# FIXED INCOME RISK ENGINE

## *Idiosyncratic-concentration risk add-on*

*Methodological notes*

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# 1 Outline

The present add-on framework aims at tackling the idiosyncratic (plus potentially illiquidity) risk of specific ISINs not captured by relevant benchmark sovereign curves (due to the particular bond type or to particular off-the-run/coupon characteristics w.r.t. bonds employed in the construction of the sovereign curve, in turn employed in the core Margin calculation).

Potential concentrated (w.r.t. total outstanding amount) net positions in specific ISINs (which can thus be considered as more difficult and/or costly to clear in case of default) are also penalized via a parametric stress (in particular, multiple, longer *holding periods*). Currently this concentration parametric stress doesn't apply to interoperable CCP nor to those Participants which are considered of strategic importance in sustaining the Italian public debt by mean of their "institutional" activity.

# 2 Scope

- Inflation-linked sovereign bonds (hereinafter *linkers*);
- Floating rate sovereign bonds (hereinafter *floaters*);
- Only in case of concentrated position, other sovereign bonds (*i.e.* bullet bonds and zero-coupon bonds. As a consequence, no *bullets/zeros* are within the current scope of the add-on framework applied to the interoperable CCP)

issued by Italy, Spain, Ireland and Portugal.

# 3 Input data

- Given the portfolio of positions of a Clearing Member, the net long/short position in all ISINs issued by Italy, Spain, Ireland and Portugal underlying *cash* and *repo* trades (*forward starting repos* are excluded) is computed, both in terms of principal and current market (nominal, *i.e.* multiplied by the inflation coefficient in case of *linkers*) value
- ISINs' info (bond type; relevant dates such as interest commencement date, issue date, maturity date; coupon frequency; coupons – minimum real/quoted nominal margin/fixed nominal…)
- ISINs' historical (clean, nominal/real) price time series
- Benchmark sovereign nominal/real zero curves (panel data)
- Other curves such as EURIBOR curve, inflation zero curves (panel data)
- CPIs, 6M EURIBOR time series
- ISINs' current total outstanding amount

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## 4 Parameter set

- Relative concentration threshold(s)
- Holding period(s) →

| SAMPLE COUNTRY HP PARAMETER MATRIX | | |
|---|---|---|
| **BOND TYPE** | **CONCENTRATION BAND** | **HP** |
| FLOATER | -5% | 5 |
| FLOATER | 5%-10% | 5,6 |
| FLOATER | 10%-15% | 5,6,7 |
| FLOATER | … | … |
| LINKER | -5% | 5 |
| LINKER | 5%-10% | 5, 6 |
| LINKER | 10%-15% | 5, 6, 7 |
| LINKER | … | … |
| OTHER | -5% | - |
| OTHER | 5%-10% | - |
| OTHER | 10%-15% | 5, 6, 7 |
| OTHER | … | … |

- Lookback period(s)
- Confidence level(s)
- Risk measure(s) (*i.e.* VaR/ES) →

| LOOKBACK PERIOD (days) | CONFIDENCE LEVEL | RISK MEASURE | SPECTRAL RISK MEASURE (Y/N) |
|---|---|---|---|
| 250 | 99.7% | ES | N |

- Variation delta add-on percentage multiplier(s) →

| SAMPLE COUNTRY MULTIPLIER MATRIX | |
|---|---|
| **BOND TYPE** | **MULTIPLIER** |
| FLOATER | 25% |
| LINKER | 25% |
| OTHER | 25% |

## 5 Calculations

A series of *LP* observed *HP*-day relative price returns $(\frac{p_t}{p_{t-HP}} - 1)$ is computed. In case of *linkers* these returns are computed once first multiplied the real clean prices by the relevant inflation coefficients, computed as illustrated in *MtM Margin* module.

These observed returns are matched against correspondent *LP* simulated *HP*-day relative price returns, obtained employing the ISIN's benchmark curve (the curve on which the ISIN is mapped for core Margin calculation purposes). In particular, for every observation date *t* one computes the coupon plan and yield to maturity of the bond in *t-HP*, as illustrated in *Mapping* module. The market value of the cash flows is then mapped on the benchmark curve, linearly interpolating contiguous tenors in case of times-to-payment comprised between two of them (a cash flow is entirely mapped on the first/last available tenor in case its time-to-payment is lower/higher than it). Then, *HP*-day relative zero price scenarios $(\frac{p_t}{p_{t-HP}})$ for the relevant (interpolated) tenors are computed. These relative zero price scenarios are applied to the market value of the cash flows, this way obtaining a revalued bond price in *t*. This revalued bond price is finally employed to compute the simulated return $(\frac{p_t}{p_{t-HP}} - 1)$.

A series of *LP* absolute variation deltas among corresponding observed and simulated returns is obtained by simply taking the absolute values of the differences between the two.

The risk measure of the series of absolute variation deltas is then computed. This is the 'unadjusted' variation delta add-on percentage (*VunadjHP)*.

In case of multiple HPs, the most conservative result is applied (*Vunadj*).

For ISINs without sufficient history (w.r.t. *LP*), their own absolute variation deltas are employed to the extent possible. The gaps are filled with absolute variation deltas of other ISINs according to the same bond type, closest maturity criteria.

As ISINs may have not witnessed any period of stress (*e.g.* 2010-2012 European PIGS sovereign debt crisis, 05-06/2018 Italian sovereign debt stress due to political uncertainty) a multiplier is applied to the 'unadjusted' variation delta add-on percentages. This multiplier is potentially calibrated taking into account the behavior of a particular bond type during periods of stress. This way 'adjusted' variation delta add-on percentages are obtained ($Vadj = Vunadj * (1 + m)$).

Each ISIN's 'adjusted' variation delta add-on percentage is then applied to the (absolute value of the) current market (nominal) value of the net long/short position in the ISIN. These quantities are summed in order to get the value of the add-on at Clearing Member's portfolio level ($Addon_{CM} = \sum_{ISIN} Addon_{ISIN} = \sum_{ISIN} |Netposition|_{ISIN} * Vadj_{ISIN}$).