Credit Risk

Lecture 6 – Counterparty risk

Loïc BRIN

École Nationale des Ponts et Chaussées
Département Ingénieurie Mathématique et Informatique (IMI) – Master II

Objectives of the lecture

Teaching objectives

At the end of this lecture, you will:

- understand what **counterparty risk** is, why it is a complex risk and how it is mitigated;
- know how **counterparty risk is measured** in risk management, regulatory and pricing perspectives;
- what **other valuation adjustments (XVA)** are used to go beyond counterparty risk in evaluating the value of OTC derivatives, taking into account other contextual information.

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Introduction to the derivatives market

Derivatives can be treated on a listed market or Over The Counter (OTC)

Derivatives – Definition

A derivative is a financial security with a value that is reliant upon or derived from an **underlying asset** or group of assets.

Where to buy derivatives?

Derivatives can be exchanged on an **listed market** or **Over The Counter (OTC)**.

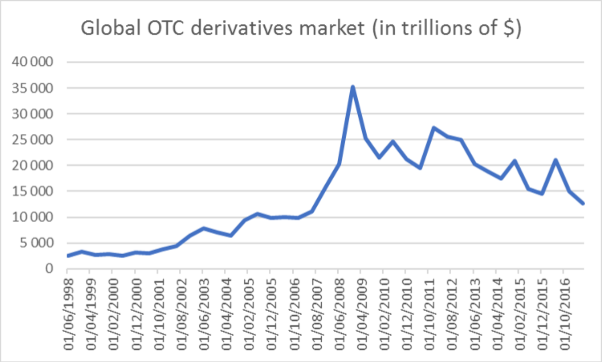
OTC derivatives – Pros and Cons

OTC derivatives are efficient tools to transfer financial risks between market participants. As a by product of such a transfer:

- they **create credit risk** between the counterparties;
- they **increase connectedness** within the financial system.

Introduction to the derivatives market

The derivatives market is a large market were interest rate swaps are predominant



Source: www.bis.org

Counterparty risk definition, specificities and mitigators

Counterparty risk is mostly the risk of default of a counterparty on the contract of a derivative

Counterparty risk

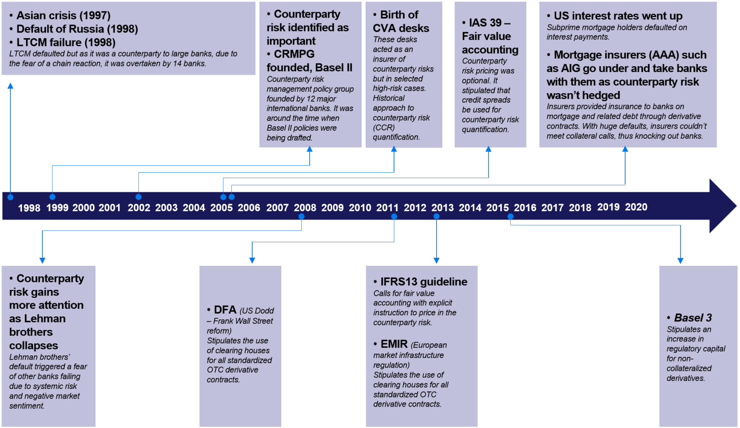
The counterparty risk is defined as the risk the counterparty to a transaction could default **before the final settlement of the transaction's cash flows**. An economic loss would occur if the transactions or portfolio of transactions with the counterparty has a positive economic value at the time of default.
[BCBS, 2006]

Counterparty risk is generated by the derivatives market

As derivatives' contracts generate cash flows between two counterparties, based on one or several underlying assets, **they generate counterparty risk**.

