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Managing the Balance Sheet under Solvency II

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Agenda

- Solvency II in a nutshell
- BNPP IP Approach: Asset allocation optimization under Solvency 2 framework
- Managing the risk in the return portfolio
- Conclusion

Solvency II in a nutshell

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Key elements of the reform from an investment point of view

- Total Balance sheet approach
  - Partnership between liability specialists (actuaries) and the asset specialists (fund managers) will be key to develop
- Market value for both assets and liabilities
  - Translated into higher volatility of assets & liabilities
  - Objectives between local accounting & Solvency II need to be conciliate
- Wide range of risks to be covered by regulatory capital
  - Value at Risk (99.5%) approach to determine the required capital based on stress tests
  - Market risk expected to account for the majority of SCR (around two thirds)
- Direct link between asset allocation & regulatory capital
  - Added value of diversification under Solvency II demonstrated
  - Key role to play also for reporting

➔ **Higher influence of asset allocation on the regulatory capital and by consequence the excess capital.**

➔ **Key for insurers to align their asset allocation to the new regulatory context**

➔**Better duration matching**

➔**Increase in downside protection**

➔**Full transparency on holdings**

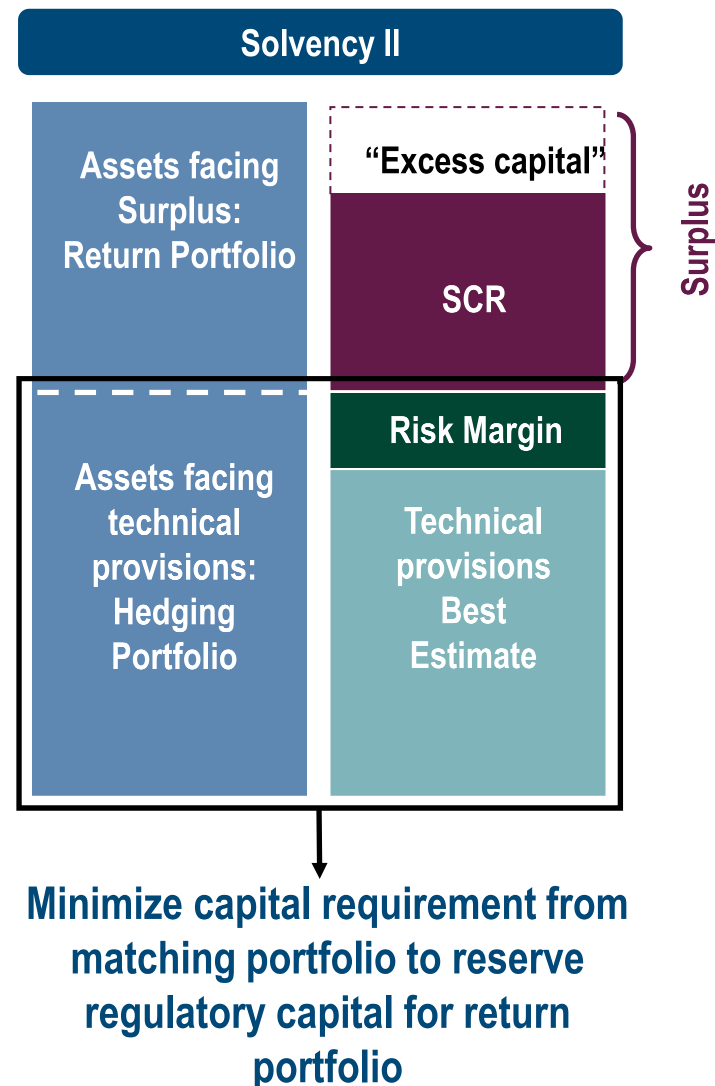
BNPP IP approach: Asset Allocation Optimization under Solvency 2 framework

