order to point out the characteristics of some of these results, a summary table is presented:

Age Group	Ratio %			
	Without Profit		With Profit	
	Policies	Sums Ass.	Policies	Sums Ass.
10- 40-less than 65	35.21 61.13	35.95 60.95	34.59 57.24	34.83 57.93
All Ages	51.42	51.59	46.46	48.17

It can be seen from all these data that the greatest proportionate reduction in mortality occured at the younger ages, and to a less extent at the older ages.

The general trend of the ratio of expected deaths by the new tables to the expected deaths by the A 24-29 U. decrease with the increase in age from the ages of 10 to 20 and vice versa over age 20 until it reaches 70.89 (policies,without profit), 70.59 (sums assured,with profit),

Table (4.5)
Ratio Of Expected Deaths By New Table(Policies, without profit) To Expected Deaths By The A 24-29 U.Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Policies (1)	A 24-29 U. (2)	%
10-	28.99	57.02	50.84
15-	37.30	106.33	35.08
20-	41.86	128.81	32.50
25-	52.68	158.60	33.22
30-	66.94	194.31	34.45
35-	98.45	281.51	34.97
40-	126.78	297.82	42.57
45-	173.72	314.64	55.21
50-	249.62	378.15	66.01
55-	226.13	317.35	71.26
60-less than 65	169.66	239.34	70.89
All Ages	1272.13	2473.88	51.42

Table (4.6)
Ratio Of Expected Deaths By New Table(Sums Assured,Without Profit) To Expected Deaths By The A 24-29 U. Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Sums Assured (1)	A 24-29 U. (2)	%
10-	29.37	56.83	51.68
15-	37.81	106.04	35.66
20-	42.47	128.45	33.06
25-	53.40	158.40	33.71
30-	68.02	194.35	34.99
35-	101.72	281.55	36.13
40-	129.39	298.15	43.39
45-	176.45	314.63	56.08
50-	249.09	378.21	65.86
55-	219.27	316.96	69.18
60-less than 65	168.10	238.12	70.59
All Ages	1275.09	2471.69	51.59

Table (4.7)
Ratio Of Expected Deaths By New Table(Policies, With Profit) To Expected Deaths By The A 24-29 U.Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Policies (1)	A 24-29 U. (2)	%
10-	12.51	25.28	49.49
15-	14.30	41.87	34.15
20-	16.07	50.79	31.64
25-	20.89	64.57	32.35
30-	28.81	85.40	33.74
35-	42.56	122.73	34.68
40-	54.16	127.50	42.48
45-	77.76	138.81	56.02
50-	64.93	96.22	67.48
55-	30.53	41.79	73.06
60-less than 65	18.91	25.97	72.81
All Ages	381.43	820.93	46.46

Table (4.8)
Ratio Of Expected Deaths By New Table(Sums Assured,With Profit) To Expected Deaths By The A 24-29 U. Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Sums Assured (1)	A 24-29 U. (2)	%
10-	12.39	25.17	49.23
15-	14.15	41.68	33.95
20-	15.94	50.62	31.49
25-	20.67	64.43	32.08
30-	28.42	85.21	33.35
35-	44.16	122.60	36.02
40-	57.87	127.25	45.48
45-	78.38	138.74	56.49
50-	62.99	96.22	65.46
55-	30.15	41.88	71.99
60-less than 65	19.84	26.15	75.87
All Ages	394.96	819.95	48.17

72.81 (policies,with profit) and 75.87 (sums assured, with profit) for the age group 60- less than 65.

Figures (4.13),(4.15) and (4.16) show the mortality rates for both the new tables and A 24-29 U.Table. From these figures, we can say that their rates are not taking the same shape,also it is very important to say that their rates are far from each other, the main reasons for this last remark are the long period between these tables-about fifty years-, also the progress in environment and medical treatments during these long years.

4.7 Comparison Between Expected Deaths By The New Tables And The A 49-52 U.Table

Tables (4.9), (4.10),(4.11) and (4.12) show the expected deaths by the new tables and the A 49-52 U.table.

In order to point out the characteristic of some of these results, a summary table is presented:

Age Group	R a t i o %			
	Without Profit		With Profit	
	Policies	Sums Ass.	Policies	Sums Ass.
10- 40-less than 65	82.96 93.34	84.58 93.07	81.23 94.02	81.80 97.72
All Ages	90.43	90.69	89.05	91.45

From this table, we can see that there are smaller mortality rates at the younger ages, i.e.the mortality rates are larger at the older ages, whilst the mortality rates at older ages (sums assured,with profit) exceed

Table (4.9)
Ratio Of Expected Deaths By New Table(Policies, Without Profit) To Expected Deaths By The A 49-52 U.Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Policies (1)	A 49-52 U. (2)	%
10-	28.99	35.56	81.52
15-	37.30	45.75	81.53
20-	41.86	51.06	81.98
25-	52.68	64.57	81.59
30-	66.94	80.52	83.13
35-	98.45	115.78	85.03
40-	126.78	140.86	90.00
45-	173.72	188.03	92.39
50-	249.62	266.53	93.66
55-	226.13	239.31	94.49
60-less than 65	169.66	178.72	94.93
All Ages	1272.13	1406.69	90.43

Table (4.10)
Ratio Of Expected Deaths By New Table(Sums Assured,Without Profit) To The Expected Deaths By A 49-52 U.Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Sums Assured (1)	A 49-52 U. (2)	%
10-	29.37	35.44	82.87
15-	37.81	45.62	82.88
20-	42.47	50.92	83.41
25-	53.40	64.49	82.80
30-	68.02	81.20	83.77
35-	101.72	115.80	87.84
40-	129.39	141.01	91.76
45-	176.45	188.02	93.85
50-	249.09	266.58	93.44
55-	219.27	239.02	91.74
60-less than 65	168.10	177.81	94.54
All Ages	1275.09	1405.91	90.69

Table (4.11)
Ratio Of Expected Deaths By New Table(Policies, With Profit) To Expected Deaths By The A 49-52 U.Table

Age Group	Expected Deaths		Ratio(1/2)
	New Table Policies (1)	A 49-52 U. (2)	%
10-	12.51	15.77	79.33
15-	14.30	18.01	79.40
20-	16.07	20.14	79.79
25-	20.89	26.29	79.46
30-	28.81	35.68	80.75
35-	42.56	50.48	84.31
40-	54.16	60.28	89.85
45-	77.76	82.95	93.74
50-	64.93	67.82	95.74
55-	30.53	31.51	96.89
60-less than 65	18.91	19.40	97.47
All Ages	381.43	428.33	89.05

Table (4.12)
Ratio Of Expected Deaths By New Table(Sums Assured, With Profit) To Expected Deaths By The A 49-52.U

Age Group	Expected Deaths		Ratio(1/2)
	New Table Sums Assured (1)	A 49-52 U. (2)	%
10-	12.39	15.70	78.92
15-	14.15	17.93	78.92
20-	15.94	20.07	79.42
25-	20.67	26.23	78.80
30-	28.42	35.60	79.83
35-	44.16	50.42	87.58
40-	57.87	60.18	96.16
45-	78.38	82.91	94.54
50-	62.99	62.35	101.03
55-	30.15	30.08	100.23
60-less than 65	19.84	19.53	101.58
All Ages	384.96	420.97	91.45

the A 49-52 U.rates.

The general trend of the ratio of expected deaths by the new tables to the expected deaths by the A 49-52 U. increase with the increase in age-except at the age group (25-less than 30) in the sums assured - until it reaches 94.93 (policies, without profit), 94.54 (sums assured, without profit), 97.47 (policies, with profit) and 101.58 (sums assured, with profit) for the age group 60- less than 65.

Figures (4.17),(4.18),(4.19) and (4.20) show the mortality rates for both the new table and A 49-52 U. From these figures, we can see that in advanced ages the curves will be closer together than at earlier ages, also we can see that the curves are generally taking nearly the same shape.

4.8 Conclusion

This attempt to construct Egyptian mortality rates based on the experience of the Egyptian insurance companies, indicates that the Egyptian rates represent a large reduction in mortality rates compared with the A 24-29 U. Table which has been in use in the Egyptian market. Also, we show that there is a lesser reduction in mortality rates compared with the A 49-52 U. Table, except at the older ages (sums assured,with profit) exceed the A 49-52 U. rates. Both mortality curves take nearly the same shape.

Figure 4.1 Egyptian Mortality Rates
(Poloicies, Without Profit)

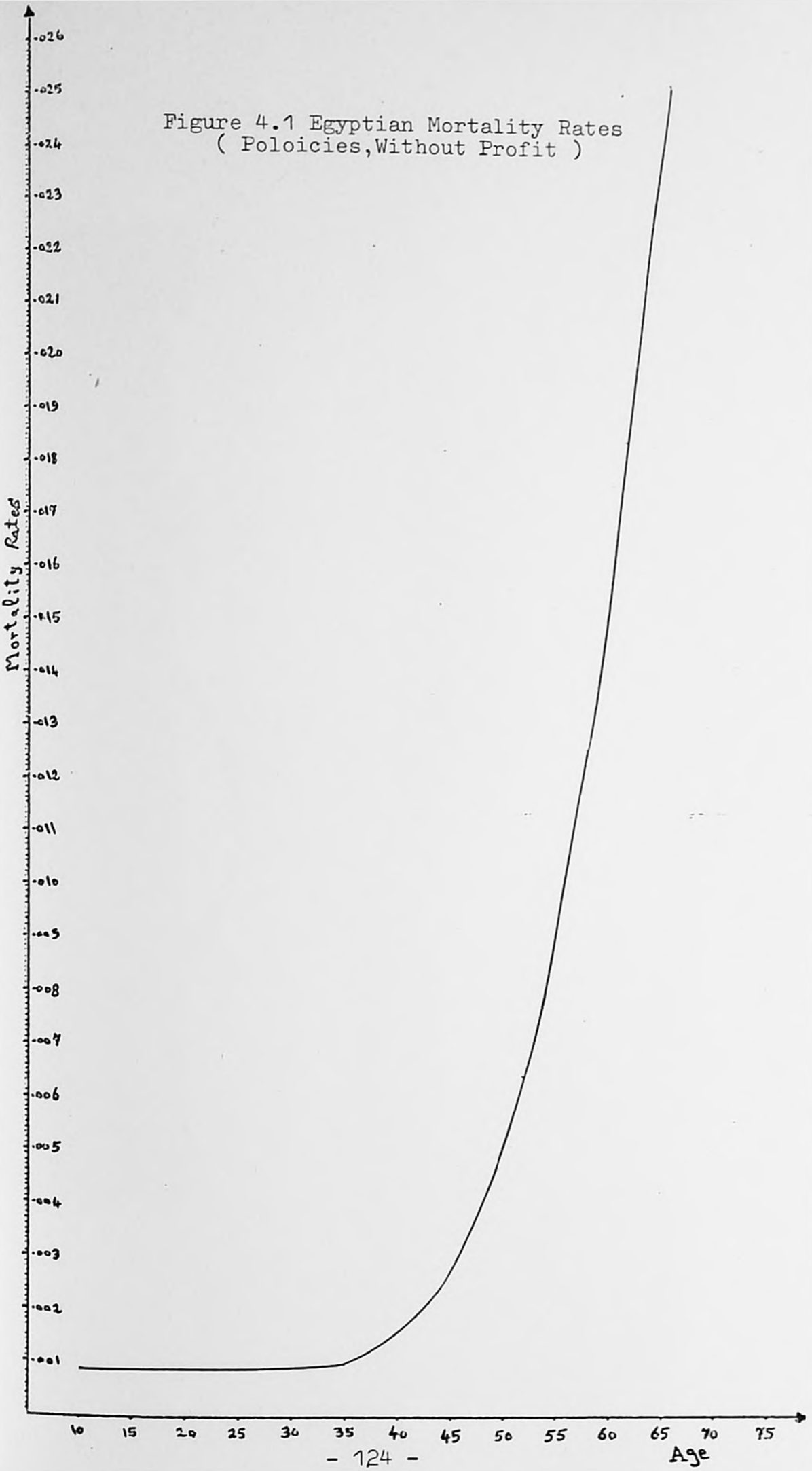


Figure 4.2 Egyptian Mortality Rates
(Sums Assured, Without Profit)

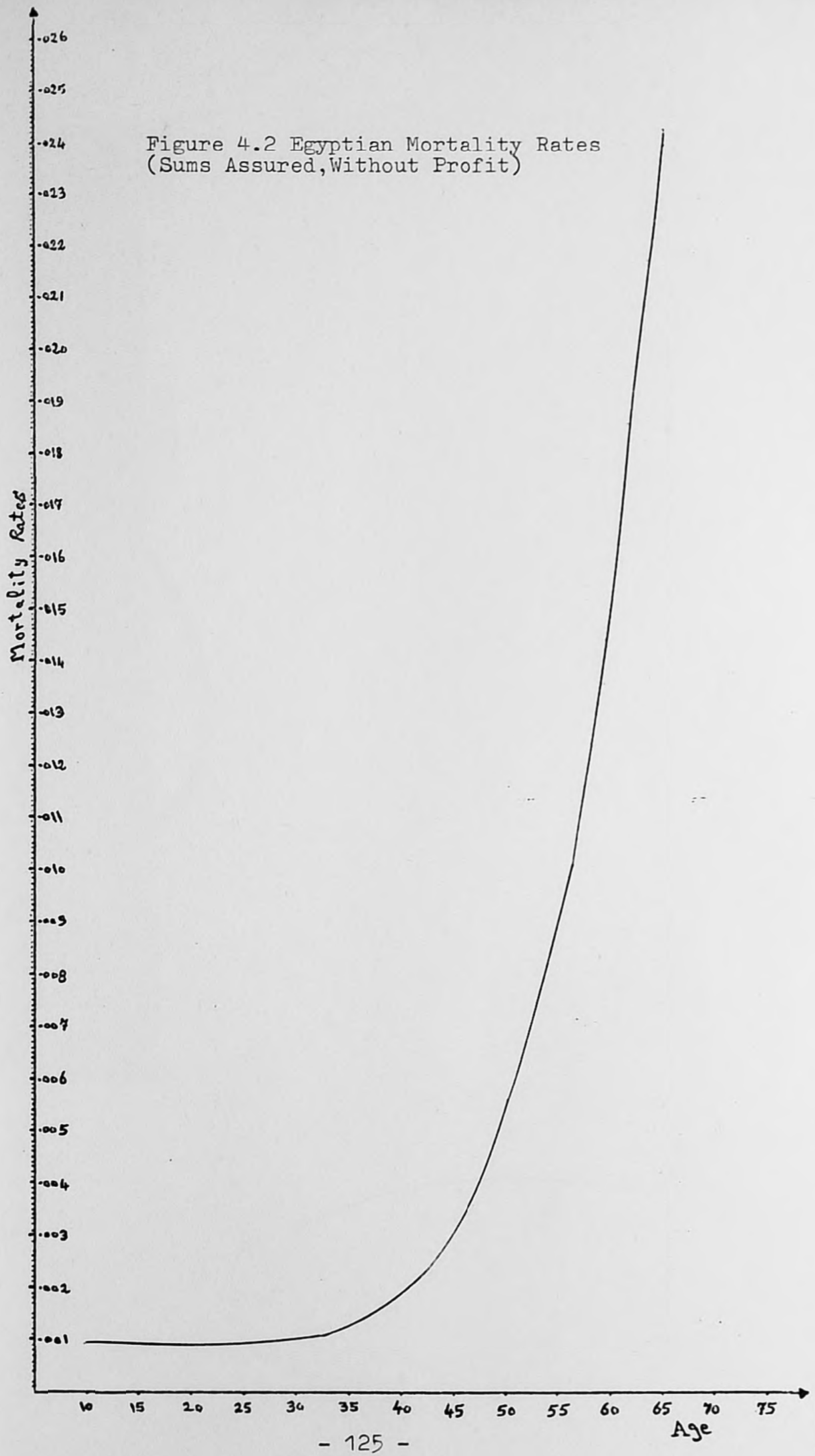


Figure 4.3 Egyptian Mortality Rates
(Policies, With Profit)

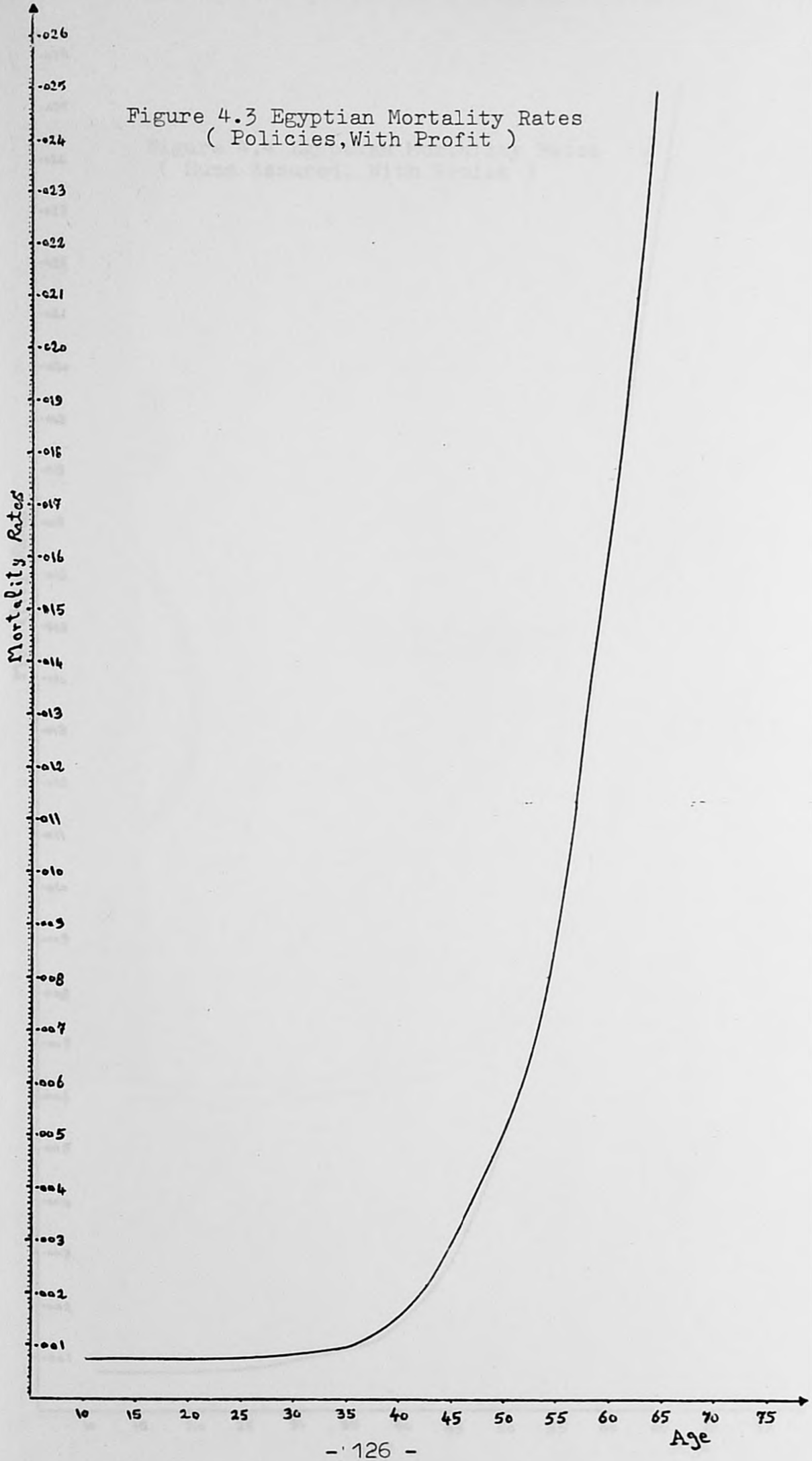
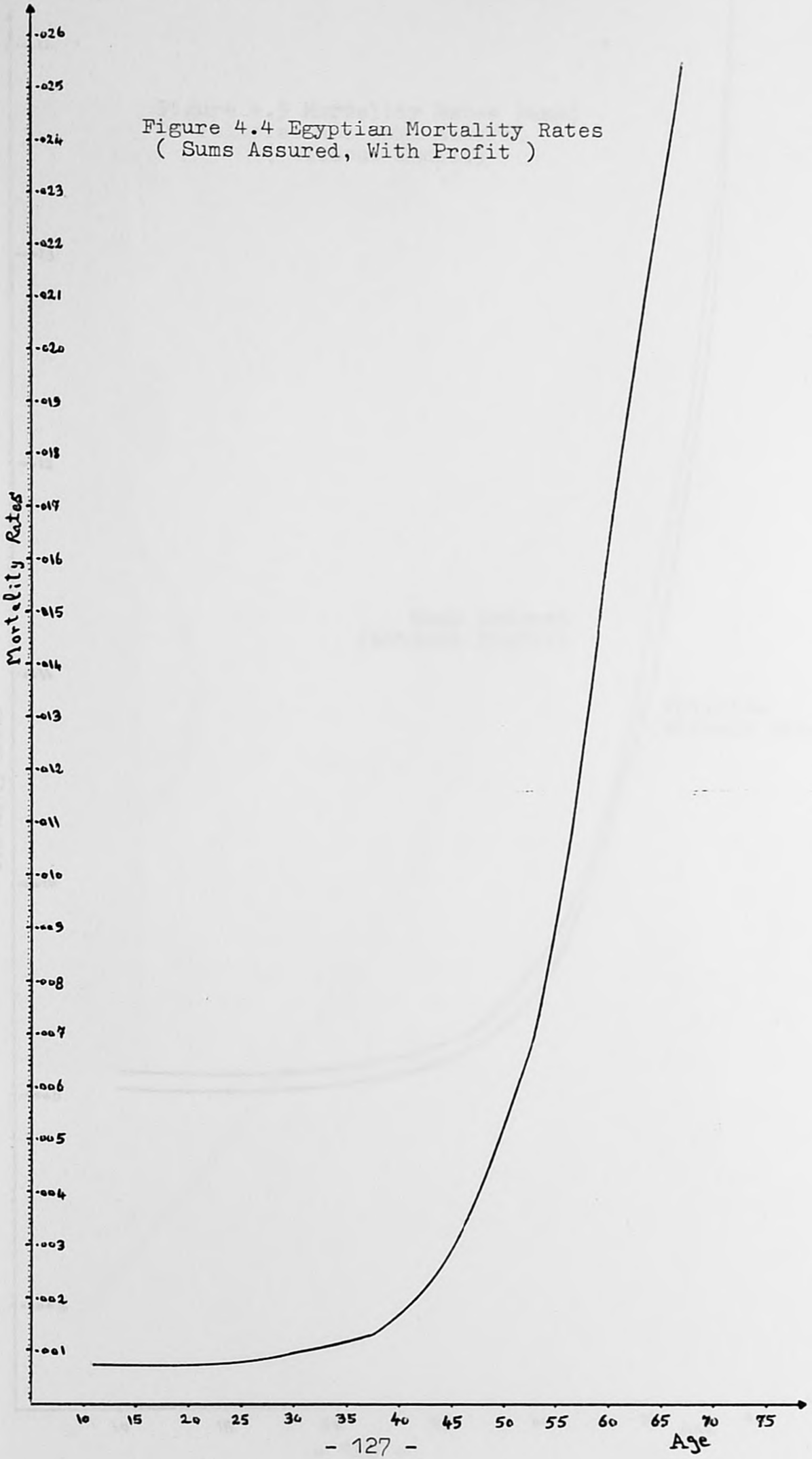


Figure 4.4 Egyptian Mortality Rates
(Sums Assured, With Profit)



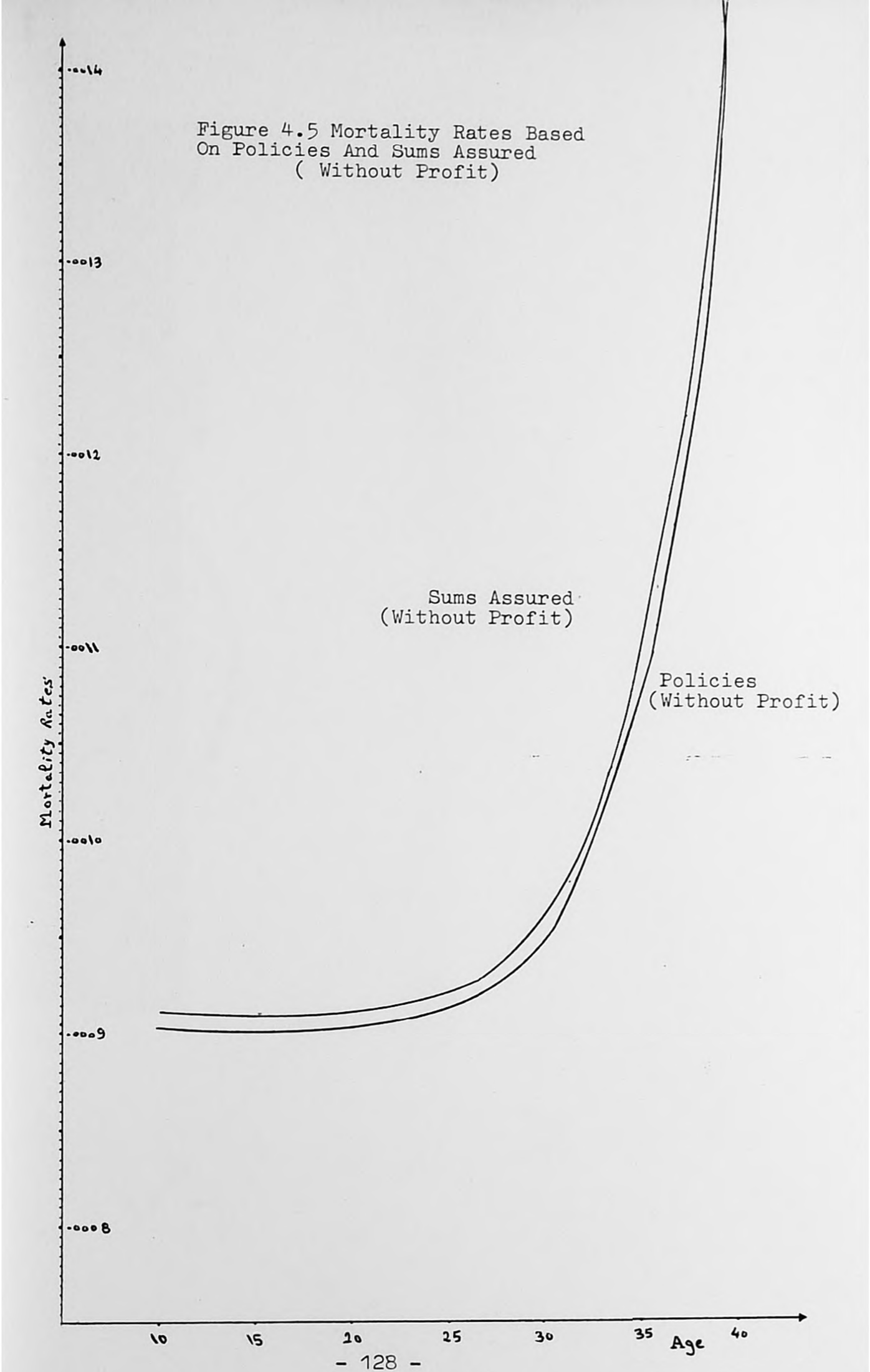


Figure 4.5 Mortality Rates Based
On Policies And Sums Assured
(Without Profit)
Sums Assured
(Without Profit)
Policies
(Without Profit)
Mortality Rates
·0014
·0013
·0012
·0011
·0010
·0009
·0008
10
15
20
25
30
35
40
Age

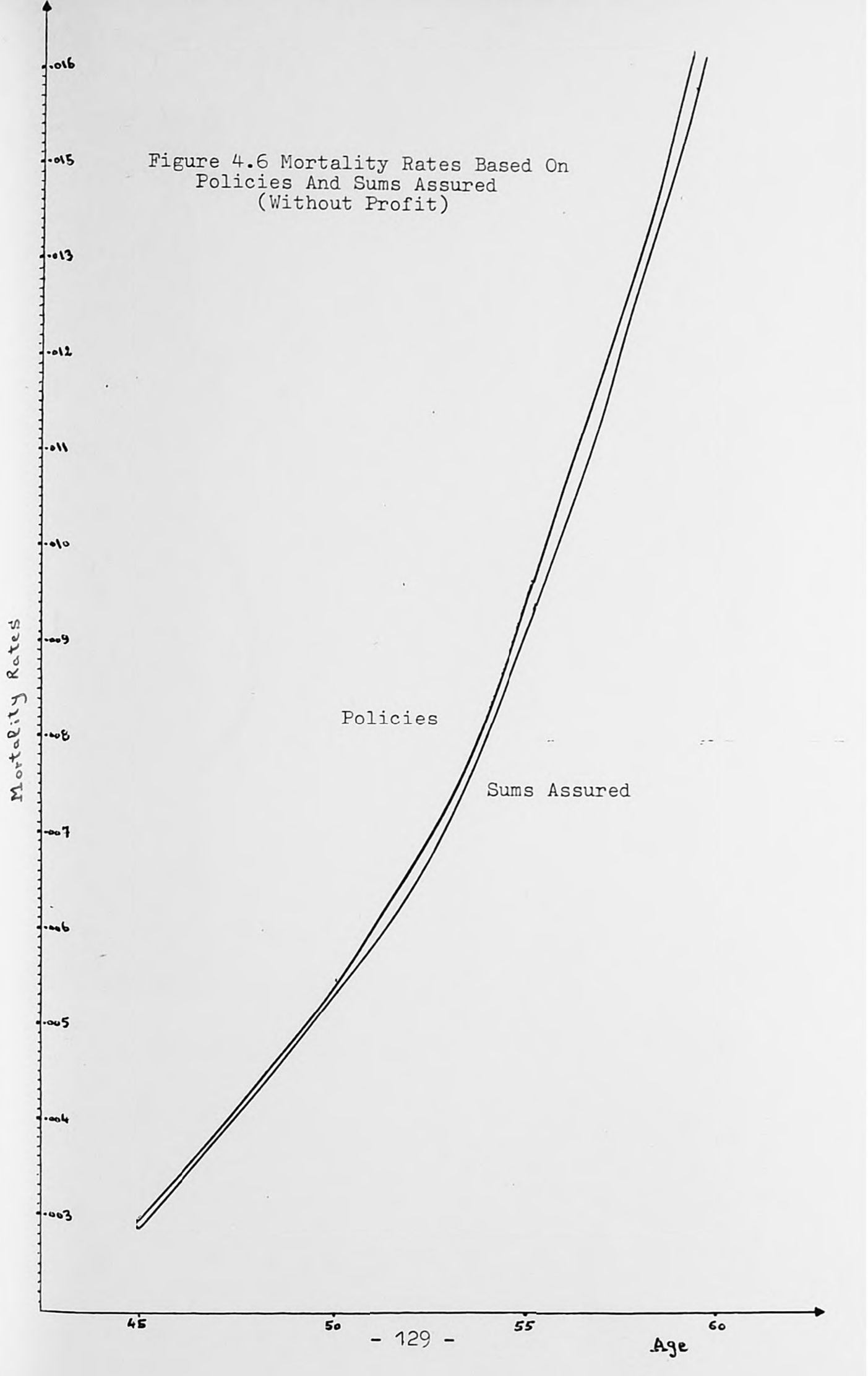


Figure 4.6 Mortality Rates Based On
Policies And Sums Assured
(Without Profit)
Mortality Rates
.016
.015
.013
.012
.011
.010
.009
.008
.007
.006
.005
.004
.003
Policies
Sums Assured
45
50
55
60
Age

