



Institute of Actuaries of India

Introduction to ECONOMIC CAPITAL in Product Pricing

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Agenda

Overview of Balance Sheets

- Traditional B/s Vs Economic B/s
- What is BEL ?

Economic Capital

- What is Economic Capital - Why/How is it Calculated?
- What are the Risks Categories and Risk Definitions?
- What are Hedgeable and Non-Hedgeable Risks?
- What is Risk Margin?

Product Pricing Cashflows

- Traditional Basis Vs Economic Basis

Traditional Vs Economic Capital Pricing – A Practical Example

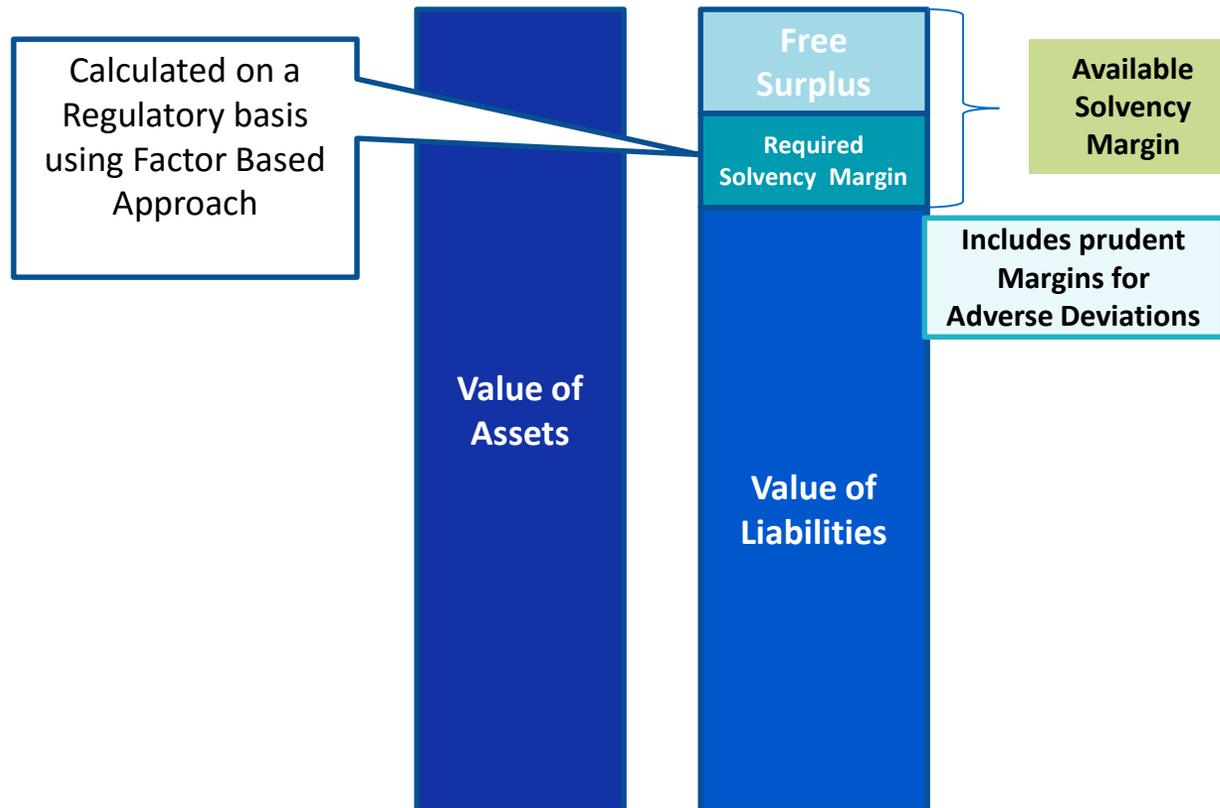
- Calculation of EC for each risk via shocks
- Aggregation of EC across risks
- What are the Pricing Metrics – Economic VNB, Economic Value Add

