



CDS Clearing at ICE: A Unique Methodology

By Stan Ivanov and Lee Underwood

Credit default swaps play a vital role in the global economy as hedging tools for credit providers and others with exposure to a corporate or sovereign entity and as a market-based indicator of an entity's financial health. Following the financial crisis of 2008, in which uncertainty about credit risk and counterparty exposures in the over-the-counter market were a major factor, IntercontinentalExchange introduced CDS clearing in March 2009 with the launch of ICE Trust, now known as ICE Clear Credit. Today, ICE Clear Credit and ICE Clear Europe, which began clearing CDS in July 2009, offer clearing on more than 300 index and single name underlying references. Through Sept. 9, ICE Clear Credit and ICE Clear Europe have cleared \$22.4 trillion in gross notional value resulting in open interest of \$1.56 trillion.

From a risk perspective, CDS differ from exchange-traded and other OTC derivatives in a number of critical aspects. For example, reliable end-of-day pricing for the CDS is not generally available, making it more difficult for clearinghouses to assess the value of cleared contracts. CDS also pose "jump-to-default" risk, meaning the risk of a default that would yield a very significant financial payment obligation by CDS protection sellers. Furthermore, the risk presented by CDS is asymmetrically larger for protection sellers

(short positions) than for protection buyers (long positions). Finally, CDS instruments may be especially vulnerable to decreased market depth and limited liquidity during distressed economic conditions.

To manage these risks, ICE Clear Credit and ICE Clear Europe have developed a unique methodology for CDS clearing. It is a dynamic model that self-adjusts to market conditions, reflects the highly asymmetric risk profiles of CDS instruments, and captures the specificities of CDS trading behavior while offering robust portfolio efficiencies.

At the heart of the ICE CDS solution is a daily auction-style price discovery process in which all clearinghouse members provide end-of-day (EOD) quotes for all index and single name CDS instruments in which they have open interest. From these quotes, the clearinghouse establishes final EOD prices for mark-to-market and variation margin calculations, as well as for computing initial margin requirements and guaranty fund contributions. All submitted quotes are subject to the same instrument-specific bid/offer width to create a coherent

market representation.

To ensure the integrity of the EOD quote process, the clearinghouse requires members on random days to execute trades if the offer price of one clearing member is lower than the bid price of another. The importance of establishing a market price for every product cleared cannot be overstated. Other price-generation approaches, such as price polling or model-based interpolation, can be particularly inadequate for providing a true representation of the market. This is especially true for infrequently-traded maturities, coupons or reference credits. The ICE CDS auction-style price discovery process has proven to be very effective for obtaining high-quality EOD prices.

Jump-to-Default Risk

While the problem of settlement price discovery is present in other OTC markets, jump-to-default risk is unique to CDS. Jump-to-default risk creates a very strong asymmetry in the risk profile of protection-sold and protection-bought positions. If a reference entity credit event is expected

by the market, the risk is reflected in the instrument prices, and the daily mark-to-market process would capture a substantial part of this risk. If the market does not expect a near-term credit event, however, the eventual liabilities associated with sold protection positions can be significant. Collateralization and mutualization levels that correctly incorporate loss-given-default are therefore essential for clearing CDS.

For portfolio/concentration risks, large position requirements, also known as concentration charges, apply to long and short protection positions that exceed predefined notional threshold levels. The concentration charge threshold reflects market depth and liquidity for the specific index family or reference entity. Positions that exceed selected thresholds are subject to additional, exponentially increasing, initial margin requirements. The accelerated initial margin creates the economic incentive to eliminate large positions. Alternatively, large directional positions can be subject to full collateralization. For example, the protection seller can create large exposure only if the

seller fully collateralizes its risk. This approach does not require hard position limits and does not create any detrimental effects on market depth and liquidity.

In the event of a clearing member default, the clearinghouse may face additional risk associated with unwinding CDS instruments with relatively low market depth and activity. The ICE CDS methodology includes explicit provisions for costs associated with this liquidity risk. For example, a bid/offer risk requirement, known as a liquidity charge, appropriately captures liquidation costs for directional curve portfolios as well as well-hedged portfolios. The estimated liquidity charges are based upon historical observations and the EOD price discovery process. The liquidity requirements reflect the expected exposure to wider bid/offer widths under extreme scenarios of clearing member default or defaults.

Scenarios and Simulations

An essential function of any risk system, especially one relied upon by a derivatives clearinghouse, is capturing portfolio-level tail risk. This requires a reliable and robust approach for estimating tail risk at high quantiles, e.g. 99% and higher, while recognizing the balance between simplicity, which may lead to conservatively-biased risk, and efficiency, which may require more sophisticated risk modeling techniques. Simplistic initial margin models often lead to capital inefficiencies and may remove the incentive for clearing members and market participants to maintain “flatter” portfolio risk profiles.

