

QUESTION 3

20 MARKS

Your office has a sub fund consisting entirely of yearly renewable term policies all written in the last year.

There are now 10,000 policies written at a premium of \$100 each, paid annually in advance. The death benefit is \$10,000. Capital at the start of the year was \$1m.

The Margin on Services valuation at outset used the following assumptions:

- acquisition expenses \$70 per policy incurred at the start of the year
- servicing expenses \$15pa per policy incurred at the end of the year in respect of policies inforce at the end of each year
- mortality rate : 0.25% first year, 0.5% second year, and 0.75% thereafter with deaths occurring evenly over the year.
- lapses 10% pa, occurring at the end of the year
- net investment return 10% pa
- the profit margin at outset was 16.1% of premium
- the expected Margin on Services Policy Liability at the end of the year was -\$27.15 per policy.

EXAMINATIONS

LIFE INSURANCE
SPECIALIST LEVEL

1996 EXAMINATIONS
PAPER ONE

Actual experience during the year was as follows:

- acquisition expenses \$80 per policy
- renewal expenses \$15 per policy
- mortality rate 0.30% in the first year
- lapses 12% pa
- investment earnings rate 15%

You have prepared a revenue account based on the expected experience to compare with the actual revenue account:

	Expected \$'000	Actual \$'000
Income		
Premiums	1,000	1,000
Net Interest Income	118	158

Outgo		
Policy Payments	250	300
Acquisition Expenses	700	800
Renewal Expenses	135	132
Increase/(Decrease) in policy liabilities	(244)	(238)
No of policies in force at year end	8,978	8,774

Calculate the actual and expected Margin on Services profit for the year.

Analyse the excess or shortfall in MoS profit arising from that expected.

END OF PAPER

Q3 - Soln

- 1 -

EXPECTED

Capital
\$1,000,000

Premiums
10,000 pols \times \$100 AP
= \$1,000,000 AP

INV = 10%

Acq. Exps
-\$70 \times 10,000 pols
= -\$700,000

Death Ben
- 0.0025 \times 10,000 pols
\times 10,000 SI
= <u>- 250,000</u>

Servicing Exps
-\$15 \times 8,977.5
= <u>- \$134,663</u>

= 8,977.5

$$= 10,000 \times (1 - 0.002) \times (1 - 0.1)$$

$$\uparrow \quad \uparrow$$
 lapse rate death rate

Expected Inv (\$8000)

$$= (\$1,000 + \$1,000 - \$700) \times 0.1$$

$$- \$250 \times 0.05$$

$$= 118 \quad (\text{or } \$18 \text{ excluding interest on capital})$$

ACTUAL

Capital
\$1,000,000

Premiums
10,000 pols \times \$100 AP
= \$1,000,000 AP.

INV = 15%.

Acq Exgs
-\$80 \times 10,000 pols.
= -\$800,000

Death Ben
- 0.003 \times 10,000 pols
\times 10,000 ST
= <u>-300,000</u>

Actual Pols
= 10,000
\times (1 - 0.0030)
\times (1 - 0.12)
= 8,774. ✓
Revered Exgs
-\$15 \times 8,774
= <u>-8131.616</u>

Actual Inv ('\$000)

$$= (\$1,000 + \$1,000 - \$800) \times 0.15 - 300 \times 0.075$$

Capital Premiums Acq Death

= 158 (or \$8 excluding interest on capital).

Exptd Revenue A/c - Excluding Capital (\$'000)

F _o	Prem's	Claims	Exp	Int	PM Rel	F _i
0	1,000	-250	-700	18	-161 x 1.1	244
			-135		= -177	

Check
 $8,977.5 \text{ pds} \times -27.15 \text{ Rs per po}$
 $= -243,739. \checkmark$

Actual Revenue A/c - Excluding Capital (\$'000)

F _o	Prem's	Claims	Exp	Int	PM Rel	F _i
0	1,000	-300	-800	8	-161 x 1.15	-409
			-132		= -185	

cf Wals
 $= -238 \checkmark$

Check $8774 \text{ pds} \times -27.15 \text{ Rs per po}$
 $= -238,214 \checkmark$

They have not used up all PM's in charging ass'ns.