Summary

- Key Differences - Traditional Pricing Vs EC Pricing
- Benefits of Economic Capital Pricing Approach
- Challenges of EC Pricing especially in the Indian context
- Differences from Regulatory Capital

Balance Sheet

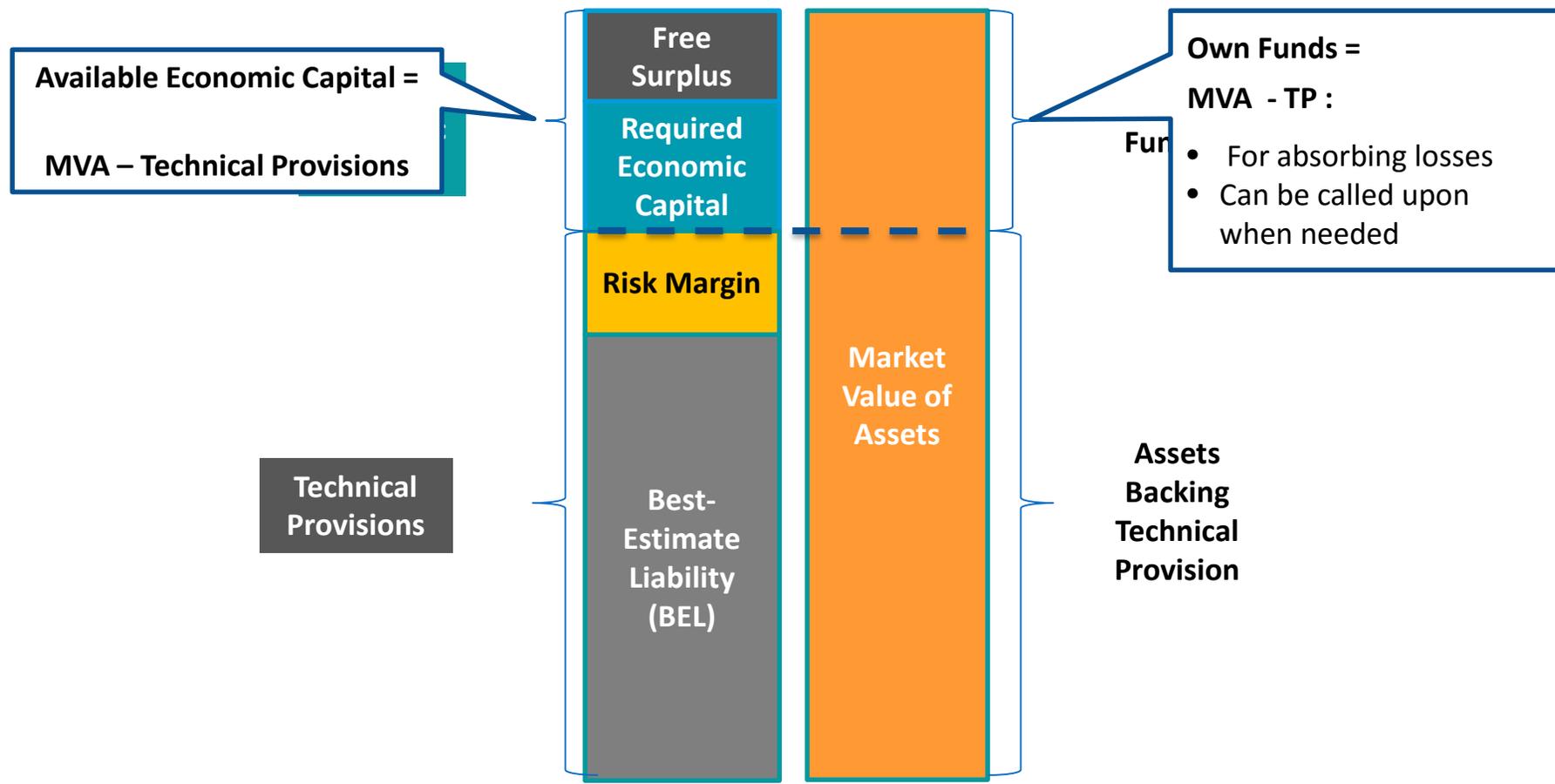
Traditional/Statutory Balance Sheet



$$\text{Solvency Ratio} = \text{Available Solvency Margin (ASM)} / \text{Required Solvency Margin (RSM)}$$

