

Reading: Werner 15: Commercial Ratemaking
Model: Text Example
Problem Type: Retrospective Rating

W-15 (070) - (Problem 1)

Find Calculate the WC retrospective premium.

Given

computation of retrospective premium:	
first:	6
subsequent:	annually

<== months after end of policy period

limited rptd loss @ 18 mths	149,000
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provisions for WC retrospective rating plan		abbreviation
(1) Minimum retrospective premium ratio (negotiated)	75%	min retro ratio
(2) Maximum retrospective premium ratio (negotiated)	125%	max retro ratio
(3) Loss Conversion Factor (negotiated)	1.12	LCF
(4) Per Accident Loss Limitation (negotiated)	100,000	LL
(5) Expense Allowance (excludes tax multiplier)	21%	EA
(6) Expected Loss Ratio	80%	ELR
(7) Tax Multiplier	1.03	TM
(8) Standard Premium	670,500	SP
(9) Insurance Charge for Maximum Premium	0.45	min IC
(10) Insurance Savings for Minimum Premium	0.06	max IC

Step 1a calculate the standard premium: SP

$$\begin{aligned}
 \text{SP} &= (\text{manual premium}) \times (\text{experience mod.}) \times (1 + \text{discount/surcharge}) \\
 &= \dots \\
 &= 670,500 \quad \text{<== standard premium is given (no calculation necessary)}
 \end{aligned}$$

Step 1b calculate the Net Insurance Charge: NIC

$$\begin{aligned}
 \text{NIC} &= (\text{max IC} - \text{min IC}) \times \text{ELR} \times \text{LCF} \\
 &= (0.45 - 0.06) \times 80\% \times 1.12 \\
 &= 0.3494
 \end{aligned}$$

Step 1c calculate the basic premium: BP

$$\begin{aligned}
 \text{BP} &= (\text{EA} - \text{ELR} \times (\text{LCF} - 1.0) + \text{NIC}) \times \text{SP} \\
 &= (21\% - 0.0960 + 0.3494) \times 670,500 \\
 &= 310,737
 \end{aligned}$$

Step 2 calculate the converted losses

$$\begin{aligned}
 \text{converted losses} &= (\text{limited reported losses @ 18 months}) \times \text{LCF} \\
 &= 149,000 \times 1.12 \\
 &= 166,880
 \end{aligned}$$

Step 3 calculate the retrospective premium: RP

$$\begin{aligned}
 \text{preliminary RP} &= (\text{BP} + \text{converted losses}) \times \text{Tax Multiplier} \\
 &= (310,737 + 166,880) \times 1.03 \\
 &= 491,945
 \end{aligned}$$

$$\begin{aligned}
 \text{min RP} &= \text{min retro ratio} \times \text{SP} = 75\% \times 670,500 = \underline{502,875} \\
 \text{max RP} &= \text{max retro ratio} \times \text{SP} = 125\% \times 670,500 = \underline{838,125}
 \end{aligned}$$

$$\begin{aligned}
 \text{final RP} &= \text{apply (min RP) \& (max RP) as lower/upper bounds to preliminary RP} \\
 &= 502,875 \quad \text{<==== final answer}
 \end{aligned}$$

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W-15 (070) - (Problem 2)

Find Calculate the WC retrospective premium.

Given

computation of retrospective premium:	
first:	6
subsequent:	annually

<== months after end of policy period

limited rptd loss @ 18 mths	104,000
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provisions for WC retrospective rating plan		abbreviation
(1) Minimum retrospective premium ratio (negotiated)	70%	min retro ratio
(2) Maximum retrospective premium ratio (negotiated)	130%	max retro ratio
(3) Loss Conversion Factor (negotiated)	1.15	LCF
(4) Per Accident Loss Limitation (negotiated)	200,000	LL
(5) Expense Allowance (excludes tax multiplier)	20%	EA
(6) Expected Loss Ratio	60%	ELR
(7) Tax Multiplier	1.02	TM
(8) Standard Premium	561,600	SP
(9) Insurance Charge for Maximum Premium	0.36	min IC
(10) Insurance Savings for Minimum Premium	0.05	max IC

Step 1a calculate the standard premium: SP

$$\begin{aligned}
 \text{SP} &= (\text{manual premium}) \times (\text{experience mod.}) \times (1 + \text{discount/surcharge}) \\
 &= \dots \\
 &= 561,600 \quad \text{<== standard premium is given (no calculation necessary)}
 \end{aligned}$$

Step 1b calculate the Net Insurance Charge: NIC

$$\begin{aligned}
 \text{NIC} &= (\text{max IC} - \text{min IC}) \times \text{ELR} \times \text{LCF} \\
 &= (0.36 - 0.05) \times 60\% \times 1.15 \\
 &= 0.2139
 \end{aligned}$$

Step 1c calculate the basic premium: BP

$$\begin{aligned}
 \text{BP} &= (\text{EA} - \text{ELR} \times (\text{LCF} - 1.0) + \text{NIC}) \times \text{SP} \\
 &= (20\% - 0.0900 + 0.2139) \times 561,600 \\
 &= 181,902
 \end{aligned}$$

Step 2 calculate the converted losses

$$\begin{aligned}
 \text{converted losses} &= (\text{limited reported losses @ 18 months}) \times \text{LCF} \\
 &= 104,000 \times 1.15 \\
 &= 119,600
 \end{aligned}$$

Step 3 calculate the retrospective premium: RP

$$\begin{aligned}
 \text{preliminary RP} &= (\text{BP} + \text{converted losses}) \times \text{Tax Multiplier} \\
 &= (181,902 + 119,600) \times 1.02 \\
 &= 307,532
 \end{aligned}$$

$$\begin{aligned}
 \text{min RP} &= \text{min retro ratio} \times \text{SP} = 70\% \times 561,600 = 393,120 \\
 \text{max RP} &= \text{max retro ratio} \times \text{SP} = 130\% \times 561,600 = 730,080
 \end{aligned}$$

$$\begin{aligned}
 \text{final RP} &= \text{apply (min RP) \& (max RP) as lower/upper bounds to preliminary RP} \\
 &= 393,120 \quad \text{<==== final answer}
 \end{aligned}$$