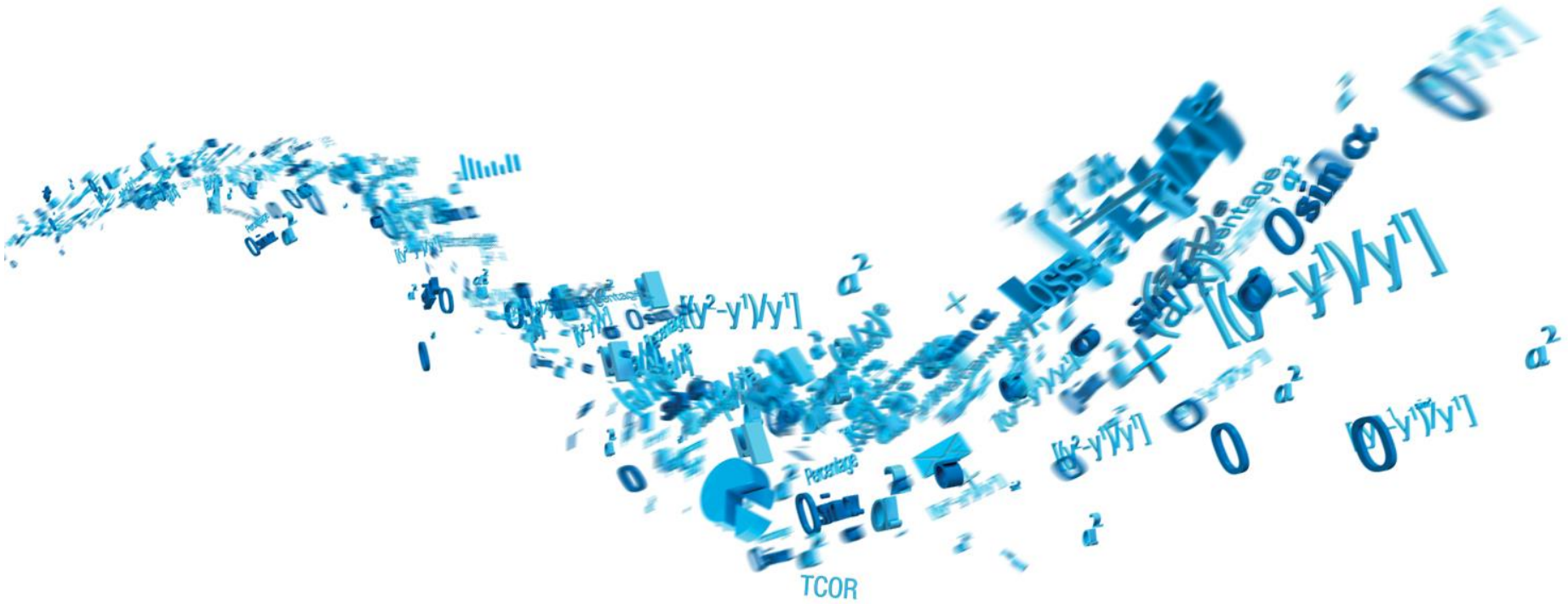

Reinsurance – A solution to manage longevity risk

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11' Longevity Lyon – 9 Septembre 2015

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Longevity risk transfer

The risk is defined as :

‘Effect of uncertainty on objectives’

The longevity risk can be seen as a deviation of longevity assumptions from “central” assumptions.

The topic of this presentation is to address two specific business cases which purposes are assessment and transfer of longevity risk:

- **→The first one is a treaty that protects the insurance company from wrong pricing of its annuities**

- **→The second one is a treaty that transfers almost all the risks measured according to Solvency II norm, for a longevity block of business**

The cases are real, the figures are neutral.

The approach used to defined these risk transfer deals

The method we used is based on :

- **A careful analysis of the Best Estimates gross of Reinsurance** for each liability portfolio, per solvency II risk module and sub-module
- **A projection a many combinations of reinsurance structures to …**
- **… Identify the optimal reinsurance structure** considering Value and SCR reduction

Managing Longevity Risk

• Cedant aims at managing longevity risk on annuity portfolio with guaranteed mortality table at conversion

• The insurance risk is determined when the mortality table at the moment of conversion of the saving amount into annuity is guaranteed by the insurer at the underwriting of the policy (during the capitalizing phase).

$$Rgar = \frac{E}{\sum_{t=1}^{\infty} \frac{{}^{*}_{t}p_{65}}{(1+i)^{t}}}$$

• the risk arises from a gap between the mortality table at underwriting and the mortality table at conversion

• This risk can be transferred to reinsurance

Portfolio statistics – inforce annuity

Global portfolio – line by line data

- Number of policies: 7 156 (40% women / 60% men)
- Total Acquired savings: 240 millions €
- Average age : 71
- Average annuity / policy : 2 906 €

Generation 2015 - line by line data

- Number of policies: 625
- Average age : 65
- Total Acquired savings : 29,5 millions €
- Mean annuity / policy : 2 853 €
- Expenses on annuity: 3%
- Lapse rate: 1% / year
- Mortality : TG 05 H/F

The results are given for the latest generation of conversions into annuity (i.e. converted in 2015).

