Longevity Hedges for Long Term Care: Why and How?

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PwC

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ILTCI

Agenda

- Executive Summary
- Long Term Care Businesses' Exposure to Longevity
- Cost/Benefit Analysis of Longevity Swaps

Executive Summary

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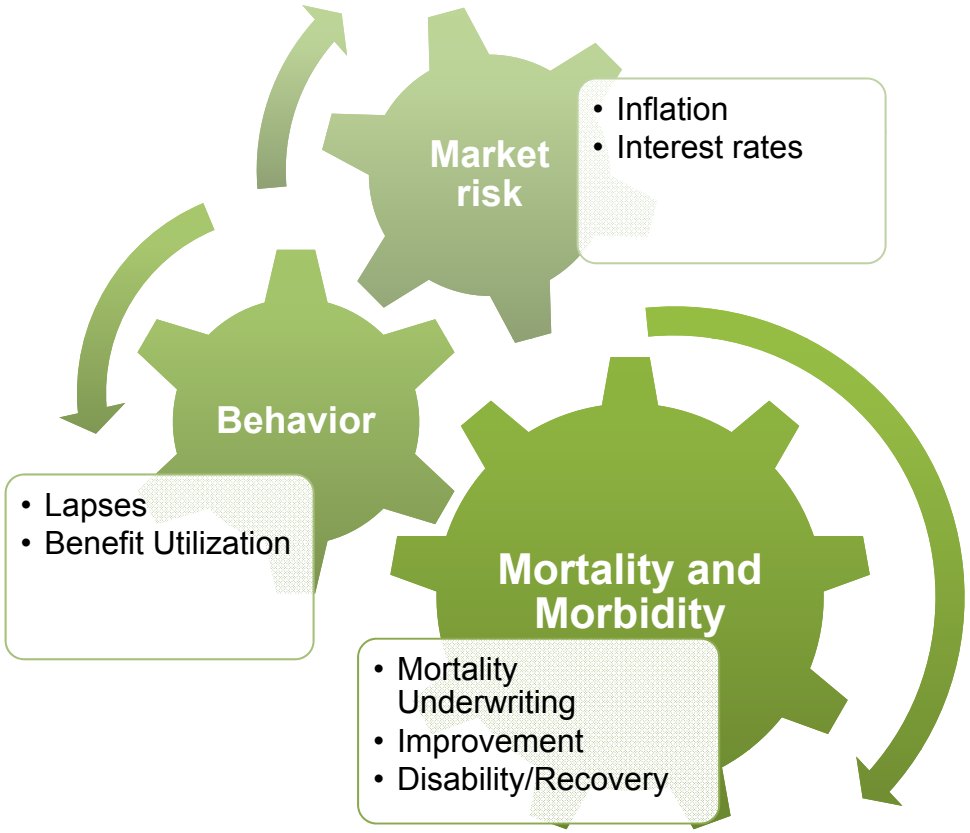
- Long term care businesses have a substantial exposure to longevity experience (e.g., a duration of 15 with respect to longevity), which overwhelms other significant risks (e.g. investment risk, incidence risk).
- A longevity swap can help hedge the earnings of the business to longevity experience over time, and can help reduce the amount of economic capital required (at a low cost of capital).
- Both the hedge structure and the syndication process could be customized relative your prioritized strategic objectives.
- There will be competing strategic objectives whose prioritization would lead to different optimal structures.
  - For example, if inexpensive capital relief is the primary objective, out-of-the-money stop loss reinsurance (with an asymmetric payout) is likely appropriate.
  - Alternatively, if the primary objective is hedging longevity across the complete distribution of earnings outcomes over time, then a swap structure (with a symmetric payout) is likely more appropriate

Long Term Care Businesses' Exposure to Longevity

The Challenges of Long Term Care

- Compared to most other insurance products, long term care has more moving parts
- Each moving part is an opportunity for adverse experience



Product Assumptions Heat Map

•The sample heat map illustrates the number of critical assumptions for Long Term Care as compared to typical insurance products

