



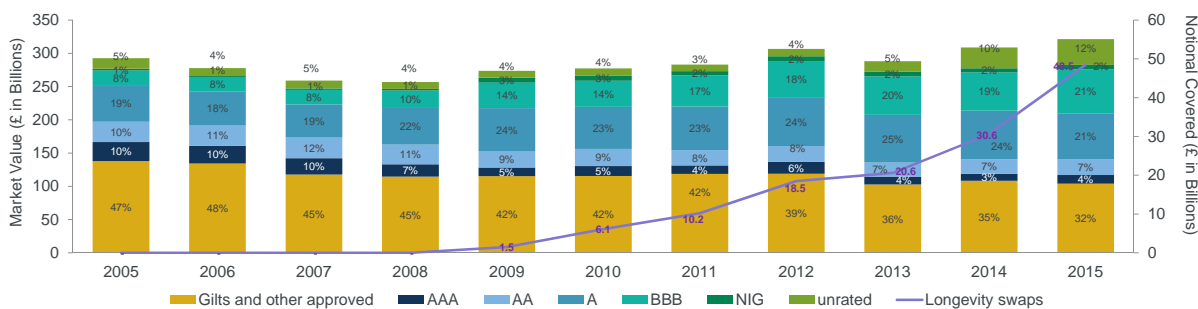
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# Credit hedging – The good, the bad and the ugly

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4<sup>th</sup> November 2016

## UK insurance – An overview



1. Government and supra holdings decreased
2. Average credit quality decreased from AA / A to A / BBB
3. Credit spread duration is expected to have increased
4. Credit risk the major driver of 'market' risk capital
5. Loss of diversification benefit between credit and longevity risk
6. More longevity risk is hedged through swaps and reinsurance

**Credit risk management has become arguably the most important risk for insurance companies to manage**

Source: FSA / PRA returns from 2005–2015.  
Source: A short Introduction to longevity swaps and Q&A session – Martin Lockwood.



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## Does it make sense for insurers to hedge credit risk?

### Why Credit is "Special"

- Unlike many other market risks, credit is viewed as a "compensated risk" from which IG investors generally expect to earn the majority of the credit spread
- As such, credit assets are a key driver of IFRS profits. The downside is that they consume capital on the regulatory balance sheet
- Capital constrained profit-maximising insurers therefore face a number of important choices in how they manage this exposure, e.g.

1. Do nothing?
2. De-risk physical assets?
3. Keep assets and use a credit derivative overlay?



### In which scenarios might insurance companies opt for (3) ?

- This depends on a number of factors including (i) available of suitable hedging instruments and (ii) insurer objectives



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## Credit derivatives – A product overview

