REINSURANCE TREATY PRICING

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REINSURANCE TREATY PRICING.

Two case studies from practice.

- **cat X.L. :**
  - **profit loadings at treaty level**

- **risk X.L. :**
  - **aggregate deductibles**
  - **reinstatement premiums**

CAT X.L. TREATY : PROFIT LOADING.

A question from the underwriter.

Q : how should I load a cat X.L. treaty for the cost of capital.

A : in theory :

- **stochastic A.L.M.**
- **marginal capital required to support writing that new treaty**

A : in practice :

- **take some short cuts**

CAT X.L. TREATY : PROFIT LOADING.

Short cut : the route.

- **Profit margin required at portfolio level**
  - **arising from marginal capital requirements calculated at company level**
- **allocate by zone / peril**
  - **reflecting marginal contribution to risk**
- **allocate within territory proportional to treaty standard deviation**

CAT X.L. TREATY : PROFIT LOADING.

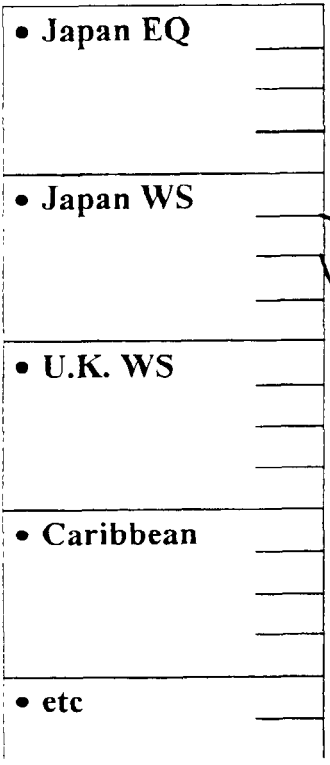
Sample cat X.L. portfolio.

- 300 treaties
- 40 zones / perils
- £50m premium income
- maximum gross exposure per zone / peril £35m
- reinsured down to first loss deductible £5m, retro premium £10m
- profit margin required for total cat X.L. portfolio £10m

CAT X.L. TREATY : PROFIT LOADING.

In principle : stochastic A.L.M. at individual treaty level.

- **300 treaties :**



Contract	Cover	Dedbl	EPI	alpha	Freqy
XYZ Ins	10,000	10,000	133.5	1.1	18
XYZ Ins	30,000	20,000	133.5	1.1	10
XYZ Ins	50,000	50,000	133.5	1:1	7
ABC Ins	7,500	7,500	48 6	1.1	22
ABC Ins	15,000	15,000	48 6	1.1	12
ABC Ins	30,000	30,000	48 6	1.1	7
ABC Ins	1,500	500	2.6	0.9	27

- **volume of calculations daunting**
- **cannot see wood for trees**

CAT X.L. TREATY : PROFIT LOADING.

Allocate profit margin required by zone / peril.

- cost of gross claims to portfolio :

Zone / peril	Return period				
	5 yrs	25 yrs	50 yrs	100yrs	250 yrs
- Japan EQ	£0m	£15m	£25m	£35m	£35m
- Japan WS	£1.5m	£5m	£7.5m	£7.5m	£7.5m
- U.K. WS	£10m	£30m	£30m	£30m	£35m
- Caribbean	£6m	£8m	£10m	£10m	£10m
- etc.					

- simulate in @RISK
  - gross claims to total portfolio
  - recoveries from retro programme
  - variability of gross results, net result
  - marginal contribution to risk of each zone / peril

CAT X.L. TREATY : PROFIT LOADING.

Allocate profit margin required within zone / peril.

- typically treaties all subject to same peril

- variability related to "distance from event "
  - volume of underlying exposure
  - height of layer
  - encapsulated in R.O.L.

- rule of thumb : standard deviation varies as square root of R.O.L.
  - now you can allocate territory profit margin to individual treaties

RISK X.L. PRICING EXAMPLES.

Prefer frequency / severity approach.

- intuitively appealing to underwriter
- extrapolate to higher deductibles
- can estimate variance of loss cost
- easy to value special terms and conditions
  - aggregate deductibles
  - reinstatment premiums

RISK X.L. PRICING EXAMPLES.

