Market Insight

OTC Derivatives under Central Clearing: Risk Measures for Liquidity Constraints

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Abstract:

The market for Over-the-Counter derivatives is transforming from a market of mostly bilateral contracts to a market where many contracts are executed through a central counterparty (CCP). As part of this transformation, derivatives market participants now face constraints imposed by the CCPs, notably the need to post and update variation and risk-based margin. Derivatives risk management in this new paradigm requires an assessment of the liquidity required to meet these margin constraints, and a metric—Liquidity Valuation Adjustment—for the cost of maintaining this liquidity.

Why This Matters:

- With derivatives moving from bilateral to centrally cleared contracts, risk management must shift from managing counterparty credit to managing liquidity for margin needs.
- Managing liquidity for margin involves more than the margin requirements at present; it is also about planning for changes in those requirements as the market changes.
- As a summary metric, the industry should consider a form of Liquidity Valuation Adjustment (LVA): that is, the cost of financing enough liquidity to support current and possible future margin needs.

Introduction

In September 2009 at the G-20 Pittsburgh Summit, the membership established a deadline at the end of 2012 for the central clearing of all standardized Over-the-Counter (OTC) derivatives contracts. While the strict deadline may not be met globally, there is no doubt that this market is in a period of significant transformation. From the perspective of participants in the derivatives market, the current constraints posed by counterparty credit concerns will be replaced by constraints stemming from a need for liquidity. Derivatives risk management must respond to this shift in constraints. In this paper, we describe a number of the new risk management challenges that central clearing poses, and propose a new metric to summarize and manage the liquidity needed to support derivatives trading.

Central Clearing Mechanics

The primary motivation for the move to central clearing of derivatives is to reduce the risk that the default of a single financial institution could trigger distress in its trading counterparties and in the overall financial system. Under central clearing, bilateral derivatives contracts between institutions will be replaced by pairs of contracts, each between one of the institutions and a central counterparty (CCP). Of course, concentrating trading through a single counterparty does not itself reduce systemic risk; rather the central counterparty must have in place sufficient lines of defense to guarantee its credit, and insulate it from defaults of other market participants.

The first line of defense is variation margin, or simply mark-to-market: on a daily basis, and possibly more frequently, clearing members (that is, institutions that clear directly with the CCP) will post margin to the CCP equal to the current valuation of their positions. Variation margin assures that a CCP can take over the positions of any defaulting member without incurring an immediate market loss. What variation margin does *not* cover is the CCP's exposure *after* taking on a defaulter's positions. In a default situation, the CCP would try to close out the positions in an orderly fashion, but would be exposed to moves in the market during that process.

A second line of defense, referred to as initial margin, is set to cover losses that a CCP might incur while closing out a defaulter's positions, under plausible assumptions about market volatility and liquidity. Historically, initial margin has been established at the outset of a position and held fixed, hence the name. This is changing. The recently published *Principles for financial market infrastructures*[1] acknowledges that initial margin can now change daily. *Initial margin* may now be a misnomer; *risk margin* might be more appropriate.

Beyond the variation and risk margin are further lines of defense: contributions to a guarantee fund, through which losses can be mutualized across member firms, as well as the CCP's own capital. Collectively, these lines of defense are designed to

[1] Bank for International Settlements and International Organization of Securities Commissions (IOSCO), April 2012.

protect the CCP, as well as its trading partners and the system at large, from the possible defaults of one or more large clearing members.

While these lines of defense help mitigate the impact of a default, another set of principles are intended to reduce the likelihood of a default. Membership in a CCP requires that certain best practices be observed, in particular regarding how members manage the risk of their own customers. For instance, clearing members should demand of their customers as much variation and risk margin as the CCP would for the same trades. Thus managing margin and liquidity is not simply a new risk management requirement for large derivatives dealers: customers who do not clear directly with the CCP, but through such a dealer, are subject to margin requirements at least as strict as the dealers themselves.

New Risk Management Needs

Managing liquidity capacity in this context entails more than knowing how much margin is required at any specific time. It entails asking where to most efficiently clear a new trade, taking best advantage of portfolio offset and netting opportunities. It entails planning for how much risk-based margin might change as market levels and volatilities evolve. And it entails examining margin requirements under stress, either an event in the market or a change in margin terms.

To probe any of these questions requires examining both variation and risk margin requirements related to derivatives trading. Variation margin is straightforward enough; existing risk models built to describe short-term fluctuations in value are adequate to anticipate variation margin needs. Risk margin is more subtle. Because risk margin is based on a portfolio, the impact of a new trade depends first on what other positions are considered in the portfolio (whether a narrow class of derivatives, or futures and other products for which the CCP also supplies clearing services), and second on the model the CCP employs to assess risk.

