COSTS OF NONFORFEITURE BENEFITS ON SUBSTANDARD POLICIES

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ABSTRACT

Costs of nonforfeiture benefits at various levels of mortality are given in the paper. The purpose is to compare these costs and to illustrate conditions under which the extended insurance option might be offered more generally in substandard policies.

The term "costs," as used here, means the present value of the death benefits, expenses, and dividends where the present values are discounted at 3 and 5 per cent on multiples of the 1955–60 Basic Ultimate Male Table.

According to the assumptions in the paper, when expenses and dividends are considered, the costs of the extended insurance option are generally lower than those of the paid-up insurance option at the lower levels of substandard extra mortality.

A T LAPSE the standard ordinary policy can be continued in force by the automatic premium loan provision or by the extended insurance or paid-up insurance nonforfeiture options. Some automatic premium loan provisions revert to the automatic nonforfeiture option after two or three premiums have been paid by the loan provision or when the net cash value has been reduced to less than the gross premium. In the substandard policy the extended insurance option is usually omitted on the premise that it is too favorable for substandard lives.

The purpose of this paper is to compare, for substandard policies, the costs of the nonforfeiture benefits at various levels of mortality and to illustrate conditions under which the extended insurance option might be offered more generally. As used here, the term "costs" means the present value of death benefits, expenses, and dividends where the present values are discounted at 3 and 5 per cent on multiples of the 1955–60 Basic Ultimate Male Table.

The use of constant multiples of the 1955–60 Basic Ultimate Male Table was chosen as a measure of substandard mortality since, for many impairments, the incidence of extra mortality as a percentage of standard mortality is either level or slightly decreasing by duration. An ultimate

table was chosen as a convenience to limit the number of illustrations even though most lapses occur before the effects of selection have entirely worn off.

Expenses are assumed to be chargeable yearly and to be equal for $1,000 of extended insurance and for the amount of reduced paid-up insurance purchased by the same cash value necessary to purchase the $1,000 of extended insurance. These expenses are assumed to continue for the period of extended insurance under the extended insurance option and for the life of the reduced paid-up option. Under this assumption the cost of mortality and expenses is assumed to be $1,000 A^1_{x:\overline{t}|} + E \cdot \ddot{a}_{x:\overline{t}|}$ under the extended insurance option and $S \cdot A_x + E \cdot \ddot{a}_x$ under the amount of reduced paid-up insurance corresponding to $1,000 of extended insurance.

Other expenses characteristic of the several types of nonforfeiture options are ignored. Dividends are calculated by the three-factor dividend formula using only the excess interest factor.

The standard nonforfeiture laws require the present value of the non-forfeiture options to be equal to the cash value at lapse according to the interest rate and mortality table used in calculating the options. However, periods of extended insurance may be calculated on a loaded table. Before the 1958 CSO Table was adopted, the same table was generally used for calculating all the nonforfeiture benefits. Now, however, the 1958 CET Table is nearly always used for calculating periods of extended insurance when the 1958 CSO Table is used for calculating the other nonforfeiture benefits. In Table 1 a comparison is made on this basis of the periods of extended insurance and amounts of paid-up whole life insurance purchased by the same cash value necessary to purchase $1,000 extended insurance.

Even though the ages in Table 1 range from 15 to 55 and the periods of extended insurance from 2 to 20 years, lapses usually occur at the younger ages and at the early policy durations, where the periods of extended insurance are shorter. An indication of this is the Society's study of extended insurance mortality, *TSA 1964 Reports*, which showed 90 per cent of the deaths occurring within ten years of lapse for that part of the experience where data were segregated by duration after lapse and 68 per cent of the deaths occurring at ages under 55 at lapse.

MORTALITY AND INTEREST

In Table 2 a comparison is shown of the present value of death benefits for the periods of extended insurance and amounts of paid-up insurance given in Table 1 at the 3 per cent nonforfeiture interest rate. The interest

rate is chosen as a compromise between the rates currently being used in participating and nonparticipating policies. The present values are discounted at 3 and 5 per cent on multiples of the 1955–60 Basic Ultimate Male Table.