Frequency / severity approach.

- frequency projected by triangulation
- severity modelled by curve fitting
  - less distorted by outliers
- model claims F.G.U., then apply reinsurance terms

FREQUENCY / SEVERITY APPROACH.

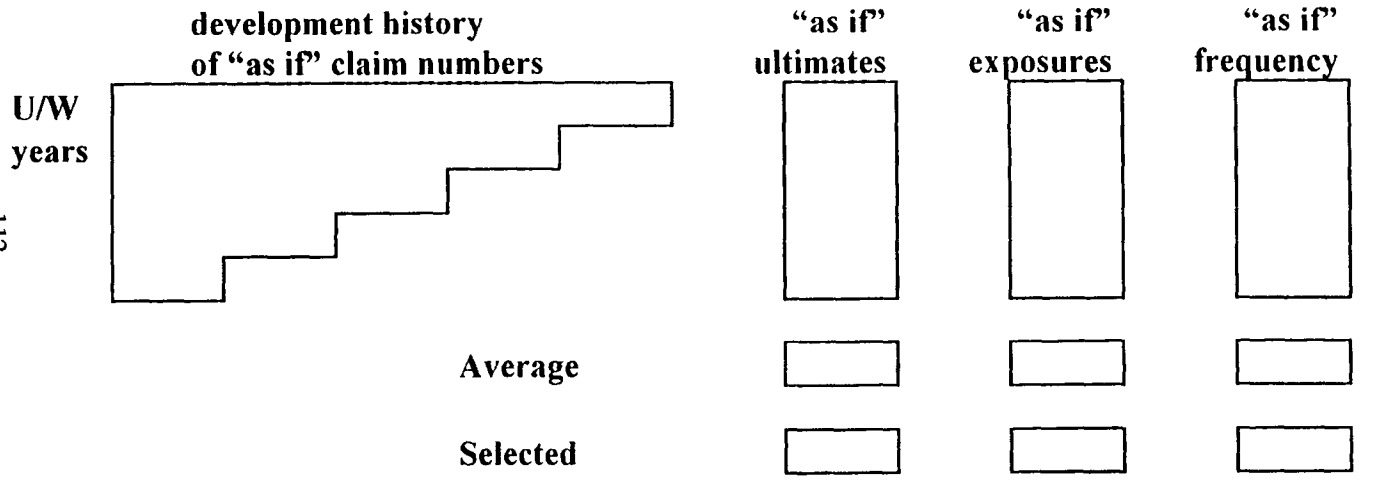
Frequency projected by triangulation.

- individual F.G.U. data triangulated on an "as if" basis
- revalued claims set against revalued exposures
- slice at different deductibles
  - get frequency IBNR at different deductibles
  - get ultimate frequency at different deductibles
- fit curve to these ultimate frequencies

FREQUENCY / SEVERITY APPROACH.

Frequency projected by triangulation.

