Principles and model for Risk evaluation (second wave)

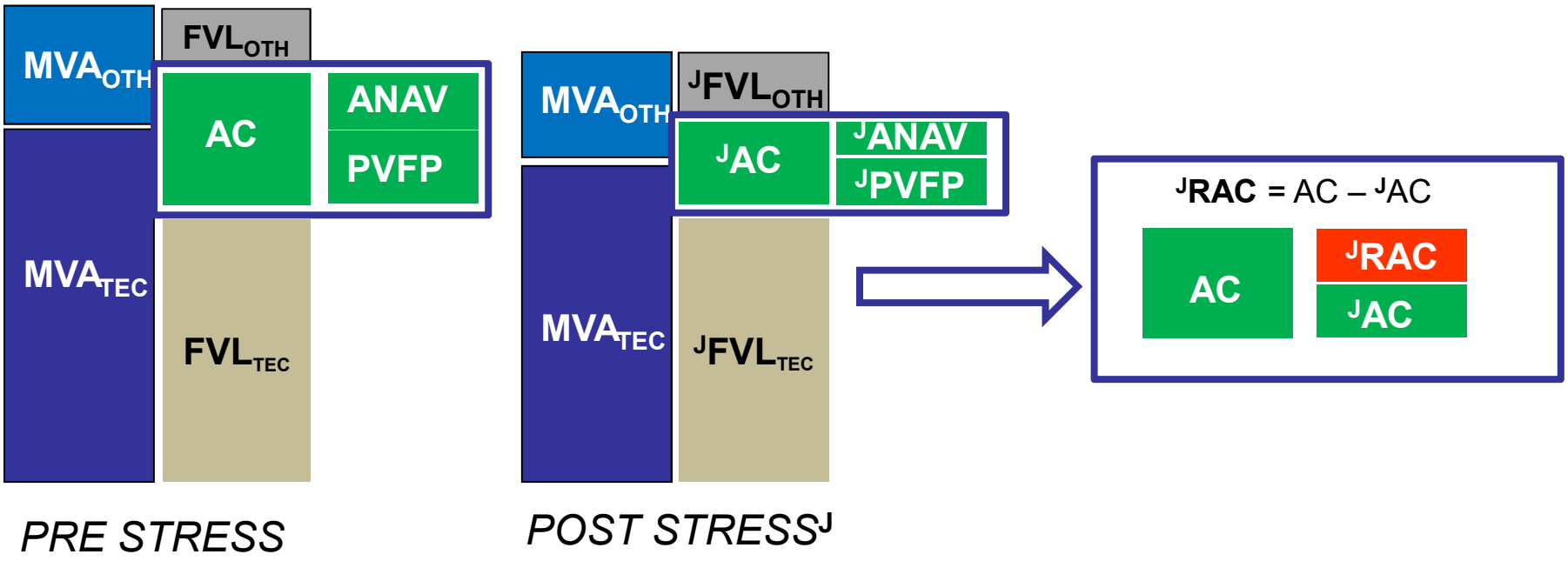
Life Product Quantitative Evaluation

Trieste – May 2012

Principles and model for Risk evaluation (second wave)

1. **Where were we?**
2. **Profit testing of a new product**
3. **Risk Adjusted Capital: a simple and “practical” example**

Where were we?: Methodology for Risk capital



^{J}RAC = AC – ^{J}AC = (MVA – FVL) - (^{J}MVA – ^{J}FVL)

(MVA_{TEC} – FVL_{TEC}) – ($^{J}MVA_{TEC}$ – $^{J}FVL_{TEC}$ -) +
Technical Component

$^{J}RAC_{TEC}$ = PVFP – ^{J}PVFP

(MVA_{OTH} – FVL_{OTH}) – ($^{J}MVA_{OTH}$ – $^{J}FVL_{OTH}$)
Not Technical Component

$^{J}RAC_{OTH}$ = ANAV – ^{J}ANAV

Where were we?: “Fair Value of Liabilities”

Perché uno scenario non basta?

Uno scenario non è in grado di catturare i **costi delle garanzie dei prodotti**.

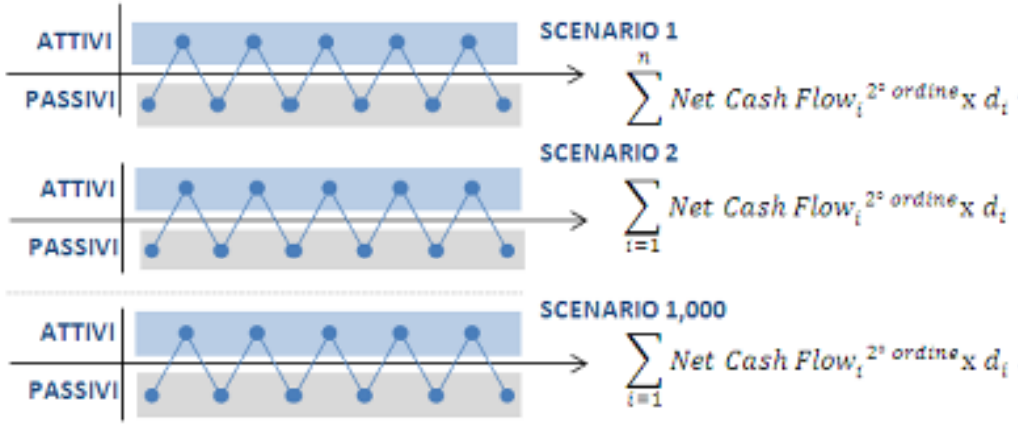
Passo da 1 a 1.000 scenari:

La valutazione va ripetuta per tutti gli scenari e il valore finale sarà pari alla media dei valori ottenuti nei 1.000 scenari.

RISERVA LOCAL GAAP: è calcolata in un unico scenario:

E’ il valore atteso dei cash flow nello scenario di 1° ordine (*ipotesi prudenti*)

RISERVA A FAIR VALUE: la valutazione va ripetuta nei 1.000 scenari



La riserva è la media dei valori ottenuti nei 1.000 scenari con ipotesi best estimate:

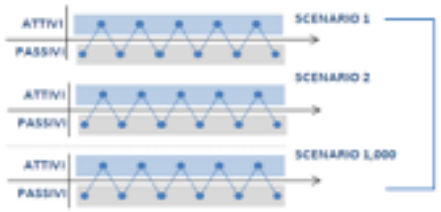
$$\frac{\sum_{j=1}^{1000}\left(\sum_{i=1}^{n} Net\ Cash\ Flow_i^{2^\circ\ ordine} \times d_i\right)}{1000}$$

PUNTI DI ATTENZIONE

Gli scenari stocastici devono catturare la diversa rischiosità degli attivi(bond governativi, corporate, azioni..)
Il rendimento medio nei 1.000 scenari è lo stesso per tutte gli attivi, ma più gli attivi sono rischiosi, maggiore è la volatilità del loro rendimento ***(SCENARI DI TIPO RISK NEUTRAL)***.

Risk Adjusted Capital: a simple and “practical” example

1. calcolare il **valore di mercato delle riserve e degli attivi** a data di valutazione:

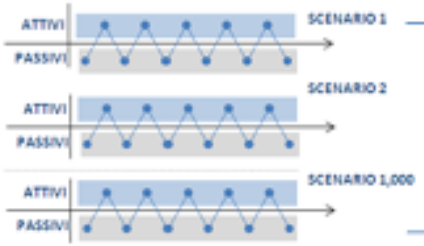


Fair Value Riserve: 1.000

Asset Allocation	Market Value
Bond Governativi:	450
Bond Corporate:	400
Equity:	150

2. sulla base del metodo di calibrazione dello stress calcolare la **variazione del valore di mercato delle azioni**: ad esempio la perdita è pari a 50 (150*33%).

3. ricalcolare il **valore delle riserve** dove gli attivi in tutti i 1.000 scenari hanno un valore ridotto (-50).
Le rivalutazioni delle prestazioni vengono diminuite in rispetto alle regole contrattuali



Fair Value Riserve: 960

4. il requisito di capitale **non è pari a 50 euro** (come per esempio accade nel ramo danni) ma a **10 euro** (50-40), retrocedendo l’80% delle perdite gli assicurati.

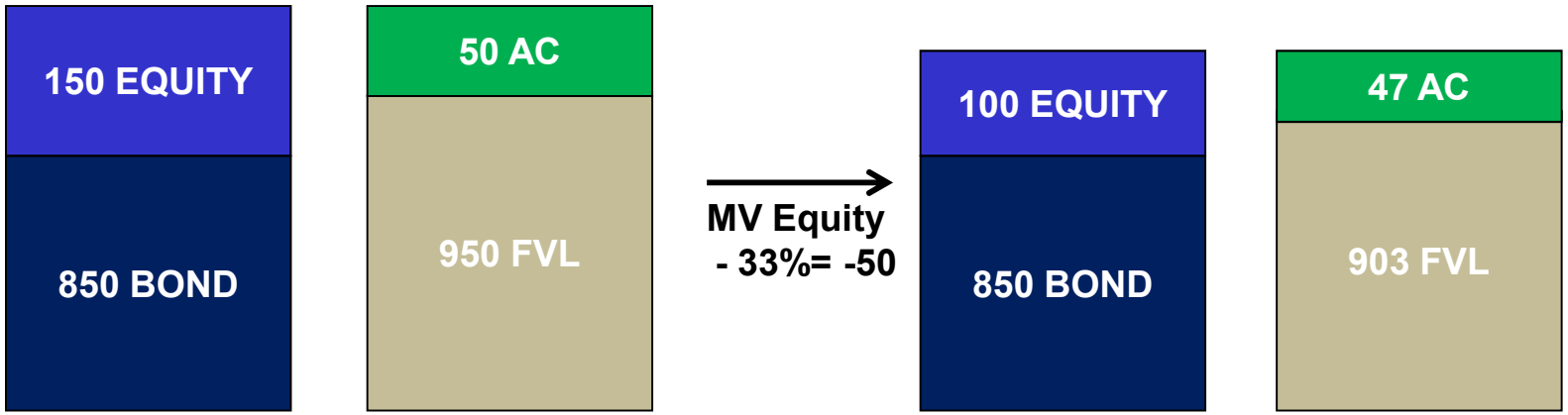
L’ aliquota di retrocessione agli assicurati risulta funzione dei rendimenti previsti e dei livelli di garanzia prestati.