Figure 4.7 Mortality Rates Based On
Policies And Sums Assured
(With Profit)

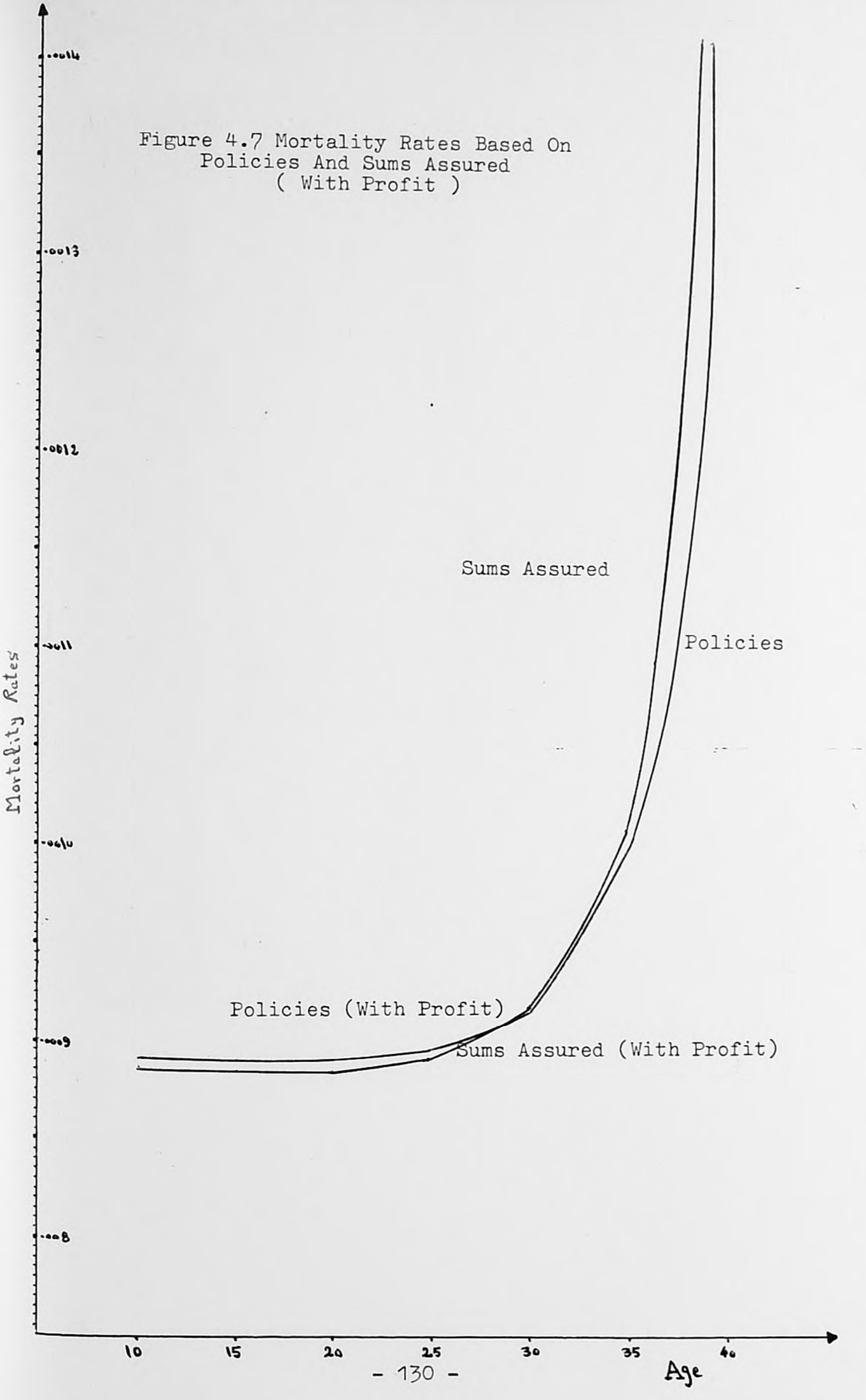


Figure 4.8 Mortality Rates Based On Policies And Sums Assured (With Profit)

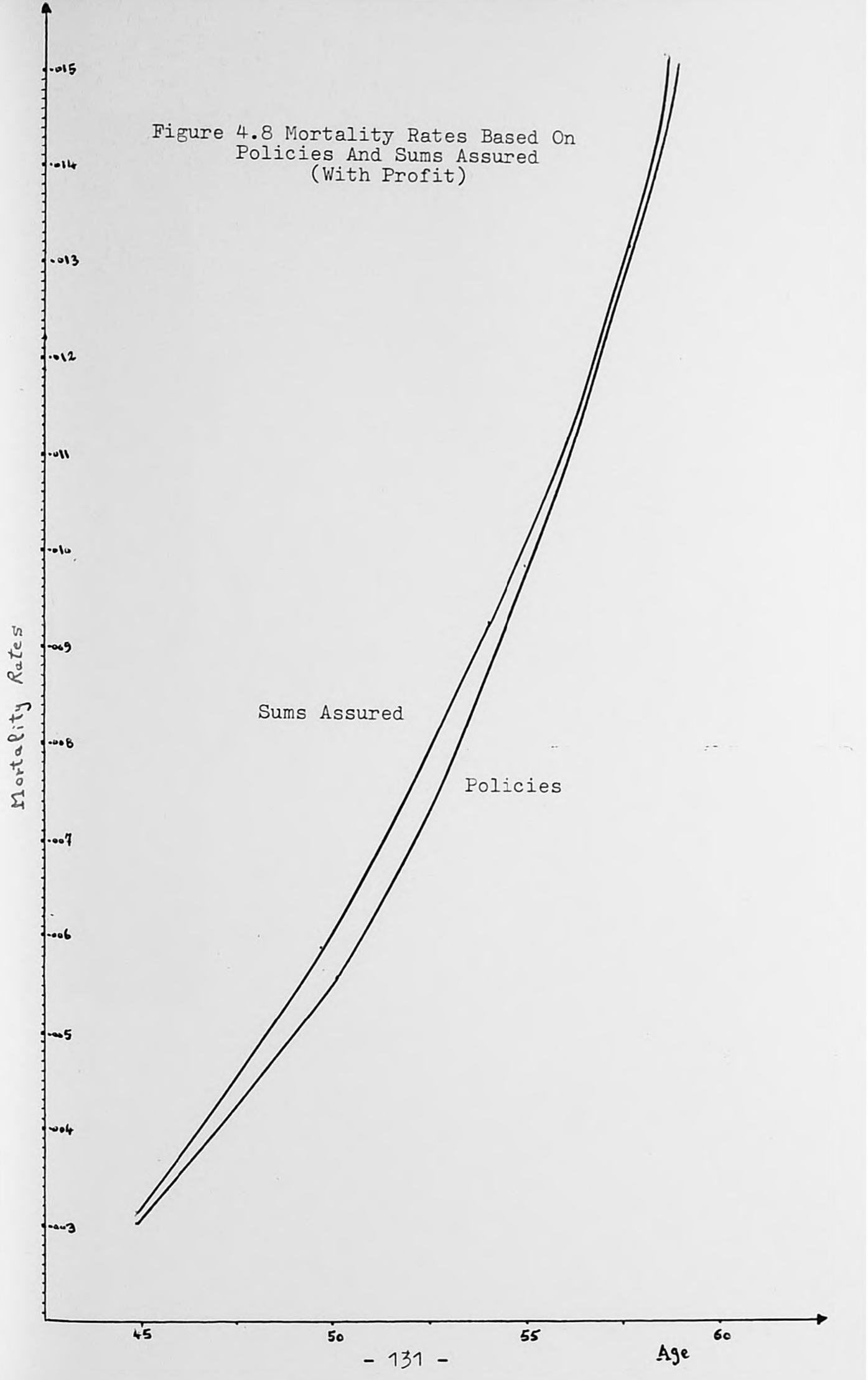
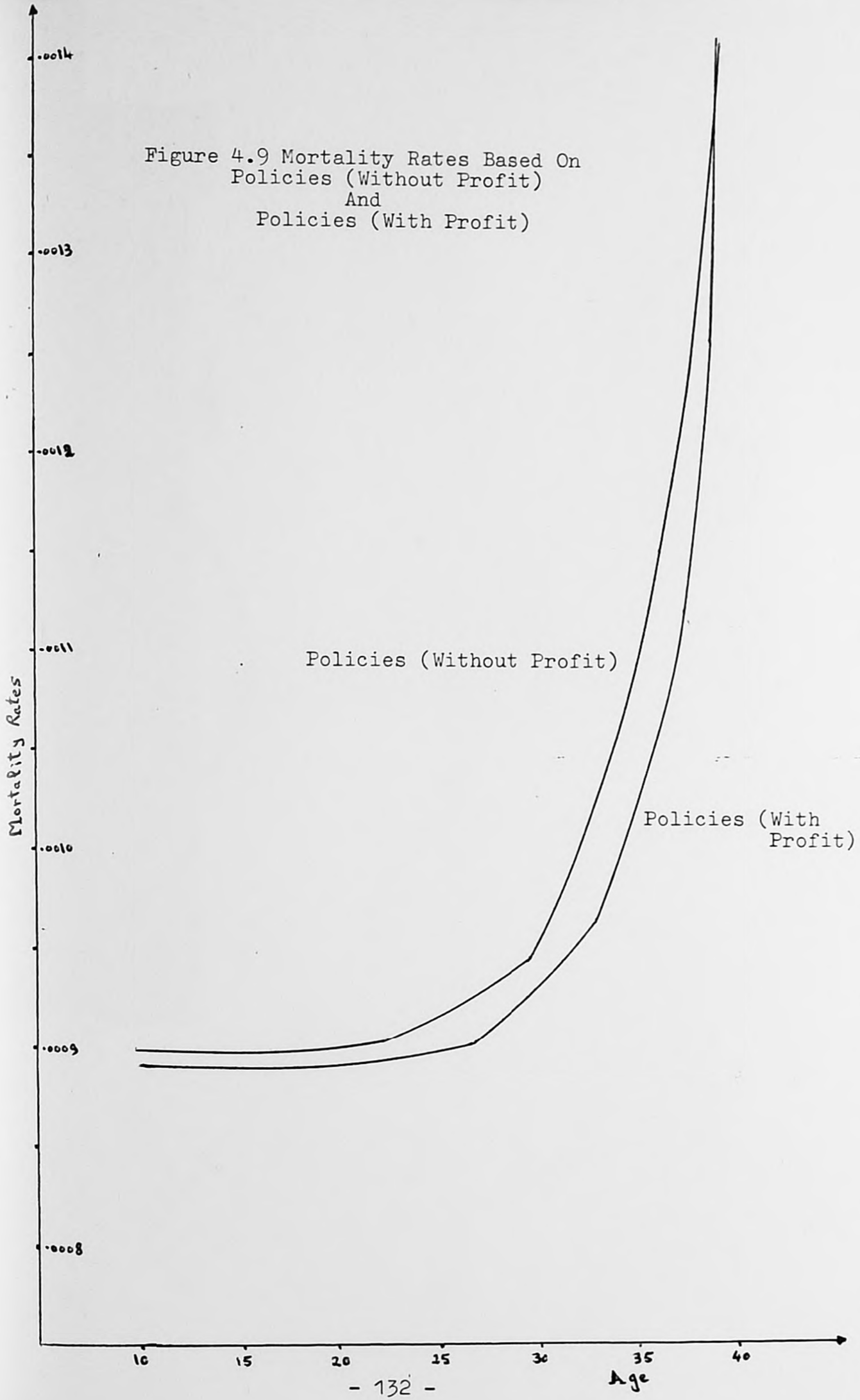


Figure 4.9 Mortality Rates Based On
Policies (Without Profit)
And
Policies (With Profit)



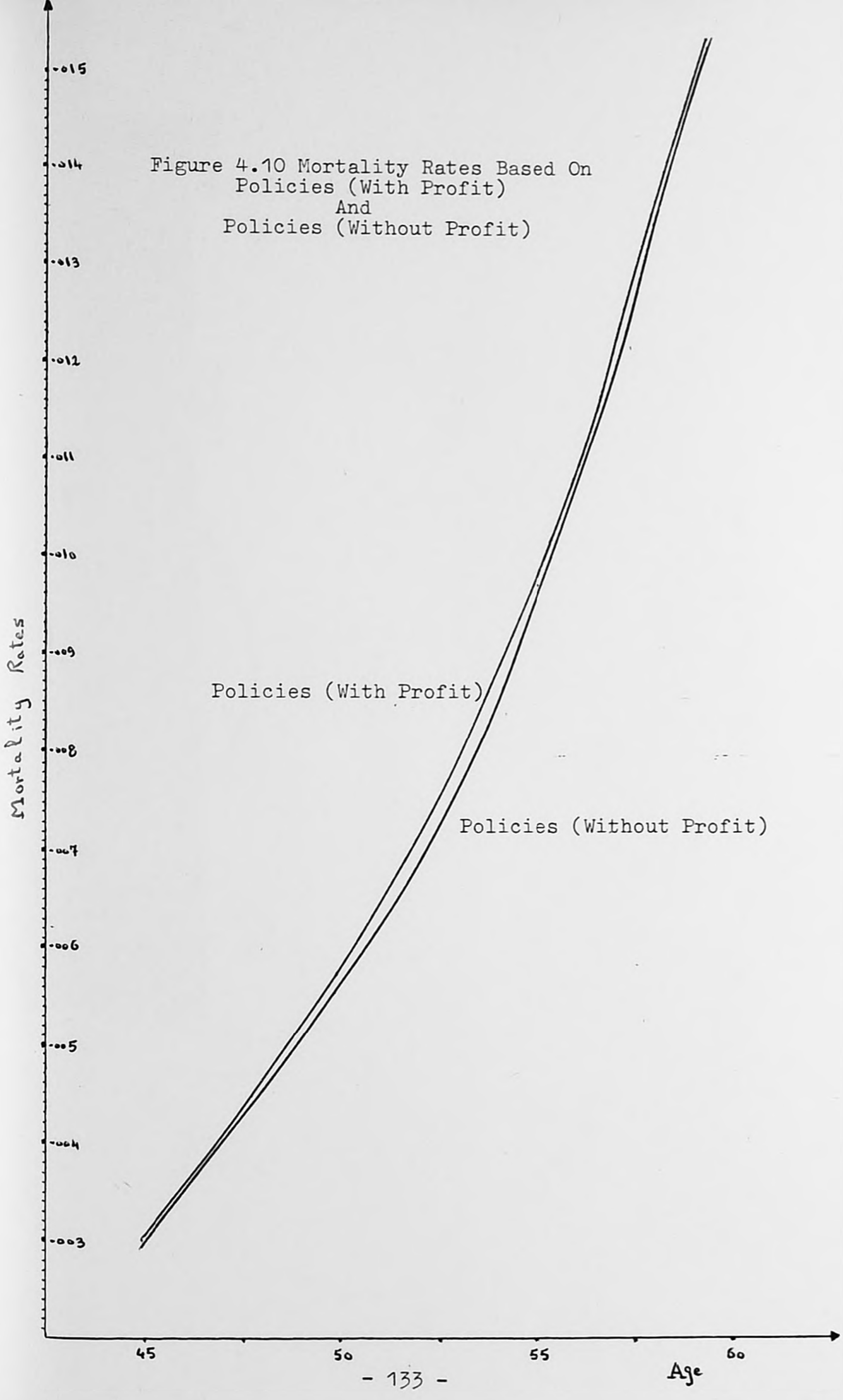


Figure 4.10 Mortality Rates Based On Policies (With Profit) And Policies (Without Profit)

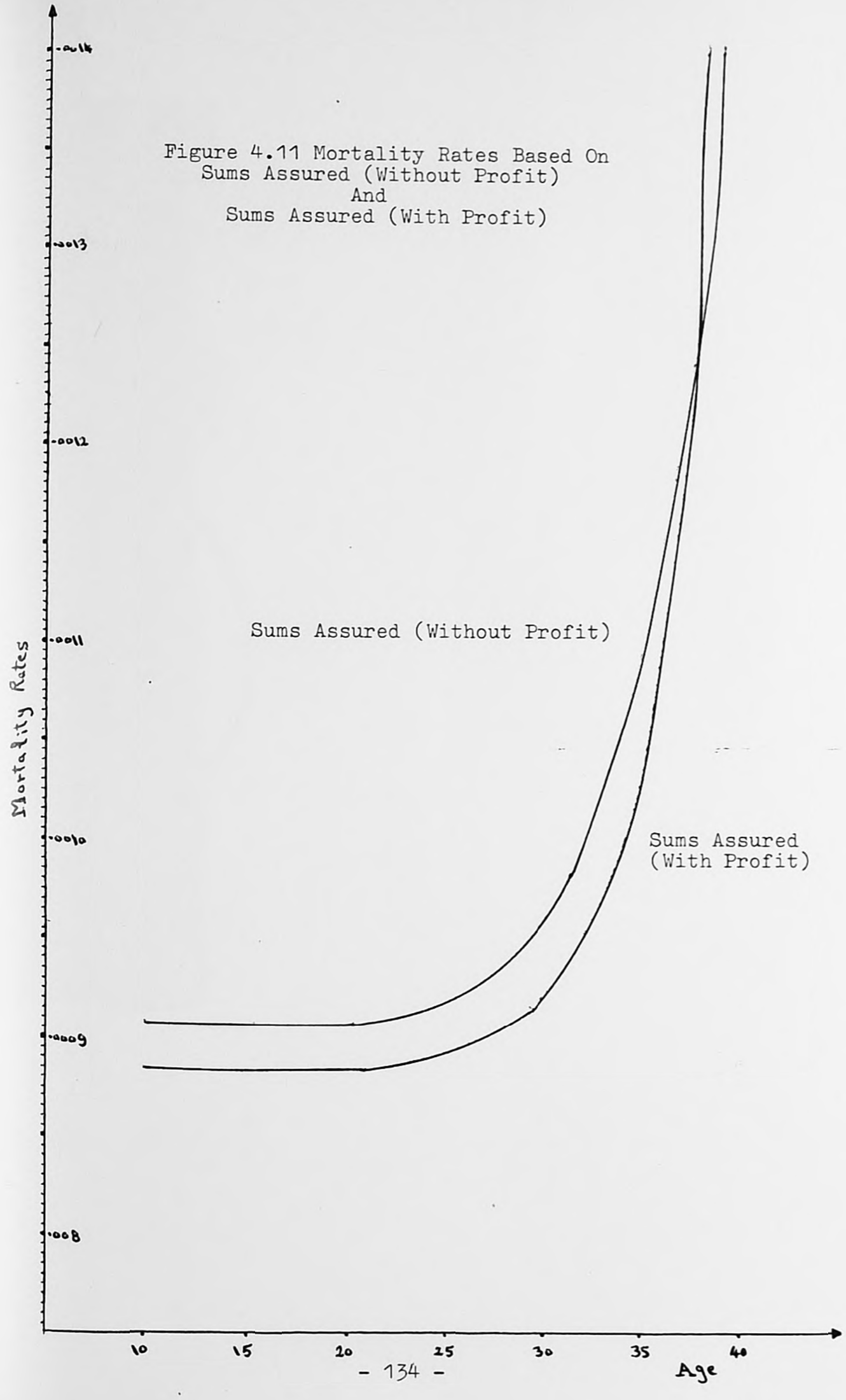


Figure 4.11 Mortality Rates Based On
Sums Assured (Without Profit)
And
Sums Assured (With Profit)

Figure 4.12 Mortality Rates Based On
Sums Assured (Without Profit)
And
Sums Assured (With Profit)

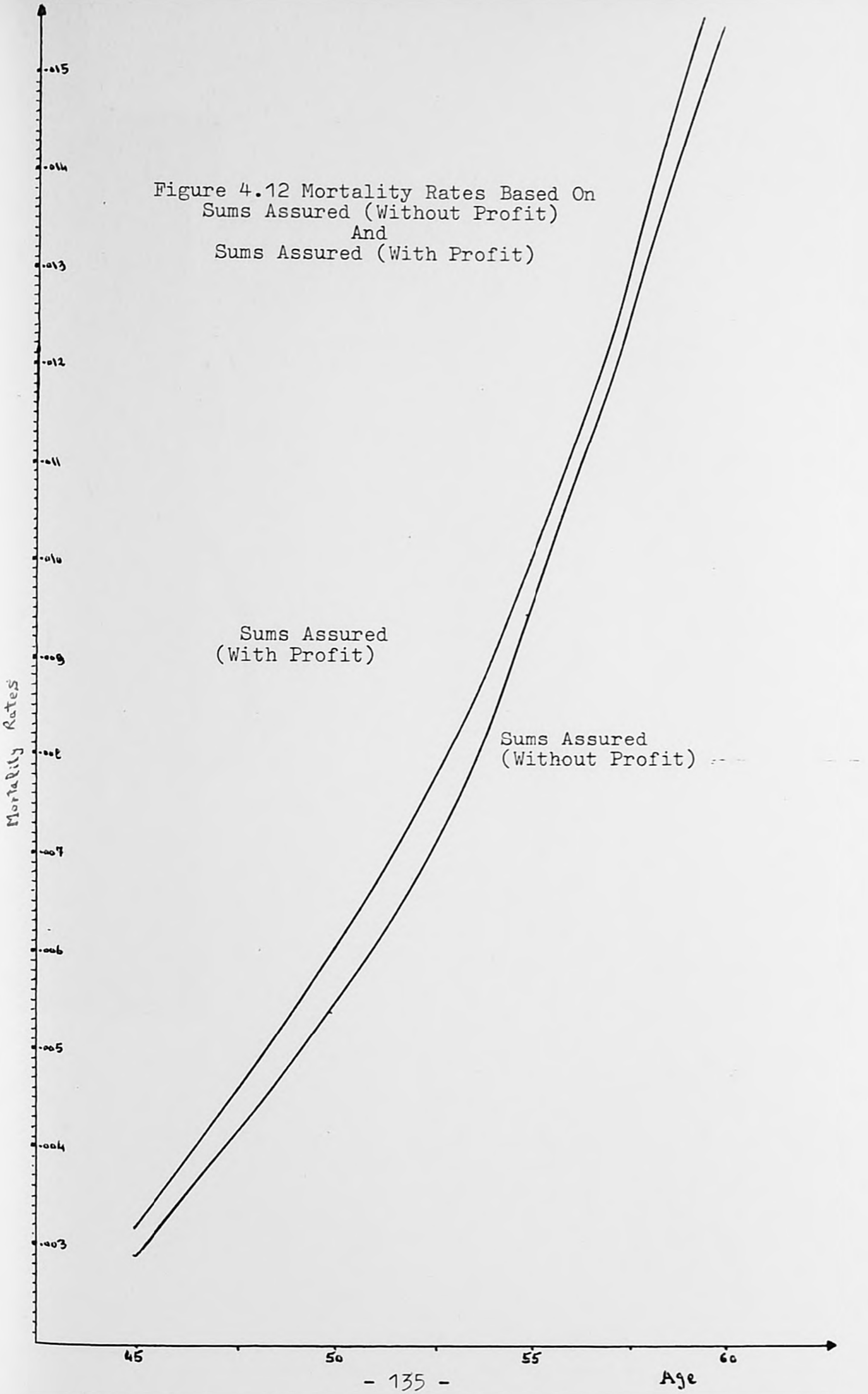


Figure 4.13 Egyptian Mortality Rates
(Policies, Without Profit)
And
Mortality Rates For
A 24-29 U.

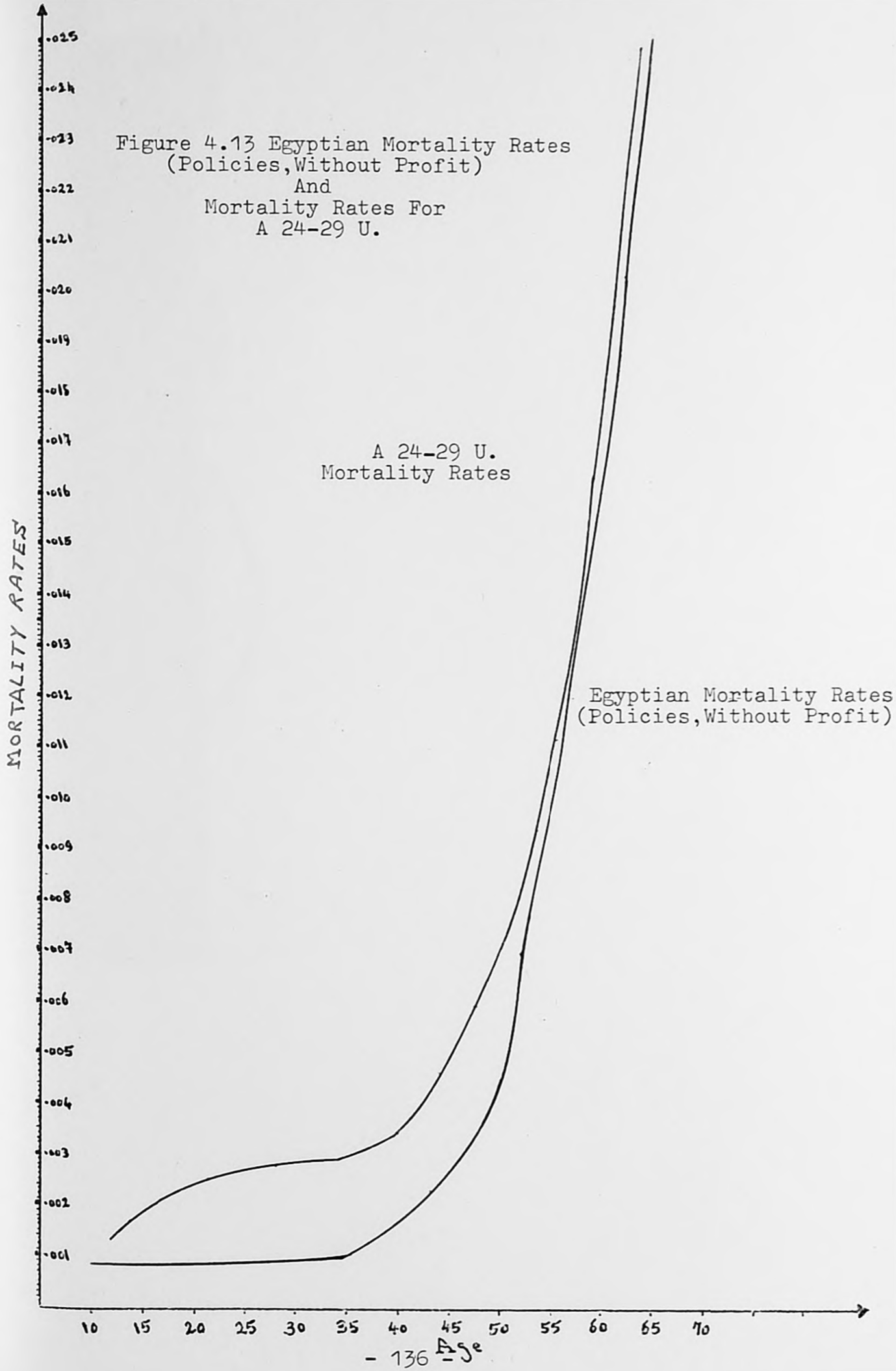


Figure 4.14 Egyptian Mortality Rates
(Sums Assured, Without Profit)
And Mortality Rates For
A 24-29 U.

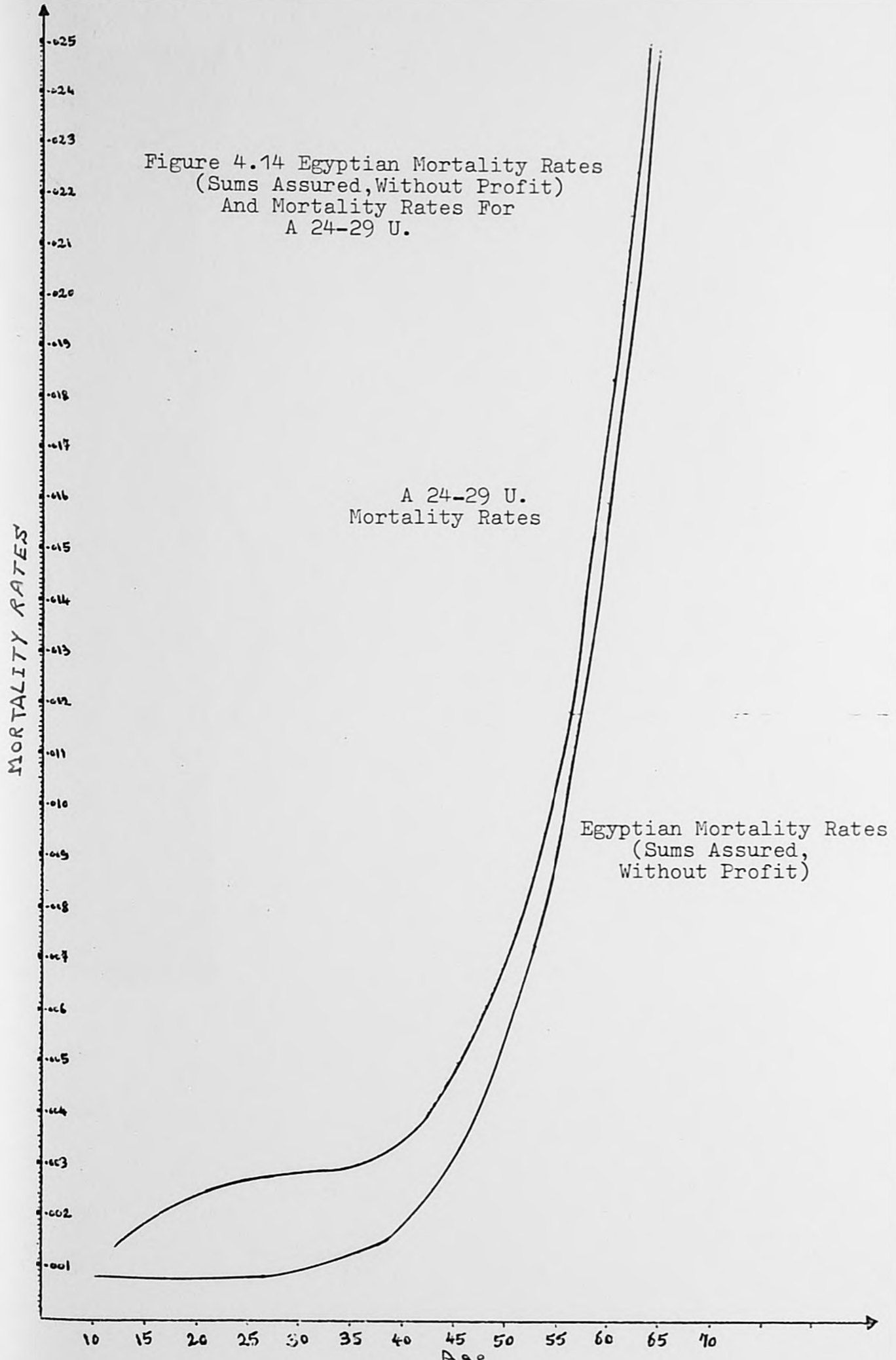


Figure 4.15 Egyptian Mortality Rates
(Policies, With Profit)
And Mortality Rates For
A 24-29 U.

