EURONEXT CLEARING

Stress Test Methodologies

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1. Executive Summary

This document aims at describing the stress scenarios adopted by ENXC for EQDER[1] and COMMDER[2] and BOND[3] stress testing purposes.

Having as purpose Markets' integrity and the respect of the risk appetite defined by the Board of Directors even in extreme default conditions, Euronext Clearing appraises the consistency of the Default Funds through Stress Test Simulations.

The amount of the Default Funds is set by Euronext Clearing to a value such as to ensure the stability of the guarantee system even in case of simultaneous members' defaults under stress market conditions. The Stress Tests performed by Euronext Clearing aim at assessing the vulnerability of the guarantee system for extreme but plausible variations of the risk factors, larger than those covered by the initial margining system, but still reasonably possible.

The purpose of the Stress Tests is the determination, according to each stress scenario applied, of the "Stressed Exposure" (SE) for each Clearing Member, that is the amount that the Participant would be required to deposit with Euronext Clearing as a consequence of the new (initial and variation) margin call after the hypothesized price variations. The SE is then aggregated at Bank Group Level.

The Stress Tests are performed daily and separately to calibrate the Fixed Income Default Fund and the Equity, Equity Derivatives and Commodity Derivatives Default Fund. Clearing activities.

2. Equity Cash, Financial & Commodity Derivatives Asset Class

For EQDER and COMMDER Asset Class, twelve stress test Scenarios are hypothesised:

1. EQDER downside / COMMDER Upside – Double Volatility;
2. EQDER downside / COMMDER Downside – Double Volatility;
3. EQDER downside / COMMDER Upside – Half Volatility;
4. EQDER downside / COMMDER Downside – Half Volatility;
5. EQDER upside / COMMDER Upside – Double Volatility;
6. EQDER upside / COMMDER Downside – Double Volatility;
7. EQDER upside / COMMDER Upside – Half Volatility;

[1] EQDER: Equity Cash and Equity Derivatives
[2] COMMDER: Commodities Derivatives
[3] BOND: Fixed Income

8. EQDER upside / COMMDER Downside – Half Volatility;
9. EQDER COMMDER Real-Life – Double Volatility;
10. EQDER COMMDER Real-Life – Half Volatility;
11. EQDER Extra Stress / COMMDER Downside – Double Volatility;
12. EQDER Extra Stress / COMMDER Upside – Double Volatility.

2.1. Definition of price scenarios

i) Equities Section

It is assumed that each security [4] undergoes a downside/upside price variation equal to the worst between the following events:

1. the largest (both upside and downside) between 1-day, two-days and three days price variation[5] actually occurred over the available time series;
2. 1,20 times the «Hypothetical Margin Interval»[6] ;
3. 4 times[7] the Standard Deviation.

The hypotheses under a.2 and a.3 allow determining a hypothetical price shock (not recorded on a time series) also for those securities recently listed having been only recently listed, have not yet shown an actual significant price variation.

It is worth mentioning that the use of a multiple of the hypothetical Margin Interval – besides using a multiple of the standard deviation – allows accounting for the different behaviour of securities – although having similar standard deviation values – towards

[4] Shares, Convertible Bonds, Warrants, Closed Funds, Shares, ETFs, Commodities Futures, Bonds.

[5] A three days holding period is sufficiently prudent taking into account that Borsa Italiana is the European leader in share turnover velocity on electronic systems (173.2% as at end November 2010, 190,3% as at end November 2011, 145,6% as at end November 2012, 135,4% as at end November 2013). The turnover velocity, calculated as the ratio between the Electronic Order Book (EOB) turnover of domestic shares and their market capitalization, is a reliable measure of market liquidity.

Moreover, the liquidation period has been identified assuming that a clearing member default will be immediately declared by CC&G and the position will be closed-out in the following one or two days.

[6] The «Hypothetical Margin Interval» for derivatives and for underlying securities is equal to the Margin Interval calculated considering the absolute value of scaled and unscaled scenarios using the same confidence level and holding period applied for whatif calculation.

[7] Such value indicates that, if price variation were normally distributed, the event being considered has a probability of occurrence no larger than 0.01%.

extreme price variations (statistically expressed by the kurtosis); this is taken into account in determining the Margin Interval.

For "Real-Life" scenarios the sign of the above variation is calculated considering the price variation of each instrument from T-2 to T-1 (i.e. in case the price of shares X increase from € 1 to € 1.1, a positive sign is used, while in case the price of shares X decrease from € 1 to € 0.9, a negative sign is used; in case a 0% price variation is recorded the sign is applied on a random basis). T is the stress date. To take into account also the CM portfolio repositioning in case of sharp moment in T, the real life scenario signs are defined on the price comparison between T-2 and T-1.

