RepoClear

A Central Counterparty for Repo

LCH: Corporate Overview

The LCH Group

LCH is a leading multi-asset class clearing house, serving a broad number of major exchanges and platforms as well as a range of OTC markets. LCH's commitment to the horizontal model supports clearing across multiple markets, exchanges, venues and geographies.

Corporate and Regulatory Structure

Holding Company	LCH Group Limited (Incorporated in UK/regulated by Autorité de contrôle prudentiel et de résolution (ACPR), France)		
Operating Entities	LCH Ltd Location: London Incorporated in UK	LCH SA Location: Paris Incorporated in France	LCH LLC Location: New York Organized in Delaware
Primary Regulator	Bank of England	L'Authorité des marchés financiers (AMF), L'Autorité de contrôle prudentiel et de résolution (ACPR), and Banque de France.	Commodity Futures Trading Commission (CFTC), USA.

RepoClear Service

RepoClear is a market leading service clearing cash bond and repo trades across a number of European markets. Operating since 1999, it provides an essential, centralized clearing and netting facility for its members.

The RepoClear Service

RepoClear Services & Products

RepoClear	
LCH Ltd	LCH SA
Cash Bonds and Repos on UK Government Bond Market Cleared in addition to General Collateral product in Term £GC In addition: • Sponsored Clearing client model in place	12 European government bond markets cleared • Interoperable link for Italian government bond market segment between LCH SA and CC&G
	€GCPlus • General Collateral clearing service of Euro cash liquidity supported by two standardised baskets based on ECB eligible securities

Key features:

- Anonymous trading via electronic platforms or bilaterally via voice broker or inter-office
- Clearing of eligible cash bond and repo transactions
- Multi-lateral netting of all settlement obligations

Balance Sheet Netting

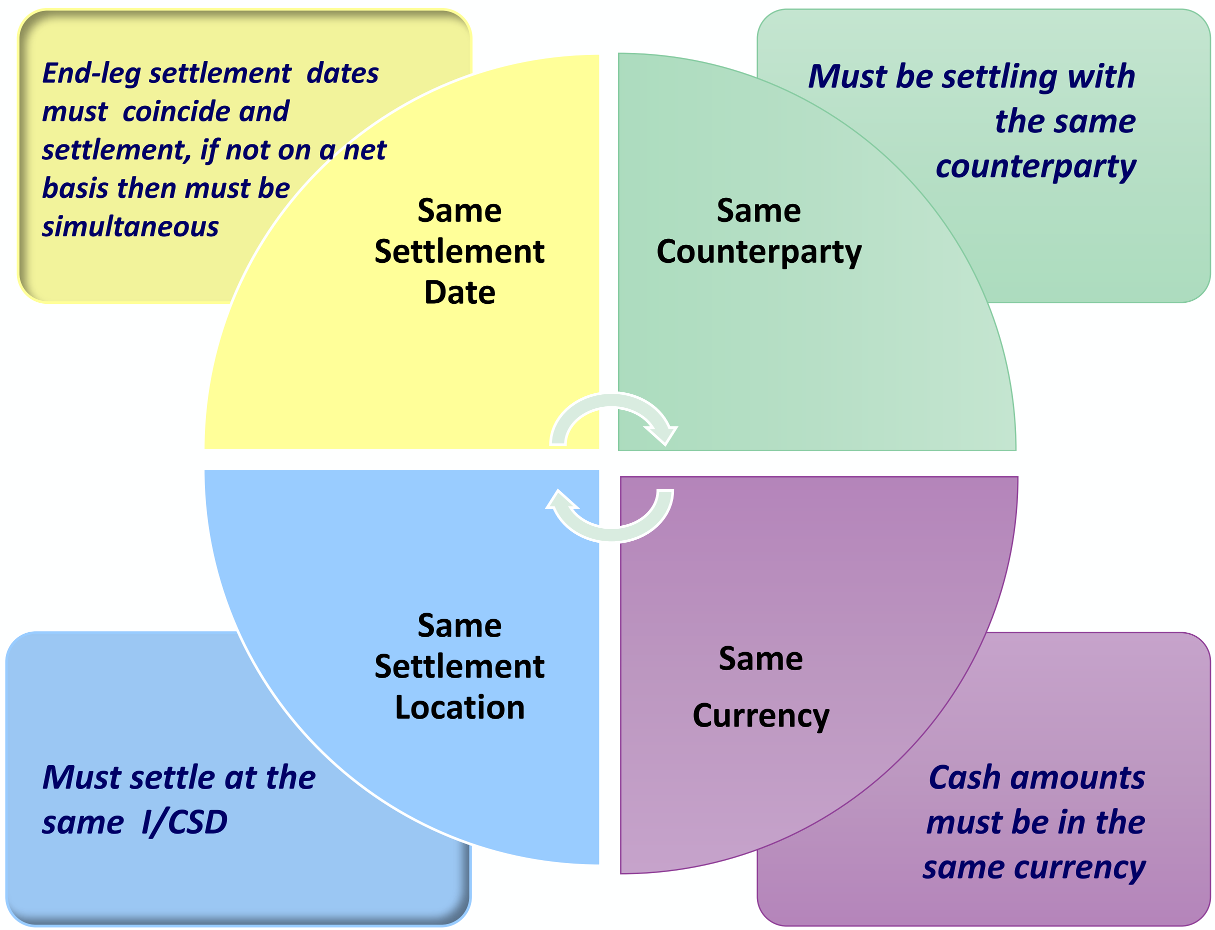
Repos are 'on balance sheet' transactions.

