Reading: Werner 12: Credibility

Model: Text Example

Problem Type: Harwayne's Method

Find Calculate the complement of credibility using Harwayne's method for:

state:	A	and	state:	C
class:	1		class:	2

Given

state	class	expos	loss	PP
A	1	100	500	5.0
	2	450	1,350	3.0
	3	150	600	4.0
	total	700	2,450	3.500
B	1	180	900	5.0
	2	420	3,990	9.5
	3	60	390	6.5
	total	660	5,280	8.000
C	1	90	1,215	13.5
	2	450	6,525	14.5
	3	630	9,450	15.0
	total	1,170	17,190	14.692
D	1	150	225	1.5
	2	90	360	4.0
	3	210	525	2.5
	total	450	1,110	2.467

** PP = Pure Premium*

state:	A
class:	1

Use Harwayne's method to find a complement of credibility for state A & class 1.

Step 1 calculate **adjusted total PP** for states B, C, D, using exposures from state A as weights

						state A total expos.
PP for state A:		3.500	<====	given		----
adjusted PP for state B	=	8.214	=	(100 x 5 + 450 x 9.5 + 150 x 6.5)	/	700
adjusted PP for state C	=	14.464	=	(100 x 13.5 + 450 x 14.5 + 150 x 15)	/	700
adjusted PP for state D	=	3.321	=	(100 x 1.5 + 450 x 4 + 150 x 2.5)	/	700

Step 2 calculate **adjusted class 1 PP** for states B, C, D, using the ratios of (state A PP) to (adjusted PP of each of states B, C, D)

				class 1 PP		
adjusted class 1 PP for state A	=	----	<====	not required because this is the base class		
adjusted class 1 PP for state B	=	2.130	=	5.0	x	3.5 / 8.214
adjusted class 1 PP for state C	=	3.267	=	13.5	x	3.5 / 14.464
adjusted class 1 PP for state D	=	1.581	=	1.5	x	3.5 / 3.321

Step 3 calculate a **new class 1 PP for the complement** as a weighted average of Step 2 results using class 1 exposures as weights

new class 1 PP for complement (for state A)	=	2.178 *(final answer)*	=	(180 x 2.13 + 90 x 3.267 + 150 x 1.581) / (180 + 90 + 150)

state:	C
class:	2

Now we'll repeat Harwayne's method but for state C & class 2.

Step 1 calculate **adjusted total PP** for states A, B, D, using exposures from state A as weights

						state C total expos.
PP for state A:		3.692	=	(90 x 5 + 450 x 3 + 630 x 4)	/	1,170
adjusted PP for state B	=	7.538	=	(90 x 5 + 450 x 9.5 + 630 x 6.5)	/	1,170
adjusted PP for state C	=	14.692	<====	given		----
adjusted PP for state D	=	3.000	=	(90 x 1.5 + 450 x 4 + 630 x 2.5)	/	1,170

Step 2 calculate **adjusted class 2 PP** for states A, B, D, using the ratios of (state C PP) to (adjusted PP of each of states A, B, D)

				class 2 PP		
adjusted class 2 PP for state A	=	11.938	=	3.0	x	14.692 / 3.692
adjusted class 2 PP for state B	=	18.515	=	9.5	x	14.692 / 7.538
adjusted class 2 PP for state C	=	----	<====	not required because this is the base class		
adjusted class 2 PP for state D	=	19.590	=	4.0	x	14.692 / 3

Step 3 calculate a **new class 2 PP for the complement** as a weighted average of Step 2 results using class 2 exposures as weights

new class 2 PP for complement (for state C)	=	15.533 *(final answer)*	=	(450 x 11.938 + 420 x 18.515 + 90 x 19.59) / (450 + 420 + 90)

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Model: Text Example

Problem Type: Harwayne's Method

Find Calculate the complement of credibility using Harwayne's method for:

state:	A	and	state:	C
class:	1		class:	2

Given

state	class	expos	loss	PP
A	1	150	1,050	7.0
	2	50	325	6.5
	3	150	825	5.5
	total	350	2,200	6.286
B	1	300	2,400	8.0
	2	180	900	5.0
	3	360	2,880	8.0
	total	840	6,180	7.357
C	1	180	2,700	15.0
	2	810	7,695	9.5
	3	450	3,600	8.0
	total	1,440	13,995	9.719
D	1	240	960	4.0
	2	300	1,050	3.5
	3	300	1,050	3.5
	total	840	3,060	3.643

** PP = Pure Premium*

state:	A
class:	1

Use Harwayne's method to find a complement of credibility for state A & class 1.

Step 1 calculate **adjusted total PP** for states B, C, D, using exposures from state A as weights

						state A total expos.
PP for state A:		6.286	<====	**given**		----
adjusted PP for state B	=	7.571	=	(150 x 8 + 50 x 5 + 150 x 8)	/	350
adjusted PP for state C	=	11.214	=	(150 x 15 + 50 x 9.5 + 150 x 8)	/	350
adjusted PP for state D	=	3.714	=	(150 x 4 + 50 x 3.5 + 150 x 3.5)	/	350

Step 2 calculate **adjusted class 1 PP** for states B, C, D, using the ratios of (state A PP) to (adjusted PP of each of states B, C, D)

				class 1 PP		
adjusted class 1 PP for state A	=	----	<====	**not required because this is the base class**		
adjusted class 1 PP for state B	=	6.642	=	8.0	x	6.286 / 7.571
adjusted class 1 PP for state C	=	8.408	=	15.0	x	6.286 / 11.214
adjusted class 1 PP for state D	=	6.769	=	4.0	x	6.286 / 3.714

Step 3 calculate a **new class 1 PP for the complement** as a weighted average of Step 2 results using class 1 exposures as weights

new class 1 PP for complement (for state A)	=	7.126 *(final answer)*	=	(300 x 6.642 + 180 x 8.408 + 240 x 6.769) / (300 + 180 + 240)

state:	C
class:	2

Now we'll repeat Harwayne's method but for state C & class 2.

Step 1 calculate **adjusted total PP** for states A, B, D, using exposures from state A as weights

						state C total expos.
PP for state A:		6.250	=	(180 x 7 + 810 x 6.5 + 450 x 5.5)	/	1,440
adjusted PP for state B	=	6.313	=	(180 x 8 + 810 x 5 + 450 x 8)	/	1,440
adjusted PP for state C	=	9.719	<====	**given**		----
adjusted PP for state D	=	3.563	=	(180 x 4 + 810 x 3.5 + 450 x 3.5)	/	1,440

Step 2 calculate **adjusted class 2 PP** for states A, B, D, using the ratios of (state C PP) to (adjusted PP of each of states A, B, D)

				class 2 PP		
adjusted class 2 PP for state A	=	10.108	=	6.5	x	9.719 / 6.25
adjusted class 2 PP for state B	=	7.698	=	5.0	x	9.719 / 6.313
adjusted class 2 PP for state C	=	----	<====	**not required because this is the base class**		
adjusted class 2 PP for state D	=	9.548	=	3.5	x	9.719 / 3.563

Step 3 calculate a **new class 2 PP for the complement** as a weighted average of Step 2 results using class 2 exposures as weights

new class 2 PP for complement (for state C)	=	8.973 *(final answer)*	=	(50 x 10.108 + 180 x 7.698 + 300 x 9.548) / (50 + 180 + 300)