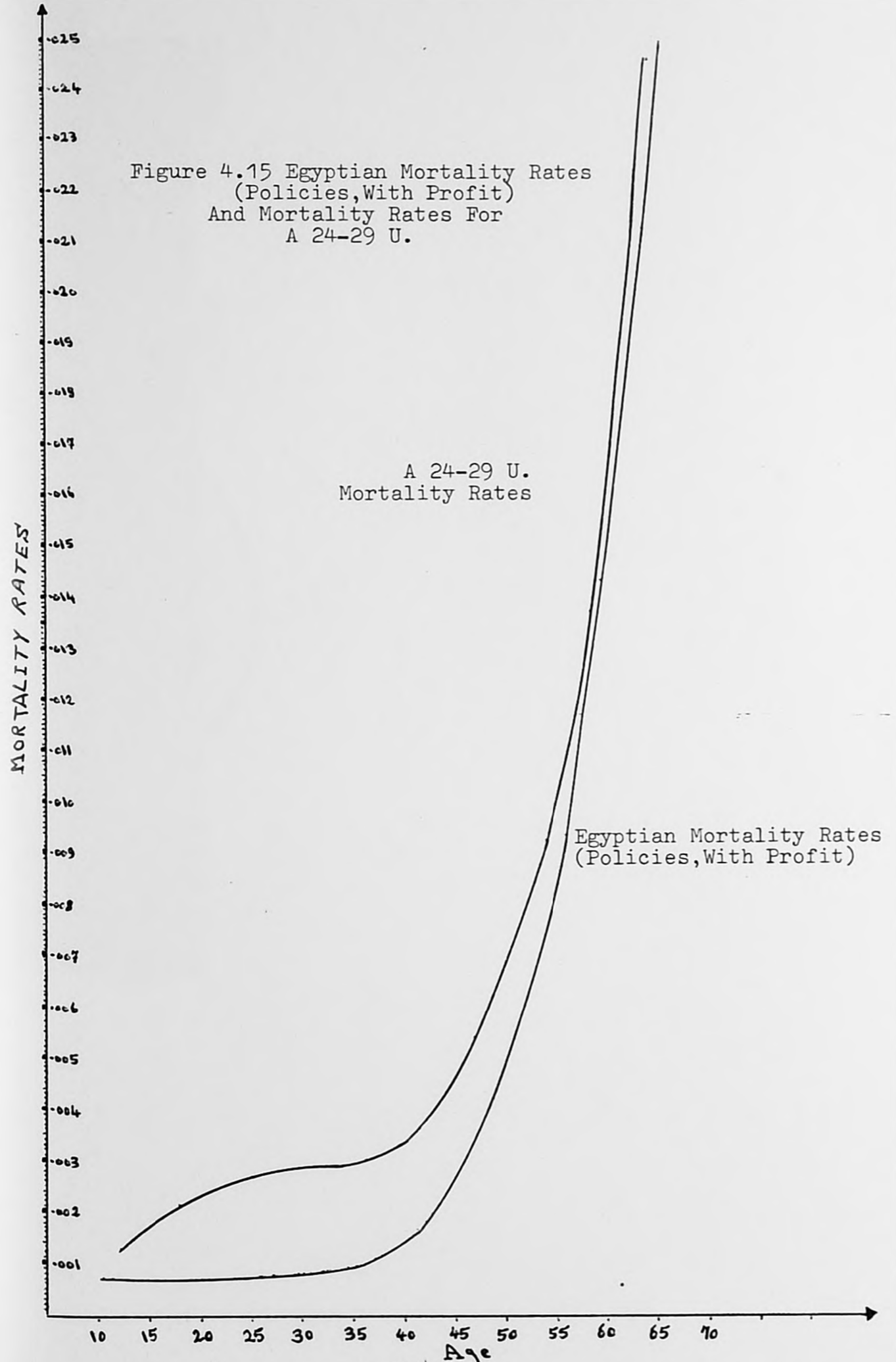


Figure 4.16 Egyptian Mortality Rates
(Sums Assured, With Profit)
And Mortality Rates For
A 24-29 U.

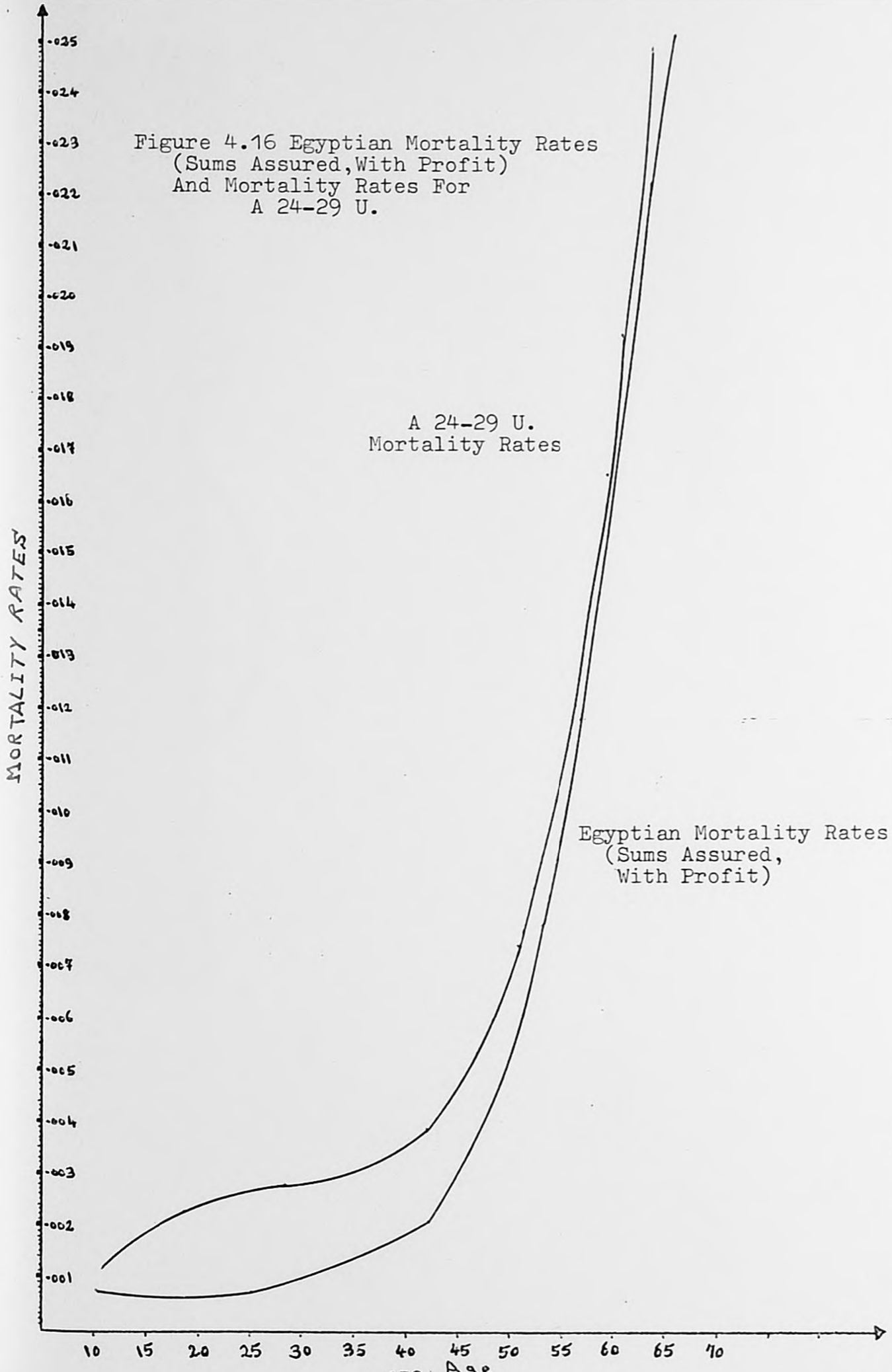


Figure 4.17 Egyptian Mortality Rates
(Policies;Without Profit)
And Mortality Rates For
A 49-52 U.

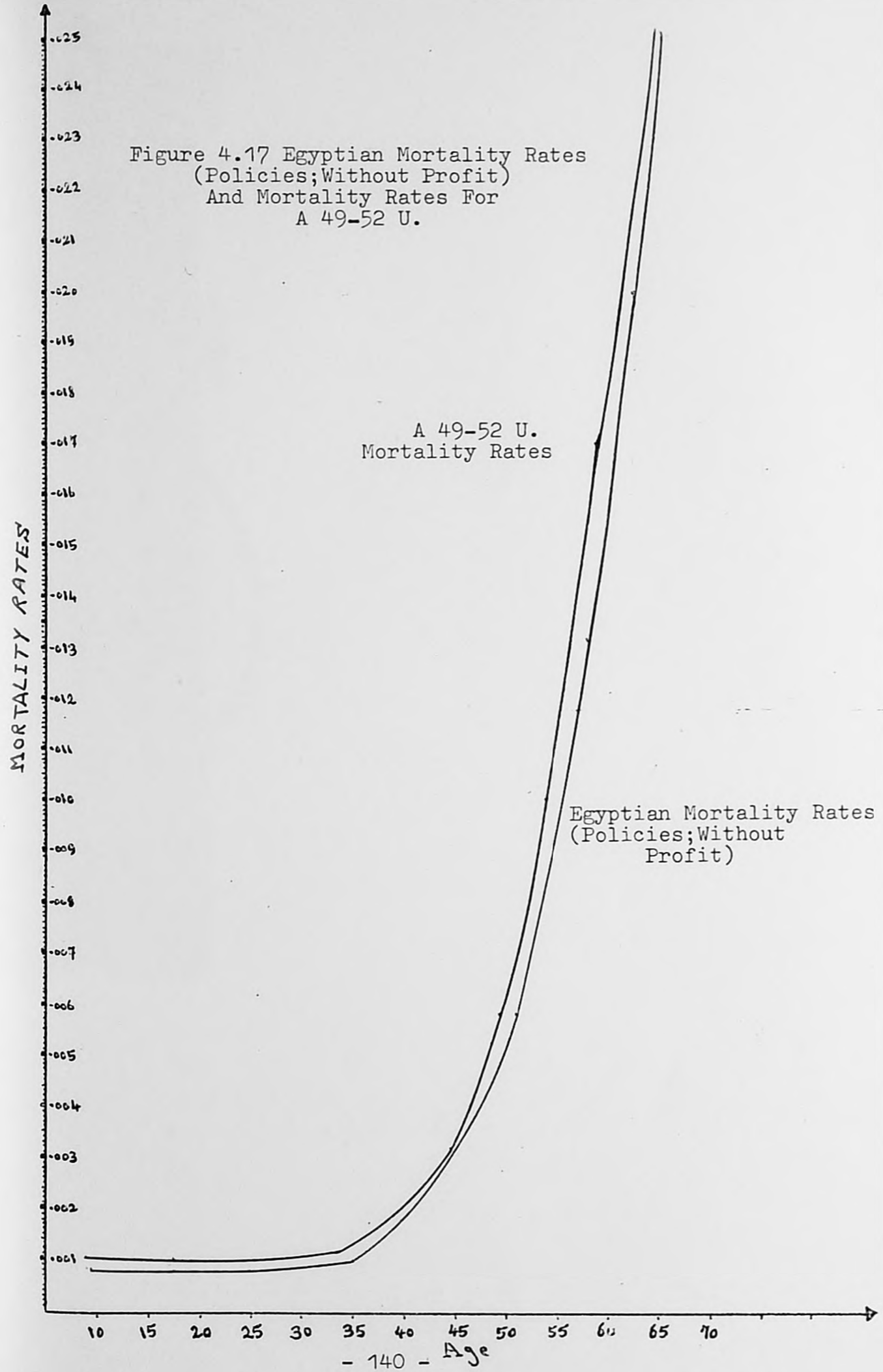


Figure 4.18 Egyptian Mortality Rates (Sums Assured; Without Profit) And Mortality Rates For A 49-52 U.

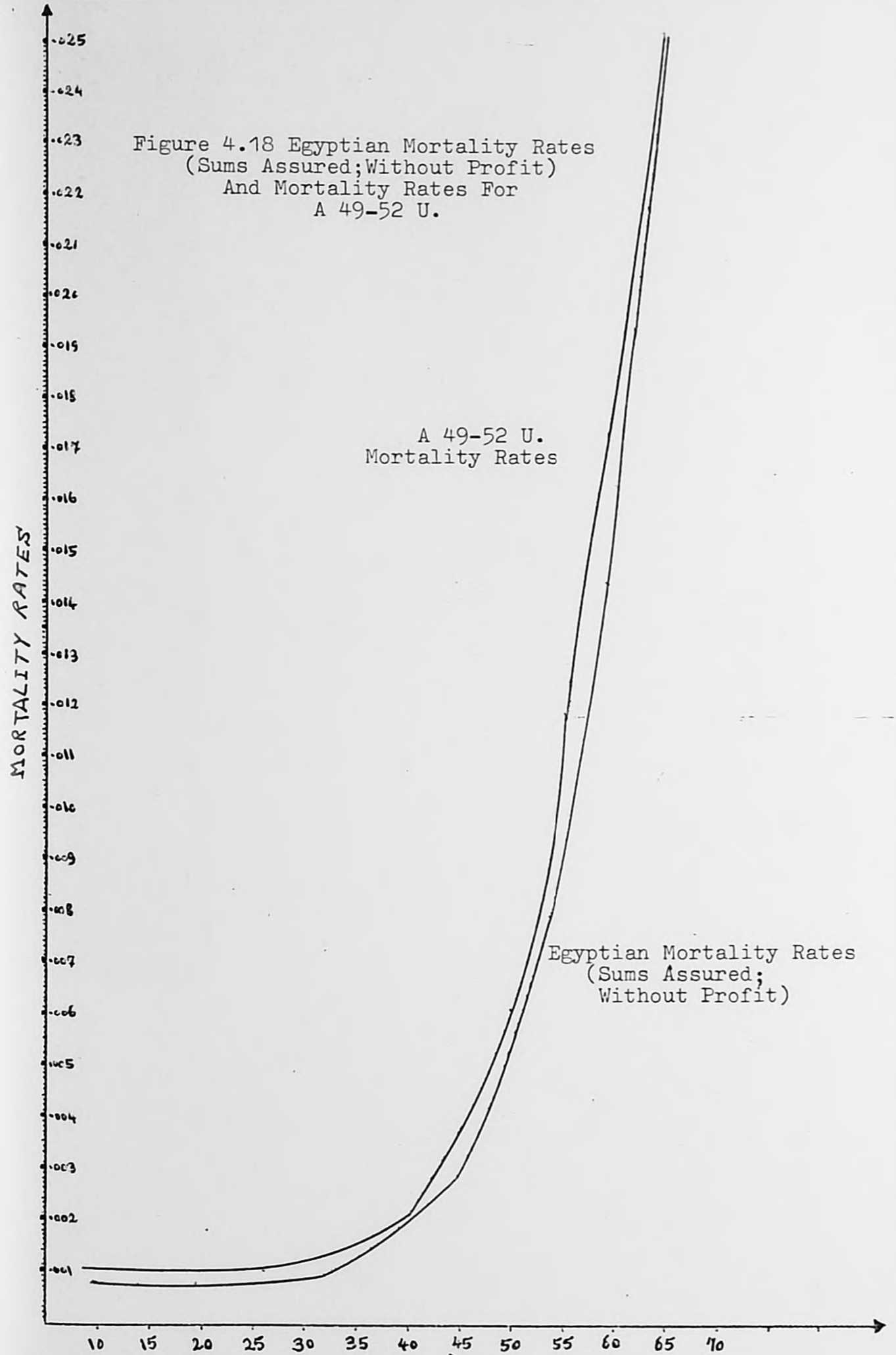
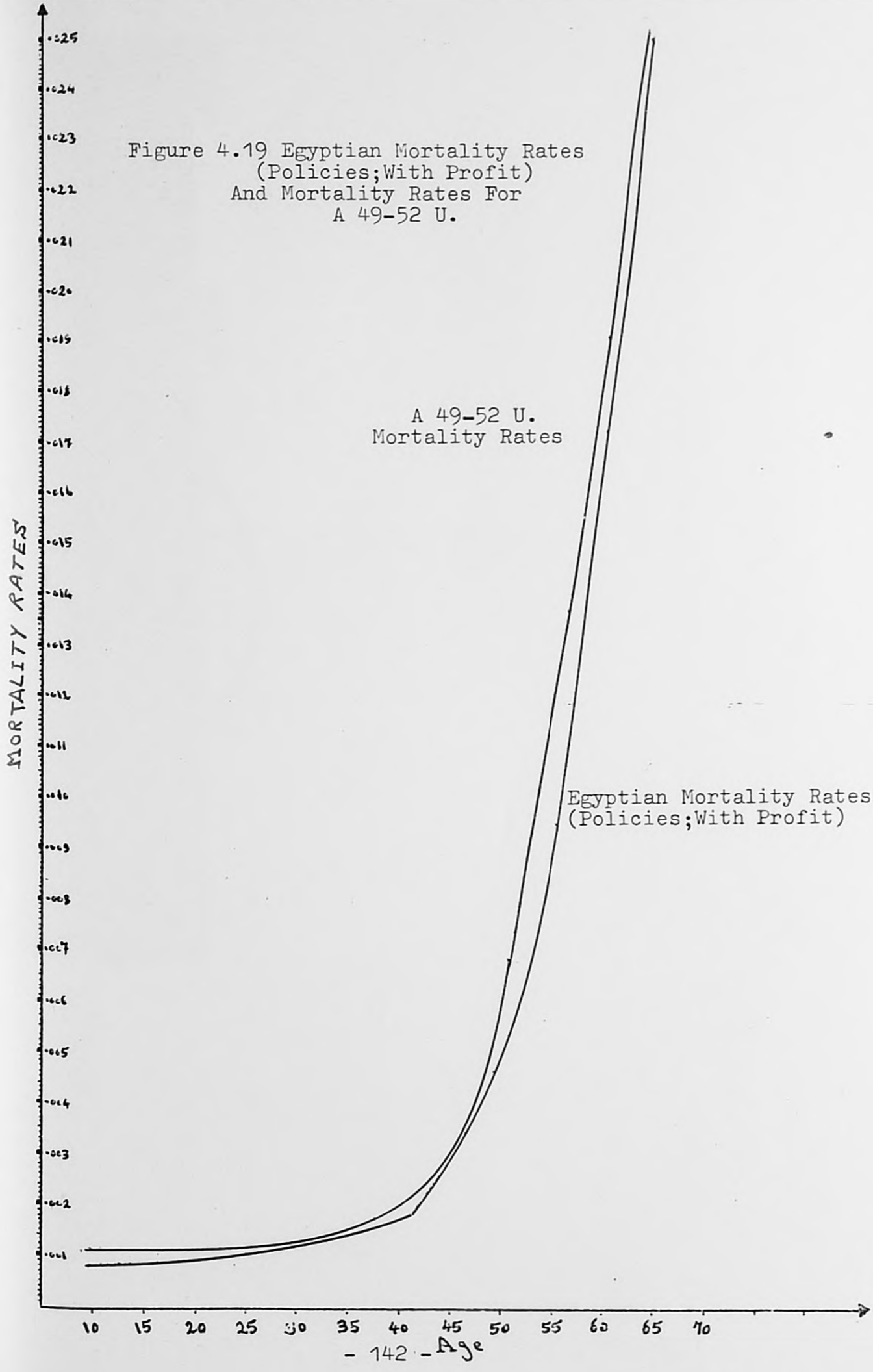


Figure 4.19 Egyptian Mortality Rates
(Policies;With Profit)
And Mortality Rates For
A 49-52 U.



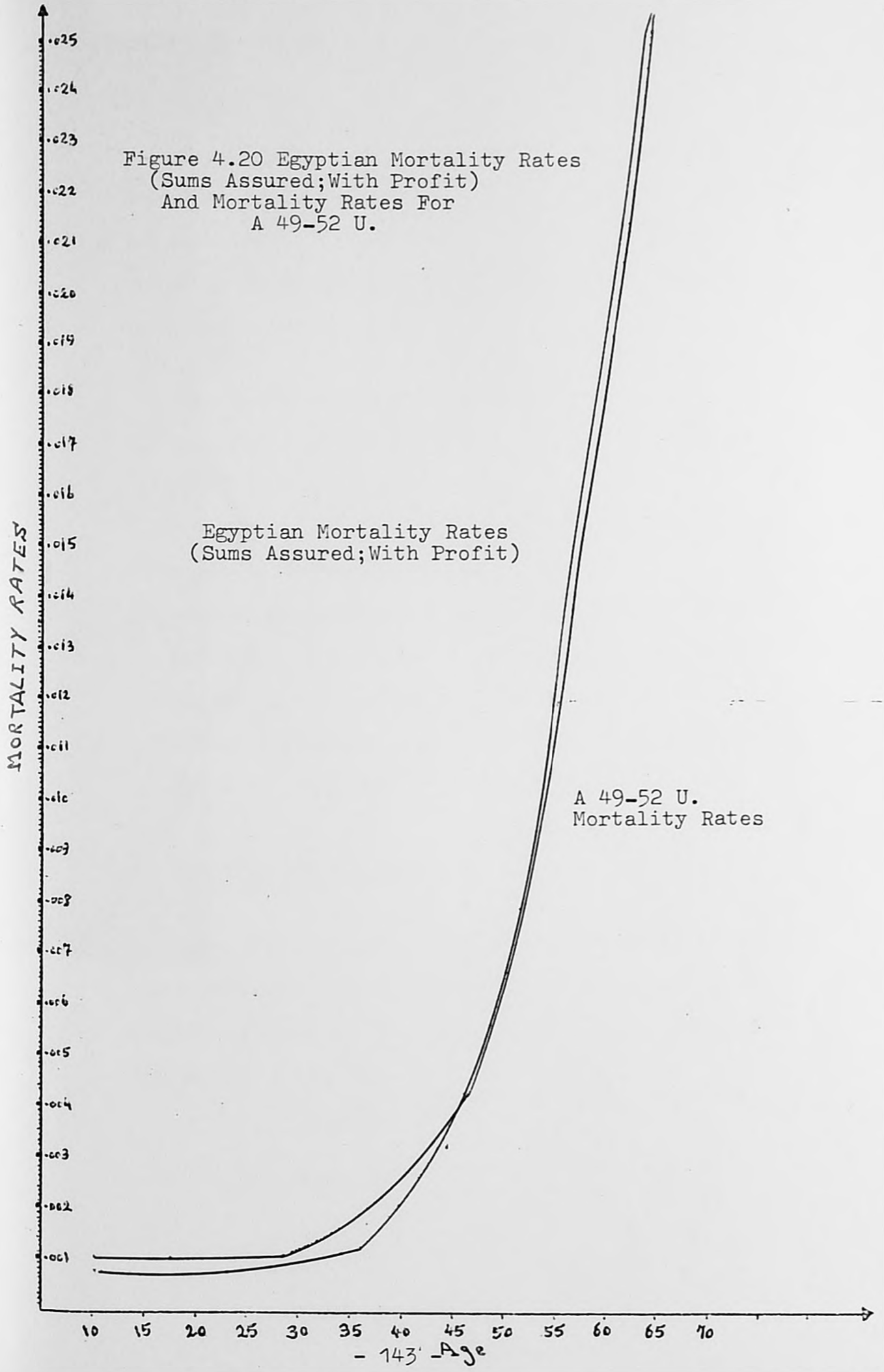


Figure 4.20 Egyptian Mortality Rates
(Sums Assured;With Profit)
And Mortality Rates For
A 49-52 U.

CHAPTER FIVE

THE MONETARY TABLES

5.1 Introduction

The researcher's aim in this chapter is to construct monetary tables based on the Egyptian mortality rates (policies and sums assured; with and without profit), also to compare between their premiums in order to select the ideal mortality table for the Egyptian market.

The approach to fulfil this aim is:

1. To construct life tables based on the Egyptian mortality rates obtained in chapter three.
2. By using some interest rates, the life table are used to construct the monetary tables.
3. Comments are made in this chapter about the difference between the new tables, also the difference between them and both those based on the A 24-29U. and the A 49-52 U. Tables, summary tables are used to sustain the arguments and aid in the selection of the ideal table.

5.2 The Egyptian Life Tables

When values of mortality rates have been obtained over the available range of ages, the life tables can be built up by starting with any suitable radix, say 10000000, and applying successively the relations:

$$d_x = \ell_x \times q_x$$

$$\ell_{x+1} = \ell_x - d_x$$

The data available from the Egyptian market show mortality rates for successive ages from 10 to 64 inclusive and we can, with confidence use the rates of the A49-52 U. for ages starting from 65 to 99 inclusive, especially as the two curves of mortality are moving closer with every age increase, as mentioned previously in chapter four. Tables (5.1), (5.2), (5.3) and (5.4) present the Egyptian life table based on experience of policies, sums assured, without and with profit successively.

Table (5.1)

The Egyptian Life Table (policies, without profit)

Age	ℓ_x	d_x	p_x	q_x
10	10000000	9050	0.999095	0.000905
11	9990949	9042	0.999095	0.000905
12	9981907	9034	0.999095	0.000905
13	9972873	9025	0.999095	0.000905
14	9963848	9017	0.999095	0.000905
15	9954831	9009	0.999095	0.000905
16	9945822	9001	0.999095	0.000905
17	993621	8993	0.999095	0.000905
18	9927828	8985	0.999095	0.000905
19	9918843	8977	0.999095	0.000905
20	9909866	8968	0.999095	0.000905
21	9900898	8960	0.999095	0.000905
22	9891938	8952	0.999095	0.000905
23	9882986	9043	0.999085	0.000915
24	9873943	9035	0.999085	0.000915
25	9864908	9026	0.999085	0.000915
26	9855882	9117	0.999075	0.000925
27	9846765	9108	0.999075	0.000925
28	9837657	9188	0.999066	0.000934
29	9828450	9278	0.999056	0.000944
30	9819192	9358	0.999047	0.000953
31	9809833	9535	0.999028	0.000972
32	9800298	9712	0.999009	0.000991
33	9790586	9986	0.998980	0.001020
34	9780600	10348	0.998942	0.001058
35	9770252	10796	0.998895	0.001105
36	9759456	11438	0.998828	0.001172
37	9748018	12166	0.998752	0.001248
38	9735852	13173	0.998647	0.001353
39	9722679	14360	0.998523	0.001477

continued

Table (5.1) Continued

Age	ℓ_x	d_x	p_x	q_x
40	9708319	15902	0.993620	0.001638
41	9692417	17727	0.998171	0.001829
42	9674690	19814	0.997952	0.002048
43	9654876	22341	0.997686	0.002314
44	9632535	25314	0.997372	0.002628
45	9607221	28726	0.997010	0.002990
46	9578495	32375	0.996620	0.003380
47	9546120	36714	0.996154	0.003846
48	9509408	41461	0.995640	0.004360
49	9467945	46696	0.995068	0.004932
50	9421249	52288	0.994450	0.005550
51	9368961	58415	0.993765	0.006235
52	9310546	65053	0.993013	0.006987
53	9245493	72254	0.992185	0.007815
54	9173239	79899	0.991290	0.008710
55	9093340	88205	0.990300	0.009700
56	9005135	97030	0.989225	0.010775
57	8908105	106505	0.988044	0.011956
58	8801600	116621	0.986750	0.013250
59	8684973	127391	0.985332	0.014668
60	8557588	138804	0.983780	0.01622
61	8418784	150890	0.982077	0.017923
62	8267894	163704	0.980200	0.019800
63	8104190	177109	0.978146	0.021854
64	7927081	191122	0.975890	0.024110
65	7735959	217380	0.9719	0.02810
66	7518579	232700	0.96905	0.03095
67	7285872	248376	0.96591	0.03409
68	7037503	264118	0.96247	0.03753
69	6773385	279741	0.9587	0.04130
70	6493644	295006	0.95457	0.04543
71	6198638	309622	0.95005	0.04995
72	5889016	323248	0.94511	0.05489
73	5565768	335505	0.93972	0.06028

continued

Table (5.1) Continued)

Age	ℓ_x	d_x	p_x	q_x
74	5230263	346034	0.93384	0.06616
75	4884229	354448	0.92743	0.07257
76	4529781	360254	0.92047	0.07953
77	4169527	363124	0.91291	0.08709
78	3806403	362674	0.90472	0.09528
79	3443729	358630	0.89586	0.10414
80	3085099	350745	0.88631	0.11369
81	2734354	338978	0.87603	0.12397
82	2395376	323376	0.865	0.13500
83	2072000	304190	0.85319	0.14681
84	1767810	281824	0.84058	0.15942
85	1485986	256808	0.82718	0.17282
86	1229178	229906	0.81286	0.18704
87	999272	201903	0.79795	0.20205
88	997369	173707	0.78215	0.21785
89	623662	146187	0.7656	0.23440
90	477475	120171	0.74832	0.25168
91	357304	96340	0.73037	0.26963
92	260964	75208	0.71181	0.28819
93	185756	57083	0.6927	0.30730
94	128673	42061	0.67312	0.32688
95	86612	30040	0.65317	0.34683
96	56572	20766	0.63294	0.36706
97	35806	13874	0.61253	0.38747
98	21932	8948	0.59205	0.40795
99	12984	5563	0.5716	0.42840

Table (5.2)

The Egyptian Life Table (Sums Assured, Without Profit)