Counterparty risk definition, specificities and mitigators

Counterparty risk has materialized during the last 20 years and yielded to new accounting, capital and collateralization regulations



Counterparty risk definition, specificities and mitigators

Counterparty risk is more complex than credit risk as it is bilateral, fluctuating and dependent on many risk factors

Counterparty risk – A bilateral risk

Unlike a firm's exposure to credit risk through loan, where the exposure to credit risk is unilateral and only the lending bank faces the risk of loss, the counterparty credit risk creates a bilateral risk of loss: **the market value of the transaction can be positive or negative to either counterparty of the transaction**.
[BCBS, 2006]

Counterparty risk – A fluctuating exposure

The core value at risk in case of default is the market value of the derivative product (if it has a positive economic value). **This exposure is not constant, nor deterministic**, as it depends on market movements. Thus, counterparty risk is subject to a fluctuating exposure.

A direct inheritance of the underlying derivatives

The market value of the derivative generating counterparty risk is dependent on the underlying asset the derivative is based on. Counterparty risks, as they depend on the exposure to derivatives, **inherit of all the underlying risk factors**.

Counterparty risk definition, specificities and mitigators

Counterparty risk on market activities is thus more complex than credit risk on the lending business

Difference between the lending business and the derivatives business:

- **Loans**: exposure at any future date is the outstanding balance, which is certain (without considering prepayments);
- **Derivatives**: exposure at any future date is determined by the market value and the date is uncertain.

Counterparty risk can be:

- **Unilateral**: one party (the investor) is considered default-free and only the exposure to the counterparty matters;
- **Bilateral**: both parties are considered risky and face exposures depending on the value of the positions they hold against each other.

Counterparty risk definition, specificities and mitigators

Counterparty risk was a reason for the subprime crisis

Counterparty risk – A systemic risk

- Derivatives create credit risk **between the counterparties**;
- Derivatives increase the **connectedness** of the financial system.

Counterparty risk during the 2008 financial crisis

The 2008 financial crisis showed that counterparty-related losses (e.g. changes is credit spreads of the counterparties and changes in the market prices that drive the underlying derivative exposures) have been **much larger than ex post default losses**.

Counterparty risk definition, specificities and mitigators

Countepraty risk is thus driven by the market value of the derivatives, the counterparty credit spread and the correlation between all these parameters

Drivers of counterparty risk

Counterparty risk is affected by several complex risk drivers:

- the Over the Counter (OTC) contract's **market value** risk drivers;
- the **counterparty credit spread**;
- the **correlation between the underlying and default of the counterparty**.

Counterparty risk definition, specificities and mitigators

For one counterparty, netting consists in aggregating all the transactions instead of considering each deal separately

Netting

In presence of multiple trades with a counterparty, netting agreements allow, in the event of a default of one of the counterparties, to **aggregate the transactions before settlings claims**.

Netting – Math formalization

- In the absence of netting, the exposure is:

$$E(t) = \sum_i E_i(t) = \sum_i V_{i(t)}^{+}$$

- A **netting agreement** is a legally binding contract between two counterparties based on which, in the event of default, the exposure results in:

$$E(t) = \left(\sum_i V_i(t) \right)^{+}$$

Counterparty risk definition, specificities and mitigators

For one counterparty, netting consist in aggregating all the transactions instead of considering each deal separately

Netting – Example

Two counterparties, a bank B and the counterparty C, such that:

- C holds a currency option written by B with a mark-to-market value of 50;
- B has an IRS with C, having a marked to market value in favor B of 80.

Exposures:

- The exposure of bank B to the counterparty C is 80;
- The exposure of the counterparty C to the bank B is 50;
- The exposure of the bank B to the counterparty C, with netting, is 30.

Counterparty risk definition, specificities and mitigators

Collateral posting is another mitigator as assets are segregated to protect both counterparties in case of a default

Collateral – Definition

Consider the bank B and the counterparty C. Let $C(t)$ be the (cash) **collateral amount posted** by C to B, at time t. B has no exposure to the contract up to the collateral amount, while its losses are reduced by the collateral amount whenever the exposure exceeds it. The collateralized exposure $EC(t)$ is defined as:

$$EC(t) = (E(t) - C(t))^+$$

Credit Support Annexes – CSA

A **Credit Support Annex (CSA)** provides credit protection by **setting forth the rules** governing the mutual posting of collateral. CSAs are used in documenting collateral arrangements between two parties that trade privately negotiated (OTC) derivative securities.

