LCH The Markets' Partner

LCH Risk Monitoring of Basis Risk

15 February 2017

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1 Introduction

The Clearing House provides robust and prudent risk management in order to meet its overriding objectives: to provide clearing members with a central counterparty of the highest quality and to safeguard the interests of the company's shareholders and contributors to its default fund. LCH's Risk Management department is responsible for measuring and monitoring members risk positions and the change in market risk factors as applied to member's portfolios.

The purpose of this document is to describe the SwapClear risk monitoring and procedure for the basis risk IM add-on approach.

2 Context

The CPSS-IOSCO Recommendations for Central Counterparties state:

"*A CCP should measure its credit exposures to its participants at least once a day. Through margin requirements, other risk control mechanisms or a combination of both, a CCP should limit its potential losses from defaults by its participants in normal market conditions so that the operations of the CCP would not be disrupted and non-defaulting participants would not be exposed to losses that they cannot anticipate or control*."

As a central counterparty, LCH guarantees the performance on all net open positions towards its Clearing Members. In the event that one of its Clearing Members defaults on its obligations, LCH will be faced with the market risk on the guaranteed positions. As such, LCH collects margin from members as protection against market risk in the event of a default.

The setting of margin rates should be viewed in the context of LCH's other margining and default policies:

- when margin rates are tested by market price moves, LCH makes intraday calls to refresh its margin cover;
- the Default Fund is in place to allow for circumstances in which there may be insufficient initial margin to cover close-out losses; and
- LCH has in place separate policies which govern its management of settlement risk and default management.

3 Tenor Curve Risk

PAIRS (Portfolio Approach to Interest Rate Scenarios) forecasts a maximum loss by simulating portfolio performance over a set of 2,500 observed market yield curve scenario shifts. Each scenario captures the yield curve shift over a five day holding period. The IM algorithm takes each scenario in turn and applies the scenario to the current EOD yield curve to create a 'shifted curve'. By re-valuing the portfolio from the shifted curve and comparing to the base (un-shifted) valuation a series of P&L values can be calculated for each scenario. The scenario value that causes the largest loss for the entire portfolio is the IM value, and the corresponding scenario the IM scenario.

SwapClear accepts trades with varying fixing periodicity e.g. 1M LIBOR, 3M LIBOR, 6M LIBOR etc. To calculate VM SwapClear maintains multiple forward curves for each currency i.e. tenor curves. This means if a trade has a 1M fixing periodicity it will be valued off the correct 1M curve. There is also a standard curve used for valuing trades that do not fall into the current tenor curve selection.

Unlike the VM model, the SwapClear IM model has a single curve methodology for calculation of Swap and FRA risks where there is one standard curve for each currency and index cleared. For example, the EURIBOR standard curve is equivalent to a 6M curve as the longer end is built using 6M EURIBOR swaps as these are standard in the EUR EURIBOR market. The standard curve is used for both risk calculation and five day return calculation. This means that for IM purposes, all EURIBOR trades regardless of fixing periodicity are valued against the standard curve and stress tested against the same set of returns from the standard curve.
This is not the case for the cross margining and inclusion of the STIR Futures into the SwapClear IM framework. New STIR Future risk factor is built with its historical series and they are priced against separate STIR future curve. That would capture the basis risk between the STD Swap curves and STIR Futures. Additionally the STIR Future risk is included into all calculation explained in the basis risk IM approach later.

Additionally to the STIR Futures as part of the cross margining SwapClear incorporated into IM framework Deliverable Swap Futures (DSF). As their pricing for the IM purposes is derived from the Swap Libor Curves which provides negligible difference versus the Mark to Market price used in Variation Margin pricing.

3.1 Netted Basis Risk

Basis risk arises from netting positions across different curves to calculate IM. To demonstrate this consider the below portfolio with EUR 1M and EUR 3M risk. Taking a PV01 predict approach for simplicity, the IM calculation is based on the total EUR PV01 i.e. net across the 1M and 3M tenors.

