Collateral Optimization : Liquidity Funding Value Adjustments, - Best Practices -

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Liquidity & Funding Value Adjustments, Best Practices

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Introduction

The aftermath of the global financial and European sovereign debt crises has helped highlight a **critical strategic challenge** for Financial Services: *Optimizing Collateral Management*.

Looking back, bankruptcy of "too-big-to-fail" banks such as Bear Stearns or Lehman Brothers triggered credit confidence to collapse and pushed collateral haircuts upwards by 5 points on average since 2008. Consequently, demand for high-quality collateral – cash and highly liquid securities (mainly G7 bonds) – skyrocketed as it demonstrates the good health of a dealer. However, the supply of quality liquidity plummeted, especially after the sovereign debt crisis. The liquidity crisis that followed during the second phase of the sovereign debt crisis drove banks to adapt their cash and collateral management activities to meet the new market demand.

With the entire financial system under heavy scrutiny, regulatory institutions in Europe and the US (respectively through Basel III, EMIR and Dodd-Frank) launched a new set of requirements to govern Financial Institutions in order to:

- **Internally reduce net exposions** impacting bank assets through specific mandatory adjustments such as Risk Weight Assets, Counterparty Value Adjustment and CVA VaR; or additional set of liquidity buffers (Basel III European regulations).
    - In Europe, an estimated amount of **EUR 2,89 Trillion**[1] would be necessary to reach the additional liquidity requirements of Basel III.

- **Improve transparency and collateralization** of sensitive products – such as derivatives and especially swaps (CDS, Interest Swaps) – to persuade Financial Institutions to clear their trades with a Central Counterparty and **externalize a great part of their counterparty risks**:
    - In 2012, an average of 71 percent of trades were reported to be collateralized (any type of OTC derivatives/ any dealer), 83.7 percent of large dealers OTC products[2].
    - Among these, the most collateralized OTC products: Credit Derivatives (93.4 percent) VS. Least collateralized: FX products (55.4 percent)
    - The required amount to cover total initial margin for cleared and non-cleared IRS and CDS OTC derivatives could range between USD $200 billion and USD $800 billion if 80 percent of trades are subject to central clearing[3].

Keywords: *Collateral Management, Collateral Optimization, Collateral Transformation, Liquidity, Funding, Refinancing, Cheapest-to-deliver collateral, Credit Value Adjustment, Debit Value Adjustment, Liquidity Value Adjustment, Funding Value Adjustment, CSA Discounting, OIS Discounting, Collateral Arbitrage*

JEL Classification*: C1, C5, G1*

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[1] Estimated financial impact according to a Basel Committee Study on Banking Supervision (December, 2010)
[2] ISDA Margin Survey 2012, Percent of trades subject to collateral agreements, by OTC derivative product type. Methodology: Percent of trade volume is the number of OTC derivative trades subject to any collateral agreement divided by the total number of derivative trades
[3] According to "OTC derivatives reform and collateral demand impact", a study handled by the Bank of England published in October 2012. Hypothesis: estimation evaluated under normal market conditions and holding the current gross notional amount outstanding fixed. "The wide range reflects the sensitivity to assumptions around netting efficiency."

Preamble

The purpose of this paper is to understand how the current financial landscape shaped by the crises and new regulations impacts Investment Banking's business model. We will focus on quantitative implications, i.e. valuation, modeling and pricing issues, as well as qualitative implications, i.e. best practices to manage quantitative aspects and handle these functions to the current Investment Banking organization.

We considered two pillars to shape our vision of collateral optimization:
1. **Collateral as a refinancing instrument.** Collateral is shifting from a mere hedging instrument for counterparty risk to a strategic refinancing instrument.
2. **Improve asymmetric collateral quality and profitability.** Recent requirements on collateralization highly impact collateral management through the increase in haircuts and funding of good-quality collateral. As a result, more and more banks are considering their net collateral balance as a KPI, i.e. monitoring their net collateral balance position and identifying the need in cash funding or transforming.