Counterparty risk definition, specificities and mitigators

Collateral posting can be very different from one counterparty to another even if the heterogeneity is often based to the same parameters

Posting threshold (H)

The **posting threshold** $H > 0$ is the **threshold** below which, no collateral is posted.

Margin period (δ)

The **marginal period is the interval** at which margin is monitored and called for:

$$C(t) = [E(t-\delta) - H]$$

Minimum Transfer Amount - MTA

The **Minimum Transfer Amount** is the amount below which **no margin transfer** is made:

$$C(t) = [E(t-\delta) - H] + \mathbb{1}_{\{E(t-\delta)-H>MTA\}}$$

Downgrade triggers

Downgrade triggers are triggers used to ensure more collateral to be posted, if the counterparty is **downgraded below** a certain level.

Counterparty risk definition, specificities and mitigators

The regulation pushed for more collateralization on the OTC market

American and European legislations pushed for more collateralization

Two major legislations made compulsory collateralization for financial institutions:

- **Dodd-Frank Act** in the United States;
- **European Market Infrastructure Regulation (EMIR)** in Europe.

Collateralization can be posted through CCP or not

Collateralization can be posted with:

- **CCP**: Central Clearing Houses (CCP) take charge of the margin calls;
- **Without CCP**: the two counterparties use accounts and call margins without any CCP.

Counterparty risk mitigations

The collateralization can be performed through CCP or not and require or not Initial Margins

Central Clearing Houses

A CCP becomes the counterparty to the buyer and the seller and guarantees the terms of a trade even if one party defaults on the agreement. The CCP collects enough money from each buyer and seller for covering potential losses incurred by not following through on an agreement, resulting in the entity replacing the trade at the current market price. Monetary requirements are based on each trader's exposures and open obligations. Two counterparties can also collateralize using regular banking accounts and call marginal amounts to adjust the collateralization.

Initial Margin

More than requiring collateralization for financial institutions, Dodd-Frank Act and EMIR requires to complete the classical margin calls (**Variation Margin – VM**) with **Initial Margin (IM)**, that comes to **cover the settlement risk** in case of default.

SIMM

The **Standard Initial Margin Model** (SIMM) is a common methodology to help market participants calculate initial margin on non-cleared derivatives under the framework developed by the Basel Committee on Banking Supervision and the International Organization of Securities Commissions.

ISDA

Wrong Way Risks and Right Way Risks

Correlations between the different risk factors can lead to cumulative risks called Wrong Way Risks

Wrong Way Risk

WWR is defined as the risk that occurs when exposure to a counterparty is **adversely correlated** with the credit quality of that counterparty. It arises when default risk and credit exposure increase together.

- **Specific WWR** arises due to counterparty **specific factors**: a rating downgrade, poor earnings or litigation;
- **General WWR** occurs when the trade position is affected by **macroeconomic factors**: interest rates, inflation, political tension in a particular region, etc.

Wrong Way Risks and Right Way Risks

Wrong Way Risks happened during the subprime crisis

Monoline insurers (e.g. Ambac and MBIA)

During the subprime crisis, the **monolines** specialized in **guaranteeing Mortgage Backed Securities (MBS)**, saw their creditworthiness deteriorate and found themselves unable to pay all of the insurance claims. Almost all exposure mitigation from monoline insurance fell short due to the guarantor's increased probability of default under exactly the same conditions when the insurance was most needed.

Collateralized Loan

Bank A enters into a **collateralized loan** with bank B (the counterparty). The collateral that Bank B provides to A can be of different nature: bonds issued by Bank B (specific WWR) bonds issued by a different issuer belonging to a similar industry, or the same country or geographical region (general WWR).