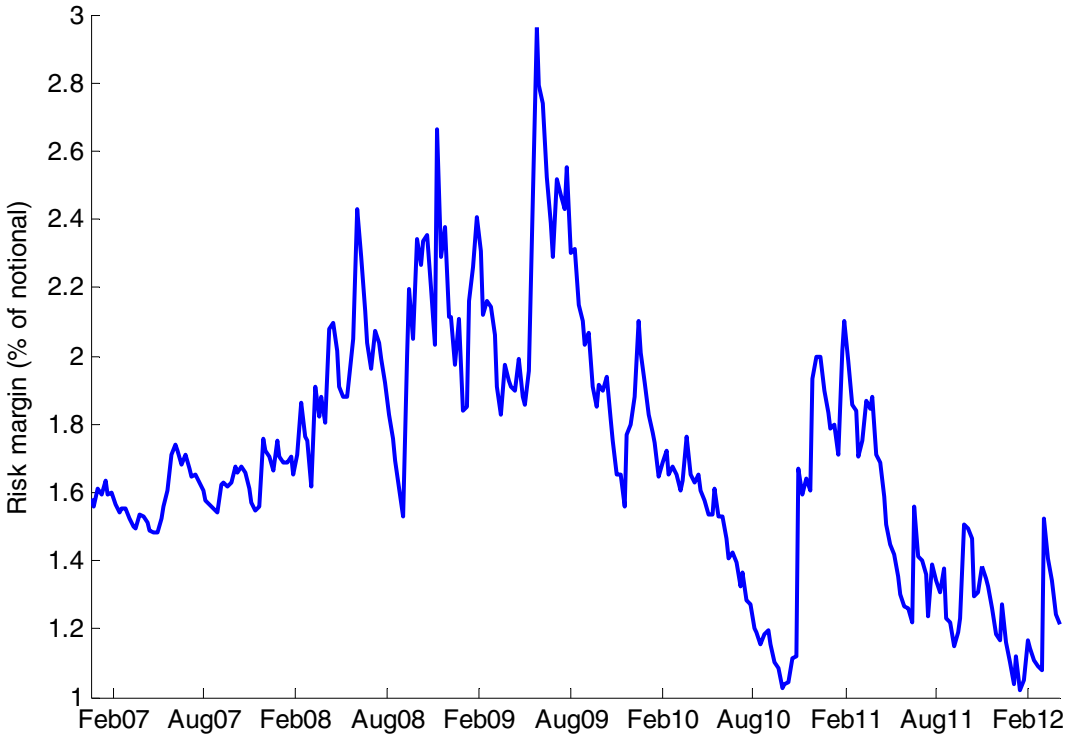
With interest rate swaps, where central clearing is most established, the competing CCPs have chosen similar risk margin models. The London Clearing House (which has cleared interest rate swaps since 1999), as well as the CME and Eurex (which started clearing swaps more recently) have all adopted risk margin frameworks based on *filtered historical simulations*. This technique creates a set of potential market shocks by adjusting actual historical shocks to match a desired market volatility, typically a blend of current market volatility and a long-term average. Moreover, each of the swap CCPs implement filtered historical simulations using relative interest rate changes, meaning that the same historical shocks have a greater absolute effect when interest rate levels are higher. The three margin models differ in their details: the length of the historical period employed, the mechanism to blend current and average volatility, and the confidence level used to characterize the worst case shock. Because the models are so similar, the question of where to clear a swap most efficiently depends mostly on portfolio effects, such as the offsetting risk of other products that are eligible for portfolio margining at each CCP.

If the first question—which CCP to choose—means simply computing the hypothetical risk margin under a small number of possible choices, questions

regarding the potential fluctuation in risk margin require a deeper analysis. The true long-term requirement for liquidity is the initial risk margin, plus a "VaR of VaR" buffer to cover how much a risk margin may increase.

One way to assess the risk margin buffer is to examine it under a variety of historical market scenarios. For example, we examine a portfolio of pay fixed USD interest rate swaps under a risk margin model similar to that of the London Clearing House. The risk margin over the last five years is presented in Figure 1. Risk margin was stable through 2007, almost doubled through the financial crisis, and then fell along with rates from 2010 onward. Over the entire five-year period, there was a three-fold swing in margin, and short-term shocks of 25 percent were common. A conservative buffer could be defined as the worst historical one-month increase in risk margin, equal in this example to about 1.1 percent of gross notional. This is roughly the size of the risk margin itself, as of April 2012.

