



Subject : Life Insurance - PPP

Actuarial Valuation & Risk

Introduction – Risk

- *There are a lot of assumptions that are made for actuarial results.
Name some assumptions...?*
- *There is a risk that these assumptions may not turn out as expected for the future.*
- *Therefore it is vital to understand the sources of risk and hence manage these risk eventually*
- *These risks are managed using underwriting, legal/compliance, actuarial valuation calculations and solvency assessment*

Sources of Risk*

1. *Policy and other data*
2. *Mortality*
3. *Investment Performance*
4. *Expenses and expense inflation*
5. *Persistency*
6. *New Business Mix*
7. *Volume of new business*
8. *Competition*
9. *Action of the board of directors and distributors*
10. *Appropriate management system and control failure*
11. *Counterparties*
12. *Fraud*
13. *Default Risk*

**Note: Please study these explanations from the textbook*

Introduction – Actuarial Valuation

- We know that during the early years of a policy the premium received by an insurance company surpasses the required amount due to the Level Annual Premium system. Thus there is collective excess, corresponding to the premiums of all the policies. This excess then constitutes a funds pool, which enables the company to, settle claims and meet deficit during years when the premium is not sufficient. It now becomes essential to determine whether the premium accumulated is on the same lines as the calculated premium. This enables the company in determining its solvency. Thus the process by which the value of all the existing policies is ascertained is called **valuation**.
- It is also called valuation of liabilities of the insurance company. And since the process of valuation is taken up by an 'actuary' by applying actuarial principles it is termed as **actuarial valuation**.
- The premium charged on policies covers the expenses incurred by a company. The pool of funds formed as a result of premium balance accumulated after deducting the expenses is called **Life Fund**.

Method of Valuation

Valuation of liabilities is the process of arriving at the value of policies existent on the day of valuation.

There are different methods of valuation:

1. Prospective method
2. Net premium method of valuation
3. Modified net premium method of valuation
4. Gross premium method of valuation
5. Gross premium method for with-profits policies
6. Retrospective method

Prospective Method

- When this method is used the prospective value of a policy at any time will be equal to the excess premium accumulated, as long as the business growth is anticipated as per the basis on which the premium was computed. Valuation also determines the adequacy of the life fund, because in a given situation the life fund is never sufficient, it is either in excess or will fall short of the requirement.

The formula applied to calculate valuation using prospective method is:

$${}_t^v_x = XA_{x+t} - P_x a_{x+t}$$

where,

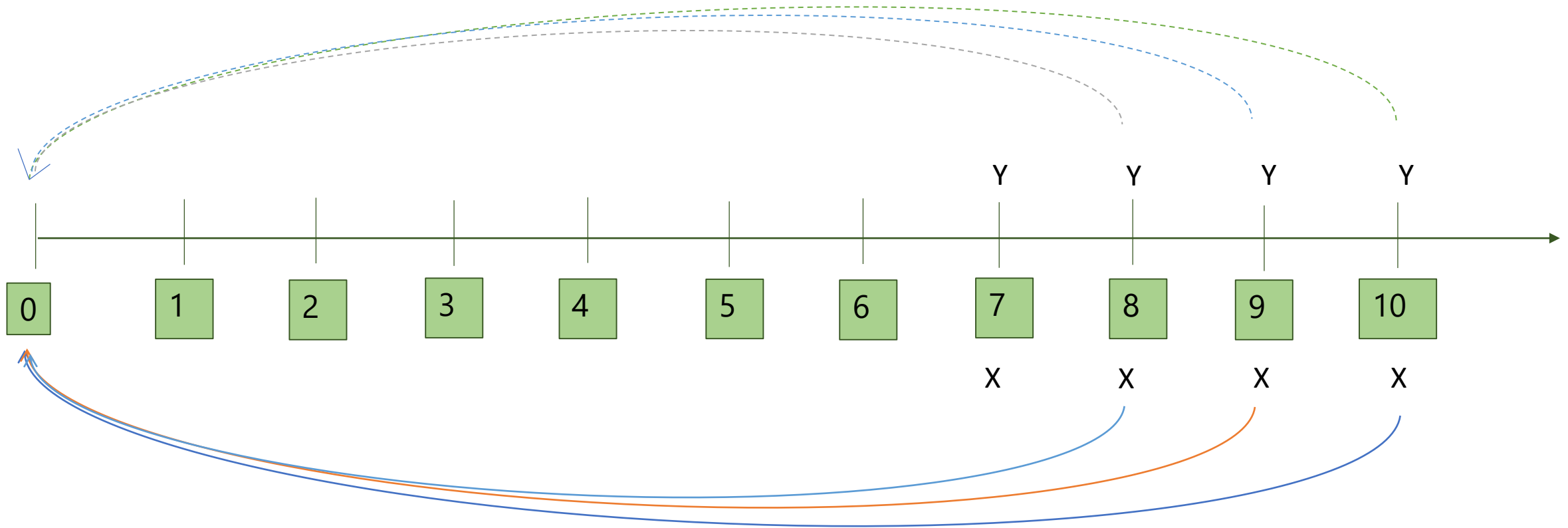
t is the duration elapsed since the date of commencement of the policy, it is reckoned in integral number of years.

x is the age as in during the latest birthday or next birthday as per the practice of the office.