For "Extra-Stress" scenarios it is assumed that the shares of the two most exposed banking groups in the:

1. EQDER downside / COMMDER Downside – Double Volatility scenario have a downside price variation equal to 90% (considering a *recovery rate* of 10%) – in this case the EQDER Extra Stress / COMMDER Downside – Double Volatility is defined.
2. EQDER downside / COMMDER Upside – Double Volatility scenario have a downside price variation equal to 90% (considering a *recovery rate* of 10%) – in this case the EQDER Extra Stress / COMMDER Upside – Double Volatility is defined.

ii) Equities Derivatives Section

With regards to derivatives, the following approach is followed:

a) Equity Futures prices and Net/Total Return Index Futures[8] prices are assumed having a one-to-one price variation with their underlying;

b) Index Dividend Futures prices for all the maturities are stressed using the absolute price variation calculated on the time series of the first maturity and using the methodology as above described for Equity Cash. For Single Stock Dividend Futures (SSDF) for each maturity prices are assumed having an absolute price variation determined as above described for Equity Cash;

c) Equity Options and Index Options prices are recalculated using the stressed price of their underlying calculated using the so-called «sticky delta» approach. It consists in attributing to each option in the stress scenario an implied volatility equal to twice/half the implied volatility of the option, having the corresponding moneyness in the real world scenario[9]).

Figure 1 provides an example of the construction of the implied volatility curve for an options expiry. There are two models, introduced by Derman (1999) that are useful for describing

[8] The index value is calculated on the basis of the new post stress values of its components.
[9] Example: It is assumed that XXX share drops –10% (from € 20.00 to € 18.00). The option Strike 20.00 (At-The-Money) has in reality an implied volatility of 16%; in the stress test the option Strike 18.00 (which in the stress test is At-The-Money) has an implied volatility of 32% (double volatility) or 8% (half volatility).

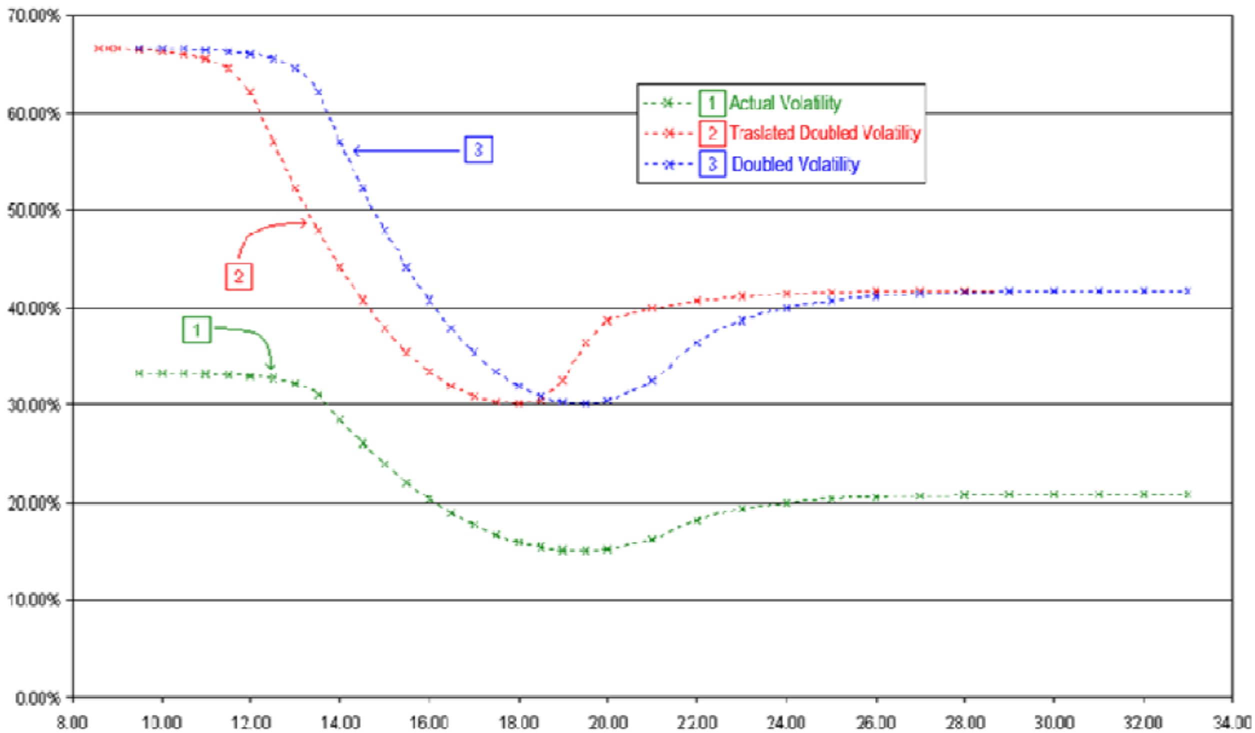
dynamics of a volatility surface with spot price changing: the *sticky strike* and *sticky delta* models. The sticky strike and sticky delta rule explain what happens with the implied volatility curve when the underlying changes as follows:

- Sticky strike means that, as the underlying moves, the implied volatility does not change. This can be visualized as a static implied volatility curve when plotted as a function of strike. Clearly, this almost never happens since volatility is not constant in reality. Nevertheless, the assumption can be assumed to be valid for small movements of the underlying asset.
- Sticky delta (moneyness) means that, as the underlying moves, the implied volatility for every moneyness value does not change. Therefore, the implied volatilities of each strike change. In fact, this change can be visualized as a horizontal shift of the implied volatility curve in the direction of underlying, when the implied volatility is plotted as function of strike. As a consequence, when implied volatility is plotted as function of moneyness, it will remain unchanged.

The underpinning assumption is that options are priced depending on their Delta, so that when the underlying price moves and the Delta of an option changes, a different implied volatility has to be plugged into the pricing model.

ENXC has adopted the sticky delta approach, applying a multiplier equal to 2 to the At-The-Money volatility of the corresponding moneyness in the double volatility scenarios or a divider equal to 2 to the At-The-Money volatility of the corresponding moneyness in the half volatility scenario (see next paragraph). This multiplier has been prudently set on the basis of the largest observed volatility jumps for a HP days time horizon, consistent with margins calculation (in a period long enough to include insolvency of Lehman Brothers).
This approach is conservative in relation to the volatility difference between ATM e OUT options since a multiplier (than an absolute increase) rises the probability in the tail of the distribution giving more importance to tail risks and obtain a conservative movement in the shape of the volatility curve.

Figure 1 Sticky delta approach with doubled volatility



iii) Commodities Derivatives Section

With regards to commodities derivatives, the following approach is followed:

a) Commodities Futures prices are recalculated applying the same methodology used for cash products (taking into account the shifting mechanism in building the historical time series, described in the paragraph 2.4).

b) Commodities Options prices are recalculated using the stressed price of their underlying calculated using the so-called «sticky delta» approach. It consists in attributing to each option in the stress scenario an implied volatility equal to twice/half the implied volatility of the option, having the corresponding moneyness in the real world scenario[10]).

For each EQDER and COMMDER instrument the following table should be prepared:

	Worst_Hist_Var	1.2 Margin Interval	4 Stdev	Stress Var
INSTR_1	45%	30%	20%	45%

[10] Example: It is assumed that XXX share drops –10% (from € 20.00 to € 18.00). The option Strike 20.00 (At-The-Money) has in reality an implied volatility of 16%; in the stress test the option Strike 18.00 (which in the stress test is At-The-Money) has an implied volatility of 32% (double volatility) or 8% (half volatility).

2.2. Combined Stress Scenarios

N°	EQDER - COMMDER Stress Scenarios	EQDER Stress Variation Sign	COMMDER Stress Variation Sign
1	EQDER downside / COMMDER upside – Double Volatility	Negative	Positive
2	EQDER downside / COMMDER downside – Double Volatility	Negative	Negative
3	EQDER downside / COMMDER upside – Half Volatility;	Negative	Positive
4	EQDER downside / COMMDER downside – Half Volatility	Negative	Negative
5	EQDER upside / COMMDER upside – Double Volatility	Positive	Positive
6	EQDER upside / COMMDER downside – Double Volatility	Positive	Negative
7	EQDER upside / COMMDER Upside – Half Volatility	Positive	Positive
8	EQDER upside / COMMDER downside – Half Volatility	Positive	Negative
9	EQDER COMMDER Real-Life – Double Volatility	Depends on real life sign price variation	
10	EQDER COMMDER Real-Life – Half Volatility	Depends on real life sign price variation	
11	EQDER Extra Stress / COMMDER downside – Double Volatility	Negative	Negative
12	EQDER Extra Stress / COMMDER upside – Double Volatility	Negative	Positive

2.3. Index Stress Scenario Calculation

The index value is calculated on the basis of the new post stress values of its components. In details the index price is calculated using a base-weighted aggregate methodology. This means the level of an index reflects the total market value of all of the constituent stocks. The total market value of a company is determined by multiplying the price of its stock by the number of shares in issue.

To perform such calculation the following information needs to be used:

- Index identifier (e.g. FTSE MIB)
- Index Constituents (list of index constituents)
- Divisor (index divisor)
- Outstanding Shares
- Constituents Price
- Constituents Stress Price

The index value is then defined as:

$$Index\ Stress\ Value = \frac{\sum_{i=1}^{N} p_{i,t} * q_{i,t}}{D_t}$$

Where:

- $p_{i,t}$ = the stress price, at stress date, of the i^{th}-share.
- $q_{i,t}$ =Number of shares in the index. The number of shares in issue for the security i^{th}.
- D_t =Value of the index divisor at time *t*.