Instrument	Instrument characteristics			Best liquidity?		
	Premium?	Pay-out?	Settlement on pay-out?	Reference entity	Currency	Tenor
Single-name CDS	<ul style="list-style-type: none"> <li>• Initial; and</li> <li>• Quarterly<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• 'Credit Event'</li> </ul>	<ul style="list-style-type: none"> <li>• Mainly cash-settled</li> <li>• Historically physical (CTD)</li> </ul>	<ul style="list-style-type: none"> <li>• Generally better liquidity on names in major indices (not limited to indices)</li> </ul>	<ul style="list-style-type: none"> <li>• Mostly in EUR and USD</li> <li>• GBP quanto</li> </ul>	<ul style="list-style-type: none"> <li>• Best liquidity &lt;5y</li> <li>• Some liquidity beyond</li> </ul>
Index CDS	<ul style="list-style-type: none"> <li>• Initial; and</li> <li>• Quarterly<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• 'Credit Event'<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Cash-settled</li> </ul>	<ul style="list-style-type: none"> <li>• iTraxx (Main/Sen. Fin/ X-Over/Sub. Fin)</li> <li>• CDX (IG, HY)</li> </ul>	<ul style="list-style-type: none"> <li>• EUR / USD</li> </ul>	<ul style="list-style-type: none"> <li>• Best liquidity 5y/10y</li> <li>• Some liquidity 3y/7y</li> </ul>
Index Credit Spread Options	<ul style="list-style-type: none"> <li>• Single</li> </ul>	<ul style="list-style-type: none"> <li>• Index level relative to strike</li> <li>• 'Credit Event'<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Physically-settled (into index CDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Very liquid on OTR index (generally)</li> </ul>	<ul style="list-style-type: none"> <li>• Generally EUR / USD</li> <li>• GBP quanto</li> </ul>	<ul style="list-style-type: none"> <li>• Generally &lt;6m</li> </ul>
Index Tranches	<ul style="list-style-type: none"> <li>• Initial; and</li> <li>• Quarterly<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• [x] 'Credit Events'<sup>1</sup> s.t. attachment point is breached</li> </ul>	<ul style="list-style-type: none"> <li>• Cash-settled</li> </ul>	<ul style="list-style-type: none"> <li>• OTR index; and</li> <li>• Series 9</li> </ul>	<ul style="list-style-type: none"> <li>• Generally EUR / USD</li> <li>• GBP quanto</li> </ul>	<ul style="list-style-type: none"> <li>• iTraxx Main – 1y/3y/5y</li> <li>• CDX IG – 1y/5y/10y</li> </ul>
Index TRS	<ul style="list-style-type: none"> <li>• N/A</li> </ul>	<ul style="list-style-type: none"> <li>• Final 'Total Return' relative to strike</li> </ul>	<ul style="list-style-type: none"> <li>• Cash-settled</li> </ul>	<ul style="list-style-type: none"> <li>• 6 major indices</li> <li>• IBOXX GBP Corporates</li> </ul>	<ul style="list-style-type: none"> <li>• USD / EUR / GBP</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 6m</li> </ul>
Bespoke – Tranche/TRS/ Downgrade	Bespoke Transactions can be structured to meet a number of different investor requirements.					

1. We define 'credit event' as any of the following – 'bankruptcy', 'Failure to Pay', 'Restructuring', 'repudiation/moratorium' or 'obligation acceleration'. Depends on the name.  
2. Generally 100bps running for IG names and 500bps running for NIG names.



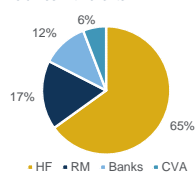
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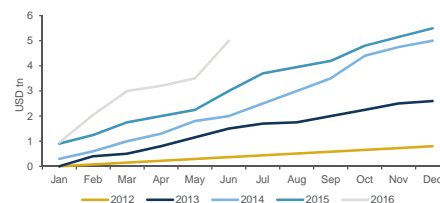
## Index credit spread options – A brief history

- >\$5 trillion gross notional traded in the market in 2015 (IG Notional Equivalent)
- Average ticket sizes between \$0.5bn – \$1.0bn. Larger tickets between \$2bn – \$4bn. Have quoted up to \$10bn on a single option
- Before 2009:** Limited liquidity. Options largely traded as bespoke structured solutions
- 2009/10:** Investors realise that hedging tails / basis / negative convexity in credit portfolios is a good idea. Interest in trading options picks up
  - Clients look to options hedges (loan, correlation, CVA desks ...). Dealers & hedge funds on the other side.
  - Options are expensive (implied vol. is high) relative to 'fair value' (realised volatility)
- 2011:** Option markets standardise. Liquidity improves and volumes keep growing. The market starts attracting option sellers looking to profit from the disconnect between implied and realised volatility.
- 2012/13:** The market continues growing with more involvement from real money investors and smaller funds.
- 2014-16:** Volumes continue to almost double year on year. Less of a purely hedging-focused market. More "alpha" players, including from other asset classes. Some interest in more exotic structures...

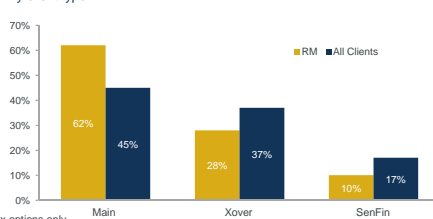
**2016 Global Client Split**  
% of "Main equivalent" total trading volumes with clients.



**Cumulative trading volume on iTraxx<sup>1</sup>**  
US\$ in Billions cumulative notional traded



**Index split**  
By client type



Source: Citi. Includes options across all indices. We use the following betas to compute "Main equivalent" volumes: 5x for Crossover, 1.5x for Senior Fin. iTraxx options only.



