



**List of technical details in the calculations carried out for
EIOPA Stress Test 2014
regarding the Volatility Adjustment**

INTRODUCTION

- A. Following the opinion of EU COM, FinReq agreed on aligning its inputs to EIOPA Stress Test 2014 with the draft of Level 2 Delegated Act as of March 14th 2014, and according to LTGA framework where it is consistent with the aforementioned draft and the purposes of EIOPA Stress Test 2014.
- B. Insurance market data on (a) the weights to be applied to the governments and corporate bond spreads once risk adjusted, and (b) the composition of the representative portfolios used in the calculation.
 - For practical reasons FinReq agreed on using LTGA inputs, with the disclaimer that such inputs refer to 31-12-2011 and were provided on best effort basis.
- C. Therefore the data limitations identified in LTGA for the so-called 'adaptation', also remain applicable to the calculation of the VA in EIOPA Stress Test 2014, mutatis mutandis. As part of LTGA exercise, during 2013 EIOPA Staff presented to FinReq the list of workarounds applied to overcome such limitations, providing full transparency to the process of calculation. This document updates such list.
- D. As specifically disclaimed, the list of workarounds should not be considered to be necessarily specified for the future.
- E. The VA reaction to stress tests has been calculated considering simultaneously a threefold instantaneous shock:
 - i. Non-parallel shift of the swap risk free curve, calibrated for the euro.

- ii. Parallel shift of corporate bond curves, calibrated for the euro (although being different pending on the credit quality and type of asset)
- iii. Parallel shift of government bond curves, being the shift country specific

Below there is a description of the method applied to transform the two first euro-specific stresses for currencies other than the euro.

LIST OF TECHNICAL DETAILS

GENERAL OBSERVATIONS

1. LTGA only considered local currencies of EEA national markets. Therefore for the purposes of EIOPAS tress Test 2014 only such currencies can be considered in the calculation of the Volatility Adjustment (no insurance market data for other currencies, see paragraph B above).

MARKET DATA

2. Basic risk free rates.
 - a. Baseline: Basic risk free interest rates term structures in the baseline scenario developed according to the criteria approved by FinReq (see annex DC1 to the Technical Specifications of EIOPA Stress Test 2014)
 - b. Stressed scenarios for the euro.

Par swap rates curve for the euro in the stressed scenarios have been defined according to the scenarios approved by EIOPA, previous endorsement of ESRB. Zero coupon complete term structure has been derived applying the same assumptions and methodology as for the euro in the baseline scenario.

- c. Stressed scenarios for currencies other than the euro: FSC has approved the following method to derive the zero-coupon stressed term structure for currencies other than the euro.

Each maturity of the term structure of the baseline scenario for each currency, will be stressed in the necessary amount to meet the following equation:

$$\frac{(1 + i_{\text{rfr_stress}}^{\text{euro}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{euro}})^{-t}} = \frac{(1 + i_{\text{rfr_stress}}^{\text{currency}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{currency}})^{-t}}$$

This means that the relative change of the current value of the same cash flow (or the best estimate of an insurance contract) will be the same for all currencies.

This approach has been applied consistently in EIOPA Stress Test 2014, in particular in order to transform (a) yields of corporate bonds expressed in euro to yields of corporate bonds expressed in other currencies, and (b) Probability of Default (PD) and Cost of Downgrades (CD) expressed in basis points for the euro, in PD and CD expressed in basis points for other currencies (see below)

3. Government curves

- a. For those currencies where it has not been possible to obtain a government interest rate curve, the curve of a country with similar rating has been considered, as follows (as in LTGA). Similar allocation is applied for the fundamental spread applied for the matching adjustment calculations

Cyprus = Greece	Estonia = Belgium	Iceland = Spain
Latvia = Spain	Liechtenstein = Germany	Lithuania = Spain
Luxemburg = France	Malta = Ireland	Romania = Portugal
Croatia = Slovenia (new compared to LTGA)		

4. Corporate curves

- a. Since only corporate bond curves for the euro have been available, their yields have been applied to other currencies, according to the formula described above and used across the stress test:

$$\frac{(1 + i_{\text{corp_bond_baseline}}^{\text{euro}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{euro}})^{-t}} = \frac{(1 + i_{\text{corp_bond_baseline}}^{\text{currency}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{currency}})^{-t}}$$