2.4. Historical Time Series for Commodities

One of the challenges in time series analysis is dealing with data that has irregular time intervals or varying frequencies. This is where the concept of shifting comes into play. The "Shifting" mechanism refers to the process of transforming irregularly spaced time series into a regular time series by aligning the data points based on a specific time frame or interval.

This process can be particularly useful in constructing historical series. Let's say we have historical data on a particular variable, but the data points are irregularly spaced or collected at different intervals. By shifting the expiries and aligning the data points, we can create a regular time series that provides a more accurate representation of the historical trends and patterns.

The process of shifting involves two main steps. The first step is to determine the desired time frame or interval for the regular time series. This can be daily, weekly, monthly, or any other appropriate interval based on the nature of the data and the analysis being performed. In our case, the time frame is daily.

Once the time frame is established, the second step is to shift the data points to align with the new expiries. For Commodities Derivatives the historical time series should be built for each nearby expiry (Exp1, Exp2, etc) in light of the shifting mechanism (i.e. the Exp1 time series contains, as time goes by, the prices of all first futures in negotiation).

Therefore, the scenarios described in the previous paragraphs should be calculated at "Expiry level" and applied at "Instrument level" (i.e. the scenario for Exp1 should be applied to the first future in negotiation).

The maximum between the following hypothesis should be taken into account:

1. the largest (both upside and downside) between 1-day, two-days and three days price variation actually occurred over the available time series;
2. 1,20 times the «Hypothetical Margin Interval» ;
3. 4 times the Standard Deviation.

For delivery positions "DP", the first step is to define the benchmark for each commodity. In our case the benchmark is always the first expiry (Exp1) of each commodity type (please refer to the below table).

Short Code	Comm. Description	Benchmark
EBM	Milling Wheat	EBM Exp1
EMA	Corn	EMA Exp1
ECO	Rapeseed	ECO Exp1
EDW	Durum Wheat	EDW Exp1
FISH	Fishpool	FISH Exp1

The second step is to define the number of holding periods used to determine the extreme variations (please refer to the below table).

Short Code	Comm. Description	Benchmark	Holding Period Max
EBM	Milling Wheat	EBM Exp1	12
EMA	Corn	EMA Exp1	12
ECO	Rapeseed	ECO Exp1	25
EDW	Durum Wheat	EDW Exp1	22
FISH	Fishpool	FISH Exp1	12

Therefore, for each commodity and for delivery positions only, the max between the following events should be taken into account:

1. the largest (both upside and downside) from 1-day up to N days price variations actually occurred over the available time series (Where N depends on the commodity, as reported in the above table) of the benchmark identified for each commodity;
2. 1,20 times the «Hypothetical Margin Interval» ;
3. 4 times the Standard Deviation.

2.5. Bonds traded on Euronext Legacy Markets scenarios

For Bonds instruments the stress scenarios (stress test variation) must be calculated considering the "clean price" for classic bonds products and "currency price" for structured products, therefore without take into account the accrued interest (this component shouldn't be stressed).

To calculate the stress price the following formula have to be applied:

- **Price Increase Double / Half Volatility:**

$$\begin{aligned}&Bond\ Stress\ Price\\&\quad = Clean\ Price * (1 + Stress\ Test\ Variation) + Accrued\ Interest\end{aligned}$$

$$\begin{aligned}&Structured\ Bond\ Stress\ Price\\&\quad = Currency\ Price * (1 + Stress\ Test\ Variation) + Accrued\ Interest\end{aligned}$$

- **Price Decrease Double / Half Volatility | Extra Stress double volatility:**

$$Bond\ Stress\ Price = Clean\ Price * (1 - Stress\ Test\ Variation) + Accrued\ Interest$$

$$Structured\ Bond\ Stress\ Price = Currency\ Price * (1 - Stress\ Test\ Variation) + Accrued\ Interest$$

- **Real life Double / Half Volatility:**

$$Bond\ Stress\ Price = Clean\ Price * (1 \pm Stress\ Test\ Variation) + Accrued\ Interest$$

$$Structured\ Bond\ Stress\ Price = Currency\ Price * (1 \pm Stress\ Test\ Variation) + Accrued\ Interest$$

Where the sign "-" or "+" depends on the price variation of the instrument between T-2 and T-1.

2.6. Settlement Risk

The Available Resources contain the Settlement addon: This addon is computed to manage the risk associated to the event of closing positions in T+1. In practice the ES is also calculated considering the portfolio in T+1, the difference (if positive) between the ES calculated on T+1 portfolio and T portfolio is requested as settlement addon. However, the Total Profit and Loss is computed only using the current portfolio, and the Total Profit and Loss in the case of the portfolio at T+1 is not considered.

This could make the SLOIM computation slightly underestimated. The stress loss is computed under a fixed settlement scenario, while the available margin is estimated under both T and T+1 settlement scenarios.