## Index tranches – A brief history

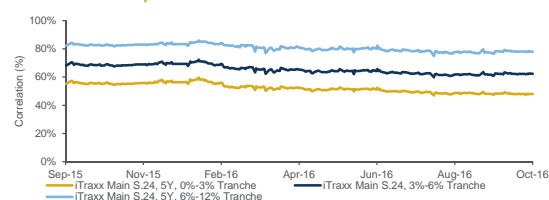
### Commentary

- The standardised CDS index tranche market originally arose from a need of correlation desks to hedge out the residual exposure left when selling synthetic bespoke tranches (CSOs) and hedging with indices and single name CDS.
- When the bespoke market shut down at the end of 2007 the standardised tranche market no longer rolled into the new series of the CDS indices.
- However, a need to hedge the existing bespoke tranches still existed so liquidity continued in the tranches that had maturities and compositions best matched to the existing bespoke tranches.
- These tranches were the iTraxx Main Series 9 and CDX IG Series 9 series which, until 2013, were the only liquid CDS tranche products.
- The liquidity on standard tranches in new Series started gathering pace in 2013.

**iTraxx spread**



**iTraxx Tranche Implied Correlations**



Source: Citi.

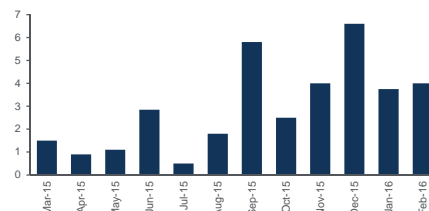


## Credit index TRS – A brief history

### Tranches strategy view

- While total-return swaps have been around for years, trading of derivatives linked to Markit's iBoxx bond indexes have only gathered pace since standardisation in 2012
- iBoxx TRS are currently 'liquid' on 6 different iBoxx indices
  - in the US, we have high grade (domestic corporates), high yield and loan TRS
  - in Europe, we have high grade (GBP and EUR corporates), and high yield TRS
- 'Liquid' maturities tend to be at the shorter end:
  - Typically 1 month, 3 month, 6 month, 9 month and 12 month maturities are traded
  - Most of the liquidity is in the 1-6 month tenors
  - Swap maturity dates always correspond to IMM dates

iBoxx TRS Monthly Notional Volume (\$bn)



Source: Citi.

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## Market drivers – A Bank's perspective

- Cash corporate bond trading volumes down in general across USD / EUR / GBP, driven by primarily:
  1. Reduced broker / dealer inventories driven by bank SLR;
  2. Increased capital charges through B3 RWA; and
  3. General heightened awareness around risk levels and decreased risk appetite.
- Total volumes traded of index products have increased (mainly driven by index & index options) - this is driven by institutional investors and hedge funds who prefer the reduced bid / offer & increased liquidity of the synthetic products
- Margining for non-cleared derivatives. Inter-bank transactions now require IM
- 'Negative basis' opportunities prevalent through credit crisis through higher funding cost. Central bank buying & other factors may start to increase the prevalence of 'positive basis' opportunities
- Considerations around intermediation of bespoke synthetic transactions:
  1. IM & VM (associated funding costs); and
  2. Hedging strategy & associated basis risk; and
  3. CVA.
- Level 3 asset disclosure requirements & investor focus
- General shift to cash-only CSAs
- EMIR – central clearing



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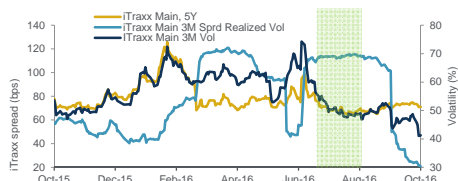
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## Timing Considerations for Credit Hedging

- Timing hedge execution (especially on longer-dated transactions) is just as important as initial capital benefit achieved – a quantitative model can be built to create ‘Trigger’ execution levels based on spread levels (bonds, CDS), implied / realised volatility & change in liquidity over time

### INSURANCE COMPANIES / PENSION FUNDS

#### Timing factors for options



#### Timing factors for tranches ?



### HEDGE FUNDS / ACTIVE INVESTORS

- Pairs trading
- Implied / realised volatility disconnect
- Flattener trades
- Tactical views



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## Bank and insurance product overlay – ‘BUG’ analysis