We built our approach on three key standards:
- In most cases, banks should prioritize the reception of cash and delivery of securities, what we call "Asymmetric Collateral Management".
    - This implies banks have to capitalize on their valuation functions to boost profitability of the net collateral balance and take advantage of pricing conditions (e.g. for CSA Discounting, precise valuation and pricing of LVA/FVA).
- Regarding Management of Non-Cash Collateral, banks should focus on
    - **Optimization of the cash-circuit** to manage the various levers of Non-Cash Collateral Transformation into Cash (repo market, central bank loans, re-hypothecation of received non-cash collateral as collateral for other deals).
    - **Management of the collateral quality (both received and delivered),** to source and receive high quality collateral and deliver lower quality collateral (**Cheapest-To-Deliver Collateral Management**).
- Considering **Management of Liquidity Issues**, banks should carefully consider Collateral Management in case of liquidity issues (e.g. sale in case of default, use of re-hypothecation). Being unable to deliver good quality collateral can be seen as a negative sign for the counterparty's financial health. We will further study the Collateral Offer Services of top financial institutions, providing specific expertise and a tailor-made approach to the new challenges of Collateral Management.

Keywords: *Collateral Management, Collateral Optimization, Collateral Transformation, Liquidity, Funding, Refinancing, Cheapest-to-deliver collateral, Credit Value Adjustment, Debit Value Adjustment, Liquidity Value Adjustment, Funding Value Adjustment, CSA Discounting, OIS Discounting, Collateral Arbitrage*

1. Liquidity & Funding Value Adjustments

1.1 Preamble

With liquidity scarce, refinancing is on top of financial institution's priorities.
Cash collateral is remunerated at a low rate (generally close to the overnight funding rate), and constitutes a great channel of cheap refinancing.

A dealer's objective is to receive more collateral (in cash, if possible) to offset risks on trades than they post on their liabilities. Therefore, those additional assets are used to finance the bank at a low rate.

There are several ways a dealer can use to achieve this:
- For collateral received in cash, the goal is to receive more collateral (in cash by preference) than posted in order to achieve the highest positive net cash collateral balance.

- For collateral received in the form of securities, there are three possibilities**:**
    - **Transformation into cash**: The objective is to convert the securities into cash, by the re-hypothecation (repos, exchanging the collateral at Central banks for cash, posting the securities as collateral for other deals)
    - **Liquidity Coverage Ratio eligibility**: Indeed, if the securities are eligible to the LCR, then it permits to replace the retained cash used to be above the ratio. If the securities are not eligible to the LCR, then the dealer has to try to exchange them for eligible securities.
    - **Equity Management**: For kept securities (eligible to the LCR or not), the bank may study the accounting options and potential challenges to enhance the value and monitor the variability of its equity.

1.2 Cash Collateral

1.2.1 CSA Discounting (OIS Discounting)

Before the financial crisis, the default of a derivatives seller was not considered probable. All pricing models assumed there was no chance of default, and that dealers could borrow or lend at a risk free rate. According to this assumption, LIBOR, the interbank rate of each specified currency zone, was supposed to represent the best estimation of the risk free rate.

After the Lehman Brothers default, the lack of confidence between banks prompted a credit crunch. As a result LIBOR increased sharply. The LIBOR-OIS spread, which is about 10 basis points in normal market conditions rose to a record 364 basis points in October 2008.

This incident led to the following conclusions:
- Zero risk does not exist: The financial community and regulators work on a better measure of counterparty credit risk (CVA, DVA…)
- A real risk free position can be set up by a full and perfect cash collateralization
- The best estimate for a risk free rate is not LIBOR but OIS - an overnight position is much closer to a riskless position

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Thus, the collateral rate commonly defined in Collateral Agreements (CSA) is the OIS rate. **The CSA (or OIS) discounting consists in using the collateral rate for discounting collateralized transactions**.

When a dealer sells a product, he receives an amount in cash equal to the present value. Then he posts this cash as collateral. The buyer pays the collateral rate on the cash collateral. For no arbitrage, the Future Product value has to be equal to the Future Collateral value. Thus, the discounting risk free rate must be the collateral rate.

