Professional Series

PRODUCT PREVIEW

ACTUARIAL ASPECTS

Of Individual Life Insurance And Annuity Contracts

Second Edition

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CHAPTER 10
DIVIDENDS AND OTHER NON-GUARANTEED ELEMENTS

10.1 DIVIDENDS

The payment of dividends on life insurance has been common almost since the beginning of life insurance in North America. Many of the earliest life insurance companies on this continent were mutual companies, and paid dividends in some form almost from the time of their charters. (Most of the early dividends were probably proportional to premiums, as is common for casualty insurance dividends.)

Life insurance contracts usually extend over many years, and it is impossible for the issuing company to predict the actual cost of insurance on a reasonably accurate basis. Therefore, individual life insurance currently being issued almost always involves some kind of dividend or other non-guaranteed element. The company can then base its **guaranteed** premiums on a reasonably conservative set of assumptions, and refund any overcharge as a dividend. This has the advantage, from the company's standpoint, of reducing the level of risk that the company must take in issuing the policy. Policyholders also benefit from this arrangement (i.e., redundant premiums and resulting dividends) since they are spared the cost of the surplus an insurer would have to hold to cover the additional risk of fully guaranteed costs.

True **non-participating** life insurance (i.e., insurance for which the original guaranteed premiums are charged without an offer or expectation of any return or reduction in cost) was once quite common, but virtually disappeared in the late 1970's when dramatic fluctuations in interest rates began to make it impossible to guarantee long-term costs at levels reasonably related to market interest rates.

10.2 THE MUTUAL COMPANY PHILOSOPHY

Mutual life insurance companies were the original issuers of **participating** life insurance (insurance on which dividends are paid) and in some jurisdictions (e.g., New York and Massachusetts) they are not permitted to issue individual life insurance on any other basis. Mutual companies differ from stock companies not only by this requirement that all policies be participating, but also in the form of their ownership. In practice almost all life insurance issued by mutual companies is participating, even where this is not required. Mutual companies are not owned by stockholders, or any outside agency. In most cases, the managers of a mutual company will consider that the policyholders (who are responsible for electing directors on a periodic basis) are the company owners, even in situations where this may not be technically correct. For example, in some cases the ownership is technically vested in the management, with policyholders in a special debtor relationship.[1]

The special relationship of the management to policyholders in the mutual company gives rise to the mutual company philosophy. The important element of this philosophy, from the standpoint of dividend distribution, is the expectation of **equity** in dividend distribution; the distribution of gains to the sources from which they arose. This is also sometimes referred to as the "**Contribution Principle**."

Traditionally, mutual companies have managed their dividend scales more actively than stock companies. For example, in the period 1982 to 1992, when interest rates first rose to record highs and then began a gradual but continuous decline, there were several stock companies that did not deviate from the dividend scales originally illustrated on 1982 issues.[2] During the same period, almost all mutual companies went through the process of raising dividends, and later cutting them.

10.3 THE CONTRIBUTION FORMULA

The contribution formula was devised to calculate dividends based on three of the most important sources of gain and loss for life insurance

[1] See *Life Insurance*, by Black and Skipper for additional background [4].
[2] See [3].

companies, mortality, investments and expenses. At one time, dividends were determined entirely by use of the formula for many companies, but this would be quite unusual at the present time. Quite often, however, dividends are determined by some other method (such as the asset share method) and a contribution formula is devised to fit the dividends as determined.

The contribution formula is sometimes called the "three-factor method" because the formula for dividends consists of three terms. Each of the three terms compares the experience of the company with the assumptions used in setting gross premiums and reserves. They are: an investment earnings term (called "Factor *i*" in the discussion that follows), a mortality term ("Factor *m*") and an expense term ("Factor *e*").