Hypothesis

• Cashflows are projected line by line (Lifemetrica™) until total expiration of portfolio (45 years) – 1 000 trials

• We use EIOPA yield curve in date 28 february 2015 with negative rates on the 2 first years

• SCR ***stand alone***

- no calculation of SCR Market (the assets are not considered here)

- no operational risk – only SCR underwriting Life

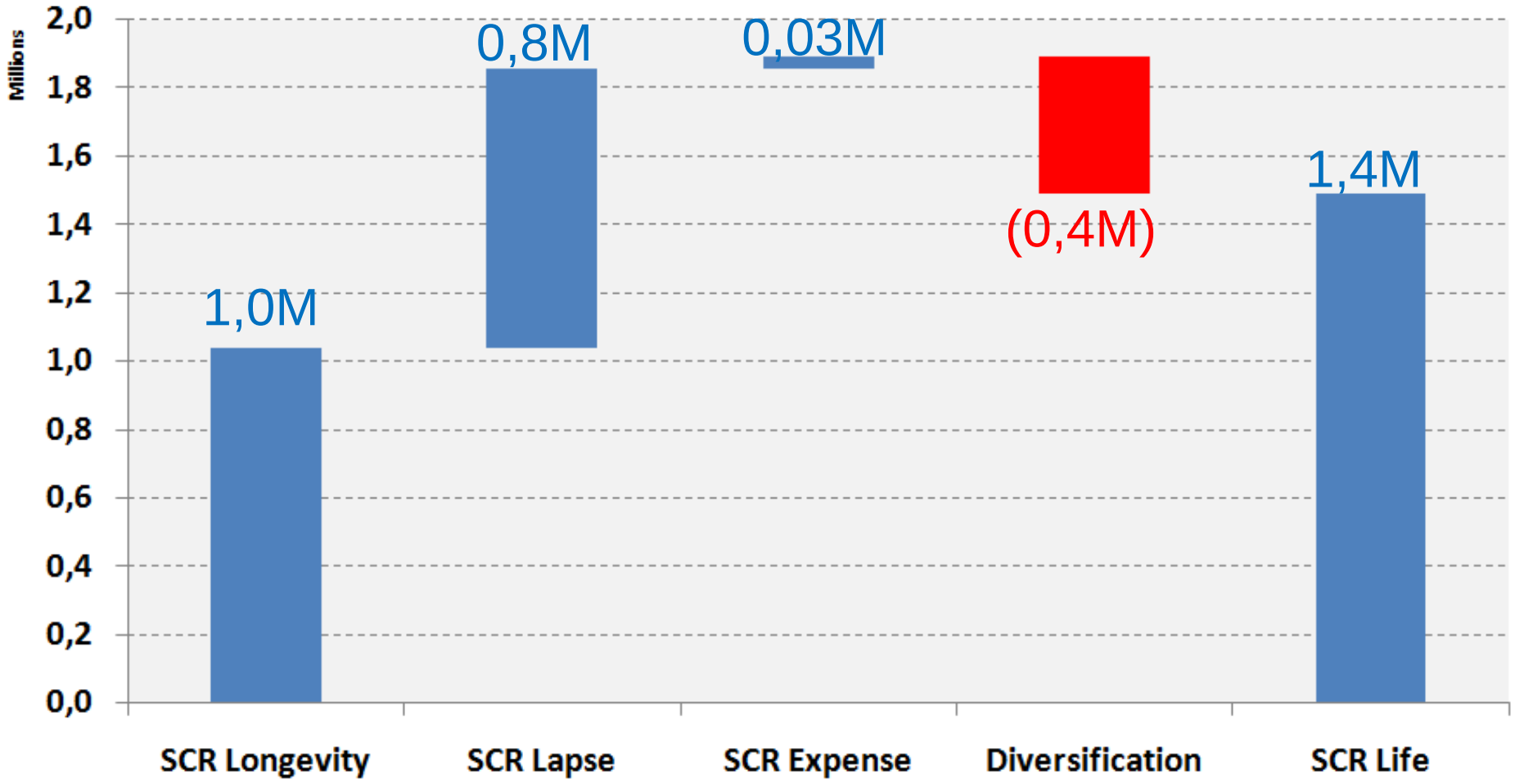
- we do not consider the environment in which is the annuity portfolio (no diversification effect)

$$SCR_{Souscr} = \sqrt{\sum_{i \times j} Corr(SCR_i; SCR_j) \times SCR_i \times SCR_j}$$

	LONGEVITY	LAPSE	EXPENSE
LONGEVITY	1	0,25	0,25
LAPSE	0,25	1	0,5
EXPENSE	0,25	0,5	1

SCR Life without reinsurance – no trend on TG05

for Generation 2015



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Quota share on conversion table guarantee

• Such a treaty aims at protecting a deviation in longevity taken into account in the annuity conversion.