Age	ℓ_x	d_x	p_x	q_x
10	10000000	9200	0.99080	0.000920
11	9990799	9192	0.99080	0.000920
12	9981607	9183	0.99080	0.000920
13	9972424	9175	0.99080	0.000920
14	9963249	9166	0.99080	0.000920
15	9954083	9158	0.99080	0.000920
16	9944925	9149	0.99080	0.000920
17	9935776	9141	0.99080	0.000920
18	9926635	9133	0.99080	0.000920
19	9917502	9124	0.99080	0.000920
20	9908378	9116	0.99080	0.000920
21	9899262	9107	0.99080	0.000920
22	9890155	9099	0.99080	0.000920
23	9881056	9189	0.99070	0.000930
24	9871867	9181	0.99070	0.000930
25	9862686	9172	0.99070	0.000930
26	9853514	9252	0.99061	0.000939
27	9844262	9244	0.99061	0.000939
28	9825018	9324	0.99052	0.000948
29	9825694	9403	0.99043	0.000957
30	9816291	9492	0.999033	0.000967
31	9806799	9660	0.999015	0.000985
32	9797139	9827	0.998997	0.001003
33	9787312	10090	0.998969	0.001031
34	9777222	10442	0.998932	0.001068
35	9766780	11154	0.998858	0.001142
36	9755626	11502	0.998821	0.001179
37	9744124	12209	0.998747	0.001253
38	9731915	13177	0.998646	0.001354

continued

Table (5.2) Continued

Age	l_x	d_x	p_x	q_x
39	9718738	14325	0.998526	0.001474
40	9704413	15828	0.998369	0.001631
41	9688585	17594	0.998184	0.001816
42	9670991	19613	0.997972	0.002028
43	9651378	22063	0.997714	0.002286
44	9629315	24950	0.997409	0.002591
45	9604365	28246	0.997059	0.002941
46	9576119	31879	0.996671	0.003329
47	9544240	36001	0.996228	0.003772
48	9508239	40600	0.995730	0.004270
49	9467639	45672	0.995176	0.004824
50	9421967	51105	0.994576	0.005424
51	9370862	57050	0.993912	0.006088
52	9313812	63502	0.993182	0.006818
53	9250310	70487	0.99238	0.007620
54	9179823	77918	0.991512	0.008488
55	9101905	85995	0.990552	0.009448
56	9015910	94586	0.989509	0.010491
57	8921324	103800	0.988365	0.011635
58	8817524	113658	0.98711	0.012890
59	8703866	124161	0.985735	0.014265
60	8579705	135293	0.984231	0.015769
61	8444412	147110	0.982579	0.017421
62	8297302	159632	0.980761	0.019239
63	8137670	172787	0.978767	0.021233
64	7964883	186538	0.97658	0.023420
65	7778345	218571	0.9719	0.02810
66	7559774	233975	0.96905	0.03095
67	7325799	249736	0.96591	0.03409
68	7076063	265565	0.96247	0.03753
69	6810498	281274	0.9587	0.04130
70	6529224	296623	0.95457	0.04543

continued

Table (5.2) Continued)

Age	ℓ_x	d_x	p_x	q_x
71	6232601	311318	0.95005	0.04995
72	5921283	325019	0.94511	0.05489
73	5596264	337343	0.93972	0.06028
74	5258921	347930	0.93384	0.06616
75	4910991	356391	0.92743	0.07257
76	4554600	396660	0.92047	0.07953
77	4157940	363115	0.91291	0.08709
78	3795825	361666	0.90472	0.09528
79	3434159	357633	0.89586	0.10414
80	3076526	349770	0.88631	0.11369
81	2726756	338036	0.87603	0.12397
82	2388720	322477	0.865	0.13500
83	2066243	303345	0.85319	0.14681
84	1762898	281041	0.84058	0.15942
85	1481857	256095	0.82718	0.17282
86	1225762	229267	0.81286	0.18704
87	996495	201342	0.79795	0.20205
88	795153	173224	0.78215	0.21785
89	621929	145780	0.7656	0.23440
90	476149	119837	0.74832	0.25168
91	356312	96072	0.73037	0.26963
92	260240	74999	0.71181	0.28819
93	185241	56925	0.6927	0.30730
94	128316	41944	0.67312	0.32688
95	86372	29956	0.65317	0.34683
96	56416	20708	0.63294	0.36706
97	35708	13836	0.61253	0.38747
98	21872	8923	0.59205	0.40795
99	12949	5547	0.5716	0.42840

Table (5.3)

The Egyptian Life Table (policies; with profit)

Age	l_x	d_x	p_x	q_x
10	10000000	8810	0.999119	0.000881
11	9991190	8802	0.999119	0.000881
12	9982388	8794	0.999119	0.000881
13	9973594	8787	0.999119	0.000881
14	9964807	8780	0.999119	0.000881
15	9956027	8771	0.999119	0.000881
16	9947256	8764	0.999119	0.000881
17	9938492	8756	0.999119	0.000881
18	9929736	8748	0.999119	0.000881
19	9920988	8740	0.999119	0.000881
20	9912248	8733	0.999119	0.000881
21	9903515	8725	0.999119	0.000881
22	9894790	8717	0.999119	0.000881
23	9886073	8808	0.999109	0.000891
24	9877265	8801	0.999109	0.000891
25	9868464	8793	0.999109	0.000891
26	9859671	8884	0.999099	0.000901
27	9850787	8876	0.999099	0.000901
28	9841911	8966	0.999089	0.000911
29	9832945	9046	0.999080	0.000920
30	9823899	9136	0.999070	0.000930
31	9814763	9324	0.999050	0.000950
32	9805439	9511	0.999030	0.000970
33	9795928	9786	0.999001	0.000999
34	9786142	10168	0.998961	0.001039
35	9775974	10636	0.998912	0.001088
36	9765338	11298	0.998843	0.001157
37	9754040	12056	0.998764	0.001236
38	9741984	13093	0.998656	0.001344
39	9728891	14321	0.998528	0.001472
40	9714570	15922	0.998361	0.001639

continued

Table (5.3) Continued

Age	ℓ_x	d_x	p_x	q_x
41	9698648	17807	0.998164	0.001836
42	9680841	19972	0.997937	0.002063
43	9660869	22587	0.997662	0.002338
44	9638282	25667	0.997337	0.002663
45	9612615	29203	0.996962	0.003038
46	9583412	33072	0.996549	0.003451
47	9550340	37476	0.996076	0.003924
48	9512864	42380	0.995545	0.004455
49	9470484	47788	0.994954	0.005046
50	9422696	53577	0.994314	0.005686
51	9369119	59916	0.993605	0.006395
52	9309203	66775	0.992827	0.007173
53	9242428	74217	0.991970	0.008030
54	9168211	82110	0.991044	0.008956
55	9086101	90679	0.990020	0.009980
56	8995422	99777	0.988908	0.011092
57	8895645	109532	0.987687	0.012313
58	8786113	119957	0.986347	0.013653
59	8666156	131032	0.984880	0.015120
60	8535124	142750	0.983275	0.016725
61	8392374	155150	0.981513	0.018487
62	8237224	168262	0.979573	0.020427
63	8068962	181987	0.977446	0.022554
64	7886975	196291	0.975112	0.024888
65	7690684	216108	0.9719	0.02810
66	7474576	231338	0.96905	0.03095
67	7243238	246922	0.96591	0.03409
68	6996316	262572	0.96247	0.03753
69	6733744	278104	0.9587	0.04130
70	6455640	293280	0.95457	0.04543
71	6162360	307810	0.95005	0.04995
72	5854550	321356	0.94511	0.05489
73	5533194	333541	0.93972	0.06028

continued

Table (5.3) Continued

Age	ℓ_x	d_x	p_x	q_x
74	5199653	344009	0.93384	0.06616
75	4855644	352374	0.92743	0.07257
76	4503270	358145	0.92047	0.07953
77	4145125	360999	0.91291	0.08709
78	3784126	360552	0.90472	0.09528
79	3423574	356531	0.89586	0.10414
80	3067043	348692	0.88631	0.11369
81	2718351	336994	0.87603	0.12397
82	2381357	321483	0.865	0.13500
83	2059874	302410	0.85319	0.14681
84	1757464	280175	0.84058	0.15942
85	1477289	255305	0.82718	0.17282
86	1221984	228560	0.81296	0.18704
87	993424	200721	0.79795	0.20205
88	792703	172690	0.78215	0.21785
89	620013	145331	0.7656	0.23440
90	474682	119468	0.74832	0.25168
91	355214	95776	0.73037	0.26963
92	259438	74767	0.71181	0.28819
93	184671	56749	0.6921	0.30730
94	127922	41815	0.67312	0.32688
95	86107	29864	0.65317	0.34683
96	56243	20645	0.63294	0.35706
97	35598	13793	0.61253	0.38747
98	21805	8895	0.59205	0.40795
99	12910	5531	0.5716	0.42840

Table (5.4)

The Egyptian Life Table (Sums Assured, With Profit)

Age	ℓ_x	d_x	p_x	q_x
10	10000000	8760	0.999124	0.000876
11	9991239	8752	0.999124	0.000876
12	9982487	8745	0.999124	0.000876
13	9973742	8737	0.999124	0.000876
14	9965005	8729	0.999124	0.000876
15	9956276	8722	0.999124	0.000876
16	9947554	8714	0.999124	0.000876
17	9938840	8706	0.999124	0.000876
18	9930134	8699	0.999124	0.000876
19	9921435	8691	0.999124	0.000876
20	9912744	8684	0.999124	0.000876
21	9904060	8676	0.999124	0.000876
22	9895384	8668	0.999124	0.000876
23	9886716	8770	0.999113	0.000887
24	9877946	8761	0.999113	0.000887
25	9869185	8754	0.999113	0.000887
26	9860431	8855	0.999102	0.000898
27	9851576	8847	0.999102	0.000898
28	9842729	8947	0.999091	0.000909
29	9833782	9047	0.99908	0.000920
30	9824735	9147	0.999069	0.000931
31	9815588	9344	0.999048	0.000952
32	9806244	9551	0.999026	0.000974
33	9796693	9855	0.998994	0.001006
34	9786838	10276	0.99895	0.001050
35	9776562	10793	0.998896	0.001104
36	9765769	11524	0.99882	0.00118
37	9754245	12358	0.998733	0.001267
38	9741887	13502	0.998614	0.001386
39	9728385	14855	0.998473	0.001527

continued

Table (5.4) Continued

Age	ℓ_x	d_x	p_x	q_x
40	9713530	16620	0.998289	0.001711
41	9696910	18696	0.998072	0.001928
42	9678214	21069	0.997823	0.002177
43	9657145	23959	0.997519	0.002481
44	9633186	27349	0.997161	0.002839
45	9605837	31229	0.996749	0.003251
46	9574608	35483	0.996294	0.003705
47	9539125	40312	0.995774	0.004226
48	9498813	45708	0.995188	0.004812
49	9453105	51633	0.994538	0.005462
50	9401472	57979	0.993833	0.006167
51	9343493	64909	0.993053	0.006947
52	9278584	72410	0.992196	0.007804
53	9206174	80526	0.991253	0.008747
54	9125648	89121	0.990234	0.009766
55	9036527	98444	0.989106	0.010894
56	8938083	108321	0.987881	0.012119
57	889762	118875	0.986537	0.013463
58	8710887	126630	0.985463	0.014537
59	8584257	142954	0.983347	0.016653
60	8441303	154645	0.98168	0.018320
61	8286658	167888	0.97974	0.020260
62	8118770	181828	0.977604	0.022396
63	7936942	196344	0.975262	0.024738
64	7740598	215196	0.972199	0.027801
65	7525402	211464	0.9719	0.02810
66	7313938	225366	0.96905	0.03095
67	7087572	241615	0.96591	0.03409
68	6845957	256929	0.96247	0.03753
69	6589028	272127	0.9587	0.04130
70	6316901	286977	0.95457	0.04543
71	6029924	301195	0.95005	0.04995

continued

Table (5.4) Continued

Age	ℓ_x	d_x	p_x	q_x
72	5728729	314450	0.94511	0.05489
73	5414279	326373	0.93972	0.06028
74	5087906	336616	0.93384	0.06616
75	4751290	344801	0.92743	0.07257
76	4406489	350448	0.92047	0.07953
77	4056041	353241	0.91291	0.08709
78	3702800	352803	0.90472	0.09528
79	3349997	348869	0.89586	0.10414
80	3001128	341198	0.88631	0.11369
81	2659930	329752	0.87603	0.12397
82	2330178	314574	0.865	0.13500
83	2015604	295911	0.85319	0.14681
84	1719693	274153	0.84058	0.15942
85	1445540	249818	0.82718	0.17282
86	1195722	223648	0.81286	0.18704
87	972074	196408	0.79795	0.20205
88	775666	168979	0.78215	0.21785
89	606687	142207	0.7656	0.23440
90	464480	116900	0.74832	0.25168
91	347580	93718	0.73037	0.26963
92	253862	73160	0.711811	0.28819
93	180702	55530	0.6927	0.30130
94	125172	40916	0.67312	0.32688
95	84256	29223	0.65317	0.34683
96	55033	20200	0.63294	0.36706
97	34833	13497	0.61253	0.38747
98	21336	8704	0.59205	0.40795
99	12632	5412	0.5716	0.42840

5.3 The Monetary Tables

In order to compute the single and annual premiums for any kind of life assurance, we need to have commutation functions, which in this case are as follows: (Hooker, P.F. & Longley-Cook, L.H., 1953, p.32 & 44):

$$D_x = v^x \cdot \ell_x$$

$$N_x = \sum_{t=o}^{\infty} D_{x+t}$$

$$S_x = \sum_{t=o}^{\infty} N_{x+t}$$

$$C_x = v^{x+1} \cdot d_x$$

$$M_x = \sum_{t=o}^{\infty} C_{x+t}$$

$$R_x = \sum_{t=o}^{\infty} M_{x+t}$$

By using computer programs (Appendix II), and interest rates from 4% to 9% the monetary tables have been calculated, but according to the interest rate 4½% which the Egyptian insurance companies are using now, tables (5.5) and (5.6) inclusive, present the monetary tables based on policies (without profit) at 4½%, tables (5.7) and (5.8) inclusive, present the monetary tables based on sums assured (without profit) at 4½%, tables (5.9) and (5.10) inclusive, present the monetary tables based on policies (with profit) at 4½% also tables (5.11) and (5.12) inclusive, present the monetary tables based on sums assured (with profit) at 4½%.

Table (5.5)

THE EGYPTIAN MONETARY FUNCTIONS(POLICIES;WITHOUT PROFIT) AT 4.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	6439276.	137559192.	2598888480.
11	6156410.	131119916.	2461329280.
12	5885970.	124963506.	2330209376.
13	5627409.	119077536.	2205245856.
14	5380207.	113450127.	2086168304.
15	5143865.	108069920.	1972718176.
16	4917904.	102926055.	1864648256.
17	4701869.	98008151.	1761722208.
18	4495324.	93306282.	1663714064.
19	4297852.	88810958.	1570407776.
20	4109055.	84513106.	1481596816.
21	3928552.	80404051.	1397083712.
22	3755977.	76475499.	1316679664.
23	3590984.	72719522.	1240204160.
24	3433204.	69128538.	1167484640.
25	3282357.	65695334.	1098356096.
26	3138137.	62412977.	1032660760.
27	3000224.	59274840.	970247784.
28	2868372.	56274616.	910972944.
29	2742288.	53406244.	854698328.
30	2621724.	50663956.	801292088.
31	2506436.	48042232.	750628128.
32	2396172.	45535796.	702585896.
33	2290715.	43139624.	657050096.
34	2189836.	40848909.	613910472.
35	2093320.	38659073.	573061560.
36	2000963.	36565754.	534402484.
37	1912553.	34564790.	497836732.
38	1827910.	32652237.	463271940.
39	1746830.	30824327.	430619704.
40	1669139.	29077497.	399795376.
41	1594645.	27408358.	370717880.
42	1523186.	25813713.	343309520.
43	1454609.	24290527.	317495808.
44	1388749.	22835919.	293205280.
45	1325454.	21447170.	270369360.
46	1264585.	20121716.	248922190.
47	1206039.	18857131.	228800474.
48	1149665.	17651093.	209943342.
49	1095361.	16501427.	192292250.
50	1043023.	15406066.	175790822.
51	992569.	14363043.	160384756.
52	943904.	13370474.	146021714.
53	896947.	12426569.	132651240.
54	851614.	11529623.	120224671.
55	807844.	10678008.	108695048.
56	765558.	9870164.	98017040.
57	724697.	9104607.	88146876.
58	685199.	8379909.	79042269.
59	647005.	7694710.	70662360.
60	610062.	7047705.	62967650.
61	574322.	6437643.	55919945.
62	539740.	5863321.	49482301.
63	506271.	5323581.	43618980.
64	473882.	4817310.	38295399.
65	442543.	4343427.	33478089.
66	411586.	3900884.	29134662.
67	381672.	3489298.	25233777.
68	352786.	3107626.	21744479.
69	324924.	2754841.	18636852.
70	298090.	2429917.	15882011.
71	272295.	2131826.	13452095.
72	247554.	1859531.	11320268.
73	223891.	1611978.	9460737.
74	201334.	1388087.	7848759.
75	179913.	1186753.	6460672.
76	159676.	1006835.	5273920.
77	140648.	847159.	4267085.
78	122869.	706511.	3419926.
79	106376.	583642.	2713415.
80	91194.	477266.	2129773.
81	77346.	386072.	1652506.
82	64839.	308727.	1266434.
83	53671.	243888.	957707.
84	43819.	190217.	713820.
85	35248.	146397.	523603.
86	27901.	111150.	377205.
87	21705.	83249.	266056.
88	20731.	61544.	182806.
89	12405.	40813.	121263.
90	9088.	28408.	80450.
91	6508.	19319.	52042.
92	4549.	12811.	32723.
93	3098.	8263.	19912.
94	2054.	5164.	11649.
95	1323.	3110.	6485.
96	827.	1788.	3374.
97	501.	961.	1587.
98	294.	460.	626.
99	166.	166.	166.

Table (5.6)

THE EGYPTIAN MONETARY FUNCTIONS(POLICIES ; WITHOUT PROFIT) AT 4.50 PER CENT INTEREST RATE

X	Cx	Mx	Rx
10	5577.	515762.	25647131.
11	5332.	510186.	25131369.
12	5098.	504854.	24621183.
13	4873.	499756.	24116330.
14	4659.	494883.	23616573.
15	4455.	490224.	23121690.
16	4259.	485769.	22631467.
17	4072.	481510.	22145698.
18	3893.	477438.	21664188.
19	3722.	473545.	21186750.
20	3558.	469822.	20713205.
21	3402.	466264.	20243382.
22	3253.	462862.	19777118.
23	3144.	459609.	19314256.
24	3006.	456465.	18854647.
25	2874.	453459.	18398182.
26	2778.	450585.	17944723.
27	2656.	447807.	17494139.
28	2564.	445151.	17046332.
29	2477.	442588.	16601180.
30	2391.	440111.	16158593.
31	2331.	437720.	15718482.
32	2272.	435388.	15280763.
33	2236.	433116.	14845374.
34	2217.	430880.	14412258.
35	2213.	428663.	13981378.
36	2244.	426449.	13552715.
37	2284.	424205.	13126266.
38	2367.	421921.	12702060.
39	2469.	419554.	12280139.
40	2616.	417086.	11860585.
41	2791.	414469.	11443499.
42	2985.	411678.	11029030.
43	3221.	408693.	10617352.
44	3492.	405472.	10208659.
45	3793.	401980.	9803186.
46	4090.	398187.	9401207.
47	4439.	394097.	9003019.
48	4797.	389658.	8608922.
49	5170.	384862.	8219264.
50	5540.	379692.	7834402.
51	5922.	374153.	7454710.
52	6311.	368230.	7080558.
53	6708.	361919.	6712327.
54	7098.	355211.	6350408.
55	7499.	348113.	5995196.
56	7894.	340615.	5647083.
57	8291.	332721.	5306468.
58	8688.	324430.	4973747.
59	9082.	315742.	4649318.
60	9469.	306660.	4333576.
61	9850.	297191.	4026916.
62	10227.	287341.	3729724.
63	10588.	277114.	3442384.
64	10933.	266527.	3165269.
65	11900.	255593.	2898743.
66	12190.	243693.	2643149.
67	12451.	231503.	2399456.
68	12670.	219052.	2167953.
69	12841.	206382.	1948900.
70	12959.	193541.	1742518.
71	13015.	180582.	1548977.
72	13003.	167566.	1368395.
73	12915.	154563.	1200829.
74	12747.	141648.	1046265.
75	12494.	128902.	904617.
76	12152.	116407.	775715.
77	11722.	104255.	659308.
78	11203.	92534.	555053.
79	10601.	81331.	462519.
80	9921.	70730.	381188.
81	9176.	60808.	310459.
82	8376.	51633.	249650.
83	7540.	43256.	198017.
84	6685.	35716.	154761.
85	5829.	29031.	119044.
86	4994.	23202.	90013.
87	4197.	18208.	66811.
88	3455.	14012.	48602.
89	2783.	10557.	34590.
90	2189.	7774.	24034.
91	1679.	5585.	16260.
92	1254.	3906.	10674.
93	911.	2652.	6768.
94	642.	1740.	4117.
95	439.	1098.	2376.
96	290.	659.	1278.
97	186.	368.	619.
98	115.	183.	251.
99	68.	68.	68.

Table (5.7)

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITHOUT PROFIT)
AT 4.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	6439276.	137566498.	2599929472.
11	6156318.	131127221.	2462362976.
12	5885793.	124970903.	2331235744.
13	5627156.	119085110.	2206264832.
14	5379884.	113457954.	2087179728.
15	5143478.	108078070.	1973721776.
16	4917460.	102934592.	1865643712.
17	4701374.	98017132.	1762709120.
18	4494784.	93315758.	1664691984.
19	4297271.	88820974.	1571376224.
20	4108438.	84523703.	1482555248.
21	3927903.	80415265.	1398031552.
22	3755300.	76487362.	1317616288.
23	3590283.	72732062.	1241128928.
24	3432482.	69141779.	1168396864.
25	3281617.	65709297.	1099255088.
26	3137383.	62427680.	1033545792.
27	2999462.	59290297.	971118112.
28	2867603.	56290836.	911827816.
29	2741516.	53423233.	855536984.
30	2620950.	50681717.	802113752.
31	2505661.	48060767.	751432032.
32	2395399.	45555107.	703371264.
33	2289949.	43159707.	657816160.
34	2189080.	40869758.	614656456.
35	2092576.	38680679.	573786696.
36	2000178.	36588103.	535106016.
37	1911789.	34587925.	498517912.
38	1827171.	32676135.	463929988.
39	1746122.	30848964.	431253852.
40	1668467.	29102842.	400404888.
41	1594015.	27434375.	371302044.
42	1522603.	25840360.	343867668.
43	1454082.	24317757.	318027308.
44	1388285.	22863675.	293709552.
45	1325060.	21475391.	270845876.
46	1264271.	20150331.	249370484.
47	1205801.	18886060.	229220154.
48	1149524.	17680259.	210334094.
49	1095326.	16530734.	192653836.
50	1043103.	15435408.	176123102.
51	992770.	14392306.	160687694.
52	944235.	13399536.	146295388.
53	897414.	12455300.	132895852.
54	852226.	11557886.	120440552.
55	808605.	10705661.	108882666.
56	766474.	9897056.	98177005.
57	725773.	9130582.	88279949.
58	686439.	8404809.	79149367.
59	648412.	7718370.	70744558.
60	611639.	7069959.	63026188.
61	576071.	6458320.	55956229.
62	541660.	5882249.	49497909.
63	508363.	5340589.	43615660.
64	476142.	4832227.	38275070.
65	444967.	4356084.	33442844.
66	413841.	3911117.	29086759.
67	383763.	3497276.	25175643.
68	354719.	3113512.	21678367.
69	326704.	2758794.	18564855.
70	299724.	2432090.	15806061.
71	273787.	2132366.	13373971.
72	248910.	1858579.	11241606.
73	225117.	1609669.	9383027.
74	202438.	1384551.	7773358.
75	180904.	1182114.	6388807.
76	160551.	1001210.	5206693.
77	140257.	840659.	4205483.
78	122528.	700403.	3364824.
79	106080.	577875.	2664421.
80	90940.	471795.	2086546.
81	77131.	380854.	1614752.
82	64659.	303724.	1233898.
83	53522.	239064.	930174.
84	43698.	185543.	691110.
85	35150.	141845.	505567.
86	27823.	106695.	363722.
87	21645.	78872.	257026.
88	16528.	57227.	178154.
89	12371.	40699.	120927.
90	9063.	28329.	80227.
91	6490.	19266.	51898.
92	4536.	12776.	32632.
93	3090.	8240.	19857.
94	2048.	5150.	11617.
95	1319.	3102.	6467.
96	825.	1783.	3365.
97	499.	958.	1582.
98	293.	459.	624.
99	166.	166.	166.

Table (5.8)

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITHOUT PROFIT)
AT 4.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	5669.	515269.	25599643.
11	5420.	509600.	25084374.
12	5182.	504180.	24574774.
13	4954.	498998.	24070594.
14	4736.	494044.	23571596.
15	4528.	489307.	23077553.
16	4329.	484779.	22588245.
17	4139.	480450.	22103466.
18	3957.	476311.	21623016.
19	3783.	472354.	21146705.
20	3617.	468570.	20674351.
21	3458.	464953.	20205781.
22	3306.	461495.	19740827.
23	3195.	458189.	19279332.
24	3055.	454994.	18821143.
25	2920.	451939.	18366148.
26	2819.	449019.	17914209.
27	2695.	446200.	17465190.
28	2602.	443505.	17018990.
29	2511.	440903.	16575485.
30	2425.	438393.	16134582.
31	2362.	435967.	15696189.
32	2299.	433606.	15260222.
33	2259.	431306.	14826616.
34	2237.	429047.	14395310.
35	2287.	426810.	13966263.
36	2257.	424523.	13539453.
37	2292.	422266.	13114930.
38	2367.	419974.	12692663.
39	2463.	417607.	12272689.
40	2604.	415144.	11855083.
41	2770.	412540.	11439939.
42	2955.	409770.	11027399.
43	3181.	406815.	10617629.
44	3442.	403634.	10210815.
45	3729.	400192.	9807181.
46	4028.	396463.	9406989.
47	4352.	392435.	9010526.
48	4697.	388083.	8618091.
49	5056.	383386.	8230009.
50	5414.	378329.	7846623.
51	5784.	372915.	7468294.
52	6161.	367131.	7095379.
53	6544.	360971.	6728248.
54	6922.	354427.	6367277.
55	7311.	347505.	6012850.
56	7695.	340194.	5665346.
57	8081.	332499.	5325152.
58	8467.	324418.	4992653.
59	8851.	315951.	4668234.
60	9230.	307100.	4352283.
61	9604.	297870.	4045183.
62	9972.	288267.	3747313.
63	10329.	278295.	3459046.
64	10671.	267965.	3180752.
65	11965.	257294.	2912786.
66	12257.	245329.	2655492.
67	12519.	233072.	2410163.
68	12739.	220553.	2177091.
69	12912.	207814.	1956538.
70	13030.	194902.	1748724.
71	13087.	181872.	1553822.
72	13074.	168785.	1371950.
73	12986.	155711.	1203165.
74	12817.	142725.	1047455.
75	12563.	129908.	904730.
76	13380.	117346.	774821.
77	11689.	103965.	657475.
78	11172.	92276.	553510.
79	10571.	81105.	461234.
80	9894.	70533.	380129.
81	9150.	60639.	309596.
82	8353.	51489.	248956.
83	7519.	43136.	197467.
84	6666.	35617.	154331.
85	5813.	28951.	118713.
86	4980.	23138.	89763.
87	4185.	18158.	66625.
88	3446.	13973.	48467.
89	2775.	10527.	34494.
90	2183.	7752.	23967.
91	1675.	5570.	16214.
92	1251.	3895.	10645.
93	909.	2644.	6750.
94	641.	1736.	4105.
95	438.	1095.	2370.
96	290.	657.	1275.
97	185.	367.	618.
98	114.	182.	250.
99	68.	68.	68.

Table (5.9)

THE EGYPTIAN MONETARY FUNCTIONS(POLICIES;WITH PROFIT)
AT 4.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	6439276.	137550168.	2596940192.
11	6156559.	131110892.	2459390016.
12	5886253.	124954333.	2328279136.
13	5627816.	119068080.	2203324800.
14	5380725.	113440264.	2084256720.
15	5144483.	108059539.	1970816448.
16	4918613.	102915056.	1862756912.
17	4702660.	97996443.	1759841856.
18	4496188.	93293783.	1661845408.
19	4298782.	88797595.	1568551632.
20	4110043.	84498813.	1479754032.
21	3929590.	80388770.	1395255216.
22	3757060.	76459180.	1314866448.
23	3592106.	72702120.	1238407264.
24	3434359.	69110014.	1165705136.
25	3283540.	65675655.	1096595120.
26	3139344.	62392115.	1030919464.
27	3001450.	59252772.	968527352.
28	2869613.	56251322.	909274584.
29	2743539.	53381710.	853023264.
30	2622981.	50638171.	799641552.
31	2507695.	48015190.	749003384.
32	2397429.	45507494.	700988192.
33	2291965.	43110065.	655480696.
34	2191077.	40818100.	612370632.
35	2094546.	38627023.	571552528.
36	2002169.	36532478.	532925504.
37	1913735.	34530308.	496393028.
38	1829062.	32616573.	461862720.
39	1747946.	30787511.	429246148.
40	1670213.	29039565.	398458636.
41	1595671.	27369352.	369419072.
42	1524154.	25773681.	342049720.
43	1455512.	24249527.	316276040.
44	1389578.	22794016.	292026512.
45	1326198.	21404438.	269232496.
46	1265234.	20078240.	247828058.
47	1206572.	18813006.	227749818.
48	1150083.	17606434.	208936812.
49	1095655.	16456351.	191330378.
50	1043183.	15360696.	174874026.
51	992585.	14317513.	159513330.
52	943768.	13324927.	145195818.
53	896649.	12381159.	131870890.
54	851148.	11484509.	119489731.
55	807201.	10633362.	108005222.
56	764732.	9826161.	97371860.
57	723684.	9061429.	87545699.
58	683993.	8337745.	78484270.
59	645603.	7653752.	70146525.
60	608460.	7008149.	62492773.
61	572521.	6399689.	55484624.
62	537738.	5827168.	49084935.
63	504071.	5289430.	43257767.
64	471485.	4785360.	37968337.
65	439953.	4313875.	33182978.
66	409177.	3873922.	28869103.
67	379438.	3464745.	24995181.
68	350721.	3085306.	21530437.
69	323022.	2734585.	18445130.
70	296346.	2411563.	15710545.
71	270701.	2115217.	13298982.
72	246105.	1844516.	11183765.
73	222580.	1598411.	9339249.
74	200156.	1375831.	7740838.
75	178865.	1175675.	6365007.
76	158741.	996810.	5189333.
77	139824.	838068.	4192523.
78	122150.	698244.	3354455.
79	105753.	576094.	2656211.
80	90660.	470341.	2080117.
81	76893.	379680.	1609777.
82	64460.	302787.	1230096.
83	53357.	238328.	927309.
84	43563.	184971.	688981.
85	35041.	141408.	504010.
86	27737.	106367.	362602.
87	21578.	78629.	256235.
88	16477.	57051.	177606.
89	12332.	40574.	120555.
90	9035.	28242.	79980.
91	6470.	19206.	51739.
92	4522.	12736.	32532.
93	3080.	8214.	19796.
94	2042.	5134.	11581.
95	1315.	3092.	6447.
96	822.	1777.	3355.
97	498.	955.	1578.
98	292.	457.	623.
99	165.	165.	165.