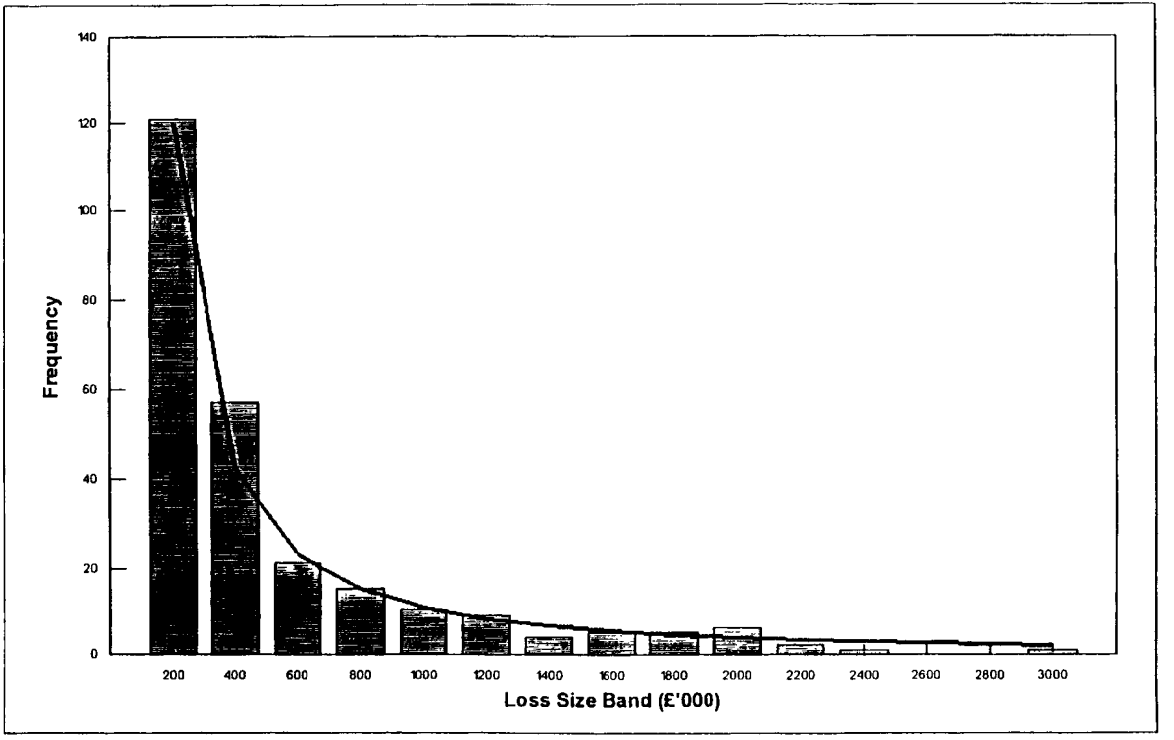
- example : claims numbers above £750,000



- repeat for other deductibles to get frequency in different loss size bands

FREQUENCY / SEVERITY APPROACH.

Fitting a curve to severity data.