Wrong Way Risks and Right Way Risks

These correlation effects can also mitigate the risk and are then called Right Way Risks

Right Way Risk

Right Way Risk is **the opposite to Wrong Way Risk**: it is the effect observed when **the exposure decreases as the default probability increases**, i.e., when there is a negative dependency between the two. The size of credit risk decreases as the counterparty approaches a potential default. RWR occurs when a company enters into transactions to partially hedge an existing exposure.

Examples of Right Way Risks

- An airline usually protects itself against a rise in fuel prices by entering into long oil derivatives contracts;
- A company would normally issue calls and not puts on its stocks. WWR and RWR are together referred to as **DWR (Directional Way Risk)**.

Wrong Way Risks and Right Way Risks

As regulatory do not require to model these correlation, they introduce an α multiplier to be conservative on that correlation risk

Regulatory Treatment of WWR

Basel II deals with WWR using the so-called α **multiplier** to increase the exposure, in the version of the model where exposure and counterparty creditworthiness are assumed to be independent.
The effect is to increase exposure by the α multiplier that is set to 1.4 (or can banks can use their own model but there is a floor at 1.2).

Regulatory treatment of WWR

- if a bank uses its own model, at minimum, the exposure has to be **20% higher** than given by the model where default and exposure are independent ;
- if a bank does not have its own model for WWR, it has to be **40% higher**.

Conclusion – Counterparty risk is a complex risk

Counterparty risk is a complex risk because of its dependency to potentially many underlying assets, the heterogeneity of the mitigators and the correlations that can amplify this risk

- Counterparty risk is **complex** as it is bilateral, fluctuating and dependent to all the risk factors of the underlying derivatives;
- **Mitigators** are numerous and not that homogeneous on the market, thus adding more complexity in the measurement of the risk;
- Eventually, **correlations** between the different risk factors can amplify the risk (Wrong Way Risk) or decrease it (Right Way Risk) adding second order effects to the model.

Quiz

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Basic counterparty metrics, EEPE and KCCR

The two purposes of counterparty risk metrics is to manage risk and take it into account in the pricing

Measuring counterparty risk can fulfill two purposes:

- **counterparty risk management**: for **internal purpose** and for **regulatory capital requirements**, following Basel II;
- **counterparty risk from a pricing point of view**: **Credit Value Adjustment (CVA)** is computed during the pricing to account for possible default of the counterparty.

Basic counterparty metrics, EEPE and KCCR

PE, EE, EPE are three basic counterparty risk metrics

Let us denote $V(t)$ the market value of a derivative or of several derivatives if a netting agreement is in place, at time t. Counterparty exposure is equal to $E(t) = V(t)^+ = \max(0, V(t))$. It is also known a **Potential Future Exposure (PFE)**.

Expected Exposure (EE)

$$\mathrm{EE}(t) = \mathbb{E}^{\mathbb{Q}}(E(t))$$

Effective Positive Exposure (EPE)

$$\mathrm{EPE}(t) = \frac{1}{t}\int_0^t \mathrm{EE}(s)\mathrm{d}s$$

Basic counterparty metrics, EEPE and KCCR

EEPE is a basic counterparty risk metric that has been retained by the regulator to calculate KCCR (Credit RWA)

Expected Effective Positive Exposure (EEPE)

$$\mathrm{EEPE}(t) = \frac{1}{t}\int_0^t \max_{h<s}(\mathrm{EE}(h))\mathrm{d}s$$

KCCR (Capital for Counterparty Credit Risk)

Uncollateralized OTC derivatives generate Credit RWA as regular loans. Nonetheless, as their Exposure At Default (EAD) is fluctuating the regulator asks banks to use for $\mathrm{EAD} = \alpha \times \mathrm{EEPE}$ in the IRBA approach (see Lecture 5), with EEPE calculated for t equal to one year, and $\alpha > 1$ in order **to account for correlations in a conservative way**.