The present values of the extended insurance death benefits are lower than those for the paid-up insurance at the younger ages and at the lower levels of mortality and interest. At 3 per cent the extended insurance present values are lower for ages 15–55 through 150 per cent of the 1955–60 Basic Ultimate Table. At 5 per cent the differences are relatively small

TABLE 1

	Amounts of Paid-up Whole Life Insurance Purchased by the Cash Value Necessary to Purchase $1,000 Extended Insurance†								
Period of Extended Insurance*	Nonforfeiture Interest Rate								
	2½ Per Cent			3 Per Cent			3½ Per Cent		
	Age at Lapse			Age at Lapse			Age at Lapse		
	15	35	55	15	35	55	15	35	55
2..............	16	15	54	20	18	58	24	21	63
5..............	40	40	145	49	47	156	60	54	167
10..............	78	92	322	95	105	341	116	119	360
20..............	146	248	723	175	274	747	209	301	770

* Based on 1958 CET.
† Based on 1958 CSO.

through 150 per cent of this table. For the higher levels of mortality and for the older ages at lapse, the present values of the extended insurance death benefits are much larger than the paid-up insurance present values. The reason for this relationship is that, as the rate of mortality is increased, the value of the extended insurance tends toward the face amount while the value of the paid-up insurance tends toward the reduced amount.

Although the examples in Table 2 are extended to 500 per cent of the 1955–60 Basic Ultimate Male Table, most substandard issues are made at much lower ratings. For example, the digest of Mr. A. A. Windecker's report of Prudential's practices stated:

The Prudential had increased its range of acceptable substandard risks from 300 to 500 per cent about three years ago. He indicated that recent ex-

TABLE 2

PERIOD OF EXTENDED INSURANCE	PRESENT VALUE OF DEATH BENEFITS						EXCESS OF EXTENDED INSURANCE OVER PAID-UP INSURANCE PRESENT VALUES		
	Extended Insurance			Paid-up Insurance					
	Age at Lapse			Age at Lapse			Age at Lapse		
	15	35	55	15	35	55	15	35	55
100 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent									
2...........	2	3	22	4	6	32	− 2	− 3	−10
5...........	5	7	59	10	16	86	− 5	− 9	−27
10...........	10	18	135	19	35	189	− 9	−17	−54
20...........	18	58	319	35	93	414	−17	−35	−95
150 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent									
2...........	2	4	33	4	7	35	− 3	− 3	− 2
5...........	7	16	88	11	18	94	− 4	− 2	− 6
10...........	15	27	194	22	39	205	− 7	−12	−11
20...........	27	85	415	40	103	449	−13	−18	−34
250 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent									
2...........	4	7	54	5	8	40	− 1	− 1	14
5...........	12	18	142	13	20	105	− 1	− 2	37
10...........	26	44	303	26	46	231	0	− 2	72
20...........	45	136	570	48	119	505	− 3	17	65
500 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent									
2...........	8	14	107	7	9	45	1	5	62
5...........	23	37	268	17	24	119	6	13	149
10...........	50	86	512	32	54	262	18	32	250
20...........	86	250	748	60	142	573	26	108	175
100 Per Cent 1955–60 Basic Ultimate Tables, Males—5 Per Cent									
2...........	1	3	21	2	3	23	− 1	0	− 2
5...........	4	7	56	4	8	62	0	− 1	− 6
10...........	9	16	121	8	19	135	1	− 3	−14
20...........	15	45	257	14	50	295	1	− 5	−38

TABLE 2—*Continued*

	PRESENT VALUE OF DEATH BENEFITS						EXCESS OF EXTENDED IN- SURANCE OVER PAID-UP INSURANCE PRESENT VALUES		
	Extended Insurance			Paid-up Insurance					
PERIOD OF EXTENDED INSURANCE	Age at Lapse			Age at Lapse			Age at Lapse		
	15	35	55	15	35	55	15	35	55
150 Per Cent 1955–60 Basic Ultimate Table, Males—5 Per Cent									
2...........	2	4	32	2	4	26	0	0	6
5...........	6	10	83	5	10	70	1	0	13
10..........	14	24	174	10	22	153	4	2	21
20..........	22	67	338	18	59	336	4	8	2
250 Per Cent 1955–60 Basic Ultimate Table, Males—5 Per Cent									
2...........	4	7	53	3	5	31	1	2	22
5...........	11	17	134	6	13	84	5	4	50
10..........	23	39	272	13	28	183	10	11	89
20..........	37	107	472	23	74	402	14	33	70
500 Per Cent 1955–60 Basic Ultimate Table, Males—5 Per Cent									
2...........	7	13	104	4	6	28	3	7	76
5...........	22	34	253	9	17	102	13	17	151
10..........	45	77	463	18	37	223	27	40	240
20..........	71	198	643	33	97	489	38	101	154

perience showed that out of 1,000 cases, 888 would be issued standard, 8 would be issued with aviation extras or temporary extras, 64 would be issued substandard in the range 130 to 180 percent, 12 substandard in the range 180 to 300 percent, and 2 between 300 and 500 percent. The remaining 26 would be rejected, including those because sufficient underwriting experience was not obtainable. [*TSA*, IV, 789.]