Instrument	Liquidity ?	Capital Impact ?	Accounting ?	Basis risk ?	Practical considerations ?
Single-name CDS	<ul style="list-style-type: none"> <li>Many names do you not have liquid CDS markets</li> <li>Less liquidity &gt; 10y</li> <li>GBP quanto CDS less liquid</li> </ul>	<ul style="list-style-type: none"> <li>MtM cash / CDS basis impact depends on location</li> <li>SCR benefit dependent on tenor mismatch</li> <li>FX mismatch ?</li> </ul>	<p>Impact on accounting balance sheet will depend on the specific strategy and interaction between asset valuation &amp; accounting liability discount rate.</p>	<ul style="list-style-type: none"> <li>Names matched</li> <li>Cash / CDS</li> <li>FX</li> <li>Duration mismatch</li> </ul>	<ul style="list-style-type: none"> <li>Cash-flow mismatch / CDS vs. bond coupons</li> <li>Positive basis ?</li> </ul>
Index CDS	<ul style="list-style-type: none"> <li>5y / 10y liquid</li> <li>No close matching index for bonds</li> </ul>	<ul style="list-style-type: none"> <li>Tall trees approach ?</li> <li>Duration matching ?</li> </ul>		<ul style="list-style-type: none"> <li>Cash / CDS</li> <li>FX</li> <li>Duration mismatch</li> <li>Portfolio name mismatch</li> </ul>	<ul style="list-style-type: none"> <li>Premium cost – where is this paid from ?</li> <li>MtM sensitivity run-off</li> <li>Index / portfolio creep</li> </ul>
Index Credit Spread Option	<ul style="list-style-type: none"> <li>Limited liquidity beyond 6m</li> <li>Quanto risk likely better value on more OTM</li> </ul>	<ul style="list-style-type: none"> <li>Rolling treatment ?</li> <li>Sizing / skew ?</li> <li>Implied volatility ?</li> </ul>		<ul style="list-style-type: none"> <li>Cash / CDS</li> <li>FX</li> <li>Duration</li> </ul>	<ul style="list-style-type: none"> <li>Roll frequency and conditions ?</li> <li>PRA discussion</li> </ul>
Index Tranches	<ul style="list-style-type: none"> <li>Depends on series</li> </ul>	<ul style="list-style-type: none"> <li>Implied correlation</li> <li>Senior tranches ?</li> <li>Longer tenor is a positive</li> </ul>		<ul style="list-style-type: none"> <li>Cash / CDS</li> <li>FX</li> <li>Duration</li> </ul>	<ul style="list-style-type: none"> <li>Marking can be challenging outside of widely traded tenors</li> </ul>
Index TRS	<ul style="list-style-type: none"> <li>Market is still developing in GBP</li> </ul>	<ul style="list-style-type: none"> <li>Tenor mismatch</li> <li>Minimal basis ?</li> </ul>		<ul style="list-style-type: none"> <li>Generally lower since based on a pricing index</li> </ul>	<ul style="list-style-type: none"> <li>Marking can be challenging</li> </ul>
Bespoke – Tranche / TRS / Downgrade	<ul style="list-style-type: none"> <li>By definition – illiquid!</li> </ul>	<ul style="list-style-type: none"> <li>Would hopefully be designed for better efficiency under capital model</li> </ul>		<ul style="list-style-type: none"> <li>Depends on structure – hopefully reduced by design compared to an index</li> </ul>	<ul style="list-style-type: none"> <li>Complex to structure and execute – can take time</li> <li>Marking methodology</li> </ul>



GOOD!



BAD!



UGLY!



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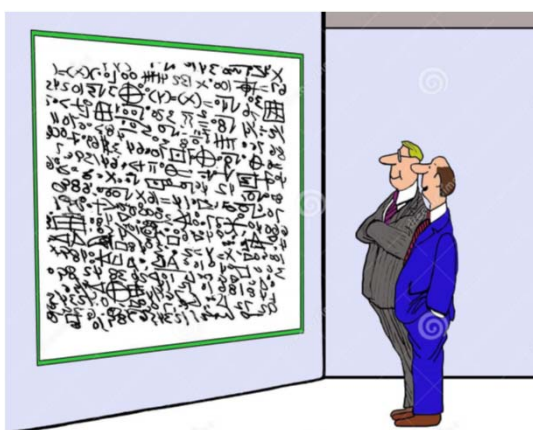
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## Credit Hedging – A Quick Poll

**Question 1:** Have you investigated credit hedging over the past 12 months on behalf of your insurance company or insurance client?