The SLOIMs formula should also account for the possible changes in positions due to the intermediary settlement of the T+1 positions. The computation is done in a similar way as for the Settlement addon, i.e., for each margin account the maximum between the P&L in T vs the P&L in T+1 is considered in SLOIM calculation.

$$P\&L = \max\,(P\&L_T, P\&L_{T+1})$$

The Settlement Risk is evaluated under all stress scenarios.

2.7. Concentration and Liquidity Risk

Under the stress testing assumption of the default of the two largest Banking Groups, ENXC will have to liquidate the aggregate portfolios, which can have a global concentration/liquidity impact higher than the sum of the individual liquidity and concentration addons. This is due to the super linear behaviour of the liquidity and concentration costs with respect to the positions sizes.

The actual concentration/liquidity cost incurred under the default of the two largest Banking Groups can be underestimated in the current setting. I.e. in case there are aligned positions on a given instrument triggering significant concentration costs, the actual liquidity and concentration cost could be greater than the sum of the collected Liquidity and concentration addons for each Banking Group.

In order to take into account such risks, ENXC computes the global liquidity cost of the largest two Banking Groups, using the aggregated positions, considering the following approach:

1) Based on end of day stress results, the top 2 Banking groups in the worst case scenario, in terms of SLOIM, are selected.
2) A new portfolio composed by positions related to all accounts associated to the top 2 Banking Groups is created.
3) On such portfolio, both concentration and liquidity addon are calculated.
4) A Delta concentration/liquidity addon is calculated as difference between the number calculated at point 3) and the sum of concentration and liquidity addons paid by the entities belonging to the top 2 Banking Groups (so calculated separately). This value could be greater than or equal to zero.
5) The SLOIM of the top 2 Banking Groups in the worst case scenario is increased by such Delta.

$$SLOIM_{DF} = SLOIM_{top\ 2\ BGs} + Max\left[0, \left(CL_{aggregated\ portfolio} - CL_{separated\ portfolios}\right)\right]$$

Where:

- $CL_{aggregated\ portfolio}$= Concentration and Liquidity addon calculated summing up all positions related to the top 2 exposed Banking Groups
- $CL_{separated\ portfolios}$= Concentration and Liquidity addon calculated summing up concentration and liquidity addons paid by Entities belonging to the top 2 Exposed Banking Groups

The Concentration and Liquidity Risk is evaluated under the worst case scenario.

The Total Default Fund to be divided among Clearing Members is therefore calculated using such risk measure increase by concentration and liquidity risk ($SLOIM_{DF}$).

3. Fixed Income Asset Class

For the Bond Section[11], the following scenarios are hypothesized: Yield Increase Scenario, Yield Decrease Scenario, Steepening Scenario, Flattening Scenario and Parallel Increase Scenario[12]. These scenarios are applied only to government bonds, for which modified duration is available[13].

The determination of prices for the scenarios "Historical Yield Decrease", "Historical Yield Increase", "Steepening" or "Flattening" is different. In these cases the shock related to the duration of the security to stress is applied. Whereas the duration of the security does not match perfectly with the maturity of any vertex, a yield variation equal to the value resulting from the linear interpolation of the yield variations relating to the previous and next vertices with respect to the duration of the bond is determined.

Yield Decrease Scenarios

a) Historical Yield Decrease scenario:

- For each vertex of the Eurozone yield curve (from TN to 30Yrs), the largest yield variation is determined, defined as the highest value between the most extreme upside, downside variations registered since January 2nd, 1999 (introduction of the Euro) and calculated taking into consideration a holding period[14] chosen on the basis of the creditworthiness of the issuer appraised according to the *Sovereign Risk Framework;*
- For each vertex of the Italian yield curve (from 3M to 30 Yrs), the largest yield variation is determined, defined as the highest value between the most extreme upside, downside, one-day, two-days, … n-days yield variations registered since January 2nd, 1999 (introduction of the Euro);

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11 Stress Scenarios for Bond Section are used also for Collateral Stress tests (see paragraph 4).

