CHAPTER 11

PRICING AND VALUATION IN LIFE INSURANCE

Chapter Introduction

The objective of this chapter is to introduce to the learner the basic elements that are involved in the pricing and benefits of life insurance contracts. We shall first discuss the elements that constitute the premium and then discuss the concept of surplus and bonus.

Learning Outcomes

A. Insurance pricing – basic elements
B. Surplus and bonus

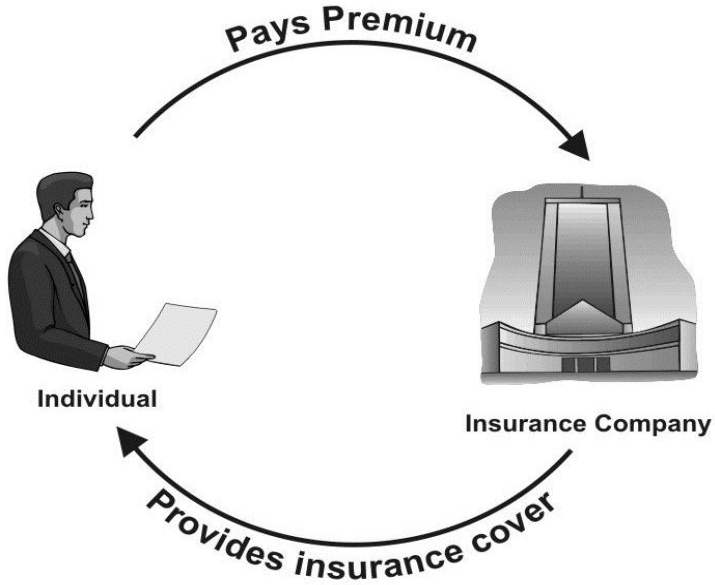
A. Insurance pricing – Basic elements

1. Premium

In ordinary language, the term premium denotes the price that is paid by an insured for purchasing an insurance policy. It is normally expressed as a rate of premium per thousand rupees of sum assured.

These premium rates are available in the form of tables of rates that are available with insurance companies.

Diagram 1: Premium



The rates that are printed in these tables are known as "Office Premiums". They are typically level annual premiums which implies that the same premium needs to be paid every year during the term of the policy. They are in most cases the same throughout the term and are expressed as an annual rate.

Example

If the premium for a twenty year endowment policy for a given age is Rs. 4,800, it means that Rs. 4,800 has to be paid each year for twenty years.

However it is possible to have some policies in which the premiums are payable only in the first few years. Companies also have single premium

contracts in which only one premium is payable at the beginning of the contract. These policies are usually investment oriented.

2. Rebates

Life insurance companies may also offer certain types of rebates on the premium that is payable. Two such rebates are:

- ✓ For sum assured
- ✓ For mode of premium

a) Rebate for sum assured

The rebate **for sum assured** is offered to those who buy policies with higher amounts of sum assured. It is offered as a way of passing on to the customer, the gains that the insurer may make when servicing higher value policies. The reason for this is simple. Whether an insurer services a policy for Rs.50,000 or Rs.5,00,000, the amount of effort required for both, and consequently, the cost of processing these policies remain the same. But higher sum assured policies yield more premium and so more profits.

b) Rebate for mode of premium

Similarly a rebate may be offered **for the mode of premium**. Life insurance companies may allow premiums to be paid on annual, half yearly, quarterly or monthly basis. More frequent the mode, more the cost of service. Yearly and half yearly modes involve collection and accounting only once a year while quarterly and monthly modes would mean the process is more frequent. Half-yearly or yearly premiums thus enable a saving in administrative costs as compared to quarterly or monthly modes. Moreover, in the yearly mode, the insurer can utilise this amount during the entire year and earn interest on it. Insurers would hence encourage payment via yearly and half yearly modes by allowing a rebate on these. They may also charge a little extra for monthly mode of payments, to cover additional administrative expenses involved.

3. Extra charges

The tabular premium is charged for a group of insured individuals who are not subject to any significant factors that would pose an extra risk. Such individual lives are known as **standard lives** and the rates charged are known as ordinary rates.