Table (5.10)

THE EGYPTIAN MONETARY FUNCTIONS(POLICIES; WITH PROFIT) AT 4.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	5429.	515973.	25712065.
11	5190.	510544.	25196092.
12	4962.	505354.	24685548.
13	4745.	500392.	24180193.
14	4537.	495647.	23679801.
15	4337.	491110.	23184154.
16	4147.	486773.	22693044.
17	3965.	482627.	22206270.
18	3791.	478662.	21723644.
19	3624.	474871.	21244982.
20	3465.	471247.	20770111.
21	3313.	467782.	20298863.
22	3167.	464469.	19831081.
23	3063.	461302.	19366612.
24	2928.	458239.	18905310.
25	2800.	455311.	18447071.
26	2707.	452511.	17991760.
27	2588.	449804.	17539248.
28	2502.	447216.	17089444.
29	2415.	444715.	16642227.
30	2334.	442299.	16197513.
31	2280.	439965.	15755213.
32	2225.	437686.	15315248.
33	2191.	435460.	14877562.
34	2179.	433269.	14442102.
35	2181.	431091.	14008833.
36	2217.	428910.	13577742.
37	2264.	426693.	13148832.
38	2352.	424430.	12722139.
39	2462.	422077.	12297709.
40	2620.	419615.	11875632.
41	2804.	416996.	11456017.
42	3009.	414192.	11039021.
43	3256.	411183.	10624829.
44	3541.	407927.	10213646.
45	3855.	404386.	9805719.
46	4178.	400530.	9401334.
47	4531.	396352.	9000804.
48	4903.	391821.	8604452.
49	5291.	386918.	8212631.
50	5676.	381627.	7825713.
51	6074.	375951.	7444085.
52	6478.	369877.	7068134.
53	6890.	363399.	6698257.
54	7295.	356509.	6334858.
55	7709.	349214.	5978349.
56	8117.	341505.	5629135.
57	8527.	333388.	5287629.
58	8936.	324861.	4954241.
59	9341.	315925.	4629380.
60	9738.	306584.	4313455.
61	10128.	296845.	4006871.
62	10511.	286717.	3710026.
63	10879.	276206.	3423309.
64	11229.	265326.	3147103.
65	11830.	254097.	2881777.
66	12119.	242267.	2627680.
67	12378.	230148.	2385413.
68	12596.	217770.	2155264.
69	12766.	205175.	1937494.
70	12883.	192408.	1732319.
71	12939.	179525.	1539911.
72	12927.	166586.	1360386.
73	12839.	153659.	1193800.
74	12672.	140819.	1040142.
75	12421.	128147.	899322.
76	12081.	115726.	771175.
77	11653.	103645.	655449.
78	11137.	91992.	551804.
79	10539.	80855.	459812.
80	9863.	70316.	378957.
81	9122.	60453.	308641.
82	8327.	51331.	248189.
83	7496.	43003.	196858.
84	6646.	35507.	153855.
85	5795.	28862.	118348.
86	4965.	23066.	89486.
87	4172.	18102.	66420.
88	3435.	13930.	48318.
89	2766.	10495.	34388.
90	2176.	7729.	23893.
91	1669.	5553.	16165.
92	1247.	3883.	10612.
93	906.	2636.	6729.
94	639.	1730.	4093.
95	436.	1092.	2363.
96	289.	655.	1271.
97	185.	366.	616.
98	114.	182.	250.
99	68.	68.	68.

Table (5.11)

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 4.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	6439276.	137371708.	2586837056.
11	6156589.	130932432.	2449465344.
12	5886312.	124775843.	2318532896.
13	5627900.	118889531.	2193757056.
14	5380832.	113261631.	2074867520.
15	5144611.	107880799.	1961605888.
16	4918760.	102736188.	1853725088.
17	4702824.	97817428.	1750988896.
18	4496368.	93114604.	1653171472.
19	4298975.	88618236.	1560056864.
20	4110248.	84319261.	1471438624.
21	3929806.	80209013.	1387119360.
22	3757286.	76279207.	1306910352.
23	3592339.	72521921.	1230631152.
24	3434596.	68929582.	1158109232.
25	3283780.	65494987.	1089179648.
26	3139586.	62211207.	1023684664.
27	3001690.	59071622.	961473456.
28	2869851.	56069932.	902401832.
29	2743773.	53200081.	846331904.
30	2623204.	50456308.	793131824.
31	2507906.	47833104.	742675512.
32	2397626.	45325198.	694842408.
33	2292144.	42927572.	649517208.
34	2191233.	40635428.	606589632.
35	2094672.	38444196.	565954200.
36	2002258.	36349524.	527510008.
37	1913775.	34347267.	491160484.
38	1829043.	32433491.	456813216.
39	1747855.	30604448.	424379724.
40	1670034.	28856593.	393775276.
41	1595385.	27186558.	364918684.
42	1523740.	25591174.	337732124.
43	1454951.	24067433.	312140952.
44	1388843.	22612483.	288073520.
45	1325263.	21223640.	265461036.
46	1264071.	19898377.	244237396.
47	1205155.	18634305.	224339020.
48	1148385.	17429150.	205704714.
49	1093645.	16280766.	188275564.
50	1040834.	15187121.	171994798.
51	989871.	14146287.	156807676.
52	940664.	13156417.	142661388.
53	893132.	12215753.	129504971.
54	847196.	11322620.	117289218.
55	802797.	10475424.	105966598.
56	759857.	9672628.	95491174.
57	718324.	8912770.	85818546.
58	678137.	8194446.	76905776.
59	639501.	7516309.	68711330.
60	601772.	6876808.	61195021.
61	565309.	6275036.	54318213.
62	530005.	5709727.	48043178.
63	495823.	5179722.	42333451.
64	462734.	4683899.	37153729.
65	430498.	4221164.	32469830.
66	400383.	3790666.	28248666.
67	371284.	3390283.	24458000.
68	343183.	3018999.	21067717.
69	316080.	2675816.	18048718.
70	289977.	2359736.	15372902.
71	264884.	2069758.	13013166.
72	240816.	1804875.	10943408.
73	217797.	1564059.	9138533.
74	195854.	1346262.	7574474.
75	175021.	1150408.	6228212.
76	155330.	975387.	5077805.
77	136819.	820057.	4102418.
78	119525.	683238.	3282361.
79	103480.	563712.	2599123.
80	88712.	460232.	2035411.
81	75240.	371520.	1575179.
82	63074.	296280.	1203659.
83	52210.	233206.	907379.
84	42627.	180996.	674173.
85	34288.	138369.	493177.
86	27141.	104081.	354808.
87	21115.	76939.	250728.
88	16123.	55825.	173788.
89	12067.	39702.	117963.
90	8841.	27635.	78261.
91	6331.	18794.	50626.
92	4425.	12463.	31833.
93	3014.	8038.	19370.
94	1998.	5024.	11332.
95	1287.	3026.	6309.
96	804.	1739.	3283.
97	487.	935.	1544.
98	286.	447.	609.
99	162.	162.	162.

Table (5.12)

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 4.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	5398.	523659.	25968846.
11	5161.	518261.	25445186.
12	4935.	513100.	24926925.
13	4718.	508166.	24413825.
14	4510.	503448.	23905659.
15	4313.	498938.	23402210.
16	4123.	494625.	22903273.
17	3942.	490502.	22408648.
18	3769.	486560.	21918146.
19	3604.	482790.	21431586.
20	3446.	479187.	20948796.
21	3294.	475741.	20469609.
22	3150.	472447.	19993868.
23	3049.	469297.	19521421.
24	2915.	466248.	19052124.
25	2787.	463333.	18585876.
26	2698.	460545.	18122544.
27	2580.	457847.	17661998.
28	2496.	455268.	17204151.
29	2416.	452772.	16748883.
30	2337.	450356.	16296111.
31	2285.	448019.	15845755.
32	2235.	445734.	15397736.
33	2206.	443500.	14952002.
34	2202.	441293.	14508502.
35	2213.	439091.	14067209.
36	2261.	436879.	13628118.
37	2320.	434618.	13191239.
38	2426.	432297.	12756621.
39	2554.	429872.	12324324.
40	2734.	427318.	11894453.
41	2944.	424583.	11467135.
42	3174.	421640.	11042552.
43	3454.	418465.	10620912.
44	3773.	415011.	10202447.
45	4123.	411238.	9787436.
46	4483.	407115.	9376198.
47	4874.	402632.	8969083.
48	5288.	397759.	8566451.
49	5716.	392470.	8168692.
50	6142.	386754.	7776222.
51	6580.	380612.	7389467.
52	7025.	374031.	7008856.
53	7476.	367006.	6634824.
54	7917.	359531.	6267818.
55	8369.	351613.	5908287.
56	8812.	343244.	5556674.
57	9254.	334432.	5213429.
58	9434.	325178.	4878997.
59	10191.	315744.	4553820.
60	10550.	305553.	4238076.
61	10960.	295003.	3932523.
62	11359.	284043.	3637519.
63	11737.	272685.	3353476.
64	12310.	260947.	3080791.
65	11576.	248637.	2819844.
66	11858.	237060.	2571208.
67	12112.	225202.	2334147.
68	12325.	213090.	2108945.
69	12492.	200765.	1895855.
70	12606.	188273.	1695090.
71	12661.	175667.	1506817.
72	12649.	163006.	1331150.
73	12563.	150356.	1168144.
74	12400.	137793.	1017788.
75	12154.	125393.	879995.
76	11821.	113239.	754601.
77	11403.	101418.	641363.
78	10898.	90015.	539945.
79	10312.	79117.	449930.
80	9651.	68805.	370813.
81	8926.	59153.	302008.
82	8148.	50227.	242855.
83	7335.	42079.	192628.
84	6503.	34744.	150548.
85	5671.	28241.	115804.
86	4858.	22571.	87563.
87	4082.	17713.	64992.
88	3361.	13630.	47279.
89	2707.	10269.	33649.
90	2129.	7562.	23380.
91	1634.	5433.	15817.
92	1220.	3800.	10384.
93	886.	2579.	6584.
94	625.	1693.	4005.
95	427.	1068.	2312.
96	283.	641.	1244.
97	181.	358.	603.
98	111.	178.	244.
99	66.	66.	66.

Since the computer deals only with capital letters, the following symbols are used instead of the original ones:

DX as D_x

NX as N_x

SX as S_x

CX as C_x

MX as M_x

RX as R_x .

5.4 Comparison Between Premiums Based on The New Tables and The A24-29 U.

A comparison is made between premiums based on the A24-29 U. and the new Egyptian Tables (policies and sums assured; without and with profit) for the whole life and endowment (period of 20 years) at 4½% interest rate.

Tables (5.5) to (5.8) show the comparison for the whole life assurance, and tables (5.9) to (5.12) show the same comparison for the endowment assurance.

From these tables we can see that:

1. The premiums based on the A24-29 U. which are in use in the Egyptian Market now are too high than the ones based on the new tables. This shows how effective the use of the new tables will be in calculating the new premiums.

Table (5.5)

Comparison between The New Table (policies; without profit) and The A1924-29 U.
For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (policies; without profit) (1)		The A 24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080096	.003749	.10447	.00502	76.67	74.68
20	.114338	.005559	.14115	.00708	81.00	78.52
30	.167871	.008687	.19510	.01044	86.04	83.21
40	.249881	.014344	.27639	.01645	90.41	87.20
50	.364030	.024646	.38745	.02724	93.96	90.48
60	.502670	.043512	.52642	.04787	95.49	90.90

Table (5.6)

Comparison between The New Table (Sums Assured; without profit) and The A1924-29 U.

For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (Sums assured; without profit) (1)		The A24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080020	.003746	.10447	.00502	76.60	74.62
20	.114051	.005544	.14115	.00708	80.80	78.31
30	.167265	.008650	.19510	.01044	85.73	82.85
40	.248818	.014265	.27639	.01645	90.02	86.72
50	.362696	.024510	.38745	.02724	93.61	89.98
60	.502094	.043437	.52642	.04787	95.38	90.74

Table (5.7)

Comparison between The New Table (policies; with profit) and The A1924-29 U.

For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (policies; with profit) (1)		The A24-29 U (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080129	.003751	.10447	.00502	76.70	74.72
20	.114657	.005577	.14115	.00708	81.23	78.77
30	.168625	.008734	.19510	.01044	86.43	83.66
40	.251234	.014450	.27639	.01645	90.90	87.84
50	.365829	.024844	.38745	.02724	94.42	91.20
60	.503868	.043747	.52642	.04787	95.72	91.39

Table (5.8)

Comparison between The New Table (Sums Assured; With Profit) and The A-924-29 U.

For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (1) (Sums assured; with profit)		The A24-29 U (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.081323	.003812	.10447	.00502	77.84	75.94
20	.116583	.005683	.14115	.00708	82.60	80.27
30	.171682	.008926	.19510	.01044	87.99	85.49
40	.255874	.014808	.27639	.01645	92.58	90.02
50	.371581	.025466	.38745	.02724	95.90	93.49
60	.507755	.044432	.52642	.04787	96.45	92.82

Table (5.9)

Comparison between The New Table (policies; Without profit) and The A24-29 U.
For The Endowment Premiums (period of 20 years) at 4½% Interest Rate

Age	The new table (policies; Without Profit) (1)		The A24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41904	.03106	.42585	.03194	98.40	97.24
25	.41950	.03112	.42676	.03206	98.30	97.07
30	.42088	.03130	.42921	.03238	98.06	96.66
35	.42439	.03175	.43395	.03301	97.80	96.18
40	.43165	.03271	.44161	.03406	97.74	96.04
45	.44432	.03443	.45410	.03582	97.85	96.12
50	.46427	.03732	.47481	.03893	97.78	95.86
55	.49407	.04205	.50711	.04430	97.43	94.92

Table (5.10)

Comparison between The New Table (Sums Assured; Without profit) and The A24-29 U.
For The Endowment premiums (period of 20 years) at 4½% Interest Rate

Age	The new table (Sums Assured; Without Profit) (1)		The A24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41911	.03107	.42585	.03194	98.42	97.28
25	.41955	.03113	.42676	.03206	98.31	97.10
30	.42090	.03130	.42921	.03238	98.06	96.66
35	.42431	.03174	.43395	.03301	97.78	96.15
40	.43134	.03266	.44161	.03406	97.67	95.89
45	.44365	.03434	.45410	.03582	97.70	95.87
50	.46319	.03716	.47481	.03893	97.55	95.45
55	.49283	.04184	.50711	.04430	97.18	94.45

Table (5.11)

Comparison between The New Table (Policies; With Profit) and The A24-29 U.
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Policies; With Profit) (1)		The A24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41894	.03105	.42585	.03194	98.38	97.21
25	.41940	.03111	.42676	.03206	98.28	97.04
30	.42084	.03129	.42921	.03238	98.05	96.63
35	.42447	.3176	.43395	.03301	97.82	96.21
40	.43198	.03275	.44161	.03506	97.82	96.15
45	.44506	.03454	.45410	.03582	98.01	96.43
50	.46546	.03750	.47481	.03893	98.02	96,33
55	.49546	.04229	.50711	.04430	97.53	95.46

Table (5.12)

Comparison between The New Table (Sums Assured; With Profit) and The A24-29 U.
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Sums Assured; With Profit) (1)		The A24-29 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41893	.03105	.42585	.03194	98.38	97.21
25	.41944	.03111	.42676	.03206	98.28	97.04
30	.42103	.03131	.42921	.03238	98.09	96.70
35	.42502	.03183	.43395	.03301	97.94	96.43
40	.43325	.03292	.44161	.03406	98.11	96.65
45	.44753	.03488	.45410	.03582	98.55	97.38
50	.46929	.03808	.47481	.03893	98.84	97.82
55	.49980	.04303	.50711	.04430	98.56	97.13

2. The reduction in the annual premiums is bigger than in the single premiums as can be shown in tables (5.5) to (5.12) inclusive. The following summary table shows the ratio of the annual premiums by using the new tables to the ones using the A24-29 U. for the whole life at 4½% interest rate:

Age	Without Profit		With Profit	
	policies %	Sums Assured %	policies %	Sums Assured %
10	74.68	74.62	74.72	75.94
20	78.52	78.31	78.77	80.27
30	83.21	82.85	83.66	85.49
40	87.20	86.72	87.84	90.02
50	90.48	89.98	91.20	93.49
60	90.90	90.74	91.39	92.82

The above table shows that, the annual premiums are substantially reduced for the younger ages, and slightly reduced for the others. So, when the Egyptian companies use the new tables, this reduction in premiums will be quite observable at the younger ages.

3. The premiums, according to the new tables, are affected by the period of the policy. The following summary table indicate that observation which include the ratio of the annual premiums by the new tables (policies;without profit) to the ones by the A24-29 U. for whole life and endowment (period of 20 years) at 4½% interest rate:

Age	Whole Life %	Endowment %
20	78.52	97.24
30	83.21	96.66
40	87.20	96.04
50	90.48	95.86

From this table the effect in the premiums is more noticeable in whole life rather than in endowment.

4. In general, it has to be said that the reduction in the net premiums, according to the new tables, is quite large, if we compare it with the existing Egyptian net premiums which are calculated by the A24-29 U., that is, may be declared how much the Egyptian market do need to use mortality rates based on its experience.

5.5 Comparison Between Premiums Based on The New Tables

A comparison is made between premiums based on the new tables (policies and sums assured; without profit) and (policies and sums assured; with profit) for the whole life and endowment (period of 20 years) at 4½% interest rate.

Tables (5.13) to (5.17) show the comparison for the whole life assurance, and tables (5.18) to (5.22) show the same comparison for the endowment assurance.

From these tables we can see that:

Table (5.13)

Comparison between The New Tables (policies; Without profit) and (Sums Assured; Without Profit)
For The Whole Life Assurance premiums at 4½% Interest Rate

Age	The new table (policies; Without profit) (1)		The new table (Sums Assured; Without Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080096	.003749	.080020	.003746	100.09	100.08
20	.114338	.005559	.114051	.005544	100.25	100.27
30	.167871	.008687	.167265	.008650	100.36	100.43
40	.249881	.014344	.248818	.014265	100.43	100.55
50	.364030	.024646	.362696	.024510	100.37	100.55
60	.502670	.043512	.502094	.043437	100.11	100.17

Table (5.14)

Comparison between the New Tables (policies; with profit) and (Sums Assured; With Profit)
For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (policies; With profit) (1)		The new table (Sums Assured; With Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080129	.003751	.081323	.003812	98.53	98.40
20	.114657	.005577	.116583	.005683	98.35	98.13
30	.168625	.008734	.171682	.008926	98.22	97.85
40	.251234	.014450	.255874	.014808	98.19	97.58
50	.365829	.024844	.371581	.025466	98.45	97.56
60	.503868	.043747	.507755	.044432	99.23	98.46

Table (5.15)

Comparison between The New Tables (policies; Without profit) and (policies; With profit)
For The Whole Life Assurance premiums at 4½% Interest Rate

Age	The new table (policies; without profit) (1)		The new table (policies; with profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080096	.003749	.080129	.003751	99.96	99.95
20	.114338	.005559	.114657	.005577	99.72	99.68
30	.167871	.008687	.168625	.008734	99.55	99.46
40	.249881	.014344	.251234	.014450	99.46	99.27
50	.364030	.024646	.365829	.024844	99.51	99.20
60	.502670	.043512	.503868	.043747	99.76	99.46

Table (5.16)

Comparison between The New Tables (Sums Assured; Without profit) and (Sums Assured; With profit) For The Whole Life Assurance premiums at 4½% Interest Rate

Age	The new table (Sums Assured; Without Profit) (1)		The new table (Sums Assured; With Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080020	.003746	.081323	.003812	98.40	98.27
20	.114051	.005544	.116583	.005683	97.83	97.55
30	.167265	.008650	.171682	.008926	97.43	96.91
40	.248818	.014265	.255874	.014808	97.24	96.33
50	.362696	.024510	.371581	.025466	97.61	96.25
60	.502094	.043437	.507755	.044432	98.89	97.76

Table (5.17)

Comparison between The New Tables (policies; Without Profit) and (Sums Assured; With profit)

For The Whole Life Assurance premiums at 4½% Interest Rate

Age	The new table (policies; Without profit) (1)		The new table (Sums Assured, with profit)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.080096	.003749	.081323	.003812	98.49	98.35
20	.114338	.005559	.116583	.005683	98.07	97.82
30	.167871	.008687	.171682	.008926	97.78	97.32
40	.249881	.014344	.255874	.014808	97.66	96.87
50	.364030	.024646	.371581	.025466	97.97	96.78
60	.502670	.043512	.507755	.044432	99.00	97.93

Table (5.18)

Comparison between The New Tables (policies; Without profit) and (Sums Assured; Without Profit)

For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Policies; Without Profit) (1)		The new table (Sums Assured; Without Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41904	.03106	.41911	.03107	99.98	99.97
25	.41950	.03112	.41955	.03113	99.99	99.99
30	.42088	.03130	.42090	.03130	100.00	100.00
35	.42439	.03175	.42431	.03174	100.01	100.03
40	.43165	.03271	.43134	.03266	100.07	100.15
45	.44432	.03443	.44365	.03434	100.15	100.26
50	.46427	.03732	.46319	.03716	100.23	100.43
55	.49407	.04205	.49283	.04184	100.25	100.50

Table (5.19)

Comparison between The New Tables (Policies; With Profit) and (Sums Assured; With Profit)
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Policies; With Profit) (1)		The new table (Sums Assured; With Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41894	.03105	.41893	.03105	100.00	100.00
25	.41940	.03111	.41944	.03111	99.99	100.00
30	.42084	.03129	.42103	.03131	99.95	99.94
35	.42447	.03176	.42502	.03183	99.87	99.78
40	.43198	.03275	.43325	.03292	99.71	99.48
45	.44506	.03454	.44753	.03488	99.45	99.03
50	.46546	.03750	.46929	.03808	99.18	98.48
55	.49546	.04229	.49980	.04303	99.13	98.28

Table (5.20)

Comparison between The New Tables (Policies; Without Profit) and (Policies; With Profit)
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Policies; Without Profit) (1)		The new table (Policies; With Profit) (2)		Ratio (1)/(2)	
.	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41904	.03106	.41894	.03105	100.02	100.03
25	.41950	.03112	.41940	.03111	100.02	100.03
30	.42088	.03130	.42084	.03129	100.01	100.03
35	.42439	.03175	.42447	.03176	99.98	99.97
40	.43165	.03271	.43198	.03275	99.92	99.88
45	.44432	.03443	.44506	.03454	99.83	99.68
50	.46427	.03732	.46546	.03750	99.74	99.52
55	.49407	.04205	.49546	.04229	99.72	99.43

Table (5.21)

Comparison between The New Tables (Sums Assured; Without Profit) and (Sums Assured; With Profit)
For The Endowment Premiums (Period of 20 Years) at 4½% Interest Rate

Age	The new table (Sums Assured; Without Profit) (1)		The new table (Sums Assured: With Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41911	.03107	.41893	.03105	100.04	100.06
25	.41955	.03113	.41944	.03111	100.03	100.06
30	.42090	.03130	.42103	.03131	99.97	99.97
35	.42431	.03174	.42502	.03183	99.93	99.72
40	.43134	.03266	.43325	.03292	99.56	99.21
45	.44365	.03434	.44753	.03488	99.13	98.45
50	.46319	.03716	.46929	.03808	98.70	97.58
55	.49283	.04184	.49980	.04303	98.61	97.23

Table (5.22)

Comparison between The New Tables (Policies; Without Profit) and (Sums Assured; With Profit)
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Policies; Without Profit) (1)		The new table (Sums Assured; With Profit) (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41904	.03106	.41893	.03105	100.02	100.03
25	.41950	.03112	.41944	.03111	100.01	100.03
30	.42088	.03130	.42103	.03131	99.96	99.97
35	.42439	.03175	.42502	.03183	99.85	99.75
40	.43165	.03271	.43325	.03292	99.63	99.36
45	.44432	.03443	.44753	.03488	99.28	98.71
50	.46427	.03732	.46929	.03808	98.93	98.00
55	.49407	.04205	.49980	.04303	98.85	97.72

1. The premiums based on the new tables are too close to each other, this result is expected due to the fact that our experience are coming from the same environment.

2. The premiums based on the new tables (policies; without profit) and (sums assured; with profit) are slightly higher than the others, this result is also expected due to the fact that the graduated mortality rates of them are slightly higher, at most of the ages, than the other graduated mortality rates (policies; with profit) and (sums assured; without profit). The following summary tables (5.23) and (5.24) indicate that observation which include the ratio of the mortality rates and the annual premiums of the new tables to the mortality rates and the annual premiums of the A49-52 U. for the whole life and endowment (period of 20 years) at 4½% interest rate. The following tables show that, the new annual premiums by using the new Egyptian life tables are too close to the ones using the A49-52 U., also they are slightly lighter than these premiums except over age 35 in the case of experience based on (sums assured; with profit).

3. In general, it has to be said that the reduction in the net premiums, according to the new tables, is quite large, especially for the whole life policies, if we compare it with the net premiums which the Egyptian companies are charging at the present time depending on the A1924-29 U., it is therefore better for the future of this business and industry in Egypt to calculate the new

Table (5.23)

The ratio of The Mortality rates and the annual premiums of the new Tables to those based on The A49-52 U. for Whole Life at 4½%

Age	Mortality Rates %				Whole Life %			
	Without Profit		with profit		Without profit		with profit	
	policies	Sums assured	policies	sums assured	policies	sums assured	policies	sums assured
20	81.53	82.88	79.37	78.26	96.18	95.92	96.49	98.32
30	82.55	83.36	80.17	80.26	97.17	96.76	97.70	99.84
40	87.28	86.76	87.18	104.90	97.84	97.31	98.57	101.01
50	92.55	90.55	94.92	102.95	98.27	97.73	99.06	101.54
60	94.30	91.68	97.24	106.51	99.03	98.86	99.56	101.12

Table (5.24)

The ratio of the mortality rates and the annual premiums of the new tables to those based on The A49-52 U. for Endowment (period of 20 years) at 4½%

Age	Mortality Rates %				Endowment (period of 20 years) %			
	Without profit		with profit		Without profit		with profit	
	policies	sums assured	policies	sums assured	policies	sums assured	policies	sums assured
20	81.53	82.88	79.37	78.26	99.62	99.64	99.58	99.58
30	82.55	83.36	80.17	80.26	99.59	99.59	99.55	99.62
40	87.28	86.76	87.18	104.90	99.39	99.24	99.51	100.03
50	92.55	90.55	94.92	102.95	98.94	98.52	99.42	100.95
55	93.72	91.29	96.43	105.26	98.98	98.40	99.46	101.19

premiums depending on a new updated and more efficient table based on the Egyptian experience.

5.6 The Ideal Life Table

From the comparisons of this chapter and the previous chapters, the mortality rates based on the experience of (sums assured; with profit) from the researcher's point of view are considered the optimal and ideal ones for two main reasons:

1. From the deviations and accumulated deviation test (chapter three - table 3.26), it is clear that these values at any age group are very reasonable, also proving a good adherence to data comparing with the others, especially those based on the experiences (without profit).

2. In general, the premiums based on these mortality rates are slightly higher than the ones based on the other rates, according to this point, it will be more advisable and more secure to depend on these mortality rates based on the experience (sums assured; with profit) to calculate the new Egyptian premiums, which are quite lighter than the present premiums based on the A24-29 U. Table.

5.7 Comparison Between Premiums Based on The New Table And The A49-52 U. Table

A comparison is made in tables (5.25) and (5.26) between premiums based on the A49-52 U. and the new Egyptian Table

Table (5.25)

Comparison between The New Table (Sums Assured; with profit) and The A1949-52 U.
For The Whole Life Assurance Premiums at 4½% Interest Rate

Age	The new table (Sums assured; with profit) (1)		The A49-52 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
10	.081323	.003812	.08405	.00395	96.76	96.51
20	.116583	.005683	.11826	.00578	98.58	98.32
30	.171682	.008926	.17185	.00894	99.90	99.84
40	.255874	.014808	.25403	.01466	100.73	101.01
50	.371581	.025466	.36805	.02508	100.96	101.54
60	.507755	.044432	.50502	.04394	100.54	101.12

Table (5.26)

Comparison between The New Table (Sums Assured; With profit) and The A1949-52 U.
For The Endowment Premiums (Period of 20 years) at 4½% Interest Rate

Age	The new table (Sums Assured; With profit) (1)		The A49-52 U. (2)		Ratio (1)/(2)	
	Single £	Annual £	Single £	Annual £	Single %	Annual %
20	.41893	.03105	.42001	.03118	99.74	99.58
25	.41944	.03111	.42048	.03124	99.75	99.58
30	.42103	.03131	.42193	.03143	99.79	99.62
35	.42502	.03183	.42561	.03194	99.86	99.66
40	.43325	.03292	.43320	.03291	100.01	100.03
45	.44753	.03488	.44644	.03473	100.24	100.43
50	.46929	.03808	.46696	.03772	100.50	100.95
55	.49980	.04303	.49684	.04252	100.60	101.19

(sums assured; with profit) for the whole life and endowment (period of 20 years) at 4½% interest rate. From these tables we can see that:

1. The premiums, according to the new table, are effected by the period of the policy and this effect is more noticeable in whole life rather than in endowment.

2. The new premiums for younger ages (less than 40) are slightly lighter than the ones based on The A49-52 U., and vice versa up to this age, that will give a good encouragement for young people to insure their lives by asking them, considering their earnings, to pay reasonable lower premiums.

CHAPTER SIX

CONCLUSIONS

6.1 Introduction

This research is undertaken to apply theoretical basis of demography and life assurance in finding an ideal life table suits the Egyptian market more than the A 24-29 U. Table, which has hitherto been in use by the Egyptian companies.

In the preceding chapters, four approaches to find this iseal table were done. The first was: to prove that the Egyptian crude mortality rates are not similar in value or in shape to those based on the A 24-29 U. Table. The second was: to compare between these crude rates and those based on the A 49-52 U. Table, we found that, they have nearly the same shape but their rates are slightly different. The third was: to try to find a mathematical formula related to Perks family of curves to fit and graduate these Egyptian crude rates, but concerning this approach, Gompertz and Makeham graduations were not likely to prove suitable. The fourth was: to use the A 49-52 U. as a standard table to graduate these Egyptian crude rates, also to select from them the ideal graduated rates for the Egyptian market.

6.2 The Egyptian Crude Mortality Rates

The Egyptian crude mortality rates are estimates of q_x , obtained directly from observational data. These data had been collected from the only three companies in Egypt which were dealing with life assurance in the period of investigation (1-1-1975 to 31-12-1979). By

grouping these data in quinary age groups and using the census method, new four tables representing the Egyptian mortality rates have been calculated.

