CHAPTER FIVE

LIFE INSURANCE

Introduction

Insurance can be classified from two angles: first from the risk (type of coverage) point of view and the second from the business point of view. The field of insurance, classified on the basis of type of coverage, is usually broken down in two areas: personal and property. Personal coverages are those relating directly to the individual. In personal coverage lines, the risk is the possibility that some peril interrupts the income that earned by individual. There are four such perils: death, poor health and sickness, unemployment and old age.

Property coverages are directed against perils that may destroy property. Property insurance is distinguished from personal insurance in that personal insurance covers perils that may prevent one from earning money with to accumulate property while property insurance is concerned with what is already accumulated.

Property insurance is used here in the broad sense to include fire, marine, liability, causality, and surety insurance. Sometimes property insurance is referred to as general insurance, while personal insurance is called life and health insurance. Possessions are damaged, destroyed, or lost as a result of perils specified in the policy. A peril may be natural or the consequences of human actions. Natural perils include fires, tornadoes, and hail. Perils caused by the actions of human are car accidents, burglary, and power may be written on all risks basis.

From business point of view, insurance can be classified in to three categories: life insurance, general insurance and social insurance.

5.1. Life insurance

Life insurance is one of the most common form of insurance. It has gained greater acceptance all over the world. Following the liberalization of the economy of the country in 1993, private insurance companies has emerged in Ethiopia. This has encouraged and motivated the society to use life insurance policies.

The main purpose of life insurance is financial protection of the dependents of the insured and savings for an old age, to cover personal loan and tuition fees for education expense.

Life insurance is a contract whereby the insurer for certain sum of money or premium proportionate to the age, profession, health, and other circumstances of the person whose life is insured engage that if such person dies within the period specified in the policy the insurer will pay the amount specified by the policy according to the term there of to the person in whose favor the policy was entered to.

The main purpose of life insurance is financial protection to the dependents of the insured upon the premature death of the insured. The sum assured is, and then upon the death of the insured will be paid to the beneficiaries. The financial compensation will provide security for a certain period of time. The insured may also purchase life insurance policy with such objectives as setting personal loans and other debts. If the insured dies before settling his debts, the insurer will settle the debt outstanding to the creditors, hence protecting the family from financial loss.

Life insurances are generally engaged in the provision of both protection and saving. The protection is against financial loss difficulty and is acquired for a consideration called premium, which is the price that keeps the policy in force. The protection given by the insurer is death benefits to the beneficiary of the insured, or in the case of survival of the insured, other financial benefits in accordance with the policy contract.

5.1.1. Essential features of life insurance

Commercial Code of Ethiopia defines life insurance as "a contract by which the insurer, for a certain sum of money or premium proportioned to the age, health, profession, and other circumstances of the person whose life is insured engages that, if such person shall die within the period limited in the policy, the insurer will pay according to the terms specified thereof, to the person in whose favor such policies are granted."

From this definition we can consider the following important features of life insurance.

1. Life insurance, like other insurances, is a contract between the insurer the insured whose life is insured or someone who has an insurable interest.
2. Its purpose is financial protection of the dependents of the insured with financial compensation amounting the sum assured if the insured die while the policy is in force. Of course, life insurance may also be engaged in encouraging savings to accumulate an educational fund that could be used to pay tuition fees for children when they join higher education, and to settle an outstanding balance of a debt.

3. The insurer charges premium based on age, sex, health condition, occupation and other criteria.
4. Life insurance policy gives protection against special types of risks i.e., death whose occurrence is certain. The uncertainty is related to the causes and time of death.
5. The benefit, financial compensation upon death is determined in advance based on the decision made by the insured and reasonableness of the premium.
6. The insured and policy owner may be different. For example, an individual may insure the life of another person, if he/she has a financial interest.
7. Life insurance is not strictly a contract of indemnity. Because life is priceless. For this reason, if the insured buys more than one policy all of the insurance companies will indemnify fully.
8. The probability of claim for compensation increases with the passage of time due to insured's deteriorating health conditions as they grow old.

5.1.2. Basic types of life insurance policies

A. Whole life insurance policies

In this kind of life insurance, the sum assured is payable on the death of the life assured whenever it occurs. Premiums are payable either throughout the life of the assured or can cease at a certain age, often 80 or 85.

This policy provides protection to the dependents of the insured upon the event of his/her death. I.e. the sum assured is payable only upon the death of the insured. One option is that the insured pays annual premiums as long as he lives. The second option is that premium payments are made for a specified number of years or up to a certain age limit, normally up to the age of retirement.

Premium payments after retirement are discontinued because of a decline in the income of the insured. The policy provides permanent protection to the insured’s dependents in the case of death. Besides this protection, whole life insurance allows for the accumulation of savings over the life of the insured. In essence, the policy encourages saving.

