Society of Actuaries in Ireland

Matching Adjustment

Calculation, Hypothecation and meeting regulatory requirements

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Disclaimer

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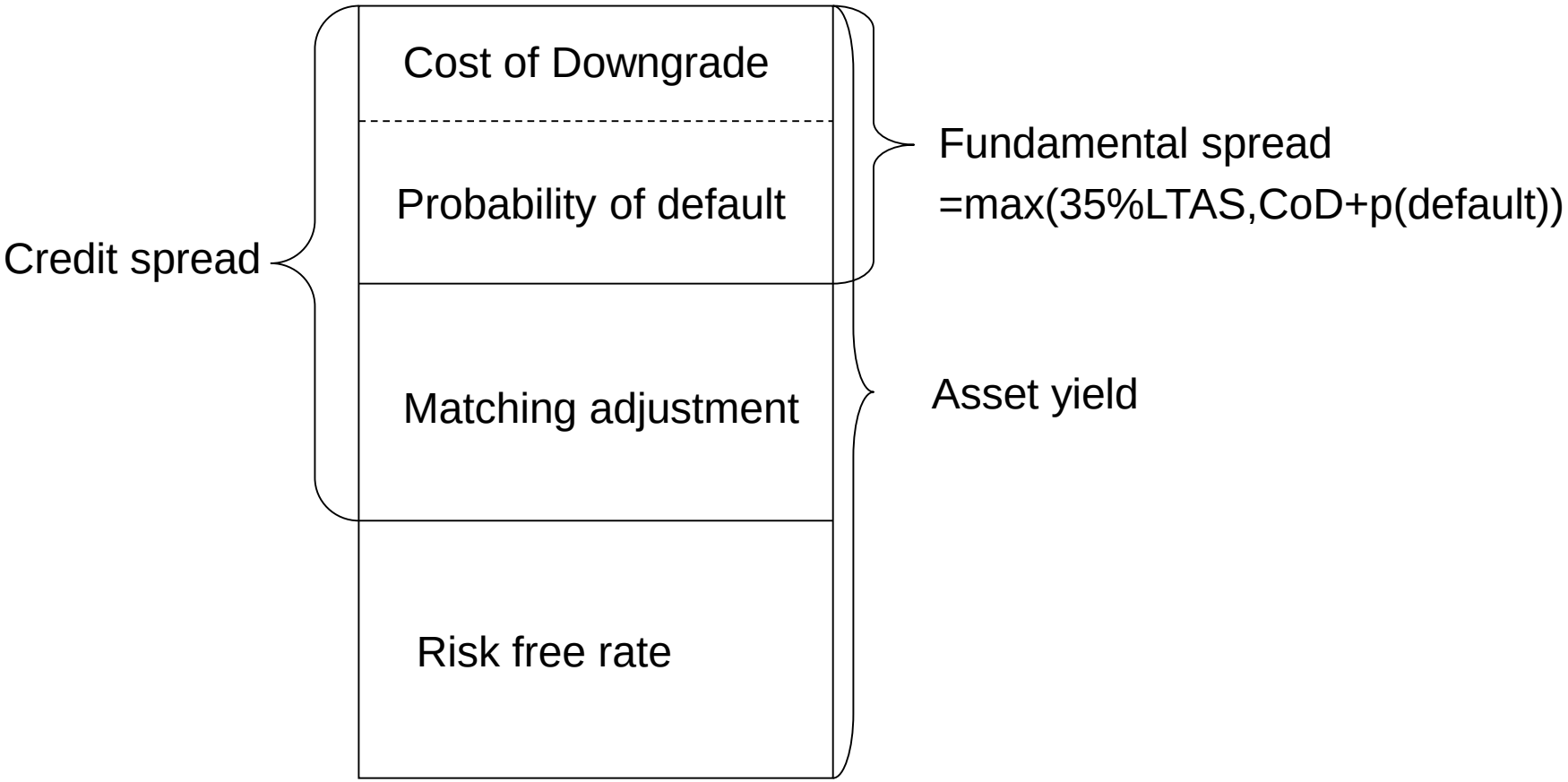
The UK annuity market

The Matching Adjustment



LTAS = Long Term Average Spread

Why make an application?