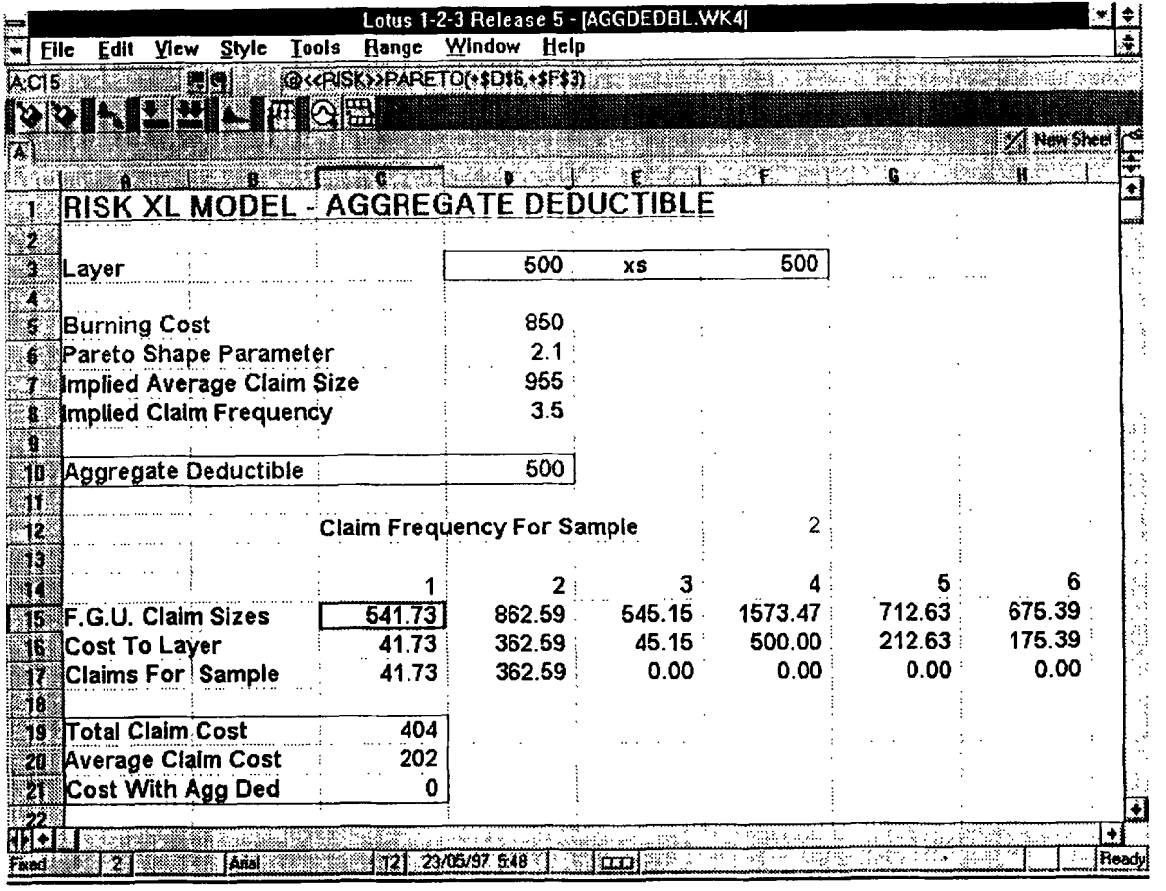


FREQUENCY / SEVERITY APPROACH.

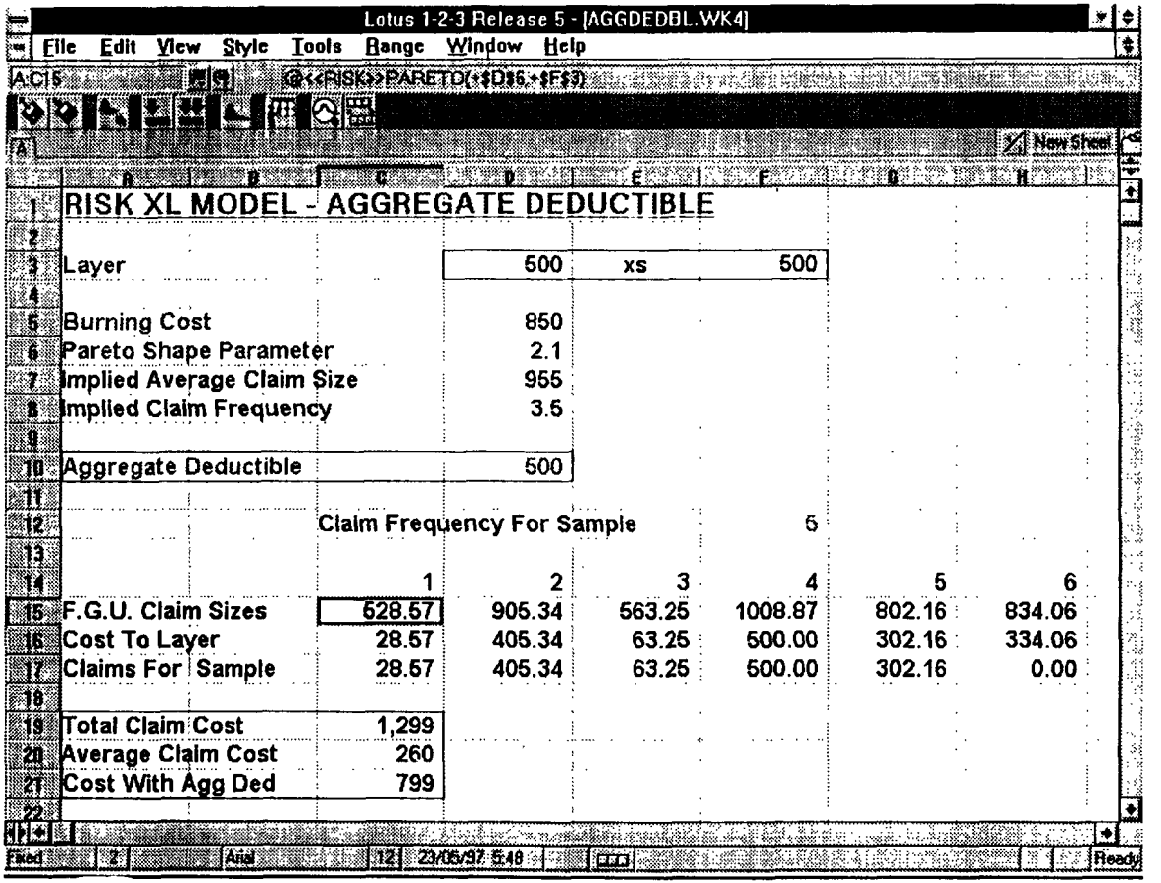
Pricing a reinsurance layer.