An approach based on 5 steps

1. Understand the client specific situation
2. Split the existing portfolio in two parts:
   - A portfolio hedging/matching the liabilities
   - A return portfolio facing the surplus
3. Optimize the hedging/matching portfolio to minimize the capital requirement
4. Optimize the return portfolio based on an accounting objective
5. Manage dynamically the risk of the return portfolio based on a prudential objective

Optimization of the hedging/matching portfolio

- The objective is to get a liability hedging portfolio matching the sensitivities of the liability structure/stream based on the Solvency II valuation methodology
- Compared to Solvency I portfolio, this will require:
  - Investments in swaps to better match the sensitivities of the liabilities
  - Investments in credits to replicate the illiquidity premium of the liabilities
- When liabilities contain optionality from profit sharing policy, need to carry out ad hoc study to determine what is hedgeable through options/swaptions, and what are the costs related to the hedge-program



➔ **This step requires a detailed understanding of the liability structure**

Optimization of the hedging portfolio under Solvency II

	Assets	Liabilities
Return Portfolio	**Equities** ▪ Global, EM, SmCap **Fixed Income** ▪ Gov, Inv Grd, HY, EMD *Total: 100*	**Surplus: 100** ▪ Excess C:46 ▪ Regulatory C: 54
Optimized Matching Portfolio with minimized regulatory capital requirement	**Fixed Income : 1000** ▪ Long duration, credit **Swap*: 0** **Profit Sharing Option: 100**	**Liabilities (policies): 1110** ▪ Basic Reserve: 1010 ▪ Profit Sharing Option: 100

*The value of a swap equal 0 when you enter into such OTC contract. Then the value will evolve based on the mark to market

➔ To match the sensibilities of the liabilities, the matching portfolio will invest in swaps and options to free the regulatory capital requirement for the return portfolio

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Return portfolio: the attractiveness of the different asset classes

- Solvency II SCR is somewhat consistent with a VAR (99.5) based on historical data's
  - Using one or the other metric gives broadly comparable results
- Nevertheless, ranking the different asset classes can not be done solely based on a risk measure (SCR or VAR) but by comparing their expected return with their capital charge
  - Choice of expected return is key

Blue bar: excess return based on historical return

Pink bar: excess return based on expected return from our "smart benchmark"

➔ **Impact of expected excess returns in evaluating the attractiveness of asset classes can be high**

➔ **Black and white conclusions on asset classes attractiveness under S2 have to be mitigated**

➔ **Especially at the level of the entire portfolio**

Manage dynamically the risk of the return portfolio to protect the initial excess capital

- The surplus (SCR + excess capital) strategic asset allocation is based on a medium term horizon. As a consequence, such allocation is not protected against short term market fluctuations and their negative impact on the excess capital.

→ This raises prudency or solvency concerns (decreasing excess capital)

- Our solution is to manage dynamically the risk of the return portfolio to take into account a prudential indicator i.e. the initial level of excess capital .

- Such approach is the optimal response to meet short term regulatory constraints (maintain a large excess capital at each moment) while building a return portfolio able to meet long term shareholders return requirement.

- Such statement of dynamic allocation has been promoted by the Edhec research in the context of a chair sponsored by BNPP IP regarding the pension fund industry.

Managing the risk in the return portfolio

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Assumption for the allocation of the return portfolio *

Underlying	Currency	Exposure
Euro Zone Government Bonds	EUR	10.0%
EMU Inflation Linked Bonds	EUR	5.0%
Global Bonds ex EMU	EUR	5.0%
Euro zone Corporate Investment Grade Bonds	EUR	15.0%
US high yield bonds	USD	10.0%
Total Fixed Income		45%
MSCI US	USD	15.0%
MSCI Europe	EUR	25.0%
MSCI Japan	JPY	5.0%
Total Equities		45%
Europe real estate	EUR	5.0%
Global Commodities	USD	5.0%
Others		10%

- Portfolio currency: Euro
- Currency risk: covered
- 1 day lag for implementation

* Portfolio doesn’t represent a typical Insurers investment portfolio. For illustration purposes only.