Capitale per rischio Equity:	
Perdita attivi	50
Requisito pre assorbimento	50
Riduzione riserve:	- 40
Requisito post assorbimento	10

Methodology for Risk capital: Market Risk (1/3)

Technical Component:

Case A: Unit Linked Portfolio w/o Guarantee



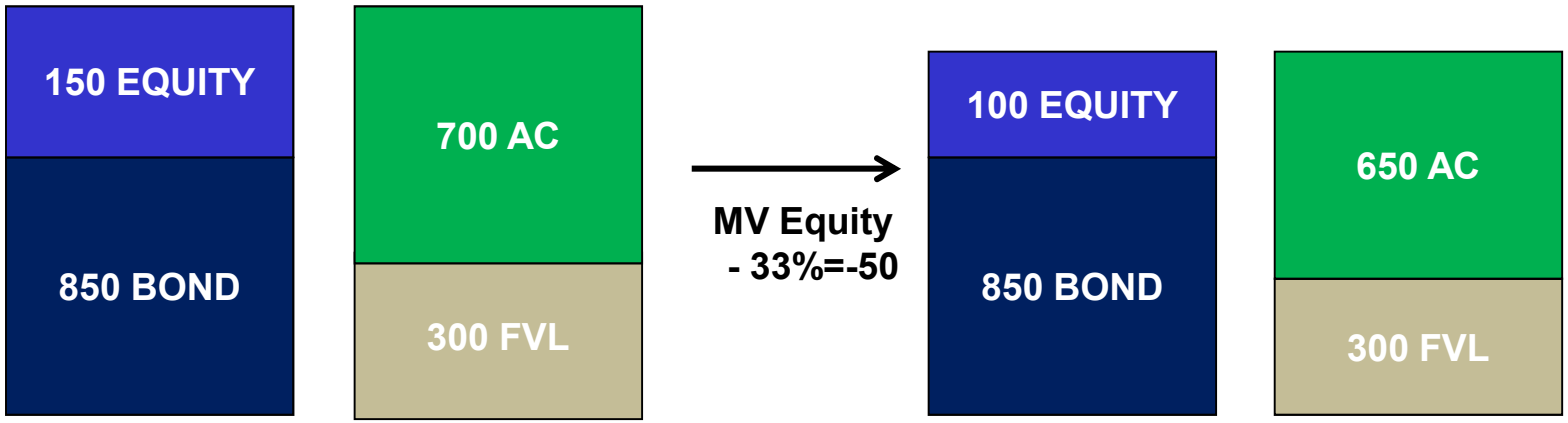
Change in Market Value = 50
Change in Liabilities = 47
RAC = AC – AC^{equity} = 50 – 47 = 3
Liability absorption = change in liabilities / change in assets = 47/50 = 95%

- In a unit linked contract the market risk is in charge of the insured;
- the asset stress produced only a “proportional reduction” of the expected profits (total MVAssets = -8% -> AC -8%)

Methodology for Risk capital: Market Risk (2/3)

Technical Component:

Case B: Term Assurance



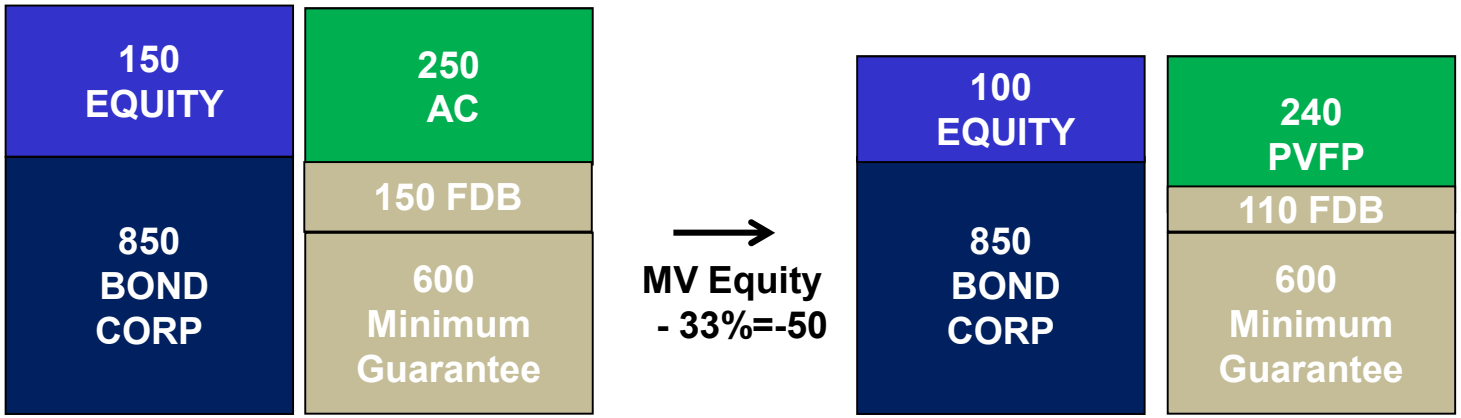
Change in Market Value = 50
Change in Liabilities= 0
RAC = AC – AC^{equity} = 50
Liability absorption = change in liabilities / change in assets = 0/50 = 0%

- In a term the market risk is in charge of the insurer
- the asset stress doesn't affect the liabilities, therefore all the stress produces a PVFP reduction

Methodology for Risk capital: Market Risk (3/3)

Technical Component:

Case C: Product with guarantee and Profit Sharing (80%)



Change in Market value of Assets = 150*33% = 50
Change in FVL = 750 – 710 = 40
Change in AC = 250 – 240 = 10
Liability absorption = 10/ 40 = 80%
The loss is shared: 20% SH, 80% PH

- In a product with profit sharing, both proifts and losses are shared; the % of sharing is a function of the portfolio structure and the level of the stress
- In general we can notice an **absence of linearity** among the loss sharing partecipation and the increase of the stress level

Life Products Quantitative Evaluation

1. Methodological framework
2. Profit testing of a new product
3. Measuring Profitability
4. Measuring capital absorption and remuneration
5. Profit breakdown
6. RAC calculated at individual product level
7. Sensitivities

New Business Value: Definition

New Business Value = *present value, at issue date, of future industrial profits (after taxes and reinsurance) expected to emerge from all contracts issued during the last year, taking into account the cost of holding the required capital*

Traditional valuation

NBV = PVFP - CoC

- **PVFP** = $\Sigma_t \frac{U_t}{(1 + r)^t}$

U_t = industrial profit (after tax and reins)
r = discount rate

- **CoC** = $\Sigma_t \frac{C_{t-1} * [r - i * (1 - tax)]}{(1 + r)^t}$

C_{t-1} = capital
i = return on assets backing the capital
r = discount rate

NBV = $\Sigma_t \frac{K_t}{(1 + r)^t}$ Present value of distributable profits

K_t = industrial + patrimonial profits (net of tax)+ yearly variations of the solvency margin

Market consistent valuation

NBV = CE PVFP – TV of FG&O – CoC – Allow. for NHR

- **CE PVFP** = **Certainty Equivalent** PVFP = the present value of future after tax and after reins. industrial profits calculated using the certainty-equivalent approach
- **TV of FG&O** = **Time Value** of financial guarantees & options = allowance for the potential impact on future industrial profits of all relevant financial guarantees and options =
  = CE PVFP – mean of stochastic PVFPs
- **CoC** = Frictional costs of Required Capital = represented by taxation and investment expenses on assets backing the required capital
- **Allowance for NHR** = allowance for non hedgeable risks = explicit allowance for residual non hedgeable risks not already allowed for in the PVFP and the TV

New Business Value: Different Approaches

Marginal

NBV = difference between portfolio value and value of old business

PROS

- It takes into consideration the cross subsidies among old business and new business
- Properly measures the value creation in the year caused by the new production

CONS

- It is complex
- It requires selection of assets backing old business; different selections may cause "artificial" NBV
- Due to one-off effects it is not appropriate to evaluate the Goodwill (NBV *multiple)

Stand Alone

NBV calculated in isolation *with its own assets, even if it insists on an open fund*

PROS

- New money investment rates are used and hence the NBV is valued in current market conditions environment
- Comparability: the same product produces the same value independenlty on the company that is selling it

CONS

- It does not capture the effects deriving from the fact that the business is sold within a going concern;
- It does not reflect the way the business is actually managed (e.g. a perfect AL matching may be assumed, even if not applied in reality).

Proportional

NBV is part of the existing business

PROS

- Simpler and understandable practical implementation
- The attribution of gains and losses from in force business to the new production reflects the way business is managed

CONS

- The attribution of gains and losses to new business may bring to their double counting

Which methodological framework shall I adopt for the profit testing?

- The methodology for the profit testing should be designed to be:
  - applied **at any valuation date** through the year, whenever there is a new product launched by the Company
  - **consistent** with the methodology applied by the Company for the **Embedded Value** and for the **required capital** calculations

- The evaluation of the impact of the **Time Value of Options and Guarantees** require time consuming stochastic calculations

- On the other hand**, exporting** these impacts from already available company new business value calculation works if and only if the new product launched is similar in terms of guaranteed rates, contracts durations and other relevant features to the new business already evaluated

- To allow for consistent exportation: **new business value granularity** i.e. calculation of the time value of the part of new business that is similar to the new tariff

Profit Testing: selection of model point (s)

On what data shall be the profit testing performed?