• The reinsurance payoffs a percentage (quota share treaty) of the difference between :

- the amount of acquired saving at date of conversion

- the present value of future annuity payments projected with new mortality table and with guaranteed annuity

$$\boldsymbol{Eproj - E = Rgar \sum_{t=1}^{\infty} \frac{{}_t p_{65}}{(1+i)^t} - E}$$

Central scenario and longevity shock – no trend on TG05

In our example, with central scenario projection (mortality table TG 05 W/M, with no trend) :

Discounted annuity payments	1 724 568	1 655 165	1 587 689	1 522 639 ...
Present value of annuity payments	29 419 426			
Initial Total Savings	29 530 894			
Ceded Loss	-			

Mean results used for BEL calculations - Lifemetrica™ output

In the longevity shock scenario (-20% on mortality table TG 05 W/M, with no trend) :

Discounted annuity payments	1 725 289	1 657 265	1 591 696	1 528 513 ...
Present value of annuity payments	30 689 151			
Initial Total Savings	29 530 894			
Ceded Loss	1 158 257			

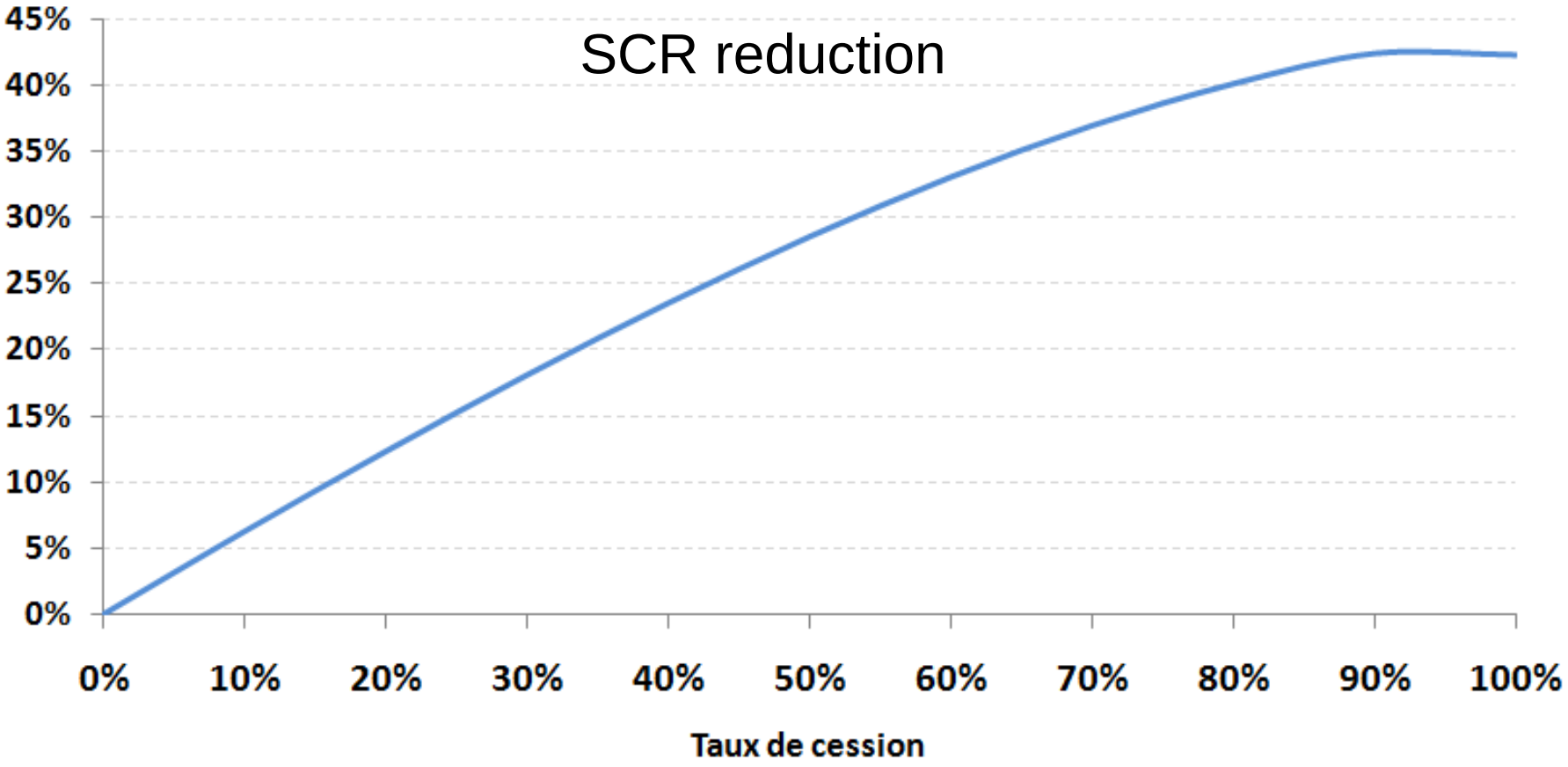
Mean results used for BEL calculations - Lifemetrica™ output

Remarks :

- « ceded loss » is to be calculated for each generation of conversion
- « ceded loss » is supposed @100% (quota share with cession rate 100%). This rate can be changed.
- the ceded loss and reinsurance premiums can be taken in BEL calculations

SCR reduction with cession rate – no trend on TG05

The reinsurance impacts BELs in shock scenario → it impacts the SCR sub-modules



Central scenario and longevity shock – WITH trend on TG05

In our example, with central scenario projection (mortality table TG 05 W/M, with trend of 2%) :

Discounted annuity payments	1 724 568	1 655 251	1 588 115	1 523 447 ...
Present value of annuity payments	31 549 625			
Initial Total Savings	29 530 894			
Ceded Loss	2 018 731			