CSA DISCOUNTING - CONCEPT

PRODUCT VALUE		COLLATERAL VALUE

$$PV = e^{-rT} EV$$
$$Risk\ free\ rate = r$$

$$Cash\ Collateral\ Value = PV$$
$$Collateral\ rate = r_C$$

FUTURE PRODUCT VALUE		FUTURE COLLATERAL VALUE

$$Future\ Product\ Value = EV = e^{rT} PV$$

$$Future\ Collateral\ Value = e^{r_C T} PV$$

$$No\ Arbitrage$$
$$r_C = r$$

$$PV = e^{-r_C T} EV$$

$$PV = Present\ Value$$
$$EV = Expected\ Value$$
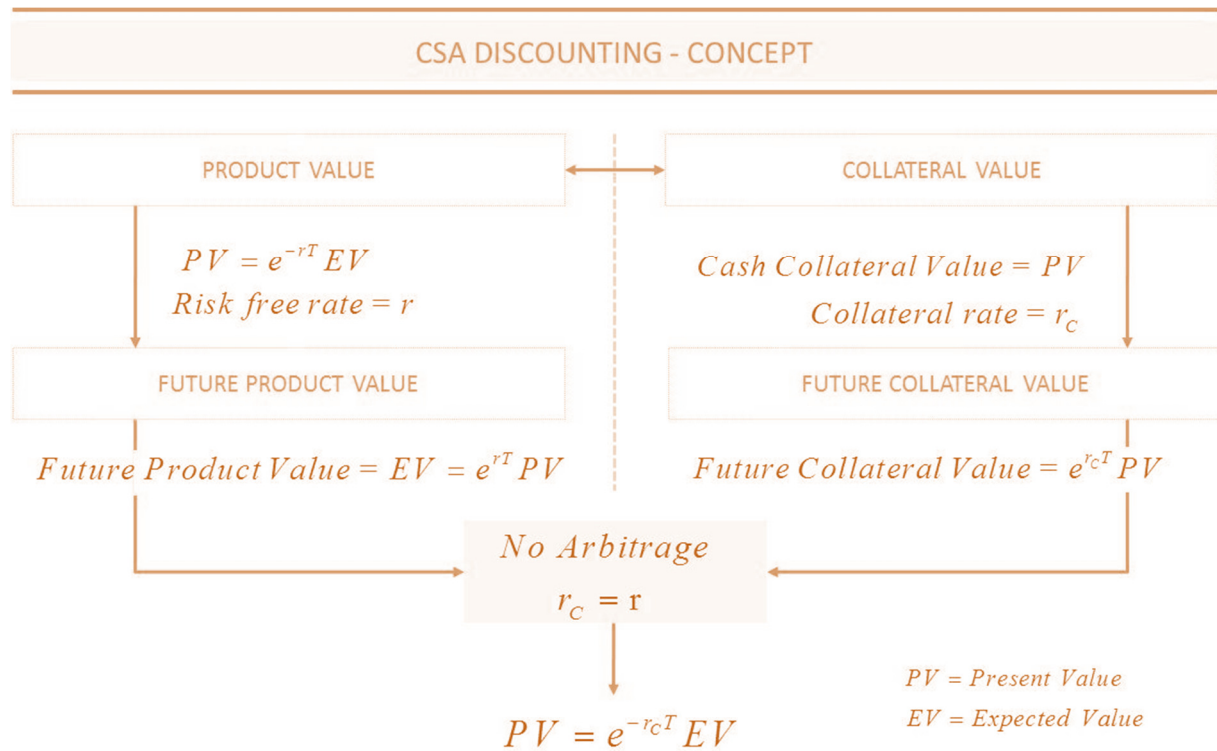
1.2.2 A pricing framework for collateralized derivatives contracts

CSA Discounting applies when the contract is fully collateralized. It does not take into account partial collateralization, or other impacts linked to partially collateralized deals.

In this section we present a pricing framework for all collateralized derivatives contracts.
This framework starts from the value of the derivative contract discounted at risk free rate, and adds successive adjustments to obtain an economic value that comprises residual risks costs (and that matches with their corresponding hedging derivatives).

For the sake of simplicity, we assume that recovery rates are null (CDS Spread coincides with default intensity and Loss Given Default = 1). The results remain valid with recovery rates > 0.