A set of **SEVERAL MODEL POINTS**

- For each new product a set of pre-defined model points shall be run with:
  - bands of ages (e.g. from 20 to 60 in 5 years buckets)
  - bands of policy term
  - bands of premium amount
  - bands of sum assured
- Summary of results
  - pivot table: easy to analyse

To be done by the **Company** when developing a new product to identify the **underwriting limits** on max/min amounts of premium, sum assured, contract term …

One single **REPRESENTATIVE MODEL POINT**

- Defined as a signle set of policy data (age, term, premium, SA, ...) thought to be representative of the entire portfolio
- Various ways to build it:
  - average parameters
  - modal case

IMPORTANT! The profitability and the internal rate of return of the chosen model point shall be similar to that of the entire expected portfolio

- For a new product is necessarily an expected case ⇨ important to verify the appopriateness of the choice

More appropriate from a **Holding** point of view that is evaluating the products

In both approaches, it is not sufficient to analyse the results in the base scenario but a **set of sensitivty tests** has to be performed to verify that the results sound reasonable in all the scenarios and to identify potenital critical areas

Profitability ratios based on volumes

New Business Margin (NBM) = NBV / APE = New Business Value/Annual Premium Equivalent (Regular premium+single premium/10)

- It is a **multi-period** profitability indicator

- **Strength**: widely used and easy to understand
- **Weaknesses**: normalized assumption of 10 years of duration for single premiums

NBV/P.V. Premiums = New Business Value/Present Value of Future Premiums

- Expresses the profitability as a percentage of the products yearly turnover

- **Strength**: solves the problem of the normalization used in the NBM, representing the effective duration of the contract

NBV/P. V. Reserves = New Business Value/Present Value of Future Premiums

- Expresses the profitability as a percentage of assets under management of the company related to the product under analysis

- **Strength**: is a good measure of the annual profitability in terms of managed assets
- **Weakness**: meaningless for products where the mathematical reserve is a very small amount (e.g. Pure risk products)

Profitability ratios based on volumes: which indicator should we look at?

The 3 ratios give different indications!

	Product 1	Product 2	Product 3
NBV/PVR	0,96%	0,66%	0,45%
NBV/PVP	4,03%	4,13%	3,68%
NBM	33,48%	44,62%	46,21%
APE	1.000	1.000	1.000
Term	10	15	20
Fee	0,85%	0,80%	0,70%

PVR: Present Value of Reserves PVP: Present Value of Premiums

Assume

- Recurrent premium financial product;
- 2% Cliquet guarantee;
- 10% loading on premium;
- 5% of sum of premium commission;
- 0,2% of reserves of financial/management expenses;
- 3% risk capital
- 35% tax
- 3% yearly surrender rates
- death according to SIM 1992
- Investment returns among 2,5% and 3,5%

- **NBM**: the **less profitable is Product 1**
  - the denominator is the same for the 3 products (equal to 1000) and hence increasing the term brings to higher NBV that is reported to the same amount leading to a higher value of the ratio
  - the effect of the annual loss of the fee (0.15% between Products 1 and 3) is lower of the effect of gaining it for a longer time

- **NBV/PVP**: the **less profitable is Product 3**
  - the denominator varies i.e. increases with the term; in Product 3 the NBV (the same as in the NBM) is divided by a higher amount

- **NBV/PVR**: the **less profitable is Product 3** but the most profitable is Product 1
  - this indicator rewards the product with higher management fee

Profitability ratios based on volume: impact of direct and indirect expenses

A more detailed analysis of the profitability can be performed by calculationg the mentioned profitability ratios by **changing the numerator** with the puprose of **isolating the impact of:**

Direct expenses: Expenses that are direclty linked to the sell of the product → Commissions, underwriting, training for the sales force, policy conditions and illustrative material for clients ...

Indirect expenses: Other expenses (e.g. personnel costs)

Profitability before direct and indirect expenses → *Expected to be always positive*

Profitability before indirect, after direct expenses → ***Expected to be positive*** *meaning that the product is at least able to support commissions i.e. the* ***direct expenses***

Profitability before expense overrun, after direct and indirect → *For start-up companies that are temporarily in a cost situation significantly higher than the long term expected level*

Profitability after direct and indirect expenses → *NBV as numerator in which both* ***direct and indirect expenses*** *are taken into account*

Impact of direct and indirect expenses - Examples

1. Net Profitability ratios	After direct and indirect exp.	Before exp. overrun after direct& indirect exp.	Before indirect after direct exp.	Before direct and indirect exp.
NBV/APE	51.76%	51.76%	132.50%	172.41%
NBV/P.V. Premiums	5.77%	5.77%	14.76%	19.21%
NBV/ P.V. Technical Reserves	0.76%	0.76%	1.94%	2.53%

1. Net Profitability ratios	After direct and indirect exp.	Before exp. overrun after direct& indirect exp.	Before indirect after direct exp.	Before direct and indirect exp.
NBV/APE	-9.32%	-9.32%	4.71%	15.29%
NBV/P.V. Premiums	-0.93%	-0.93%	0.47%	1.53%
NBV/ P.V. Technical Reserves	-0.17%	-0.17%	0.09%	0.28%

Product that **supports direct expenses but not the indirect** that can anyway be acceptable becuase absorbs expenses of other products

1. Net Profitability ratios	After direct and indirect exp.	Before exp. overrun after direct& indirect exp.	Before indirect after direct exp.	Before direct and indirect exp.
NBV/APE	12.60%	17.17%	43.26%	59.20%
NBV/P.V. Premiums	2.06%	2.81%	7.08%	9.69%
NBV/ P.V. Technical Reserves	0.36%	0.50%	1.25%	1.71%

Example of **start-up company** with expense overrun

Remuneration of the employed capital

Return on Risk Adjusted Capital (RoRAC)

= (Industrial profit of the year + Return on Risk Capital)/ Risk Capital

- No prospective view (as in EV or NBV), but only reference to the result of the year: compares the reuslt of the year with the capital necessary to support the business of the year

Average RoRAC

$$= \frac{\text{PV Return on Risk Capital + PV Industrial Profit}}{\text{PV Risk Capital}}$$

- It is the **weighted average of the annual returns** with weights equal to the discount factors
- Catches the **perspective view** on the run-off of the generation of the new business/new product considering the RAC totally allocated to the new business/product and the total profit produced by it over the whole projection period

NBV/P.V. Required Capital

- It is a profitability indicator that however compares the profitability to the capital necessary to support it
- Similar to the Average RoRAC

Remuneration of the employed capital: IRR

Internal Rate of Return = *the* ***discount rate that makes the net present value of distributable profits equal to zero***

STRENGHTS	WEAKNESSES
Widely used, easy to calculate and to be understood by the management because it is similar to the concept of RoE (Return on Equity)	May not exist (e.g. where there is no intial investment)
Allows comparison among dissimilar investments	In case of low initial strain, it can be extremely high and difficult to interpret
Helps to understand the remuneration of the invested capital from a shareholder perspective	May have multiple values (e.g. in case of positive cash flows followed by negative ones and then agian by positive ones)
	Assumes reinvestment of interim cash flows in projects with equal rates of return

- Being internal, it refers to monetary items and has to be "**judged" in respect to local currency interest rates (**Ex: 10-year local government bond + a spread)

Comparing the IRR with the RoRAC

- The Average RoRAC always exists
- If the discount rate used in the average RoRAC is equal to the IRR, the Average RoRAC is equal to the IRR

Remuneration of the employed capital: IRR

- Can be caluclated on **industrial** and on **distributable profits**

Further analysis

IRR on distributable profits
=
weighted average of
IRR on industrial profits and the **IRR on the capital** necessary to support the business

IRR on distributable profits	IRR on Industrial profits	IRR on Required Capital
11.80%	12.0%	4.0%

Interpretation:

✓the level of the IRR on distributable profits is closer to the IRR on industrial profits when the capital required to support the product/business is relatively low;

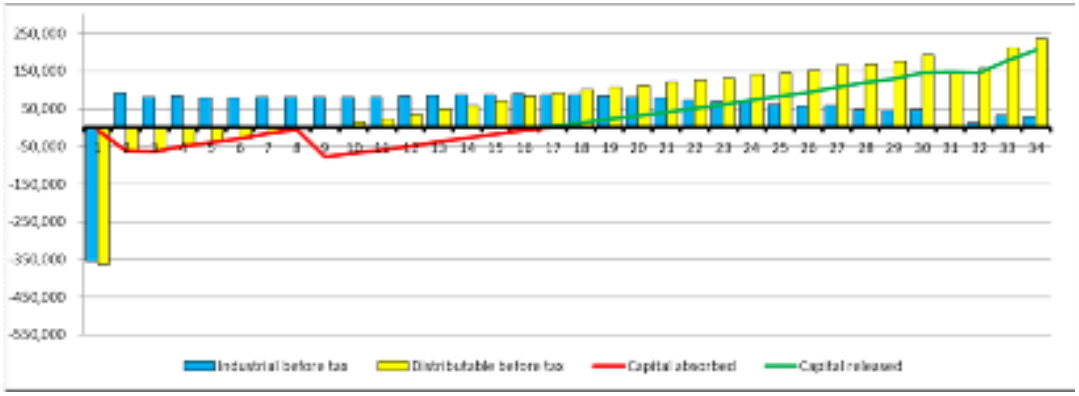
✓Increasing the required capital means moving the average towards the 4%

- Additional **effect of taxes** that can bring distortion in the average

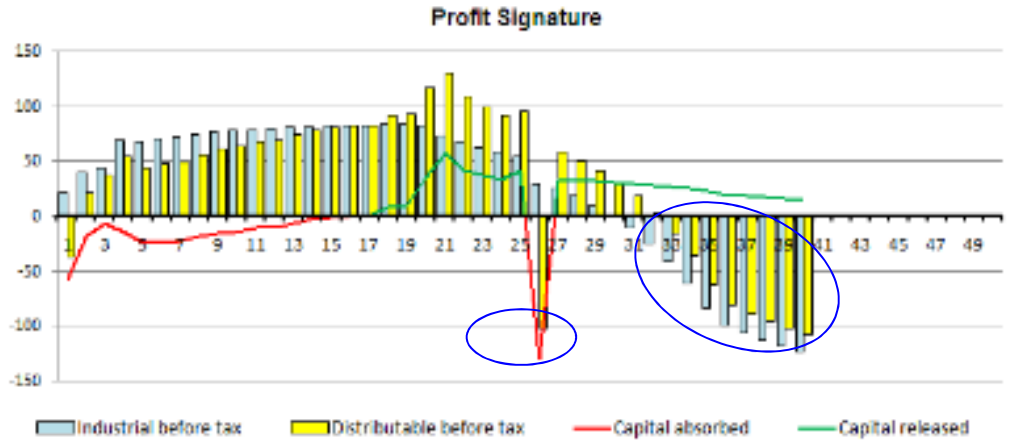
IRR on distributable profits after tax	IRR on Industrial profits	IRR on Required Capital **before tax**	IRR on Distributable Profits **before tax**
4.90%	5.3%	3.9%	5.2%

Remuneration of the employed capital: Profit Signature

- Besides the ratios/indicators that analyse the product in a perspective view though via comparisons of "present values", it is interesting and useful to have a look to the **yearly profits** to detect possible anomalous effects



- The **typical Product profit profile** is featured an initial loss, to be divided among the industrial strain due to commissions and the capital absorption, followed by a set of (hopefully!) positive profits



- Sharp drop of the distributable profit in year 26 … ???
- Negative industrial and distributable losses in the final years of the contract … ???