Whole life policy acquires cash value after two or three years of premium payment. When a person no longer wants his policy, or for some reason cannot continue the premiums, he can ask for the surrender value. He ca\eases payment and receives not a proportion of the sum assured, but a proportion of the premiums already paid. Not all policies allow a surrender value

and surrender within the first few years of any policy will not normally produce an amount for the policyholder. This is because surrender value is calculated using the premiums paid, less expenses incurred in issuing and renewing the policy, and less the cost of the life assurance cover provided during the years it was in force. In view of the level premium system, any surrender value in the early years will be low, if any accrues at all.

The practice of life assurance is always changing to keep pace with the demands of modern living. Many of these changes have involved life assurance companies in issuing policies, which are combinations of different types of contracts. In some of these cases it may well be possible for the surrender value to exceed the premium paid.

The cash value gradually grows to equal the sum assured upon maturity or at the time the insured attains age 100. If the assured, for some reasons, discontinues premium payments after the policy accumulates cash value, then the cash value can be used to keep the policy in force under the automatic premium loan provision. Moreover, the assured can apply for loans when the policy acquires cash value. In some cases, an alternative to the surrender value is the paid-up policy. The premiums cease and the policy continues but on maturity a smaller sum than would originally have been paid will be due to the policyholder. Depending on the policy and the company concerned, these paid-up policies may not continue to participate in profits.
In general, whole life insurance has two salient features:

I. **Protection** – It protects the insured in the case of premature death. If the insured died prematurely the face amount is paid to the beneficiary.
II. **Saving-** premium will accumulate with interest till the date of maturity of the policy (age 100) the face value of the policy will be paid to the beneficiary.

Depending up on the manner of premium payments, whole life insurance contracts are classified as straight life, limited pay and single pay policies.

i. **Straight life insurance:** it is also called ordinary life insurance. Under this policy, premiums are to be paid at regular interval until the death of the insured or until the achievement of specified age limit, say 100 years. Such policy gives permanent protection at lower cost.
ii. **Limited pay life insurance:** under this insurance scheme, premiums are paid for a definite period of time, which is determined in advance. That is for 10,15,20,25, and 30

years or up to age 85. After the expiration of the specified, the policy is said to be paid-up, which means that no more premiums are to be paid to keep the policy in force until the time of death the insured at which time compensation amounting the face value of the initial policy is to be made to the insured's beneficiary. This policy is desirable when one intends to stop payment of premiums after reaching a given age level, usually upon retirement, but wants to continue with the insurance protection till the end of his life. Since premiums are to be paid for a limited period, they are usually higher than those under straight life policy. Similarly, the cash values under the limited whole life insurance are higher than the straight-line policy.

iii. **Single payment life insurance:** here, premium payment is made in one lump sum at the time of purchase of the whole life insurance. In most cases, insurance buyers don't prefer this type of arrangements.

B. Term life insurance policies

This insurance scheme provides compensation to the beneficiary of the insured dies within the stated period mentioned in the policy. If the insured survives beyond the specified time limit in the policy, the policy will expire and there will be no payment made by the insurer. Term life policy gives temporary protection and there is no saving element involved. Since the policy is taken for a specified period to deal with premature death, the cost of this policy is relatively low. It is a form of temporary life insurance.

This is the simplest and oldest form of assurance and provides for payment of assured on death, provided death occurs within the specified term. Should the life have assured survives to the end of the term then the cover ceases and no money is payable. Depending on the age of the life assured, this is very cheap form of cover and would be suitable. For example, in the case of young married man with medium to low income, who wants to provide a reasonable sum for his wife in the event of his death.

Term policy does not provide the insured with loans, cash surrender or non-forfeiture options. Insurance coverage terminates at the end of the period unless it provides an option for conversion in to other insurance schemes.

Term life policy can be single or level premium policy. Single premium policy requires the insured to pay premiums at the time the policy is purchased at lump sum while level premium requires the payment of equal amount of premiums at definite intervals. Most of the term policies are level premium.

More appropriately, term contracts can be classified as level term, renewable term or decreasing term.
The policy provides only temporary protection and has no saving element. Another important feature of this policy is that since it is taken for a specified period to deal with premature death, the cost/premium payment is relatively low.

Term policy is issued for short term ranging from few months to a specified number of years such as 10 years, 15 years, 20 years etc.

This insurance also often used when maximum coverage is desired at a minimum premium payment. The following are the different types of term insurance policies.

i) Level Term Policy

This policy provides a constant sum assured (amount of money payable in the event of death) throughout the term of the policy. For example, under a 20-year term policy of Br. 50, 000, the amount of payment/compensation to the insured's beneficiaries will be Birr 50,000 if the insured dies at any time during the term of the policy.

ii) Decreasing (or Diminishing) Term Policy

In this policy, the amount of claims to be paid to the insured decreases periodically. These policies are usually issued to borrowers of money and the amount of the policy payable at the end of each year is automatically reduced and is equal to the outstanding loan which will be paid if the insured dies before the end of the term. This is also known as "***Mortgage – Redemption Policy***."