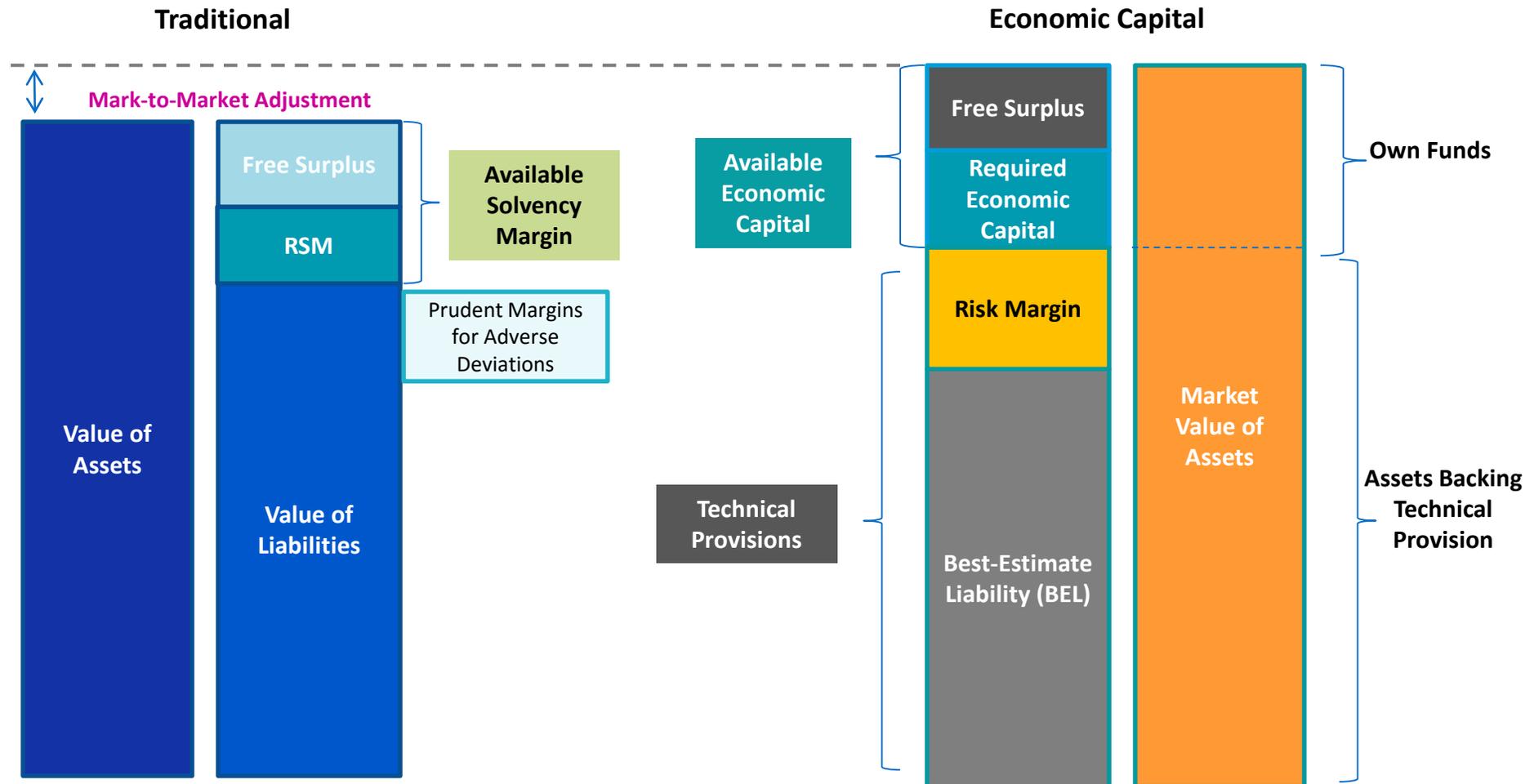
Balance Sheet

Economic Balance Sheet



Balance Sheet - Comparison

Traditional Vs Economic Balance Sheets



What is BEL?