Remuneration of the employed capital

New Business Strain

= Sum of yearly losses divided by the first year premium

- **On industrial profits:** highlights the impact on the P&L of the initial investment in terms of commissions and other acquisition expenses
- **On distributable profits:** measures also the negative effect of setting aside the required capital

From industrial to distributable profits: **tax effect**

SOME CONSIDERATIONS

- **Regular premium contracts** usually **have higher NB strain** than **single premium contracts** because of:
  - the impact of the up-front commissions paid on regular premiums
  - regular premiums are generally more remunerated than single premiums

- Among regular premiums the NB strain varies due to:
  - term of the contract
  - the level and the way commissions are paid: how much is paid up-front and how much is the regular commission spread over the whole duration of the contract

- The NB strain should be evaluated on **"pure" cash flows** because accounting practices such as DAC (Deferred Acquisition Costs) artificially alter the result of the first year

- Measures that concretely decrease the NB strain:
  - **Zillmer reserves**
  - **Profit sharing system** in which the policyholder participates to all source of profits (the first year loss is shared between policyholder and shareholder)

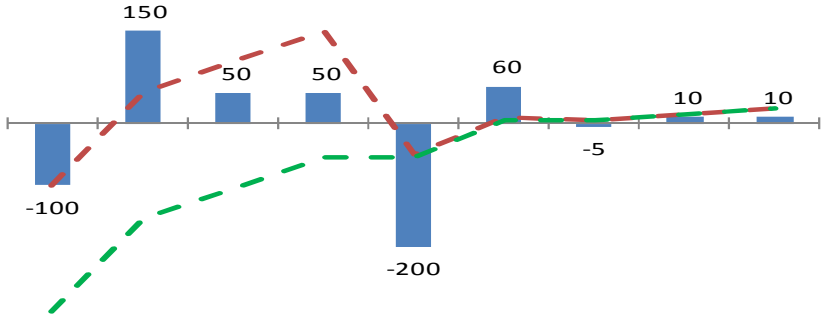
Remuneration of the employed capital

Pay-back period = *Period of time required to repay the sum of the original investment*

Modified pay-back period = *Period of time required to repay the sum of the original investment but in case of several changes of sign, the pay-back corresponds to the moment in which the cumulative positive inflows exceed the total outflows*

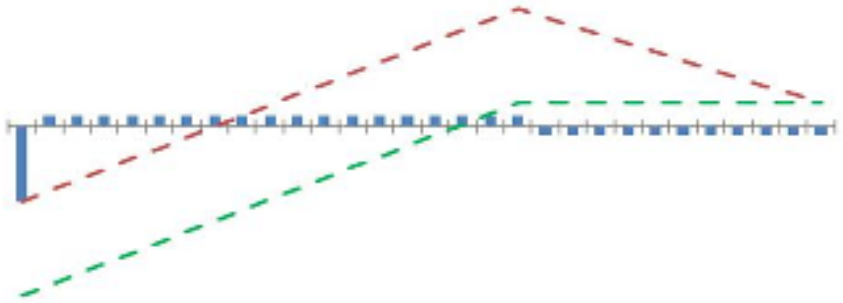
- Can be calculated on **industrial profits** and on **distributable profits**
- Should be based on **pure cash flows**

Example: alternation of +/- results



- **Red dotted line**: cumulated profits
- In the example, more than one payback period exists
- **Green dotted line**: cumulated positive results minus the sum of all negative results (**modified payback period** that is **unique** and **only exists when the sum of profits is positive)**

Example: Annuity product with losses in the last years



- **Red dotted line**: pay-back period in which final losses are not taken into account
- **Green dotted line**: final losses of the annuity are taken into account

Remuneration of the employed capital

- Similarly to what can be done for the IRR, these three indicators can be seen as the sum of:
  - ✓ Effect on **industrial profits**
  - ✓ Effect on the **required capital**
  - ✓ Effect on **taxes**

- **Example on New Business Strain**

NB Strain on distributable after tax	of which **industrial** effect	of which **capital** effect	of which **tax** effect
-28.5%	-36.3%	-2.8%	10.6%

Positive effect of taxes due to the losses

Pay-back Period towards Duration

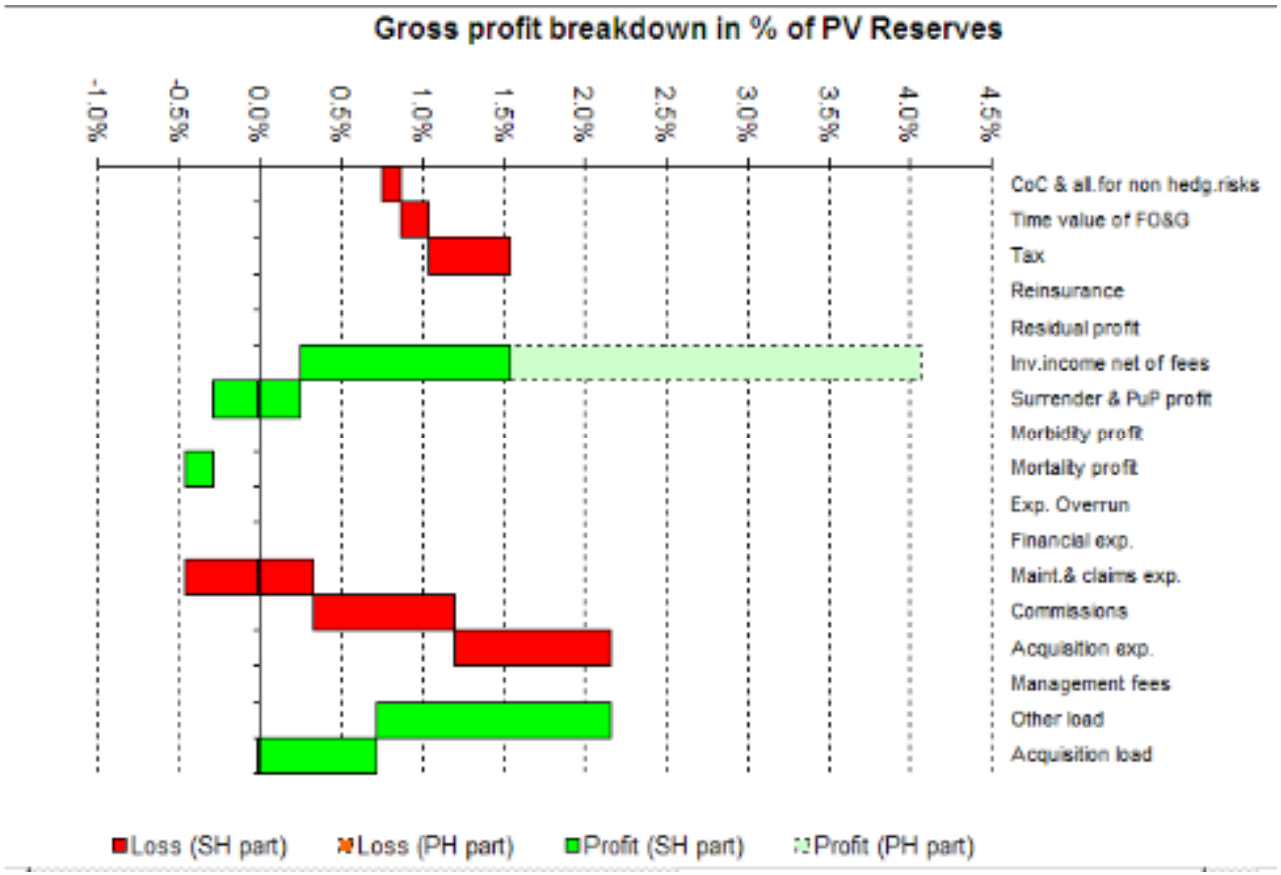
- The pay-back should be “judged” together with the **contract duration**
  - Example of a possible reference economic threshold: a combination of an absolute n° of years and a parameter linked to the contract duration that captures the peculiarity of the product under analysis
- The **Profit Period = contract duration – payback period**: period of the contract in which the company is expected to make profit
  - Example: setting an economic threshold for the pay back period equal to 2/3 of the contract duration means that the shareholder has to wait for 2/3 of the duration to recover the investment, the remaining 1/3 is to make profit
- Products/Portfolios with **long pay-back** can be sustainable if:
  - ✓ the **duration** of the products is also **long**
  - ✓ the company can rely on a **stable portfolio** to avoid that the policyholder leaves the company before the capital employed is recovered

⇩

High persistency to be achieved via:

- ✓ **Claw-back** mechanisms
- ✓ Regular Commissions dependent on portfolio persistency
- ✓ **Surrender penalties** and **fidelity/terminal bonuses**

Profit Breakdown



- Gives indication on the **equilibrium of the product among different sources of profits**:
  - What is the main source of profit of the product?
  - Is it highly exposed on the financial side?
  - Are the loadings sufficient to cover the expenses?