- Appetite for credit risk
- Capital efficiency
  - Reductions to BEL, RM and SCR
  - Trapped capital
- Interaction with reinsurance
  - Asset transfer vs. longevity swap
- Commercial pressure
  - UK branches use MA

Contents

- Requirements
- Matching Adjustment Calculation
- Ongoing management
- Hypothecation
- Planning an application
- Q&A

Requirements - Liabilities

Main eligibility criteria are defined in Article 77b - Directive 2009/138/EC
clarification of these requirements has been provided in a number of PRA letters

Liabilities

- Do not give rise to future premiums;
- Have limited underwriting risks;
- Do not have mortality risk higher than 5% of best estimate liability (BEL) (under a 15% mortality shock); and
- Do not have surrender values in excess of the values of assets.

Separation

- The business is identified, organised and managed separately; the assigned portfolio of assets cannot be used to cover losses arising from other activities.

Requirements - assets

Main eligibility criteria are defined in Article 77b - Directive 2009/138/EC clarification of these requirements has been provided in a number of PRA letters

Portfolio of assets / ALM Requirements

- Assets are fixed; inflation linked assets are eligible if they back inflation linked liabilities
- Portfolio of assets with similar cash-flow characteristics to liabilities; Replicates each of the expected cashflows with no material mismatch risk; and
- Assets maintained over the term of the liabilities with changes only being made in response to changes in the matching position

Matching Adjustment Calculation

The main steps in MA calculation

1. Calculate asset cashflows de-risked by p(default) factors
2. Calculate asset cashflows de-risked by full fundamental spreads
3. Hypothecate de-risked asset cashflows to liability cashflows
4. Calculate MA on asset cashflows de-risked by p(default)
5. Remove the remaining part of the fundamental spread from hypothecated assets and calculate the final MA