**Question 2:** Are you expecting to implement credit hedging over the next 12 months on behalf of your insurance company or insurance client?

## Credit Hedging – An Illustration

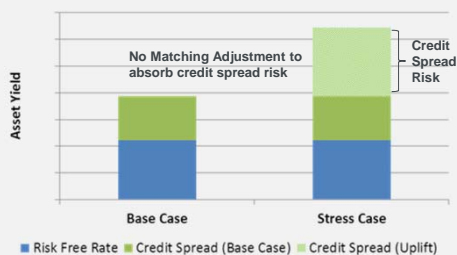


*“When you put it like that,  
it makes complete sense”*

## Insurer's perspective – Sources of credit risk

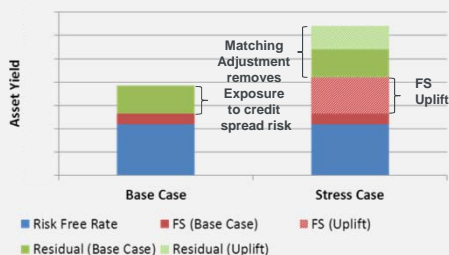
### Credit Risk in Non-MA/Non-VA Eligible Books

- Insurance companies need to hold capital against the full market value exposure on credit assets which don't have corresponding liabilities
- Any potential hedge would need to **offset exposure to credit spread stresses** to provide capital relief



### Credit Risk in MA Eligible Books

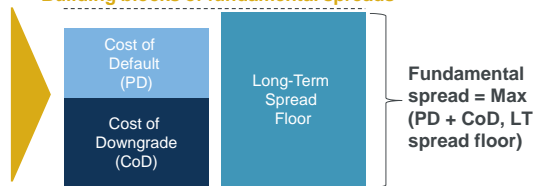
- Changes in market values largely neutralised through changes in liability discounting via MA
- Exposure to defaults and downgrades reduce liability discount rates via Fundamental Spreads
- Any potential hedge would need to **offset Fundamental Spreads (base and/or stress)** to provide capital relief



## Overview of SII fundamental spreads

Any potential credit hedging transaction in respect of MA-Eligible Books requires analysis of composition of Fundamental Spreads in Base and Stress

### Building blocks of fundamental spreads



	Base fundamental spreads	Uplift to fundamental spreads
What are Fundamental Spreads?	<ul style="list-style-type: none"> <li>Intended to reflect base case expected cost of defaults and downgrades</li> </ul>	<ul style="list-style-type: none"> <li>Intended to reflect the uplift to base case expected defaults and downgrades in a 1-in-200 year stress</li> </ul>
How are Fundamental Spreads determined?	<ul style="list-style-type: none"> <li>EIOPA</li> </ul>	<ul style="list-style-type: none"> <li>Either through Standard Formula or Internal Model</li> </ul>
When are Fundamental Spreads updated?	<ul style="list-style-type: none"> <li>Updated on a monthly basis</li> </ul>	<ul style="list-style-type: none"> <li>Revised in line with SCR calibration timescales</li> </ul>
How are Fundamental Spreads used?	<ul style="list-style-type: none"> <li>Used in calculation of matching adjustment</li> </ul>	<ul style="list-style-type: none"> <li>Used in calculation on capital requirements</li> </ul>
What are the determinants of Fundamental Spreads?	<ul style="list-style-type: none"> <li>Bond credit rating, term to maturity, category (financial/non-financial)</li> </ul>	<ul style="list-style-type: none"> <li>Bond credit rating (whether internally or externally rated), term to maturity, category (financial/non-financial)</li> </ul>



## Insurer's perspective – Potential hedging challenges and mitigants

- "Standard" challenges highlighted below typically apply when using more liquid instruments
- Additional challenges will likely apply depending on risks hedged and insurer's objectives