If a person proposing for insurance suffers from certain health problems like heart ailments or diabetes, it can pose a hazard to his life. Such a life is considered to be sub-standard, in relation to other standard lives. The insurer may decide to impose an extra premium by way of a health extra. Similarly an occupational extra may be imposed on those engaged in a hazardous occupation, like a circus acrobat. These extras would result in the premium being more than the tabular premium.

Again, an insurer may offer certain extra benefits under a policy, which are available on payment of an extra premium.

Example

A life insurer may offer a double accident benefit or DAB (where double the sum assured is payable as a claim if death is a result of accident). For this it may charge an extra premium of one rupee per thousand sum assured.

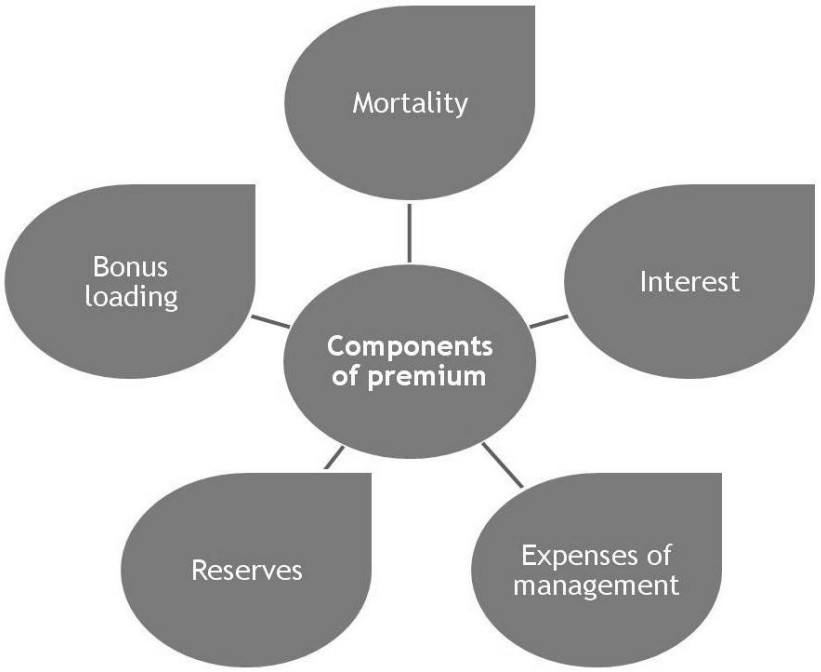
Similarly a benefit known as Permanent Disability Benefit (PDB) may be availed by paying an extra per thousand sum assured.

4. Determining the premium

Let us now examine how life insurers arrive at the rates that are presented in the premium tables. This task is performed by an actuary. The process of setting the premium in case of traditional life insurance policies like term insurance, whole life and endowment considers following elements:

- ✓ Mortality
- ✓ Interest
- ✓ Expenses of management
- ✓ Reserves
- ✓ Bonus loading

Diagram 2: Components of Premium



The first two elements give us the Net premium. By adding [also called 'loading'] the other elements to the net premium we get the gross or office premium

a) Mortality and Interest

Mortality is the first element in premiums. It is the chance or likelihood that a person of a certain age would die during a given period, of typically one year. To find out the expected Mortality of a person, we use a "Mortality Table", which gives us an estimate of the rate of mortality for different ages.

Example

If the mortality rate for age 35 is 0.0035 it implies that out of every 1000 people who are alive as on age 35, 3.5 (or 35 out of 10,000) are expected to die between age 35 and 36.

The table may be used to calculate mortality cost for different ages. For example the rate of 0.0035 for age 35 implies a cost of insurance of 0.0035 x 1000 (sum assured) = Rs. 3.50 per thousand sum assured.

The above cost may be also called the "Risk Premium". For higher ages the risk premium would be higher.

Consider a person aged 35. If he wants to take life insurance cover for a term of twenty years [age 35 to 55], the insurance company must have sufficient money available to meet the cost of claims that can arise if he dies at any time during this period. This cost can be found out by summing up the individual risk premiums for different ages from age 35 to 55.