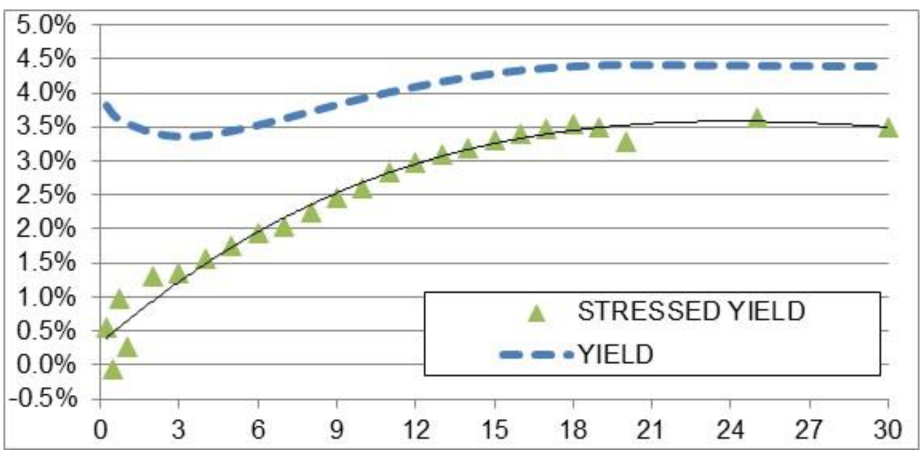
12 The parallel increase scenario (+300 bps on all nodes) was introduced on 17th June 2015 as a worst case in order to simulate the impact of a Grexit scenario but is not used for the calibration of the Default Fund.

13 For Corporate Bonds and Inflation Linked Bonds, since Modified Duration is not available, a 1,2 times the Margin Interval shock is applied.

14 Current Holding period is equal to five days (i.e. 1-day, 2-days, 3-days, 4-days and 5days yield variations are analyzed).

- For each one of the 25 vertices (from 3 M to 30YRS) the maximum value between the largest yield variation of the Eurozone zero coupon bonds curve and the largest yield variation of the Italian zero coupon bonds curve is determined;
- For each government bond a yield variation, equal to the value resulting from the linear interpolation of the largest variation of the previous and next vertices with respect to the duration of the bond, is determined;
- For each government bond the new yield in the downside scenario is equal to the current yield minus the respective largest yield variation, determined as described at the preceding point;
- The bond prices are recalculated on the basis of the above-mentioned downside yield curve scenario;
- For each bond belonging to classes of duration less than 3 months (available just for Eurozone yield curve), the higher price resulting from the yield decrease scenario and the yield obtained by considering an upward price change equal to 1.2 times the margin interval (related to the duration class of the bond) is determined.

Figure 2: Historical Yield Decrease Scenario (example)



For inflation linked bonds and corporate bonds, an upside price variation equal to 1.20 the Margin Interval is hypothesized.

Yield Increase Scenarios

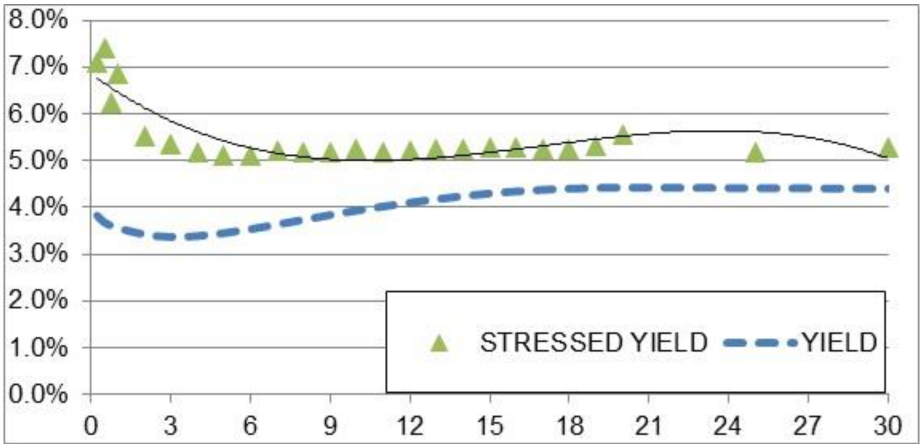
a) Historical Yield Increase Scenario:

- For each vertex of the Eurozone yield curve (from TN to 30Yrs), the largest yield variation is determined, defined as the highest value between the most extreme upside, downside variations registered since January 2nd, 1999 (introduction of the Euro) and calculated taking into consideration a holding period chosen on the basis of the creditworthiness of the issuer appraised according to the *Sovereign Risk Framework;*

- For each vertex of the Italian yield curve (from 3M to 30 Yrs), the largest yield variation is determined, defined as the highest value between the most extreme upside, downside, one-day, two-days, … n-days[15] yield variations registered since January 2nd, 1999 (introduction of the Euro).;
- For each one of the 25 vertices (from 3 M to 30YRS) the maximum value between the largest yield variation of the Eurozone zero coupon bonds curve and the largest yield variation of the Italian zero coupon bonds curve is determined;
- For each government bond a yield variation, equal to the value resulting from the linear interpolation of the largest variation of the previous and next vertices with respect to the duration of the bond, is determined;
- For each government bond the new yield in the upside scenario is equal to the current yield plus the respective largest yield variation as identified according to the previous point;
- The bond prices are recalculated on the basis of the above-mentioned upside yield curve scenario;
- For each bond belonging to classes of duration less than 3 months (available just for Eurozone yield curve), the lower price resulting from the yield increase scenario and the yield obtained by considering a downward price change equal to 1.2 times the margin interval (related to the duration class of the bond) is determined.