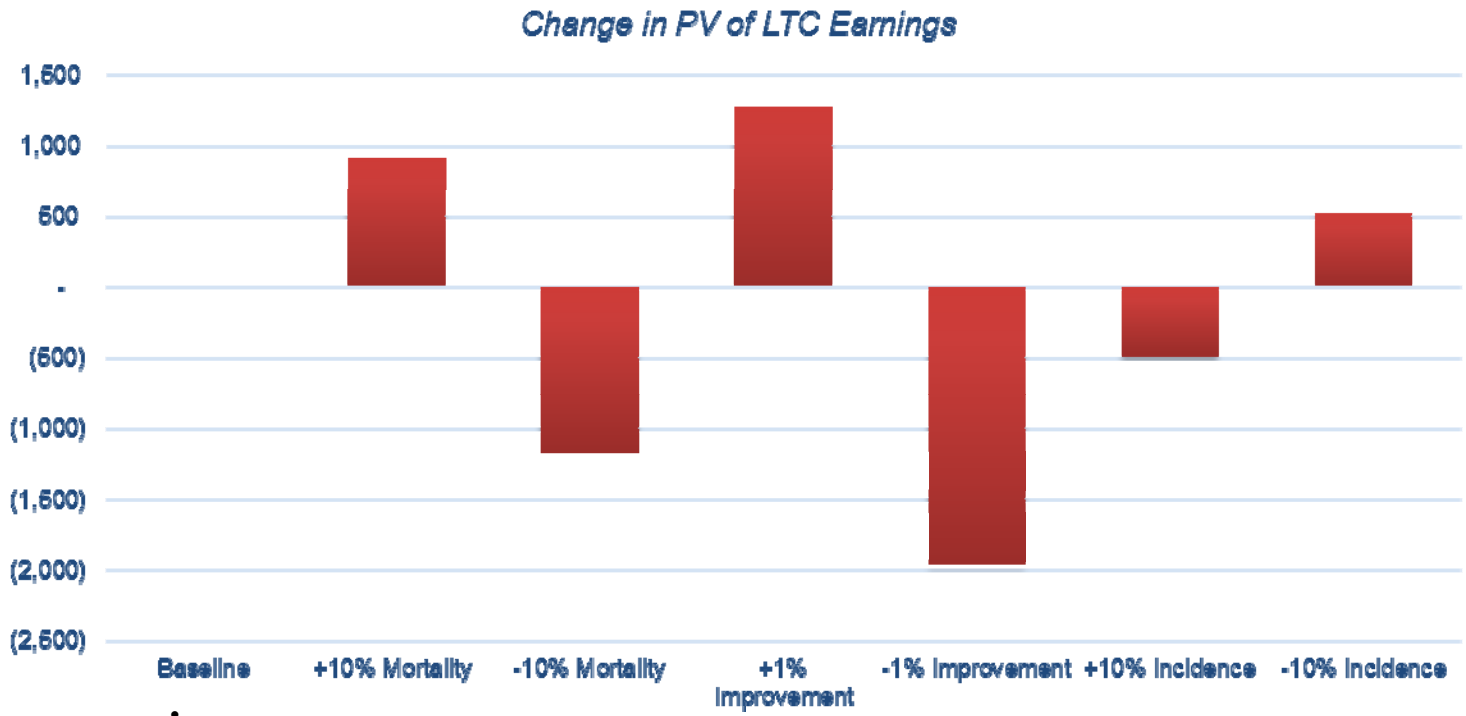
	Whole Life	Term	ULSG	VUL	IUL	LTC
Actuarial Assumptions						
Mortality – Standard	M	H	H	H	H	H
Mortality - Substandard	M	H	H	M	M	M
Lapse/Surrender	M	H	H	M	M	H
Partial Withdrawals			L	L	L	
Dynamic Lapse	L		L	L	L	M
Premium Persistency			H	M	M	
Benefit Utilization						H
Claim Termination			L			H
Premium Rate Increase Approval			L			H
Morbidity Improvement			L			H
Morbidity (including LTC Riders)	L	L	L	L	L	H

High Sensitivity **Moderate Sensitivity** **Low Sensitivity** **No Sensitivity**

Long Term Care Exposure to Longevity

- Longevity impacts long term care business in two ways:
  - If healthy lives experience longevity that is greater than expected, the company needs to establish additional reserves for the greater number of lives in force.
  - If disabled lives experience longevity that is greater than expected, the company will pay claims for a longer period of time than expected.