BEL is the present value of best estimate net cashflows, discounted using a risk-free yield curve. ⁴

- All assumptions are best estimate, with no margins for prudence
- Discounted @ risk free curve
- Cash-flow projections are done on a policy by policy basis
- BEL can be negative i.e. no floor of 'zero'
- Allows for expected decrements, increments & policyholder behavior (e.g. Lapses)
- For Financial Options & Guarantees, a Market Consistent simulation or Stochastic analysis or any other risk based/ market consistent approach including the deterministic Approach

Risk Free Interest Rates

'As a default approach, the RFR interest rate is primarily derived from the rates at which two parties are prepared to swap fixed and floating cashflows' (source: EIPOA Website)

Swap/G-sec Rates – An Example			
Year	Annual Swaps	Zero Coupon G-Sec Rate	Diff
1	6.348%	6.387%	-0.040%
2	6.255%	6.370%	-0.115%
3	6.296%	6.526%	-0.230%
4	6.343%	6.597%	-0.254%
5	6.389%	6.587%	-0.198%
6	6.389%	6.700%	-0.311%
7	6.389%	6.902%	-0.513%
8	6.389%	6.936%	-0.547%
9	6.389%	6.719%	-0.330%
10	6.389%	6.521%	-0.132%

As per Solvency II, for countries where ;

- Swaps exist and are sufficiently liquid and reliable, the RFR is mostly based on the swap curve appropriately adjusted to remove credit risk if any
- Swaps do not exist or are not sufficiently liquid and reliable, the RFR references the government securities curve