This type of policies provides financial protection to the policy holder (creditors) and the dependents of the debtor who are supposed to cover the debt otherwise. Premiums for such type of policies are paid at the beginning of the policy.

The following are types of decreasing term policies.

A. Mortgage Protection Insurance

Mortgage protection insurance is issued in connection with real estate loans made by banks. It gives financial protection to the creditor and the dependents of the debtor of the outstanding

mortgage loans in the event of accidental death of the debtor. Since a mortgage loan is paid on an installment basis, the outstanding loan decreases over time. As a result the sum assured decreases and finally becomes zero. This is why it is called decreasing term insurance.

B. Credit Life Insurance

Credit life insurance is issued to give protection to a lender/borrower's dependent of the unpaid balance of a credit transaction if the borrower dies before setting the unpaid balance of his debt.

C. Credit Cooperative Insurance

This policy is issued to protect savings and credit associations from facing a financial loss on the loans they provide to their members, due to death before setting his/her debt.

iii) Renewal (Renewable) Term Policy

This is a term policy that can be renewed after the expiry of the term without medical examination but at a different rate of premium applicable to the age level reached at the time of renewal. For instance, a one-year term policies require renewal every year. Similarly, a 10-year term policy may be renewed upon its maturity.

iv) Convertible Term Policy

Under the convertible term policy an option is available to the insured to convert it into whole life or endowment life policy without going in for new medical examination. However, the premium may be adjusted either at the attained age at the time of conversion of the term policy or using the initial term policy issued.

To make the conversation process simple, the following requirements are to be met upon conversation:

1. There will not an increase or decrease in the sum assured.
2. conversion will have to be made within a specified period, usually before the maturity date of the term policy.

v) Non-Convertible Term Policy

Under the non-convertible term policy an option is not available to the assured to convert into other forms of life insurance contracts. The policy expires upon maturity. However, it gives the policyholder the option to renew it upon expiration.

vi) Increasing Term Contract

Under this policy the sum assured can be arranged each year to correspond to a need of the insured that increases periodically.

On the basis of mode of premium payment, term insurance policies can also be classified as:

a) **Level Premium Policy or Regular premium policy** - The level-premium policy requires the payment of premium regularly in equal installments at a fixed interval throughout the policy period such as monthly, quarterly or yearly.
b) **Limited Premium Policy** – The payment of premium is limited to a period of attaining certain age of the assured, say retirement age.
c) **Single Premium Policy** – Single premium policy requires the payment of all the premium only once in a lump sum at the time the policy is issued.

C. Endowment insurance policies

Endowment policy is issued for a fixed period (endowment period) and premium is payable during that period only. This policy provides protection of the beneficiary of the insured if he/she dies within the endowment period. In addition, it provides for the payment of the face value of the policy to the insured if he/she is living at the end of the policy period.

This policy is known as a modified form of whole life insurance policy. The period of this policy is shorter than that of whole life insurance and hence the premiums are higher for the same age level. In general, the shorter the endowment period, the higher the premium will be.

One important advantage of this policy over that of term policy is that the insured can terminate the contract at any time and can collect the cash value in a lump sum which normally becomes positive after two or more years. The policy, therefore, has dual purpose: financial protection and accumulation of funds for possible contingencies in the future. Unlike the term insurance whose purpose is only protecting the insured's dependents upon the death of the insured, endowment policy helps insureds to save money for some other purposes.

Another advantage of endowment policy is that it provides the assured with loan facility after the policy acquires cash value.

The following are the different types of endowment policies.

a- Ordinary Endowment Policy

This policy will mature for payment on the survival of the assured on the date of maturity or on the date of his death within the endowment period. This means payment to the insured or his dependents is certain whether or not he dies before the policy matures or survives the endowment period.

b- Pure Endowment Policy

The pure endowment policy will mature only if the insured person survives the endowment period. In other words, the sum assured is payable only if the insured survive beyond the endowment period. In this case, payment to the insured is uncertain. The objective of this policy is to benefit the insured himself rather than his dependents. As a result, it is considered as more of an investment than protection.

c- Cash Surrender Value

Many types of life insurance coverage can be analyzed as consisting of two parts: term insurance and an investment. Normally, this type of contract provides a benefit payable under any set of circumstances, with a larger benefit payable if the insured dies. For example, whole life and endowment life insurance policies provide a set of circumstances, with a larger benefit payable if the insured dies. For example, whole life and endowment life insurance policies provide a stated benefit when the insured person dies, with a smaller benefit if the insured person is living when the benefit is paid.

This smaller benefit, called the cash surrender value. Cash surrender value is the amount the holder of the policy can elect to receive by surrendering the contract to the insurer while the insured person is alive.