10.3.1 THE INVESTMENT FACTOR

Factor *i* of the contribution formula is intended to return as dividend those elements of surplus gain that are related to investment income. It is usually calculated as:

$$(i'-i)\times(P+{}_{t-1}V) \qquad (10.1)$$

where i is the interest rate used in calculating reserves, i' is a (usually higher) rate representing the actual returnable investment earnings, and $P+{}_{t-1}V$ is the initial reserve for policy year t. If the contribution formula were used directly to calculate dividends, it would probably be more appropriate to have the interest return (i.e., the $(i'-i)$ term) multiplied by an asset share or fund. In practice, however, many companies find it convenient to use either net level or modified initial reserves in this term. The investment interest rate i' is the element of this term subject to variation to fit the desired dividend schedule. If dividends were being developed directly, it would equal the company's net investment earnings rate, less any amount held back as a required surplus contribution, plus adjustment for capital gains.

As is true in the example shown, Factor *i* is usually the largest part of the total dividend especially at the later durations. Also, it is important to note that for permanent life insurance, Factor *i* increases in size with duration (assuming a constant difference between i' and i). This is not generally true of the other two factors. Elements of company gain or loss that are not strictly related to investments (especially federal income tax) are sometimes charged directly against this factor because their incidence by duration follows a similar pattern.

10.3.2 THE MORTALITY FACTOR

Factor *m* of the contribution formula returns those parts of the gain that depend upon mortality. Factor *m* is usually calculated as:

$$(q_{x+t} - q'_{x+t}) \times (1000 - {}_tV) \tag{10.2}$$

Where q_{x+t} is the mortality rate based on the mortality table used in establishing reserves, q'_{x+t} is the (usually lower) mortality rate actually being experienced, and $(1000 - {}_tV)$ is the **net amount at risk**, i.e., the amount the insurance company stands to lose if the insured dies, calculated as the difference between the reserve and the amount of insurance payable at death. Dividend factors are usually calculated per $1000 of insurance face amount, so for a policy with level death benefit equal to the face amount, the net amount at risk is $1000 less the reserve per thousand $({}_tV)$. Some approximation for the net amount at risk is often used for policies with non-level face amounts. As with the investment element, the use of the death benefit less an asset share or fund would probably give a more theoretically correct net amount at risk, but this refinement has little practical effect, and is seldom used. While the difference between the mortality rates in this formula may increase or decrease with duration, the net amount at risk on a whole life policy always decreases at the advanced ages, and therefore so does the mortality factor in the dividend.

In the example shown, valuation mortality has been calculated using the 2001 CSO Non-Smoker Table. Experience mortality was based on a modification of this table. In practice, most insurance companies have either a table of their own construction or some percentage of a standard table (perhaps varying by age, plan and duration) to represent experience mortality.

10.3.3 The Expense Factor

The final term in the three-term contribution formula, Factor *e*, is intended to return any excess of loading in the policy gross premium over the expenses needed to sell, issue and administer the policy. Factor *e* is usually calculated as:

$$(1+i')\times\left[G\times(1-r_t)-P-E_t\right] \tag{10.3}$$

where G is the gross premium, P is the valuation net premium, r_t is the percentage of premium expense at duration t, and E_t is the expense per \$1000 of face amount at duration t. While there may be many expenses that do not actually vary by either the amount of premium or the face amount, an attempt is usually made to allocate all expenses to one factor or the other. To the extent that they are not allocated to Factor *i*, the contributions to required surplus, to taxes, and where applicable the dividends to stockholders are usually charged to this term.

10.3.4 Other Adjustments to the Contribution Formula

However theoretically correct a company may make its dividends by using the contribution formula, it is likely that the total dividends that the formula will distribute will differ from the company's **divisible surplus;** the amount of dividends the company's board of directors has established to be distributed for the year. To adjust for this, the final contribution formula dividends may be of the form:

$$(1-a)(Factor\ i+Factor\ m+Factor\ e)-b \tag{10.4}$$

where a and b are constants (of course, either or both may be zero) that adjust the total contribution formula dividends to the divisible surplus.

An argument can be made that equity is preserved with non-zero values of a and b as long as they do not vary by series, but are the same for all policies. However, all values of a and b other than zero diminish the ability of the dividend scale to allocate the correct reward to true sources of gain, and most actuaries look on adjustments like this as a practical expedient only and attempt to keep a and b near zero to the extent possible.