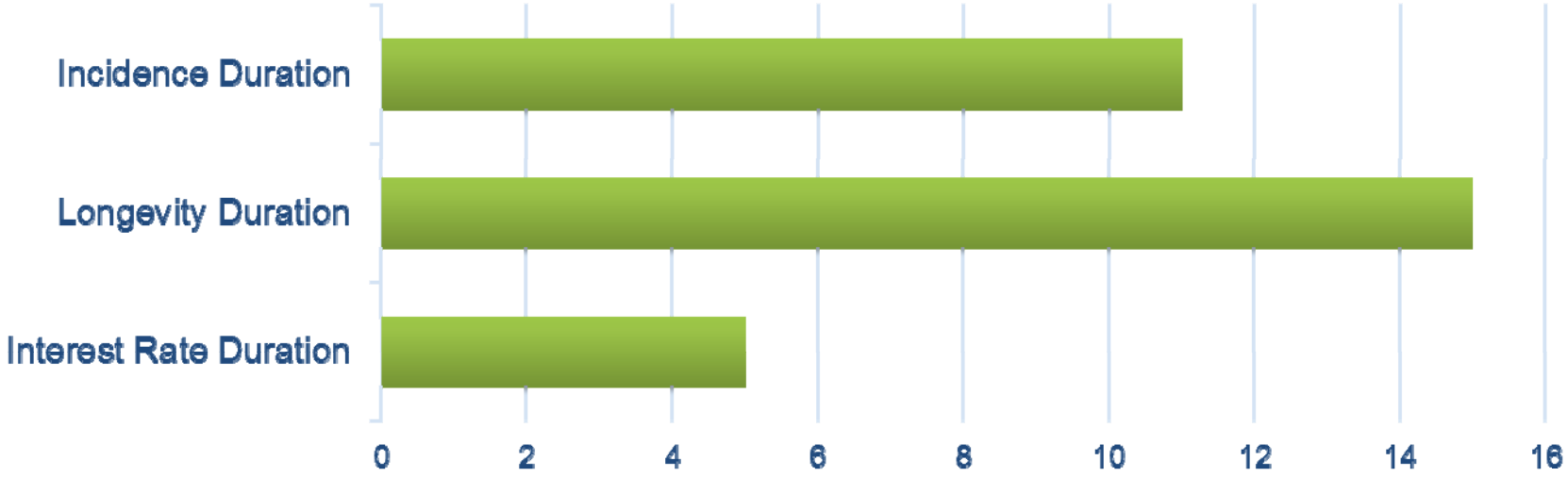
LTC Earnings: Unhedged Sensitivities



Assumptions:

1) Initial active life reserve is $5.6bn for the sample book of business used above.
2) PVOE represents present value of operating earnings (product cash flows and changes in reserves)
3) 80 year projections of operating income
4) Operating earnings are discounted at Treasury forwards
5) Sensitivities do not impact reserve valuation assumptions

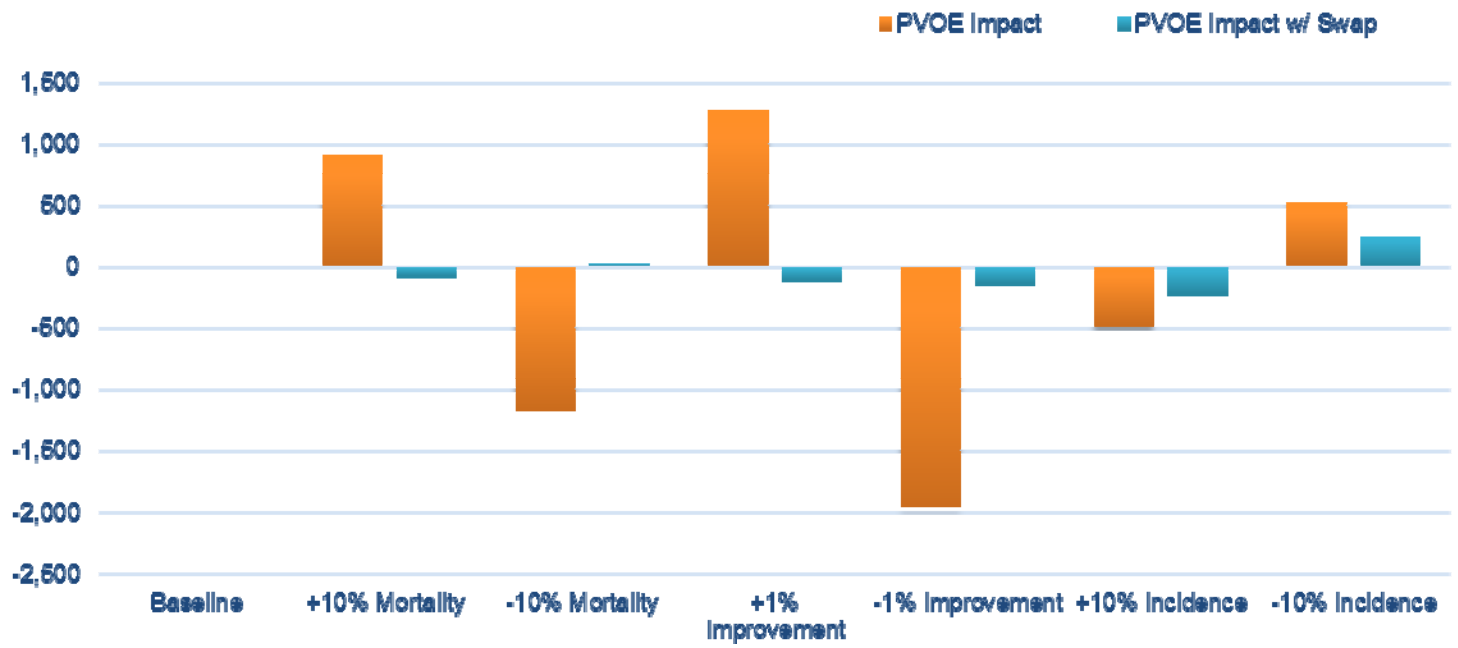
LTC Durations: Interest Rates, Incidence and Longevity