Basic counterparty metrics, EEPE and KCCR

Let us look at a fictitious example of a KCCR calculus

KCCR on a fictitious swap

A bank strikes a deal with Total. They sold a 8-years EUR/USD currency swap. To calculate the KCCR in an IRBA approach, the bank must use the regulator formula and plug into it: PD, EAD and LGD. We assume that for this bank, $\alpha = 1.5$.

- LGD: we can assume LGD is equal to 35%;
- PD: the internal rating and model of the bank (Lecture 2 on Statistical models) give us a value of 0.63 %;
- Diffusing the risk parameters (EUR, USD, risk-free rates), we can see that the Expected Effective Positive Exposure over one year is 1 MEUR.

Thus: $KCCR = f_{\text{regulator}}(0.63, 35\%, 1.5 \times 1MEUR)$

Counterparty and Debt Value Adjustment – CVA and DVA

Counterparty Value Adjustment (CVA) accounts for counterparty risk the evaluation of a derivative value and is an accounting requirement that brings volatility in the balance sheet of the banks

Counterparty Value Adjustment – CVA – Definition

CVA is defined as:

- the **difference between the risk-free value and the risk value** of one or more trades or, alternatively,
- the expected loss arising from a **future counterparty default**.

CVA – An accounting rule

CVA is first and foremost a **provision** that is compulsory since IFRS13 was published.

CVA – A source of P&L fluctuations

IFRS13 requires this provision to be risk neutral (future exposures should be risk neutral and PD must be implied from the CDS market), which make these reserves **fluctuating and volatile**. Given the amount at stakes and to avoid P&L jumps, banks have created **CVA desks** which purpose are to hedge theses provisions fluctuations by buying CDS and futures which values will evolve in the opposite way of CVA in case of market changes.

Counterparty and Debt Value Adjustment – CVA and DVA

Because this provision is volatile, banks hedge these and make the client pay for these hedging costs

CVA – An hedging cost

Of course, **these hedging strategies have a cost** (CDS premium in particular). As the provision are risk neutral, their value is equal to the cost to hedge them.

CVA – A component of the price

The market practice is to **make the client pay for this/these hedging strategy/provision moves**. When the deal is complex, the additive CVA component of the price is calculated by the CVA desk.

CVA equations

CVA reserves change = Cost of hedging them = Fee charged to the customers

Counterparty and Debt Value Adjustment – CVA and DVA

CVA are concentrated on corporate and fixed income departments

CVA are generally concentrated on Fixed Income and Corporate departments

As financial institutions must collateralized (DFA and EMIR), the vast majority of the CVA generated in a bank comes from **corporate customers**.
Additionally, as most of the time corporate customers buy fixed income derivatives (e.g. currency swaps, rates swaps), **Fixed Income departments** in banks concentrate the vast majority of the CVA.

Counterparty and Debt Value Adjustment – CVA and DVA

Counterparty Value Adjustment (CVA) – Unilateral CVA

Riskless price of an OTC deal does not take into account counterparty risk

$$P_{\text{riskless}} = \mathbb{E}^{\mathbb{Q}}\left[\int_0^T CF_t e^{-rt} dt\right]$$

Replacement cost

$$L_{\tau_C} = (1-R)\mathbb{1}_{\{\tau_C \le T\}} E(\tau_C)$$

Risky price

$$P_{\text{risky}} = \mathbb{E}^{\mathbb{Q}}\left[\int_0^T (CF_t - L_t \cdot \mathbb{1}_{\{\tau_c = t\}}) e^{-rt} dt\right]$$

Counterparty and Debt Value Adjustment – CVA and DVA

Counterparty Value Adjustment (CVA) is the component to add to the riskless price to take into account counterparty risk

