



SOCIETY OF ACTUARIES

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Immunization

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our needs:

$$500 + (1210/2)(1/1.1)^2 = \\ (1100)(1/1.1)$$

If the interest rate changes, either upward or downward, to y , then let's let $x = 1.1/(1+y)$. The value of the first term above is still 500, but the value of the second term, which had been 500, now becomes $500x^2$, and the third term, which had a numerical value of 1000, now becomes $1000x$.

Dividing all these terms by 500, the new equation will have on the left side $1 + x^2$, and on the right side, $2x$. Now, let's be high-class about this and prove a lemma:

$$\begin{aligned} \text{Lemma:} \quad & 1 + x^2 \geq 2x \\ \text{Since:} \quad & (1 - x)^2 \geq 0 \\ & 1 - 2x + x^2 \geq 0 \\ \text{Therefore:} \quad & 1 + x^2 \geq 2x \end{aligned}$$

We can, therefore, be very comfortable with our instinctive decision to put half of our money into each of the two investments. Whichever way interest rates change, the combined holding will be adequate to provide the needed \$1,100.

Since this result just doesn't seem reasonable (even to me), let's look at what we have done and see how it relates to the complex formula usually used to determine duration.

What we did was to choose our investments so that our invested funds, on the average, matured at our target date. The complex formulas for duration are the inverse of this calculation, wherein we look at a bond or mortgage and determine for what period, on the average, we have made our investment. The crucial point is that the calculation isn't based on a weighting, using amounts to be paid multiplied by the time till payment—this gives the average maturity date, which is a different thing. Rather, in these duration calculations, we multiply the *present value* by the time till payment so as to get an average term for our investments.

The Basic Idea

The simple, basic idea behind immunization is that all investments that have the same duration, or average life, have the same changes in value when interest

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SOCIETY FINANCES IN PERSPECTIVE

by Robert J. Johansen, Treasurer

Inflation, membership growth and broadened activities have all boosted the Society's budget through the years. Added to our staff have been an Executive Director (1968), Director of Education (1977), Communications Manager, now Director of Communications (1978), Director of Finance (1979), and Director of Research (1981). Seminars, part of our continuing education program, have grown rapidly; 41 are in prospect for 1981-82.

Table I shows how our 1981-82 budget stacks up with results for 1980-81, and to the extent possible with two widely separated earlier years. The present cost-center accounting doesn't go back farther than 1980-81, preventing fully detailed comparisons with the early years; a three-year comparison on the old basis is available in *The Actuary*, December 1981.

Table II shows these figures adjusted for CPI changes since 1958-59, a period during which the Consumer Price Index has more than tripled.

Adjusted income from dues reflects, of course, membership growth as well as the dues scale itself; likewise, examination fee income grows with numbers of students as well as the fee level. Inflation-adjusted expenses per member increased between 1958-59 and a decade later, but have remained fairly stable since, as have, even more so, adjusted dues per member.

The Society's ability to engage in new activities on members' behalf evidently comes largely from growth in the number of our members.

Table I
SOCIETY INCOME AND EXPENSE

(Amounts in Thousands)

<u>Income</u>	<u>1958-59</u>	<u>1968-69</u>	<u>1980-81</u>	<u>Budget 1981-82</u>
Membership Dues	\$ 44 M	128	801	932
Seminars			186	350
Meetings	1	40	264	301
Exam Fees	26	108	830	903
Publications	32	53	136	95
Investment Income	5	11	134	125
Other Income	15*	34*	408	436
Total Income	123*	374*	2,759	3,142
<u>Expenses (By Cost Center)</u>				
Seminars			208	348
Meetings			261	303
Examinations			1,056	1,011
Public Information		(Figures by	46	62
Research Services		Cost Center	3	112
Other Memb. Services		Not	873	1,002
Gen. & Administrative		Available)	283	301
Total Expense	114*	391*	2,730	3,139
Income Less Expense	+ 9	- 17	+ 29	+ 3
<u>Statistics</u>				
Number of Members	1,822	3,275	7,697	8,447
Dues per Fellow (\$)	30	50	130	145
Expense per Member (\$)	60*	120*	355	370
Equity per Member (\$)	143	77	66	60
(Funds on hand)				

*These figures, and the same ones in Table II, would be higher if the assessments and expenses for mortality and morbidity reports had been accounted for in the manner used today.