Many major repo market participants have found that their usage of repos is constrained as a result, as each bilateral repo trade requires allocation of balance sheet. The use of LCH as a central counterparty maximises the possibility for banks to net for balance sheet, thereby facilitating longer term repo trading in particular.

Market participants are recommended to consult their own professional advisers regarding the applicability of balance sheet netting rules to their individual organisations

Balance Sheet Netting: The Cornerstones

Key pillars supporting balance sheet netting are:



Risk Management

Setting the standards for Risk Management

- LCH's robust risk management framework provides its clearing members with exceptional levels of protection. Both the soundness of its risk management approach and the resilience of its systems have been proven in recent times.
- As demand for robust clearing services continues to grow, LCH is committed to setting and maintaining the highest standards across all asset classes cleared.
- The driving force behind our risk management activities is a dedicated team of risk managers, who share a wealth of experience and a convincing record of successfully managed defaults – including Lehman Brothers in September 2008 and MF Global in 2011.

LCH has successfully managed many defaults:

- Drexel Burnham Lambert - 1990
- Woodhouse Drake and Carey (Commodities) Limited – 1991
- Baring Brothers & Co Limited – 1995
- Griffin Trading Company – 1998
- Lehman Brothers International (Europe) - 2008
- Lehman Brothers Special Financing Inc - 2008
- MF Global UK Ltd – 2011
- Cyprus Popular Bank Co Ltd – 2013
- Maple Bank - 2016

Margining and Risk Management

- Standard initial margin (IM) is designed to ensure that LCH has sufficient funds to cover potential losses in the event of the default of one of its Clearing Members in normal market conditions

- IM protects LCH against potential losses that may occur between the time that variation margin (VM) is last paid and when LCH expects to hedge/liquidate a defaulted portfolio

- Risks not covered in the VaR model are subject to additional margins

The Core of IM: VaR

- Initial Margin is based on an Expected Shortfall VaR calculation
- Its basic outline is
  - A 10 year (2500 days) look-back period - Intended to cover at least one economic cycle for historical events
  - Set a 99.7% confidence level to ensure enough margin is held to cover the potential loss of any member’s portfolio under normal market conditions, over a 5 day holding period.
  - The historical returns are calculated on a 5-day overlapping holding basis, each return is then scaled by a volatility based function in order to align them with current market conditions.
  - The scaling is floored at percentiles of long term volatility and short term volatility
  - It includes the risk towards the underlying bonds and the risk towards the repo and discount rate for ongoing and forward trades

Repo VaR Model Parameters

Parameters	
Holding Period	5 days
Look-Back Period	2500 days
Confidence Level (aim)	99.7%
Risk Measure for IM	Expected Shortfall
Scenario Generation	One tailed
Volatility Scaling	EWMA
Key Risk Factors	•Zero Coupon Sovereign curves •OIS Zero Curves •Repo Zero Curves •FX Rates

Initial Margin vs. Haircuts

- Collateral haircuts are commonly used in B2B transactions as a form of margin:

  Bank A wishes to borrow €100mn cash but is required by its counterparty, Bank B, to deliver €105.26mn value of bond X as collateral.