Counterparty Value Adjustment – CVA

CVA is equal to the **market value of the expected loss**:

$$CVA = \mathbb{E}^{\mathbb{Q}}(L_{\tau_C} e^{-r\tau_C}) = (1-R)\mathbb{E}^{\mathbb{Q}}\left[\mathbb{1}_{\{\tau_C \leq T\}} E(\tau_C) e^{-r\tau_C}\right]$$

Counterparty Value Adjustment – CVA – Case of independence between τ_C and $E(\tau_C)$

In the case of independence between the default and the exposure:

$$CVA = (1-R)\int_0^T \mathbb{E}^{\mathbb{Q}}\left[E(t)\right] dQ_C(t)$$

where $Q_C(t) = 1 - e^{\frac{s_t}{1-R}t}$ is the survival function of the counterparty.

The latter expression can be discretized:

$$CVA \approx (1-R)\sum_{i=0}^{n-1} \frac{\mathbb{E}^{\mathbb{Q}}(E(t_i)) + (E(t_{i+1}))}{2} \times \left(e^{-\frac{s_{t_i}}{1-R}t_i} - e^{-\frac{s_{t_{i+1}}}{1-R}t_{i+1}}\right)$$

Tutorial Notebook

Counterparty and Debt Value Adjustment – CVA and DVA

As counterparty risk is bilateral, so is CVA through DVA (Debt Valuation Adjustment)

Bilateral CVA

Bilateral CVA is expressed as:

$$CVA_{\text{bilateral}} = CVA_{unilateral} - DVA$$

where DVA is the Debt Value Adjustment, that is, my own CVA.

DVA and CVA – Expressions

Let denote B and C the two counterparties in the transactions, **DVA and CVA** are expressed as:

$$CVA_{\text{unilateral}} = (1 - R)\mathbb{E}^{\mathbb{Q}}(\mathbb{1}_{\{\tau_C \leq \min(T;\tau_B)\}} E(\tau_C) e^{-r\tau_C})$$

$$DVA = (1 - R)\mathbb{E}^{\mathbb{Q}}(\mathbb{1}_{\{\tau_B \leq \min(T;\tau_C)\}} E(\tau_B) e^{-r\tau_B})$$

Counterparty and Debt Value Adjustment – CVA and DVA

Let us take a look at the exposure on a CDS and how to infer a CVA proxy on a CDS

Exposure on a CDS protection contract

Let us consider the exposure on a CDS contract:

$$V(t) = (s_t - s_0) \cdot DV(t, T)$$

We assume that the spread process is normal:

$$s_t = s_0 + \sigma W_t$$

$$\begin{aligned} EE(t) &= \mathbb{E}^{\mathbb{Q}}(V(t)^+) \\ &\approx \mathbb{E}^{\mathbb{Q}}((s_t - s_0)^+) DV(t, T) \\ &\propto \sigma\sqrt{t} DV(t, T) \\ &\propto \sigma\sqrt{t}(e^{-(r+\lambda)t} - e^{-(r+\lambda)^T}) \end{aligned}$$

▸ Tutorial

Counterparty and Debt Value Adjustment – CVA and DVA

CVA and DVA induce a lot of computational complexities

There are not that many CDS

There are **not that many CDS quoted on the market**. According to [Gregory, 2015], only 1600 CDS are traded.

Use of proxies' rules and of indices

As IFRS13 requires to use market estimation of the PD (risk neutral), banks use either **credit indices** as proxies (e.g. iTraxx, CDX) or **CDS of similar counterparties**.
The CVA Desk strategy is aligned with the CDS used to estimate the CVA.

Supercomplex calculations

CVA often require the use of a Monte Carlo in a Monte Carlo, as calculating the exposure in a future scenario requires to use derivatives pricers, which might be itself a Monte Carlo Pricer. We talk about **Nested Monte-Carlo**. For that reason, calculations of CVA is complex and can limit the ability of the CVA Desk to have a complete measurement of all its sensibilities to all the risk parameters it is sensible to.