The total cost of these claims, as summed up above, would give us the future liabilities under a policy. In other words it tells us how much money is needed by an insurer to pay claims that may arise in future.

Since Life insurers collect premiums at the beginning of a given term, these premiums earn interest. While estimating the amount money that would be needed at hand to pay claims that may arise in future [future liabilities], it is necessary to take this factor of interest into account.

Interest is simply the discount rate we assume for arriving at the present value of future claim payments that have to be made.

Example

If we need to have Rs. 5 per thousand to meet the cost of insurance after five years and if we assume a rate of interest of 6%, the present value of Rs. 5 payable after five years would be $5 \times 1/ (1.06)^5 = 3.74$.

If instead of 6% we were to assume 10%, the present value would be only 3.10. In other words the higher the rate of interest assumed, the lower the present value.

From our study of mortality and interest there are two major conclusions we can derive

- ✓ Higher the mortality rate in the mortality table, higher the premiums would be
- ✓ Higher the interest rate assumed, lower the premium

Actuaries, who are responsible for arriving at these estimates, tend to be prudent and a little conservative. The mortality rates they assume would be typically higher than what they expect to be the actual

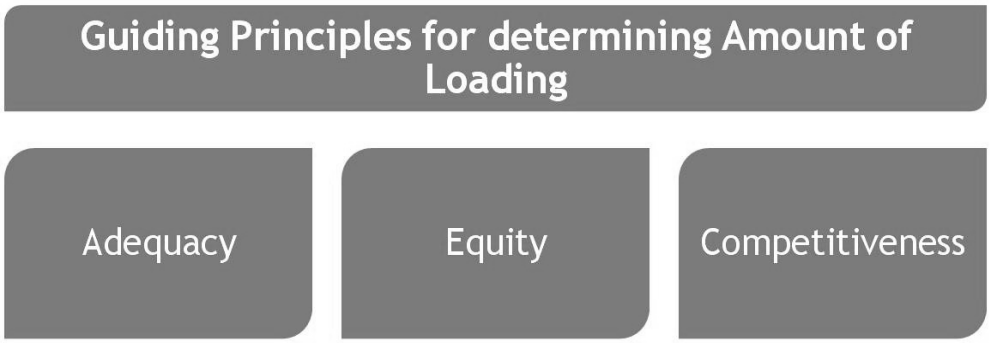
experience. They would also assume a lower interest rate than what they expect to earn from their investments.

Net premium

The estimates of mortality and interest give the "Net Premium" which is the estimate of present value of future claim costs.

Gross premium

Diagram 3: Guiding Principles for determining Amount of Loading



Gross premium is the net premium plus an amount called loading. There are three considerations or guiding principles that needs to be borne in mind when determining the amount of loading:

i. Adequacy

The total loading from all policies must be sufficient to cover the company's total operating expenses. It should also provide a margin of safety and finally it should contribute to the profits or surplus of the company.

ii. Equity

Expenses and safety margins etc. should be equitably apportioned [divided and shared] among various kinds of policies, depending on type of plan, age and term etc. The idea is that each class of policy should pay for its own costs, so that to the extent possible, one class of policy does not subsidise [pay for] another.

iii. Competitiveness

The resulting gross premiums should enable the company to improve its competitive position. If the loading is too high, it would make the policies very costly and people would not buy.

b) Expenses and reserves

Life insurers have to incur various types of operating expenses including:

- ✓ Agents training and recruitment,
- ✓ Commissions of agents,
- ✓ Staff salaries,
- ✓ Office accommodation,
- ✓ Office stationery,
- ✓ Electricity charges,
- ✓ Other miscellaneous etc.

All these have to be paid from premiums that are collected by insurers. These expenses are loaded to the net premium.

A life insurer incurs two types of expenses:

i. The first, known as **"New Business Expenses"**, are incurred at the beginning stage of the contract

ii. The second type of expenses, known as **"Renewal Expenses,"** is incurred during subsequent years.