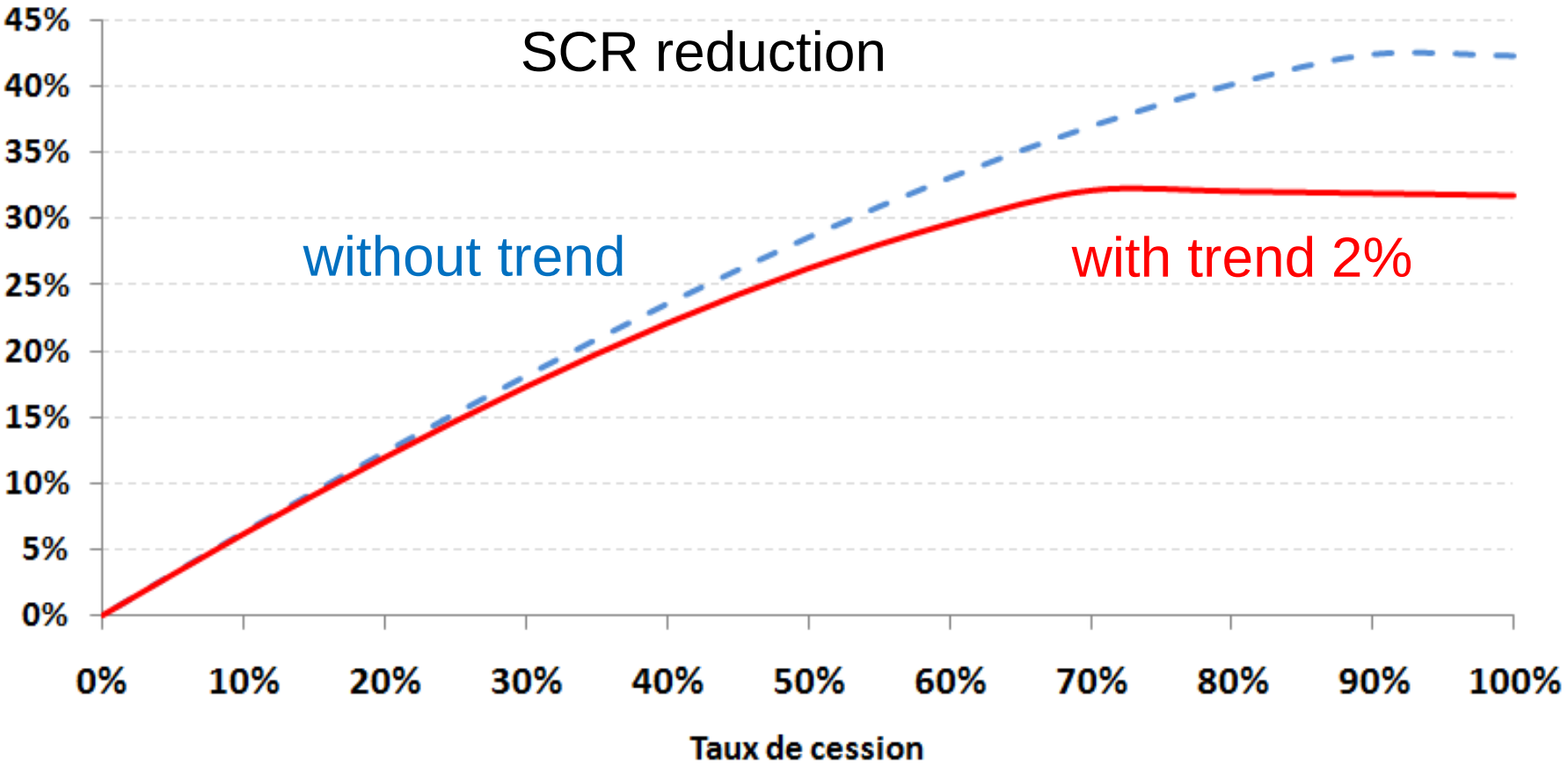
Mean results used for BEL calculations - Lifemetrica™ output

In the longevity shock scenario (-20% on mortality table TG 05 W/M, with no trend) :

Discounted annuity payments	1 725 289	1 657 357	1 591 914	1 529 065 ...
Present value of annuity payments	32 867 888			
Initial Total Savings	29 530 894			
Ceded Loss	3 336 994			