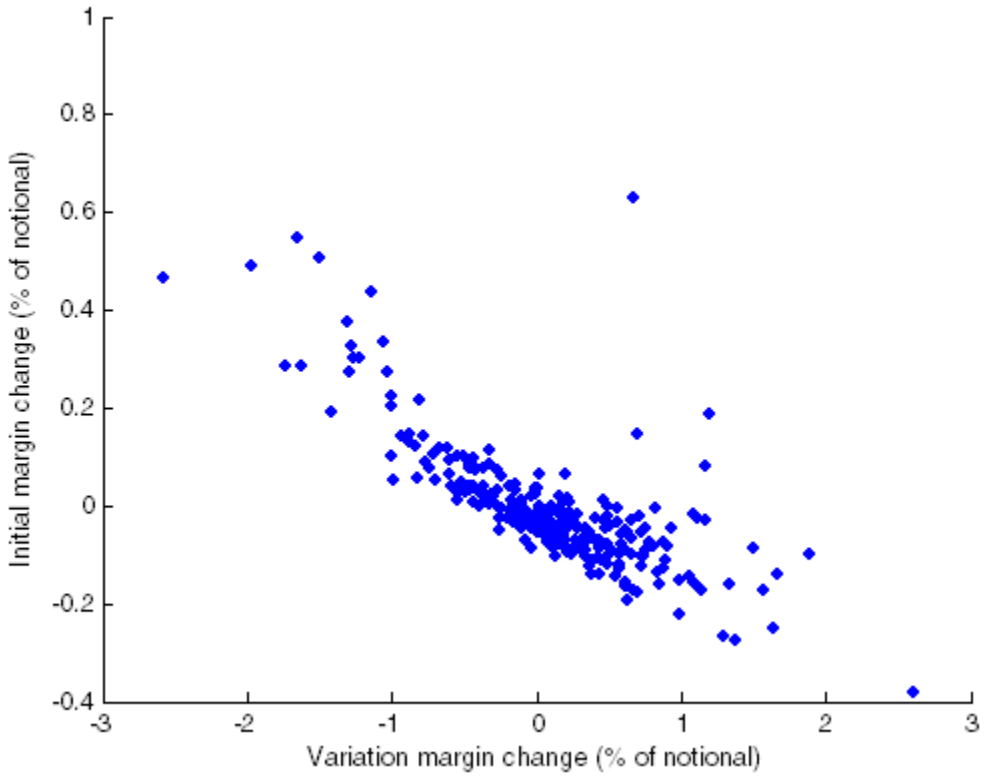
Figure 1: Risk margin for an example pay fixed USD swap portfolio. Source: RiskManager.



Of course, it is not just the risk margin that can vary. The total liquidity need is to support changes in both variation and risk margin, and so the relationship between the two is another crucial aspect to analyze. Continuing the example from above, we plot the weekly changes in variation and risk margin in Figure 2. For this portfolio the correlation is strongly negative: as rates fall, there is typically a call for more variation margin as the portfolio loses value, but this tends to be accompanied

by a relief in risk margin as the historical relative interest rate shocks are applied to a lower base level. The result is that the change in total margin (weekly standard deviation of 0.57 percent of notional) is markedly less volatile than the change in variation margin only (weekly standard deviation of 0.66 percent). Note, however, that this is a particular result for this portfolio, deriving from the specific exposure to interest rates. In other cases, the two margin needs may exacerbate each other, rather than diversifying.

Figure 2: Relationship between variation margin and risk margin weekly changes, 2007-2012. Source: RiskManager.



As a complement to a statistical buffer for margin needs, market participants can also examine the impact on both variation and risk margin of specific market events, such as a simple shift of a single interest rate curve, or a change in the relationship across different maturities or different currencies. These are standard analyses in the space of stress testing, but a new form of stress test also is relevant in the CCP context, as market participants also face the risk that the CCP changes its margin rules. In a stressed market, for instance, a market participant might want to examine the impact of the CCP imposing a longer close out horizon in the risk margin model.

From Credit to Liquidity Valuation Adjustment

Under bilateral trading of derivatives, the Credit Valuation Adjustment (CVA) emerged as the measure of the cost of the counterparty credit risk on a set of derivatives. The CVA can be seen as the upfront cost of protecting a set of derivatives from counterparty default, and is utilized both to accurately value derivatives and to determine the most efficient counterparty with which to place a new trade.

With liquidity replacing credit as the essential constraint, centrally cleared derivatives demand a metric for the upfront cost of funding the margin requirements, including a buffer for possible changes. The market should consider this Liquidity Valuation Adjustment (LVA) in the coming new paradigm for the derivatives market.

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[1] *As of June 30, 2011, based on eVestment, Lipper and Bloomberg data.*