Figure 3: Historical Yield Increase Scenario (example)

[15] Depending on the *Sovereign Risk Framework* results.



Steepening and Flattening scenarios

Two other hypothetical scenarios - involving non-parallel shift of the Italian yield curve and Eurozone yield curve - may be applied:

a) **Steepening:** +/- n *basis point* on the vertex "x" and +/- m *basis point* on the vertex "y",

b) **Flattening:** +/- n *basis point* on the vertex "x" and +/- m *basis point* on the vertex "y",

where x and y are two possible vertices of the curve, while *n* and *m* are shocks defined time-to-time. In particular, the vertex x corresponds to a shorter maturity and y to a longer one.

Here below two examples of application of a flattening and of a steepening scenario.

	Steepening	**Flattening**
First Node (x)	3 Y	5 Y
First Node Delta	+100 b.p.	+169 b.p.
Last Node (y)	10 Y	10 Y
Last Node Delta	+19 8 b.p.	+132 b.p.

For the steepening scenario (Figure 4) the basis point increase on the first vertex x is lower (e.g. +100 basis points) compared to the one on the second one (e.g. +198 basis points). Conversely, with regards to the flattening (Figure 5), the increase in terms of basis points is higher on the first expiry and lower on the second. The shift applied to the other vertices of the curve is determined by linear interpolation.

Figure 4: Steepening Scenario (example)

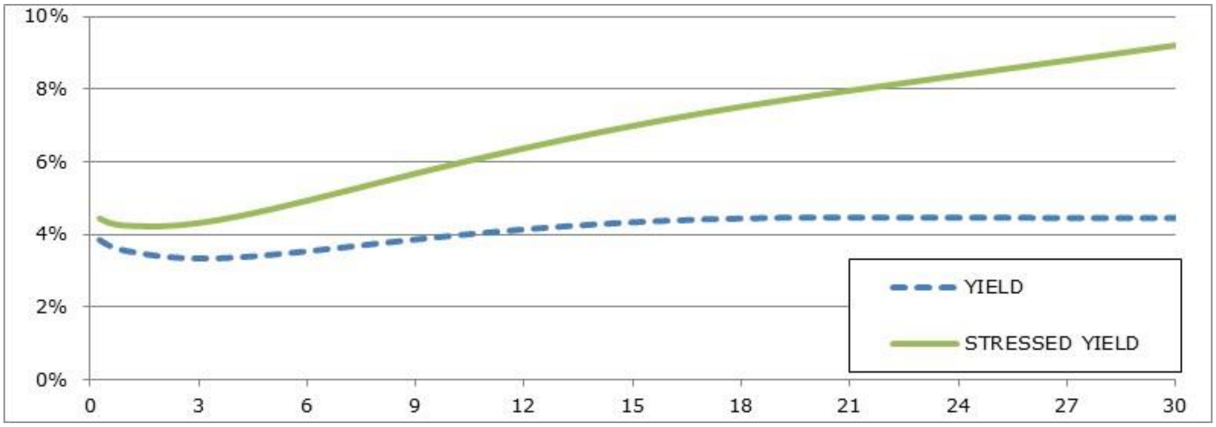
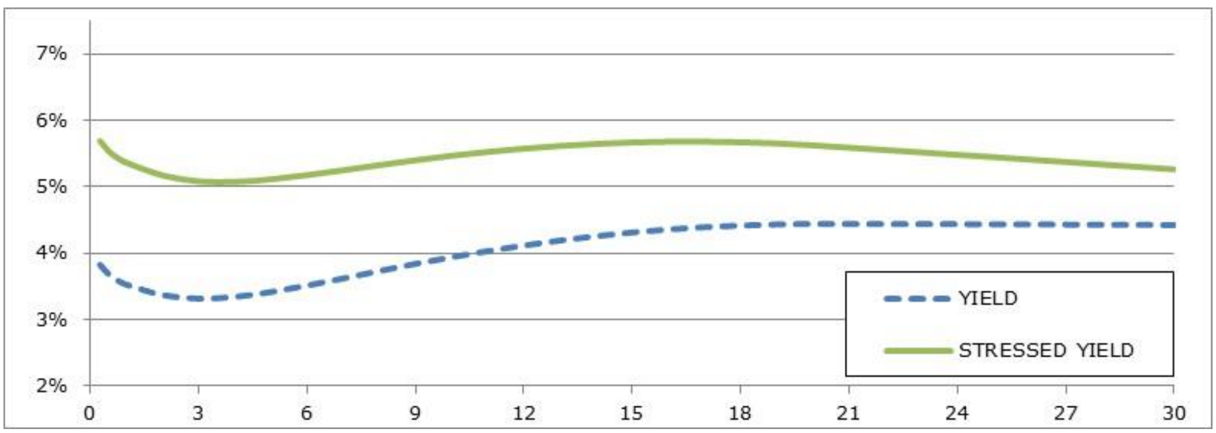