	EUR 1M	EUR 3M	Total	WCL Scenario	Scenario P&L
2Y	-16	16	0	2.43	0
5Y	-140	130	-10	14.04	-140.4
10Y	-9220	9110	-110	16.45	-1809.5
Total	**-9376**	**9256**	**-120**		**-1949.9**

The above example depicts a 1m v 3m basis swap. The IM charged only reflects the different payment schedules when priced against the same standard curve. As the risk is offsetting and the spread between 1M and 3M trades is not accounted for margin levels are very low. Basis positions potentially have material risk, particularly during periods of market stress where the spread between tenors can widen significantly and have an increase in price volatility, as seen post 2007 during and after the Lehman Brothers crisis. If basis spreads widen (or narrow) basis positions such as these could have a negative P&L impact.

3.2 Reference Curve Risk

Reference curve risk arises from using one standard curve to calculate the risk and returns for trades in a particular currency and index regardless of fixing periodicity i.e. tenor. This creates a pricing mismatch in the IM calculation from pricing cash flows based on the standard curve rather than the relevant tenor curve e.g. in the case of EUR 3M cash flows, pricing based on 6M rather than 3M curve. This could potentially causes losses from the different behaviour of the two curves.

4 Discounting Curve Risk

Before the 2008 Lehman crisis it was market convention to use the idea of modelling discount factors and forward rates from the same LIBOR indexed curve, assuming all cash flows within the swap accrue at this LIBOR indexed interest rate. However, this assumption doesn't take into account the reality of how IRS are collateralised. Swaps that are collateralised at a particular rate should be discounted using the same rate. LCH requires member to collateralise the NPV of trades registered at LCH in cash, and the rates on this cash is the OIS rate. Due to LCH's collateralisation obligations LCH discounts at the OIS rate (in the currencies where liquidity exists) when calculating VM.

However, LCH maintains a single curve methodology in its IM model where there is one standard curve for calculating both the forward rates and the discount factors for valuation. This means that all cashflows in the IM model are discounted at LIBOR for LIBOR indexed trades, and not at the OIS rate. There is therefore a LIBOR-OIS spread that is not taken into account in the IM model.

5 Approach

To address these areas there are three key calculations calculated by the Risk team.

5.1 OIS IM approach

This incorporates the OIS discounting risk as a new exposure to OIS curves and it extends the OIS risk factors from 30Y out to 50Y. The calculation is based on the same OIS discounting risk used in the VM calculation. The difference between the new IM figure including the OIS discounting risk, and the current production IM figure is the “add-on IM”.

5.2 Tenor curve IM approach

This incorporates the full set of basis curves as additional risk factors according to the same curves used in the VM calculation. The difference between the new IM figure including tenor curves and the IM figure produced by OIS IM approach including the OIS discounting risk is the “add-on IM”.

The result of the Tenor curve IM approach can be relatively small, and would possibly understate hitherto unrealised larger basis moves. Therefore, the clearing house also uses a second calculation designed to cover larger stress exposure from particular portfolios.

5.3 Standalone stress approach

Applies observed historical changes in basis spreads to portfolios’ basis risk position to calculate future potential losses due to widening or narrowing of the basis.

6 Process

6.1 Basis Risk Calculation

The total basis risk calculation considers the risk measures obtained by the tenor curve IM approach, the standalone stress risk and the OIS curve IM approach.

For a given portfolio we consider the following measures:

A – Firstly sum the liabilities from OIS IM Approach plus the Tenor Curve IM Approach. A is confined to be negative or zero

B - Calculate the difference between the Stress Approach and min (IM Tenor Curve Approach,0).

Then, only if the result from B is greater (liability increasing) than £3mm this is added to A.

This final result is then compared against a £3mm call tolerance.

6.2 Margin Calls

The additional margin requirement is calculated as a risk add-on to ensure that the basis margin requirement is covered. There is currently a £3m calling tolerance for issuing calls.

Liabilities under both the IM and stress approach are calculated on a weekly basis on Friday. A snapshot of COB Thursday positions is downloaded to re-compute liabilities. Liabilities are called in the following Tuesday morning PPS calls.

The weekly basis risk liability can be found in Member Report 86 for members and 86c for clients. Below is a sample of Report 86. Basis risk liability can be found under the heading BRMargin.

CobDate	TradeMarginRun	MbrMnemonic	Account	ReportingCCY	ConversionExchangeRate	InitialMargin	LiquidityMargin	AdditionalMargin	ToalImRequirement	BRMargin
dd/mm/yyyy	10000	ABC	H	GBP	1	150,000,000	0	0	150,000,000	3,000,000