Assumptions:

1) Sensitivities based on 80 year cash flow projections for both active and disabled lives
2) Projected cash flow are discounted at Treasury forwards and include benefits, expenses and premiums
3) Longevity/incidence durations represent percentage changes in present value of cash flows for a 1 basis point parallel shift in longevity/incidence

Longevity Swap: Hedged Sensitivities($m)



Assumptions:

1) PVOE represents present value of operating earnings (product cash flows and changes in reserves)
2) Initial active life reserve is $5.6bn for the sample block of business above
3) 80 year projections of operating income and swap
4) Annual reinsurer risk margin on PV of expected payments is 4%

Cost/Benefit Analysis of Longevity Swap

Cost/Benefit Analysis of Longevity Swap

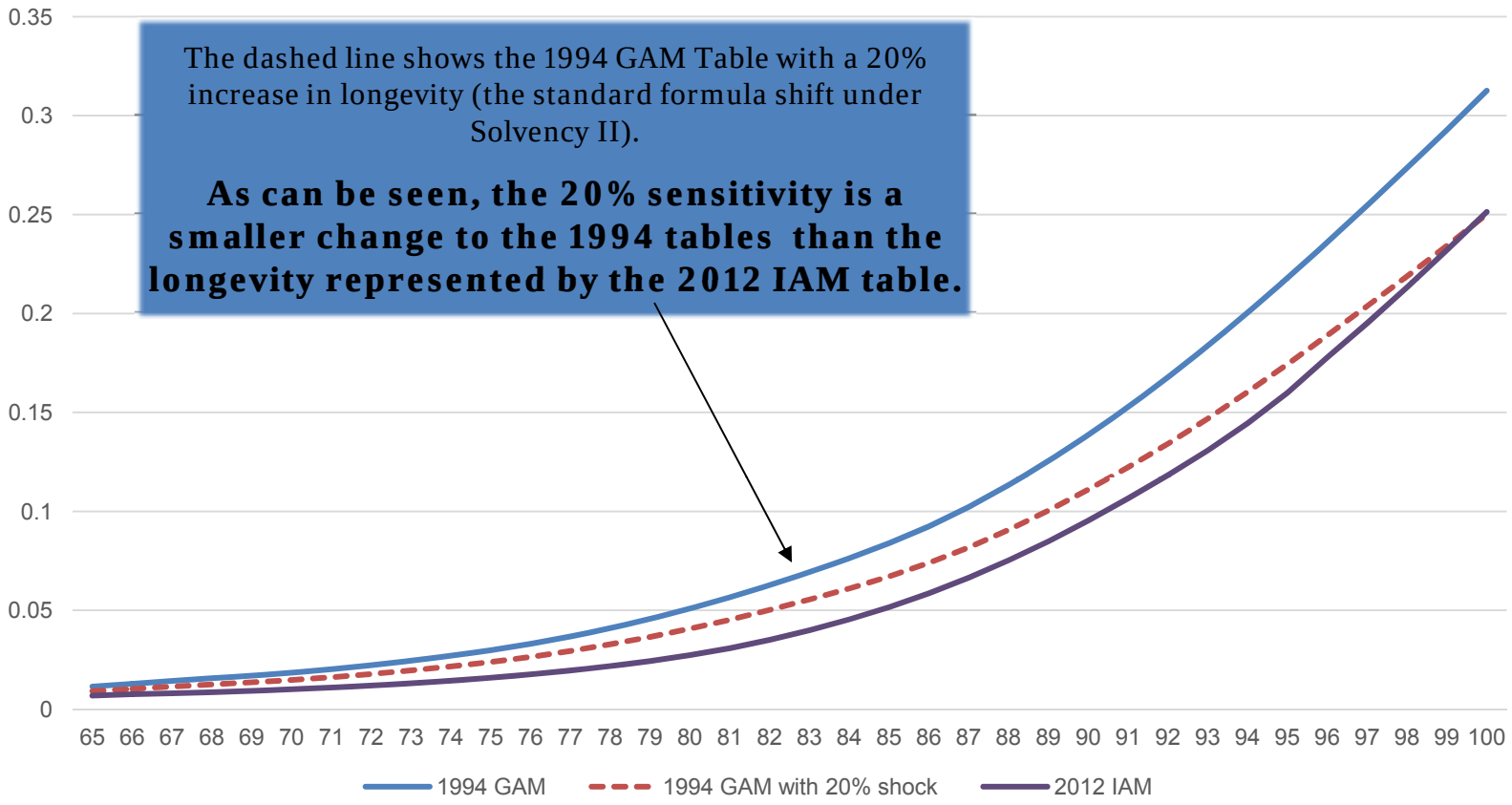
- Currently RBC does not have a capital charge for longevity. To estimate the economic capital for longevity on long term care, we applied the Solvency II standard formula to a mature book of LTC liabilities. This resulted in a capital requirement of approximately 27% of the book reserve.
- Assuming a 10% cost of capital on this required capital, produces a cost of 2.7% of reserves per year (which amortizes over time).
- If the bid/offer for the longevity swap is 4% on the expected benefit payments per year, this produces a one time upfront PV cost of 4% 0f reserves. If your book is in loss recognition, this would be an addition to the loss recognition reserve. If not, then the cost would be amortized over the life of the book.

