Reading: Fisher.OtherLSPlans Fisher_CashflowLDD (Problem 1)
Model: Source Text
Problem Type: Visualize the cash flow for both the policyholder and the insurer under a large dollar deductible rating plan.

Given

Pricing Assumptions	
$600,000	Expected Primary Loss & ALAE
$300,000	Expected Excess Loss & ALAE
$55,000	Commission
$15,000	General Expenses
$5,000	Underwriting Profit Provision
10.0%	ULAE
3.0%	Tax Rate

There is no aggregate excess loss exposure.

Payment Patterns

Time (Years)	Initial Premium	(1) Primary Incurred Loss & ALAE	(2) Primary Paid Loss & ALAE	(3) Excess Paid Loss & ALAE	(4) Total Paid Loss & ALAE	Commission	(5) General Expenses	(6) ULAE
0.00	100%					100%	25.0%	
0.25		10.7%	2.1%	0.1%	1.4%		43.8%	7.3%
0.50		26.3%	7.2%	0.5%	5.0%		62.5%	16.2%
0.75		45.4%	14.5%	2.0%	10.3%		81.3%	26.5%
1.00		65.5%	23.4%	5.0%	17.3%		100.0%	38.0%
1.50		77.3%	40.9%	15.0%	32.3%			49.2%
2.50		87.9%	63.5%	35.0%	54.0%			65.5%
3.50		93.9%	79.8%	60.0%	73.2%			79.9%
4.50		97.4%	90.4%	80.0%	86.9%			90.2%
5.50		98.9%	95.6%	90.0%	93.7%			95.3%
6.50		99.7%	97.7%	95.0%	96.8%			97.6%
7.50		100.0%	100.0%	100.0%	100.0%			100.0%

Find The premium charged for the large dollar deductible rating plan and illustrate the cash flows from both the policyholder and insurer perspectives.

Note As the CAS moves towards computer based testing, this type of problem (which is tedious to do by hand) becomes much easier to test.

Solution Fisher_CashflowLDD (Solution 1-1)

Under a large dollar deductible rating plan the policyholder is responsible for all losses in the deductible layer, i.e. all of the primary losses. However, since the insurer pays all claims and then seeks to recover the deductible layer from the policyholder, ULAE applies to all claims.

Using our Exam 5 knowledge the premium formula for a large dollar deductible rating plan is:
Premium = { Expected Excess Loss & ALAE + Commission + General Expense + UW Profit + [ULAE * (Expected Primary & Excess Loss & ALAE)] }* Tax Multiplier

The tax multiplier, T, is 1 / (1 - 3.0%)
T = 1.031

Also, unlike a retrospective policy, the premium charged for a large dollar deductible does not change over time. So we immediately get the LDD premium as:
Premium = { $300,000 + $55,000 + $15,000 + $5,000 + 10.0% * ($600,000 + $300,000) } * 1.031
= $479,381

We're given the payment pattern, let's look at this information in more detail before working with it.

1. This is a 1-year large dollar deductible rating plan and the insurer will recover losses in the deductible layer at the end of each quarter.
2. Since it's a 1-year policy, all general expenses happen within the first year. ULAE is accrued all the time the losses aren't at ultimate.
3. We assume all losses are at ultimate after 7.5 years.
4. Commission is paid in full immediately at policy inception.

Policyholder Cash Flow

Time (Years)	(7) Total Premium Paid	(8) Deductible Loss Reimbursements	(9) Cumulative Cash Flow	(10) Incremental Cash Flow
0.00	$479,381	$0	($479,381)	($479,381)
0.25	$479,381	$12,600	($491,981)	($12,600)
0.50	$479,381	$43,200	($522,581)	($30,600)
0.75	$479,381	$87,000	($566,381)	($43,800)
1.00	$479,381	$140,400	($619,781)	($53,400)
1.50	$479,381	$245,400	($724,781)	($105,000)
2.50	$479,381	$381,000	($860,381)	($135,600)
3.50	$479,381	$478,800	($958,181)	($97,800)
4.50	$479,381	$542,400	($1,021,781)	($63,600)
5.50	$479,381	$573,600	($1,052,981)	($31,200)
6.50	$479,381	$586,200	($1,065,581)	($12,600)
7.50	$479,381	$600,000	($1,079,381)	($13,800)

