4.1.2 → Marketing considerations

→ Covered in above pdf ?

→ Assignment

→ Q1) The fundamental insurance equation is:

$$\text{Premium} = \text{Losses} + \text{Loss Adjustment Expense} + \text{Underwriting Expenses} + \text{Underwriting Profit}$$

Werner and Modlin state that "It is important to consider the ***fundamental insurance equation*** at the individual or segment level" in addition to the aggregate level.
Discuss two reasons it would be acceptable to maintain an imbalance in the fundamental insurance equation at the individual or segment level.

→ Maintaining a competitive position could justify underpricing to avoid losing market share or retention. Insurers may use a lifetime value approach, accepting short term imbalance if long-term profitability is expected

→ If the operational cost of implementing changes exceeds the financial benefit, it may be reasonable to have the equation unbalanced. Resource limitations may make balancing the equation too costly or time-consuming, & insufficient data might prevent precise adjustments

→ Regulatory constraints may limit the impact of rate changes on individuals, preventing balance for the equation at the individual level.

→ Q2) An insurer categorizes policies into two groups: "New Business" and "Renewal". A policy is considered to be "New Business" during its first year and "Renewal" for each year thereafter. Information about both policy types is given in the table below on an annual basis.

Group	Earned Premium	Expenses
New Business	$500	$150
Renewal	$500	$80

- The expected loss cost is $400 for the first year and decreases by $10 each renewal.
- The discount rate is 5%.
- The probability of the first renewal is 90%.
- The probability of the second renewal is 85%.
- No policyholders renew 3 times.
- All expenses including losses are incurred at the beginning of the policy year.

Determine the lifetime value of the expected total profit.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2										=IF(G6=1,$G$6,$D$7)*VLOOKUP(G6-1,$C$12:$C$14,$D$12:$D$14)*(1+$C$11)^-(G6-1)						
3										=IF(G6=1,$C$9,$C$9-(G6-1)*$C$10)*VLOOKUP(G6-1,$C$12:$C$14,$D$12:$D$14)*(1+$C$11)^-(G6-1)						
4										=IF(G6=1,$C$6,$C$7)*VLOOKUP(G6-1,$C$12:$C$14,$D$12:$D$14)*(1+$C$11)^-(G6-1)						
5		Group	Earned Premium	Expenses				EP	Pure Premium	LAE						
6		New Business	$500	$150		Year	1	$600.00	$400.00	$150.00						
7		Renewal	$500	$80		Year	2	$428.57	$334.29	$88.57						
8						Year	3	$346.94	$263.67	$55.51						
9		Expected loss cost per year	400			Total		$1,276	$998	$274						
10		Expected decrease in loss cost per year	10					=SUM(H6:H8)								
11		Discount rate	0.05													
12		Probability of renewal # (NB)	0	1												
13		Probability of renewal #	1	0.9	0.9											
14		Probability of renewal #	2	0.765	0.85	=D13*E14		Lifetime value of expected profit =		$3.47	=H9-SUM(I9:J9)					
15																

(working down ⇒ by category)

OR (easier way)

→

Policy Year	Earned Premium (1)	Expenses (2)	Loss Cost (3)	Cumulative Persistency (4)	Expected Profit (5)	Discount Factor (6)	Expected Present Value (7)
1	$500	$150	$400	100%	−$50.00	1	−$50.00
2	$500	$80	$390	90%	$27.00	1.05^{-1}	$25.71
3	$500	$80	$380	76.50%	$30.60	1.05^{-2}	$27.76

(working across ⇒ year by year)

- (4): The probability a new policyholder will still be with the insurer for a given policy year.
- $(5) = [(1) - (2) - (3)] \times (4)$
- (6): Calculated using the discount rate of 5%.
- $(7) = (5) \times (6)$

The lifetime value of a policy is the sum of each term in (7).

$$\begin{aligned}\text{Lifetime Value} &= (-\$50.00) + \$25.71 + \$27.76 \\ &= \mathbf{\$3.47}\end{aligned}$$