T is obtained by calculating the difference between the calendar year of valuation and calendar year of commencement of the policy. But adjustment has to be made with regard to the month of valuation and the month in which the policy begins.

x + t is the valuation age. It is calculated by adding the duration elapsed (t) to the age (x).

In other words this method evaluates the current value of future premiums and the current value of future claims at a particular date.



X = Premiums received annually

Y = Sum assured or any benefits and expenses paid

Reserve/Liability: The expected present value of the future outgo less the expected present value of the future income

Prospective Method

Valuation surplus = (Life Fund + Present value of future premiums) – Present value of future claims.

There is **valuation deficit** if the present value of future claims is more than the sum of life fund and present value of future premiums. Life insurance companies employ this method of valuation as for the purpose of calculation it considers the existent trends in interest, mortality and expenses, while it determines the present values of future premiums and benefits.

Net Premium Method of Valuation

The net premium method is the method wherein the premium charged by insurers is always inclusive of the expense loading and it is taken as a reserve to handle any unprecedented eventualities in the future.

Herein, if the valuation loadings are not utilized by the insurers then it gets added to the asset of the company and becomes a source of disposable surplus. This helps insurers to have a surplus at end of the year if there is no deviation from their assumptions.

In this method it is assumed that the bonuses are also provided to the policyholders (for participating plans)

Modified Net Premium Method

- In this method the net premium value of the policy is reduced and brought to a new value, which is called the modified net premium.
- The deductions are made from the premium of the first year and the reserve formed as a result is termed as full net premium reserve. This implies that the net premium of the first year is set aside for expenses of that year and in doing so the entire modified net premium reserve becomes nil.
- But at the end of the term both the policy values become equal because the deduction from the net policy value gradually decreases. This modified net premium method is suited for a prospective method of valuation as it takes into account a higher value of premium, so that deductions can be made from the benefits to be availed, but finally arrives at a low-priced policy.

Gross Premium Method

In this method, the entire premium value is considered. The part of the premium that remains left after the expense is contributed to the policy value.

Herein, the percentage of premium that is kept aside for expense, in the end, will correspond to what total expense bear to the total premium.

In this method, there is enough margin between interest and mortality assumption made during valuation and actual expense.

However, this method overestimates the liability of the insurer and diminishes the bonuses received by policyholders.

Gross Premium Method For With – Profit Policies

In the method of valuation we discussed above (gross premium method) a part of the office premium is thrown off to meet expenses.

Likewise in a situation of expansion of business a percentage higher than the renewal expense ratio, but lower than the ratio of total expenses to total premiums is suitable. But such a case is not applicable for With-Profit policies and is only for without profit office premiums. This is because the with-profit office premiums in addition to expenses also contain bonus loadings. Thus in the case of with-profit office premiums, a larger percentage has to be thrown off at the time of valuation to meet future bonuses.

Example: Let us assume that 15% is set aside from a without profits office premium for future expenses. But for a with profit policy the insurer will have to set aside at least 20% or more for expenses and bonuses. And this will also depend on the rate at which the future bonuses are to be declared for the policyholders.

Net Premium	Gross Premium
is the prospective reserve, where we make no allowance for future expenses	the premium required to meet all the costs under an insurance contract, and is the premium that the policyholder pays.
expected present value (PV) of an insurance policy's benefits minus the expected PV of future premiums.	expected present value (PV) of an insurance policy's benefits plus expected value of expenses minus the expected PV of future premiums.