No.	Likely Challenges	Example	Potential Mitigants
1	<ul style="list-style-type: none"> <li>• Mis-match of hedge constituents vs portfolio constituents</li> </ul>	<ul style="list-style-type: none"> <li>• iTraxx Main Index consists of 125 names vs an underlying portfolio consisting of different names</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct extensive correlation analysis to set suitable haircuts</li> </ul>
2	<ul style="list-style-type: none"> <li>• Mis-match of hedge credit quality and portfolio credit quality</li> </ul>	<ul style="list-style-type: none"> <li>• The average credit quality of the index might be "BBB" vs "A" for underlying portfolio</li> </ul>	<ul style="list-style-type: none"> <li>• Size hedge allowing for mis-match in credit quality and credit spread sensitivity</li> </ul>
3	<ul style="list-style-type: none"> <li>• Mis-match of hedge currency vs portfolio currency</li> </ul>	<ul style="list-style-type: none"> <li>• CDX.NA.IG Index denominated in USD vs. underlying portfolio denominated in mixed currencies</li> </ul>	<ul style="list-style-type: none"> <li>• Quantify potential impact and consider quanto for large single name exposures</li> </ul>
4	<ul style="list-style-type: none"> <li>• Mis-match of hedge credit duration vs portfolio duration</li> </ul>	<ul style="list-style-type: none"> <li>• Hedge duration may run-off quicker than underlying portfolio</li> </ul>	<ul style="list-style-type: none"> <li>• Consider need for rolling the hedges to manage mis-match</li> </ul>
5	<ul style="list-style-type: none"> <li>• Mis-match arising from unfunded vs funded credit exposures</li> </ul>	<ul style="list-style-type: none"> <li>• Certain CDS spreads tend to be less sensitive in market stress situations vs portfolio credit spreads</li> </ul>	<ul style="list-style-type: none"> <li>• Understand how sensitivities are likely to vary over the cycle and set hedge notionals accordingly</li> </ul>
6	<ul style="list-style-type: none"> <li>• Exposure to non-observable variables pricing variables</li> </ul>	<ul style="list-style-type: none"> <li>• Base correlations and implied volatility for index tranches and options (respectively)</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct sensitivity analysis to set suitable haircuts</li> </ul>



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## Insurer's perspective – Criteria for rolling hedges

### Solvency II criteria

- SCR 11.3 requires the risk mitigation technique to be in force for at least the next 12 months. For shorter expiry risk mitigation techniques, full benefit could be obtained if the intention is to replace the risk mitigation technique at expiry with a similar arrangement, which requires the following qualitative criteria to be met (SCR 11.14)
  - Presence of a written policy on replacement of risk mitigation technique
  - At most quarterly rolling of strategy
  - Replacement is not subject to a future event that is outside the control of insurer
  - Not material liquidity risk for the risk mitigation technique
  - Risk of increase in cost of hedging reflected in solvency capital requirement
  - Replacement is not contrary to future management actions
  - Risk mitigation technique should not result in material basis risk or in creation of other risks
  - If risk mitigation technique has shorter expiry and does not satisfy above mentioned qualitative criteria, benefit of risk mitigation technique will be considered on a pro-rata basis



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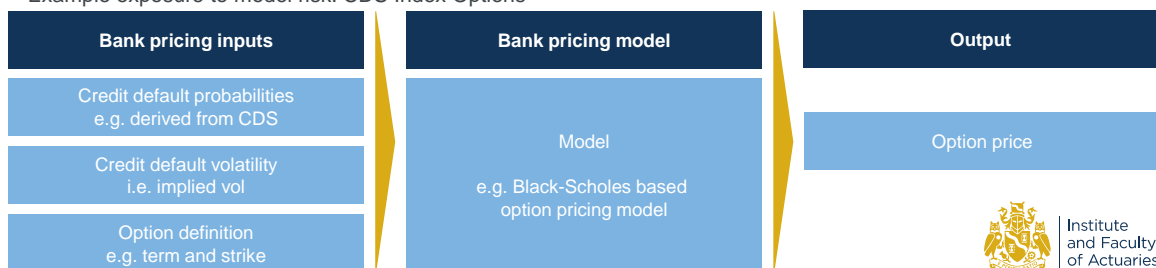


## Insurer's perspective – Potential retained risks and mitigants

- Insurer needs a protocol for managing its retained risks which could be significant