- model produces frequency / severity distribution for F.G.U. losses above a threshhold
- "integrate" between deductible and limit
- "layering" - easy to produce alternative quotes that are consistent
- extrapolate to higher layers - with care

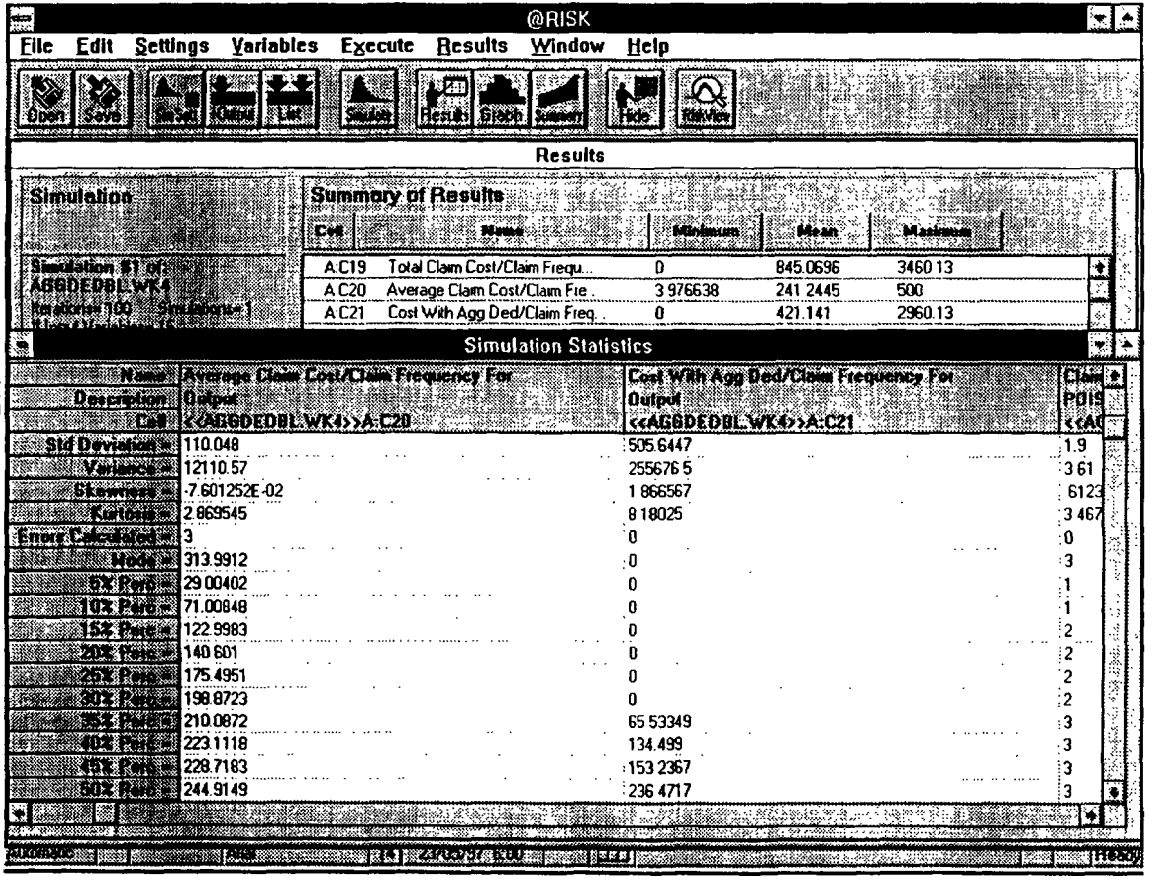
RISK X.L. PRICING EXAMPLES - AGGREGATE DEDUCTIBLE (1).