Mean results used for BEL calculations - Lifemetrica™ output

SCR reduction with cession rate – with trend on TG05



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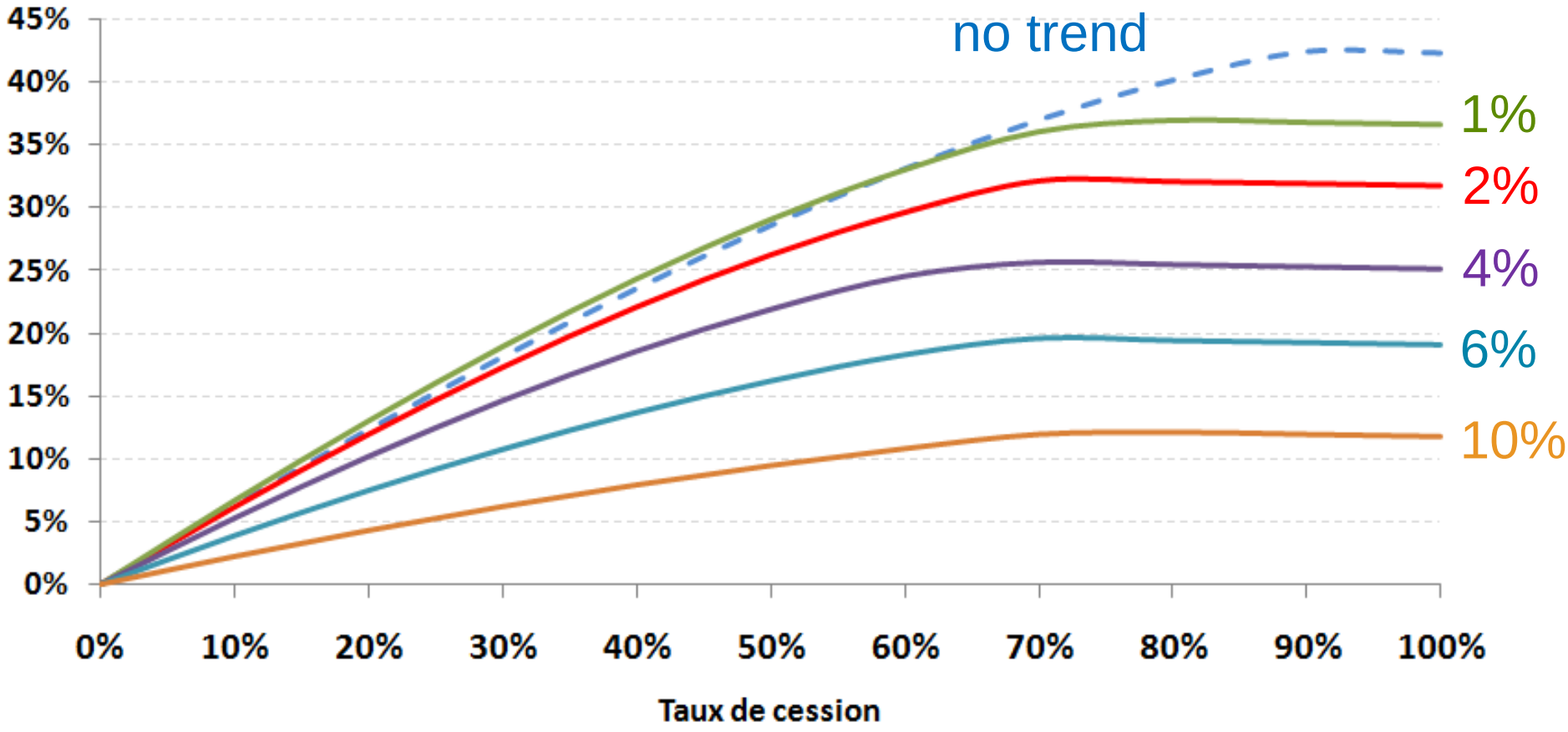
SCR reduction and sensitivity to longevity calibration



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Comments

- Sensitivity to hypothesis – importance on SCR reduction and pricing
- Robust optimality for all shocks
- Pure biometric solution - enlargement to the whole balance sheet

II – A full transfer of Longevity liabilities – description of the business case (1/3)

- The ceding company presents a Balance Sheet with a very significant part of annuities in its liabilities:

Assets

Liabilities

	100%
Own Fund w/o Future Profits (3)	8,1 %
Future Profits + DT (0.07)	0,2 %
Risk Margin (0.5)	1,3%
BEL - Deferred Annuities (8.8)	23,7 %
BEL - Annuities (5.4)	14,5 %
BEL - Savings (19.4)	52,2 %
BEL - Protection (0.01)	0 %
Oth. Liab. (0.02)	0,1 %

II – A full transfer of Longevity liabilities – description of the business case (2/3)

Solvency Capital Requirement	
Own Funds	**3 046**
Market Risk	1 752
Credit Risk	33
Life Underwriting Risk	407
Health Underwriting Risk	0
- Health Non SLT	0
Operational Risk	179
Solvency Capital Requirement	**2 084**

Market Risk	1 752
Interest Rate - Level Up	530
Interest Rate - Level Down	642
Interest Rate	642
Equity - Global	295
Equity - Other	108
Equity	383
Property	281
Spread	786
Currency	46

- The main specificities of the company are :

  → **Sensitivity to downfall of the interest rates. It caused by the low yield environment**

  → **High level of the longevity risk transfer caused by the significant proportion of annuity liabilities in the Balance Sheet of the company**

Life Underwriting Risk	407
Mortality	6
Longevity	189
Disability	-
Life Expense	157
Revision	-
Lapse - Increase in lapse rates	200
Lapse - Decrease in lapse rates	30
Lapse - Mass lapse	187
Lapse	200

II – A full transfer of Longevity liabilities – description of the business case (3/3)

	Balance Sheet Value	Future Profits / BEL
Elligible Own Funds	**3 046**	
Without Future Profits	3 000	
Future Profits	46	0,14 %
Future Profits per Port.		
Deferred Annuities	(146)	(1,6 %)
Annuities	(82)	(1,5 %)
Savings	215	1,1 %
Protection	59	589 %

