Estimating Insurance Losses: Frequency-Severity Approach

The following example uses a Poisson distribution for estimating the number of claims (frequency) and a Lognormal distribution for estimating the average size of each claim (severity). The average or mean # of Claims in a given year is 10 as shown below. The average size of each claim is $250K with a standard deviation of $25K as shown in column F below. Total paid losses are estimated by running 1,000 iterations of the model using @RISK and are tracked as a desired output to be measured. The ground up claims model is shown in the first box below.

The client is considering to self insure this exposure, but would like to cap its retained losses at $3M in the aggregate. The client wishes to determine what a fair price would be for insurance protection in excess of its desired maximum aggregate retention. To incorporate the calculation of aggregate excess losses above the retention, the model is expanded to include two additional entries, one for the aggregate retention and one for total excess paid losses, respectively, as shown in the second box below. Total excess paid losses are entered as an additional output to be measured in @RISK.

Graphical results and selected statistics shown on the following page suggest that total paid losses exceed the $3M threshhold about 1/4 of the time. Assuming the excess insurer needs to allocate risk capital between the 95th & 99th percentile loss, is targeting a 15% return on capital and has an expense ratio of 35%, a fair price for the excess insurance protection would be roughly $275K (i.e., $1.2M allocated risk capital x 15% / .65).

Ground Up Claims Model

Total Paid Losses		$2,500			Notes:
# of Claims	=RiskPoisson(10)	10	1	$250	=IF(E28<=D28,RiskLognorm(250,25),0)
			2	$250	as above except column E entry 1 row down
			3	$250	"
			4	$250	"
			5	$250	"
			6	$250	"
			7	$250	"
			8	$250	"
			9	$250	"
			10	$250	"
			11	$0	"
			12	$0	"
			13	$0	"
			14	$0	"
			15	$0	"
			16	$0	"
			17	$0	"
			18	$0	"
			19	$0	"
			20	$0	"
			21	$0	"
			22	$0	"
			23	$0	"
			24	$0	"
			25	$0	"

Aggregate Excess Losses

Total Excess Paid Losses	$0	Aggregate Retention	$3,000

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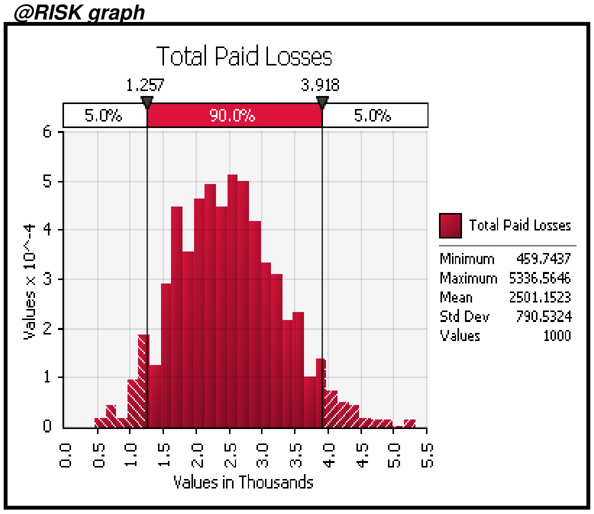
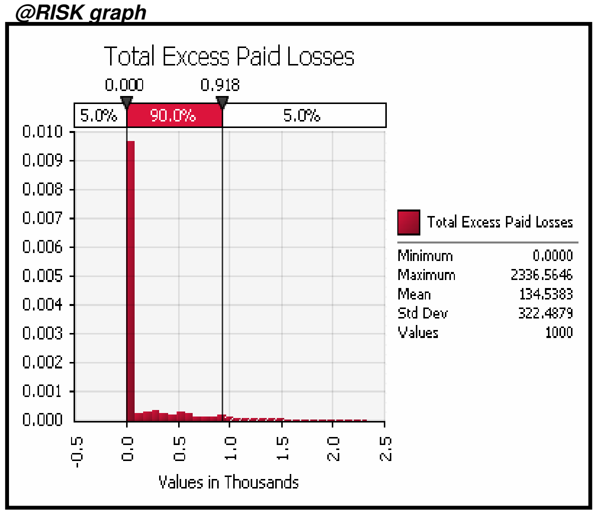
Loss Results

@RISK graph



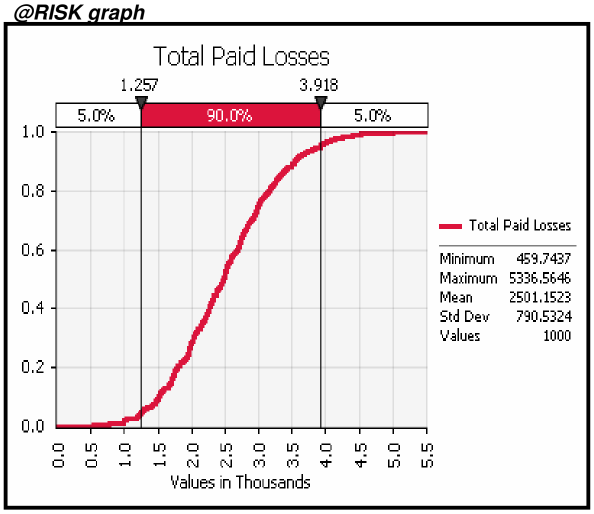
@RISK graph



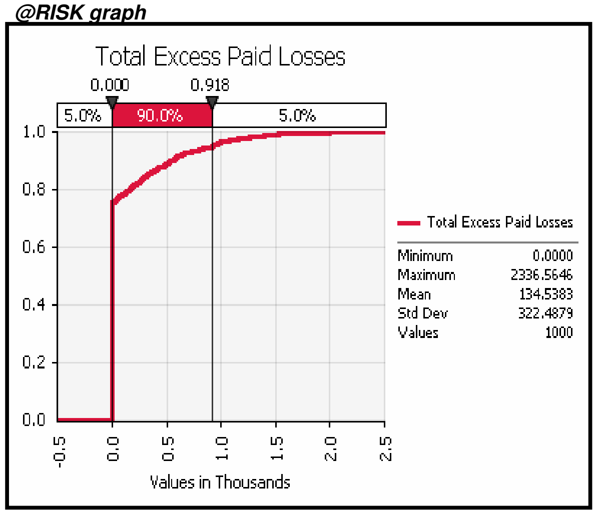
Statistic	Value
Min	$460
Max	$5,337
Mean	$2,501
StdDev	$791
90th P	$3,546
95th P	$3,918
99th P	$4,467
P(L>$3,000)	25%

Statistic	Value
Min	$0
Max	$2,337
Mean	$135
StdDev	$322
90th P	$546
95th P	$918
99th P	$1,467

@RISK graph



@RISK graph



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