In Table 2 the same rates of interest and mortality apply to the extended insurance option and to the paid-up insurance option. However, each option might be subject to different rates of interest and mortality. A comparison is shown in Table 3 of the excess of the extended insurance

TABLE 3

PERIOD OF EXTENDED INSURANCE	EXCESS OF EXTENDED INSURANCE OVER PAID-UP INSURANCE PRESENT VALUES					
	Assuming Same Mortality on Each Option			Assuming 50 Per Cent Higher Mortality on Extended Insurance than Paid-up Insurance		
	Age at Lapse			Age at Lapse		
	15	35	55	15	35	55
100 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent						
2..........	− 2	− 3	−10	− 2	− 2	1
5..........	− 5	− 9	−27	− 3	0	2
10..........	− 9	−17	−54	− 4	− 8	5
20..........	−17	−35	−95	− 8	− 8	1
250 Per Cent 1955–60 Basic Ultimate Table, Males—3 Per Cent						
2..........	− 1	− 1	14	− 1	0	25
5..........	− 1	− 2	37	1	2	64
10..........	0	− 2	72	6	6	122
20..........	− 3	17	65	6	41	123
100 Per Cent 1955–60 Basic Ultimate Table, Males—5 Per Cent						
2..........	− 1	0	− 2	0	1	9
5..........	0	− 1	− 6	2	2	21
10..........	1	− 3	−14	6	5	39
20..........	1	− 5	38	8	17	43
250 Per Cent 1955–60 Basic Ultimate Table, Males—5 Per Cent						
2..........	1	2	22	1	3	32
5..........	5	4	50	7	8	75
10..........	10	11	89	15	19	134
20..........	14	33	70	22	52	122

present values when the same mortality applies to each option and when 50 per cent higher mortality applies to the extended insurance option.

Because current yields on investments are high, it might be assumed that a higher rate of interest applies to the extended insurance option than to the presumably longer-lasting paid-up insurance option. A comparison is shown in Table 4 of the excess of the extended insurance present values

TABLE 4

PERIOD OF EXTENDED INSURANCE	EXCESS OF EXTENDED INSURANCE OVER PAID-UP INSURANCE PRESENT VALUES					
	Discounting Present Values of Both Options at 5 Per Cent			Discounting Present Values of Extended Insurance Option at 5 Per Cent and of Paid-up Insurance Option at 4 Per Cent		
	Age at Lapse			Age at Lapse		
	15	35	55	15	35	55
	100 Per Cent 1955–60 Basic Ultimate Table, Males					
2...........	− 1	0	− 2	− 2	− 2	− 7
5...........	0	− 1	− 6	− 3	− 5	−18
10...........	1	− 3	−14	− 4	−11	−41
20..........	1	− 5	−38	−10	−26	−98
	250 Per Cent 1955–60 Basic Ultimate Table, Males					
2...........	1	2	22	0	1	17
5...........	5	4	50	1	1	40
10...........	10	11	89	4	2	65
20..........	14	33	70	1	11	19

when the same interest rate is used in discounting each option and when an interest rate 1 per cent higher is used in discounting the extended insurance option.

Although the relationship is not constant, the change in present values when the extended insurance mortality is increased 50 per cent is roughly equal to the change in present values when the interest rate used in discounting the extended insurance present values is increased 1 per cent.

DIVIDENDS

In participating policies the paid-up insurance option is participating, whereas the extended insurance option is nearly always nonparticipating. Since most of the dividend on the paid-up insurance arises from interest earnings, the dividends used here are equal to the excess interest factor of 2 per cent applied to the paid-up insurance single premium. The present values of the dividends are discounted at 5 per cent on 100 per cent of the 1955–60 Basic Ultimate Male Table. Dividends under this assumption are given in Table 5 per $1,000 paid-up life insurance.

TABLE 5

DIVIDENDS AND PRESENT VALUE OF
DIVIDENDS PER $1,000 PAID-UP
LIFE INSURANCE

Age	Dividend*	Present Value of Dividends†
15...............	4	119
25...............	5	143
35...............	7	157
45...............	9	169
55...............	11	159

* Basis: 0.02 × 1,000 A_{x-1} 1958 CSO, 3 per cent.
† Discounted at 100 per cent 1955–60 Basic Ultimate Male Table, 5 per cent.

In Table 6 the present values of the dividends are given for the amounts of paid-up insurance at the 3 per cent rate of interest in Table 1. The excess of the present value of the extended insurance death benefits over the paid-up insurance death benefits is also shown for 150 and 250 per cent of the 1955–60 Basic Ultimate Male Table at 5 per cent. Under these assumptions, if the present value of the dividends exceeds the difference of the present value of the death benefits, the extended insurance option costs less than the participating paid-up insurance option.