Whole life and endowment policies acquire cash value after two or three years of premium payment. The cash value can be used to keep the policy in force under the automatic premium loan provision, if the insured discontinues premium payment. The policyholder can also apply for loans when the policy acquires cash value.

D. Supplementary Insurance Policies

Supplementary policies as their name suggests are issued only in conjunction with the main life insurance policies i.e., term, whole life or endowment for additional premium for each contract. Supplementary policies also known as RIDERS. The supplementary contracts include:

- ★ Supplementary Accident Insurance
- ★ Total and Permanent disability benefit
- ★ Supplementary group accident insurance.

- ★ **Supplementary Accident Insurance:** The amount of cover under this contract is equal to the sum assured under the related main policy. Supplementary accident insurance gives cover against bodily injury effected through external violent and accidental means of which there is evidence of visible contusion or wound on the exterior of the insured's body. After the presentation of proof of bodily injury as specified in the policy, the person will be indemnified in the policy, the person will be indemnified according to different schedule of benefits.

- ★ **Total and Permanent Disability Benefit:** This is also a supplementary contract attached to the main life insurance policy. It is defined here as disability resulting from bodily injury or disease that totally prevents the insured from performing any business or occupation uninterruptedly for a period of at least six months.

- ★ **Group Insurance:** life insurance policies are issued on a group basis. Some of these are:

1) Modified large group life insurance

This policy can be issued to cover natural or accidental death only and compensation is made to the beneficiary only upon the occurrence of death of the member of the group. This policy is a new type of group life policy and issued at least for 200 individuals.

2) Group ordinary life insurance

This is a policy where a number of individuals are insured under a single policy. Basically, it is a whole life insurance issued on a group basis. The member of the group are not required to

present evidence of insurability unless the person is above 40 years. The policy holder in this scheme is an employer, a union, a professional association and the like.

The policy can be issued for all employees of the organization as a single group or for different classes of members (management, factory workers etc). The employer decides on behalf of the members of the group. It is also the employer who bears the Insurance premium (non-contributory). In some cases, contributions are made by employees (contributory scheme).

3) Group regularly, yearly renewable term life insurance.

This policy which is issued on a group basis covers risk of death. The policy expires unless it is renewed every year at the appropriate time. The premium is adjusted for the attained age level when it is renewed every year.

5.1.3. Provisions of Life Insurance

The policy conditions and provisions in life insurance that must be agreed by all parties of the contract include the following:

1. Contract documents: The life insurance contract requires documents such as the proposal form, the policy term, the medical report and any other supplementary contracts.
2. General information: The general information relates to the granting of insurance which is based on the following factors for selection of lives:
   - The build: it relates to the present condition of health and physical build, such as height, weight and other measurements of the life to be insured.
   - Physical condition: the medical examiner's report will reveal the physical condition of the life to be insured.
   - Personal history: relates to the records of illness suffered, accidents met with, surgical operations undergone, etc by the life to be insured.
   - Habits and temperaments
   - Moral hazards
   - Hobbies or avocations
   - Family history
   - Occupational hazard
   - Age, sex
   - Residence and the like

These are the factors used to assess the insurability of individual or group lives.

3. Payment of Premium: one of the responsibilities of an insured is to pay the premium agreed at the time of the contract. Payment can be made in different arrangement such as annually, semi-annually, quarterly or monthly. In an annual premium payment arrangement, the insured is expected to pay in advance. However, the insured have the following privileges:

   - Grace Period: the insured will usually receive a notice of reminder for the payment of premium on the due date for the payment of yearly, semi-annually or quarterly premium not for the monthly payment premium. Usually 30-day grace period is given to the insured. If death occurs within the grace period, the total sum assured less the outstanding premium will be payable to the beneficiary.
   - Non-forfeiture Options: as explained earlier, the cash surrender value of a life insurance contract (whole life and endowment) is the amount the policy owner could receive if the policy is surrendered to the insured prior to the insured's death. If the policy owners discontinue payment of premiums, he/she can use the cash value to keep the policy in force under the automatic premium loan provision. The insurer will allow the policy to continue automatically with the payment of premium out of the net surrender value.
   - Loan Provision: It permits the policy owner to borrow against the policy's cash surrender value. Methods for determining the upper limit on the borrowed amount vary among policies.

4. Policy Conversations: A policy change clause permits the insured to convert the policy, without demonstrating evidence of insurability, to some other form requiring a higher premium.

5. Restrictions: A life policy is subject to the following restrictions:
   - Occupation – all policies are free from all restrictions as to travel, residence and occupation except where a proposer has at the time of proposal an intention to take up a hazardous occupation or the propose is a student. In all such cases, policies will be issued subject to a suitable endorsement and, if necessary, extra premium will be charged to cover any additional risk, if any.
   - Suicide – if the insured commits suicide within one year of taking insurance, noting is payable to the beneficiary. In the absence of a suicide clause, adverse selection could occur when a person contemplating suicide takes out a large amount of coverage shortly

before committing suicide. The suicide clause makes this type of adverse selection unlikely.

