

5th Webinar in Enterprise Risk Management

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Risk Management – Metrics for Monitoring, Hedge Ratio and Collateral Management



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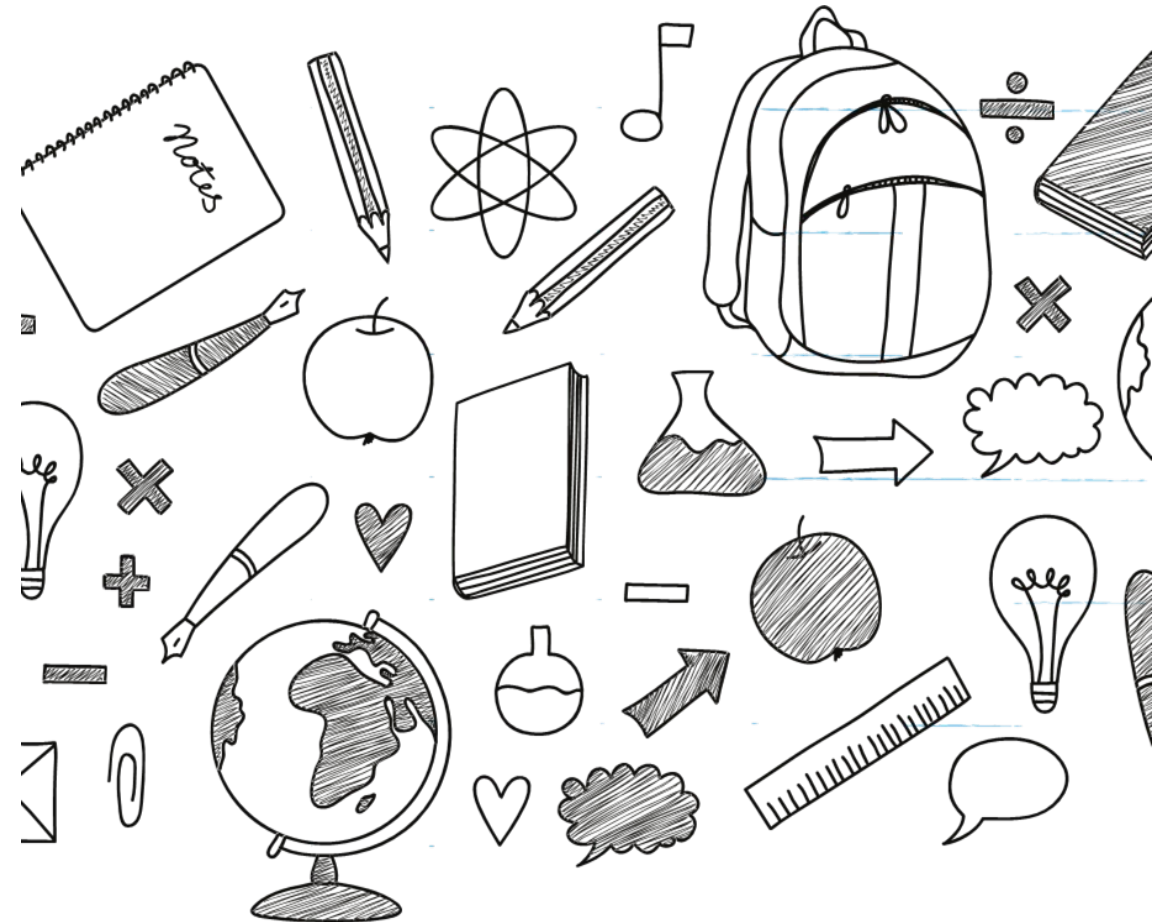
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Background - Derivatives Hedging for Insurance

Regulatory Requirements (IRDA/F&I/INV/CIR/138/06/2014)

Derivatives Allowed

- I. Forward rate agreements
- II. Interest rate Swaps
- III. Exchange traded interest rate futures

Hedging should be done only for the following:

- a) Reinvestment of Maturity proceeds of existing fixed income investments;
- b) Investment of interest income receivables
- c) Expected policy premium income receivable on the insurance contracts which are already underwritten in Life and Pension & Annuity business in case of Life insurers and General Insurance business in case of General Insurers.

Objective

Mitigate Interest Rate risk by hedging a percentage of the cash flows using Interest Rate Derivatives, example: Forward Rate Agreement.

Hedged Item

Expected Net Cashflows of a product or portfolio of Products (including income from existing assets).

Hedge Ratio

Hedge ratio is the comparative value of an open position's hedge to the overall position. A hedge ratio of 1, or 100%, means that the open position has been fully hedged. By contrast, a hedge ratio of 0, or 0%, means that the open position hasn't been hedged in any way.