In India, Swap rates are not available/credible after duration 5 years

What is Economic Capital ? - A Definition

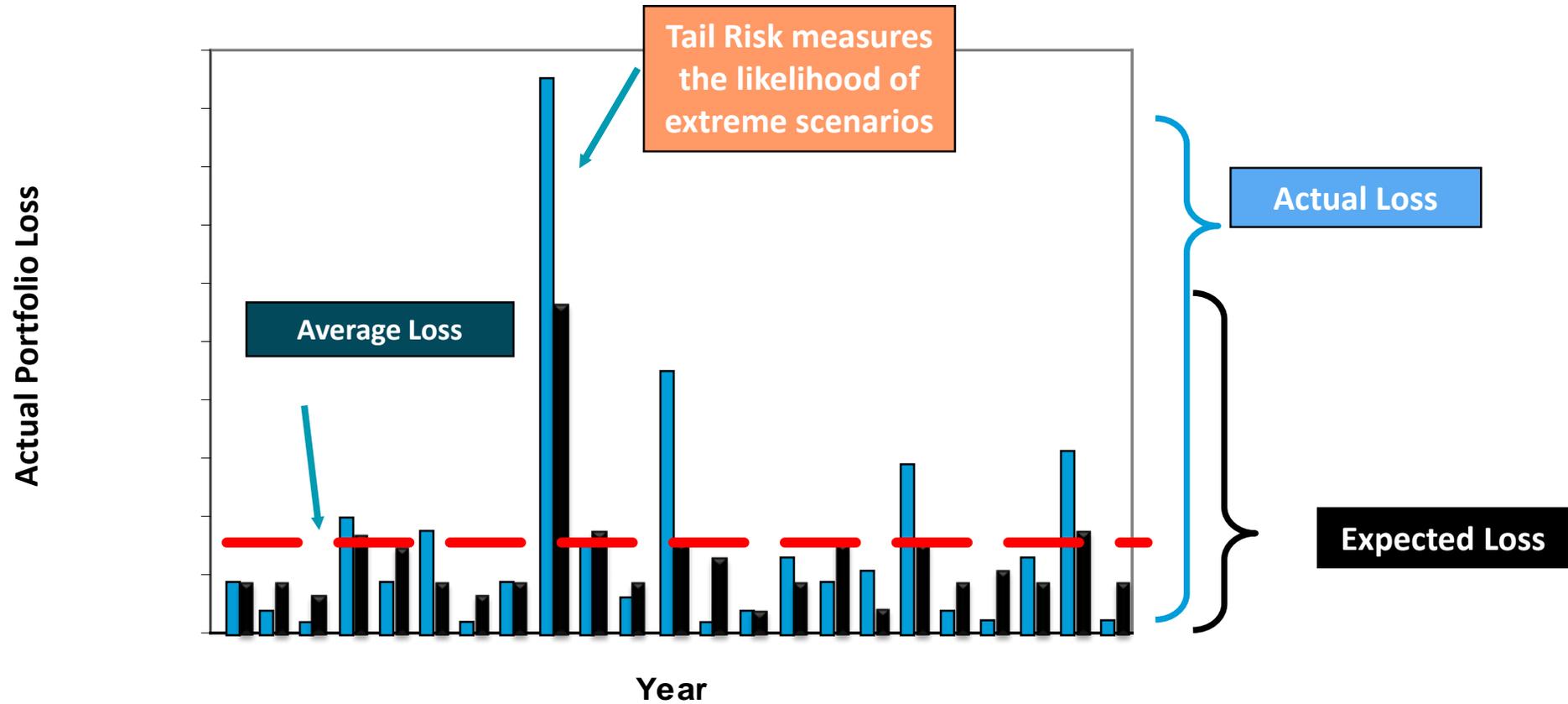
Economic Capital is the amount of **Risk Capital** that a financial institution estimates in order to **remain solvent** at a given **confidence level** and **time horizon**.¹

¹Economic Capital; Investopedia; Accessed 26th May 2017; <http://www.investopedia.com/terms/e/economic-capital.asp>

Why is Economic Capital Calculated?