- ★ Proof of Age – as the premium is charged on the basis of age of the proposer, proof of age by any one of the prescribed certificates should be submitted along with the proposal invariably where the age of the life insurance at entry is found to be lower than the age given in the proposal form, the premium shall be payable at the correct age and the excess premium already collected will be refunded. On the other hand, if it is higher than the age given in the proposal form, the difference between the premium for the correct age and the original premium already paid will be collected within a certain interest rate.

5.1.4. Life Insurance Premium Calculations

The determination of a price for insurance is a complex activity and involves the incorporation of a mathematical analysis into competitive business decision processes. This price is known as premium, which may be paid annually, semi-annually, quarterly or monthly.

Life insurance premium are influenced by the following major determinants:

1. Expected mortality rates in the insured population. The morality table can be prepared from the census records or from the records of the first class insurance companies.
2. Investment income earned by the insurer on invested premium Income-Interest factor. Life insurance is a long term contact and premium so received is invested in securities or deposited in a bank yielding interest. Such income may help reduce the cost of insurance. So interest-earning is also a factor for calculating the premium rate.
3. Expenses incurred in operating an insurance enterprise and in providing insurance – related services. The expense includes policy expenses, commission to agents, cost of preparing policy, administrative and local charges loaded, and other service charges.
4. Other factors required to determine premium rate include: age and sex of the insured, period of the insurance policy, and sum assured.

We will illustrate using a hypothetical example how these determinants are incorporated into rates for life insurance coverage. But first let us discuss the following terms.

1. **Net Premium:** the net premium is a rate determined based on the mortality and interest rates only. No consideration is given for expenses incurred and the future contingencies. The net premium is an amount of money collected by the insured to meet only death claims.
2. **Gross Premium:** gross premium includes all the insured's costs of running the business known as ***loading***. These costs include operating expenses, commissions, advertisement expenses, etc. So if these expenses and the expected profit to policy issuer are added to net premium, it becomes gross premium, also known as "the office premium." It is a premium the policy holder actually pays to the insurer to keep the policy in force.

   Gross Premium = Net premium + Loading

   Loading of the premium refers to the process of adding expenses to the net premium. In the next section of this unit, we will illustrate how to determine premium for the life insurance using a hypothetical exercise.

Illustration 1: You are given the following information

1. According to the 1995 Ethiopian Central Statistical office of mortality table, out of an initial population size of 1,500,000 male people of Bahir Dar city, 100,000 live at the age of 40.
2. The number of people expected to die at age 40 is 500. This means that the probability of death at age 40 will be 500/100,000 = 0.005 or 0.5%
3. Assume that Ethiopian Insurance Corporation issued a one-year term insurance to all these male individuals aged 40 for death benefit of Birr. 10,000 each.
4. Death claim is to be paid at the end of the term and premium is collected at the beginning of the policy.
5. Interest rate is 3%.
6. Each insured is assumed to bring the same level of risk to the group.

Required: Based on the information given, how much premium the insurer should charge each insured? (Net single premium)

Solution:

Expected Death Benefit (Amount) = (No of insured expected to die) x (the sum assured death benefit/insured)

= 500 x 10,000

= Birr 5,000,000.00

This is an amount expected to be paid by EIC at the end of the one-year term. The question here is how much money EIC need to collect from premium payments to satisfy this death claim? The answer is the present value of the future death claims, because money has a time value. This is given by the following formula.

Present Value (Pv) = Amount (A) X $(1 + r)^{-n}$

Pv = = $A(1 + r)^{-n}$

Where Pv = Present Value

A = Amount (Future Value)

r = interest rate per period

n = number of periods

Given:

r = 0.03 = 3%

A = 5,000,000

n = 1 Year

Pv of claims = 50,000,000 $(1.03)^{-1}$

= Br. 4,854,368.93

This is the total net premium that EIC is going to collect from the insureds at the beginning of the policy. The net single premium (NSP) can be calculated by dividing the present value of premium collected by the number of insured at the age of 40.

$$NSP = \frac{\text{PV of the expected total claim}}{\text{No. of policy holders (Insured)}}$$

$$= \frac{4{,}854{,}368.932}{100{,}000}$$

= 48.54

The amount that EIC will collect from each insured can Br. 48.54 and total of Br. 48,543,689.32 at the beginning of the term which will grow to Br. 5,000,000 in one year at 3% interest rate. The 48.544 Birr does not include the leading. The insurer may charge a fixed sum of money or certain percentage of the net premium. For example, if the insurer charges each insured 20% of the net premium as an additional cost, the gross premium will be Birr 48.544 + 0.2 (485.44) = 58.253 Br.