Matching Adjustment Calculation

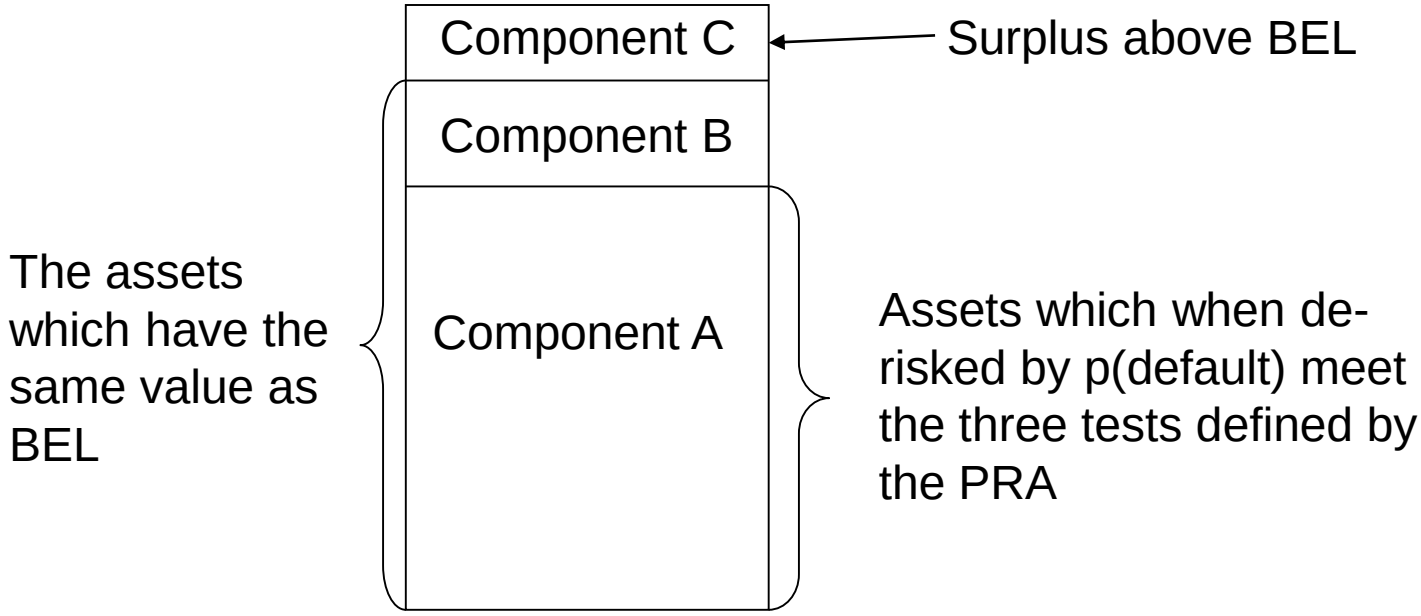
Steps 1 – 2 De-risking asset cashflows

- EIOPA publish Fundamental Spreads (and components) monthly
- The components are:
  - Probability of default
  - Cost of downgrade
  - Long Term Average Spread
- These values are split by:
  - Credit rating
  - Cashflow term (note this applies to term of cashflow, not term of asset)
  - Whether financial, non-financial or government
- The values are published as a spread which can be used to de-risk asset cashflows using (1/(1+FS))^t
- Note that sub investment grade assets can have MA no bigger than a BBB asset. The fundamental spread of these assets have to be raised accordingly
- Steps 1 and 2 involve de-risking all asset cashflows by p(default) and in a separate calculation, the full fundamental spread

Matching Adjustment Calculation

Step 3 – hypothecation

- Hypothecation involves selecting a subset of the assets in the MA portfolio to meet the matching requirements set out by the PRA
- The PRA specified three tests which are required to demonstrate the portfolio is adequately matched. To do this the PRA defined the MA asset portfolio comprising of three parts shown below.



Matching Adjustment Calculation

Step 3 – hypothecation

The three PRA matching tests are:

1. Test 1 - Discounted accumulated shortfall test
   - The largest accumulated shortfall on de-risked component A asset cashflows in any year is less than or equal to 3% of PV of liabilities
2. Test 2 – 99.5th percentile VaR test
   - The VaR on component A + B asset (not de-risked) cashflows is less than or equal to 1% BEL for nominal yield risk, inflation risk and FX risk (aggregating these risks where appropriate)
3. Test 3 – Notional swap test
   - The present value of the liability cashflows (at Solvency II risk free rate without MA) must be between 99% and 100% of the present value (at same risk free rate) of de-risked component A cashflows

Hypothecation involves selecting component A and B assets to meet these requirements

Matching Adjustment Calculation

Step 4 – Calculate MA on component A assets

This step involves calculating the MA on just the component A assets.

The approach is specified directly in the Level 1 regulations Article 77c.

The calculation is:

1. Calculate the (Annual Effective Rate) AER on the liability cashflows set equal to the present value of the liability cashflows (at Solvency II risk free rate without MA). This is effectively the average risk free rate weighted by the liability cashflows
2. Calculate the AER on the liability cashflows set equal to the market value of component A cashflows
3. MA on component A is: Step 2 – Step 1

Note this result is not used in any reporting calculations. It is an intermediate step in the MA calculation which is reported in Solvency II forms.

Matching Adjustment Calculation

Step 5 – Calculate the Final MA

This step involves calculating the final MA which is used in the reporting calculations.