Counterparty and Debt Value Adjustment – CVA and DVA

Additionally to CVA and DVA, the regulator asks for a capital buffer to face potential highly fluctuating CVA and DVA reserves

Definition of KCVA

The **KCVA is a VaR on CVA** used to calculate a capital regulatory requirement, additional to KCCR, and which economic purpose is to have a capital buffer in case of high fluctuant CVA reserves.

Different scopes

Paradoxically in Europe, **KCVA only applies to Financial Institutions** (even if most of the CVA is generated by corporates customers as seen before).

Role of the CVA desk on KCVA

Additionaly to its pricing role and hedging role, the CVA desk often buys CDS to **reduce the KCVA** VaR and thus the capital requirement.

Counterparty and Debt Value Adjustment – CVA and DVA

Many elements make CVA, DVA and KCVA models quite risky in terms of model risk

Complex models that entail a high risk model

Several aspects of CVA models make them risky in a risk model perspective:

- they are used for **several purpose**: accounting, regulatory requirements, pricing;
- they are based on **hardly observable** input parameters: use of proxies for credit, illiquid underlying risk factors;
- they are **prospective**: they require nested simulations (nested Monte Carlo);
- they must be **risk neutral**: martingality hypothesis to consider;
- they must take into account **many complexities**: netting, CSA aggreements;
- they are **transversal and global**: they use data from all the market activities systems, all the pricers;
- they are used on **different granularities**: at the bank-level for accounting requirements, at the counterparty level for pricing.

Counterparty and Debt Value Adjustment – CVA and DVA

Let us sum all of this up in one infography

CVA (Counterparty Valuation Adjustments) are reserves on OTC deals that fulfill accounting requirements and that are charged to clients. They introduce volatility in the P&L and thus require capital buffers. Their fluctuations are hedged and releases of CVA, as time passes by, compensate hedging costs.

A new OTC deal was made with XYZ.

It generates incrementally **350 kEUR** of CVA for the bank as reserves.

CVA on OTC deals are reserves that fulfill an accounting requirements…

IFRS13 requires to account for Counterparty Valuation Adjustments (CVA), calculated based on market parameters (risk neutral valorization); they represent future credit exposure risk linked to OTC derivatives deals.

CVA ~ Future Positive Exposures x PD x LGD

As PD cannot be observed on the market for all clients, proxys are used (credit indexes).

…and that are charged to clients.

CVA are an upfront losses for the bank that are compensated by a fee paid by the client.

Market parameters changed, the CVA is now **550 kEUR**.

The bank loses **200 kEUR**.

They introduce volatility in the P&L,…

CVA reserves fluctuate a lot as they are based on market parameters.

Their fluctuation impact the P&L of the bank.

…and thus require capital buffers.

As it can fluctuate a lot, regulatory capital, called KCVA, must be set aside.

Their fluctuations are hedged,…

The market practice is to buy CDS, futures and take out loans with internal treasury to hedge these fluctuations.

As time passes by, the reserves are released.

If no default occurs, the CVA of this deal is equal to **0 EUR** at its maturity.

…and releases of CVA…

As time passes by, if no default happens, the reserves are released.

…compensate hedging costs.

These hedges costs are equal to the CVA releases.

Would no default occur, and the CVA reserves has been hedged, the CVA P&L of the bank is null.

Other market credit risks that are not counterparty risks

Incremental Risk Charge (IRC) is a capital requirement (Market RWA) generated by credit risk on the underlying asset of a derivative, not by counterparty risk

Defintion of IRC

The IRC is a risk metrics that **captures risk due to adverse rating migration** on vanilla credit securities such as bonds and CDS on corporate and sovereign within the trading book. It is a component of Market RWA.