Cost/Benefit Analysis of Longevity Swap (cont'd)

Depending upon the preferred metric, one could view this as:

- The economic cost of capital of the transaction will be 2% to 6% depending upon the specifics and whether done in option (lower cost of capital) or swap (higher) form.
- Under the Solvency II framework scenario where a company is in loss recognition, the net benefit of the transaction is an annual annuity of 2.7% of reserves (amortizing over time) minus the 4% of reserves upfront, if executed in swap form. This is the equivalent to a 70% return on capital.
- The equivalent rate increase request under the stress scenario would be over 400%.

Mortality Sensitivity Comparison



- The above chart shows the 1994 Uninsured Pensioner (UP-94) Mortality Table (formerly called the 1994 GAM Basic Table) compared with the 2012 Individual Annuity Mortality (IAM) Basic Table using a mix of 65% females and 35% males.

Closing Remarks

- Impact of longevity risk overwhelms other significant risks

- Even though RBC does not have a charge for longevity, a properly structured ORSA report should include a significant capital requirement for longevity, which could be addressed with this structure.

Actuarial & Finance

Investing and Hedging for Long Duration Liabilities

Mike Huff, TIAA

March 27th, 2017

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ILTCI

17th Annual Intercompany Long Term Care Insurance Conference

Agenda

- Challenges of Managing Investments and Hedging for Long Duration Liabilities
- Alternative Hedging Strategies & Considerations
- Conclusions

Challenges of Managing Investments and Hedging for Long Duration Liabilities

Key Problem: Reinvestment Risk

– Can't Invest in Appropriate Assets to Match Liabilities

Similar ALM Challenges Across Products

Long Term Care	Annuity Products with Guarantees
Universal Life	Pensions

Reasons that Reinvestment Problem Exists:

1) Supply of Long Duration Assets

- Very few 30+ Year Assets
- Not Enough Market Supply of "Attractive" 20-30 Year Assets

2) Company will Receive Cash in the Future (Premiums/Contributions)

- Can't Invest Right Now. Need to Wait Until Cash is Received to Invest.