Cashflow Matching can be used as a starting point for the calculation of Principal/Notional of Derivatives to be used for interest rate hedging

Cash Flow Hedging & Hedge Ratio – Illustrative Example

Cash flow hedging uses the expected Net Cashflows of a product or portfolio of products (including income from existing assets), aggregated for insurance contracts already underwritten, to calculate Principal amount of assets to be invested now and in the future. Interest Rate risk arising from the need to invest into these future assets at current locked in rates is mitigated by investing in interest rate derivatives.

Bond Yield **7%** *Amount is in Cr..*

Year	Net Cash Flow
1	20.00
2	12.00
3	14.00
4	5.00
5	10.00
6	(15.00)
7	2.00
8	(11.00)
9	(16.00)
10	(20.00)

Net Asset & Liability Cash Flows

Premium less Expenses less Outgoes
plus Investment Income

+

Maturity proceeds plus coupon
payment of existing fixed income
investments

Cash Flows Hedging

Process of hedging in which an Insurance company matches its cash outflows with its cash inflows over a given time horizon.

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9	(16.00)
10	(20.00)

Aggregation of Cashflows

- Multiple products may be clubbed together
- Products with similar Investment Strategy should only be clubbed together

Cash Flow Hedging & Hedge Ratio - Illustrative Example

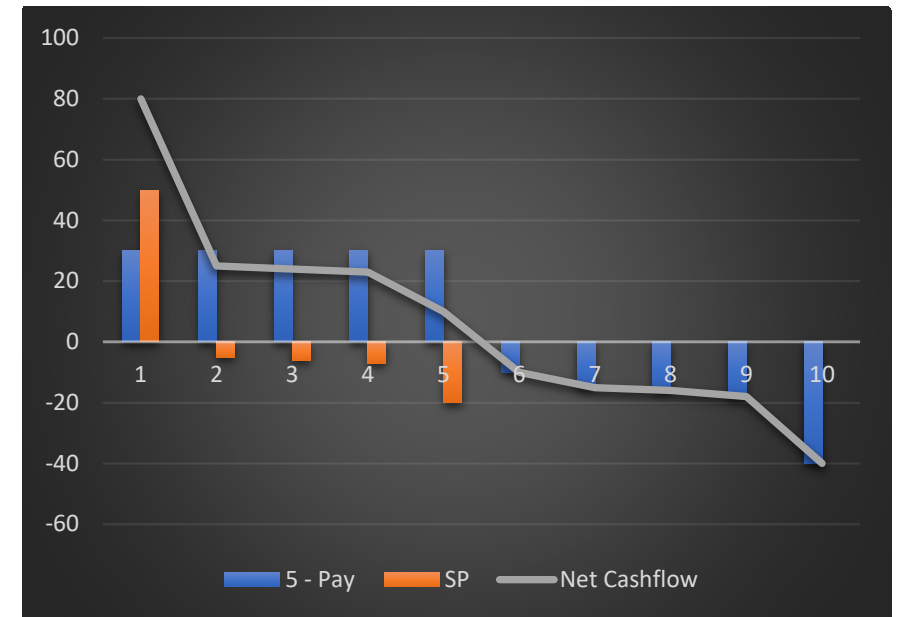
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Existing Business Cashflows – One time Hedge

- ❖ Consider current Net Cashflows for the total business sold till date
- ❖ Derivative Nationals calculated should only be based on business already sold

- ❖ Future New Business can only be hedged when it is underwritten
- ❖ Insurance company to decide on the frequency of Hedging (Monthly/Quarterly/Yearly)

Cash Flow Hedging & Hedge Ratio – Illustrative Example

Cash flow hedging uses the expected Net Cashflows of a product or portfolio of products (including income from existing assets), aggregated for insurance contracts already underwritten, to calculate Principal amount of assets to be invested now and in the future. Interest Rate risk arising from the need to invest into these future assets at current locked in rates is mitigated by investing in interest rate derivatives.