6.3 Comparison Of The Egyptian Crude Mortality Rates By The A 24-29 U. And A 49-52 U. Rates

A comparison between the Egyptian crude mortality rates and both of these standard tables showed that, the Egyptian crude rates are closer to the A 49-52 U. rates than the A 24-29 U. rates. Also by plotting these crude rates against A 24-29 U. rates and A 49-52 U. rates, we can see that the Egyptian shapes are looking more similar to A 49-52 U. shape than the other.

6.4 The Egyptian Graduated Mortality Rates

From the previous comparisons, we knew that the Egyptian crude mortality rates and their shapes are similar to those based on A 1949-52 U. Table, which has a formula derived by R.E.Beard related to the Perks family of curves. At this point, the researcher was expecting to find a similar formula to graduate these Egyptian crude rates mathematically, but according to the preliminary tests, Gompertz or Makeham graduations were not likely to prove suitable. The main reason for that was the Egyptian scanty data, and since these data are scanty but known to come from an experience similar to that for which a standard (graduated) table already exists, it may be possible to use the A 49-52 U. Table as a standard table to graduate these Egyptian crude rates.

6.5 The Egyptian Monetary Tables

In order to compute the single and annual premiums for any kind of life assurance, we need to have commutation functions (monetary tables). By using computer programs (Appendix II), and interest rates from 4% to 9% the Egyptian monetary tables based on the Egyptian graduated rates have been calculated. And those monetary tables concerning the new ideal life table (sums assured, with profit), are represented in (Appendix III).

6.6 The Ideal Life Table

In order to select this ideal table, many comparisons between these new tables, also between these tables and both of A 24-29 U. table and A 49-52 U. Table have been done. These comparisons illustrated that, the mortality rates based on the experience of (sums assured, with profit), from the researcher's point of view are considered the optimal and ideal ones for the Egyptian market.

6.7 The Benefits Of The New Life Table

The insurance was not known in Egypt till the second half of the nineteenth century, when Italian and English companies started to transact with insurance as a service to their subjects living in Egypt, while the first Egyptian company was established in 1900. Nowadays, if we compare the evolution of the insurance market in Egypt with its counter part in the developed countries like U.K or U.S.A, where it commenced earlier, we can see that Egyptians still

need time and great efforts to understand and accept insurance.

However, with the new Egyptian strategy of economic development called " The Open Door Policy " started 1974, insurance as an applied division of economics, can play a major role in developing this economy, because the insurance companies are considered major investors in any development plans with their accumulated funds, especially those of life branches.

In order to let life assurance fulfil its role, new investment laws must be issued, designing new policies, calculating new optimal premiums on higher interest rates and lower loadings, etc.... , which will give new benifits to the individuals and make them realize these new utilizes, so they decide to buy life policies.

In view of the above mentioned investment laws, this research is constructing the ideal life table based on up-dated Egyptian experience, which showed lower mortality rates than those in use by the Egyptian companies at the present time.

The research also includes a complete set of monetary tables based on the Egyptian mortality rates (sums assured, with profit), and interest rates varying between 4% and 9% .

Appendix I

Graduation by a Standard Table (The A1949-52 U.)

$$q^{o}_{x} = aq_{x} + b$$

where a and b constants.

To obtain a and b, if we assume for every age (age group) that

$$q^{o}_{x} = aq_{x} + b \ , \qquad \text{it follows that}$$

$$E_x q^{o}_{x} = aE_x q_x + bE_x$$

$$\left.\begin{aligned} \Sigma E_x q^{o}_{x} &= a\Sigma E_x q_x + b\Sigma E_x \\ \Sigma^2 E_x q^{o}_{x} &= a\Sigma^2 E_x q_x + b\Sigma^2 E_x \end{aligned}\right\} \quad (1)$$

where $E_x q^{o}_{x}$ is merely the actual deaths observed at age x, while $E_x q_x$ is the expected deaths according to the standard table (The A49-52 U.). By solving the equation (1), we can get the constants a and b.

For graduating the mortality rates based on (policies; without profit), we consider

q^{1}_{x}(graduated) = aq_x (A49-52) + b

Age Group	E_x	ΣE_x	$E_x q_x$	$\Sigma E_x q_x$	θ_x	$\Sigma \theta_x$
10 -	32033.5	32033.5	35.56	35.56	23	23
15 -	41212	73245.5	45.75	81.31	34	57
20 -	46002	19247.5	51.52	132.83	42	99
25 -	56642.5	175890	69.10	201.93	55	154
30 -	66545	242435	81.18	283.11	72	226
35 -	75676	318111	115.78	398.89	98	324
40 -	57494.5	375605.5	140.86	539.75	137	461
45 -	42064	417669.5	188.03	727.78	194	655
50 -	33568.5	451238	266.53	994.31	243	898
55 -	17859	469097	239.31	1233.62	206	1104
60 - less than 65	8109	477206	178.72	1412.34	168	1272
All Ages	477206	3151778.5	1412.34	6041.43	1272	5273

$$1272 = 1412.34\ a + 477206\ b$$

$$5273 = 6041.43\ a + 3151778.5\ b$$

$a = 0.951784, \quad b = -0.000151$

$$q^{1}_{x} = 0.951784\ q_x(\text{A49-52 U.}) - 0.000151$$

For graduating the mortality rates based on (sums assured, without profit), we consider:

$$q^{1}_{x}\text{(graduated)} = aq_{x}\ \text{(A49-52)} + b$$

Age Group	E_x	ΣE_x	$E_x q_x$	$\Sigma E_x q_x$	θ_x	$\Sigma \theta_x$
10 -	41980842	4198042	46598.73	46598.73	30268	30268
15 -	54047840	96028682	59993.10	106591.83	45292	75560
20 -	60327072	156355754	66963.04	173554.87	55862	131422
25 -	74392110	230747864	83319.16	256874.03	73276	204698
30 -	87525844	318273708	105906.27	362780.30	95666	300364
35 -	99525132	417798840	150282.95	513063.25	130078	430442
40 -	75687468	493486308	196030.54	709093.79	180970	611412
45 -	55312506	548798814	262181.28	971275.07	255710	867122
50 -	44150040	592948854	369535.83	1340810.90	320176	1187298
55 -	23455676	616404530	314306.06	1655116.96	270822	1458120
60 - less than 65	10609050	627013580	233823.46	1888940.42	219834	1677954
All Ages	627013580	4139837776	1888940.42	8024700.15	1677954	6974660

$$1677954 = 1888940.42\ a + 627013580\ b$$

$$6974660 = 8024700.15\ a + 4139837776\ b$$

$a = 0.922871,\quad b = -0.000104$

$$q^{1}_{x} = 0.922871\ q_{x}\text{(A49-52 U.)} - 0.000104$$

For graduating the mortality rates based on (policies; with profit), we consider:

$$q^{1}_{x}(\text{graduated}) = aq_{x}\ (A49\text{-}52) + b$$

Age Group	E_x	ΣE_x	$E_x q_x$	$\Sigma E_x q_x$	θ_x	$\Sigma \theta_x$
10 -	14205	14205	15.77	15.77	10	10
15 -	16229.5	30434.5	18.01	33.78	13	23
20 -	18141	48575.5	20.14	53.92	16	39
25 -	23061	71636.5	26.29	80.21	22	61
30 -	29245.5	100882	35.68	115.89	31	92
35 -	32993	133875	50.48	116.37	42	134
40 -	24606	158481	60.28	226.65	58	192
45 -	18558	177039	82.95	309.6	84	276
50 -	8541.5	185580.5	67.82	377.42	61	337
55 -	2351.5	187932	31.51	408.93	27	364
60 - less than 65	880	188812	19.40	428.33	18	382
All Ages	188812	1297453	428.33	2216.87	382	1910

$$382 = 428.33\ a + 188812\ b$$

$$1910 = 2218.49\ a + 1297453\ b$$

$a = 0.984697,\quad b = -0.000212$

$$q^{1}_{x} = 0.984697\ q_{x}(A49\text{-}52\ U.) - 0.000212$$

For graduating the mortality rates based on (sums assured; with profit), we consider:

q^{1}_{x}(graduated) = aq_{x} (A49-52) + b

Age Group	E_x	ΣE_x	$E_x q_x$	$\Sigma E_x q_x$	θ_x	$\Sigma \theta_x$
10 -	25313310	25313310	28097.77	28097.77	18100	18100
15 -	28920969	54234279	32102.28	60200.05	23512	41612
20 -	32363544	85597823	36247.17	96447.22	28934	70546
25 -	41186946	127784769	46953.12	143400.34	39622	110168
30 -	52232463	180017232	63723.60	207123.94	55940	166108
35 -	58991484	239008716	90256.97	297380.91	75746	241854
40 -	43970922	282979638	107728.76	405109.67	103992	245846
45 -	33200262	316179900	148405.17	553514.84	150662	496508
50 -	15289285	331469185	121396.92	674911.76	109426	605934
55 -	4218591	33568776	56529.12	731440.88	48496	654430
60 - less than 65	1585760	337273536	34950.15	735322.03	32456	686886
All Ages	337273536	2013427164	735322.03	3778549.41	686886	3437992

686886 = 735322.03 a + 337273536 b

437992 = 3778549.41 a + 2013427164 b

a = 1.084115, b = - 0.000327

q^{1}_{x} = 1.084115 q_x(A49-52 U.) - 0.000327

Appendix II

Computer Programs

A.1 Monetary Functions (policies; without profit)

A.2 Monetary Functions (policies; without profit)

A.3 Monetary Functions (sums assured; without profit)

A.4 Monetary Functions (sums assured; without profit)

A.5 Monetary Functions (policies, with profit)

A.6 Monetary Functions (policies; with profit)

A.7 Monetary Functions (sums assured; with profit)

A.8 Monetary Functions (sums assured; with profit)

```
*OLD MONET1
*IST

10       REAL L,N                                                    (A.1)
20       DIMENSION L(100),N(100),S(100),D(100),V(100)
30       READ(1,10)(L(I),I=10,99)
40    10 FORMAT(V)
50       P=.035
60       DO 20 I=1,11
70       P=P+.005
80       DO 30 J=1,100
90    30 V(J)=1./(1.+P)**J
100      DO 40 J=10,99
110   40 D(J)=V(J)*L(J)
120      N(99)=D(99)
130      DO 50 K=10,98
140      J1=108-K
150      J3=J1+1
160   50 N(J1)=N(J3)+D(J1)
170      S(99)=N(99)
180      DO 60 K=10,98
190      J2=108-K
200      J4=J2+1
210   60 S(J2)=S(J4)+N(J2)
215      PP=P*100.0
220      WRITE(2,70)PP
230   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(POLICIES;WITHOUT P
240     &ROFIT)  AT  ',F5.2,' PER CENT INTEREST RATE')
250      WRITE(2,55)
260   55 FORMAT(70(1H=))
270      WRITE(2,80)
280   80 FORMAT(1H ,11X,1HX,7X,2HDX,16X,2HNX,22X,2HSX)
290      WRITE(2,55)
300      DO90 J=10,99
310   90 WRITE(2,100)J,D(J),N(J),S(J)
320  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
330   20 CONTINUE
340      STOP
350      END
```

```
*OLD MONET1-
*LIST

      REAL M
      DIMENSION D(100),C(100),M(100),R(100),V(100)                    (A.2)
      READ(1,10) (D(I),I=10,99)
   10 FORMAT(V)
      P=.035
      DO 20 I=1,11
      P=P+.005
      DO 30 J=1,100
   30 V(J)=1./(1.+P)**J
      DO 40 J=10,99
   40 C(J)=V(J+1)*D(J)
      M(99)=C(99)
      DO 50 K=10,98
      J1=108-K
      J3=J1+1
   50 M(J1)=M(J3)+C(J1)
      R(99)=M(99)
      DO 60 K=10,98
      J2=108-K
      J4=J2+1
   60 R(J2)=R(J4)+M(J2)
      PP=P*100.0
      WRITE(2,70)PP
   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(POLICIES ; WITH
     &OUT PROFIT) AT    ',F5.2,' PER CENT INTEREST RATE')
      WRITE(2,55)
   55 FORMAT(70(1H=))
      WRITE(2,80)
   80 FORMAT(12X,'X',8X,'CX',17X,'MX',21X,'RX')
      WRITE(2,55)
      DO 90 J=10,99
   90 WRITE(2,100)J,C(J),M(J),R(J)
  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
   20 CONTINUE
      STOP
      END
```

(A.3)

```
*OLD MONET2
*IST

10        REAL L,N
20        DIMENSION L(100),N(100),S(100),D(100),V(100)
30        READ(1,10)(L(I),I=10,99)
40     10 FORMAT(V)
50        P=.035
60        DO 20 I=1,11
70        P=P+.005
80        DO 30 J=1,100
90     30 V(J)=1./(1.+P)**J
100       DO 40 J=10,99
110    40 D(J)=V(J)*L(J)
120       N(99)=D(99)
130       DO 50 K=10,98
140       J1=108-K
150       J3=J1+1
160    50 N(J1)=N(J3)+D(J1)
170       S(99)=N(99)
180       DO 60 K=10,98
190       J2=108-K
200       J4=J2+1
210    60 S(J2)=S(J4)+N(J2)
215       PP=P*100.0
220       WRITE(2,70)PP
230    70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITHO
240      &UT PROFIT) AT ',F5.2,' PER CENT INTEREST RATE')
250       WRITE(2,55)
260    55 FORMAT(70(1H=))
270       WRITE(2,80)
280    80 FORMAT(1H,10X,1HX,7X,2HDX,16X,2HNX,22X,2HSX)
290       WRITE(2,55)
300       DO90 J=10,99
310    90 WRITE(2,100)J,D(J),N(J),S(J)
320   100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
330    20 CONTINUE
340       STOP
350       END
```

(A.4)

```
*OLD MONET2-
*IST

10        REAL M
20        DIMENSION D(100),C(100),M(100),R(100),V(100)
30        READ(1,10) (D(I),I=10,99)
40     10 FORMAT(V)
50        P=.035
60        DO 20 I=1,11
70        P=P+.005
80        DO 30 J=1,100
90     30 V(J)=1./(1.+P)**J
100       DO 40 J=10,99
110    40 C(J)=V(J+1)*D(J)
120       M(99)=C(99)
130       DO 50 K=10,98
140       J1=108-K
150       J3=J1+1
160    50 M(J1)=M(J3)+C(J1)
170       R(99)=M(99)
180       DO 60 K=10,98
190       J2=108-K
200       J4=J2+1
210    60 R(J2)=R(J4)+M(J2)
215       PP=P*100.0
220       WRITE(2,70)PP
230    70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITHO
240      &UT PROFIT) AT  ',F5.2,' PER CENT INTEREST RATE')
250       WRITE(2,55)
260    55 FORMAT(70(1H=))
270       WRITE(2,80)
280    80 FORMAT(12X,'X',8X,'CX',17X,'MX',21X,'RX')
290       WRITE(2,55)
300       DO 90 J=10,99
310    90 WRITE(2,100)J,C(J),M(J),R(J)
320   100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
330    20 CONTINUE
340       STOP
350       END
```

```
*OLD MONET3
*LIST

      REAL L,N
      DIMENSION L(100),N(100),S(100),D(100),V(100)
      READ(1,10)(L(I),I=10,99)
   10 FORMAT(V)
      P=.035
      DO 20 I=1,11
      P=P+.005
      DO 30 J=1,100
   30 V(J)=1./(1.+P)**J
      DO 40 J=10,99
   40 D(J)=V(J)*L(J)
      N(99)=D(99)
      DO 50 K=10,98
      J1=108-K
      J3=J1+1
   50 N(J1)=N(J3)+D(J1)
      S(99)=N(99)
      DO 60 K=10,98
      J2=108-K
      J4=J2+1
   60 S(J2)=S(J4)+N(J2)
      PP=P*100.0
      WRITE(2,70)PP
   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(POLICIES)WITH
     & PROFIT)          AT ',F5.2,' PER CENT INTEREST RATE')
      WRITE(2,55)
   55 FORMAT(70(1H=))
      WRITE(2,80)
   80 FORMAT(1H,10X,1HX,7X,2HDX,16X,2HNX,22X,2HSX)
      WRITE(2,55)
      DO90 J=10,99
   90 WRITE(2,100)J,D(J),N(J),S(J)
  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
   20 CONTINUE
      STOP
      END
```

(A.5)

```
*OLD MONET3-
*LIST

      REAL M
      DIMENSION D(100),C(100),M(100),R(100),V(100)                    (A.6)
      READ(1,10) (D(I),I=10,99)
   10 FORMAT(V)
      P=.035
      DO 20 I=1,11
      P=P+.005
      DO 30 J=1,100
   30 V(J)=1./(1.+P)**J
      DO 40 J=10,99
   40 C(J)=V(J+1)*D(J)
      M(99)=C(99)
      DO 50 K=10,98
      J1=108-K
      J3=J1+1
   50 M(J1)=M(J3)+C(J1)
      R(99)=M(99)
      DO 60 K=10,98
      J2=108-K
      J4=J2+1
   60 R(J2)=R(J4)+M(J2)
      PP=P*100.0
      WRITE(2,70)PP
   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(POLICIES; WITH
     & PROFIT) AT    ',F5.2,' PER CENT INTEREST RATE')
      WRITE(2,55)
   55 FORMAT(70(1H=))
      WRITE(2,80)
   80 FORMAT(12X,'X',8X,'CX',17X,'MX',21X,'RX')
      WRITE(2,55)
      DO 90 J=10,99
   90 WRITE(2,100)J,C(J),M(J),R(J)
  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
   20 CONTINUE
      STOP
      END
```

```
*OLD MONET4
*IST

10       REAL L,N                                                    (A.7)
20       DIMENSION L(100),N(100),S(100),D(100),V(100)
30       READ(1,10)(L(I),I=10,99)
40    10 FORMAT(V)
50       P=.035
60       DO 20 I=1,11
70       P=P+.005
80       DO 30 J=1,100
90    30 V(J)=1./(1.+P)**J
100      DO 40 J=10,99
110   40 D(J)=V(J)*L(J)
120      N(99)=D(99)
130      DO 50 K=10,98
140      J1=108-K
150      J3=J1+1
160   50 N(J1)=N(J3)+D(J1)
170      S(99)=N(99)
180      DO 60 K=10,98
190      J2=108-K
200      J4=J2+1
210   60 S(J2)=S(J4)+N(J2)
215      PP=P*100.0
220      WRITE(2,70)PP
230   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH
240     & PROFIT)        AT ',F5.2,' PER CENT INTEREST RATE')
250      WRITE(2,55)
260   55 FORMAT(70(1H=))
270      WRITE(2,80)
280   80 FORMAT(1H,10X,1HX,7X,2HDX,16X,2HNX,22X,2HSX)
290      WRITE(2,55)
300      DO90 J=10,99
310   90 WRITE(2,100)J,D(J),N(J),S(J)
320  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
330   20 CONTINUE
340      STOP
350      END
```

(A.8)

```
*OLD MONET4-*
*ST

10       REAL M
20       DIMENSION D(100),C(100),M(100),R(100),V(100)
30       READ(1,10) (D(I),I=10,99)
40    10 FORMAT(V)
50       P=.035
60       DO 20 I=1,11
70       P=P+.005
80       DO 30 J=1,100
90    30 V(J)=1./(1.+P)**J
100      DO 40 J=10,99
110   40 C(J)=V(J+1)*D(J)
120      M(99)=C(99)
130      DO 50 K=10,98
140      J1=108-K
150      J3=J1+1
160   50 M(J1)=M(J3)+C(J1)
170      R(99)=M(99)
180      DO 60 K=10,98
190      J2=108-K
200      J4=J2+1
210   60 R(J2)=R(J4)+M(J2)
215      PP=P*100.0
220      WRITE(2,70)PP
230   70 FORMAT(1H1,10X,'THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;
240     &WITH PROFIT) AT   ',F5.2,' PER CENT INTEREST RATE')
250      WRITE(2,55)
260   55 FORMAT(70(1H=))
270      WRITE(2,80)
280   80 FORMAT(12X,'X',8X,'CX',17X,'MX',21X,'RX')
290      WRITE(2,55)
300      DO 90 J=10,99
310   90 WRITE(2,100)J,C(J),M(J),R(J)
320  100 FORMAT(1H,9X,I2,2X,F10.0,4X,F16.0,8X,F16.0)
330   20 CONTINUE
340      STOP
350      END
```

Appendix III

Monetary Functions

New Table (sums assured, with profit)

Interest Rate 4% - 9%

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 4.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	6755641.	157434828.	3153510272.
11	6490118.	150679188.	2996075456.
12	6235031.	144189070.	2845396256.
13	5989971.	137954038.	2701207200.
14	5754542.	131964067.	2563253152.
15	5528366.	126209525.	2431289088.
16	5311080.	120681159.	2305079552.
17	5102334.	115370079.	2184398400.
18	4901793.	110267745.	2069028320.
19	4709133.	105365952.	1958760576.
20	4524046.	100656819.	1853394624.
21	4346234.	96132773.	1752737808.
22	4175410.	91786539.	1656605040.
23	4011300.	87611129.	1564818496.
24	3853598.	83599829.	1477207360.
25	3702097.	79746231.	1393607536.
26	3556551.	76044134.	1313861312.
27	3416689.	72487583.	1237817184.
28	3282328.	69070894.	1165329600.
29	3153216.	65788566.	1096258704.
30	3029149.	62635351.	1030470136.
31	2909931.	59606202.	967834784.
32	2795347.	56696271.	908228584.
33	2685216.	53900924.	851532312.
34	2579341.	51215708.	797631384.
35	2477532.	48636367.	746415672.
36	2379612.	46158836.	697779304.
37	2285388.	43779224.	651620472.
38	2194705.	41493835.	607841248.
39	2107368.	39299131.	566347416.
40	2023221.	37191763.	527048284.
41	1942077.	35168541.	489856520.
42	1863781.	33226465.	454687980.
43	1788196.	31362684.	421461516.
44	1715153.	29574488.	390098832.
45	1644504.	27859335.	360524344.
46	1576113.	26214831.	332665008.
47	1509877.	24638719.	306450176.
48	1445669.	23128842.	281811456.
49	1383378.	21683173.	258682614.
50	1322905.	20299795.	236999442.
51	1264180.	18976890.	216699646.
52	1207113.	17712710.	197722756.
53	1151628.	16505597.	180010046.
54	1097648.	15353970.	163504448.
55	1045124.	14256321.	148150478.
56	993979.	13211197.	133894157.
57	944166.	12217218.	120682960.
58	895630.	11273052.	108465742.
59	848664.	10377422.	97192690.
60	802433.	9528759.	86815268.
61	757435.	8726326.	77286509.
62	713548.	7968890.	68560183.
63	670738.	7255342.	60591293.
64	628935.	6584605.	53335950.
65	587980.	5955619.	46751345.
66	549478.	5367639.	40795726.
67	511992.	4818161.	35428086.
68	475518.	4306169.	30609925.
69	440069.	3830651.	26303757.
70	405667.	3390582.	22473106.
71	372344.	2984914.	19082525.
72	340140.	2612570.	16097610.
73	309105.	2272430.	13485040.
74	279301.	1963325.	11212610.
75	250790.	1684024.	9249286.
76	223645.	1433234.	7565262.
77	197941.	1209589.	6132028.
78	173752.	1011648.	4922439.
79	151151.	837896.	3910791.
80	130202.	686746.	3072894.
81	110961.	556544.	2386149.
82	93466.	445583.	1829605.
83	77739.	352117.	1384022.
84	63775.	274378.	1031905.
85	51546.	210603.	757527.
86	40998.	159057.	546924.
87	32048.	118059.	387868.
88	24589.	86011.	269809.
89	18493.	61422.	183798.
90	13613.	42929.	122376.
91	9795.	29316.	79446.
92	6879.	19521.	50130.
93	4708.	12642.	30610.
94	3136.	7933.	17968.
95	2030.	4797.	10035.
96	1275.	2768.	5238.
97	776.	1493.	2470.
98	457.	717.	977.
99	260.	260.	260.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 4.00 PER CENT INTEREST RATE

X	CX	MX	RX
10	5690.	700311.	36133085.
11	5466.	694621.	35432774.
12	5252.	689154.	34738154.
13	5045.	683902.	34049000.
14	4847.	678857.	33365097.
15	4657.	674010.	32686241.
16	4474.	669353.	32012231.
17	4298.	664880.	31342878.
18	4129.	660582.	30677998.
19	3966.	656453.	30017416.
20	3811.	652487.	29360963.
21	3661.	648676.	28708476.
22	3517.	645015.	28059801.
23	3421.	641498.	27414786.
24	3286.	638077.	26773287.
25	3157.	634790.	26135211.
26	3071.	631633.	25500420.
27	2950.	628562.	24868787.
28	2869.	625612.	24240225.
29	2789.	622743.	23614614.
30	2712.	619953.	22991871.
31	2664.	617242.	22371918.
32	2618.	614578.	21754676.
33	2597.	611960.	21140098.
34	2604.	609363.	20528138.
35	2630.	606759.	19918775.
36	2700.	604129.	19312017.
37	2784.	601429.	18707888.
38	2925.	598645.	18106459.
39	3094.	595720.	17507814.
40	3329.	592626.	16912094.
41	3600.	589297.	16319469.
42	3901.	585697.	15730171.
43	4266.	581795.	15144475.
44	4682.	577530.	14562679.
45	5141.	572848.	13985150.
46	5616.	567707.	13412302.
47	6135.	562091.	12844595.
48	6689.	555955.	12282505.
49	7265.	549266.	11726549.
50	7845.	542001.	11177283.
51	8444.	534156.	10635282.
52	9058.	525712.	10101126.
53	9686.	516654.	9575414.
54	10307.	506968.	9058760.
55	10948.	496661.	8551792.
56	11583.	485713.	8055131.
57	12222.	474130.	7569418.
58	12519.	461903.	7095288.
59	13589.	449389.	6633380.
60	14135.	435800.	6183991.
61	14755.	421664.	5748192.
62	15366.	406909.	5326527.
63	15955.	391543.	4919618.
64	16814.	375588.	4528075.
65	15887.	358775.	4152487.
66	16352.	342888.	3793712.
67	16782.	326536.	3450825.
68	17160.	309753.	3124289.
69	17476.	292593.	2814536.
70	17721.	275117.	2521943.
71	17883.	257397.	2246825.
72	17952.	239514.	1989428.
73	17916.	221561.	1749915.
74	17768.	203645.	1528353.
75	17500.	185877.	1324708.
76	17102.	168377.	1138831.
77	16576.	151275.	970454.
78	15918.	134699.	819179.
79	15135.	118731.	684479.
80	14233.	103646.	565698.
81	13227.	89412.	462053.
82	12133.	76186.	372640.
83	10974.	64053.	296455.
84	9776.	53079.	232402.
85	8566.	43303.	179323.
86	7373.	34737.	136020.
87	6226.	27364.	101282.
88	5151.	21138.	73918.
89	4168.	15987.	52780.
90	3294.	11819.	36793.
91	2540.	8525.	24974.
92	1906.	5985.	16449.
93	1391.	4079.	10464.
94	986.	2688.	6384.
95	677.	1702.	3697.
96	450.	1025.	1994.
97	289.	575.	969.
98	179.	286.	394.
99	107.	107.	107.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 4.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	6439276.	137371708.	2586837056.
11	6156589.	130932432.	2449465344.
12	5886312.	124775843.	2318532896.
13	5627900.	118889531.	2193757056.
14	5380832.	113261631.	2074867520.
15	5144611.	107880799.	1961605888.
16	4918760.	102736188.	1853725088.
17	4702824.	97817428.	1750988896.
18	4496368.	93114604.	1653171472.
19	4298975.	88618236.	1560056864.
20	4110248.	84319261.	1471438624.
21	3929806.	80209013.	1387119360.
22	3757286.	76279207.	1306910352.
23	3592339.	72521921.	1230631152.
24	3434596.	68929582.	1158109232.
25	3283780.	65494987.	1089179648.
26	3139586.	62211207.	1023684664.
27	3001690.	59071622.	961473456.
28	2869851.	56069932.	902401832.
29	2743773.	53200081.	846331904.
30	2623204.	50456308.	793131824.
31	2507906.	47833104.	742675512.
32	2397626.	45325198.	694842408.
33	2292144.	42927572.	649517208.
34	2191233.	40635428.	606589632.
35	2094672.	38444196.	565954200.
36	2002258.	36349524.	527510008.
37	1913775.	34347267.	491160484.
38	1829043.	32433491.	456813216.
39	1747855.	30604448.	424379724.
40	1670034.	28856593.	393775276.
41	1595385.	27186558.	364918684.
42	1523740.	25591174.	337732124.
43	1454951.	24067433.	312140952.
44	1388843.	22612483.	288073520.
45	1325263.	21223640.	265461036.
46	1264071.	19898377.	244237396.
47	1205155.	18634305.	224339020.
48	1148385.	17429150.	205704714.
49	1093645.	16280766.	188275564.
50	1040834.	15187121.	171994798.
51	989871.	14146287.	156807676.
52	940664.	13156417.	142661388.
53	893132.	12215753.	129504971.
54	847196.	11322620.	117289218.
55	802797.	10475424.	105966598.
56	759857.	9672628.	95491174.
57	718324.	8912770.	85818546.
58	678137.	8194446.	76905776.
59	639501.	7516309.	68711330.
60	601772.	6876808.	61195021.
61	565309.	6275036.	54318213.
62	530005.	5709727.	48043178.
63	495823.	5179722.	42333451.
64	462734.	4683899.	37153729.
65	430498.	4221164.	32469830.
66	400383.	3790666.	28248666.
67	371284.	3390283.	24458000.
68	343183.	3018999.	21067717.
69	316080.	2675816.	18048718.
70	289977.	2359736.	15372902.
71	264884.	2069758.	13013166.
72	240816.	1804875.	10943408.
73	217797.	1564059.	9138533.
74	195854.	1346262.	7574474.
75	175021.	1150408.	6228212.
76	155330.	975387.	5077805.
77	136819.	820057.	4102418.
78	119525.	683238.	3282361.
79	103480.	563712.	2599123.
80	88712.	460232.	2035411.
81	75240.	371520.	1575179.
82	63074.	296280.	1203659.
83	52210.	233206.	907379.
84	42627.	180996.	674173.
85	34288.	138369.	493177.
86	27141.	104081.	354808.
87	21115.	76939.	250728.
88	16123.	55825.	173788.
89	12067.	39702.	117963.
90	8841.	27635.	78261.
91	6331.	18794.	50626.
92	4425.	12463.	31833.
93	3014.	8038.	19370.
94	1998.	5024.	11332.
95	1287.	3026.	6309.
96	804.	1739.	3283.
97	487.	935.	1544.
98	286.	447.	609.
99	162.	162.	162.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 4.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	5398.	523659.	25968846.
11	5161.	518261.	25445186.
12	4935.	513100.	24926925.
13	4718.	508166.	24413825.
14	4510.	503448.	23905659.
15	4313.	498938.	23402210.
16	4123.	494625.	22903273.
17	3942.	490502.	22408648.
18	3769.	486560.	21918146.
19	3604.	482790.	21431586.
20	3446.	479187.	20948796.
21	3294.	475741.	20469609.
22	3150.	472447.	19993868.
23	3049.	469297.	19521421.
24	2915.	466248.	19052124.
25	2787.	463333.	18585876.
26	2698.	460545.	18122544.
27	2580.	457847.	17661998.
28	2496.	455268.	17204151.
29	2416.	452772.	16748883.
30	2337.	450356.	16296111.
31	2285.	448019.	15845755.
32	2235.	445734.	15397736.
33	2206.	443500.	14952002.
34	2202.	441293.	14508502.
35	2213.	439091.	14067209.
36	2261.	436879.	13628118.
37	2320.	434618.	13191239.
38	2426.	432297.	12756621.
39	2554.	429872.	12324324.
40	2734.	427318.	11394453.
41	2944.	424583.	11467135.
42	3174.	421640.	11042552.
43	3454.	418465.	10620912.
44	3773.	415011.	10202447.
45	4123.	411238.	9787436.
46	4483.	407115.	9376198.
47	4874.	402632.	8969083.
48	5288.	397759.	8566451.
49	5716.	392470.	8168692.
50	6142.	386754.	7776222.
51	6580.	380612.	7389467.
52	7025.	374031.	7008856.
53	7476.	367006.	6634824.
54	7917.	359531.	6267818.
55	8369.	351613.	5908287.
56	8812.	343244.	5556674.
57	9254.	334432.	5213429.
58	9434.	325178.	4878997.
59	10191.	315744.	4553820.
60	10550.	305553.	4238076.
61	10960.	295003.	3932523.
62	11359.	284043.	3637519.
63	11737.	272685.	3353476.
64	12310.	260947.	3080791.
65	11576.	248637.	2819844.
66	11858.	237060.	2571208.
67	12112.	225202.	2334147.
68	12325.	213090.	2108945.
69	12492.	200765.	1895855.
70	12606.	188273.	1695090.
71	12661.	175667.	1506817.
72	12649.	163006.	1331150.
73	12563.	150356.	1168144.
74	12400.	137793.	1017788.
75	12154.	125393.	879995.
76	11821.	113239.	754601.
77	11403.	101418.	641363.
78	10898.	90015.	539945.
79	10312.	79117.	449930.
80	9651.	68805.	370813.
81	8926.	59153.	302008.
82	8148.	50227.	242855.
83	7335.	42079.	192628.
84	6503.	34744.	150548.
85	5671.	28241.	115804.
86	4858.	22571.	87563.
87	4082.	17713.	64992.
88	3361.	13630.	47279.
89	2707.	10269.	33649.
90	2129.	7562.	23380.
91	1634.	5433.	15817.
92	1220.	3800.	10384.
93	886.	2579.	6584.
94	625.	1693.	4005.
95	427.	1068.	2312.
96	283.	641.	1244.
97	181.	358.	603.
98	111.	178.	244.
99	66.	66.	66.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 5.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	6139132.	120604021.	2138115392.
11	5841671.	114464889.	2017511376.
12	5558623.	108623218.	1903046480.
13	5289289.	103064595.	1794423264.
14	5033005.	97775306.	1691358672.
15	4789139.	92742301.	1593583360.
16	4557089.	87953162.	1500841056.
17	4336283.	83396073.	1412887888.
18	4126176.	79059790.	1329491808.
19	3926249.	74933614.	1250432016.
20	3736009.	71007365.	1175498400.
21	3554987.	67271356.	1104491040.
22	3382736.	63716370.	1037219688.
23	3218831.	60333634.	973503320.
24	3062834.	57114803.	913169688.
25	2914398.	54051968.	856054888.
26	2773155.	51137570.	802002920.
27	2638728.	48364415.	750865352.
28	2510818.	45725687.	702500936.
29	2389081.	43214869.	656775248.
30	2273222.	40825788.	613560376.
31	2162958.	38552565.	572734592.
32	2057999.	36389607.	534182024.
33	1958090.	34331608.	497792416.
34	1862972.	32373518.	463460808.
35	1772396.	30510546.	431087288.
36	1686133.	28738150.	400576740.
37	1603946.	27052018.	371838588.
38	1525632.	25448072.	344786572.
39	1450969.	23922440.	319338500.
40	1379765.	22471471.	295416060.
41	1311814.	21091706.	272944588.
42	1246938.	19779892.	251852882.
43	1184974.	18532955.	232072990.
44	1125747.	17347981.	213540036.
45	1069096.	16222233.	196192056.
46	1014877.	15153137.	179969822.
47	962967.	14138260.	164816684.
48	913236.	13175293.	150678424.
49	865563.	12262057.	137503130.
50	819844.	11396494.	125241073.
51	775988.	10576650.	113844579.
52	733902.	9800662.	103267929.
53	693500.	9066760.	93467267.
54	654699.	8373260.	84400507.
55	617433.	7718561.	76027247.
56	581626.	7101128.	68308686.
57	547216.	6519502.	61207558.
58	514142.	5972285.	54688057.
59	482541.	5458143.	48715771.
60	451910.	4975602.	43257628.
61	422505.	4523693.	38282025.
62	394234.	4101187.	33758332.
63	367052.	3706954.	29657145.
64	340925.	3339902.	25950191.
65	315664.	2998976.	22610289.
66	292185.	2683312.	19611313.
67	269659.	2391127.	16928001.
68	248063.	2121469.	14536873.
69	227384.	1873406.	12415405.
70	207612.	1646022.	10541999.
71	188743.	1438409.	8895977.
72	170777.	1249666.	7457568.
73	153717.	1078889.	6207902.
74	137572.	925172.	5129013.
75	122353.	787600.	4203841.
76	108070.	665247.	3416241.
77	94738.	557177.	2750994.
78	82369.	462438.	2193817.
79	70972.	380069.	1731379.
80	60554.	309097.	1351310.
81	51114.	248543.	1042214.
82	42645.	197429.	793671.
83	35131.	154784.	596242.
84	28546.	119653.	441457.
85	22853.	91107.	321804.
86	18003.	68254.	230697.
87	13939.	50251.	162443.
88	10593.	36312.	112193.
89	7891.	25719.	75881.
90	5753.	17828.	50162.
91	4100.	12075.	32334.
92	2852.	7974.	20259.
93	1934.	5122.	12285.
94	1276.	3188.	7163.
95	818.	1913.	3975.
96	509.	1095.	2062.
97	307.	586.	967.
98	179.	280.	381.
99	101.	101.	101.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 5.00 PER CENT INTEREST RATE