Strategies to meet the prudential objective

Different ways to protect the excess capital

Strategy		Advantages/Disadvantages
Ex ante protection	Option strategies (consisting in buying puts and selling calls with low/zero net premium	**Initial SCR saving** (e.g. of 50% in case of a portfolio made of 100% equity and a put of 80%) Reduction of max drawdown for surplus and excess capital Opportunity costs due to loss of upside linked to the sale of the call **A way to turn equity more solvency II friendly**
Ex Post protection	Dynamic risk management consisting in adjusting the risk of the portfolio in order to protect the excess capital	No initial SCR saving **Protection of the excess capital** Reduction of max drawdown for surplus Opportunity costs due to lower participation to upside

Such protection mechanisms constitute optimal solutions to meet short term regulatory constraints while building a return portfolio enabling to meet long term shareholders return requirement

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Strategy 1: reversal strategy on an equity portfolio

Systematic options strategy (risk reversal)*

Buying downside protection put — **financed by** → **Selling upside call**

Put protection:

- with strike at 80%
- 1 year maturity
- 12 puts spread over 12 months to avoid entry point dependency

Costs neutral →

Selling calls:

- at a strike covering the cost of the puts
- 1 year maturity
- 12 calls spread over 12 months

Assuming 100% in equity, the puts strategy allows to reduce the initial Solvency II capital charge roughly by 50% (from 39% to 19%)

Question: How this protection will translate into a loss of upside due to calls?

Strong ex ante benefit through SCR reduction but costs linked to loss of upside (sale of calls)

