Reading: Bahnemann.Chapter6 Bahnemann_StrDed (Problem 1)
Model: Source Text
Problem Type: Calculate various aspects using a straight deductible

Given

Deductible, d	E[X;d]	$F_X(d)$	C(d)	(Modified) Frequency	Severity	Pure Premium
0	0	0	?	?	?	?
1,000	659	0.4847	?	?	?	?
2,000	1,111	0.5989	?	?	?	?
3,000	1,478	0.6625	?	?	?	?
5,000	2,071	0.7364	?	?	?	?
10,000	3,144	0.8215	?	?	?	?

0.0005	Ground-up claim frequency, ϕ
100,000	Basic policy limit
8,896	Basic limit expected loss, E[X;b]
0	Fixed ALAE per claim, ε
20%	Variable ALAE, u

Find

a.) Fill in the missing information in the table.

b.) For a policy with a deductible of $2,000
i.) Calculate the deductible-adjusted frequency
ii.) Calculate the modified severity.

c.) The basic limit premium for a policy is $3,285
The ILF for a $1,000,000 limit is 1.8074
Calculate the premium for a policy with $1,000,000 limit and $2,000 deductible.

Solution

Recall $C(d) = \dfrac{E[X;d] + F_X(d)\cdot\epsilon}{E[X;b] + \epsilon}$, modified frequency = $\phi(1 - F_X(d))$, and

modified severity = $\left(\dfrac{E[X;b] - E[X;d] + \big(1 - F_X(d)\big)\epsilon}{1 - F_X(d)}\right)\cdot(1+u)$

Notice if $\epsilon = 0$ then C(d) simplifies to $C(d) = \dfrac{E[X;d]}{E[X;b]}$

a.)

Deductible, d	E[X;d]	F_X(d)	C(d)	(Modified) Frequency	Severity	Pure Premium
0	0	0	0.0000	0.000500	$10,675	$5.34
1000	659	0.4847	0.0741	0.000258	$19,182	$4.94
2000	1111	0.5989	0.1249	0.000201	$23,291	$4.67
3000	1478	0.6625	0.1661	0.000169	$26,375	$4.45
5000	2071	0.7364	0.2328	0.000132	$31,070	$4.10
10000	3144	0.8215	0.3534	0.000089	$38,669	$3.45

b.)

i.) We can read this off directly from the frequency column for the $2,000 deductible row: 0.000201

ii.) Same row, severity column $23,291

c.) The formula is $P_b \cdot (I(L) - C(d))$

Here L = $1,000,000 and d = $2,000

P_L = $5,527.05

Reading: Bahnemann.Chapter6 Bahnemann_StrDed (Problem 2)
Model: Source Text
Problem Type: Calculate various aspects using a straight deductible

Given

Deductible, d	E[X;d]	FX(d)	C(d)	(Modified) Frequency	Severity	Pure Premium
0	0	0	?	?	?	?
750	336	0.5374	?	?	?	?
1,000	464	0.6077	?	?	?	?
1,750	1,606	0.6322	?	?	?	?
2,000	1,745	0.6675	?	?	?	?
8,500	3,164	0.8272	?	?	?	?

0.0007	Ground-up claim frequency, ϕ
150,000	Basic policy limit
11,649	Basic limit expected loss, E[X;b]
300	Fixed ALAE per claim, ε
21%	Variable ALAE, u

Find

a.) Fill in the missing information in the table.

b.) For a policy with a deductible of $750
i.) Calculate the deductible-adjusted frequency
ii.) Calculate the modified severity.

c.) The basic limit premium for a policy is $4,393
The ILF for a $1,750,000 limit is 1.8922
Calculate the premium for a policy with $1,750,000 limit and $750 deductible.

Solution

Recall $C(d) = \dfrac{E[X;d] + F_X(d)\cdot\epsilon}{E[X;b]+\epsilon}$, modified frequency = $\phi(1-F_X(d))$, and

modified severity = $\left(\dfrac{E[X;b]-E[X;d]+(1-F_X(d))\epsilon}{1-F_X(d)}\right)\cdot(1+u)$

Notice if $\epsilon = 0$ then C(d) simplifies to $C(d) = \dfrac{E[X;d]}{E[X;b]}$

a.)

Deductible, d	E[X;d]	$F_X(d)$	C(d)	(Modified) Frequency	Severity	Pure Premium
0	0	0	0.0000	0.000700	$14,458	$10.12
750	336	0.5374	0.0416	0.000324	$29,954	$9.70
1000	464	0.6077	0.0541	0.000275	$34,862	$9.57
1750	1606	0.6322	0.1503	0.000257	$33,403	$8.60
2000	1745	0.6675	0.1628	0.000233	$36,405	$8.47
8500	3164	0.8272	0.2856	0.000121	$59,778	$7.23

b.)

i.) We can read this off directly from the frequency column for the $750 deductible row: 0.000324

ii.) Same row, severity column $29,954

c.) The formula is $P_b \cdot (I(L) - C(d))$

Here L = $1,750,000 and d = $750

P_L = $8,074.82