Initial or new business expenses can be substantial. Life insurers are also required by law to hold certain margins as reserves to ensure they can meet their obligations even in those situations when their actual experience is worse than assumed. The initial expenses along with the margins required to be maintained as reserves are typically higher than the initial premiums received by the life insurer.

The company thus faces a strain, known as new business strain. The initial outflow is only recovered from subsequent annual premiums. An implication is that life insurers cannot afford to have large number of their policies cancelled or lapsing in initial years, before the expenses are recouped. Another implication of new business strain is that life insurance companies begin to make profits only after a gestation period of some years.

Expenses are also determined in different ways, depending on the type of expense.

i. For instance, commissions and incentives for agency managers / development officers are typically decided as a percentage of the premiums earned.
ii. On the other hand, expenses like medical examiners' fees and policy stamps vary depending on the amount of sum assured or face value of the policy and are considered in relation to the sum assured.

iii. A third category of expenses is overheads like salaries and rents which generally vary with the amount of activities. These in turn depend on the number of policies being serviced. More the number of policies, higher the overhead expenses.

All the above types of expenses are All the above types of expenses are suitably loaded to the net premium.

Lapses and contingencies

Apart from expenses, the life insurer also constantly faces the risk that actual experience may be different from the assumptions made at the stage of designing the contract.

One source of risk is that of lapses and withdrawals. A lapse means that the policyholder discontinues payment of premiums. In case of withdrawals, the policyholder surrenders the policy and receives an amount from the policy's acquired cash value.

Lapses can pose a serious problem. They usually happen within the first three years with highest incidence being typically in the very first year of the contract. Life insurers incorporate a loading in anticipation of leakages that may arise as a result.

Life insurers must also be prepared for the eventuality that the assumptions on basis of which they set their premiums differs from actual experience. Towards this purpose they include a loading margin in the premium, which could help to absorb any adverse loss that may arise between expected and actual experience.

c) With Profit policies and Bonus loading

During the early years of the life insurance industry, the major uncertainty faced was about the rate of mortality. Life insurers solved the problem by charging excessive premiums in advance. This would ensure that they remained solvent even in adverse situations. When, in the light of sufficient experience, it was found that the premiums were higher than what was needed, life insurers would return the excess or some of it to policyholders by way of bonus additions. This was the origin of the traditional with profit policies we find today

Participation in profits also ushered an element called "**Bonus Loading**" into premiums. The idea was to provide a margin for profits as a loading in the premium, such that it served as an added cushion against unforeseen contingencies and also paid for the policy's share of surplus distributed (as bonus).

In sum we can say that:

Gross premium = Net premium + Loading for expenses + Loading for contingencies + Bonus loading

Test Yourself 1

What does a policy lapse mean?

I. Policyholder completes premium payment for a policy
II. Policyholder discontinues premium payment for a policy
III. Policy attains maturity
IV. Policy is withdrawn from the market

B. Surplus and bonus

1. Determination of surplus and bonus

Every life insurance company is expected to undertake a periodic valuation of its assets and liabilities. Such a valuation has two purposes:

i. To assess the financial state of the life insurer, in other words to determine if it is solvent or insolvent
ii. To determine the surplus available for distribution among policyholders / share holders

Definition

Surplus is the excess of value of assets over value of liabilities. If it is negative, it is known as a strain.

Let us now see how the concept of surplus in life insurance is different from that of profit of a firm.

Firms in general look at profits in two ways. Firstly, profit is the **excess of income over outgo** for a given accounting period, as it appears in the profit and loss account. Profit also forms part of the balance sheet of a firm - it may be defined as the **excess of assets over liabilities**.

In both instances, profits are determined at the end of the accounting period.

Example

The profits of XYZ firm as on 31stMarch 2013, is given as its income less expenses or its assets less liabilities as on that date.

In both instances, the profit is clearly defined and is known.