The process of dividend determination is fundamentally retrospective, in that dividends are determined based on past experience. However, once dividend experience has been established and current dividends have been determined, it is usual to project dividends for at least twenty years into the future. An important test of a dividend scale is the company's ability to maintain it in future years if experience does not change.

Table 10.1 shows an example of contribution formula dividends projected twenty years from issue. In the example shown, experience interest is 5.5%, valuation interest is 4.5%, and valuation mortality is 1980 CSO Table B Non-Smoker. Experience mortality was calculated as 50% of this table at the first duration, 51% at the second duration, and so on, up to a level of 100% in the fifty-first and later years. The gross premium is $13.73 (130% of $10.56, the net level premium). As a final adjustment, dividends were adjusted by adding .6202 to the value of E_t shown.

TABLE 10.1

Dividends Calculated on the Contribution Formula
Whole Life, Non- Smoker, Age 35

t	r_t	E_t	$1000_t q_x$	$_{t1}V_{35}$	Factor i	Factor m	Factor e	Dividend
1	95.00%	$5.00	1.09	0.00	$0.21	$1.04	($15.38)	$0.00
2	10.00%	2.00	1.15	0.00	0.21	1.04	(1.08)	0.16
3	10.00%	2.00	1.20	9.52	0.40	1.01	(1.08)	0.33
4	10.00%	2.00	1.29	19.39	0.59	1.01	(1.08)	0.52
5	10.00%	2.00	1.37	29.58	0.80	1.00	(1.08)	0.71
6	8.00%	2.00	1.46	40.11	1.01	0.84	(0.82)	1.03
7	6.00%	2.00	1.58	50.98	1.23	0.75	(0.56)	1.42
8	4.00%	2.00	1.73	62.20	1.45	0.81	(0.29)	1.97
9	4.00%	2.00	1.90	73.74	1.68	0.88	(0.29)	2.27
10	4.00%	2.00	2.10	85.60	1.92	0.96	(0.29)	2.58
11	4.00%	2.00	2.33	97.78	2.16	1.05	(0.29)	2.92
12	4.00%	2.00	2.55	110.26	2.41	1.13	(0.29)	3.25
13	4.00%	2.00	2.79	123.07	2.67	1.22	(0.29)	3.60
14	4.00%	2.00	2.93	136.21	2.93	1.27	(0.29)	3.90
15	4.00%	2.00	3.09	149.80	3.20	1.31	(0.29)	4.22
16	4.00%	2.00	3.32	163.84	3.48	1.39	(0.29)	4.58
17	4.00%	2.00	3.59	178.28	3.77	1.47	(0.29)	4.95
18	4.00%	2.00	3.96	193.14	4.07	1.60	(0.29)	5.37
19	4.00%	2.00	4.36	208.34	4.37	1.73	(0.29)	5.80
20	4.00%	2.00	4.87	223.89	4.68	1.89	(0.29)	6.28

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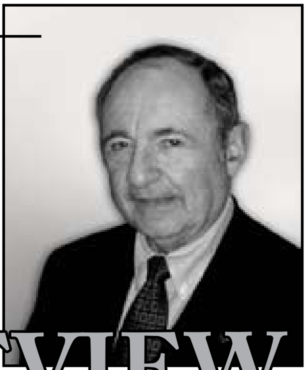

Albert E. Easton, FSA, MAAA was a Consulting Actuary in the Albany, New York office of Milliman, Inc. responsible for managing the life insurance consulting practice in that office prior to his retirement. In addition to his actuarial credentials, he is a CLU, ChFC, and FLMI. He has served the Society of Actuaries in a number of volunteer roles, including terms as chair of two different examination committees.

About the Text

Actuarial Aspects of Individual Life Insurance and Annuity Contracts focuses on the relationships among the various types of values that are associated with individual life and annuity contracts. For the student, it illustrates the dependencies that exist among premiums, cash values, reserves, dividends and other non-guaranteed elements when designing individual products. For the experienced actuary, the text provides a comprehensive summary of current actuarial practice in the design, pricing and daily maintenance of individual products.

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