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| First Principles Add-on for Inflation |

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# Purpose

IM measures are based on closing out portfolios within a market’s trading capacity. However should a position be very large and beyond the normal market capacity additional measures are required to deal with this liquidity risk. First Principle Liquidity Multipliers are additional margin that is called due to concentrated currency exposure. It mitigates the risk that a position may not be able to be closed in 5 days and/or extra hedging costs may be incurred. Where a member has an exposure above set thresholds in a particular currency and maturity, an add-on is computed to reflect the expected cost of mitigating the oversize position. multiplier is applied to the balance and an additional call is made. These thresholds are reviewed on a regular and take into account prevailing perceptions of market conditions from the SwapClear dealer community.

## Inflation Buckets

For the purposes to inflation liquidity add-ons, risk is measured to a set of buckets agreed with the Design Authority as being the key points at which risk would be mitigated in event of a default. The set of points are set as 2y, 5y, 10y, 20y, 30y (and 50y in GBP only). Unlike the IRS case, no offset between buckets is proposed, so large spread positions will receive no benefit.

# Market Survey

A market survey was performed to establish the size of the market, and the impact on the market of trades larger than this. Survey respondents were Goldman Sachs, Deutsche Bank, Société Générale, Morgan Stanley, BNP-Paribas and Royal Bank of Scotland. Data was averaged from all members and this is reported below. The aggregated data was presented back to the Design Authority and also to members in bilateral meetings to ensure its validity.

## Market Size

Members were asked how much inflation risk (IE01) could be done in a two day period without moving the bid offer spread. Members were asked to supply values for both normal market conditions and in a stressed scenario (where 2008 was suggested as a representative event). The figures are in ‘000s of currency unit. The green columns are for normal markets and the red for distressed.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | EUR | | FRF | | USD | | GBP | |
| 2y | 131.25 | 95.00 | 81.25 | 65.00 | 137.50 | 77.50 | 143.75 | 65.00 |
| 5y | 225.00 | 134.00 | 150.00 | 90.00 | 250.00 | 166.00 | 193.75 | 110.00 |
| 10y | 337.50 | 195.00 | 225.00 | 110.00 | 362.50 | 236.00 | 268.75 | 180.00 |
| 20y | 337.50 | 192.00 | 162.50 | 105.00 | 343.75 | 245.00 | 356.25 | 265.00 |
| 30y | 312.50 | 170.00 | 81.25 | 57.00 | 293.75 | 225.00 | 375.00 | 285.00 |
| 50y | - | - | - | - | - | - | 275.00 | 230.00 |

First principles addons will be based on the distressed figures.