The ICE CDS risk management methodology is a synthesis of two approaches that undergird a number of risk management models now in use at other clearinghouses: scenario-based stress tests and Monte Carlo simulations. The scenario-based stress approach is the foundation of CME SPAN, for example, and generally considers a small set of hypothetical future scenarios. While the scenario-based stress approach is useful for portfolios consisting of a relatively small set of risk factors, its utility for large portfolios composed of nonlinear instruments such as CDS is limited by the absence of an efficient portfolio treatment that can adequately capture hedging and diversification benefits.

The Monte Carlo framework is the foundation for STANS, the risk management methodology used by The OCC. Advanced Monte Carlo simulations can readily incorporate realistic distributional assumptions



about the behavior of underlying risk factors, and thus provide reliable and efficient portfolio risk measures. The main advantage of the Monte Carlo framework is its ability to generate large numbers of potential market scenarios and to obtain accurate estimates for the impact of low-probability events. By contrast, relying on observed-only scenarios, as in historical simulations, has some disadvantages: Among other things, it implies that a name that never defaulted in the past will not default in the future. Properly implemented Monte Carlo methods offer better forecasting because they consider scenarios that follow realistic distributions with specific statistical behavior—but are not limited to historical events. The Monte Carlo approach captures low-probability events that have not happened previously but may occur in the future. It provides a consistent framework

the stress-test approach, and monitors the effects of replacing the large set of Monte Carlo scenarios with a smaller set of stress scenarios.

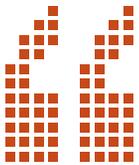
Because it can take several days for the market to absorb the shock of default in an OTC market such as CDS, the ICE CDS risk methodology has adopted a five-day risk horizon at a risk quantile of 99%. This means that margins are set to cover five days of adverse price/credit spread movements for the portfolio positions with a confidence level of 99%.

Dynamic Margining

As a dynamic model, the ICE CDS risk methodology revises margin requirements as market conditions and credit spreads change. The approach differs from other methodologies, where initial margin is established by the clearinghouse as a fixed

metric tail risk associated with protection selling, the relatively small number of members, and the need to create strong incentives for clearing members to actively participate in the default management process. As the main source of systemic risk in the CDS market, large protection sellers are required to make very significant contributions to the guaranty fund. Protecting these contributions in the event of a member default—that is, avoiding the possibility that the guaranty fund will be consumed—provides a powerful incentive to participate in default management and to expedite the liquidation of the defaulting member's portfolio.

The size of the guaranty fund is monitored daily through a series of stress scenarios based on observed market realizations as well as theoretical scenarios derived from statistical analysis. Guaranty fund moni-



Because the ICE risk management model is self-adjusting, new initial margin requirements are computed daily, as CDS spreads and volatility change.



for stress-testing and for sensitivity analysis in response to deviations from observed behavior, such as correlation structure changes and market volatility changes.

The ICE CDS risk management methodology can be viewed as a scenario-based framework that incorporates concepts and techniques used in advanced Monte Carlo simulations. The ICE CDS approach features a small number of scenarios that provide computational transparency and efficiency, and that reflect the unique characteristics of the CDS market in terms of credit spread behavior, risk asymmetry, liquidity, quoting conventions, and trading and pricing practices. Heavy-tailed asymmetric distributions with time-changing volatilities are used for projecting hypothetical shocks to CDS spreads combined with credit term structure changes capturing different “curve” shapes. For internal monitoring and regulatory reporting, the ICE Monte Carlo framework provides high-quantile benchmark Value-at-Risk and Expected-Shortfall measures extracted from 20,000 scenarios with a full instrument revaluation at each scenario. It features the same distributional assumptions as those in

dollar amount per contract and often revised following a post hoc review process. Because the ICE risk management model is self-adjusting, new initial margin requirements are computed daily, as CDS spreads and volatility change. The dynamic behavior of the ICE approach improves the risk forecasting capacity. The ICE CDS risk framework also recognizes the importance of initial margin stability for efficient capital allocation and seeks to mitigate margin rate fluctuations.

For the guaranty fund size and contribution determinations, ICE aims to achieve protection against two clearing members and three additional reference entities simultaneously entering state of default. The three reference entities are selected based on the overall exposure of the clearinghouse to potential extreme losses resulting from contagion and systemic risk, as well as from idiosyncratic credit events. The two clearing members are selected based on the largest uncollateralized losses under extreme but plausible scenarios.

Unlike most clearinghouse guaranty funds, the ICE CDS guaranty funds are structured to reflect the extreme asym-

toring also includes consumption analysis, which provides information for plausible scenarios under which available funds will be exhausted.

Central clearing is a critical step in the evolution of the credit derivatives market. With nearly \$25 trillion in outstanding notional cleared since the launch of CDS clearing in 2009, ICE Clear Credit and ICE Clear Europe have substantially increased the stability and transparency of the CDS market and contributed to the reduction of systemic risk. Along with the EOD price discovery process behind mark-to-market functions, the ICE CDS approach is a major innovation and a substantial development in the modernization of derivatives and clearinghouse risk management. 

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Stan Ivanov is chief risk officer, ICE Clear Credit. **Lee Underwood** is director, communications, IntercontinentalExchange.