Expected Vs Actual Loss & Tail Risk

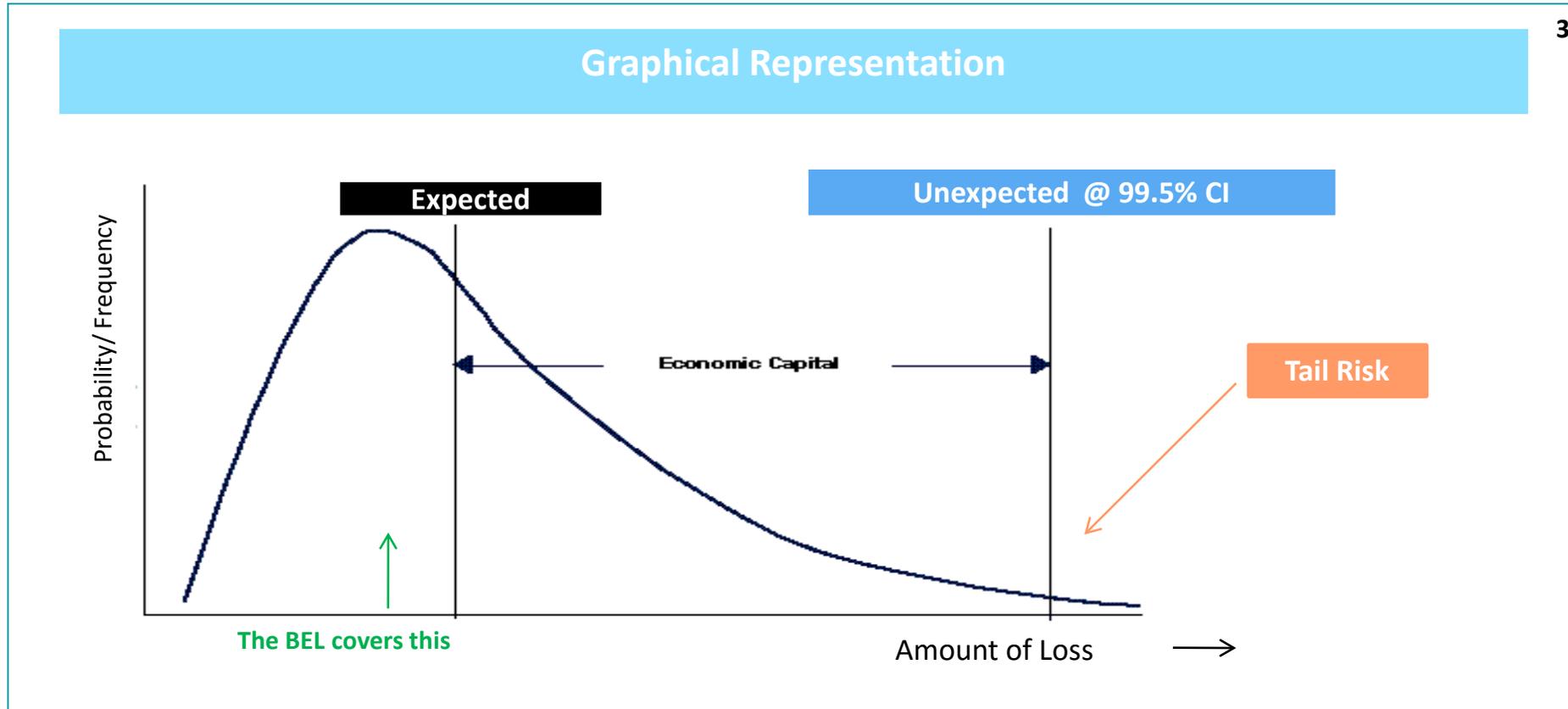
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² Adapted from - Uses and Misuses of Required Economic Capital; Brian Dvorak, Moody's KMV

How is Economic Capital Calculated? - 1

EC is Value at Risk measure based on **99.5% CI** of **variation** over **1 year** in the **amount of Loss**.



³ Adapted from - Economic Capital; Investopedia; Accessed 26th May 2017; <http://www.investopedia.com/terms/e/economic-capital.asp>

How is Economic Capital calculated ? - 2

EC for any particular risk may be calculated in the following way for an individual risk :

$$\begin{aligned} \text{EC} &= \text{Net Asset Value}_{\text{Base}} - \text{Net Asset Value}_{\text{Stressed}} \\ &= (A_0 - L_0)_{\text{Base}} - (A_0 - L_0)_{\text{Stressed}} \\ &= \text{Surplus}_{\text{Base}} - \text{Surplus}_{\text{Stressed}} \end{aligned}$$

These risks may be

- Market-based : Interest Rates , equity, Credit risk, Inflation etc
- Insurance-based : Morbidity, Mortality, Catastrophe, Policyholder Actions, expenses etc.
- Operational Risks: Legal, IT, Physical threats

- Under Sol II Regime - it is a “ 1 in 200 year” event ~ 99.5% CI
- It is also called Solvency Capital Requirement (SCR)
- A Company’s internal criteria may be more generous too e.g. ‘1 in 500 year’ event ~ 99.8% CI

The SCR is a Value-at-Risk measure based on a 99.5% confidence interval of the variation over one year of the amount of “basic own funds” (Assets - Technical Provisions).