Bond Yield		7% Amount is in Cr..	
Year	Net Cash Flow	Bond 1	Adj. CashFlow
1	20.00	(18.69)	1.31
2	12.00	1.31	13.31
3	14.00	1.31	15.31
4	5.00	1.31	6.31
5	10.00	1.31	11.31
6	(15.00)	1.31	(13.69)
7	2.00	1.31	3.31
8	(11.00)	1.31	(9.69)
9	(16.00)	1.31	(14.69)
10	(20.00)	20.00	-

Cash Flow Hedging

- Match the last negative cashflow by investing in a strategic asset
- Buy a Bond with Principal amount of 20 Cr
- Price of the Bond is 18.69 cr. based on the current 10 year, Gsec. yield of 7%
- Invest in Government securities to reduce counter party risk

Cash Flow Hedging & Hedge Ratio – Illustrative Example

Cash flow hedging uses the expected Net Cashflows of a product or portfolio of products (including income from existing assets), aggregated for insurance contracts already underwritten, to calculate Principal amount of assets to be invested now and in the future. Interest Rate risk arising from the need to invest into these future assets at current locked in rates is mitigated by investing in interest rate derivatives.

		Bond Yield 7%		Amount is in Cr..	
Year	Net Cash Flow	Bond 1	Adj. CashFlow	Bond 2	Adj. CashFlow
1	20.00	(18.69)	1.31	(1.31)	-
2	12.00	1.31	13.31	0.09	13.40
3	14.00	1.31	15.31	0.09	15.40
4	5.00	1.31	6.31	0.09	6.40
5	10.00	1.31	11.31	0.09	11.40
6	(15.00)	1.31	(13.69)	0.09	(13.60)
7	2.00	1.31	3.31	0.09	3.40
8	(11.00)	1.31	(9.69)	0.09	(9.60)
9	(16.00)	1.31	(14.69)	1.40	(13.29)
10	(20.00)	20.00	-		-

Cash Flow Hedging

- Match the last negative cashflow by investing in a strategic asset
- Buy a Bond with Principal amount of 1.4 Cr
- Price of the Bond is 1.31 cr. based on the current 9 year, Gsec. yield of 7%
- Invest in Government securities to reduce counter party risk

Cash Flow Hedging & Hedge Ratio – Illustrative Example

Cash flow hedging uses the expected Net Cashflows of a product or portfolio of products (including income from existing assets), aggregated for insurance contracts already underwritten, to calculate Principal amount of assets to be invested now and in the future. Interest Rate risk arising from the need to invest into these future assets at current locked in rates is mitigated by investing in interest rate derivatives.

		Bond Yield 7%		Amount is in Cr..			
Year	Net Cash Flow	Bond 1	Adj. CashFlow	Bond 2	Adj. CashFlow	Bond 3	Adj. CashFlow
1	20.00	(18.69)	1.31	(1.31)	-		-
2	12.00	1.31	13.31	0.09	13.40	(12.42)	0.98
3	14.00	1.31	15.31	0.09	15.40	0.87	16.27
4	5.00	1.31	6.31	0.09	6.40	0.87	7.27
5	10.00	1.31	11.31	0.09	11.40	0.87	12.27
6	(15.00)	1.31	(13.69)	0.09	(13.60)	0.87	(12.73)
7	2.00	1.31	3.31	0.09	3.40	0.87	4.27
8	(11.00)	1.31	(9.69)	0.09	(9.60)	0.87	(8.73)
9	(16.00)	1.31	(14.69)	1.40	(13.29)	13.29	-
10	(20.00)	20.00	-		-		-

Bond 3 to be bought after 1 year.

Will the interest rates remain the same after 1 year?

Hedge this risk using Interest Rate Derivatives (IRDs)

Will you want to hedge the entire risk or only portion of it?

Hedge Ratio

12.42 cr. IRD for 100% hedge
9.94 cr. IRD for 80% Hedge
7.45 cr. IRD for 60% Hedge

Cash Flow Hedging & Hedge Ratio – Illustrative Example

Bond Yield		7% Amount is in Cr..					
Year	Net Cash Flow	Bond 1	Adj. CashFlow	Bond 2	Adj. CashFlow	Bond 3	Adj. CashFlow
1	20.00	(18.69)	1.31	(1.31)	-		-
2	12.00	1.31	13.31	0.09	13.40	(12.42)	0.98
3	14.00	1.31	15.31	0.09	15.40	0.87	16.27
4	5.00	1.31	6.31	0.09	6.40	0.87	7.27
5	10.00	1.31	11.31	0.09	11.40	0.87	12.27
6	(15.00)	1.31	(13.69)	0.09	(13.60)	0.87	(12.73)
7	2.00	1.31	3.31	0.09	3.40	0.87	4.27
8	(11.00)	1.31	(9.69)	0.09	(9.60)	0.87	(8.73)
9	(16.00)	1.31	(14.69)	1.40	(13.29)	13.29	-
10	(20.00)	20.00	-		-		-

Interest rate Hedging using Forward Rate Agreements

A Forward Rate Agreement (FRA) is a financial contract between two parties to exchange interest payments for a 'notional principal' amount on settlement date, for a specified period from start date to maturity date.