No.	Likely retained risk	Potential mitigants
1	Counterparty risk	• Collateralisation under ISDA / CSA protocol
2	Basis risk	• Hedge construction/haircut to capital relief
3	Operational risk	• Consider "static" hedge structure
4	Regulatory risk	• Engage regulator/future-proofing
5	Model risk	• Model sensitivities and retain capital as required

- Example exposure to model risk: CDS Index Options

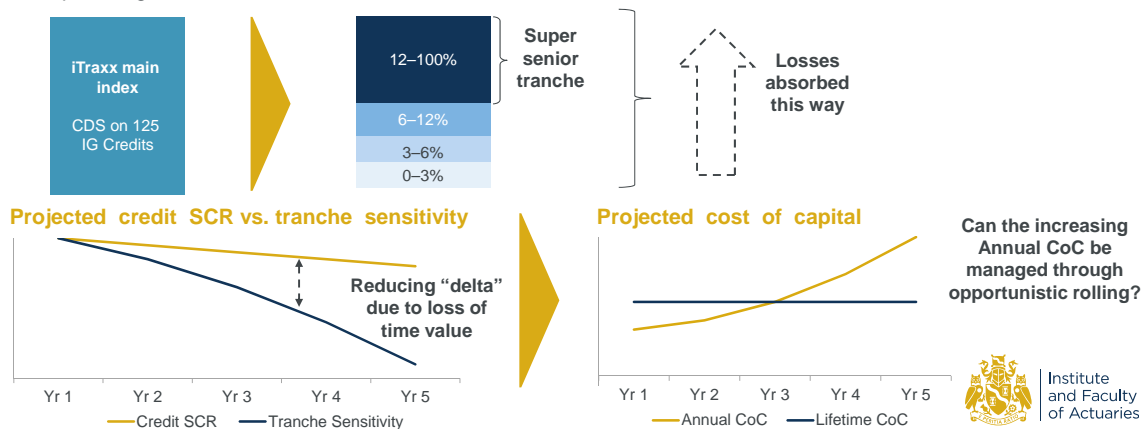


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## Transaction application 1 – CDS index tranches

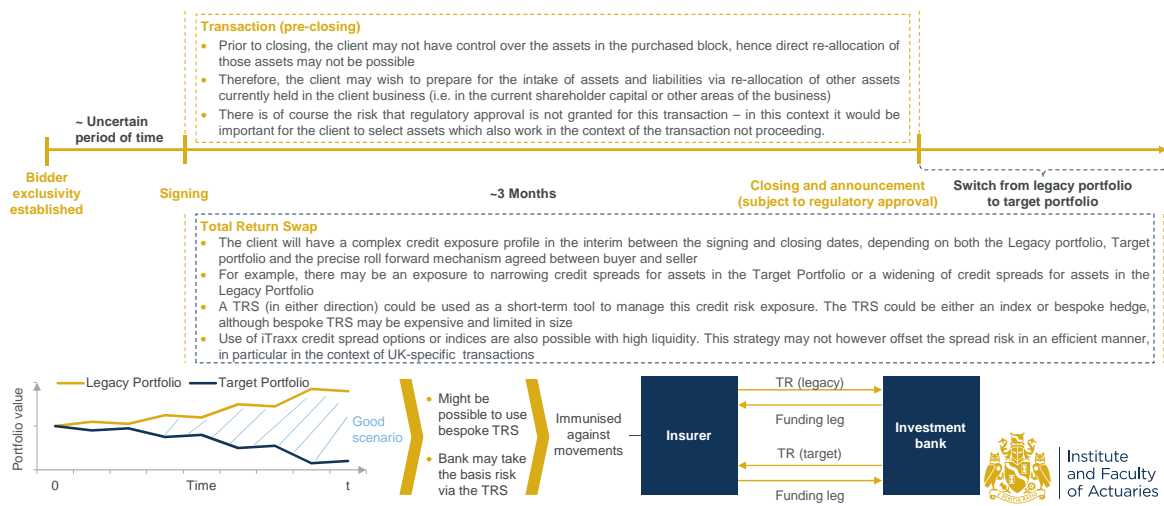
- Potential reasons for using CDS index tranches: Cheaper running costs than ATM index and longer tenors and CDS index options
- Example Hedge: 12-100% iTraxx Main Tranche



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## Transaction application 2 – TRS in an M&A situation



## Questions?