X	CX	MX	RX
10	5122.	396029.	18784067.
11	4873.	390907.	18388038.
12	4638.	386034.	17997131.
13	4413.	381396.	17611097.
14	4199.	376983.	17229701.
15	3996.	372784.	16852718.
16	3802.	368789.	16479933.
17	3618.	364987.	16111145.
18	3442.	361369.	15746158.
19	3276.	357927.	15384788.
20	3117.	354651.	15026861.
21	2966.	351534.	14672210.
22	2822.	348568.	14320676.
23	2719.	345746.	13972107.
24	2587.	343027.	13626361.
25	2462.	340440.	13283334.
26	2372.	337978.	12942894.
27	2257.	335606.	12604916.
28	2174.	333349.	12269310.
29	2093.	331176.	11935961.
30	2016.	329082.	11604785.
31	1961.	327067.	11275703.
32	1909.	325106.	10948636.
33	1876.	323197.	10623530.
34	1863.	321321.	10300334.
35	1863.	319458.	9979013.
36	1895.	317594.	9659555.
37	1935.	315699.	9341961.
38	2014.	313764.	9026261.
39	2110.	311750.	8712497.
40	2248.	309640.	8400747.
41	2409.	307392.	8091106.
42	2585.	304983.	7783714.
43	2800.	302398.	7478731.
44	3044.	299598.	7176334.
45	3310.	296554.	6876736.
46	3582.	293244.	6580182.
47	3876.	289662.	6286938.
48	4185.	285786.	5997276.
49	4503.	281601.	5711489.
50	4815.	277098.	5429888.
51	5134.	272283.	5152790.
52	5455.	267149.	4880507.
53	5777.	261695.	4613357.
54	6089.	255917.	4351663.
55	6406.	249828.	4095745.
56	6713.	243422.	3845917.
57	7016.	236709.	3602495.
58	7118.	229693.	3365786.
59	7653.	222574.	3136094.
60	7885.	214921.	2913519.
61	8152.	207037.	2698598.
62	8409.	198884.	2491562.
63	8648.	190475.	2292677.
64	9027.	181828.	2102202.
65	8448.	172801.	1920374.
66	8612.	164353.	1747573.
67	8755.	155741.	1583220.
68	3866.	146986.	1427480.
69	8944.	138119.	1280494.
70	8983.	129175.	1142375.
71	8979.	120193.	1013199.
72	8928.	111214.	893006.
73	8825.	102286.	781792.
74	8668.	93462.	679506.
75	8456.	84793.	586044.
76	8186.	76337.	501251.
77	7858.	68151.	424914.
78	7474.	60293.	356763.
79	7039.	52819.	296469.
80	6557.	45780.	243650.
81	6035.	39223.	197870.
82	5483.	33189.	158647.
83	4912.	27706.	125458.
84	4334.	22794.	97753.
85	3761.	18459.	74959.
86	3207.	14698.	56500.
87	2682.	11491.	41802.
88	2198.	8809.	30310.
89	1762.	6611.	21501.
90	1379.	4850.	14890.
91	1053.	3471.	10041.
92	783.	2418.	6570.
93	566.	1635.	4153.
94	397.	1069.	2518.
95	270.	672.	1449.
96	178.	402.	777.
97	113.	224.	376.
98	69.	111.	152.
99	41.	41.	41.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 5.50 PER CENT INTEREST RATE

X	Cx	Mx	Rx
10	4861.	303102.	13678049.
11	4603.	298241.	13374947.
12	4360.	293638.	13076706.
13	4129.	289278.	12783068.
14	3910.	285149.	12493791.
15	3703.	281239.	12208642.
16	3507.	277536.	11927403.
17	3321.	274029.	11649867.
18	3145.	270708.	11375838.
19	2979.	267562.	11105131.
20	2821.	264584.	10837568.
21	2672.	261763.	10572985.
22	2530.	259091.	10311222.
23	2426.	256561.	10052131.
24	2297.	254135.	9795570.
25	2176.	251837.	9541435.
26	2086.	249661.	9289598.
27	1976.	247575.	9039936.
28	1894.	245599.	8792361.
29	1815.	243706.	8546761.
30	1740.	241890.	8303056.
31	1684.	240151.	8061165.
32	1632.	238466.	7821015.
33	1596.	236834.	7582548.
34	1578.	235238.	7345714.
35	1571.	233661.	7110476.
36	1590.	232090.	6876815.
37	1616.	230501.	6644725.
38	1673.	228885.	6414225.
39	1745.	227212.	6185340.
40	1850.	225467.	5958128.
41	1973.	223616.	5732661.
42	2108.	221643.	5509045.
43	2272.	219536.	5287402.
44	2458.	217264.	5067866.
45	2660.	214806.	4850603.
46	2865.	212145.	4635797.
47	3085.	209280.	4423651.
48	3316.	206195.	4214371.
49	3551.	202879.	4008176.
50	3779.	199328.	3805297.
51	4010.	195549.	3605969.
52	4241.	191539.	3410420.
53	4470.	187298.	3218882.
54	4689.	182828.	3031583.
55	4910.	178139.	2848755.
56	5121.	173229.	2670616.
57	5327.	168109.	2497387.
58	5378.	162782.	2329278.
59	5755.	157404.	2166496.
60	5901.	151649.	2009092.
61	6072.	145748.	1857443.
62	6234.	139675.	1711695.
63	6381.	133441.	1572020.
64	6629.	127061.	1438578.
65	6174.	120432.	1311517.
66	6265.	114258.	1191085.
67	6338.	107993.	1076827.
68	6388.	101655.	968833.
69	6414.	95267.	867178.
70	6411.	88853.	771911.
71	6378.	82443.	683058.
72	6311.	76065.	600615.
73	6209.	69753.	524550.
74	6070.	63544.	454797.
75	5894.	57474.	391253.
76	5678.	51580.	333779.
77	5425.	45903.	282198.
78	5136.	40478.	236296.
79	4814.	35342.	195818.
80	4462.	30529.	160475.
81	4088.	26066.	129947.
82	3696.	21979.	103880.
83	3296.	18282.	81901.
84	2894.	14987.	63619.
85	2500.	12092.	48632.
86	2121.	9593.	36540.
87	1766.	7471.	26947.
88	1440.	5705.	19476.
89	1149.	4265.	13771.
90	895.	3117.	9505.
91	680.	2222.	6388.
92	503.	1542.	4167.
93	362.	1038.	2625.
94	253.	676.	1587.
95	171.	423.	910.
96	112.	252.	487.
97	71.	140.	235.
98	43.	69.	95.
99	26.	26.	26.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 5.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	5854305.	106481494.	1780079632.
11	5544243.	100627189.	1673598144.
12	5250603.	95082946.	1572970960.
13	4972515.	89832343.	1477888016.
14	4709156.	84859828.	1388055680.
15	4459745.	80150672.	1303195856.
16	4223543.	75690927.	1223045184.
17	3999851.	71467384.	1147354256.
18	3788007.	67467533.	1075886864.
19	3587383.	63679526.	1008419328.
20	3397384.	60092144.	944739800.
21	3217448.	56694760.	884647656.
22	3047042.	53477312.	827952896.
23	2885662.	50430269.	774475584.
24	2732798.	47544608.	724045312.
25	2588033.	44811810.	676500704.
26	2450935.	42223777.	631688896.
27	2321075.	39772842.	589465120.
28	2198096.	37451766.	549692280.
29	2081609.	35253671.	512240516.
30	1971274.	33172062.	476986844.
31	1866766.	31200788.	443814784.
32	1767762.	29334021.	412613996.
33	1673972.	27566259.	383279976.
34	1585107.	25892286.	355713716.
35	1500894.	24307179.	329821428.
36	1421078.	22806285.	305514248.
37	1345403.	21385208.	282707964.
38	1273648.	20039804.	261322758.
39	1205576.	18766156.	241282954.
40	1140981.	17560580.	222516798.
41	1079649.	16419598.	204956218.
42	1021390.	15339950.	188536620.
43	966035.	14318559.	173196670.
44	913401.	13352524.	158878110.
45	863325.	12439123.	145525586.
46	815657.	11575798.	133086463.
47	770270.	10760141.	121510665.
48	727028.	9989871.	110750524.
49	685810.	9262843.	100760653.
50	646506.	8577033.	91497810.
51	609023.	7930527.	82920777.
52	573263.	7321504.	74990250.
53	539136.	6748241.	67668746.
54	506560.	6209105.	60920505.
55	475462.	5702545.	54711400.
56	445766.	5227083.	49008855.
57	417406.	4781317.	43781772.
58	390319.	4363911.	39000455.
59	364592.	3973592.	34636544.
60	339830.	3609000.	30662952.
61	316213.	3269170.	27053952.
62	293655.	2952957.	23784782.
63	272112.	2659302.	20831824.
64	251546.	2387190.	18172522.
65	231803.	2135644.	15785332.
66	213545.	1903841.	13649687.
67	196147.	1690296.	11745846.
68	179584.	1494149.	10055550.
69	163833.	1314565.	8561401.
70	148878.	1150732.	7246835.
71	134706.	1001854.	6096103.
72	121306.	867148.	5094249.
73	108670.	745842.	4227101.
74	96796.	637172.	3481259.
75	85679.	540376.	2844086.
76	75319.	454697.	2303710.
77	65715.	379378.	1849014.
78	56864.	313663.	1469636.
79	48764.	256799.	1155973.
80	41408.	208035.	899174.
81	34787.	166626.	691140.
82	28886.	131839.	524513.
83	23684.	102953.	392674.
84	19153.	79269.	289721.
85	15261.	60116.	210452.
86	11965.	44855.	150336.
87	9220.	32890.	105481.
88	6974.	23670.	72590.
89	5170.	16697.	48920.
90	3752.	11526.	32224.
91	2661.	7775.	20697.
92	1842.	5113.	12923.
93	1243.	3271.	7809.
94	816.	2028.	4538.
95	521.	1212.	2510.
96	322.	691.	1298.
97	193.	369.	607.
98	112.	175.	238.
99	63.	63.	63.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 6.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	5583947.	94499638.	1492273888.
11	5263260.	88915691.	1397774256.
12	4960990.	83652431.	1308858560.
13	4676079.	78691441.	1225206128.
14	4407531.	74015362.	1146514688.
15	4154406.	69607831.	1072499320.
16	3915818.	65453426.	1002891488.
17	3690931.	61537608.	937438064.
18	3478961.	57846677.	875900456.
19	3279163.	54367716.	818053776.
20	3090840.	51088553.	763686056.
21	2913333.	47997713.	712597504.
22	2746019.	45084380.	664599792.
23	2588315.	42338361.	619515408.
24	2439641.	39750046.	577177048.
25	2299506.	37310405.	537427000.
26	2167421.	35010899.	500116596.
27	2042901.	32843477.	465105696.
28	1925534.	30800576.	432262220.
29	1814891.	28875042.	401461644.
30	1710586.	27060151.	372586604.
31	1612258.	25349566.	345526452.
32	1519550.	23737308.	320176888.
33	1432141.	22217758.	296439580.
34	1349718.	20785616.	274221824.
35	1271982.	19435899.	253436206.
36	1198658.	18163917.	234000308.
37	1129475.	16965259.	215836392.
38	1064192.	15835784.	198871134.
39	1002564.	14771591.	183035350.
40	944371.	13769028.	168263758.
41	889391.	12824657.	154494730.
42	837431.	11935266.	141670072.
43	788309.	11097835.	129734805.
44	741843.	10309526.	118636970.
45	697865.	9567684.	108327444.
46	656223.	8869819.	98759760.
47	616784.	8213596.	89889941.
48	579412.	7596813.	81676345.
49	543985.	7017400.	74079532.
50	510390.	6473415.	67062132.
51	478531.	5963025.	60588716.
52	448308.	5484494.	54625691.
53	419632.	5036186.	49141197.
54	392416.	4616554.	44105012.
55	366589.	4224138.	39488458.
56	342071.	3857549.	35264320.
57	318797.	3515479.	31406770.
58	296703.	3196681.	27891292.
59	275840.	2899978.	24694611.
60	255892.	2624139.	21794632.
61	236985.	2368246.	19170494.
62	219042.	2131261.	16802248.
63	202015.	1912219.	14670987.
64	185866.	1710204.	12758768.
65	170470.	1524339.	11048564.
66	156302.	1353868.	9524225.
67	142891.	1197566.	8170357.
68	130207.	1054676.	6972790.
69	118227.	924468.	5918115.
70	106928.	806241.	4993646.
71	96293.	699313.	4187405.
72	86305.	603020.	3488092.
73	76951.	516715.	2885072.
74	68219.	439764.	2368358.
75	60100.	371545.	1928594.
76	52583.	311446.	1557048.
77	45662.	258862.	1245603.
78	39325.	213201.	986741.
79	33565.	173875.	773540.
80	28367.	140311.	599664.
81	23719.	111944.	459353.
82	19602.	88225.	347410.
83	15996.	68622.	259185.
84	12875.	52626.	190562.
85	10210.	39751.	137936.
86	7968.	29541.	98185.
87	6111.	21573.	68644.
88	4600.	15463.	47071.
89	3394.	10863.	31609.
90	2452.	7468.	20746.
91	1731.	5017.	13278.
92	1192.	3286.	8261.
93	801.	2094.	4975.
94	523.	1293.	2881.
95	332.	769.	1589.
96	205.	437.	819.
97	122.	232.	382.
98	71.	110.	150.
99	39.	39.	39.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 6.00 PER CENT INTEREST RATE

X	CX	MX	RX
10	4615.	234889.	10029388.
11	4349.	230275.	9794499.
12	4100.	225925.	9564224.
13	3864.	221825.	9338299.
14	3642.	217961.	9116474.
15	3433.	214319.	8898513.
16	3236.	210885.	8684194.
17	3050.	207649.	8473309.
18	2875.	204599.	8265660.
19	2710.	201724.	8061061.
20	2554.	199014.	7859337.
21	2408.	196460.	7660323.
22	2269.	194052.	7463863.
23	2166.	191783.	7269811.
24	2041.	189617.	7078028.
25	1924.	187575.	6888412.
26	1836.	185651.	6700836.
27	1731.	183815.	6515185.
28	1651.	182084.	6331370.
29	1575.	180433.	6149286.
30	1502.	178858.	5968853.
31	1448.	177355.	5789995.
32	1396.	175907.	5612640.
33	1359.	174511.	5436733.
34	1337.	173152.	5262221.
35	1325.	171815.	5089069.
36	1334.	170490.	4917254.
37	1350.	169156.	4746764.
38	1391.	167806.	4577608.
39	1444.	166415.	4409802.
40	1524.	164970.	4243387.
41	1618.	163446.	4078417.
42	1720.	161828.	3914971.
43	1845.	160108.	3753143.
44	1987.	158263.	3593034.
45	2140.	156276.	3434771.
46	2294.	154136.	3278495.
47	2459.	151842.	3124359.
48	2630.	149383.	2972517.
49	2803.	146752.	2823134.
50	2969.	143949.	2676382.
51	3136.	140980.	2532432.
52	3301.	137844.	2391452.
53	3463.	134543.	2253608.
54	3615.	131081.	2119065.
55	3768.	127465.	1987985.
56	3911.	123698.	1860519.
57	4049.	119787.	1736822.
58	4069.	115738.	1617035.
59	4334.	111669.	1501298.
60	4423.	107335.	1389629.
61	4530.	102912.	1282294.
62	4628.	98383.	1179381.
63	4715.	93755.	1080999.
64	4875.	89040.	987244.
65	4519.	84166.	898203.
66	4564.	79647.	814038.
67	4595.	75083.	734391.
68	4610.	70487.	659308.
69	4606.	65877.	588821.
70	4583.	61271.	522944.
71	4538.	56688.	461673.
72	4469.	52151.	404985.
73	4376.	47681.	352834.
74	4258.	43305.	305153.
75	4115.	39047.	261847.
76	3945.	34933.	222800.
77	3752.	30988.	187867.
78	3535.	27236.	156879.
79	3298.	23701.	129643.
80	3043.	20404.	105942.
81	2774.	17361.	85538.
82	2497.	14587.	68177.
83	2215.	12091.	53590.
84	1936.	9875.	41499.
85	1665.	7939.	31624.
86	1406.	6274.	23685.
87	1165.	4868.	17411.
88	945.	3703.	12543.
89	751.	2758.	8839.
90	582.	2008.	6081.
91	440.	1425.	4074.
92	324.	985.	2648.
93	232.	661.	1663.
94	161.	429.	1002.
95	109.	267.	573.
96	71.	159.	306.
97	45.	88.	147.
98	27.	43.	59.
99	16.	16.	16.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 6.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	5327260.	84263809.	1259243248.
11	4997740.	78936549.	1174979440.
12	4688603.	73938809.	1096042896.
13	4398588.	69250206.	1022104088.
14	4126511.	64851619.	952853880.
15	3871264.	60725108.	888002264.
16	3631806.	56853843.	827277160.
17	3407159.	53222038.	770423320.
18	3196408.	49814879.	717201280.
19	2998693.	46618471.	667386400.
20	2813207.	43619778.	620767928.
21	2639195.	40806571.	577148152.
22	2475947.	38167376.	536341584.
23	2322796.	35691429.	498174208.
24	2179095.	33368632.	462482780.
25	2044283.	31189538.	429114148.
26	1917812.	29145254.	397924612.
27	1799146.	27227442.	368779356.
28	1687822.	25428296.	341551916.
29	1583368.	23740475.	316123620.
30	1485363.	22157106.	292383144.
31	1393409.	20671743.	270226036.
32	1307119.	19278334.	249554294.
33	1226147.	17971215.	230275960.
34	1150153.	16745068.	212304746.
35	1078822.	15594914.	195559678.
36	1011860.	14516092.	179964764.
37	948983.	13504232.	165448672.
38	889934.	12555249.	151944440.
39	834461.	11665315.	139389190.
40	782335.	10830854.	127723875.
41	733330.	10048518.	116893021.
42	687245.	9315188.	106844503.
43	643896.	8627943.	97529315.
44	603097.	7984047.	88901372.
45	564681.	7380950.	80917325.
46	528493.	6816270.	73536375.
47	494398.	6287777.	66720105.
48	462262.	5793378.	60432329.
49	431960.	5331116.	54638950.
50	403381.	4899156.	49307834.
51	376426.	4495775.	44408678.
52	350996.	4119349.	39912903.
53	327002.	3768353.	35793553.
54	304358.	3441352.	32025200.
55	282991.	3136993.	28583848.
56	262825.	2854002.	25446855.
57	243793.	2591177.	22592853.
58	225832.	2347384.	20001675.
59	208966.	2121552.	17654291.
60	192945.	1912586.	15532739.
61	177850.	1719641.	13620153.
62	163612.	1541792.	11900511.
63	150185.	1378180.	10358720.
64	137531.	1227994.	8980540.
65	125547.	1090464.	7752545.
66	114572.	964917.	6662082.
67	104249.	850345.	5697165.
68	94550.	746096.	4846820.
69	85447.	651546.	4100724.
70	76919.	566099.	3449178.
71	68943.	489180.	2883080.
72	61502.	420237.	2393900.
73	54578.	358735.	1973663.
74	48158.	304157.	1614927.
75	42227.	255999.	1310770.
76	36772.	213772.	1054771.
77	31782.	177000.	840999.
78	27243.	145218.	663999.
79	23143.	117974.	518782.
80	19468.	94831.	400807.
81	16201.	75363.	305976.
82	13327.	59162.	230613.
83	10824.	45835.	171452.
84	8671.	35011.	125617.
85	6844.	26340.	90606.
86	5316.	19496.	64266.
87	4058.	14180.	44770.
88	3040.	10122.	30590.
89	2233.	7082.	20468.
90	1605.	4849.	13386.
91	1128.	3244.	8537.
92	773.	2116.	5293.
93	517.	1343.	3176.
94	336.	826.	1833.
95	213.	490.	1008.
96	130.	277.	518.
97	77.	147.	241.
98	45.	69.	94.
99	25.	25.	25.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 6.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	4382.	184385.	7407393.
11	4111.	180003.	7223008.
12	3857.	175893.	7043005.
13	3618.	172036.	6867112.
14	3394.	168418.	6695076.
15	3184.	165024.	6526658.
16	2987.	161840.	6361634.
17	2802.	158852.	6199794.
18	2629.	156050.	6040942.
19	2466.	153421.	5884892.
20	2314.	150954.	5731471.
21	2171.	148640.	5580517.
22	2036.	146469.	5431877.
23	1935.	144433.	5285407.
24	1815.	142498.	5140974.
25	1703.	140683.	4998476.
26	1617.	138981.	4857793.
27	1517.	137364.	4718812.
28	1441.	135847.	4581448.
29	1368.	134406.	4445602.
30	1298.	133038.	4311196.
31	1246.	131740.	4178157.
32	1195.	130494.	4046417.
33	1158.	129299.	3915923.
34	1134.	128141.	3786624.
35	1118.	127007.	3658484.
36	1121.	125888.	3531477.
37	1129.	124767.	3405588.
38	1158.	123638.	3280821.
39	1196.	122480.	3157183.
40	1257.	121284.	3034702.
41	1328.	120027.	2913419.
42	1405.	118699.	2793392.
43	1500.	117295.	2674692.
44	1608.	115795.	2557398.
45	1724.	114187.	2441603.
46	1839.	112463.	2327416.
47	1962.	110624.	2214953.
48	2089.	108662.	2104329.
49	2215.	106574.	1995667.
50	2336.	104358.	1889093.
51	2455.	102022.	1784735.
52	2572.	99567.	1682713.
53	2686.	96995.	1583146.
54	2791.	94309.	1486151.
55	2895.	91518.	1391841.
56	2991.	88624.	1300323.
57	3082.	85633.	1211699.
58	3083.	82551.	1126066.
59	3268.	79468.	1043515.
60	3319.	76201.	964047.
61	3383.	72882.	887846.
62	3441.	69499.	814964.
63	3489.	66058.	745466.
64	3590.	62569.	679408.
65	3313.	58979.	616838.
66	3330.	55667.	557859.
67	3337.	52337.	502192.
68	3332.	49000.	449855.
69	3314.	45668.	400855.
70	3281.	42355.	355187.
71	3234.	39074.	312832.
72	3170.	35840.	273758.
73	3089.	32670.	237918.
74	2992.	29581.	205248.
75	2877.	26589.	175667.
76	2746.	23712.	149077.
77	2599.	20966.	125365.
78	2437.	18367.	104399.
79	2263.	15930.	86032.
80	2078.	13667.	70103.
81	1886.	11588.	56436.
82	1689.	9703.	44847.
83	1492.	8013.	35145.
84	1298.	6521.	27132.
85	1111.	5223.	20610.
86	934.	4113.	15387.
87	770.	3179.	11275.
88	622.	2409.	8096.
89	491.	1787.	5687.
90	379.	1296.	3899.
91	286.	917.	2603.
92	209.	631.	1687.
93	149.	422.	1056.
94	103.	273.	634.
95	69.	169.	362.
96	45.	100.	192.
97	28.	55.	92.
98	17.	27.	37.
99	10.	10.	10.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 7.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	5083493.	75463028.	1069236296.
11	4746766.	70379535.	993773264.
12	4432344.	65632769.	923393728.
13	4138749.	61200425.	857760960.
14	3864601.	57061676.	796560536.
15	3608613.	53197075.	739498856.
16	3369581.	49588462.	686301784.
17	3146383.	46218881.	636713320.
18	2937969.	43072499.	590494440.
19	2743360.	40134530.	547421944.
20	2561642.	37391170.	507287416.
21	2391960.	34829528.	469896244.
22	2233519.	32437568.	435066716.
23	2085572.	30204049.	402629148.
24	1947404.	28118477.	372425100.
25	1818390.	26171073.	344306624.
26	1697922.	24352683.	318135552.
27	1585418.	22654761.	293782868.
28	1480369.	21069343.	271128108.
29	1382264.	19588975.	250058764.
30	1290647.	18206710.	230469790.
31	1205089.	16916063.	212263080.
32	1125180.	15710973.	195347018.
33	1050546.	14585794.	179636044.
34	980831.	13535248.	165050250.
35	915702.	12554417.	151515002.
36	854851.	11638715.	138960584.
37	797984.	10783864.	127321868.
38	744834.	9985881.	116538004.
39	695142.	9241046.	106552123.
40	648673.	8545904.	97311077.
41	605200.	7897231.	88765173.
42	564517.	7292031.	80867942.
43	526437.	6727515.	73575911.
44	490777.	6201078.	66848396.
45	457368.	5710301.	60647319.
46	426057.	5252934.	54937018.
47	396708.	4826877.	49684084.
48	369188.	4430169.	44857207.
49	343376.	4060980.	40427039.
50	319159.	3717605.	36366059.
51	296440.	3398446.	32648454.
52	275122.	3102006.	29250008.
53	255117.	2826884.	26148003.
54	236341.	2571767.	23321119.
55	218723.	2335425.	20749353.
56	202187.	2116703.	18413927.
57	186670.	1914516.	16297225.
58	172109.	1727846.	14382709.
59	158511.	1555737.	12654863.
60	145674.	1397226.	11099126.
61	133650.	1251551.	9701901.
62	122376.	1117901.	8450349.
63	111809.	995525.	7332448.
64	101909.	883717.	6336922.
65	92594.	781808.	5453206.
66	84105.	689213.	4671398.
67	76170.	605108.	3982185.
68	68760.	528938.	3377077.
69	61850.	460178.	2848138.
70	55417.	398328.	2387961.
71	49438.	342911.	1989633.
72	43896.	293473.	1646722.
73	38773.	249577.	1353249.
74	34052.	210804.	1103672.
75	29719.	176752.	892868.
76	25759.	147034.	716116.
77	22159.	121275.	569082.
78	18906.	99116.	447808.
79	15985.	80210.	348692.
80	13384.	64224.	268482.
81	11086.	50841.	204258.
82	9077.	39754.	153417.
83	7338.	30678.	113663.
84	5851.	23340.	82985.
85	4596.	17489.	59645.
86	3553.	12893.	42156.
87	2700.	9340.	29262.
88	2013.	6640.	19923.
89	1472.	4627.	13282.
90	1053.	3155.	8656.
91	736.	2102.	5500.
92	503.	1366.	3398.
93	334.	863.	2032.
94	216.	529.	1169.
95	136.	312.	640.
96	83.	176.	328.
97	49.	93.	152.
98	28.	44.	59.
99	16.	16.	16.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 7.00 PER CENT INTEREST RATE