RISK X.L. PRICING EXAMPLES - AGGREGATE DEDUCTIBLE (2).

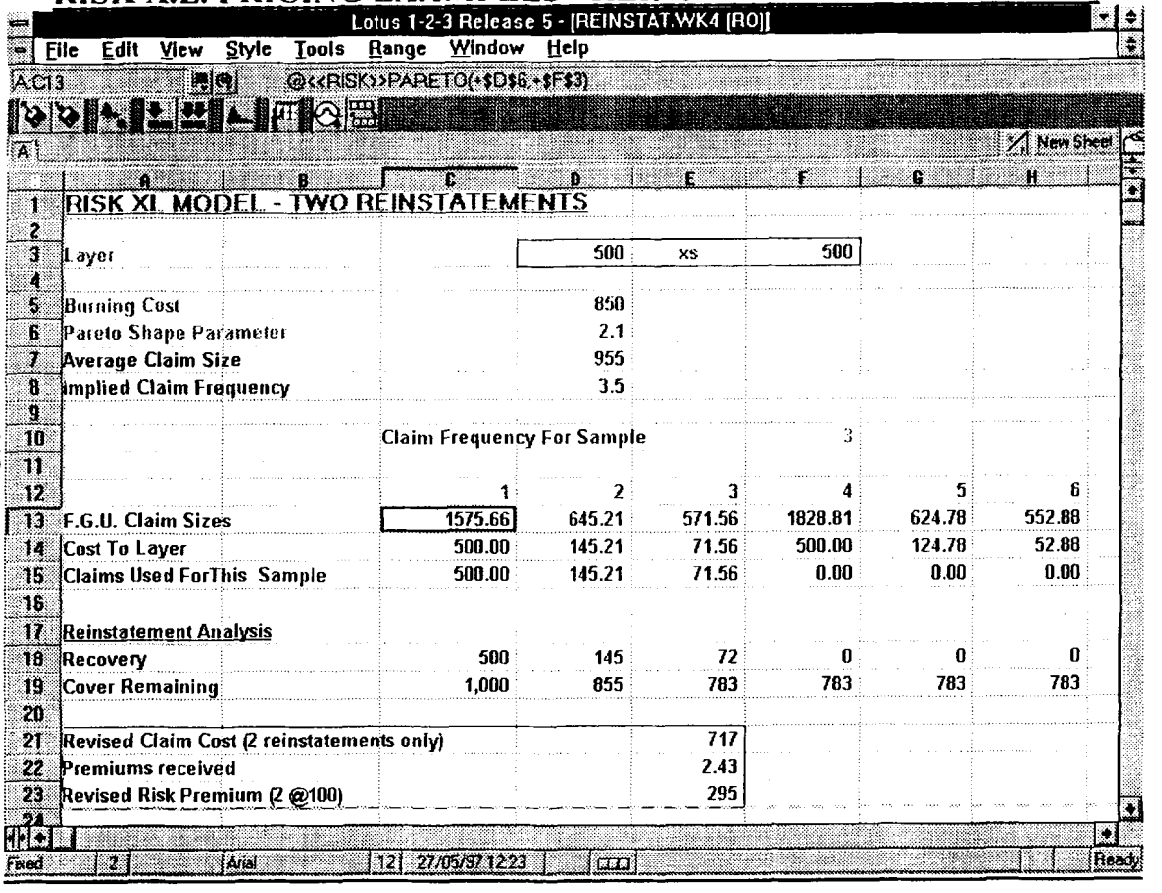


RISK X.L. PRICING EXAMPLES - AGGREGATE DEDUCTIBLE (3).



117

RISK X.L. PRICING EXAMPLES - REINSTATEMENT PREMIUMS.



RISK X.L. PRICING EXAMPLES.

Be careful with loadings !

- need to preserve cash value of loadings :

	Full Cover Premium	With Aggregate Deductible	
Risk Premium	£850k	£425k	- 50%
Expense Loading	£55k	£55k	n/c
Profit Loading	£125k	£106k	- 15%
Commission	£115k	£65k	
Total Premium	£1,145k	£651k	- 41%

- note how profit loading has decreased in cash terms, but increased as % premium