* Based on Eurostoxx

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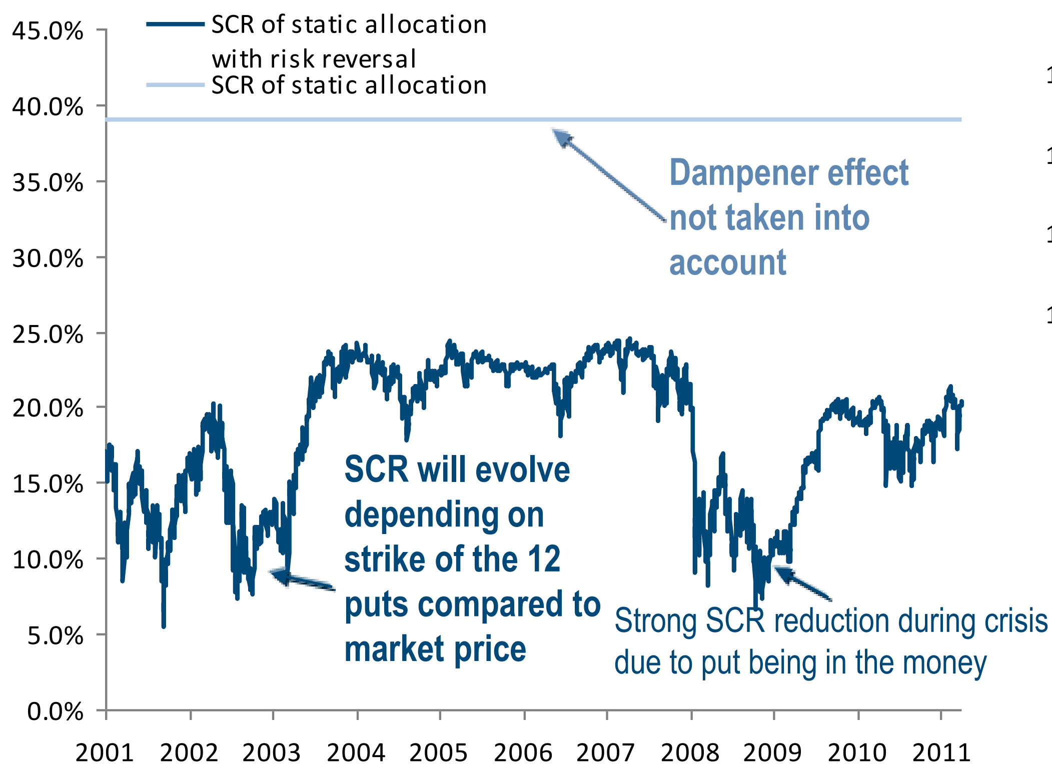
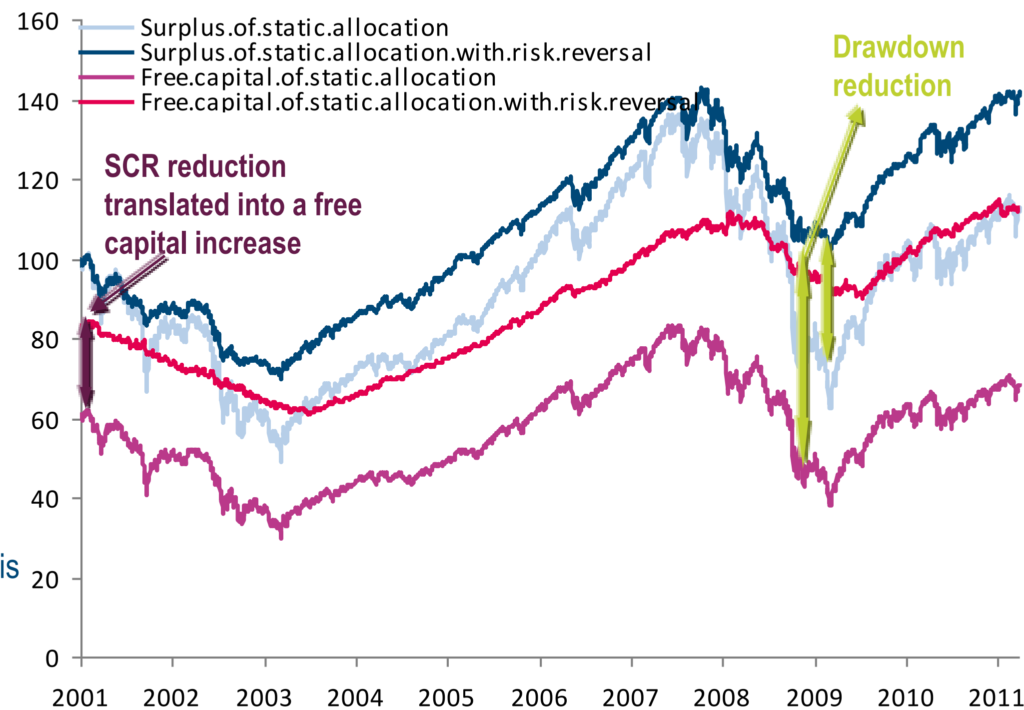
Backtest of risk reversal considering 100% in equities (2001-2011)*

SCR, Surplus and Free capital evolution

SCR evolution with and without risk reversal



Surplus & Free Capital evolution with and without risk reversal



SCR divided by at least 2 in average.

Significant drawdown reduction for free capital and surplus with a risk reversal strategy

Source: BNPP IP

* The backtest starts in 2001 after we bought a full hedge (12 puts and 12 calls) over 2000.

Strategy 2: Dynamic Risk Management overlay

- Allocation of the surplus to risky assets is adjusted to protect the initial level of free capital (which is not ensured through a risk reversal strategy)
- The algorithm consists in:
  - defining the level of initial free capital to protect
  - de-risking the portfolio based on development of the free capital
  - increasing the level of free capital to be protected when surplus reached the highest NAV (ratchet)
- Deleveraging optimized by deleveraging the assets with the largest contributions to the SCR
- To avoid too much trading, we define a trading range above the free capital:
  - the trading range is defined based on the cushion between the surplus and the free capital to be protected
  - when the cushion is below 100% of the SCR, we de-risk
  - when the cushion is above 122.5% of the SCR, we increase the risk
- Daily risk monitoring