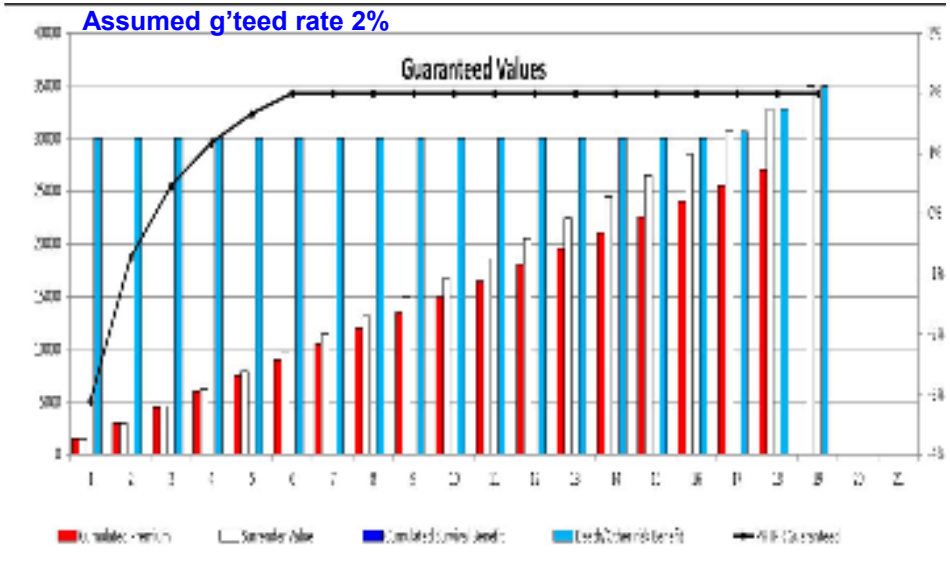
Analysis of the product from the Policyholder's persepctive

Policyholder's IRR

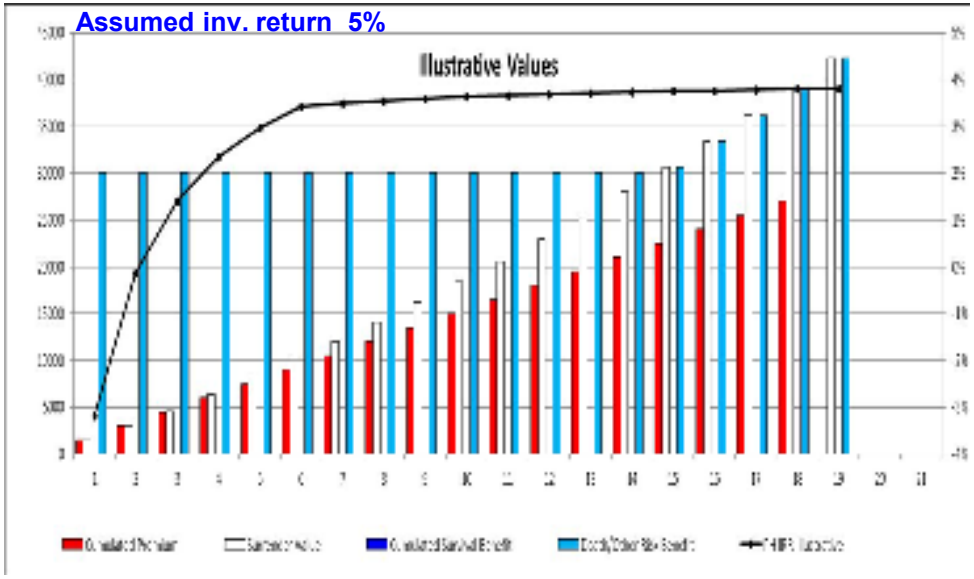
- Negative or very low IRR for the policyholder on saving products may arise potential **reputational risk** for the Insurance Company

- Problem of the **emerging markets** where there are cases in which the policyholder does not recover the money invested in the insurance contract even if he stays in the contract for many years

Assumed g'teed rate 2%



Assumed inv. return 5%

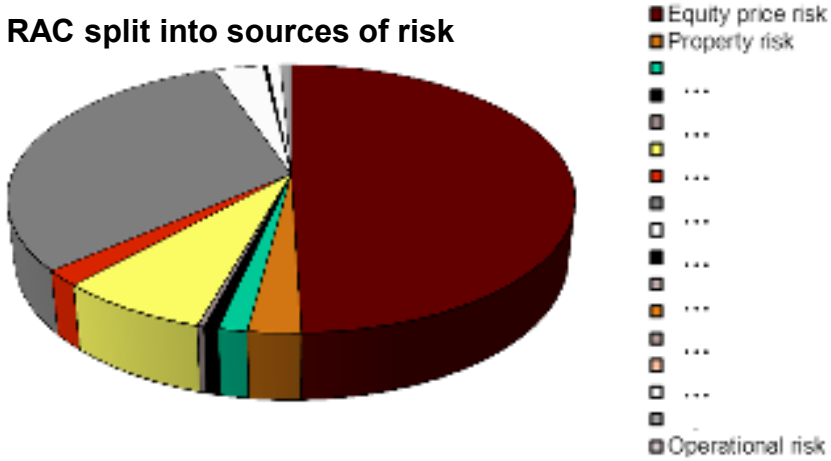


RAC at product level

- In a Solvency II perspective, when a new product is launched, it shall be evaluated **in terms of capital absorption and remuneration**

- **Estimate of the RAC at product level**, possibly with **simplified procedures** that avoid fully stochastic calculations but too **strong approximations** (e.g. rescaling of the RAC calculated for the total new production or even worse that on the existing contracts) **may be meaningless** leading to totally misleading allocation of capital to the new product the company is going to launch

RAC split into sources of risk



- Solvency II is not only only quantitative time consuming and reporting but it is:
  - an instrument to **improve the risk management in the ''real world''**
  - a **better efficiency in the capital management**

Sensitivities

- Once having calculated the RAC at product level, **is it still necessary to perform the sensitivities** (it could be argued that "stresses" of the RAC and "sensitivities" are substantially the same concept …)?

- The answer should be "**yes**": the "stresses" applied in the calculation of the RAC are aiming at evaluate the losses in extreme situations, the "sensitivities" are in a way "complementary" to them aiming at assuring that the product is overall in equilibrium in case of slight deviations from the base assumptions

  - Examples of the usual sensitivities:
    - Risk Free +/-1%
    - Maintenance/Financial Expenses: -10%
    - Lapse rates * 90%
    - Lapse rates * 110%
    - Mortality/Morbidity *95%

- Besides, it may be useful to perform an additional sensitivity (or more than one):

  - on the model point that provides the **maximum level of commissions to the sales force** to make sure that it is sustainable

→ Product seen also from the **sales force perspective**!

NBV/P. V. (Commissions+Other Acquisition costs)

- the profit of the company per unit of currency necessary to acquire the new business, in terms of commissions paid to sales forces and other acquisition expenses

The 5 dimensions of new production monitoring in Generali Group

V. FINAL REMARKS

Generali on new life production

We evaluate new life products across 5 dimensions:

Profitability

Margins on APE	Italy	France	Germany
	28.6%	10.3%	17.7%
Total	CEE	RoE	RoW
21.7%	39.1%	23.3%	28.2%

Riskiness / Capital Absorption

Capital Strain[1] / NBP[2]	Italy	France	Germany
	2.3%	2.3%	2.2%
Total	CEE	RoE	RoW
2.5%	1.9%	2.1%	8.4%

Capital remuneration

IRR	Italy	France	Germany
	13.7%	10.5%	18.7%
Total	CEE	RoE	RoW
13.1%	15.1%	11.9%	15.0%

1st Year P&L impact

P&L Strain[3] / NBP[2]	Italy	France	Germany
	5.8%	1.6%	1.1%
Total	CEE	RoE	RoW
3.7%	23.3%	4.5%	5.7%

Payback period

Payback Period (years)	Italy	France	Germany
	7	8	6
Total	CEE	RoE	RoW
7	6	7	7

(1) Required capital due to new business production
(2) New business premiums
(3) P&L cost of investment in life new business

Q: What does Free Surplus mean at product level?