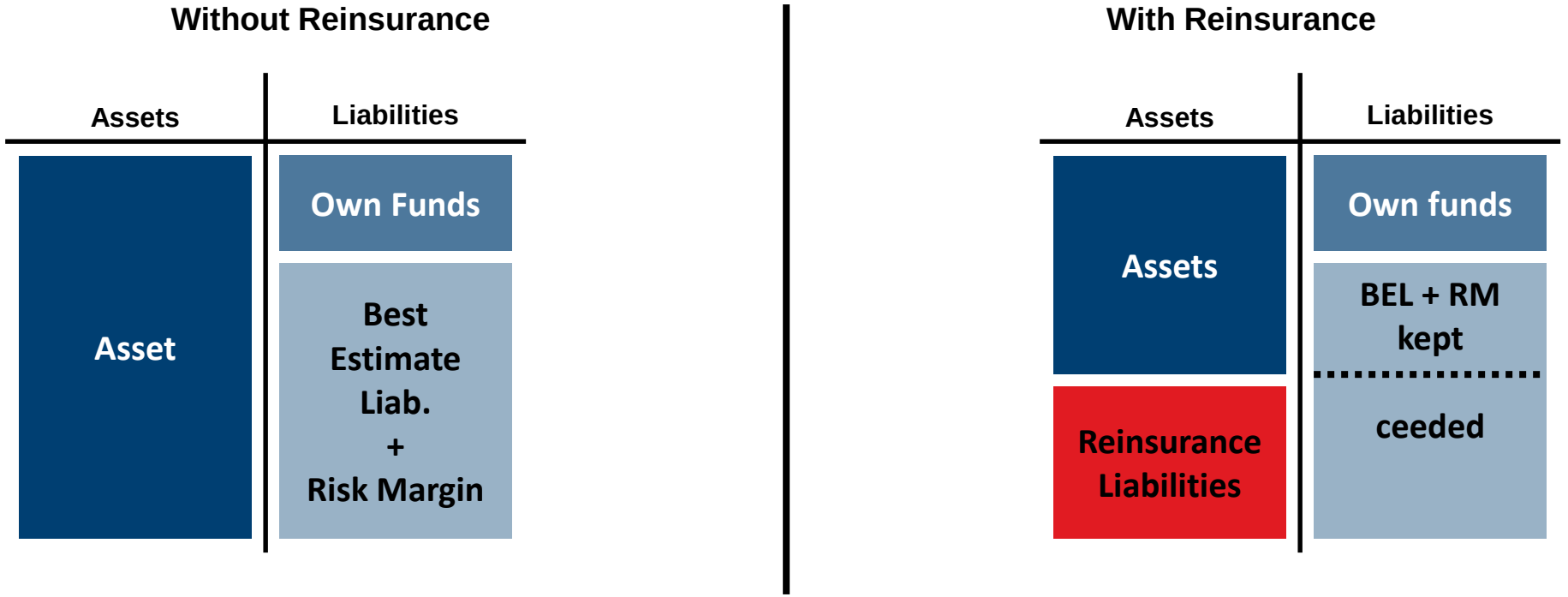
	SCR Value
SCR per Port.	**2 084**
Own Funds	127
Deferred Annuities	723
Annuities	440
Savings	1 054
Protection	5
Diversification	(265)

- **The main objectives of the company are the following:**

  → **Do not have a Longevity SCR since its shareholder does not want to have long term risks**

  → **Lower its regulatory capital requirement to raise its solvency ratio to a target of 200 %**