Illustration 2: Based on the above information and the following mortality table answer the questions that follow:

Year	Age	No. of living	Number of dying
1	40	100,000	500
2	41	99,500	750
3	42	98,750	1,250
4	43	97,500	1,500
5	44	96,000	---

Assume that the 100,000 population has purchase a 4 year term insurance at the age of 40 for a sum assured equal to Br. 10,000.

Required: Determine

A) The net single premium (NSP) of Term Insurance
B) The net level premium (NLP) of Term Insurance
C) The net level premium of pure and ordinary endowment
D) The total gross premium, if 40% of the gross premium is the cost of running the business (loaded amount).

Solution:

A) Fist we can calculate the probability of dying and the expected death claims in each of the years during the term of the policy as follows:

No	Age	No. of Dying (1)	Probability of dying	Amount of Policy (2)	Expected Death claim (1x2)
1	40	500	0.005*	10,000	5,000,000
2	41	750	0.0075	10,000	7,500,000
3	42	1250	0.0125	10,000	12,500,000
	Total Expected Claims				40,000,000

Prob. Of dying = $\frac{\text{No. of dying}}{\text{No. of living at the age of 40}} = \frac{500}{100,000} = 0.005$

As it is discussed above, the insurer will not collect Birr. 40,000,000 from the insureds. Rather it will collect the present value of the total claims. The calculation is shown as follows:

Age	Expected Death Claims **(a)**	Present Value* Factor at 3% **(b)**	Present Value of Claims C = **(a x b)**	Annual net Premium**
40	5,000,000	0.9709	4,854,500	48.55
41	7,500,000	0.9426	7,069,500	70.70
42	12,500,000	0.9151	11,438,750	114.39
43	15,000,000	0.8885	13,327,305.72	133.27
Total	**40,000,000**		**36,690,055.7**	**366.91**

Note: *Present Value of 1 Birr $= \frac{1}{(1+r)^n} = \frac{1}{(1.03)^n} = (1.03)^{-n}$

So when n = 1, the present value of 1 Birr is $(1.03)^{-1} = 0.9709$ and when n = 2, the present value is 0.9426 and so on as shown in the table above in column b.

** Annual premium is calculated by dividing the present value by the number of insured (i.e., 100,000). For example, 4,854,500/100,000 = 48.55. When we add the annual premium per insured of the four years, we can find the total net single premium, which is equal to Br. 366.91

(48.54 + 70.70 + 144.39 + 133.27) or we can divide the total present value by the number of insured at the begging of the policy period, which gives:

$$NSP = \frac{36{,}690{,}055.7}{100{,}000}$$

$$= \underline{\underline{366.90}}$$

It is also possible to use actuarial formula to calculate the net single premium. The following variables are used in the calculation of the NSP.

t = time in years

x = Age at a time of insurance purchase

L_x = number of people living during age x

d_x = number of people dying during age x

P_x = probability of dying during age x

1 – Px = probability that an individual survive at age x

S = sum assured

r = interest rate

$$NSP = S\left(\frac{\frac{d_x}{l_x}}{(1+r)^1}\right) + S\left(\frac{\frac{d_x+1}{l_x}}{(1+r)^2}\right) + ... + S\left(\frac{\frac{d_x+t}{L_X}}{(1+r)^t}\right)$$

Using this formula NSP of the above exercise is computed as follows:

$$NSP = 10{,}000\left(\frac{500/100{,}000}{(1.03)^1}\right) + 10{,}000\left(\frac{\frac{750}{100{,}000}}{(1.03)^2}\right) + 10{,}000\left(\frac{\frac{1250}{100{,}000}}{(1.03)^3}\right) + 10{,}000\left(\frac{\frac{15000}{100{,}000}}{(1.03)^4}\right)$$

$$= 48.54 + 70.70 + 144.39 + 133.27$$

$$= 366.90$$

B) **Determine the net level premium (NLP).** Net level premium is an equal annual premiums paid by the insured. Some life insurance policies may allow the insured to pay annual premiums of equal size. In this case, all the policy holders may not pay all the annual level premium. Because some of them are expected to die before the end of the policy period.

Another point here is that the insurer will collect limited amount of premiums to invest at the beginning of the policy. As a result, the annual net level premium paid by the insured under this arrangement is greater than the single premium paid at the beginning of the policy.

The NLP is calculated as follows:

1. Assume each insured pays constant premium of Br. 1 throughout the term of the policy.
2. Determine present value of Birr 1 collected from each insured.
3. Divide the total present value of Birr 1 by the number of insureds to arrive at the present value of Birr 1 premium payment per insured.
4. Divide the net single premium (NSP) by the present value of Birr 1 premium payment per insured. This gives you the net level premium. The following tables shows the calculations.