Reinvestment Risk

Measures of Reinvestment Risk

- Cash Flow Mismatches
- Duration Mismatches
- Key Rate Duration
- DV01/KRDV01 Mismatches

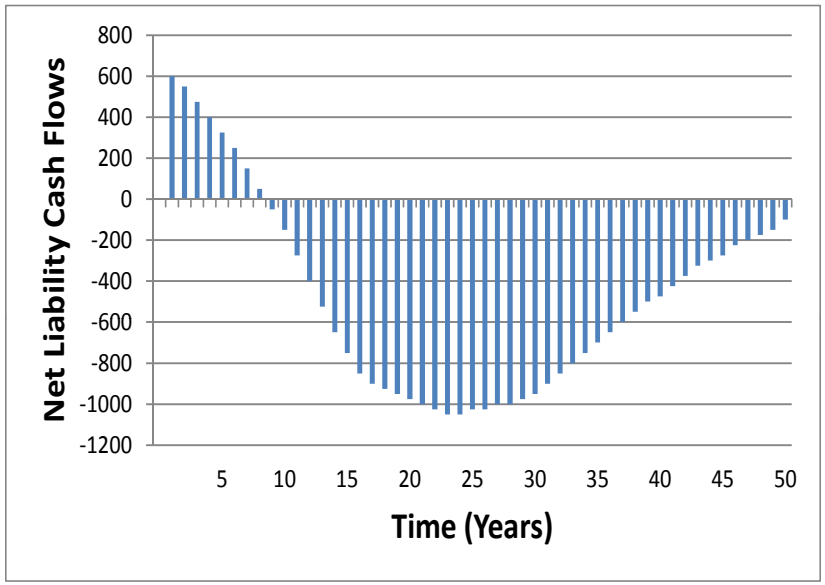
Scenario Analysis & Stress Testing of Balance Sheet and Income

How Does Reinvestment Risk Emerge?

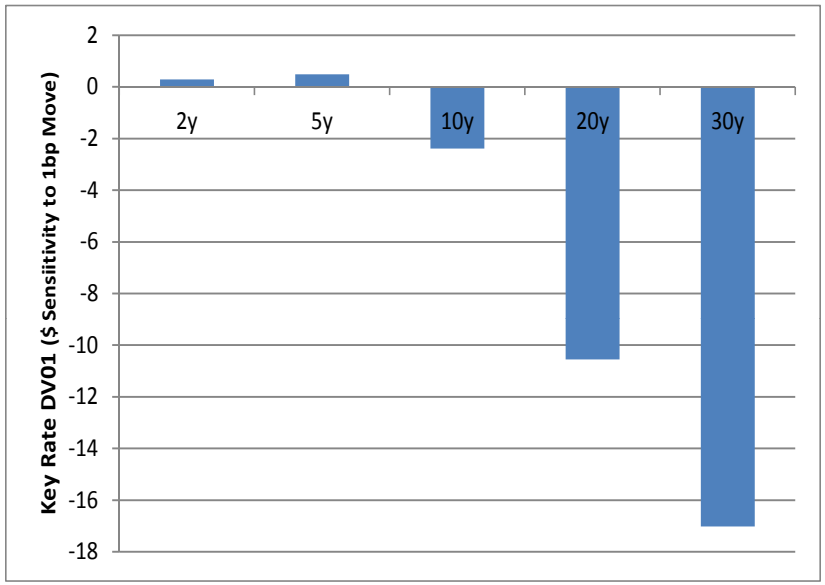
- Volatility in Future Earnings
- Volatility in Future Surplus
- Volatility in Economic Balance Sheet
  - -Volatility of Economic Balance Sheet is Leading Indicator of Volatility in Future Financial Performance

Cash Flow Profile and Key Rate Profile

Liability Cash Flow Profile



Key Rate Duration Profile



Significant Cash Flows beyond ~20 years create Key Rate Exposure at the 30 Year Point

Unmatched 30 year Liability Key Rate Exposure can Create Significant Yield Curve Risk

Alternative Solutions for

Hedging Reinvestment Risk

Reinvestment Risk Hedging Solutions

Ideal Solution:

Buy Assets to Cash Flow Match to Liability Cash Flows

Alternative Hedging Solutions:

Hedges for Purchases of Future Investments

Forward Starting Swaps

Forward UST Bonds

Hedges for Key Rate Duration/DV01 Exposures

Interest Rate Swaps

UST Total Return Swaps

Option Hedges

Purchased Floor/Swaption

Costless Collar (Buy Floor/Sell Cap)