Check: PM Released ----- 185
 Expense Loss -409+238 = -171
 Earn on Cap

150
164 \checkmark Profit

Actual and Expected MOS Profit is as follows

	EXPECTED	ACTUAL
Prem's	1,000.	1,000
Claims	- 250	- 300
Inv	118	158
Exps. - Aca	- 700	- 800
- Ren	- 135	- 132
Δ Liab's	244	238
MOS PROFIT.	<u>277</u>	<u>164.</u>

1. Interest Profit - Exp Int
- Actual others

$$= 158 - (1,000 + 1,000 - \$800) \times 0.1 - 300 \times 0.05$$

↑ Actual Int. ↑ Capital ↑ Premiums ↑ Acq ↑ Death

Expected int. rate on actual cash flows.

$$= 158 - 105$$

$$= \underline{\underline{53}}$$

2. Expense Profit

- Exp Int
- Exp Expense
- Actual Others

Acquisition

$$(700 - 800) \times (1 - 1) = -110$$

↑ Exp Expenses (Acq) ↑ Actual Expenses (Acq) ↑ Expected Int Rate

Renewal (Servicing)

$$(132 - 132) = \underline{\underline{NIL}}$$

↑ Expected expenses on actual decrements ↑ Actual expenses on actual decrements

3. 8 Lapse

- Exp Inc
- Exp Expense
- Exp Lapse
- Actual Others

EXPECTED STRAIN

$$\begin{array}{c}
 \uparrow \qquad \qquad \uparrow \\
 \text{Payment} \quad \text{Liability} \\
 \text{on Lapse} \quad \text{for policy}
 \end{array}
 \left[0 - (-27.15) \right] \times 10,000 \times (1 - 0.003) \times 0.10 = \underline{\underline{27}}$$

$$\begin{array}{c}
 \uparrow \qquad \qquad \uparrow \\
 \text{Actual} \quad \text{Expected} \\
 \text{death} \quad \text{Lapse} \\
 \text{rate} \quad \text{rate}
 \end{array}$$

ACTUAL STRAIN

$$\left[0 - (-27.15) \right] \times 10,000 \times (1 - 0.003) \times 0.12 = \underline{\underline{32}}$$

$$\begin{array}{c}
 \uparrow \\
 \text{Actual} \\
 \text{Lapse} \\
 \text{rate}
 \end{array}$$

∴ Profit on Lapse = — 85.

4. Mortality

- Exp Int
- Exp Expense
- Exp Lapse
- Exp Mort
- Actual Others

EXPECTED STRAIN

$$\begin{aligned}
 & \left[10,000 - \left[\frac{-27.15 + 15}{(1.05)} \right] \right] \times 0.0025 \times (1.05) \times 10,000 = \underline{263} \\
 & \quad \uparrow \qquad \qquad \qquad \uparrow \qquad \qquad \qquad \uparrow \qquad \qquad \qquad \uparrow \\
 & \text{Payment on death} \quad \text{Liability at time of death} \quad \text{Expected Death Rate} \quad \text{Int} \quad \text{No. pets}
 \end{aligned}$$

less

ACTUAL STRAIN

$$\left[10,000 - \left[\frac{-27.15 + 15}{(1.05)} \right] \right] \times 0.003 \times (1.05) \times 10,000 = 315$$

equals

- 52 ~~2~~

5. Profit Margins Released

$$\begin{aligned}
 & 0.161 \times 1,000 \times (1.10) = \underline{177} \\
 & \quad \uparrow \qquad \qquad \qquad \uparrow \qquad \qquad \qquad \uparrow \\
 & \text{PM \%} \quad \text{Annual Prem} \quad \text{Int}
 \end{aligned}$$

6. Interest on Capital

$$1,000 \times 0.1 = 100$$

SUMMARY OF ANALYSIS

Interest	53
Expense	-110
Layse	-5
Mort	-52

}

$$\Sigma = -114$$

ie

=

$$164 - 277 =$$

ie diff betw
exp & actual
profit

PM Released	177
Int. on Capital	100

~~163~~

163

of TOTAL
PROFIT

164