Year	**Age**	**No of insureds Paying premium**	**Birr 1. Premium collected form each insured**	**PV of Birr 1 to be collected at the beginning of the year**	**PV of Br. 1 Premium**
1	40	100,000	100,000	1	100,000
2	41	99,500	99,500	0.9709	96,604.55
3	42	98,750	98,750	0.9426	93,081.35
4	43	97,500	97,500	0.9151	89,226.31
Total					**378,912.21**

PV of 1 Br. Premium = 378,292.21

Payment Per insured 100,000

= **3.789 Br**

Therefore,

$$\text{NLP} = \frac{\text{NSP}}{\text{PV of Br. 1 premium per insured}}$$

$$= \frac{366.91}{3.789}$$

$$= \underline{\underline{96.84 \text{ Br.}}}$$

Therefore each insured is expected to pay Br. 96.84 every year for four years in order to get coverage of Br. 10,000 in the event of death.

Actuarial formula can be used to find the present value of Birr. 1 premium payment. The formula is given as follows:

PV of Br. 1 Premium Payment = $\sum p_L \, . \, P_v$ factor

Calculation

Actuarial formula can be used to find the present value of Birr 1 premium payment. The formula is given as follows:

PV of Birr 1 premium payment = $\sum P_L = P_V$ factor

where P_L = Probability of living

P_V factor = present value factor

$$= \left(\frac{(L_x / L_x)}{(1+r)^0}\right) + \left(\frac{(L_{x+1} / L_x)}{(1+r)^1}\right) + \ldots + \left(\frac{(L_x + t - 1 / L_x)}{(1+r)^{t-1}}\right)$$

Accordingly, the PV of Birr 1 annual premium payment for four periods become:

$$\text{PV of Birr 1 premium payment} = \left(\frac{100{,}000}{100{,}000}\right)(1) + \left(\frac{99{,}500}{100{,}000}\right)(0.9709) +$$

$$\left(\frac{98{,}750}{100{,}000}\right)(0.9426) + \left(\frac{97500}{100{,}000}\right)(0.9151)$$

= 1 + 0.966 + 0.9308 + 0.8922

= Birr $\underline{\underline{3.789}}$

Note: The total present value of premiums collected from the insureds will be the same whether net single premium or net level premium is charged.

C) Pure Endowment

The NSP and NLP for pure and ordinary endowment using the information given above can be calculated as follows.

Pure Endowment Policy

Under the pure endowment policy, the insurer expects to pay the face value of the policy, Br. 10,000, if the insured survives the policy period. Accordingly, it would be necessary to determine the probability of survival for the insured.

$$\text{Survival rate} = \frac{\text{Number of persons living at age 43 (end of the policy)}}{\text{Number of persons living at age 40 (beginning of policy period)}}$$

Out of the 100,000 people insured at the age of 40, 96,000 of them are expected to survive at the end of the policy period. Then, the probability of survival becomes:

$$\frac{96{,}000}{100{,}000} = 0.96 \text{ or } 96\%$$

The NSP for pure endowment is calculated as:

NSP = Sum assured x probability of survival x present value factor

NSP $= 10{,}000 \times 0.96 \times (1.03)^{-4}$

$= 10{,}000 \times 0.96 \times 0.8885$

= Br. 8529.48

NLP for pure endowment calculated in a similar fashion as of NLP for term insurance. It

$$\text{Net Level Premium} = \frac{\text{Net single premium}}{\text{Present value of Birr 1 premium per insured}}$$

$$= \frac{8529.48}{3.789}$$

= 2251.12

Ordinary Endowment Policy

Under this policy, the determination of the NSP should reflect the probability of death of the insured within the policy period and its survival to the end of the policy period. This is because payment to the insured is certain whether or not the insured dies before the policy matures or survives the policy period. As a result, the net single premium of an ordinary endowment policy and the USP of the term policy for the same period.

Therefore, NSP for the above illustration is calculated as:

NSP = NSP for term + NSP for pure endowment

= 366.69 + 8529.48

= 8,896.17

D) If loading = 40% gross premium, then

Net premium = 60% of gross premium

$$\text{Gross premium} = \frac{\text{Net premium}}{60\%}$$

i) Gross Single Premium of term $= \frac{NSP}{0.6}$

$= \frac{366.69}{0.6}$

= 611.15 Birr

Br. 611.15 is an actual amount that the insured should pay to the insurer at the beginning of the policy.

ii) Gross Level Premium of term $= \frac{NLP}{60\%}$

$= \frac{96.84}{0.6}$

= 161.4 Br

Exercise

The following table shows mortality rate and group size of MASSO Life Insurance Company.

Year	Age	Number of Insureds paying premium	Number of Insurds expected to die
1	20	150,000	500
2	21	?	700
3	22	?	300
4	23	?	400

Additional Information

Masso Insurance Company used to collect premium at the beginning of the year and pay death claim or benefits at the end of the year. Face value of the policy to this group is Br. 5,000. The prevailing interest rate is 10%.