Structure of treaty – a Quota Share

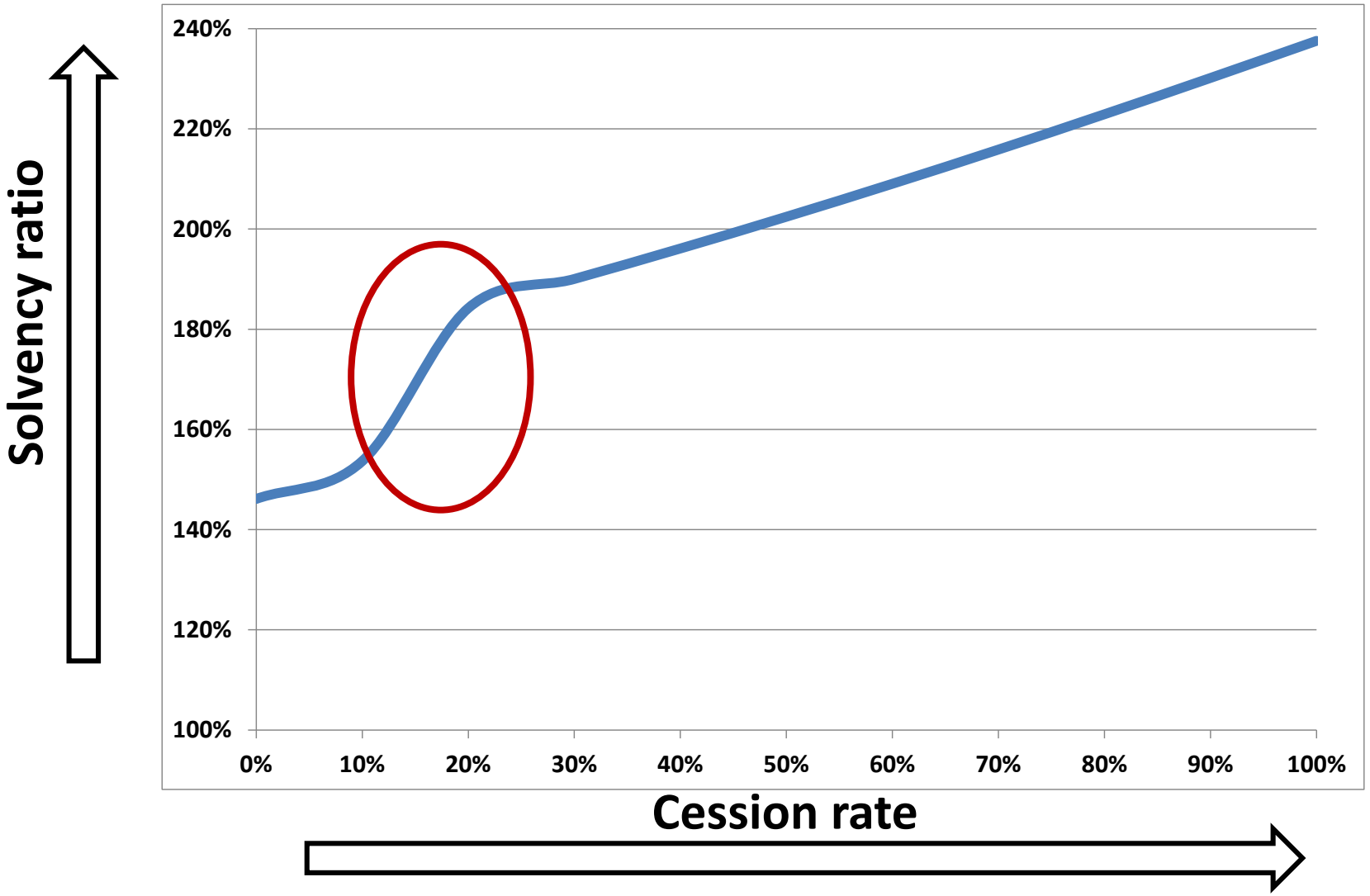


- The Insurance company plans to transfer a percentage of its mathematical reserves and assets under local gaap to a reinsurer.
- The transfer is assorted to guarantee from the reinsurer to cover financial et technical losses until the end of the treaty

Impacts of one parameter of the Reinsurance Treaty (1/2)

Impact on the Solvency Ratio when the ceding rate of the treaty increases

(duration of treaty = 40years)



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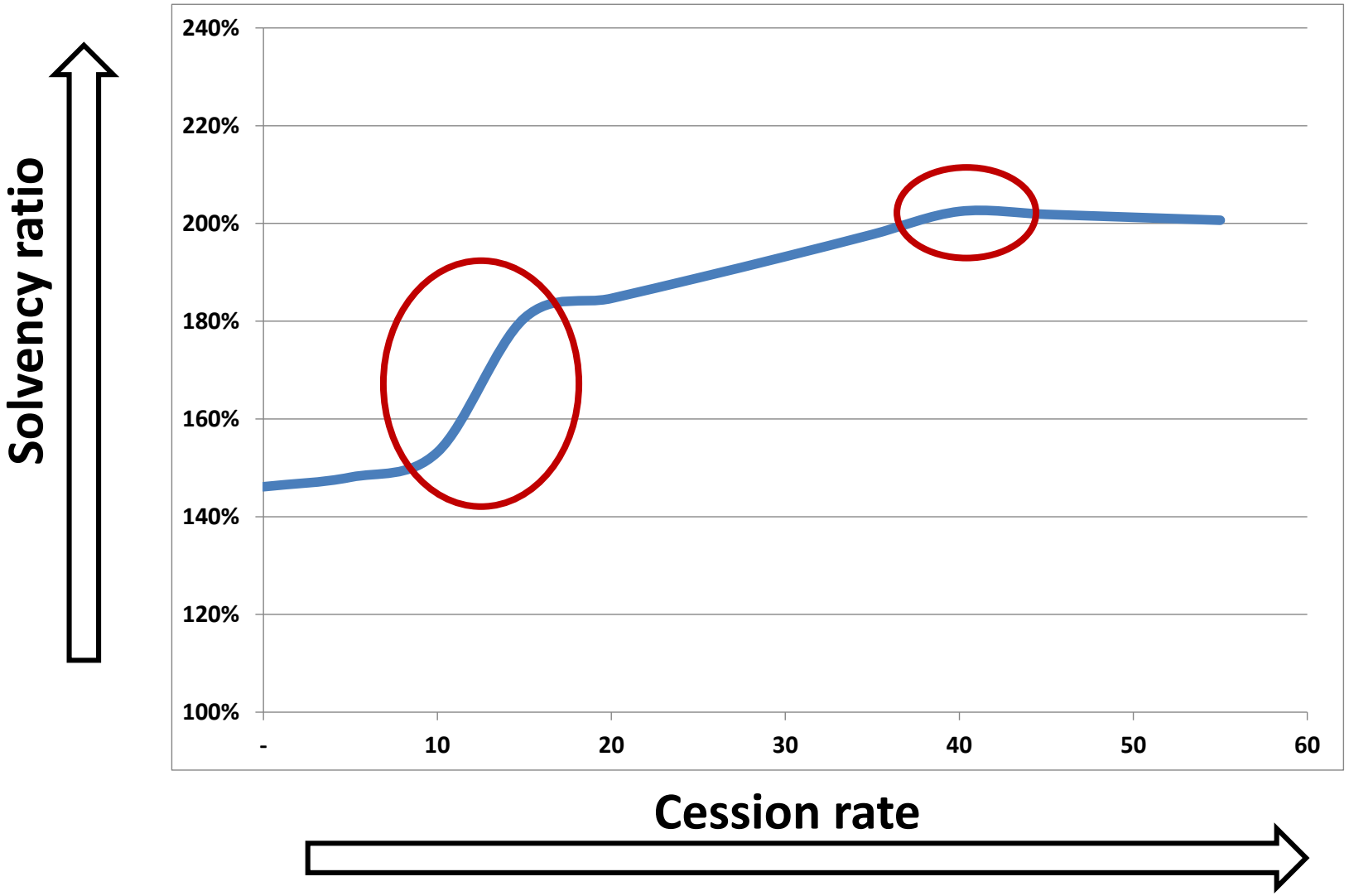
Impacts of one parameter of the Reinsurance Treaty (2/2)