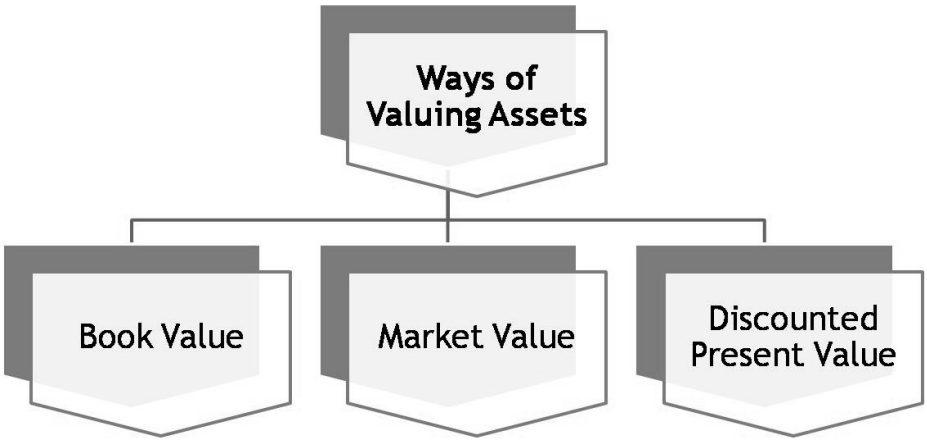
Can we apply a similar argument and specify the liabilities and assets in case of a life insurance valuation?

For life insurers, as for other firms, the surplus is determined as the excess of assets over liabilities.

Surplus = Assets - Liabilities

Let us understand what the liabilities are. For a given block of life insurance policies, the life insurer has to make provision for meeting future claims, expenses and other expected pay-outs that may arise. The insurer also expects to receive premiums for these policies. Liabilities are thus determined as the present value of all payments that have to be made less the present value of premiums expected to be received on these policies. The present value is arrived at by applying a suitable rate of discount [the interest rate]

Diagram 4: Ways of Valuing Assets



Let us now look at how assets are valued. This can be done in one of three ways

i. **At Book Value**

This is the value at which the life insurer has purchased or acquired its assets

ii. **At Market Value**

The worth of the life insurer's assets in the market place

iii. **Discounted Present Value**

Estimating the future income stream from various assets and discounting them to the present

The problem is that one cannot place an exact value on liabilities because one cannot precisely predict what will happen in the future. The value of liabilities depends on assumptions about factors like mortality, interest, expenses and persistency which are made while

estimating the present value of future liabilities. It is for this reason that in life insurance we use the term surplus instead of profits.

Surplus is thus a function of how assets and liabilities are valued.

i. When a life insurer is very conservative in its valuation, it would result in liabilities being overvalued than otherwise while assets are undervalued. As a result the surplus that is declared would be reduced. This means lesser bonuses would be available for distribution among current policyholders. But it would also contribute to financial soundness of the insurer, since the actual amount of surplus is higher than the declared surplus and so higher provisions can be retained for the future. This would benefit future policyholders.

ii. On the other hand, if assets and liabilities are valued liberally, it has the opposite result. Current policyholders would be benefited at the expense of future ones.

The life insurance company has to strike the right balance between current and future policyholders.

2. Allocating the surplus

Surplus arises as a result of the life insurer's actual experience being better than what it had assumed. Under with profit contracts, the life insurer is obliged to pass on the benefits of such a favourable gap (between the actual and expected results) to policyholders who have agreed to participate in the profits and have purchased these with profit policies.

At the same time, surplus is also a source for increasing the company's basic capital (its equity or net worth). It contributes to the life insurer's financial soundness.

Let us now see how the surplus that is determined would be allocated

a) Solvency requirements

Firstly, life insurers have to maintain a solvency margin which may be defined as the portion of surplus assets over liabilities that are specifically set aside to serve as a cushion to meet any unforeseen deviations between expected and actual experience.

b) Free assets

Another purpose for having surplus that is unallocated (for distribution) is to increase the level of free assets. Free assets are unencumbered. In other words they are not required for meeting any specific liabilities. The life insurer is thus free to use them for various purposes like business expansion.

Once the divisible surplus is declared, the next issue is to determine their distribution among the life insurer's policyholders (after leaving a portion for distribution among shareholders if any).