  This provides Bank B with a 5 % haircut to cover the change in value of bond X post the default of Bank A

- RepoClear Initial margin provides protection against price movements in Bond X in much the same way as a haircut but is administered differently.

  Bank A trades with Bank B (probably anonymously via an ATS) to lend €100mn cash against €100mn value of bond X

  Bank A delivers €100mn value of Bond X to LCH on a DVP basis.

  LCH determine that a 5% initial margin is required for the trade today. This margin of €5mn is covered independently to the DVP settlement of the trade itself.

  - The level of initial margin can – and does – change throughout the term of a trade.

Additional Margin

- Reasons for additional margin:
  - High stress testing losses (High portfolio sensitivities)
  - Concentration/liquidity risk
  - Idiosyncratic risk
  - Sovereign credit risk (including wrong way risk)
  - Credit Risk
  - Settlement Liquidity concentrations
  - Any other if needed

Default Management Process

RepoClear Default Management Group (RDMG) to advise throughout default management process

Phase 1: Identify defaulting Clearing Member's portfolio & resources → **Phase 2:** Prepare for auction → **Phase 3:** Auction process → **Phase 4:** Loss attribution

The default management process follows the steps above:

1. The defaulting Clearing Member's RepoClear portfolio and its composition will be determined.
2. The RepoClear DMG will convene and advise on the best way to neutralise risk and how the portfolio should be split into a set of auction portfolios. The DMG to advise on an initial subset of RepoClear Clearing Members to participate in the portfolio auction.
3. The auction process will be carried out, in which the selected RepoClear Clearing Members will have the opportunity to bid for the auction portfolio(s). Invited Clearing Members will not be obligated to bid.
4. If, once the auction process has completed, the total losses to RepoClear are greater than the financial resources of the defaulter and the relevant proportion of LCH capital, the remaining losses will be allocated, pro-rata, to all of the non-defaulting RepoClear Clearing Members in proportion to their Default Fund contribution

Default Waterfalls

ForexClear Member Default	Rates Derivatives Member Default	CommodityClear Member Default	EquityClear Member Default	RepoClear Member Default
Defaulter's Initial Margin, Delivery Margin, Contingent Variation Margin and Additional Margins[1]				
Defaulter's Default Fund Contribution				
LCH LTD Capital €12.5mn[2]	LCH LTD Capital €49.5mn[2]	LCH LTD Capital €0.2mn[2]	LCH LTD Capital €1.8mn[2]	LCH LTD Capital €10.0mn[2]
ForexClear Default Fund[2] $1,550mn	Rates Derivatives Default Fund[2] £4,907mn	CommodityClear Default Fund[2] $23mn	EquityClear Default Fund[2] £174mn	RepoClear Default Fund[2] €1,170mn
Unfunded Contributions – Assessment[3]	Unfunded Contributions – Assessment[3]	Unfunded Contributions – Assessment[3]	Unfunded Contributions – Assessment[3]	Unfunded Contributions – Assessment[3]
Service Continuity – VM Haircutting[4]	Service Continuity – VM Haircutting[4]	Service Continuity – Loss Distribution[4]	Service Continuity – Loss Distribution[4]	Service Continuity – Loss Distribution[4]
Voluntary Service Continuity	Voluntary Service Continuity	Voluntary Service Continuity	Voluntary Service Continuity	Voluntary Service Continuity
ForexClear Service Closure	Rates Derivatives Service Closure	CommodityClear Service Closure	EquityClear Service Closure	RepoClear Service Closure

1. LCH LTD held margin collateral with a market value of €154bn on 31[st] March 2017.
2. The size of each prefunded Default Fund and an indicative allocation of dedicated capital are as at 31[st] March 2017.
3. Assessments are callable up to the value of each member's Default Fund contribution at the time of the default.
4. Further resources are available in the service continuity phase as determined by the LCH LTD Rulebook.

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