Whereas step 4 is precisely defined in the regulations, this step is not defined which leaves a few options for how it can be calculated. The main options are:

1. 'AER approach' – Calculate the final MA using an AER calculation.
2. 'Z spread approach' - Calculate the final MA using a z-spread calculation (i.e. calculate a single number 'z' which is the MA)
3. 'Weighted average' - Calculate the weighted average of the remaining part of the fundamental spread and remove this from the value in step 4

Note z-spread is flat addition to the risk free rate

Hypothecation

There are several approaches to hypothecation. The aim is to maximise the MA whilst staying within the PRA tests. The main hypothecation approaches are:

1. By hand - Select assets by hand until pass the tests
2. Automated matching – automate the approach to matching by choosing assets with the highest MA at each term until have enough to cover liability cashflows, starting at either the longest or shortest term and finishing at the shortest or longest term respectively
3. Using a numerical method to optimise the MA. This requires two steps:
   - Setting out the problem aiming to solve
   - Producing a numerical method to solve this problem

Hypothecation

By Hand

- Typically done in a spreadsheet with assets sorted by term and with the MA on each individual asset calculated.
- The user types a percentage along side each asset until the PRA tests are passed and the MA is as high as possible

+ Easy to set up initial spreadsheet to do this approach
- Can take a few hours to carry out during a live valuation
- May not be able to find a solution that meets all the tests by hand
- Will not get the maximum possible MA, in most cases significantly below the maximum possible

Hypothecation

Automated matching

- This is done using an automated tool. Typically the tool assigns assets to match liabilities, starting either at the shortest or longest term ensuring the asset cashflows cover liability cashflows. The tool selects assets with higher MAs first
- If at any term the asset cashflows do not cover the liability cashflows, additional assets are added at the next term to cover the liability cashflows in the previous term

\+ Should work quickly to provide matched portfolio in a live valuation

\+ Could provide a higher MA than the manual approach

\- Has an initial development cost to set up

\- May not be able to find a solution meeting all the tests even when there is a solution

\- Will not get the maximum possible MA

Hypothecation

Numerical method - optimisation

- Define the problem we are trying to solve. That is we are trying to maximise the MA subject to a number of limitations in the PRA tests
- Require a numerical method to solve this problem

\+ Works extremely fast to provide the maximum MA meeting all tests

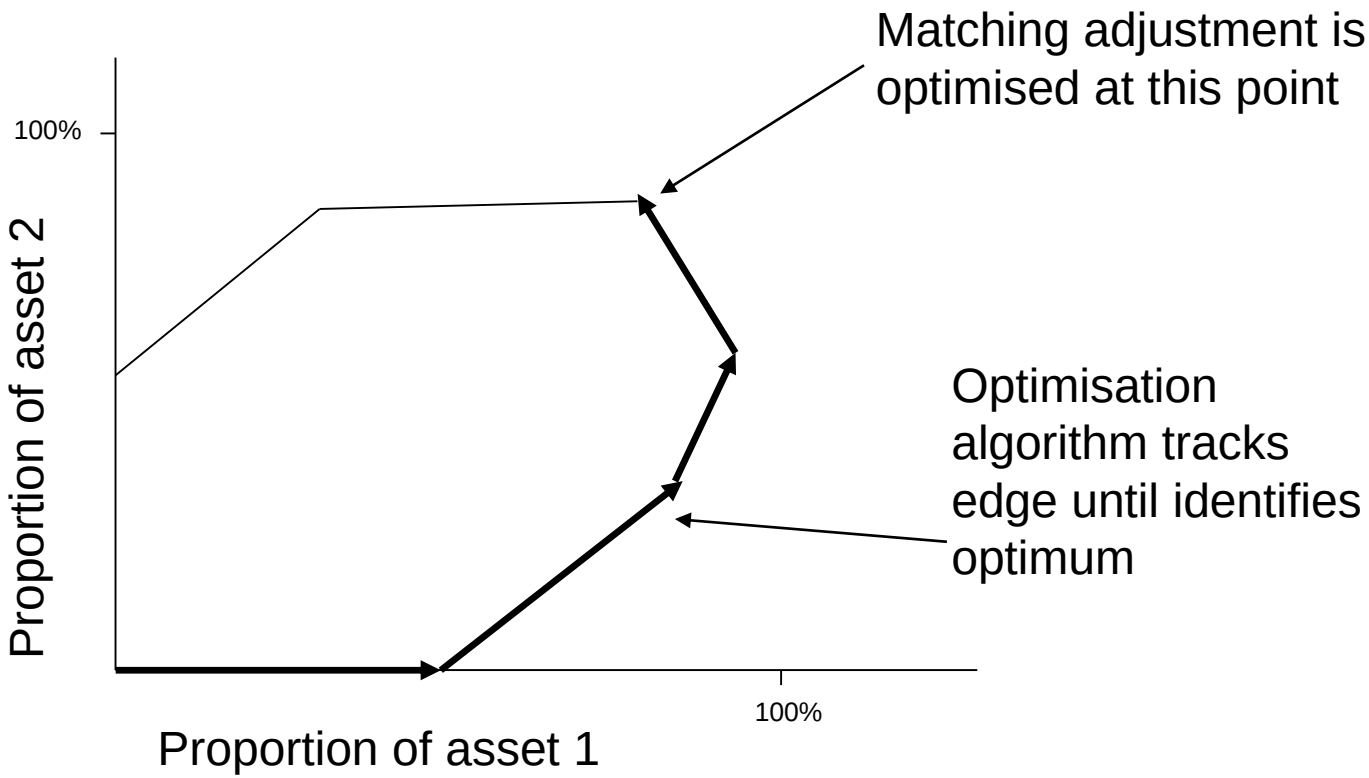
\+ If there is a solution this approach will find it, and show if there is no solution