1.2.2.1 Liquidity Value Adjustment

Definition: The **Liquidity Value Adjustment (LVA) is the discounted value of the difference between the collateral rate and the risk free rate on the collateral**, and it represents the profit or loss produced by the liquidation of the Net Present Value of the derivative contract due to the collateralization agreement.

We suppose that the collateral rate differs from the risk free rate, so if the contract is (even partially) collateralized, then the value of the operation has to take it into account.

We define γ as the collateralization percentage ($\gamma = 0$ corresponds to a non-collateralized contract while $\gamma = 100\%$ corresponds to a fully collateralized contract).

As described above, if the contract is fully collateralized, then we can apply the collateral rate to discount the expected value of the contract.

Thus, the Liquidity Value Adjustment on a cash collateralized operation is:

$$LVA = -\left(1 - e^{-\gamma(r_C - r)T}\right),$$

Where r_C is the collateral rate, and:

$$PV(with\ LVA) = [1 + LVA] * PV(risk\ free)$$

$$PV(with\ LVA) = e^{-\gamma(r_C - r)T} * PV(risk\ free) = e^{-\gamma(r_C - r)T} * EVe^{-rT}$$

$$PV(with\ LVA) = EVe^{-[\gamma r_C + (1-\gamma)r]T}$$

1.2.2.2 Funding Value Adjustment

Definition: The **Funding Value Adjustment (FVA) is the discounted value of the difference between the real rate to apply and the risk free rate on the uncollateralized part of the contract**. It represents the profit or loss produced by the liquidation of the Net Present Value of the derivative contract due to partial non-collateralization.

On a partially collateralized derivative contract, we studied how to evaluate the collateralized part by discounting with the collateral rate. The uncollateralized part is discounted with the risk free rate, but we know that this part is not riskless.

To determine how to price these remaining risks, we split the contract in two parts:
- The first part contains the expected value. We assume that the expected value will be paid at maturity and not at inception (as usual). Thus, at maturity, the seller pays the payoff and the buyer pays the value expected at inception.
- The second part represents the case when the buyer pays the premium not at maturity, but at inception. It exactly corresponds to a bond with a notional equal to the expected value.

DECOMPOSITION OF THE OPERATION

EXPECTED VALUE AT INCEPTION

EXPECTED VALUE AT MATURITY

$$PV = e^{-rT}EV$$

e^{-rT}

EV

ZERO COUPON
DISCOUNT FACTOR

t
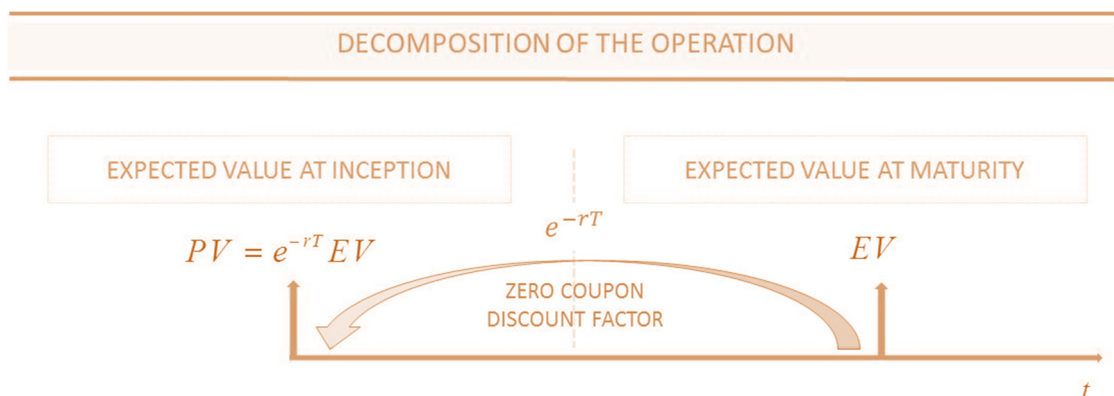
Thus, on the uncollateralized part of derivative contracts, the operation value is equal to the value of a zero coupon bond, issued by the seller, on a notional equal to the expected value.

