Reading: Werner 14: Implementation
Model: Text Example
Problem Type: Limiting Premium Effect of a Single Variable **(Base Level)**

Find Calculate the relativities that satisfy the given requirements.

overall rate change	9%
maximum premium increase for any level of the rating variable	18%

Given **Rating variable information prior to capping**

level	premium	current	indicated
A	549,000	0.85	0.69
B	316,000	1.00	1.00
C	170,000	1.33	1.17
total	1,035,000	--	--

Step 1 calculate total %-change for each rating variable level

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
level	premium	current	indicated	change	off-bal	overall	total chg	new prem	
A	549,000	0.85	0.69	-18.82%	1.1359	9%	0.50%	551,762	
B	316,000	1.00	1.00	0.00%	1.1359	9%	23.81%	391,234	<==== *base level*
C	170,000	1.33	1.17	-12.03%	1.1359	9%	8.91%	185,154	
total	1,035,000	--	--	-11.96%	1.1359	9%	9.00%	1,128,150	
				= Δs%					

(5) = (4) / (3) - 1.0
(Tot5) = (5) weighted by (2)
(6) = 1.0 / (1.0 + (Tot5)) = off-balance = 1 / (1 + Δs%)
(7) = given
(8) = [1.0 + (5)] x (6) x [1.0 + (7)] - 1.0
(9) = (2) x (1.0 + (8))

Step 2 since the BASE LEVEL change exceeds the cap, we will adjust the base rate to bring it down

base rate adjustment = (1 + max increase) / (1 + total base level change fom column (8))
= 1.18 / 1.2381
= 0.9531 <==== *base rate adjustment*

Step 2b calculate the premium shortfall created by the base rate decrease in step 2a

revised premium for B = (9) x (base rate decrease)
= 391,234 x 0.9531
= **372,880**

shortfall = 391,234 - **372,880** = 18,354 <==== *premium shortfall*

Step 3a redistribute this shortfall across levels A and C by increasing their relativities by a proportional amount

premium for levels A & C = 551,762 + 185,154 = **736,916**

required relativity increase = 18,354 / **736,916** = **2.491%** <==== *A & C relativity increase*

Step 3b BUT, we must now back out the base rate decrease from A & C so we don't "lose" any of the new premium

Level	original indicated		relativity adjustment		base rate adjustment		adjusted relativities	
A	0.69	x	**1.0249**	/	0.9531	=	0.7420	<==== *revised Level A relativity*
B	1.00						1.0000	<==== *base level (no change)*
C	1.17	x	**1.0249**	/	0.9531	=	1.2582	<==== *revised Level C relativity*

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final answers

Reading: Werner 14: Implementation
Model: Text Example
Problem Type: Limiting Premium Effect of a Single Variable **(Base Level)**

Find Calculate the relativities that satisfy the given requirements.

overall rate change	5%
maximum premium increase for any level of the rating variable	9%

Given **Rating variable information prior to capping**

level	premium	current	indicated
A	530,000	0.90	0.79
B	357,000	1.00	1.00
C	184,000	1.25	1.06
total	1,071,000	--	--

Step 1 calculate total %-change for each rating variable level

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
level	premium	current	indicated	change	off-bal	overall	total chg	new prem	
A	530,000	0.90	0.79	-12.22%	1.0948	5%	0.90%	534,795	
B	357,000	1.00	1.00	0.00%	1.0948	5%	14.95%	410,389	<==== *base level*
C	184,000	1.25	1.06	-15.20%	1.0948	5%	-2.52%	179,366	
total	1,071,000	--	--	-8.66%	1.0948	5%	5.00%	1,124,550	
				= Δs%					

(5) = (4) / (3) - 1.0
(Tot5) = (5) weighted by (2)
(6) = 1.0 / (1.0 + (Tot5)) = off-balance = 1 / (1 + Δs%)
(7) = given
(8) = [1.0 + (5)] x (6) x [1.0 + (7)] - 1.0
(9) = (2) x (1.0 + (8))

Step 2 since the BASE LEVEL change exceeds the cap, we will adjust the base rate to bring it down

base rate adjustment = (1 + max increase) / (1 + total base level change fom column (8))
= 1.09 / 1.1495
= 0.9482 <==== *base rate adjustment*

Step 2b calculate the premium shortfall created by the base rate decrease in step 2a

revised premium for B = (9) x (base rate decrease)
= 410,389 x 0.9482
= **389,130**

shortfall = 410,389 - **389,130** = 21,259 <==== *premium shortfall*

Step 3a redistribute this shortfall across levels A and C by increasing their relativities by a proportional amount

premium for levels A & C = 534,795 + 179,366 = **714,161**

required relativity increase = 21,259 / **714,161** = **2.977%** <==== *A & C relativity increase*

Step 3b BUT, we must now back out the base rate decrease from A & C so we don't "lose" any of the new premium

Level	original indicated		relativity adjustment		base rate adjustment		adjusted relativities	
A	0.79	x	**1.0298**	/	0.9482	=	0.8580	<==== *revised Level A relativity*
B	1.00						1.0000	<==== *base level (no change)*
C	1.06	x	**1.0298**	/	0.9482	=	1.1512	<==== *revised Level C relativity*

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final answers