X	CX	MX	RX
10	4162.	146651.	5512248.
11	3886.	142490.	5365596.
12	3629.	138604.	5223107.
13	3388.	134975.	5084503.
14	3164.	131586.	4949529.
15	2954.	128423.	4817942.
16	2759.	125468.	4689520.
17	2576.	122709.	4564052.
18	2405.	120134.	4441342.
19	2246.	117728.	4321209.
20	2097.	115482.	4203480.
21	1958.	113385.	4087998.
22	1828.	111427.	3974613.
23	1729.	109598.	3863186.
24	1614.	107869.	3753588.
25	1507.	106255.	3645718.
26	1425.	104748.	3539463.
27	1331.	103323.	3434716.
28	1258.	101992.	3331393.
29	1188.	100734.	3229401.
30	1123.	99546.	3128666.
31	1072.	98423.	3029120.
32	1024.	97351.	2930697.
33	988.	96327.	2833347.
34	962.	95339.	2737020.
35	945.	94376.	2641681.
36	943.	93432.	2547304.
37	945.	92489.	2453873.
38	965.	91544.	2361384.
39	992.	90579.	2269840.
40	1037.	89587.	2179260.
41	1091.	88550.	2089673.
42	1149.	87460.	2001123.
43	1221.	86311.	1913664.
44	1302.	85090.	1827353.
45	1390.	83788.	1742262.
46	1476.	82399.	1658474.
47	1567.	80923.	1576076.
48	1660.	79356.	1495153.
49	1753.	77696.	1415797.
50	1839.	75943.	1338101.
51	1925.	74103.	1262158.
52	2007.	72179.	1188054.
53	2086.	70172.	1115876.
54	2157.	68087.	1045703.
55	2227.	65930.	977617.
56	2290.	63703.	911687.
57	2349.	61413.	847984.
58	2338.	59064.	786572.
59	2467.	56726.	727508.
60	2494.	54259.	670782.
61	2531.	51765.	616523.
62	2561.	49234.	564759.
63	2585.	46673.	515525.
64	2648.	44088.	468852.
65	2432.	41440.	424765.
66	2433.	39008.	383325.
67	2427.	36575.	344317.
68	2412.	34149.	307742.
69	2387.	31737.	273593.
70	2353.	29349.	241856.
71	2308.	26997.	212507.
72	2252.	24689.	185510.
73	2184.	22437.	160822.
74	2105.	20253.	138385.
75	2016.	18147.	118132.
76	1915.	16131.	99985.
77	1804.	14217.	83854.
78	1684.	12413.	69637.
79	1556.	10730.	57224.
80	1422.	9174.	46494.
81	1284.	7752.	37320.
82	1145.	6467.	29568.
83	1007.	5322.	23100.
84	872.	4316.	17778.
85	742.	3444.	13463.
86	621.	2701.	10019.
87	510.	2080.	7317.
88	410.	1571.	5237.
89	322.	1161.	3666.
90	248.	838.	2506.
91	186.	591.	1668.
92	135.	405.	1077.
93	96.	270.	672.
94	66.	174.	402.
95	44.	107.	229.
96	29.	63.	121.
97	18.	35.	58.
98	11.	17.	23.
99	6.	6.	6.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 7.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	4851939.	67850349.	913256936.
11	4509478.	62998411.	845406584.
12	4191188.	58488933.	782408176.
13	3895364.	54297745.	723919240.
14	3620420.	50402381.	669621496.
15	3364883.	46781960.	619219112.
16	3127381.	43417077.	572437152.
17	2906644.	40289696.	529020072.
18	2701486.	37383052.	488730376.
19	2510809.	34681566.	451347324.
20	2333590.	32170757.	416665756.
21	2168880.	29837167.	384495000.
22	2015795.	27668287.	354657832.
23	1873516.	25652492.	326989544.
24	1741259.	23778976.	301337052.
25	1618340.	22037717.	277558076.
26	1504097.	20419377.	255520358.
27	1397903.	18915281.	235100980.
28	1299207.	17517377.	216185700.
29	1207466.	16218170.	198668322.
30	1122191.	15010703.	182450152.
31	1042927.	13888512.	167439448.
32	969241.	12845585.	153550936.
33	900741.	11876344.	140705350.
34	837056.	10975603.	128829005.
35	777839.	10138547.	117853402.
36	722773.	9360707.	107714855.
37	671553.	8637935.	98354148.
38	623909.	7966381.	89716213.
39	579576.	7342472.	81749832.
40	538317.	6762896.	74407360.
41	499904.	6224578.	67644464.
42	464130.	5724675.	61419886.
43	430809.	5260545.	55695211.
44	399758.	4829736.	50434666.
45	370812.	4429978.	45604930.
46	343820.	4059165.	41174953.
47	318648.	3715345.	37115788.
48	295164.	3396697.	33400443.
49	273250.	3101533.	30003746.
50	252797.	2828284.	26902212.
51	233710.	2575486.	24073928.
52	215894.	2341776.	21498442.
53	199265.	2125882.	19156666.
54	183741.	1926617.	17030784.
55	169253.	1742876.	15104167.
56	155729.	1573623.	13361291.
57	143109.	1417894.	11787668.
58	131332.	1274785.	10369774.
59	120394.	1143453.	9094989.
60	110129.	1023059.	7951536.
61	100569.	912930.	6928477.
62	91657.	812361.	6015547.
63	83353.	720704.	5203186.
64	75619.	637352.	4482481.
65	68388.	561732.	3845130.
66	61829.	493344.	3283397.
67	55735.	431515.	2790053.
68	50079.	375780.	2358538.
69	44837.	325701.	1982758.
70	39986.	280864.	1657057.
71	35507.	240877.	1376193.
72	31380.	205371.	1135316.
73	27588.	173991.	929945.
74	24116.	146403.	755954.
75	20950.	122286.	609551.
76	18074.	101337.	487265.
77	15476.	83263.	385928.
78	13142.	67787.	302665.
79	11061.	54645.	234878.
80	9217.	43584.	180233.
81	7599.	34367.	136649.
82	6193.	26768.	102282.
83	4983.	20575.	75514.
84	3955.	15592.	54940.
85	3093.	11637.	39348.
86	2380.	8544.	27712.
87	1800.	6164.	19167.
88	1336.	4365.	13003.
89	972.	3029.	8638.
90	692.	2057.	5609.
91	482.	1365.	3552.
92	327.	883.	2186.
93	217.	556.	1303.
94	140.	339.	747.
95	87.	200.	408.
96	53.	112.	208.
97	31.	59.	96.
98	18.	28.	37.
99	10.	10.	10.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 7.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	3954.	118188.	4134278.
11	3675.	114234.	4016090.
12	3415.	110560.	3901856.
13	3174.	107144.	3791296.
14	2950.	103970.	3684152.
15	2742.	101020.	3580182.
16	2548.	98278.	3479162.
17	2368.	95729.	3380885.
18	2201.	93361.	3285155.
19	2046.	91159.	3191795.
20	1902.	89113.	3100635.
21	1767.	87212.	3011522.
22	1643.	85444.	2924310.
23	1546.	83802.	2838866.
24	1437.	82256.	2755064.
25	1335.	80819.	2672808.
26	1256.	79484.	2591989.
27	1168.	78227.	2512505.
28	1099.	77060.	2434278.
29	1033.	75961.	2357218.
30	972.	74928.	2281257.
31	924.	73956.	2206330.
32	878.	73032.	2132374.
33	843.	72154.	2059342.
34	818.	71311.	1987188.
35	799.	70494.	1915877.
36	793.	69695.	1845383.
37	791.	68901.	1775688.
38	804.	68110.	1706787.
39	823.	67306.	1638677.
40	857.	66482.	1571371.
41	897.	65625.	1504889.
42	940.	64729.	1439264.
43	994.	63789.	1374535.
44	1056.	62795.	1310746.
45	1121.	61739.	1247951.
46	1185.	60618.	1186212.
47	1253.	59432.	1125595.
48	1321.	58180.	1066162.
49	1388.	56858.	1007983.
50	1450.	55470.	951124.
51	1510.	54020.	895654.
52	1567.	52509.	841634.
53	1621.	50942.	789125.
54	1669.	49321.	738183.
55	1715.	47652.	688862.
56	1756.	45936.	641210.
57	1792.	44181.	595274.
58	1776.	42389.	551093.
59	1865.	40613.	508704.
60	1877.	38748.	468092.
61	1895.	36871.	429344.
62	1910.	34975.	392474.
63	1918.	33066.	357498.
64	1956.	31148.	324432.
65	1788.	29192.	293285.
66	1780.	27404.	264093.
67	1767.	25624.	236688.
68	1748.	23857.	211064.
69	1723.	22109.	187207.
70	1690.	20386.	165098.
71	1650.	18696.	144712.
72	1602.	17046.	126016.
73	1547.	15444.	108970.
74	1484.	13897.	93526.
75	1414.	12413.	79629.
76	1337.	10999.	67216.
77	1254.	9661.	56218.
78	1165.	8408.	46556.
79	1071.	7243.	38148.
80	975.	6171.	30906.
81	876.	5197.	24734.
82	773.	4320.	19538.
83	681.	3542.	15217.
84	587.	2862.	11675.
85	497.	2275.	8813.
86	414.	1778.	6538.
87	338.	1364.	4759.
88	271.	1026.	3395.
89	212.	755.	2369.
90	162.	543.	1614.
91	121.	381.	1070.
92	88.	261.	689.
93	62.	173.	429.
94	42.	111.	256.
95	28.	68.	145.
96	18.	40.	77.
97	11.	22.	37.
98	7.	11.	15.
99	4.	4.	4.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 8.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	4631935.	61228301.	784374512.
11	4285071.	56596366.	723146208.
12	3964183.	52311295.	666549840.
13	3667324.	48347112.	614238544.
14	3392696.	44679787.	565891432.
15	3138633.	41287091.	521211644.
16	2903596.	38148458.	479924552.
17	2686160.	35244862.	441776096.
18	2485006.	32558702.	406531236.
19	2298916.	30073695.	373972536.
20	2126762.	27774779.	343898840.
21	1967499.	25648017.	316124060.
22	1820162.	23680519.	290476044.
23	1683859.	21860357.	266795526.
24	1557746.	20176498.	244935170.
25	1441078.	18618752.	224758672.
26	1333143.	17177675.	206139920.
27	1233288.	15844527.	188962246.
28	1140907.	14611239.	173117720.
29	1055435.	13470332.	158506480.
30	976356.	12414896.	145036148.
31	903192.	11438540.	132621251.
32	835492.	10535349.	121182711.
33	772851.	9699856.	110647362.
34	714883.	8927006.	100947506.
35	661233.	8212123.	92020500.
36	611577.	7550890.	83808377.
37	565607.	6939312.	76257487.
38	523047.	6373706.	69318175.
39	483631.	5850659.	62944470.
40	447123.	5367028.	57093811.
41	413294.	4919905.	51726783.
42	381942.	4506611.	46806878.
43	352880.	4124668.	42300268.
44	325930.	3771788.	38175599.
45	300931.	3445858.	34403811.
46	277734.	3144927.	30957953.
47	256208.	2867194.	27813026.
48	236227.	2610986.	24945832.
49	217676.	2374759.	22334846.
50	200451.	2157083.	19960086.
51	184458.	1956633.	17803003.
52	169608.	1772174.	15846370.
53	155819.	1602566.	14074196.
54	143015.	1446747.	12471629.
55	131128.	1303733.	11024882.
56	120092.	1172605.	9721149.
57	109849.	1052513.	8548545.
58	100342.	942664.	7496032.
59	91559.	842322.	6553368.
60	83365.	750763.	5711046.
61	75776.	667398.	4960283.
62	68741.	591622.	4292886.
63	62224.	522880.	3701264.
64	56189.	460657.	3178384.
65	50581.	404467.	2717727.
66	45518.	353886.	2313260.
67	40842.	308368.	1959373.
68	36527.	267527.	1651005.
69	32552.	230999.	1383478.
70	28896.	198447.	1152479.
71	25540.	169551.	954032.
72	22467.	144010.	784482.
73	19661.	121543.	640471.
74	17107.	101882.	518928.
75	14792.	84775.	417046.
76	12702.	69983.	332271.
77	10826.	57280.	262288.
78	9151.	46454.	205008.
79	7666.	37303.	158554.
80	6359.	29637.	121251.
81	5219.	23278.	91614.
82	4233.	18060.	68336.
83	3390.	13827.	50276.
84	2678.	10436.	36450.
85	2085.	7758.	26013.
86	1597.	5674.	18255.
87	1202.	4077.	12582.
88	888.	2875.	8505.
89	643.	1987.	5630.
90	456.	1344.	3642.
91	316.	888.	2298.
92	214.	572.	1410.
93	141.	359.	837.
94	90.	218.	479.
95	56.	128.	260.
96	34.	71.	133.
97	20.	37.	61.
98	11.	18.	24.
99	6.	6.	6.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 8.00 PER CENT INTEREST RATE

X	CX	MX	RX
10	3757.	96502.	3126191.
11	3476.	92745.	3029689.
12	3216.	89269.	2936944.
13	2975.	86054.	2847675.
14	2752.	83079.	2761622.
15	2546.	80327.	2678543.
16	2355.	77781.	2598215.
17	2179.	75426.	2520434.
18	2016.	73248.	2445008.
19	1865.	71232.	2371760.
20	1725.	69367.	2300528.
21	1596.	67642.	2231161.
22	1476.	66046.	2163519.
23	1383.	64570.	2097473.
24	1279.	63187.	2032903.
25	1184.	61908.	1969716.
26	1109.	60724.	1907808.
27	1025.	59616.	1847084.
28	960.	58590.	1787468.
29	899.	57630.	1728878.
30	842.	56731.	1671249.
31	796.	55889.	1614518.
32	753.	55093.	1558629.
33	720.	54340.	1503536.
34	695.	53620.	1449196.
35	676.	52925.	1395576.
36	668.	52249.	1342652.
37	664.	51581.	1290403.
38	671.	50917.	1238822.
39	684.	50246.	1187905.
40	708.	49562.	1137660.
41	738.	48854.	1088098.
42	770.	48116.	1039244.
43	811.	47346.	991128.
44	857.	46535.	943782.
45	906.	45679.	897247.
46	953.	44773.	851568.
47	1003.	43820.	806796.
48	1053.	42817.	762976.
49	1101.	41765.	720159.
50	1145.	40664.	678394.
51	1187.	39519.	637731.
52	1226.	38333.	598212.
53	1262.	37107.	559879.
54	1293.	35845.	522772.
55	1323.	34552.	486927.
56	1348.	33229.	452375.
57	1369.	31882.	419146.
58	1351.	30512.	387265.
59	1412.	29162.	356752.
60	1414.	27750.	327591.
61	1421.	26336.	299841.
62	1425.	24914.	273505.
63	1425.	23489.	248591.
64	1446.	22063.	225103.
65	1316.	20617.	203039.
66	1304.	19301.	182422.
67	1289.	17997.	163121.
68	1269.	16707.	145125.
69	1245.	15438.	128418.
70	1216.	14193.	112980.
71	1181.	12978.	98786.
72	1142.	11796.	85809.
73	1097.	10655.	74012.
74	1048.	9557.	63358.
75	994.	8509.	53800.
76	935.	7515.	45291.
77	873.	6580.	37776.
78	807.	5707.	31196.
79	739.	4900.	25489.
80	669.	4160.	20590.
81	599.	3491.	16429.
82	529.	2892.	12939.
83	461.	2363.	10047.
84	395.	1902.	7684.
85	334.	1507.	5782.
86	277.	1173.	4275.
87	225.	897.	3102.
88	179.	672.	2206.
89	140.	493.	1534.
90	106.	353.	1042.
91	79.	247.	689.
92	57.	168.	442.
93	40.	111.	274.
94	27.	71.	163.
95	18.	44.	92.
96	12.	25.	49.
97	7.	14.	23.
98	4.	7.	9.
99	2.	2.	2.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 8.50 PER CENT INTEREST RATE

X	DX	NX	SX
10	4422854.	55437715.	677212528.
11	4072792.	51014861.	621774816.
12	3750437.	46942068.	570759952.
13	3453596.	43191631.	523817884.
14	3180250.	39738034.	480626252.
15	2928538.	36557785.	440888216.
16	2696749.	33629247.	404330432.
17	2483306.	30932497.	370701184.
18	2286756.	28449192.	339768688.
19	2105763.	26162435.	311319496.
20	1939095.	24056672.	285157060.
21	1785619.	22117577.	261100388.
22	1644290.	20331958.	238982812.
23	1514147.	18687668.	218650854.
24	1394290.	17173520.	199963186.
25	1283920.	15779231.	182789666.
26	1182287.	14495311.	167010436.
27	1088687.	13313024.	152515126.
28	1002497.	12224338.	139202102.
29	923120.	11221841.	126977764.
30	850019.	10298721.	115755923.
31	782699.	9448702.	105457202.
32	720694.	8666003.	96008500.
33	663588.	7945309.	87342497.
34	610986.	7281721.	79397188.
35	562530.	6670735.	72115467.
36	517888.	6108206.	65444732.
37	476753.	5590317.	59336526.
38	438847.	5113564.	53746209.
39	403907.	4674717.	48632644.
40	371696.	4270811.	43957927.
41	341991.	3899115.	39687116.
42	314591.	3557124.	35788001.
43	289314.	3242533.	32230877.
44	265988.	2953219.	28988344.
45	244454.	2687231.	26035125.
46	224571.	2442777.	23347894.
47	206211.	2218206.	20905117.
48	189253.	2011996.	18686911.
49	173587.	1822743.	16674915.
50	159114.	1649156.	14852172.
51	145745.	1490042.	13203016.
52	133394.	1344297.	11712974.
53	121984.	1210903.	10368677.
54	111444.	1088919.	9157773.
55	101711.	977475.	8068854.
56	92721.	875764.	7091379.
57	84422.	783043.	6215615.
58	76760.	698621.	5432572.
59	69719.	621861.	4733950.
60	63187.	552142.	4112090.
61	57170.	488956.	3559947.
62	51623.	431786.	3070991.
63	46514.	380163.	2639205.
64	41809.	333649.	2259043.
65	37463.	291840.	1925394.
66	33557.	254377.	1633554.
67	29971.	220820.	1379176.
68	26682.	190849.	1158356.
69	23668.	164167.	967508.
70	20913.	140499.	803341.
71	18399.	119585.	662842.
72	16111.	101186.	543257.
73	14034.	85075.	442071.
74	12155.	71042.	356995.
75	10461.	58887.	285954.
76	8942.	48426.	227067.
77	7586.	39484.	178641.
78	6383.	31898.	139157.
79	5322.	25515.	107259.
80	4394.	20193.	81744.
81	3590.	15798.	61551.
82	2898.	12209.	45753.
83	2311.	9310.	33544.
84	1817.	7000.	24234.
85	1408.	5183.	17234.
86	1073.	3775.	12051.
87	804.	2702.	8276.
88	591.	1898.	5574.
89	426.	1306.	3677.
90	301.	880.	2370.
91	207.	579.	1490.
92	140.	372.	911.
93	92.	232.	539.
94	58.	140.	307.
95	36.	82.	167.
96	22.	46.	85.
97	13.	24.	39.
98	7.	11.	15.
99	4.	4.	4.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 8.50 PER CENT INTEREST RATE

X	CX	MX	RX
10	3571.	79805.	2384016.
11	3288.	76235.	2304210.
12	3028.	72946.	2227976.
13	2788.	69918.	2155030.
14	2568.	67130.	2085111.
15	2365.	64562.	2017981.
16	2177.	62198.	1953419.
17	2005.	60021.	1891221.
18	1846.	58016.	1831200.
19	1700.	56169.	1773185.
20	1566.	54469.	1717015.
21	1442.	52904.	1662546.
22	1328.	51462.	1609642.
23	1238.	50135.	1558180.
24	1140.	48897.	1508046.
25	1050.	47757.	1459149.
26	979.	46707.	1411392.
27	901.	45729.	1364685.
28	840.	44828.	1318956.
29	783.	43988.	1274128.
30	729.	43205.	1230141.
31	687.	42476.	1186936.
32	647.	41789.	1144460.
33	615.	41142.	1102671.
34	591.	40527.	1061529.
35	572.	39935.	1021002.
36	563.	39363.	981067.
37	557.	38800.	941704.
38	561.	38243.	902904.
39	568.	37683.	864661.
40	586.	37114.	826978.
41	608.	36528.	789864.
42	631.	35920.	753336.
43	662.	35289.	717416.
44	696.	34628.	682127.
45	732.	33932.	647499.
46	767.	33199.	613568.
47	803.	32432.	580369.
48	839.	31629.	547937.
49	874.	30789.	516308.
50	904.	29916.	485519.
51	933.	29011.	455603.
52	959.	28078.	426592.
53	983.	27119.	398514.
54	1003.	26135.	371395.
55	1021.	25132.	345260.
56	1036.	24111.	320128.
57	1048.	23075.	296017.
58	1028.	22028.	272941.
59	1070.	20999.	250914.
60	1067.	19929.	229914.
61	1068.	18862.	209985.
62	1066.	17795.	191123.
63	1061.	16729.	173328.
64	1071.	15669.	156599.
65	970.	14597.	140930.
66	957.	13627.	126333.
67	942.	12670.	112706.
68	923.	11728.	100036.
69	901.	10805.	88307.
70	876.	9904.	77502.
71	847.	9029.	67598.
72	815.	8182.	58569.
73	780.	7367.	50387.
74	741.	6587.	43020.
75	700.	5846.	36433.
76	655.	5146.	30588.
77	609.	4491.	25441.
78	561.	3882.	20951.
79	511.	3321.	17069.
80	460.	2810.	13748.
81	410.	2350.	10937.
82	361.	1940.	8587.
83	313.	1579.	6647.
84	267.	1267.	5068.
85	224.	1000.	3802.
86	185.	775.	2802.
87	150.	590.	2027.
88	119.	441.	1436.
89	92.	322.	996.
90	70.	230.	674.
91	52.	160.	444.
92	37.	108.	284.
93	26.	71.	175.
94	18.	45.	104.
95	12.	28.	59.
96	7.	16.	31.
97	5.	9.	15.
98	3.	4.	6.
99	2.	2.	2.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT)
AT 9.00 PER CENT INTEREST RATE

X	DX	NX	SX
10	4224107.	50349455.	587574288.
11	3871933.	46125348.	537224832.
12	3549121.	42253415.	491099484.
13	3253222.	38704294.	448846068.
14	2981992.	35451073.	410141772.
15	2733376.	32469080.	374690700.
16	2505488.	29735704.	342221620.
17	2296599.	27230216.	312485916.
18	2105126.	24933617.	285255700.
19	1929617.	22828490.	260322082.
20	1768740.	20898874.	237493592.
21	1621275.	19130134.	216594718.
22	1486106.	17508859.	197464584.
23	1362205.	16022753.	179955724.
24	1248621.	14660548.	163932970.
25	1144508.	13411927.	149272422.
26	1049076.	12267419.	135860496.
27	961591.	11218343.	123593077.
28	881401.	10256753.	112374734.
29	807890.	9375352.	102117981.
30	740501.	8567462.	92742629.
31	678727.	7826960.	84175167.
32	622092.	7148234.	76348207.
33	570171.	6526142.	69199973.
34	522566.	5955971.	62673832.
35	478915.	5433405.	56717861.
36	438887.	4954489.	51284456.
37	402173.	4515603.	46329967.
38	368499.	4113429.	41814364.
39	337604.	3744930.	37700935.
40	309255.	3407327.	33956004.
41	283235.	3098071.	30548677.
42	259348.	2814836.	27450606.
43	237416.	2555489.	24635769.
44	217272.	2318073.	22080280.
45	198766.	2100801.	19762207.
46	181762.	1902035.	17661406.
47	166136.	1720273.	15759371.
48	151774.	1554138.	14039098.
49	138572.	1402364.	12484960.
50	126436.	1263791.	11082596.
51	115281.	1137355.	9818805.
52	105028.	1022074.	8681450.
53	95604.	917047.	7659375.
54	86943.	821443.	6742328.
55	78985.	734500.	5920885.
56	71674.	655515.	5186385.
57	64959.	583842.	4530870.
58	58793.	518883.	3947028.
59	53154.	460090.	3428145.
60	47953.	406935.	2968055.
61	43188.	358982.	2561120.
62	38819.	315794.	2202138.
63	34816.	276975.	1886344.
64	31151.	242158.	1609369.
65	27785.	211007.	1367211.
66	24774.	183222.	1156204.
67	22025.	158448.	972982.
68	19518.	136422.	814534.
69	17234.	116905.	678112.
70	15158.	99670.	561207.
71	13275.	84512.	461537.
72	11570.	71237.	377025.
73	10032.	59667.	305788.
74	8649.	49634.	246121.
75	7410.	40985.	196487.
76	6305.	33575.	155502.
77	5324.	27270.	121927.
78	4459.	21946.	94657.
79	3701.	17486.	72711.
80	3042.	13785.	55225.
81	2474.	10743.	41439.
82	1988.	8270.	30696.
83	1578.	6282.	22427.
84	1235.	4704.	16145.
85	952.	3469.	11441.
86	723.	2517.	7972.
87	539.	1794.	5455.
88	395.	1255.	3661.
89	283.	860.	2406.
90	199.	577.	1546.
91	137.	378.	968.
92	91.	242.	590.
93	60.	150.	348.
94	38.	91.	198.
95	23.	53.	107.
96	14.	29.	54.
97	8.	15.	25.
98	5.	7.	10.
99	2.	2.	2.

THE EGYPTIAN MONETARY FUNCTIONS(SUMS ASSURED;WITH PROFIT) AT 9.00 PER CENT INTEREST RATE

	X	CX	MX	RX
,	10	3395.	66812.	1834028.
,	11	3112.	63417.	1767217.
,	12	2852.	60305.	1703800.
,	13	2615.	57453.	1643495.
,	14	2396.	54838.	1586042.
,	15	2197.	52442.	1531204.
,	16	2014.	50245.	1478762.
,	17	1846.	48231.	1428517.
,	18	1692.	46386.	1380286.
,	19	1551.	44694.	1333900.
,	20	1422.	43143.	1289206.
,	21	1303.	41722.	1246063.
,	22	1194.	40419.	1204342.
,	23	1109.	39224.	1163923.
,	24	1016.	38116.	1124699.
,	25	931.	37100.	1086583.
,	26	864.	36168.	1049483.
,	27	792.	35304.	1013315.
,	28	735.	34512.	978011.
,	29	682.	33777.	943499.
,	30	632.	33095.	909722.
,	31	593.	32462.	876627.
,	32	556.	31870.	844165.
,	33	526.	31314.	812295.
,	34	503.	30788.	780981.
,	35	485.	30284.	750194.
,	36	475.	29799.	719909.
,	37	467.	29324.	690110.
,	38	469.	28857.	660786.
,	39	473.	28388.	631930.
,	40	485.	27915.	603542.
,	41	501.	27430.	575627.
,	42	518.	26929.	548197.
,	43	540.	26411.	521268.
,	44	566.	25870.	494858.
,	45	593.	25304.	468987.
,	46	618.	24711.	443683.
,	47	644.	24094.	418972.
,	48	670.	23449.	394878.
,	49	694.	22779.	371429.
,	50	715.	22085.	348649.
,	51	735.	21370.	326564.
,	52	752.	20635.	305195.
,	53	767.	19883.	284560.
,	54	779.	19116.	264677.
,	55	789.	18337.	245561.
,	56	797.	17547.	227224.
,	57	802.	16750.	209677.
,	58	784.	15948.	192927.
,	59	812.	15164.	176978.
,	60	806.	14352.	161814.
,	61	803.	13546.	147462.
,	62	798.	12743.	133916.
,	63	790.	11946.	121173.
,	64	795.	11155.	109228.
,	65	716.	10361.	98072.
,	66	703.	9645.	87711.
,	67	689.	8941.	78067.
,	68	672.	8252.	69126.
,	69	653.	7580.	60873.
,	70	632.	6927.	53293.
,	71	608.	6296.	46366.
,	72	583.	5687.	40070.
,	73	555.	5105.	34383.
,	74	525.	4550.	29278.
,	75	493.	4025.	24729.
,	76	460.	3531.	20704.
,	77	425.	3071.	17173.
,	78	390.	2646.	14101.
,	79	354.	2256.	11455.
,	80	317.	1903.	9199.
,	81	281.	1585.	7297.
,	82	246.	1304.	5712.
,	83	212.	1058.	4408.
,	84	181.	845.	3350.
,	85	151.	665.	2505.
,	86	124.	514.	1840.
,	87	100.	390.	1327.
,	88	79.	290.	937.
,	89	61.	211.	647.
,	90	46.	150.	437.
,	91	34.	104.	287.
,	92	24.	70.	183.
,	93	17.	46.	113.
,	94	11.	29.	67.
,	95	7.	18.	37.
,	96	5.	10.	20.
,	97	3.	6.	9.
,	98	2.	3.	4.
1023	99	1.	1.	1.

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