The present values of the dividends shown in Table 6 exceed the excess of the present value of the extended insurance death benefit over the present value of the paid-up insurance death benefits at 150 per cent of the 1955–60 Basic Ultimate Male Table at 5 per cent. This relation holds true at 250 per cent of this table if lapse occurs at age 35 or younger.

For simplicity this example assumes dividends are paid in cash. In practice dividends are usually applied to purchase additional insurance on the basis of a net single premium. The preceding example could be ad-

justed to reflect this by increasing the dividends at each age by the ratio of the life insurance single premiums at the substandard level of mortality to that at the standard level of mortality and then discounting the adjusted dividends. This has not been done here because the adjustment would not have made a significant difference in the comparison. For example, the ratios of the life insurance single premiums at 250 per cent mortality to those at 100 per cent mortality are 137 per cent at age 15, 128 per cent at age 35, and 122 per cent at age 55.

TABLE 6

Period of Extended Insurance	Present Value of Dividends on Paid-up Insurance*			Excess of Present Value of Extended Insurance Death Benefits over Paid-up Insurance Death Benefits:					
				(1) †			(2) ‡		
	Age at Lapse			Age at Lapse			Age at Lapse		
	15	35	55	15	35	55	15	35	55
2.............	2	3	9	0	0	6	1	2	22
5.............	6	7	25	1	0	13	5	4	50
10.............	11	16	54	4	2	21	10	11	89
20.............	21	43	119	4	8	2	14	33	70

* Based on 100 per cent 1955–60 Basic Ultimate Male Table.
† Based on 150 per cent 1955–60 Basic Ultimate Male Table.
‡ Based on 250 per cent 1955–60 Basic Ultimate Male Table.

EXPENSES

In the following equations the present value of the death benefits and expenses of the extended insurance option are equal to those of the paid-up insurance option, according to the assumptions given earlier. E denotes the annual expense per $1,000 extended insurance, and S denotes the amount of paid-up life insurance given in Table 1 at 3 per cent.

$$1,000\,A^1_{x:\bar{t}|}+E\cdot\ddot{a}_{x:\bar{t}|}=S\cdot A_x+E\cdot\ddot{a}_x ,$$

$$E=\frac{1,000\,A^1_{x:\bar{t}|}-S\cdot A_x}{\ddot{a}_x-\ddot{a}_{x:\bar{t}|}} .$$

If the expense is larger than the amount shown in the second equation, the costs, ignoring dividends, of the extended insurance option will be lower than those of the paid-up insurance option. Table 7 shows the expenses meeting this condition.

TABLE 7

Annual Expense per $1,000 Extended Insurance for Which Extended Insurance Costs Equal Paid-up Insurance Costs

Period of Extended Insurance	Present Values Discounted at:					
	3 Per Cent Interest			5 Per Cent Interest		
	Age at Lapse			Age at Lapse		
	15	35	55	15	35	55
100 Per Cent 1955–60 Basic Ultimate Male Table						
2..........	*	*	*	*	*	*
5..........	*	*	*	0	*	*
10..........	*	*	*	0	*	*
20..........	*	*	*	0	*	*
150 Per Cent 1955–60 Basic Ultimate Male Table						
2..........	*	*	*	0	0	1
5..........	*	*	*	0	0	2
10..........	*	*	*	0	0	5
20..........	*	*	*	1	2	2
250 Per Cent 1955–60 Basic Ultimate Male Table						
2..........	*	*	0	0	0	3
5..........	*	*	6	0	0	9
10..........	0	*	20	1	2	33
20..........	*	3	†	3	11	†
500 Per Cent 1955–60 Basic Ultimate Male Table						
2..........	0	0	10	0	1	14
5..........	0	1	39	1	2	47
10..........	1	4	†	3	7	†
20..........	3	38	†	8	58	†

* Less than 0.
† Greater than 100.

According to Table 7, if expenses are as high as $0.50 per year per $1,000 extended insurance, the costs of the extended insurance are lower than those of the paid-up insurance for most periods of extended insurance at 150 per cent of the 1955–60 Basic Ultimate Male Table. This relation also holds true at 250 per cent of this table at ages 15 and 35.

The examples in this paper, although necessarily general, compare the costs of the nonforfeiture options at various levels of mortality. When dividends and expenses are considered, the costs of the extended insurance option are lower than those of the paid-up insurance option for many levels of substandard mortality according to the assumptions used here.

These conclusions may, or may not, be true for a particular company. However, by adjusting the assumptions to fit its experience, the relative costs of the nonforfeiture benefits can be found for its substandard policies.