## Cost for Larger Positions

Members were asked how much the market would be moved by trading a position in inflation risk (IE01) that was twice, five times and ten times the position sizes in the table above. Figures are in basis points on the Par rate. Colour is defined as above.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUR | 2X | 5X | 10X |  | EUR | 2X | 5X | 10X |
| 2y | 3.50 | 8.60 | 15.00 |  | 2y | 4.08 | 10.75 | 21.50 |
| 5y | 3.10 | 6.60 | 13.00 |  | 5y | 3.67 | 8.33 | 16.83 |
| 10y | 2.30 | 5.00 | 10.20 |  | 10y | 3.08 | 6.75 | 14.00 |
| 20y | 2.50 | 5.60 | 11.40 |  | 20y | 3.33 | 7.50 | 15.50 |
| 30y | 2.30 | 5.40 | 10.40 |  | 30y | 3.33 | 7.50 | 15.50 |
| 50y |  |  |  |  | 50y |  |  |  |
|  |  |  |  |  |  |  |  |  |
| FRF | 2X | 5X | 10X |  | FRF | 2X | 5X | 10X |
| 2y | 3.80 | 8.50 | 15.40 |  | 2y | 4.75 | 12.00 | 23.83 |
| 5y | 3.40 | 7.40 | 13.40 |  | 5y | 4.33 | 10.00 | 19.17 |
| 10y | 2.80 | 5.80 | 10.60 |  | 10y | 3.75 | 8.42 | 16.33 |
| 20y | 3.00 | 6.40 | 11.80 |  | 20y | 4.00 | 9.17 | 18.67 |
| 30y | 3.00 | 6.40 | 10.80 |  | 30y | 4.00 | 9.17 | 20.33 |
| 50y |  |  |  |  | 50y |  |  |  |
|  |  |  |  |  |  |  |  |  |
| USD | 2X | 5X | 10X |  | USD | 2X | 5X | 10X |
| 2y | 3.50 | 7.25 | 12.75 |  | 2y | 3.80 | 9.80 | 21.20 |
| 5y | 2.50 | 6.13 | 10.50 |  | 5y | 3.40 | 8.00 | 14.60 |
| 10y | 2.50 | 6.13 | 10.00 |  | 10y | 3.20 | 7.60 | 13.40 |
| 20y | 2.50 | 6.13 | 10.00 |  | 20y | 3.20 | 7.60 | 13.40 |
| 30y | 2.50 | 6.13 | 10.00 |  | 30y | 3.20 | 7.60 | 13.40 |
| 50y |  |  |  |  | 50y |  |  |  |
|  |  |  |  |  |  |  |  |  |
| GBP | 2X | 5X | 10X |  | GBP | 2X | 5X | 10X |
| 2y | 4.80 | 12.10 | 20.50 |  | 2y | 5.25 | 13.33 | 24.17 |
| 5y | 3.50 | 9.00 | 14.80 |  | 5y | 4.08 | 10.25 | 19.67 |
| 10y | 2.80 | 7.30 | 12.05 |  | 10y | 3.42 | 8.58 | 17.50 |
| 20y | 2.30 | 6.50 | 10.45 |  | 20y | 3.00 | 7.83 | 16.00 |
| 30y | 2.10 | 5.90 | 9.25 |  | 30y | 2.75 | 7.08 | 14.50 |
| 50y | 2.10 | 5.38 | 10.06 |  | 50y | 3.00 | 6.60 | 15.60 |

First principles addons will be based on the distressed figures.

# Extrapolation

As the market survey only covers as far out as 10 times market size, it is necessary to define how larger positions would impact the market and this requires an extrapolation scheme. 3 approaches were considered. here is used to mean the additional spread for a position of x times market size.

## Flat Extrapolation

The simplest scheme is to use flat extrapolation where the assumed basis point cost (bpc) for trades larger than 10 times market size is set to the same level as the bpc for 10 times.

When this is multiplied by the bucket deltas, the addon is seen to be a linear function beyond 10 times. This is currently implemented in the existing rate products within SwapClear.

As the market is less liquid than the IRS market, it was deemed not to be conservative enough to cover oversize positions.

## Linear Extrapolation

A simple alternative is to extrapolate the bpc from 5 and 10 times in a linear fashion

When this is multiplied by the bucket deltas, the addon is seen to be a parabolic function beyond 10 times.

## Parametric Function Approach

A number of parametric functions were considered that would allow more control on extrapolation and how fast the addons should grow. One particular set of functions were selected it contains both the above alternatives a specific limiting cases, which would allow existing behaviour to be replicated if desired.

The specific functional form is

This function is linear in the case n = 1 and flat when n = 0. For values of n>1, the bpc will rise faster than linear.

For any given n (>= 1), which is an exogenous parameter selected to reflect risk views, the function can be calibrated to two limiting conditions to find the values of a and b, where the conditions for the function are bpc is both continuous and first order smooth at the knot point:

Condition 1: Continuous: The value of the function for a 10 times position should match that given from the survey.

Condition 2 : Smooth : The slope of the function at the 10 times position should match the linear slope between the survey points for 5 and 10 times.

This system of equations can solved to give the following results:

In the case of n = 0, the above functions do not hold, but simply collapse to

Using the 2Y EUR survey data

|  |  |  |  |
| --- | --- | --- | --- |
| EUR | 2X | 5X | 10X |
| 2y | 4.08 | 10.75 | 21.50 |

The following extrapolation curves are constructed for various given values of n, where the chart shows the basis point cost for different position sizes ranging from 10 to 30 times market size.

This is the proposed functional form to perform the extrapolation for inflation products in production.