Risks - Definitions (1)

Interest Rate Risks

Risk that the value of an asset and/or liability will change due to a change in shape and/or level of the interest rate curve

Stress as per Sol II : Ranges from +/- 25% to +/- 75% of the Interest rate curve

Morbidity/ Mortality Risk

- Risk arising from misestimating or change in level, trend and volatility of mortality rates
- Captures the risk of more amount of claims than anticipated during the policy term

Stress as per Sol II : + 15% of the BE Mortality assumption for long term/ +5% for short term

Expense Risk

Risk from mis-estimation/variations in the expected Vs actual expenses incurred in servicing contracts

Stress as per Sol II : Increase of 10% of future expenses and 1% of the BE Inflation rate

Catastrophe Risk

Risk stemming from extreme events leading to large number/ amount of claims

Stress as per Sol II : +1.5 per mille to the mortality rate of the first 12 months

Lapse/ Renewal Risks

- Risk arising due to adverse change in the value of insurance liabilities, resulting from changes in the level or volatility of the rates of policy lapses, terminations, renewals etc.

Stress as per Sol II : +/- 50% of the base Lapse Assumption and a mass lapse event of 40%-70% of surrender strain depending on the business

Hedgeable and Non-Hedgeable Risk

Hedgeable risks:

- those risks which can be replicated by a financial instrument with a reliable market value

Example:

- Best estimate cashflows of insurance risks (claims, expenses etc.)

Non-Hedgeable Risks :

- those risks where the liabilities can not be matched/replicated by traded financial instruments with reliable market values;

Examples:

- Long term liabilities, say 30+ years (difficult to replicate by trade-able assets!)
- Risk of insurance risks unfold worse than best estimate values e.g. Higher claim amounts.

What is Risk Margin ?

Risk Margin represents the theoretical compensation for the risk of future experience being worse than the best estimate assumptions, and for the cost of holding regulatory capital against this.

It is calculated using the 'cost of capital' method *i.e. based on the cost of holding capital to support those risks that cannot be hedged.*

- Intended to increase TP
- Calculated @ CoC of EC (*as per Sol II this is 6%*)
- Only for Non-Hedgeable risks
 - Insurance Risks
 - Operational Risks
 - Reinsurance Credit Risk
 - Residual market risks (to the extent not Hedgeable)

Product Pricing - Key Differences

- Each risk component is considered separately and then aggregated
- Risks are assessed to determine the amount of capital required to be kept aside
- Explicit allowance for CoC via WACC while calculating profit testing metrics for pricing
- While aggregation, Diversification benefit is allowed for across various risks
- Investment return assumption is the **Risk free curve applicable**
- No credit/capitalization of credit risk or any other market risk

Aggregation of Risks to Calculate Economic Capital

Why Diversification?

EC for two risks \neq Sum of the EC for both risks, but
EC has to take into consideration probability of both risks happening together

Example:

An insurance company has calculated *EC for expense and morbidity risks*

$$REC_{morbidity} = 100$$

$$REC_{expense} = 20$$

Correlation between Morbidity and expense = 0.25

$$\begin{aligned} REC &= \sqrt{\sum_i \sum_j Corr_{ij} \times REC_i \times REC_j} \\ &= \sqrt{REC_{morb}^2 + REC_{exp}^2 + 2 * REC_{morb} * REC_{exp} * Corr_{morb \& exp}} \\ &= \sqrt{100^2 + 20^2 + 2 * 100 * 20 * 0.25} \\ &= 107 \text{ which is less than } (100 + 20) \end{aligned}$$



Economic Capital Pricing

Advantages -

- All product related business risks are measured and priced accurately
- Helps remove personal judgment from subjective assumptions – such as use of RDR and use of investment return assumptions
- Uses market observable values or well defined methodologies to quantify risks
- Helps to identify efficient product strategy to deploy capital to new business



Economic Capital Pricing

Disadvantages -

- Lack of data to calibrate the stresses relevant to India as Sol II stresses based on EU may not be applicable in the Indian context
- Is there a deep and liquid market place to get the reliable market value of life insurance business liabilities? Probably not !
- Arbitrary cost of Capital through RM – brings in subjectivity (can vary from one company to the other)
- Local statutory rules on maintaining solvency capital remain the same - How to integrate it with EC ?
- Regulator guidelines on EC Pricing ?

THANK YOU !