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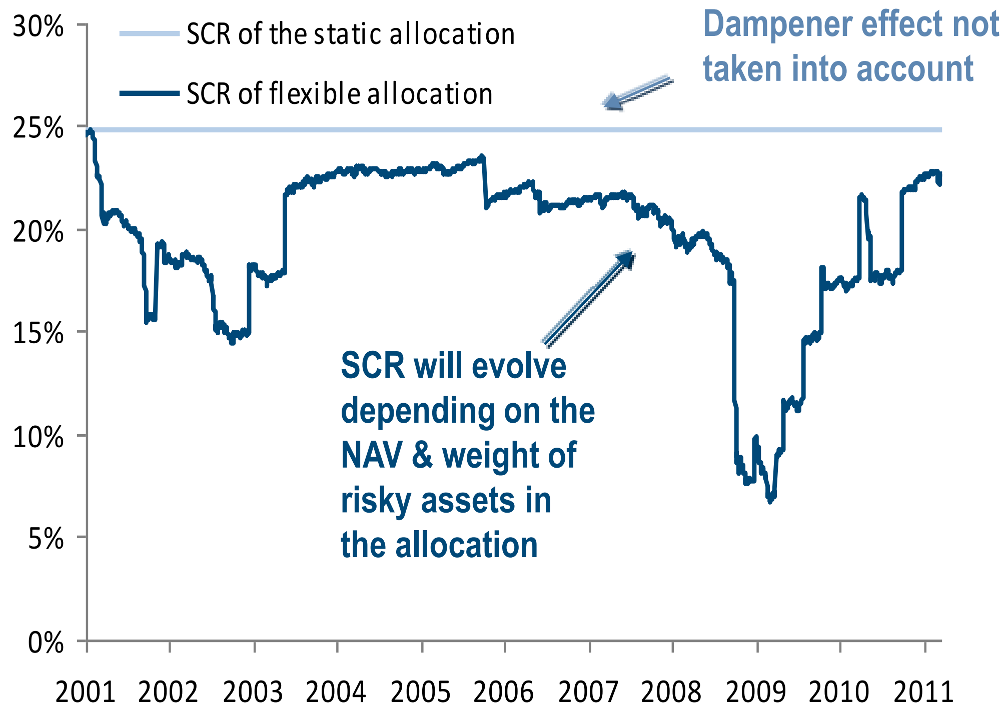
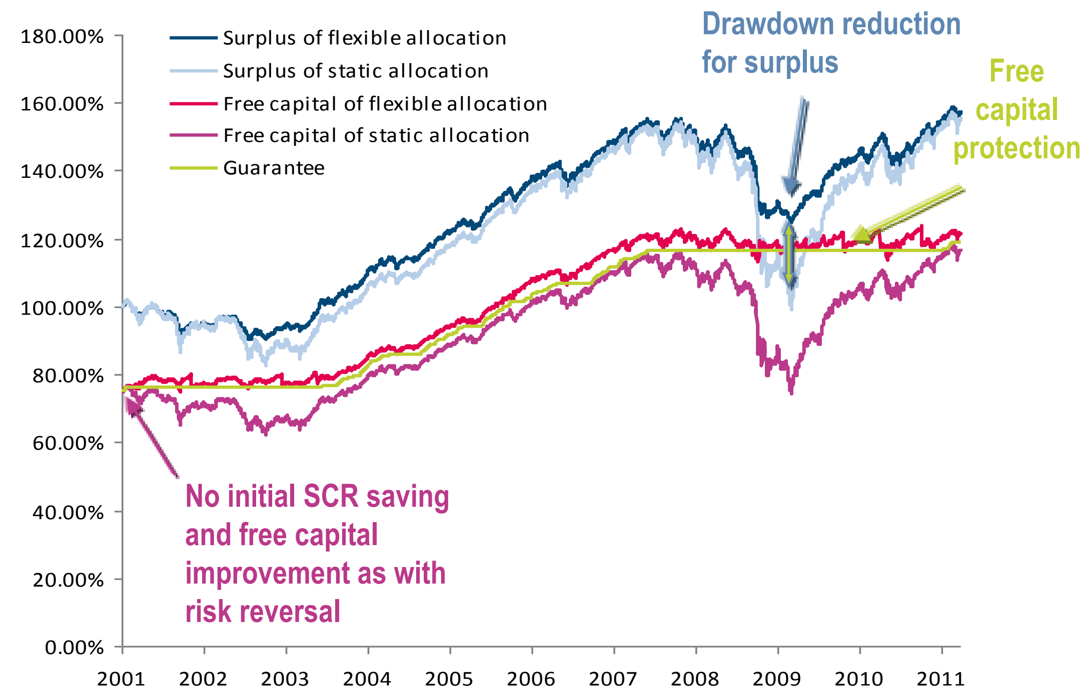
Backtest for risk overlay based on diversified allocation (2001-2011)