- b. Since the risk correction of the spread for the VA is expressed in basis points as well, consistently the risk correction for currencies other than the euro has been calculated with the following formula:

$$\frac{(1 + i_{\text{corp_bond_risk_corrected}}^{\text{euro}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{euro}})^{-t}} = \frac{(1 + i_{\text{corp_bond_risk_corrected}}^{\text{currency}})^{-t}}{(1 + i_{\text{rfr_baseline}}^{\text{currency}})^{-t}}$$

being obviously $i_{\text{corp_bond_risk_corrected}} = i_{\text{corp_bond_baseline}} - \text{risk correction}$

- c. Where there is no yield for long term maturities, the last observed yield is used (it has no material impact, because durations declared in LTGA refer to terms where market data exist)

5. Banks.

In absence of market data

- Yields for credit quality step 3 = yield for other finance bonds credit quality 3 + 0.25 (amount based on the difference among banks bonds and corporate finance bonds for credit quality step 2)
- Yields for credit quality step 4 = Yields for credit quality step 3 + 0.50

6. Industrial

- a. In absence of market data

Yields for industrial bonds credit quality step 0 = industrial bonds credit quality 1

Yields for credit quality step 4 = Yields for credit quality step 3 + 0.50

7. Utilities

a. In absence of market data

- Yields for credit quality steps 0 & 1 = industrial credit quality 0 & 1, respectively
- Yields for credit quality steps 4 = Yields for credit quality steps 3 + 0.50

8. Other corporate bonds

a. Yields for industrial corporate bonds used.

9. Risk correction adjustment for governments:

The fundamental spread for government bonds has been calculated as 35% of the daily average for the same period as LTGA of the spread:

Zero coupon government bonds versus

Basic risk free rates term structure, credit risk adjusted according to the draft of Level 2 Delegated Act (as of March 14th, 2014)

Negative spreads included in the calculation as in LTGA.

10. Probability of default + cost of downgrades for corporate bonds

Used the excel file FinReq produced for LTGA, with the exclusion of the component relative to default volatility, according to the aforementioned draft of Level 2 Delegated Act.

11. Probability of default for de-risking cash flows in the matching adjustment is calculated assuming that the difference of actual values of a risk-free financial asset compared to a non-risk free asset reflects the current value of the expected loss given default.

Since the cost of defaults expressed in basis points are based on zero coupon curves, the previous reflection may be expressed as follows:

$$(1 + i_{rfr})^{-t} - (1 + i_{rfr} + \text{fundam. spread})^{-t} = (1 - \text{recovery rate}) * PD * (1 + i_{rfr})^{-t}$$

12. Sub investment grade assets. Introduced the same approach as for the fundamental spread, according to the draft of Level 2 Delegated Act (as of March 14th, 2014)

CALCULATION OF THE OVERALL SPREAD

13. International institutions (both EEA and non-EEA)

- a. Risk free rate = Risk free rate of the relevant currency
 - b. Bond spread = Risk free rate of the relevant currency
14. Where the yield of a bond is lower than its relevant risk free rate, the negative spread is retained in subsequent calculations..
15. For those currencies whose basic risk-free rates term structure is derived from government bonds (Croatia, Hungary, Iceland, and Poland), spread for their national government bonds is set to zero (not applicable to government bonds of other countries).
16. For non-integer durations, both the risk free rate and the yields of each bond are linearly interpolated from the rates for the up and down nearest integer maturities, and the overall spread derived as simple difference among the interpolated value corresponding the accurate duration declared in LTGA inputs.
17. Volatility Adjustment at currency/country level is derived according to the methodology described in Annex 1 to EIOPA Report on LTGA, and presented to FinReq and EU COM during the preparation of EIOPA Stress Test 2014 (applying the formula set out in Article 77d of OII Directive).

UNDERSTANDING OUTPUTS

18. Spreads corresponding to government bonds for a country should be read considering that undertakings of such market may invest in government bonds of other countries.
- In the case of IE, according to available data (see Annex 1 to LTGA Report),the central governments bond portfolio is mainly materialized in bonds from DE (32%), UK (28%), FR (24%) and NL (5%)
19. In the case of DK, 58% of its corporate bonds portfolio corresponds to Banks of credit quality step 0. These bonds have as of YE2013 a negative spread compared to the basic risk free curve (credit risk adjusted) at the relevant duration