Figure 5: Flattening Scenario (example)



Sample Scenario for Bond Section

Years to Maturity	**1**	**2**	**3**	**5**	**7**	**10**

Yields Decrease	Yield Variation	-3.28%	-2.14%	-2.00%	-1.76%	-1.58%	-1.39%
	Price Variation	3.35%	4.24%	5.95%	8.23%	10.99%	12.95%
Yields Increase	Yield Variation	3.28%	2.14%	2.00%	1.76%	1.58%	1.39%
	Price Variation	-3.19%	-4.02%	-5.56%	-7.70%	-9.81%	-11.29%

4. Stress on Collateral

The Stress Exposure (SE) is calculated under the assumption that Participants have deposited an amount of collateral - in cash or Securities – equals to or greater than the amount calculated by Euronext Clearing as Initial Margins.

The stress applied to the collateral is different according to the section.

Calculation of stressed collateral value for sections other than fixed income

The amount of collateral deposited by each Clearing Member is stressed according to one of the "Yield Increase" scenarios applied to Bonds.

The value of the stressed collateral is split on each section using the margins as allocation criterion. Hence:

$$\text{Collateral}_{\text{section } \alpha} = \text{Total Collateral}_{\text{stressed}} * \text{Margin}_{\alpha} / \text{Total Margins}_{\text{CM}}$$

Where:

- α is one of the n sections to which the Clearing Member participates;
- Total Collateral$_{\text{stressed}}$ is the value of the collateral, revalued according to the upside scenario on yield curve;
- Total Margins$_{\text{CM}}$ is the total amount of margins calculated for the Clearing Member.

Calculation of Stressed Collateral for the Bond Section

The stressed value of the collateral used for the Bond Section is determined according to the same scenarios applied to Bond Section itself.

The total value of the collateral for Bond Section is calculated consistently with the stress scenario elaborated on the sector itself (e.g. Yield increase, Yield decrease, steepening, flattening).

After scenarios have been applied, the collateral allocated to the Bond Section is determined as follows:

$$\text{Collateral}_{\text{bond Section}} = \text{Total collateral}_{\text{stress scenario i}} * \text{Margins}_{\text{Bond Section}} / \text{Total Margins}_{\text{CM}}$$

Where:

- Total collateral$_{\text{stress scenario i}}$ is the value of the collateral after stress used by applying a scenario coherent with the one applied for the Bond Section;
- Margins$_{\text{Bond Section}}$ is the total amount of Margins for a Clearing Member in the bond section;

- Total $Margins_{CM}$ is the total of margins calculated for the Clearing Member.

Calculation of the cash collateral for each section

As for collateral in form of securities, also collateral in cash is allotted among the different Sections according to the same criterion:

$Cash_{section\ \alpha}$ = Total cash * $Margins_{section\ \alpha}$ / Total $Margins_{CM}$

Calculation of the cash collateral

As for collateral in form of securities, also collateral in cash is allotted among the different Sections according to the same criterion:

$Cash_{section\ \alpha}$ = Total cash * $Margins_{section\ \alpha}$ / Total $Margins_{CM}$

5. Reporting

The following charts are examples of the outcome of the analysis performed submitted to the different stakeholders (e.g. Risk Committee, Internal Risk Committee, Board of Directors…).

Historical trend

Figure 1 –BITA Fixed Income: Historical trend (worst case scenario)

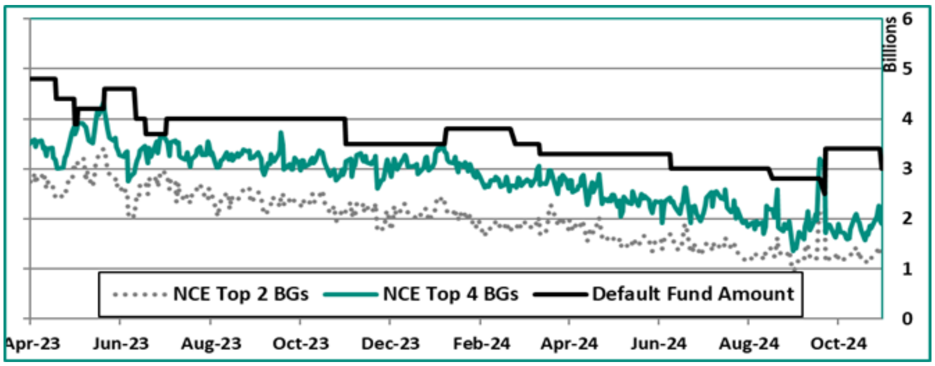


Figure 2 – BITA & LEGACY Equity, Eq. Derivatives and Commodities Derivatives: Historical trend (worst case scenario)