In India, the popular method for the purpose has been the "Bonus Mechanism" where surplus is distributed in the form of a bonus. This system is popular in the United Kingdom, India and many other countries.

3. Bonus

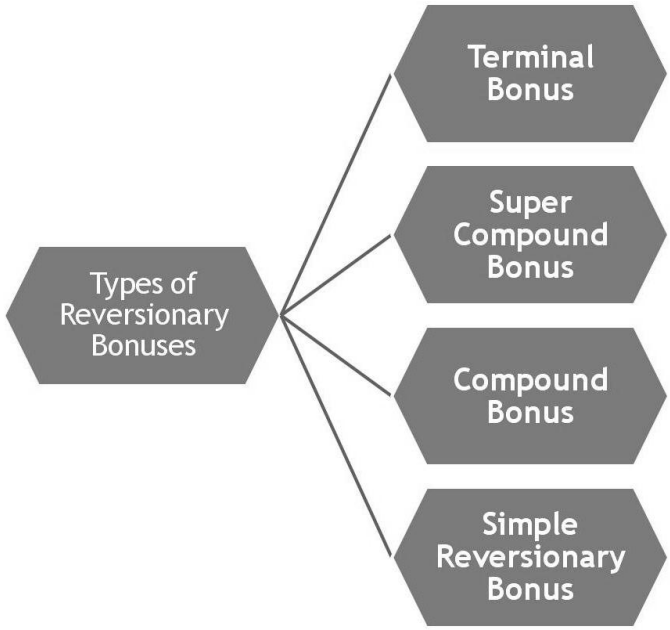
Bonus is paid as an addition to the basic benefit payable under a contract. Typically it may appear as an addition to basic sum assured or basic pension per annum. It is expressed, for example, as Rs. 60 per thousand sum assured (or 60% of SA).

The most common form of bonus is the **reversionary bonus**. The company is expected to declare such bonus additions each year, throughout the lifetime of the contract. Once declared, they get attached and cannot be taken away. They form part of the liabilities of the company. They are called 'Reversionary' bonuses because the policyholder only receives them when the contract becomes a claim by death or maturity.

Bonuses may also be payable on surrender. In such cases it is often stipulated that the contract should have run for a certain term (say 5 years) to become eligible.

Types of reversionary bonuses

Diagram 5: Types of Reversionary Bonuses



i. Simple Reversionary Bonus

This is a bonus expressed as a percentage of the basic cash benefit under the contract. In India for example, it is declared as amount per thousand sum assured.

ii. Compound Bonus

Here the company expresses a bonus as a percentage of basic benefit and already attached bonuses. It is thus a bonus on a bonus. A way to express it may be as @ 8% of basic sum assured plus attached bonus.

One may also have Super Compound bonus, where the bonus is arrived at as a percentage of basic benefit and applying another percentage for attached bonus. For instance it may be expressed as @8% of basic sum assured and @10% of attached bonus.

iii. Terminal Bonus

As the name suggests, this bonus attaches to the contract only on its contractual termination (by death or maturity). The bonus is declared only for claims of the ensuing year without any commitment about subsequent years (as in case of reversionary bonuses). Thus the

terminal bonus declared for 2013 would only apply to claims that have arisen during 2013-14 and not for subsequent years.

Finally, terminal bonuses depend on the time duration of the contract, and increases as the duration increases. Thus the terminal bonus for a contract that has run for 25 years would be higher than one which has run for 15 years.

4. The Contribution Method

Another method of distribution of surplus which has been adopted in North America is the "Contribution" method. Under this method, consideration is given to three sources of surplus - excess interest, mortality savings and savings arising with respect to expense and other loadings.

