Quantifying Counterparty Credit Risk

Saleh Alsanea

03 August 2023

During the 2008 financial crisis, many institutions' balance sheets (banks & corporates) suffered significantly due to the deterioration of the fair values of their over-the-counter (OTC) derivatives assets. Derivatives used to be valued under the assumption of risk-neutrality, neither counterparty is expected to default on their obligations, particularly large counterparties who were assumed to be "too big to fail". Yet, the collapse of many corporates and the iconic downfall of Lehman Brothers have changed the narrative and markets participants have started accounting for counterparty credit risk (CCR) and incorporating the credit quality of the counterparty in a derivative fair value via the calculation of a Credit Valuation Adjustment (CVA).

The Bank of International Settlement (BIS) has defined the CVA as an adjustment to the fair value (or price) of derivative instruments to account for counterparty credit risk. In other words, it is a reduction to the derivative value This concept was introduced as an improvement to fair value accounting of financial instruments in 2007/08, coincidentally with the unveiling of a financial crisis. Worth mentioning, exchange-traded derivatives do not incorporate counterparty credit risk into their value as such risk is minimized by the Exchange playing the role of an intermediary between the two counterparties.

CVA for a financial instrument, such as a bond, can be calculated relatively easier than that of a derivative. Bonds have standard and predictable future cashflows. Hence, credit exposure can be calculated as the difference between risk-free and risky bonds. Derivatives on the other hand are more complex since their cashflows varies with time and are not always predictable. Additionally, derivatives can be categorized as either unilateral or bilateral instruments, depending on the instrument's payoff. In the case of a purchaser of an interest rate cap, for example, the cap would always be reported on their balance sheet as a derivative asset till maturity and the purchaser will be exposed to the risk of a counterparty default in case of deteriorated credit quality or bankruptcy. Intuitively speaking, the seller would have no such exposure to the purchaser, given the cap premium is paid up front. Put differently, the purchaser's solvency and creditworthiness do not evoke additional credit exposure to the seller. This is a simple illustration of a unilateral derivative instrument, where counterparty credit risk is one-sided.

On the other hand, bilateral instruments such as interest rate swaps have a counterparty credit risk that goes both ways (i.e., bilateral). Since a swap fair value can swing between an asset and liability depending on various market factors. This nature of the instrument exposes each party to the probability of default of the other.

One widely applied way to quantify bilateral instruments counterparty credit risk is to compute the Bilateral Credit Valuation Adjustment (BCVA). This is the sum of CVA and DVA (Debit Valuation Adjustment). DVA is rather a counterintuitive concept and can be considered as a gain, given that it represents a deduction to an entity's own liability in accounting for its own credit risk. This means it can be thought of as the CVA from the counterparty perspective. Hence, it is computed in the same way, and one party's CVA, represents the other party's DVA.

Valuation Techniques

There is no one specific technique for calculating CVA, and the method applied usually depend on the market participant sophistication and the resources they can leverage. One standard approach is calculating CVA as the sum of the future expected losses till the instrument's maturity. This method involves using Monte Carlo simulation to model different scenarios to obtain the derivative exposures under different market conditions. CVA is then calculated as per the below formula, which incorporate three factors. Loss given default (LGD), which represent the percentage amount of the loss when a counterparty defaults (LGD = 1 – recovery ratio). The second factor is the Expected Exposure (EE), which is the expected positive MtM value (i.e., the portion of fair value) in future dates and represents the amount that could be lost in case of a default. This is multiplied by the probability of default (PD), which is a function of a counterparty creditworthiness measured its credit spread. Credit spreads can be obtained from the counterparty's latest bonds issuances, borrowings, rating agencies or credit default swaps (CDS).

$$\mathbf{CVA} = -\sum \text{LGD} * \text{EE} * \text{PD}$$

Now, looking at this from the other side, an entity would incorporate its own credit risk via DVA, which can also be calculated using the same formula above. However, EE is replaced with Negative Expected Exposure (NEE), which is basically the opposite side of EE. Hence, it is the expected negative MtM value in future dates. Netting both of these adjustment would result in BCVA.

> **There is no one specific technique for calculating CVA, and the method applied usually depends on the market participant's sophistication and the resources they can leverage.**

Hedge Accounting Considerations

IFRS13, the standard that concerns fair value measurement, requires incorporating the counterparty and the entity's own credit risk in the valuation of derivatives instruments (i.e., BCVA). This requirement has implications on hedge accounting as the standard applicable to it, IFRS9, provides no specific guidance on incorporating credit risk (i.e., CVA & DVA) in the derivative fair value or in the hypothetical derivative valuation when conducting hedge effectiveness testing.

As discussed in our previous hedge accounting bulletin, hedge effectiveness is performed by creating a hypothetical derivative that matches the hedged item perfectly and comparing its fair value changes to the hedging instrument (i.e., actual derivative).

> **IFRS9, provides no specific guidance on incorporating credit risk in the derivative fair value or in the hypothetical derivative valuation when conducting hedge effectiveness testing.**

The standard doesn't dictate whether CVA should be incorporated in the hypothetical fair value and there is a rationale that favors the exclusion of credit risk impact from the hypothetical fair value. Because a counterparty credit deterioration will directly impact the hedging effectiveness even if the derivative serves as a perfect hedge instrument to the underlying exposure.

In summary, CVA is a tool used to account for CCR in order to reach a fair value figure that can reflect the trade's position more accurately. Yet, this is not the only risk factor that can be considered. Other elements as liquidity risk and funding risk could be taken into account as well.

For more information, please contact Saleh Alsanea, Associate at Ehata Financial, ***saleh.alsanea@ehata.com.sa.***
You can also read the article from the website here.

ABOUT EHATA

Ehata is a specialist financial risk management advisory firm, licensed and regulated by the Capital Market Authority (license No. 17183-20). We are independent practitioners with expertise covering interest rate, foreign exchange, commodities, and derivatives. We leverage on our technical capabilities and market know-how to ensure that our clients get the excellence of the advice and the satisfaction that comes with it.