

Solvency Capital Requirements in the Solvency 2 environment

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Insurance (and reinsurance) companies must respect a Solvency 2 ratio, which is looked after, in each country, by a watchdog in charge of financial institutions' supervision.

The solvency ratio which is defined by Own funds / Solvency Capital Requirements (SCR) must be equal or higher than 100%

In the Solvency 1 environment, SCR was only taking underwriting risks into account for life and non-life businesses. The Solvency 2 environment requires to include all the risk that are borne by the insurance company: life underwriting, non-life underwriting, health underwriting, default of a counterpart, market.

The additional risks in the Solvency 2 framework might have had a negative impact on the ratio but a total SCR is not, in this environment, a simple sum of all the risks. As all the risks are correlated to each other, the SCR formula is the following one:

$$SCR = \sqrt{\sum_{i=1}^5 corr(i,j).SCR_i.SCR_j}$$

where:

$i = 1$ for default risk

$i = 2$ for market risk

$i = 3$ for life underwriting risk

$i = 4$ for life underwriting risk

$i = 5$ for non-life underwriting risk

The correlation coefficients are given by the following table:

	Market	Default	Life	Health	Non-life
Market	1	0,25	0,25	0,25	0,25
Default	0,25	1	0,25	0,25	0,25
Life	0,25	0,25	1	0,25	0
Health	0,25	0,25	0,25	1	0
Non-Life	0,25	0,25	0	0	1

Unsurprising, the correlation coefficient of a risk with itself is equal to 1 and that of life underwriting or health underwriting and non-life underwriting is equal to 0.

Assuming a company has only 2 risks: life and non-life; the its SCR is equal to!

$$= \sqrt{corr(L,L)SCR_L.SCR_L + corr(L,NL)SCR_L.SCR_{NL} + corr(NL,L)SCR_{NL}.SCR_L + corr(NL,NL)SCR_{NL}.SCR_{NL}}$$

As: $corr(L,L) = corr(NL,NL) = 1, corr(L,NL) = corr(NL,L) = 0$:

$$SCR = \sqrt{SCR_L^2 + SCR_{NL}^2} \leq \sqrt{SCR_L^2 + 2SCR_L.SCR_{NL} + SCR_{NL}^2} = \sqrt{(SCR_L+SCR_{NL})^2}$$

$$SCR = \sqrt{SCR_L^2 + SCR_{NL}^2} \leq SCR_L+SCR_{NL}$$

This formula has 2 obvious consequences:

1. For an insurance company with 2 uncorrelated risks, the Solvency 2 environment is more favourable than the Solvency 1 environment, assuming there is no other risk, which highly theoretical as the investment of the premiums paid by the policy holders generates a default risk and a market risk
2. There is a regulatory incentive for an insurance (or a reinsurance) company to diversify its risks between life and non-life underwriting.

Example of a calculation of benefits of diversification for an insurance company with the following risks:

Market	100
Default	200
Life	300
Health	400
Non-Life	500

The following tables enable to calculate the SCR in the Solvency 2 environment in order to get, eventually the benefits of diversification:

	Market	Default	Life	Health	Non-life
Market	1	0,25	0,25	0,25	0,25
Default	0,25	1	0,25	0,25	0,25
Life	0,25	0,25	1	0,25	0
Health	0,25	0,25	0,25	1	0
Non-Life	0,25	0,25	0	0	1
	Market	Default	Life	Health	Non-life
Market	100	200	300	400	500
Default	200				
Life	300				
Health	400				
Non-Life	500				
$corr(i, j) \cdot SCR_i \cdot SCR_j$	Market	Default	Life	Health	Non-life
Market	10 000	5 000	7 500	10 000	12 500
Default	5 000	40 000	15 000	20 000	25 000
Life	7 500	15 000	90 000	30 000	0
Health	10 000	20 000	30 000	160 000	0
Non-Life	12 500	25 000	0	0	250 000
Total	800 000	$= \sum_{i=1}^5 corr(i, j) \cdot SCR_i \cdot SCR_j$			
SCR					
Without benefits of diversification		1 500			
With benefits of diversification		894	= squared root of:		800 000
Benefits of diversification		606			
Presentation in an insurance company's solvency report:					
SCR Market		100			
SCR Default		200			
SCR Life		300			
SCR Health		400			
SCR Non-Life		500			
Benefits of diversification		-606			
Total SCR		894			

Inside each segment of risk, SCR is calculated taking the possible risks and their correlation coefficients into account.