A: Free Surplus = NBV - RAC

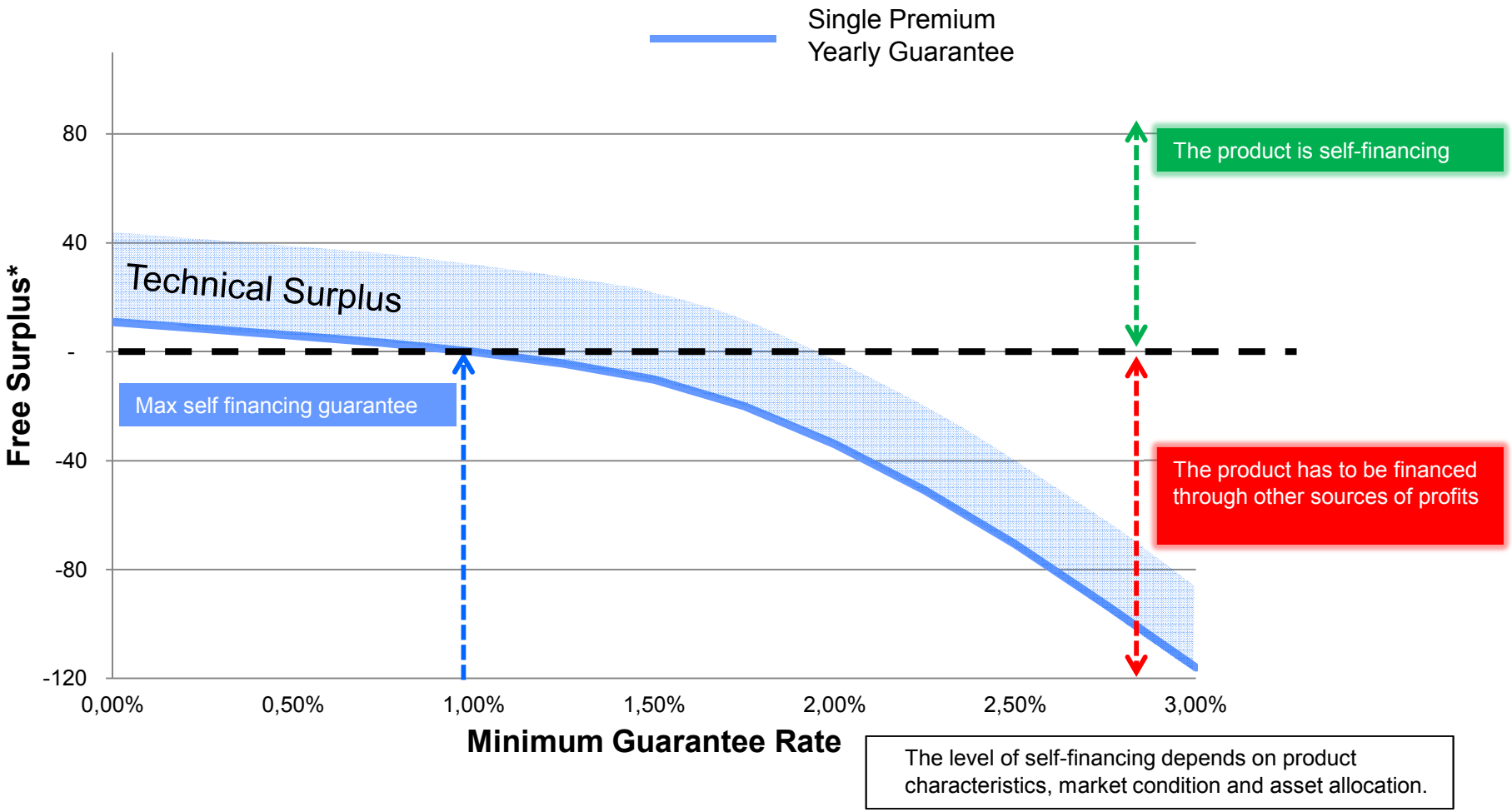
Q: When a new product is self financing?

A: When it does not require a capital injection:

- In Solvency 1: NEVER
- In Solvency 2: «could be» if the expected profits are considered as TIER 1 capital

ORSA: New Products and Capital Absorption

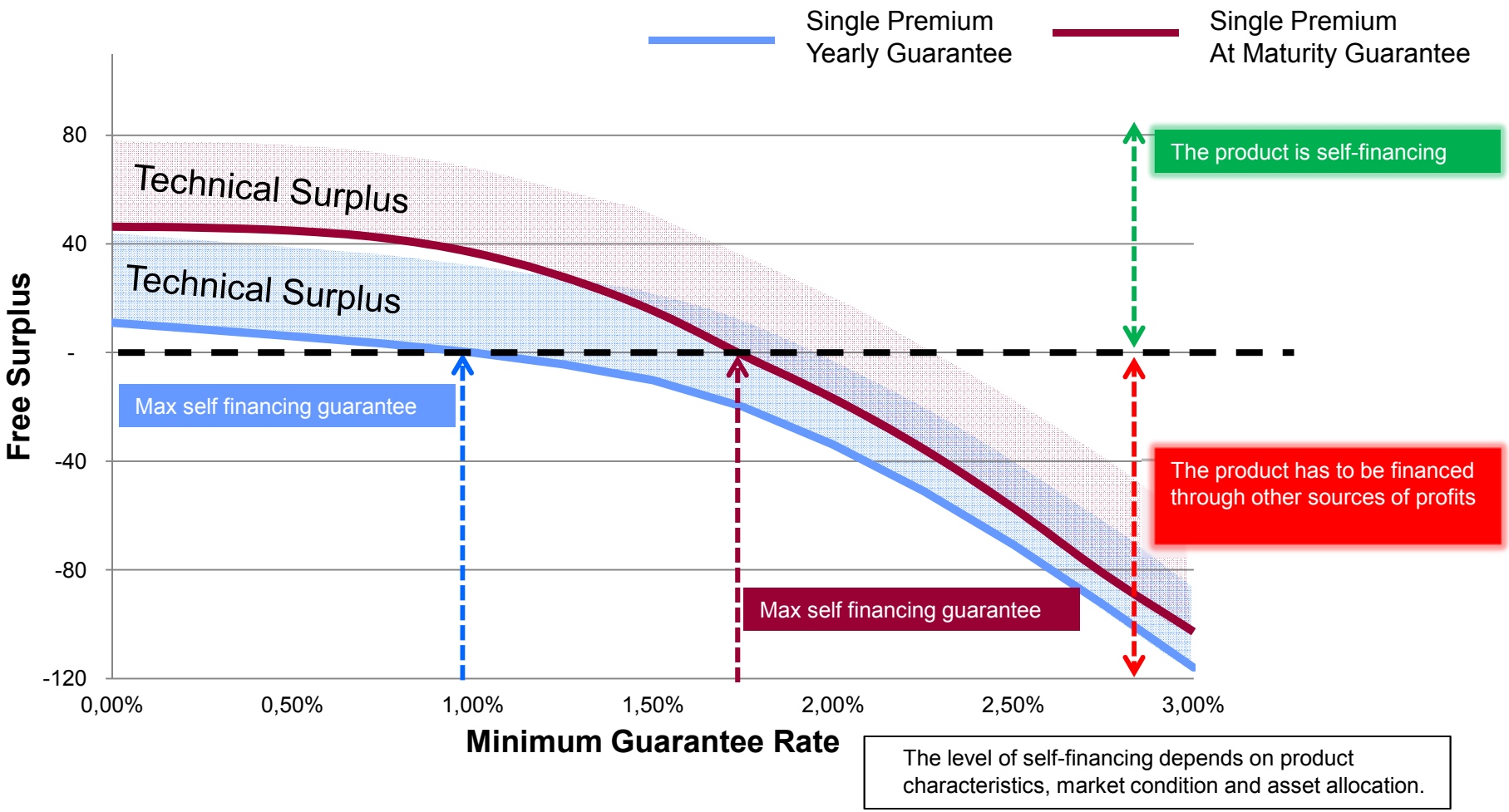
90/10 with profit contract , 15 yrs contractual term: Yearly vs At Maturity Guarantee



The level of self-financing depends on product characteristics, market condition and asset allocation.

ORSA: New Products and Capital Absorption

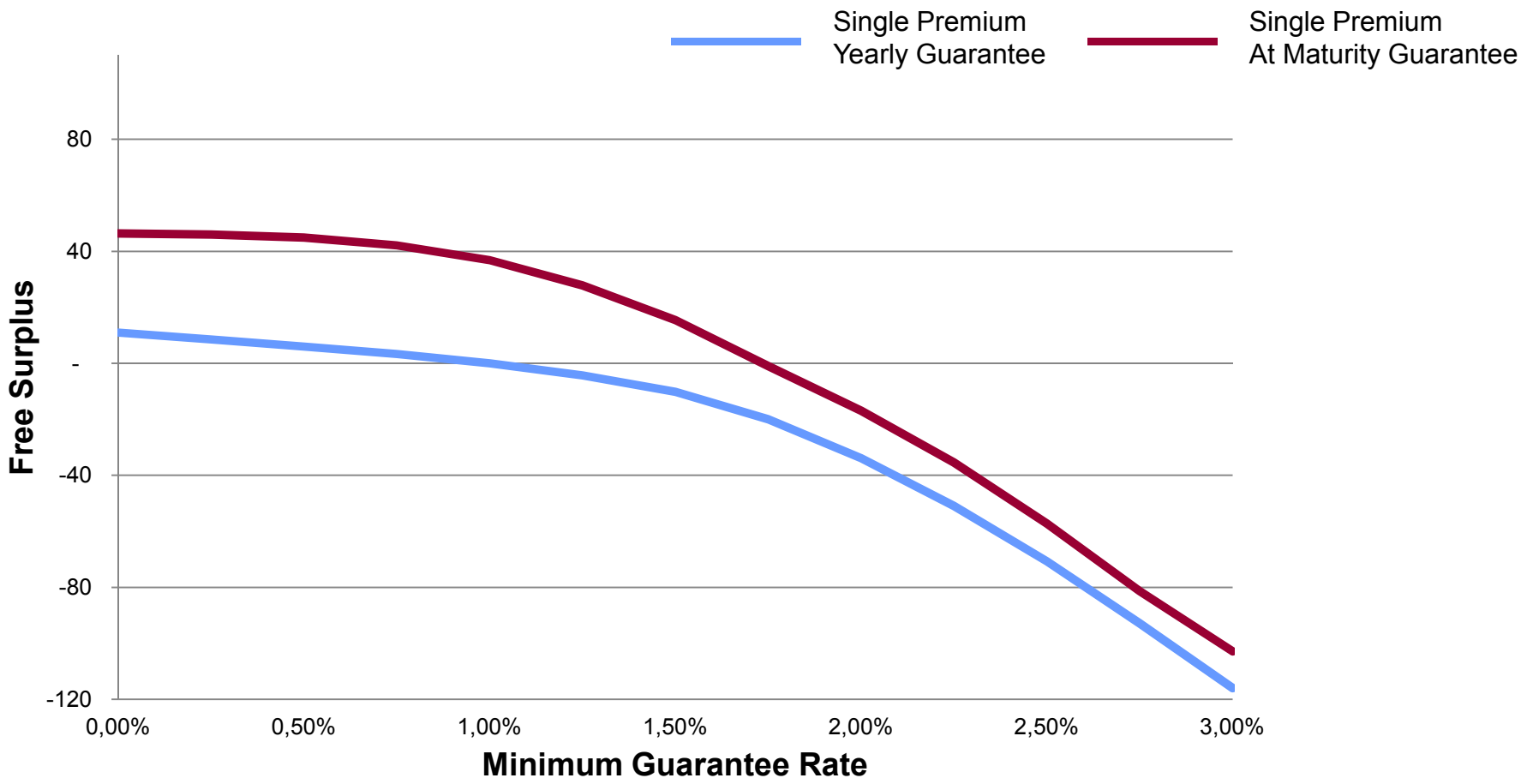
90/10 with profit contract , 15 yrs contractual term: Yearly vs At Maturity Guarantee



The level of self-financing depends on product characteristics, market condition and asset allocation.