SCR, Surplus and Free capital evolution

SCR evolution without and with a risk overlay



Evolution of surplus and free capital without and with a risk overlay



SCR reduction of 22% in average due to NAV reduction but no upfront SCR saving as it's the case with a risk reversal

Strong Protection of free capital and reduction of drawdown for surplus

Source: BNPP IP

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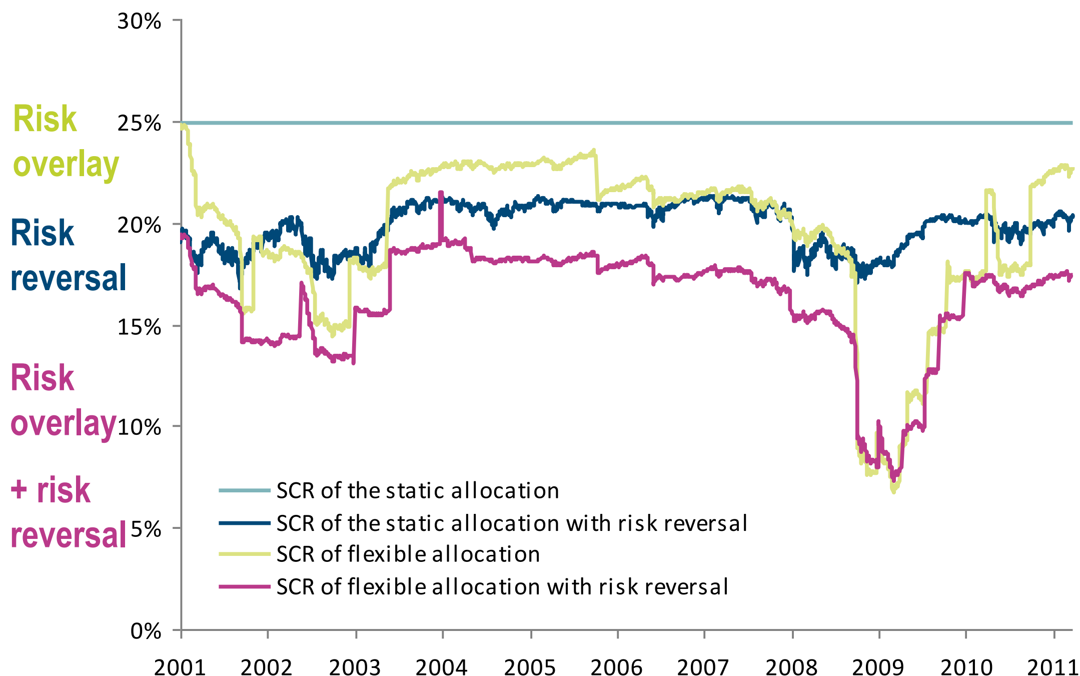
Backtest 2001-2011: combining the 2 protection mechanisms*

