

LIFE OFFICE ACCOUNTS

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When the actuary begins with valuation the total of the resulting policy values is called the valuation reserves or liabilities. The object of the valuation will be to check that the offices assets are greater than these liabilities. Here we consider the assets side of the balance sheet.

Suppose for example that the liabilities are $V_0 = 10\,000$ and that the office has assets whose market values are $A_0 = 14\,000$. It is common to divide the offices total assets into two parts, the **fund** and the **investment** reserve. It contains assets sufficient to cover at least the valuation reserves. Therefore the fund is $F_0 = 10\,000$ and the investment reserve is $R_0 = 4\,000$.

The changes in the fund from one year end to the next for by the items of revenue during the year. Define:

$P = 1\,000$ – premiums received during the year,

$S_m = 100$ – death claims paid during the year,

$S_d = 100$ – maturity values paid during the year,

$S_o = 500$ – surrender values,

$N = 200$ – expenses paid....,

$I = 2\,000$ – investment income received on the fund during the year,

$D = 0$ – tax p....

Then the values of the fund at the start F_0 and at the end F_1 of the year are related by

$$F_1 = F_0 + P + I - S_m - S_d - S_o - N - D$$

that means in our example

$$F_1 = 10\,000 + 1\,000 + 2\,000 - 100 - 100 - 500 - 200 = 12\,100.$$

We carry out a valuation and reserves at the end of the year are $V_1 = 11\,000$, and the difference $PR_1 = F_1 - V_1 = 1\,100$ is called the surplus disclosed during the year.

If we know total investment income $I_c = 2\,800$ of LI during the year, than the value of the assets at the end of the year A_1 is

$$A_1 = A_0 + P + I_c - S_m - S_d - S_o - N - D =$$

$$= 14\,000 + 1\,000 + 2\,800 - 100 - 100 - 500 - 200 = 16\,900.$$

Comparing the fund with the assets we obtain

Market value of assets	16 900	fund	12 100
		investment reserve	4 800
	<hr/>		<hr/>
total	16 900	total	16 900

and comparing the fund with the valuation reserves

reserves	11 000	fund	12 100
surplus	1 100		
	<hr/>		<hr/>
total	12 100	total	12 100

The valuation has disclosed the surplus, i. e. the assets in the fund grew by more than liabilities. All or part of the surplus has been used as a share of the company's profit by policyholders or it can be carried forward to the next year.

Now we can analyse in detail investment income. What forms it can take:

Interest, dividends and rents: During the year, coupons (dividends, rents) will be received in respect of gilts (shares, properties). These items represent cash actually received and in the strictest sense, only this can truly be called investment income. They can never be negative.

Realised gains: The value of the assets may change since the start of the year. But if any asset is sold, a capital gain or loss will be realised. These gains are cash in hand. The transaction can be not reversed, assets have been liquidated. Realised gains also can be negative.

Unrealised gains: The value of the assets may change again since the start of the year, but company does not sell the asset. Then the gain is said to be unrealised. It could be convert to realised gain by selling the asset.

Suppose that I consists from:

$I_V = 750$ – coupons, dividends, rents,

$I_R = 750$ – realised gains,

$I_N = 500$ – unrealised gains.

There is no problem interest income I_V and realised gains I_R in the surplus. With unrealised gains I_N it is different. What gained this year could be lost next year. Suppose that company uses whole surplus $PR_1 = 1100$ for profit contracts and on the next day the unrealised gains $I_N = 500$ were lost in the stock market crash. Then

reserves	11 000	fund	11 600
policyholders			
share on profit	1 100		
surplus	<u>- 500</u>		
total	11 600	total	11 600

i. e. surplus is negative and company makes a loss. But company is saved by the existence of investment reserve in the background from which it could transfer assets worth 500 in to the fund to solve this situation.

This example illustrates two points:

- IR can be used to keep the fund in balance. In good years some surplus can be transferred into it and in the bad years can be transferred back out to cover negative surplus.
- Counting unrealised gains as surplus and gives it, as a share on profit to policyholders is risky.

More prudent approach for LIC is to exclude the unrealised gains $I_N = 500$ from the account. Then we obtain

reserves	11 000	fund	11 600
surplus	<u>600</u>		
total	11 600	total	11 600

Then the item $I_N = 500$ we can find as an increase of investment reserve. Therefor

Market value of assets	16 900	fund	11 600
		investment reserve	5 300
	<u>16 900</u>		
total	16 900	total	16 900

Company can be more prudent and can exclude also half of the realised gains from the account.

IR provides a set of assts in excess of those needed to cover the liabilities of LIC. These assets improve security of LIC and allows the office more freedom by following activities:

- LIC can invest in equity assets, which are riskier then gilts, but with higher income.
- LIC can try to smooth maturity payments to with profit policyholders. That means to pay them more in bad times provided that it also pays less in the good times.

Using preceding example we have: $F_0 = 10\,000$, $P = 1\,000$, $S_m = 100$, $S_d = 100$, $S_0 = 500$, $N = 200$, $I_V = 750$ a $I_R = 750$. LIC decides to declare something for with profit policyholders. Because $V_1 = 11\,000$, LIC has at the end of the year surplus for this purpose

$$PR_1 = F_1 - V_1 = 11\,600 - 11\,000 = 600.$$

Suppose that this amount is not enough for this purpose because LIC does not want so to reduce profit rates for policyholders with respect to preceding years. If office needs a value surplus 800, then it can transfer from investment reserve missing amount $IR = 200$. Then

$$PR_1 = F_1 - V_1 = 11\,800 - 11\,000 = 800.$$

At other times when a large surplus may be disclosed, the office would make a transfer to the investment reserve and moderate any increase of a profit share for policyholders.

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