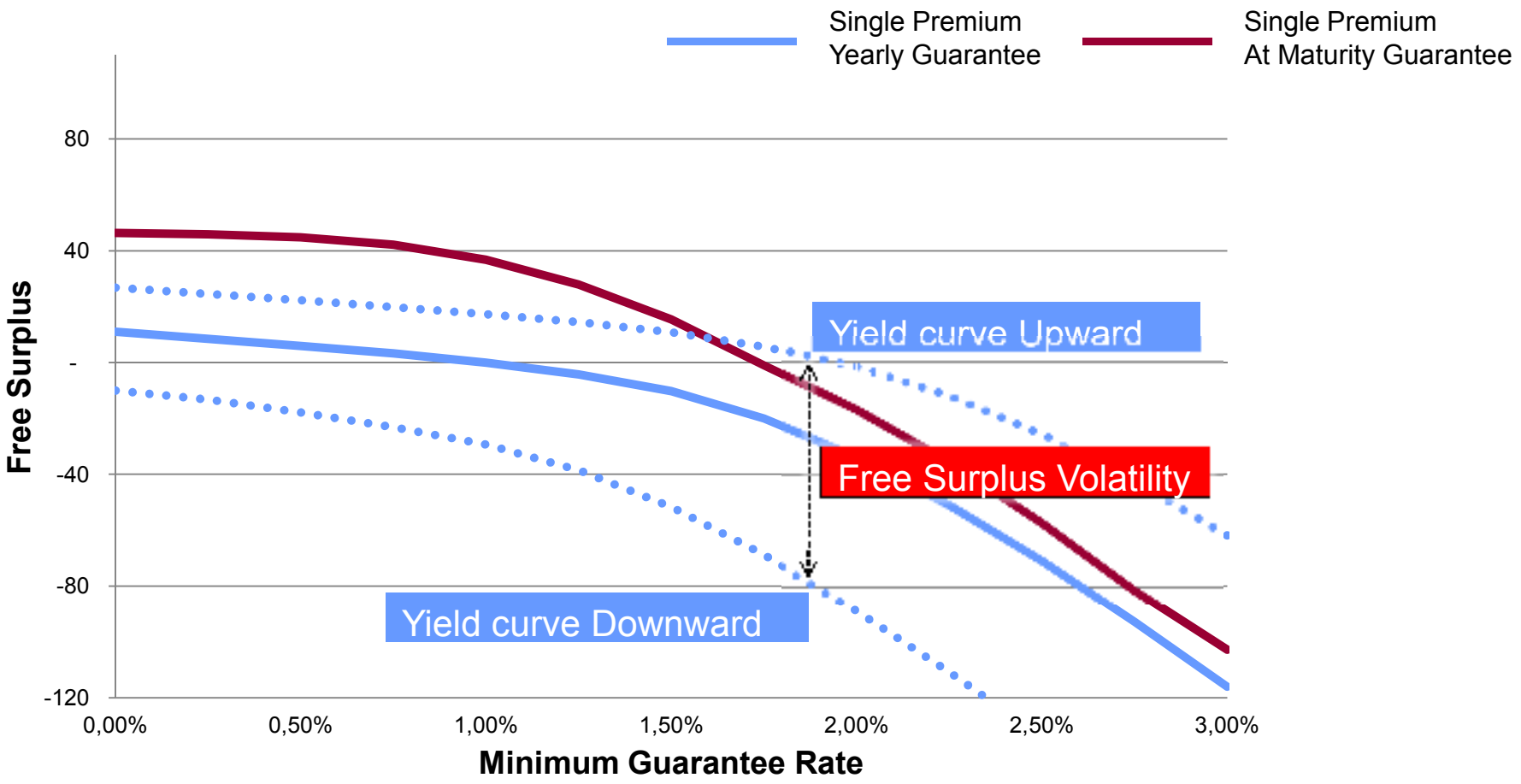
ORSA: New Products and Capital Absorption

Free Surplus Volatility: Yearly vs At Maturity Guarantee



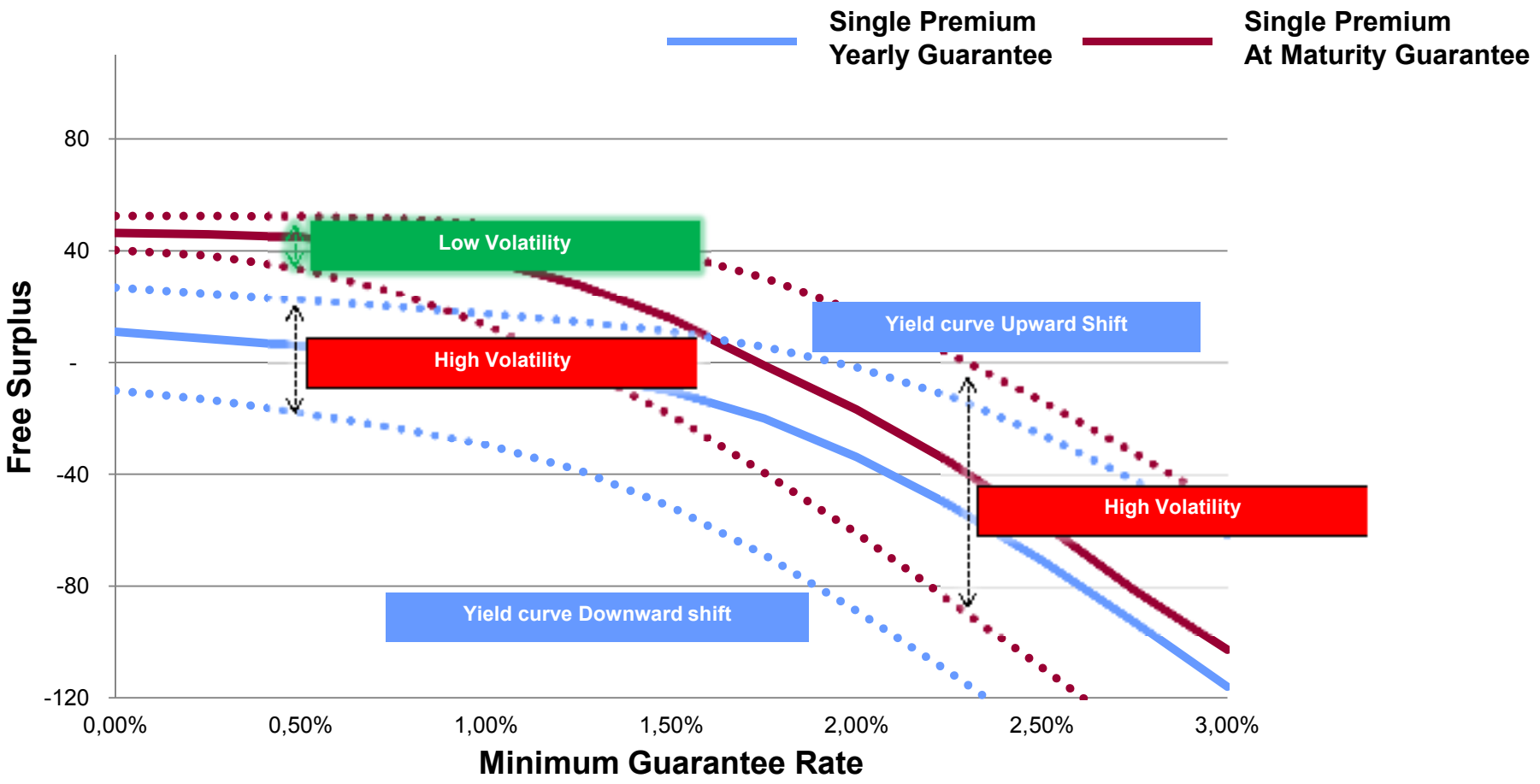
ORSA: New Products and Capital Absorption