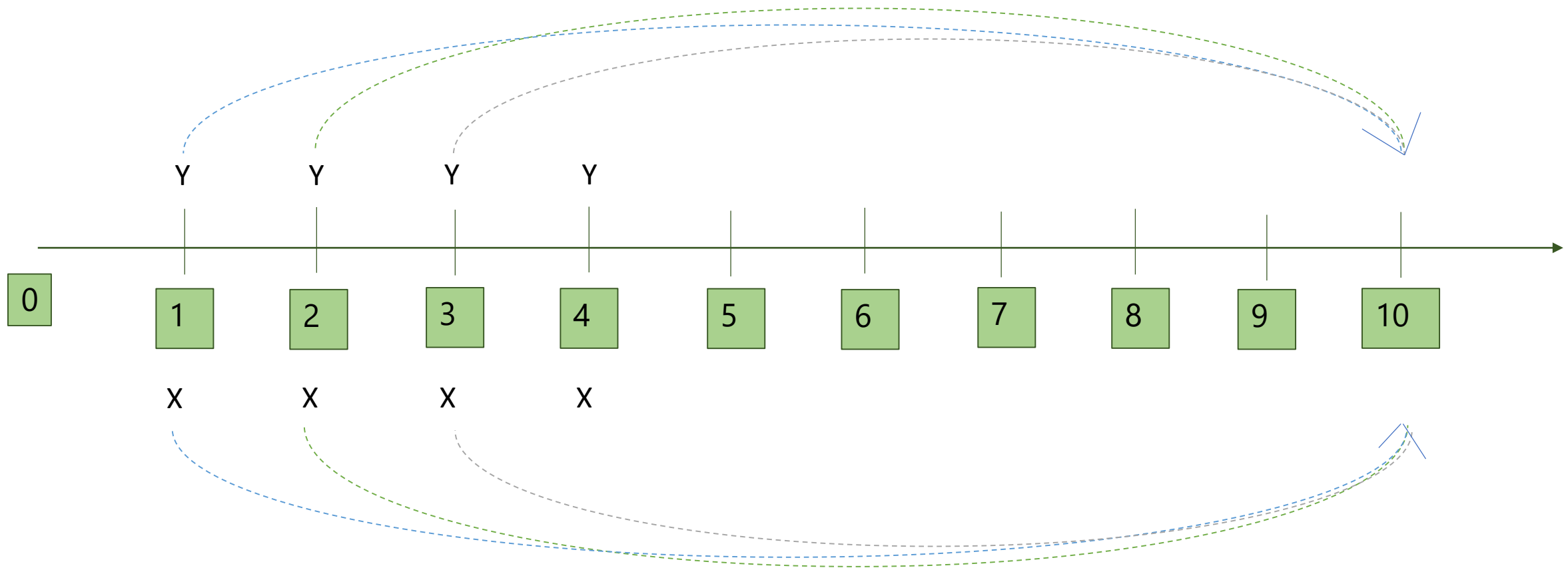
Retrospective Method of Valuation

A retrospective method is employed to determine the policy values of all the existing policies.

The excess of the existing life fund after meeting the value of all the policies is called valuation surplus.

There is a valuation deficit if the life fund falls short of the total policy values.

Accumulated Value of Income (premiums) – Accumulated Value of the outgo (SA and expenses if any) = Retrospective Reserve at time t



X = Premiums received annually

Y = Sum assured or any benefits and expenses paid

Reserve/Liability-The accumulated value allowing for interest and survivorship of the premiums received to date less the accumulated value allowing for interest and survivorship of the benefits and expenses paid to date

Role of Actuarial in the Valuation Team

Discuss from Textbook Page 116

Surplus & Its Distribution

When the insurer firm has an appropriate projection and the actuarial experience is better than the projection, the profit achieved in such scenarios is not only due to margins kept during valuation calculation but also due to profit realized due to favorable experience.

These favorable circumstances reduce the expenses. In life insurance, declaring profit is a very unpredictable and intricate task. The excess of assets left after the current liability settlement should not be misunderstood as profit. It can be required to meet future expenses arising out of any source of risk. Therefore profit is only when the insurer firm closes its new business procurement and it has met all the liabilities of the last policy.

As soon as surplus is announced as divisible surplus, it no more remains a surplus but becomes a liability for the insurer firm.

Nature of Surplus

Surplus is accumulated when there is a favourable deviation from the projected value with respect to mortality savings, excess interest and loading savings. That is, when the actual experience overshoots the assumptions made during valuation, which are very conservative estimates.

In life insurance there are five sources of surplus:

- **Excess Interest:** Life insurance policies are long term contracts, thus it becomes essential for the insurance company to maintain a conservative rate of interest, so that there is a steady income as long as the policy is in force. The interest rates are often conservative. For example if the insurance company bases the reserves expecting to earn 4% but actually earns 7% then there is an excess of 3%, which should go to the policyholders.
- **Mortality Savings:** The rate of mortality considered during cashflow calculations is much higher/different than what exists on ground. Usually the projected mortality is higher than the experienced, thus the surplus after settling all mortality claims is considered a gain.