\- Has an initial development cost to set up

\- Requires some research to define the problem and develop a numerical method to solve the problem

Hypothecation

Numerical method - optimisation



Ongoing management

1. BEL Coverage – article 77b 1a 09- -
Portfolio surplus is positive

2. Matching/ PRA tests – PRA letter March 2015 / Article 77b 1 c
- Three PRA defined statistics :
Test 1 - Maximum Accumulated Shortfall Test <3%
Test 2 - 99.5th percentile VaR < 1%
Test 3 - Notional Swap > 99%, < 100%
-ALM team in house metrics

3. Asset Eligibility – article 77b 1 h 2009/138/EC
-Max make whole spreads defined by the Application
-Callables beyond maturity date
-Paired assets
-Inflation linked assets

4. Trading - article 77b 1 a
PRA letter on 9 March 2015 states that firms should "reflect a buy-and-hold strategy" and demonstrate that "rebalancing of assets within MA portfolios is strictly for the purposes of good risk management"
-Circumstances under which trading is permissible
-Circumstances where trading is not allowed

Ongoing management

5. Internal ratings - PRA firm specific correspondence

Firm's Internal Credit Rating Framework (ICR)

-Appropriate governance

-Well defined methodologies

-Robust process for ongoing review

Investment Managers Portfolio Reporting

- Eligibility
- Trading activity
- Internal ratings
- Defaulted assets

6. Policyholder surrenders – article 77b 1d, e, f, g

-Surrender basis

-New product lines

7. Liquidity Plans article 44 (2)138/EC

- Short term projection of asset and liabilities
- Liquidity risk framework
- Liquidity risk appetite
- Liquidity metrics

8. Extraction of surplus – PRA letter October 201438/EC

- Rigorous profit and loss (P&L) attribution
- Robust governance process
- Extractable surplus

Ongoing management

Liquidity Plans

Need to meet the PRA tests outlined on previous slides

- If these tests are not met at any point – there is a requirement to adjust the portfolio to meet these tests within 2 months

A certain amount of relatively liquid assets need to be held outside the MA portfolio to meet this requirement in the event of some sort of stress to the portfolio. The amount of these assets depends on risk appetite

- This requirement is a “structural liquidity” requirement
- This needs to be included with a wider firm assessment of short term outgo and income.
- Typically a firm will assess outgo (due to liabilities, expenses etc….) over a short term (e.g. 1 week, 1 month, 6 month) and compare this outgo with what are assessed to be liquid assets (e.g. cash, government bonds, possibly other assets with a haircut)
- This plan might also be considered stress conditions. These stresses would be stresses to liquidity rather than purely asset values, so may differ in nature from Internal Model stresses