Impact on the Solvency Ratio when the duration of the treaty increases

(ceding rate = 50 %)



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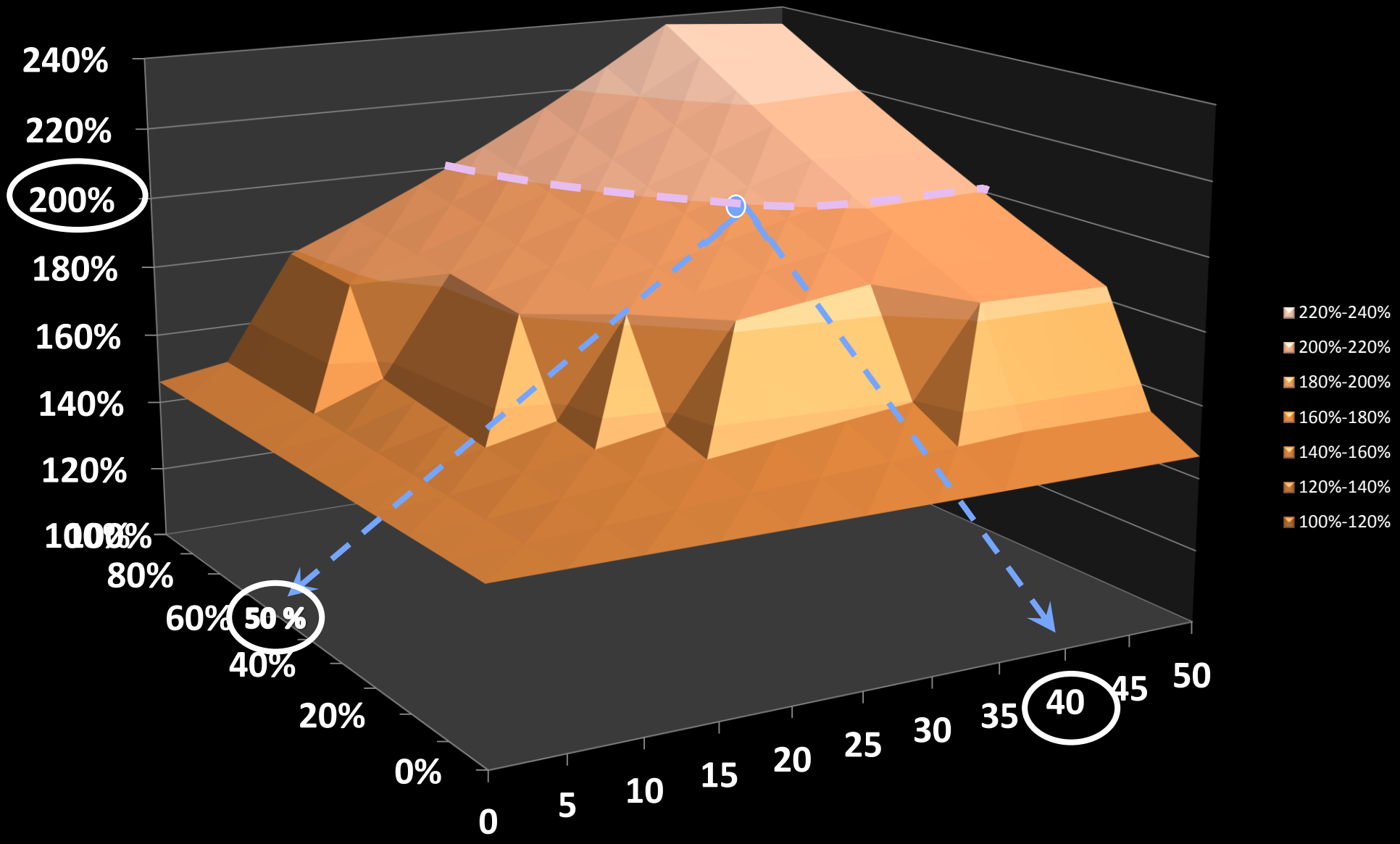
The solvency ratio surface provides optimal structures



Conclusion

→ **The definition of an optimal longevity risk transfer has to be calibrated on the ceding company valuation of its risk and the robustness of its assumptions**

→ **The transfer price will depend of the valuation of the same risk by reinsurers**

→ **There different kind of longevity risk transfer depending of what are the objectives of the insurance company**

→ **Expertise into the valuation of risks is key to design efficient or optimal risk transfer solutions**

Thank you

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