

C-ROSS Insurance Capital Calculation Formula

The calculation of the minimum capital for each LOB and each peril in C-ROSS is formulated as:

$$MC_{\text{peril / LOB}} = \text{VaR}(\Sigma(EX_{\text{risk areas}} \times DR_{\text{risk areas, scenario}}), p)$$

$MC_{\text{peril / LOB}}$ is the minimum capital for Catastrophe risk by peril/LOB; VaR is value at risk; $EX_{\text{risk areas}}$ is the net retained effective sums insured after a proportional reinsurance for cat risks in different risk areas for insurance companies. $DR_{\text{risk areas, scenario}}$ is the damage factor of related catastrophe event scenario in each risk area; p is quantile, using 99.5% in C-ROSS, which means the return period represents a 200-year loss.

C-ROSS Reinsurance Capital Calculation Formula

For reinsurance, the minimum capital is calculated with this formula:

$$MC_{\text{CAT } i} = \min(MC_{\text{CAT } i}^*, \max(MC_{\text{CAT } i}^* - OL_{\text{CAT } i}, RT_{\text{CAT } i}))$$

$MC_{\text{CAT } i}$ is the minimum capital for catastrophe risk i after the CAT XOL; $MC_{\text{CAT } i}^*$ is the minimum capital for Catastrophe risk i before the CAT XOL; $OL_{\text{CAT } i}$ is the total of all the layers' occurrence limit of CAT XOL for Catastrophe risk i; $RT_{\text{CAT } i}$ is the attachment point of CAT XOL for Catastrophe risk i.

The total minimum capital for combined LOB and perils is calculated as follows:

$$MC_{\text{CAT}} = \sqrt{\sum_i MC_{\text{CAT } i}^2 + \sum_{i,j(i>j)} 2 \times \rho_{i,j} \times MC_{\text{CAT } i} \times MC_{\text{CAT } j}}$$

MC_{CAT} is the minimum capital for Catastrophe risk; $MC_{\text{CAT } i}$, $MC_{\text{CAT } j}$ are the minimum capital for Catastrophe risk i and j respectively; $\rho_{i,j}$ is the correlation factor of the minimum capital for catastrophe risk i and j respectively, given in the following table:

Correlation factor $\rho_{i,j}$	Property TY	Property EQ	Auto	Agriculture
Property TY	1	0	0	0
Property EQ	0	1	0.75	0.5
Auto	0	0.75	1	0.25
Agriculture	0	0.5	0.25	1