Free Surplus Volatility: Yearly vs At Maturity Guarantee



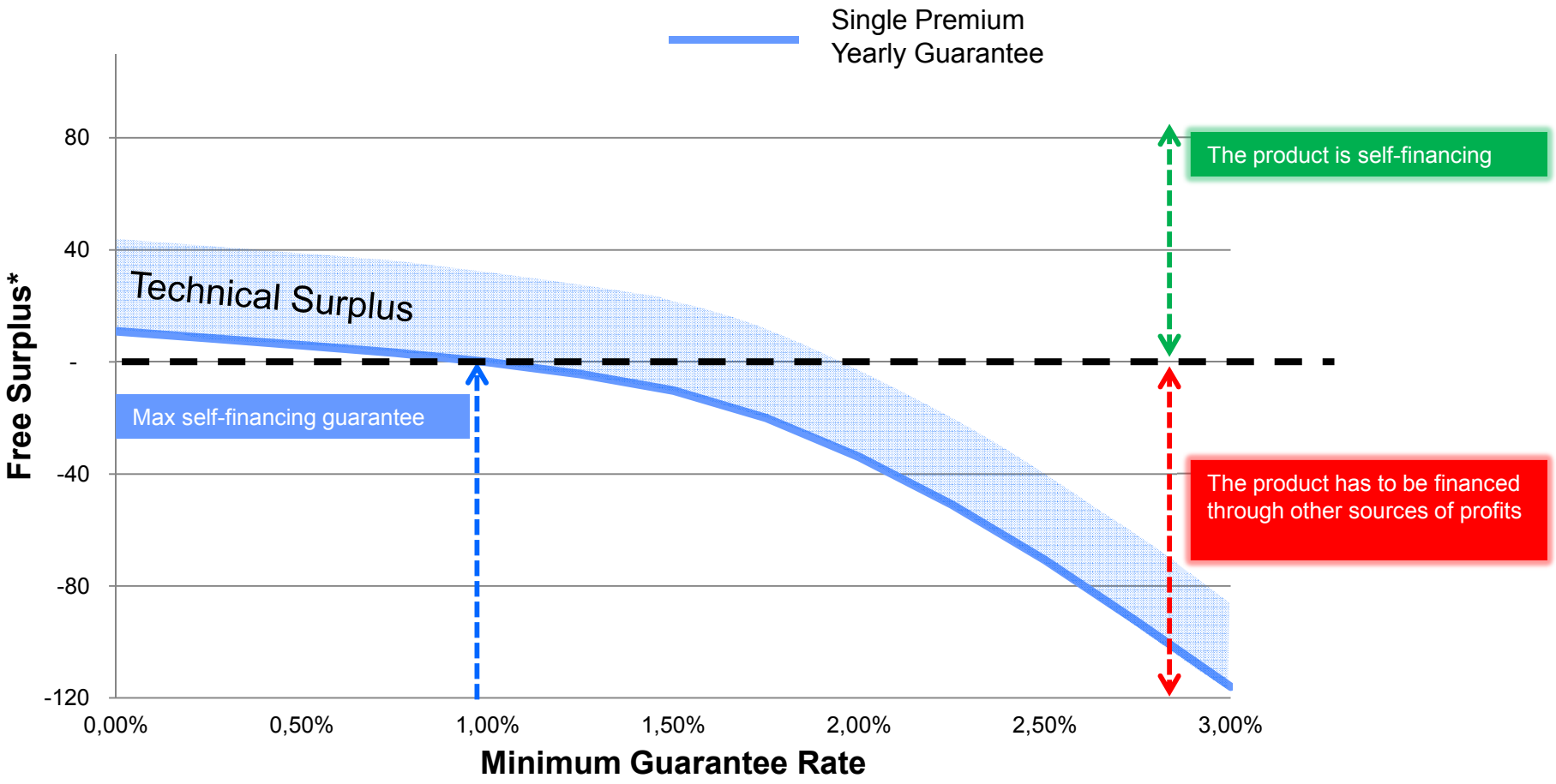
ORSA: New Products and Capital Absorption

Free Surplus Volatility: Yearly vs At Maturity Guarantee



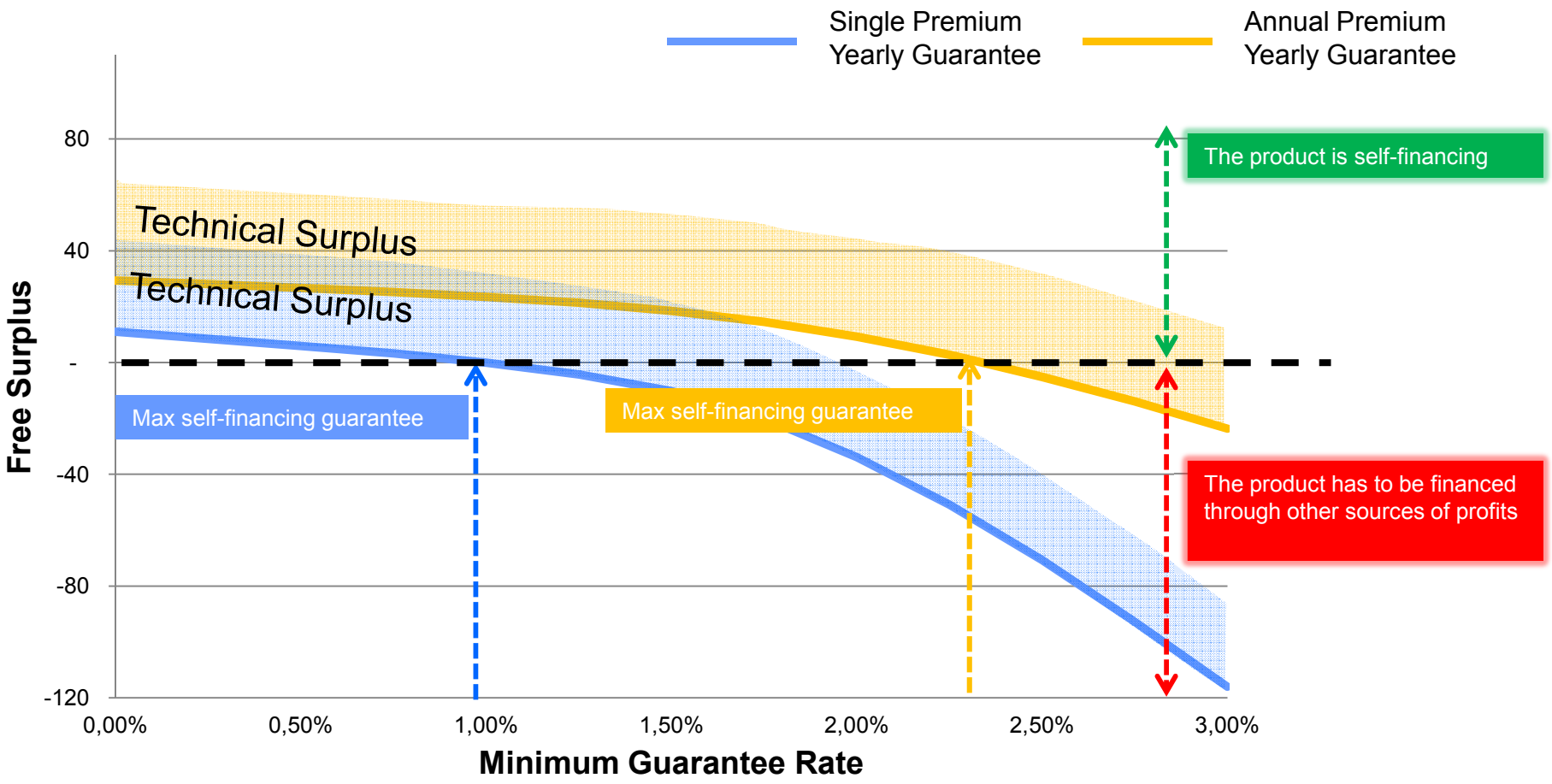
ORSA: New Products and Capital Absorption

90/10 with profit contract , 15 yrs contractual term: Single vs Annual Premium



ORSA: New Products and Capital Absorption

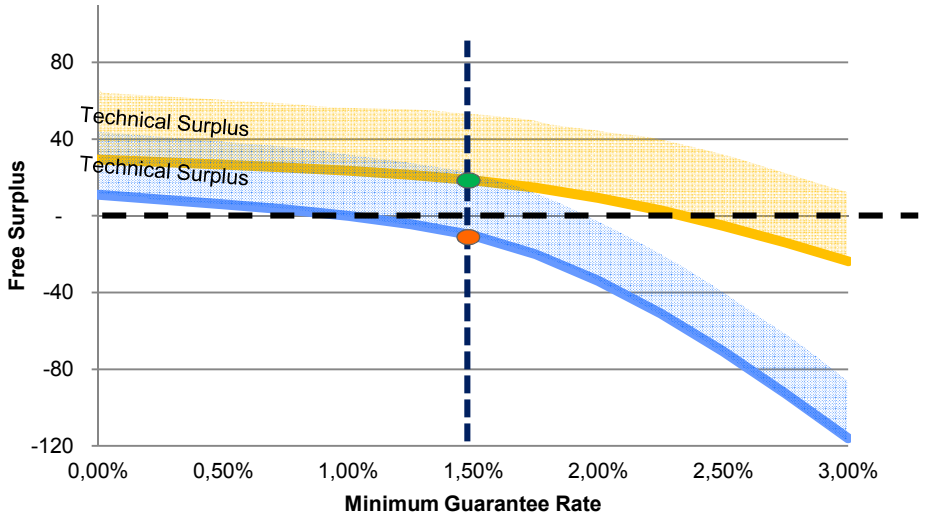
90/10 with profit contract , 15 yrs contractual term: Single vs Annual Premium



ORSA: New Products and Capital Absorption

Example: 1.5% guarantee

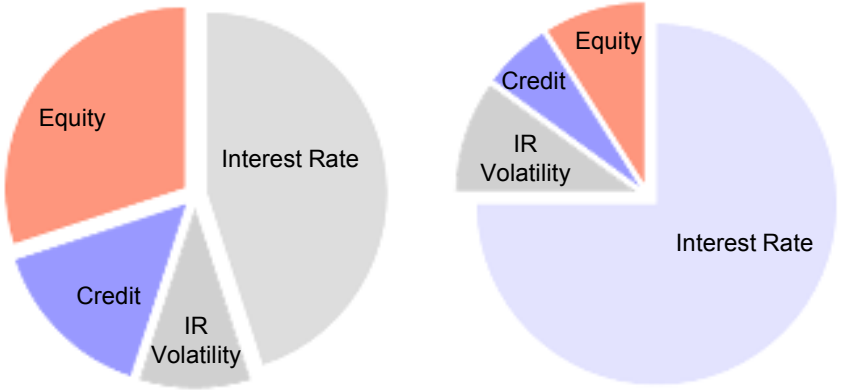
	Single Premium	Annual Premium
PVFP	41	36
RAC	52	18
FREE SURPLUS	-11	18



KEY POINTS

- ✓instantaneous shocks
- ✓permanent variation 1 y calibrated
- ✓instantaneous stress on asset exposures

RAC BREAKDOWN



Single Premium

Annual Premium