The surplus is thus given by the difference between what was expected to happen and what actually happened over the year with respect to mortality, interest and expenses

The dividends that are declared may be used in one of the following four ways

i. It may be paid in the form of dividends in cash

ii. In the form of adjustment to, and reduction in future premiums

iii. A third method is to allow purchase of non-forfeitable paid up additions to the policy

iv. Finally dividends may be allowed to accumulate, with interest, to the credit of the policy. It may be either withdrawn at the option of policyholder or only at the end of the contract

5. Unit Linked Policies

Traditional "With Profit" policies, as discussed above, contain a linkage between the bonuses they pay and the investment performance of the life insurer. The linkage however is not direct. The policyholder's bonus is determined by the surplus that is declared during the periodic valuation of the insurer's assets and liabilities. As a result, the bonus structure does not directly reflect the value of the underlying assets of the insurer.
Again, bonuses are generally only declared once a year. They obviously cannot reflect the daily fluctuations in the value of assets. Unit linked

policies have been designed precisely to overcome some of the limitations spelt out above.

They involve a different approach to the design of products and follow a different set of principles.

a) Unitising

The distinctive feature of these policies is that their benefits are wholly or partially determined by the value of units credited to the policyholder's account at the date when the claim payment is due to be made. A unit is created through the division of an investment fund into a number of equal parts.

b) Transparent structure

The charges for insurance protection and expenses component of a unit linked product are clearly specified. Once these charges are deducted from the premium the balance of the account and income from it is invested in units. The value of these units is fixed with reference to a pre-determined index of performance.

It is defined by a rule or formula, which is outlined in advance. Two independent persons, by following this formula, would arrive at the same estimate of benefits. Policy holder benefits, in other words, do not depend on the assumptions and discretions of the life insurance company

c) Pricing

In traditional plans like endowment, the insured decides the amount of sum assured to be purchased. This sum assured is guaranteed and the premium is set such that, under given assumptions of mortality, interest and expenses, it would be adequate to pay this amount. If the actual experience is better than the assumptions made while setting the premiums, the benefit is passed on in the form of a bonus.

Under unit linked policies, the insured decides what amount of premium he / she can contribute at regular intervals. The premium may vary, subject to a minimum that may need to be paid. The insurance cover is a multiple of the premiums paid – for example it may be ten times the annual premium.
The premium is divided into three parts

i. Firstly there is a policy allocation charge (PAC) which is comprised of agents' commission, policy setup costs, administrative costs and statutory levies.

ii. The second component is the mortality charge which is the cost of providing risk cover.

iii. The balance of premiums after meeting the above two, are allocated for the purchase of units.

The PAC as a proportion of the premiums is high in the initial years, both under traditional and ULIP plans. Under the former, these charges are apportioned and spread out throughout the policy term. In the case of ULIPs however they are deducted from the initial premiums itself. This implies that in the initial stages, the charges would significantly reduce the amount allocated for investment. This is why the value of the benefits, vis-à-vis the premiums paid, would be very low. It would in fact be less than the premiums paid in the early years of the contract.

d) The bearing of investment risk

Finally, since the value of the units depends on the value of the life insurer's investments, there is a risk that these unit values may be lower than expected and result in the returns being low and even negative. The life insurer, while being expected to manage these investments in an efficient and prudent manner, does not give any guarantee about the unit values. The investment risk, in other words, is borne by the policyholder/unit holder. The life insurer may however bear the mortality and expense risk.

Test Yourself 1

Who bears the investment risk in case of ULIPs?

I. Insurer
II. Insured
III. State
IV. IRDA

Summary

- In ordinary language, the term premium denotes the price that is paid by an insured for purchasing an insurance policy.
- The process of setting the premium for life insurance policies involves consideration of mortality, interests, expense management and reserves.
- Gross premium is the net premium plus an amount called loading.
- A lapse means that the policyholder discontinues payment of premiums. In case of withdrawals, the policyholder surrenders the policy and receives an amount from the policy's acquired cash value.
- Surplus arises as a result of the life insurer's actual experience being better than what it had assumed.
- Surplus allocation could be towards maintaining solvency requirements, increasing free assets etc.
- The most common form of bonus is the reversionary bonus.

Key Terms

1. Premium
2. Rebate
3. Bonus
4. Surplus
5. Reserve
6. Loading
7. Reversionary bonus

Answers to Test Yourself

Answer 1

The correct option is II.

Policyholder discontinuing premium payment for a policy is termed as policy lapse.