Nature of Surplus

- **Expense/Loading Savings:** If an insurance company has to do well then the gross premium earned by the company should be sufficient to meet not only the regular expenses but any unforeseen expenditure also. Thus loading on policies is inclusive of policyholders' dividend and gains from other sources.
- **Surplus from surrenders:** The surplus gain as a result of the difference between the policy reserves released due to surrender and the surrender values permitted is called surrender surplus. This form of surplus also represents the amount that was originally taken from the surplus to replenish the reserves.
- **Overshoot conservative experience:** These is due to the release of extra margins built in the assumptions of mortality, interest rate, expense loadings, withdrawal assumption, etc. Insurers employ conservative methods thereby retaining a broad margin to meet any eventuality.

Nature of Surplus

Divisible surplus: The percentage to be set aside for distribution is decided by the trustees or directors of the insurance company. Once the divisible surplus is decided it is no more a surplus but a liability for the insurer. There are certain basic norms that an insurance company has to abide with, while determining the divisible surplus. They are as follows:

- **Equity:** The distribution of surplus should be fair and proportionate, that is the policies contributing more to the surplus should be given a better share.
- **Flexibility:** The divisible surplus should be flexible according to the situation.
- **Simplicity:** The method employed in ascertaining the divisible surplus should be simple and uncomplicated for easy understanding by the shareholders. The process should also be transparent.
- **Consistency:** The dividend provided to policyholders should exhibit consistency, for, the sales force as the policyholders do not appreciate wide fluctuations in dividend.

To Read: Method for Distribution of Divisible Surplus

- **Contribution Method:** This is also called as fair distribution, but is an impractical method of surplus distribution. According to this method distribution is directly based on the contribution of the policies to the surplus accumulated from basic sources like interest, expenses, mortality etc.
- **Simple Reversionary Method:** In this method the bonus is paid in addition to the sum insured, when the event for which insurance is provided occurs, that is death during the term of the policy, or on maturity of the policy. Therefore it is termed as reversionary. It is a popular method as it allows the insurer to retain the surplus enabling him to earn interests on it. It also gives an incentive to policyholders to maintain their policies. Furthermore it is a very simple procedure.
- **Compound Reversionary Bonus System:** This method is also reversionary as the one discussed above. But the incentives provided to the policyholder by this method are better. In this process the bonus addition of each year is of an increasing nature, and the rate that is given is a percentage of the sum insured and the bonuses added during the maturing years of the policy.
- **Bonus in Cash:** In this method the bonus announced is paid in the form of cash to the policyholders.

To Read: Method for Distribution of Divisible Surplus

- **Bonus in Reduction of Premium:** In this method the bonus is reduced from the premium payable by the policyholders to the company. But after a certain period there will be no premium to reduce from, so the company will have to change its way of distributing surplus. There is another disadvantage of this method; it reduces the profit acquiring capacity of the company due to loss of premium income and due to depletion of funds, as the surplus is distributed as cash.
- **Tontine Bonus:** In this process the bonus is distributed after a specific period to the survivors among the policyholders. To avail this kind of bonus, the policyholder should be alive on the date when the bonus is announced. In this method the distribution of divisible surplus is deferred to a future date, and for the first few years of the policy it is not considered eligible to participate in profit sharing. New entrants favour this method, as it enables them to conserve their resources and also removes the need to distribute surplus in early stages.

To Read: Method for Distribution of Divisible Surplus

- **Interim Bonus:** In this the bonuses are announced on the basis of valuation of all the policies at the date of valuation. If some policies result in claim (in case of death) or maturity before the next valuation then they are not eligible for that bonus, as by then they will not be part of the company records, but an interim bonus according to the previous valuation is provided.
- **Guaranteed Bonus:** This method is applicable for without profit policies, which are not entitled to surplus of actuarial valuation. In this process there is guaranteed addition of bonus at a fixed rate for every year, to the sum assured, as long as the policy is in force.
- **Final Additional Bonus:** This is an extra bonus paid by the company to policyholders apart from the usual annual bonus. This is generally paid to policies lasting for long durations, and due to the contribution made by these policies to the surplus. Considering the period for which the premium under a policy was received the company may decide to pay an additional bonus to the policyholder in case of claim or maturity of the policy. Life insurance Corporation of India was following this process, provided the policies were in force at the time of claim or maturity, along with prior payment of 15 years premium.

To Read: Frequency of Distribution

Frequency of Distribution

- In many countries it is a statutory requirement to pay dividend annually, due on all participating policies. However there are certain policies on which dividends are paid only after the passage of the stipulated time like, 5, 10 and 20 years etc. This is called deferred dividend.
- Policyholders are not entitled to the annual dividend if they fail to pay the premium within the stipulated time frame. The lost dividend is paid to policyholders who had been regularly paying the premium during the deferred dividend period.