On Balance Sheet Solutions

UST Bond/Strip + CDS

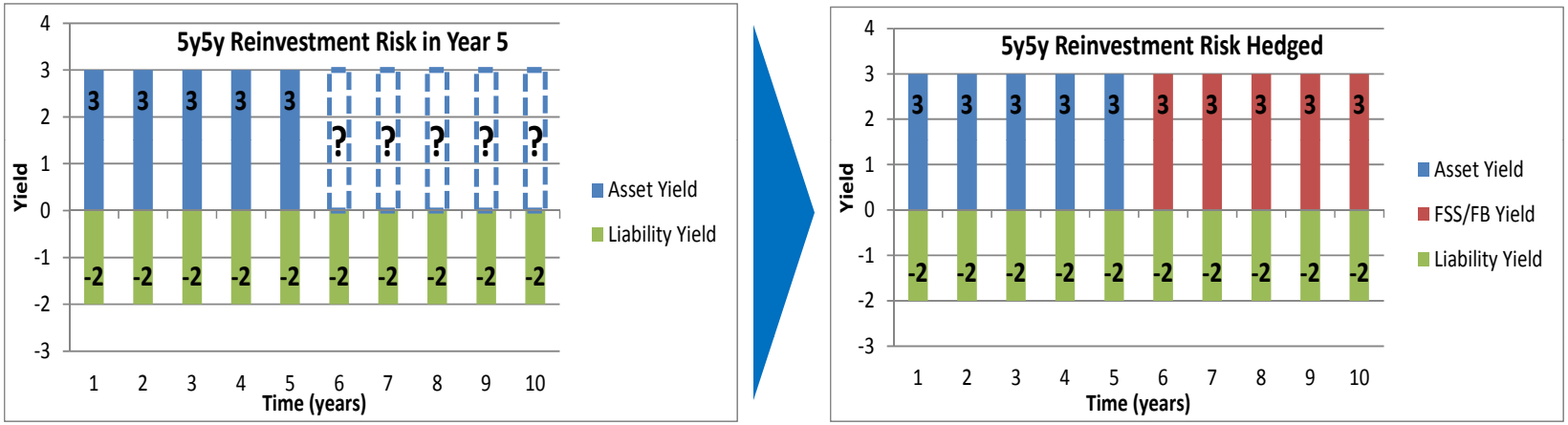
UST Bonds Funded on Repo + CDS

Hedges for Future Investments

Forward Starting Swaps

Forward UST Bonds

Economically Locks-in Yield on a Bond to be Purchased in the Future



Considerations:

Cleared vs. OTC Derivative

Margin Issues & Impact on Investment Strategy

Hedge Tenor (Forward Bonds Only Available for Shorter Tenors)

Swap Spreads (UST Rates > Swap Rates)

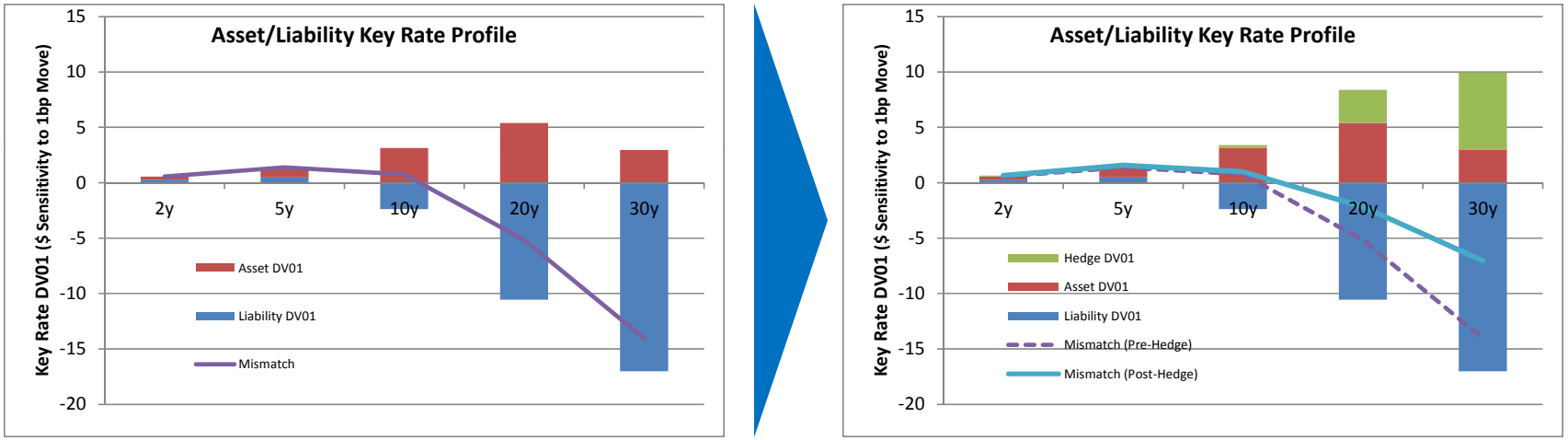
Accounting

Hedges for Key Rate Duration Exposure

Interest Rate Swaps

Total Return Swaps (TRS) on UST Bonds

Enter Hedges with KRD Exposures that Offset Liability KRD Exposure



Considerations:

Cleared vs. OTC Derivative

Margin/Settlement Issues & Impact on Investment Strategy

Hedge Tenor (TRS Only Available for Shorter Tenors)

Swap Spreads (UST Rates > Swap Rates)

Accounting

Interest Rate Option Strategies

Purchase Rate Floor/Swaption

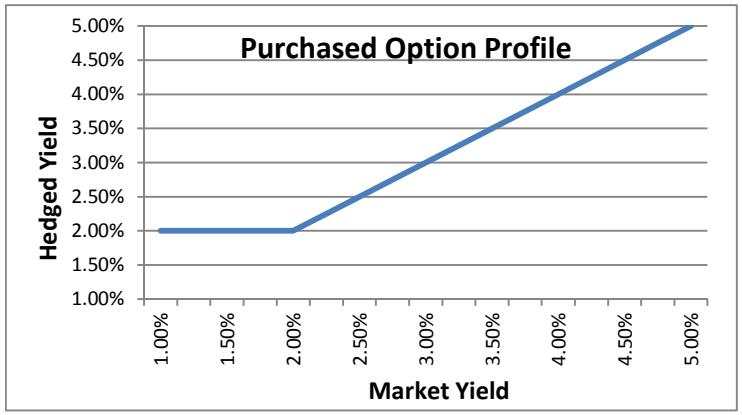
Ensures that Yield for Future Investment will not be below Certain Level(Strike)

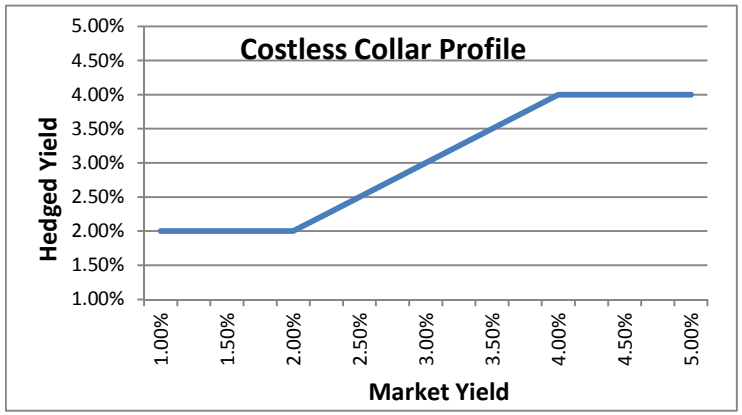
- Requires Premium

Costless Collar (Buy Floor/Sell Cap)

Ensures that Yield for Future Investment will be with in a band of Interest Rates

- No Upfront Premium
- Opportunity Cost – Give up the upside if rates rise above the cap





Considerations:

Usually OTC Derivative

Option Premium vs. Opportunity Cost

Hedge Tenor (Short Term/Roll Hedge vs. Long Term)

Accounting

On Balance Sheet Strategies

Purchase Long Duration UST Bond/Strip + Credit Derivative

Synthetically Creates Long Duration Corporate Bond

Purchase UST Bond, Funded with Repo + Credit Derivative

Creates Similar Profile to Interest Rate Swap (Receive Fixed, Pay Floating)

CDS adds Corporate Credit Exposure & Credit Spread

Considerations:

Alternative Uses of Cash to Purchase UST

Increases Balance Sheet Size

Counterparty Risk

Leverage

Repo Roll Risk

CDS Roll Risk (Future spread not locked in)

Accounting (Repo Accounting, CDS Accounting)

CDS Margining

Conclusions

Caveat:

Investing & Hedging Strategies for Managing Interest Rate Risk are based on Liability Cash Flow Projections.

Asset Strategy can only be as good as the Liability Cash Flow Projections.

Conclusions:

1) No Simple Solutions

2) Measure Your Risk (even if you don't hedge it)

3) Quantify Tradeoffs & Risks for Each Hedging Strategy

4) Understand and Communicate Why You Are Selecting One Strategy Over Another

Questions?