(7) Calculated at the top of the page.
(8) = (2) * Expected Primary Loss & ALAE
(9) = -1 * (7) - (8)
(10) = [(9) current row] - [(9) prior row]

The requirement for the insured to make additional payments for losses within the deductible layer creates credit risk for the insurer.

Note:
In the text, Fisher uses an unrounded value of T. Here we've rounded T to 3 decimal places for convenience.

On the next page we look at the cash flow from the insurer's perspective.

Insurer Cash Flow

Fisher_CashflowLDD (Solution 1-2)

Columns (11) – (19) are cumulative figures to date

Time (Years)	(11) Total Premium Received	(12) Deductible Loss Reimbursements	(13) Excess Loss & ALAE Paid	(14) Total Loss & ALAE Paid	(15) Total Commission	(16) Premium Tax	(17) General Expenses	(18) ULAE	(19) Cash Flow	(20) Incremental Cash Flow
0.00	$479,381	$0	$0	$0	$55,000	$14,381	$3,750	$0	$406,250	$406,250
0.25	$479,381	$12,600	$300	$12,900	$55,000	$14,381	$6,570	$6,570	$396,560	($9,690)
0.50	$479,381	$43,200	$1,500	$44,700	$55,000	$14,381	$9,375	$14,580	$384,545	($12,015)
0.75	$479,381	$87,000	$6,000	$93,000	$55,000	$14,381	$12,195	$23,850	$367,955	($16,590)
1.00	$479,381	$140,400	$15,000	$155,400	$55,000	$14,381	$15,000	$34,200	$345,800	($22,155)
1.50	$479,381	$245,400	$45,000	$290,400	$55,000	$14,381	$15,000	$44,280	$305,720	($40,080)
2.50	$479,381	$381,000	$105,000	$486,000	$55,000	$14,381	$15,000	$58,950	$231,050	($74,670)
3.50	$479,381	$478,800	$180,000	$658,800	$55,000	$14,381	$15,000	$71,910	$143,090	($87,960)
4.50	$479,381	$542,400	$240,000	$782,400	$55,000	$14,381	$15,000	$81,180	$73,820	($69,270)
5.50	$479,381	$573,600	$270,000	$843,600	$55,000	$14,381	$15,000	$85,770	$39,230	($34,590)
6.50	$479,381	$586,200	$285,000	$871,200	$55,000	$14,381	$15,000	$87,840	$22,160	($17,070)
7.50	$479,381	$600,000	$300,000	$900,000	$55,000	$14,381	$15,000	$90,000	$5,000	($17,160)

(11) Calculated at the top of the prior page.
(12) = (2) * Expected Primary Loss & ALAE
(13) = (3) * Expected Excess Loss & ALAE
(14) = (12) + (13)
(15) Commission is paid upfront then doesn't change.
(16) = (11) * 3.0% (Premium tax rate)
(17) = (5) * General Expenses
(18) = (Expected Primary and Excess Loss & ALAE) * ULAE % * (6)
(19) = (11) + (12) - (14) - (15) - (16) - (17) - (18)
(20) = [(19) current row] - [(19) prior row]

Notes:

- (12) Deductible Loss Reimbursements could also be called Primary Loss & ALAE Paid.
- The policyholder always has a negative cash flow (unless they experienced no claims in a quarter).
- The insurer has a negative cash flow after t = 0 because they have to pay general expenses during the first year plus ULAE on all claims, and pay out on the excess portion of any claims above the deductible.
- When all losses have reached ultimate and assuming all losses in the deductible layer are recovered, the insurer is left with the UW profit.