Other market credit risks that are not counterparty risks

Incremental Risk Charge (IRC) is a VaR but which calculation can differ a lot from one bank to another

Example of a simple IRC modeling

The IRC can be computed as follows:

- Simulate random rating migration using **transition matrices** and risk drivers;
- For each simulation derive a **spread variation** from the rating migration;
- For each spread variation derive **a proxy of the P&L** on the portfolio;
- Compute **a 99.9% quantile** of the portfolio P&L distribution at a one year horizon.

Many IRC implementations!

There is **not a unique definition** of the IRC.

Other market credit risks that are not counterparty risks

Comprehensive Risk Measure (CRM) is a capital requirement (Market RWA) generated by credit risk on the underlying asset of a derivative, not by counterparty risk

Definition of CRM

- The **Comprehensive Risk Measure (CRM)** is a risk metrics that, as the IRC, captures the risks due to **adverse rating migration** on credit securities. It applies to credit correlation portfolios (CDO, CLO, CBO, etc.) within the trading book.
- The CRM also **captures risks due to credit spread variations, recovery rates and base correlations**.
- CRM is also a component of the market RWA of a bank.

Conclusion – Counterparty risk metrics

Counterparty risk is exotic and complex and is measured through metrics dedicated to pricing and risk management

- Counterparty risk is taken into account **through KCCR**, as EAD is substituted by α times EEPE;
- Counterparty risk is taken into account in the **provision called CVA and in the regulatory requirement KCVA**;
- Credit Risk impacts market activities too through the credit derivatives and give rise to capital requirement through **IRC and CRM**.

Quiz

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Other Valuation Adjustments

There other valuation adjustements that could be taken into account

XVAs

These costs mainly arise from counterparty risk hedging (CVA), regulatory capital holding costs (for tail risks, KVA) and funding costs (FVA). Some banks have a more mature XVAs desk and in addition to the above costs also calculate ColVA, MVA, LVA and TVA, etc.

CVA

CVA is the market value of counterparty credit risk which depends on counterpartycredit spreads. It can be thought of as the cost to hedge counterparty risk.

DVA

DVA is the market value of the bank's credit risk. It is often thought of as 'the other side' of CVA (i.e. a bank's DVA is its counterparty's CVA).

FVA

FVA captures the impact of funding and liquidity on the cost of a trade that is not under a perfect Credit Support Annex (CSA).

KVA

KVA captures the impact of holding regulatory capital related to provisions for unexpected losses (tail risk) on the cost of a trade.

ColVA/MVA

ColVA captures the costs and benefits from embedded optionality in the collateral agreement (such as being able to choose the currency or type of collateral to post), and any other non-standard collateral terms.

LVA, TVA

LVA – Liquidity Valuation adjustment.

TVA – Tax valuation adjustment.

Maturity of the desk and the bank →

Complex to take them all into account

All XVA are not easy to compute / charge to customer / likely to be provisioned

- A bank **cannot always compute super complex valuation adjustments**: as they would cost a lot because of their computational costs;
- A bank **cannot always reserve what it wants**: reserving, means reducing the P&L and thus require the approval of external auditors;
- A bank **cannot always charge to customer what it wants**: the bank needs to take into account market practices.

Thus, these complex XVAs are studied essentially to **appreciate a more refined vision of profitability** when they appear to be an important component of the price.

Conclusion – Introduction to other XVA

Over The Counter Derivatives sometimes need to take into account other effects than counterparty risk

- **Other effects** such as collateral type, initial margin, scarce resources requirements **can impact the profitability of a deal**;
- For that reason, banks, and in particular XVA desks, work on **new metrics to have a more complete vision of profitability**;
- These refined metrics are nonetheless **complex to price**.

Conclusion

Counterparty risk is exotic and complex and is measured through metrics dedicated to pricing and risk management

- **Counterparty risk is complex and exotic** as it is fluctuating, bilateral, dependent on many factors among which correlations;
- Counterparty metrics are used to comply with **accounting and regulatory requirements** and also to determine **prices of OTC deals**;
- Other XVA are currently studied to take into account in profitability's metrics **more complex effects**.

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