Required: Determine

1) The probability of dying at the end of each year and number of insureds expected to pay premium
2) NSP of term insurance
3) NLP of term insurance
4) The gross single premium of loading is 20% of NSP.
5) NSP and NLP of pure endowment.

Solution

Probability dying at the end of each year.

Year	Age	No. of Insureds Expected to pay premium	No of Dying	Prob. of death**
1	20	150,000	500	0.0033
2	21	149,500	700	0.0047
3	22	148,800	300	0.002
4	23	148,500	400	0.0027
5	-	148,100		

$$** \ \frac{\text{Number of dying}}{\text{No. of living at the begining of the policy}}$$

2. You can also use the actuarial formula to calculate NSP of term.

$$\begin{aligned} NSP &= 5000\ (0.0033)\ (1.1)^{-1} + 5000\ (0.047)\ (1.1)^{-2} + 500\ (0.002)\ (1.1)^{-3} + \\ &\quad 5000\ (0.0027)\ (1.1)^{-4} \\ &= 15 + 19.42 + 7.51 + 9.22 \\ &= \underline{51.15} \end{aligned}$$

3. NLP =?

We can also use the actuarial formula to find the NLP of the above problem.

$$\text{PV of Birr 1 premium per insured} = \left(\frac{000}{000}\right)(1.1)^{0} + \left(\frac{149{,}500}{150{,}000}\right)(1.1)^{-1} + \left(\frac{148{,}800}{150{,}000}\right)(1.1)^{-2} + \left(\frac{148{,}100}{150{,}000}\right)(1.1)^{-3}$$

$$= 1 + 0.906 + 0.819 + 0.742$$

$$= \underline{3.467 \text{ Birr}}$$

$$NLP = \frac{NSP}{\text{PV of birr 1 premium payment}}$$

$= \frac{51.15}{3.467} = \underline{\underline{14.75}}$ Birr

4. Gross Single Premium = NSP + 20% of NSP

= 51.15 + 0.2(51.15)

= $\underline{\underline{61.38}}$ Birr

5. Pure and ordinary endowment

NSP of pure endowment = Sum assured x Probability of survival x PV factor

$= 5000 \times \frac{148,100}{150,000} \times (1.10)^{-4}$

= 5000 x 0.98733 x 0.683

= $\underline{\underline{3,371.81 \text{ Br}}}$

NLP of pure endowment $= \frac{NSP}{\text{PV of birr 1 premium per insured}}$

$= \frac{3371.81}{3.467}$

= $\underline{\underline{972.54 \text{ Br}}}$

NSP of ordinary endowment = NSP for term + NSP for pure endowment

= 51.15 + 3371.81

= $\underline{\underline{3422.96 \text{ Br}}}$

Personal accident insurance

This type of cover is devised to compensate the insured that is temporarily or totally disabled from engaging in his usual occupation due to sickness. Personal accident and sickness policies are renewable annually and, if a claim has occurred, which could be of a recurring nature, the cover may be restricted at renewal or in server cases renewal may not be offered.

i. Permanent health insurance

This type of cover has been devised to overcome the limitation of the personal accident and sickness policies. It provides benefits for those who are disabled for longer periods or who, due to accident or illness; have to change to a lower paid occupation. It may also be called long term disability insurance.

It is usual to arrange cover to exclude the first month, six months or twelve months of disablement with appropriate discounts in the premium rates, since many people will receive a

substantial part of their salaries for a certain period when off-work. Cover cannot continue beyond age 65 and in order to save premium some people elect for cover to cease at age 55 or 60. The maximum benefit payable is usually 66 per cent or 75 per cent of earnings, less any other disability benefits payable.

The intention of the basic policy is to provide compensation in the event of an accident causing death or injury. What are termed capital sums are paid in the event of death or certain specified injuries, such as the loss of limbs or sight as may be defined in the policy.

The policy is usually extended to include a weekly benefit for up to 104 weeks, or compensation if the insured is temporarily totally disabled due to an accident and a reduced weekly benefit if he is temporarily only partially disabled from carrying out his normal duties. In the event of permanent total disablement (other than loss of eyes or limbs) an annuity is paid.

Workmen's Compensation Insurance

The Ethiopian labor law proclamation no. 42/1993 holds an employer liable for death, bodily injury or illness befalling employees from circumstances connected with their work or at the place of work. This policy protects the insured, employer, from any loss he might have to suffer as a result of his having to meet such liability.

Health Insurance

- Health Insurance is an insurance against loss by sickness or accidental bodily injury. The risk may be loss of income due to disability or medical expenses. The common health insurance policies are disability income insurance and medical expense insurance. The costs are:
    - Hospital expense
    - Surgical expense

In addition to the purchase of personal accident insurance by individuals, it is also possible for companies to arrange coverage on behalf of their employees and many organizations arrange ‘group schemes’ to this end.