Ongoing management

P&L Attribution

Surplus from within the MA portfolio (component C) can only be extracted if it has arisen due to experience being better than expected rather than due to market movements

- Expenses lower than expected
- The costs of defaults / downgrades lower than expected
- Longevity lighter than expected

Surplus arising due to market movements would not be eligible for release

- such as change in yields, inflation or credit spreads

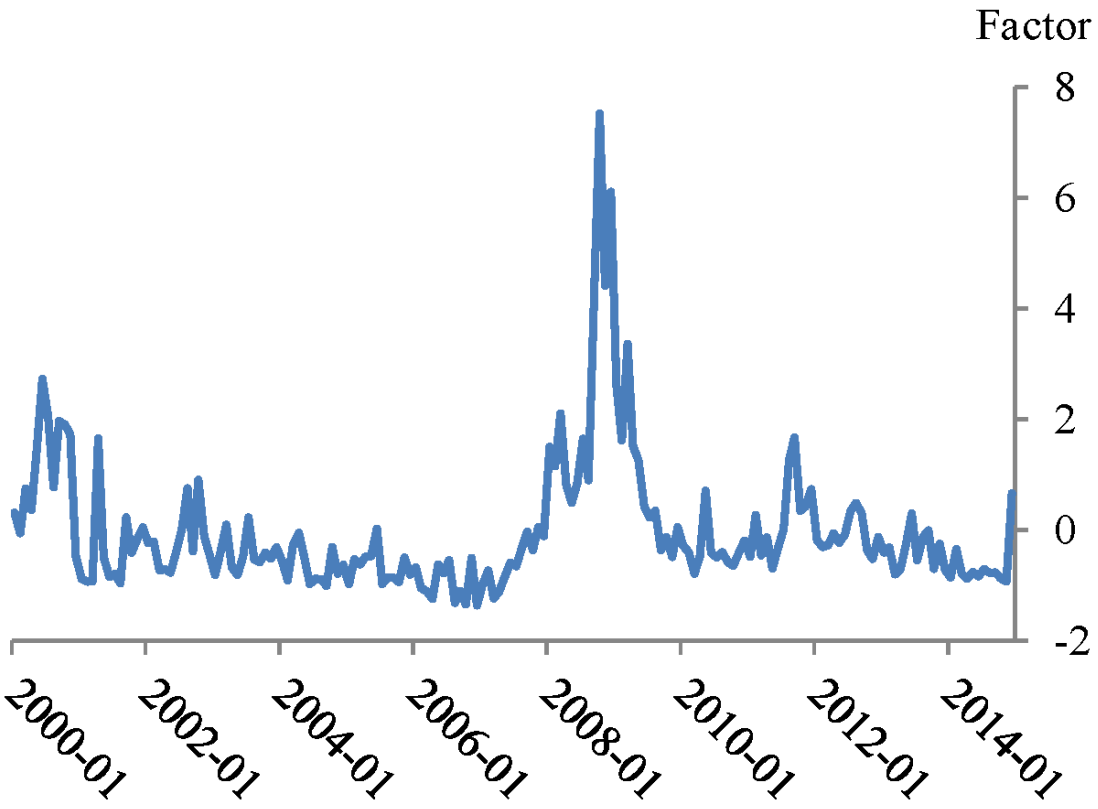
A rigorous P&L attribution is required on the MA portfolio.

- This can be included with other P&L attribution processes looking at risk margin and SCR or just cover the MA portfolio itself.
- The process typically involves a number of steps for which the matching adjustment is re-calculated in each step to allow correct attribution of the change in surplus to each

Planning an application

1. 4 Workstreams
   - Asset selection
   - MA calculation and hypothecation
   - P&L attribution
   - Liquidity plans
2. Timeframe
   - 6-12 months
3. Regulatory interaction
4. BAU overhead
   - 1 mid-level resource with oversight

Liquidity risk shock



Euro corporate bond market liquidity risk

Q&A