SCR, Surplus and Free capital evolution

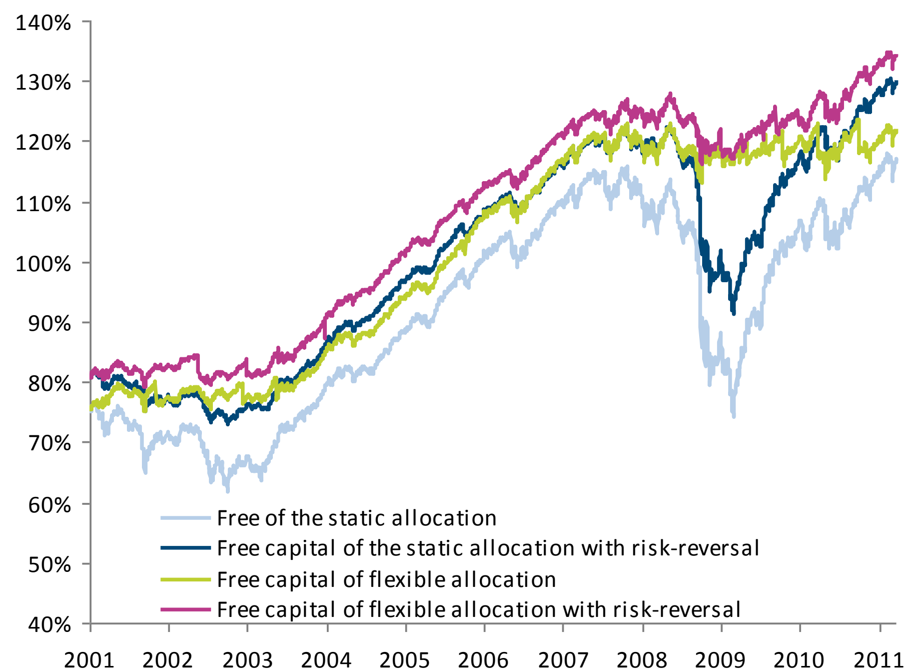
SCR of a the diversified allocation without or with the risk overlay and with or without risk reversal



SCR reduction by 35% on average with the 2 protection mechanisms vs. ~20% on average for each mechanism standalone

•Considering the diversified allocation page 12

Free capital of a the diversified allocation without or with the risk overlay and with or without risk reversal



Source: BNPP IP

During crisis (as 2008), the risk overlay dominates. When market rebounds, the risk reversal dominates. This allows to protect free capital while offering a higher upside

Strong added value of combining the two protection mechanisms

- Clear benefit of the risk reversal and the risk overlay on the portfolio over the last 10 years
  - Reduction of the initial SCR thanks to the risk reversal
  - Clear protection of the free capital thanks to the risk overlay (when the puts of the risk reversal are not yet at or in the money) translated into a reduction of maximum drawdown of free capital
  - Increase of initial and final free capital
  - Significant reduction of the maximum drawdown of the surplus and reduction of average SCR thanks to the two protection mechanisms
  - Strong volatility reduction and excess return increase
- Over the last decade, the backtest is very appealing. That's why we have adjusted the peculiarities of this decade by introducing a cost linked to the upside loss in good market circumstances. Despite such adjustment, this solution with two protection mechanisms stays very interesting from a risk reward prospective

Conclusion

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Conclusion

- The objective of this analysis was to demonstrate the benefit of different protection mechanisms for the investment portfolio based on a number of assumptions/parameters
- These protection mechanisms are being constructed as overlays:
  - existing portfolio's will not be effected
  - are tailor-made to the requirement of the client (protection levels, risk monitoring frequency)
  - have successfully been implemented
- In constructing portfolios
  - Provide transparency (in products, solutions and reporting)
  - Think top/ down
  - Avoiding all risky assets could be too simplistic
  - Provide solutions in the spirit of the regulation : protect capital in worse case scenarios while creating value for insurance companies' stakeholders

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