At Settlement Date (Year 2):

Insurance Company will pay Forward Price x Notional Amount.
Example: $93.46\% \times 13.29 = 12.42$ cr. **(locked in a 7% yield)**

Bank will pay Reference security price x Notional Amount

Scenario 1: price increases $95\% \times 13.29 = 12.63$ cr.

Scenario 2: Price decreases $90\% \times 13.29 = 11.96$ cr.

Note: Bank would typically buy the bond in advance and add a spread to it and then sell it to the Insurer on the settlement date. Forward rate agreements are not Bond forwards and hence the Bank does not have any obligation to sell the underlying bond.

The insurance company has hedged its interest rate risk by locking in the yield of 7% for a defined time period (8 years in this case)

[illegible]

Cash Flow Hedging & Hedge Ratio - Illustrative Example

Cash flow hedging uses the expected Net Cashflows of a product or portfolio of products (including income from existing assets), aggregated for insurance contracts already underwritten, to calculate Principal amount of assets to be invested now and in the future. Interest Rate risk arising from the need to invest into these future assets at current locked in rates is mitigated by investing in interest rate derivatives.

[illegible]

Optimal Hedge Ratio

An optimal hedge ratio is an investment risk management ratio that determines the percentage of a hedging instrument, i.e., a hedging asset or liability that an insurer should hedge.

Position on Future Interest Rate Movement

Solvency Ratio and future growth plans

Risk appetite of the company

Sensitivity of Lapses on Cashflows

Product specific Investment Strategy

	Year of buying	Tenor in years	Expected Bond Yield	Principle Amount in Cr.	Price of Bond in Cr.
Bond 1	1	10	7%	20.00	18.69
Bond 2	1	9	7%	1.40	1.31
Bond 3	2	8	7%	13.29	12.42
Bond 4	2	7	7%	1.05	0.98
Bond 5	3	7	7%	9.78	9.14
Bond 6	3	4	7%	7.70	7.20
Bond 7	4	3	7%	4.32	4.04



				Hedge Ratio		
				80%	70%	60%
	Settlement Date	Underlying Yield	Tenor	Notionals in Cr.	Notionals in Cr.	Notionals in Cr.
FRA 3	2	7%	8	9.94	8.70	7.45
FRA 4	2	7%	7	0.78	0.68	0.59
FRA 5	3	7%	7	7.31	6.40	5.48
FRA 6	3	7%	4	5.76	5.04	4.32
FRA 7	4	7%	3	3.23	2.82	2.42

Risks Associated with Hedging using Derivatives

- ❖ Actuarial Risk
- ❖ Hedge Ineffectiveness
- ❖ Market Risk
- ❖ Operational Risk
- ❖ Counterparty Risk
- ❖ Basis Risk
- ❖ Liquidity Risk
- ❖ Legal Risk

Year	Net Cash Flow
1	20.00
2	12.00
3	14.00
4	5.00
5	10.00
6	(15.00)
7	2.00
8	(11.00)
9	(16.00)
10	(20.00)

Net Cash Flows

Premium less Expenses less Outgoes
plus Investment Income

+

Maturity proceeds plus coupon
payment of existing fixed income
investments

Description:

- Lapse Risk: Actual lapse/surrender cases are different from planned
- Expense Risk: The expenses incurred to operationalize the derivatives turn out to be more than planned

Impact

Higher than expected lapses could lead to hedge being ineffective while lower lapses could put constraints on meeting policyholder commitments

Higher expenses would impact the P&L

Risk Measure, Mitigation & Monitoring:

- Quarterly persistency report
- Any adverse experience on lapsation and higher expenses than expected should lead to a detailed review of the product and derivative strategy
- Regular experience monitoring of lapses and expenses
- Sensitivity of lapses and Expense on the Notional value

Risk of - Hedge Ineffectiveness

Description:

Risk that change in value of hedged item and change in hedging instrument move with a difference beyond the hedged corridor or does not meet the criteria under the regression method

Impact

Ineffective hedge would not only be counter-productive to the strategy decided but also impact on profit and loss account

Risk Measure, Mitigation & Monitoring:

- Deploying hedge strategy and operational controls over computation of cash flows and structuring the deal to match cash flows on derivatives with the underlying
- The test of effectiveness shall be conducted on regularly
- Types of Hedge Effectiveness Testing:

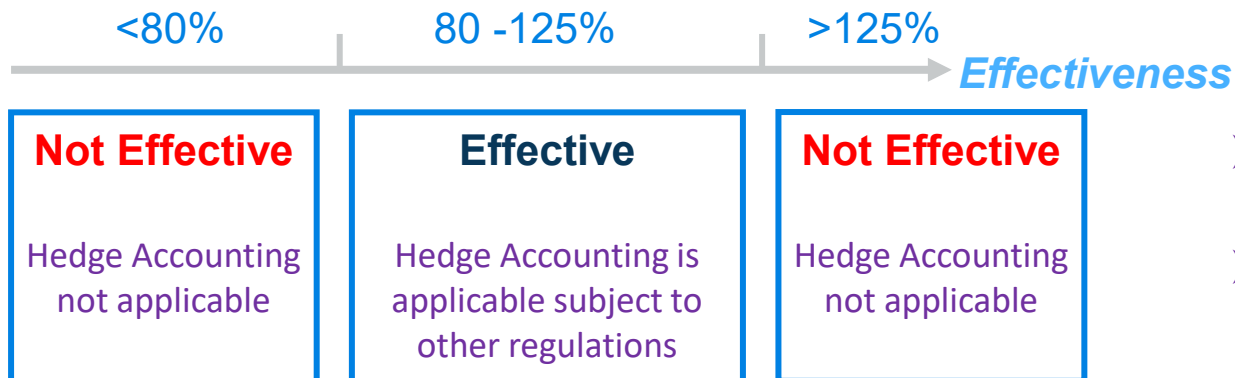
Qualitative Methods

- ✓ Critical Terms Match
- ✓ Short Cut Method

Quantitative Methods

- ✓ Regression Analysis
- ✓ Dollar Offset Method

For Example: Dollar Offset Method



Note: This requirement is removed in IFRS 9

Market Risk

Description:

Movement in market rates shall impact the value of swap / forward

If the difference between the *Value of the derivative* and *Value of the Underlying* is Greater than the threshold agreed in ISDA
Then, the amount will be adjusted between the 2 parties.

Impact

While the effectiveness of hedge is defined as movement of value of swap / forward and underlying within the hedge corridor, movement in excess of 100% too needs to be booked in P&L

Risk Measure, Mitigation & Monitoring:

- The risk could be managed by investing in securities that give returns commensurate to the floating rate paid by the company. In case of FRA, the contracted price mitigates against the market risk.
- Risk would be monitored using Value-at-Risk (VaR) and Stress testing

Report the derivative position to CIO & take Management decision when:

The 10 Day VaR at 99% is higher than the thresholds agreed in ISDA

Other Risks

Type Of Risk	Description of Risk	Impact	Measure, Mitigation & Monitoring
Operational Risk	Deficiency in Internal controls Losses due to Human error, System Failure, etc.	Significant losses on account of operational failures	1. Strong Maker Checker process 2. Streamlining roles and responsibilities across functions 3. continuous trainings 4. strong Systems with Automation 5. Regular peer reviews
Counterparty Risk	The risk that Counterparty (Bank) will not honor its obligation	Counterparty default	1. Aggregate Counterparty wise Exposure 2. Define threshold amount in Credit Support Annex (CSA) to the International Swap and Derivatives Association, Inc. (ISDA) 3. Calculate Exposure to Counter Party and MTM every month
Basis Risk	The risk that the Derivative's benchmark is different form that if the underlying	Will impact the effectiveness of the Hedge and shortfall needs t be funded	1. Use the same underlying to that of the hedging instrument 2. Monitor continuously
Liquidity Risk	Risk due to limited availability of Interest Derivatives for longer durations	Unwinding challenges Margin calls could impact liquidity	1. Ensure a termination clause is added in ISDA 2. Ensure sufficient time is agreed in ISDA to arrange for cash due to margin calls
Legal Risk	Improper documentation of ISDA & CSA	Lead to premature termination of contract with the bank	1. Documents to be reviewed by Legal council 2. Second opinion should be taken when needed

Key Considerations – A practitioner's perspective

- ❖ Actual vs Expected movement in cashflows play a significant role in hedging, periodic experience monitoring should be done and its impact to be adjusted in the hedging process
- ❖ Hedge ratio should be reviewed periodically
- ❖ Actuarial and investment teams should talk to each other and there should be synergies to ensure Notional calculated by the Actuarial team is based on most recent Investment data.
- ❖ Cohort / Bucketing strategies for Future New Business to be re assessed and streamlined based on the situation
- ❖ Regulatory compliance to be ensured on Accounting and Actuarial methodologies
- ❖ Exhaustive and detailed documentation of the Derivative Management policy
- ❖ Risk limits and thresholds to be defined and set up a process to take management action if those thresholds are breached

Thank You

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