A bond rate is constituted by three rates:
- The Risk Free Rate
- The Default Risk Spread Rate
- The Bond-CDS Basis Spread Rate

The Default Risk Rate is represented by the CDS Spread Rate, which corresponds to the cost of the counterparty probability of default before the maturity of the contract.

The Bond-CDS liquidity basis rate represents the difference of a bond spread and the matched maturity CDS spread on the same issuer/underlying. This difference can arise from credit factors (e.g. documentation, convertible issuance, expectations of debt buybacks) or liquidity factors (e.g. liquidity differences between markets, low bond market supply).

Similarly to the Liquidity Value Adjustment, the Funding Value Adjustment on a partially cash collateralized operation is: $FVA = -\left(1 - e^{-(1-\gamma)(r_{CDS} + r_{Liquidity})T}\right)$

Where r_{CDS} is the CDS Spread rate and $r_{Liquidity}$ is the Bond-CDS basis spread rate. Thus:

$$PV(with\ LVA\ \&\ FVA) = [1 + FVA] * PV(with\ LVA)$$

$$PV(with\ LVA\ \&\ FVA) = e^{-(1-\gamma)(r_{CDS} + r_{Liquidity})T} * PV(with\ LVA) = e^{-(1-\gamma)(r_{CDS} + r_{Liquidity})T} EVe^{-[\gamma r_C + (1-\gamma)r]T}$$

$$PV(with\ LVA\ \&\ FVA) = EVe^{-[\gamma r_C + (1-\gamma)(r + r_{CDS} + r_{Liquidity})]T}$$

1.2.2.3 Key Remarks/Findings

We notice the following points:
- The full CSA Discounting corresponds to the particular case on which $\gamma = 100\%$.
- If the risk free rate is equal to the collateral rate, then LVA = 0.
- If the operation is fully collateralized ($\gamma = 100\%$), then FVA = 0.
- The framework presented is valid with values of recovery >0.

- The part represented by r_{CDS} alone corresponds to the CVA/DVA adjustment on the MtM (instead of Exposure at Default). It is already comprised in the whole CVA/DVA impact.
- The objective of these adjustments calculation is to have a value which takes into account the real risks and costs the contract will involve. Knowing the real value of the contract, the dealer anticipates its hedging costs. Then, with complete information and competitiveness constraints, the dealer can decide to impact the client's price proposed to the client or not.
- The drift rate is equal to the risk free rate, in case of index or borrowable asset underlying. Indeed, for indices, futures prices are quoted using the risk free rate, and for borrowable assets, the asset is bought and then lent (the loan of assets is fully collateralized in cash, thus the balance is flatted, but the asset lender pays the collateral rate, assimilated to the risk free rate).

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1.3 Non-Cash Collateral

1.3.1 Wrong Way Risk

As a first step, the collateral in form of securities requires the upstream monitoring of an implied specific risk: the Wrong Way Risk.

Definition: **The Wrong Way Risk (WWR) is the implicit existence of a negative correlation between the counterparty's exposure and credit quality**.
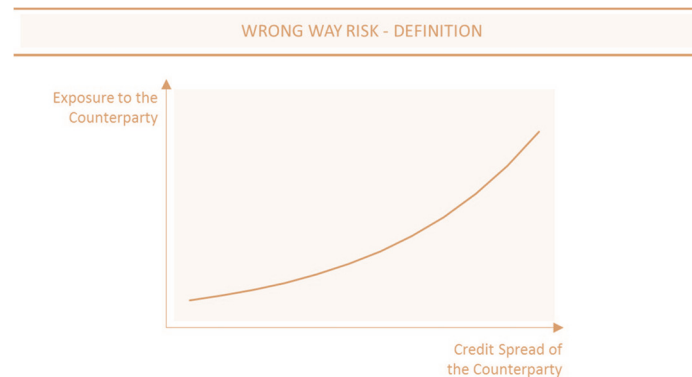
In a non-cash collateralized product, the Wrong Way Risk can have two aspects:
- **Collateral / Product Wrong Way Risk**: Collateral must be non-negatively correlated with the payoffs of products it guarantees.
- **Collateral / Counterparty Wrong Way Risk**: Collateral must be non-positively correlated with the counterparty financial health or with the counterparty guarantors (clearly defined or potential) financial health.
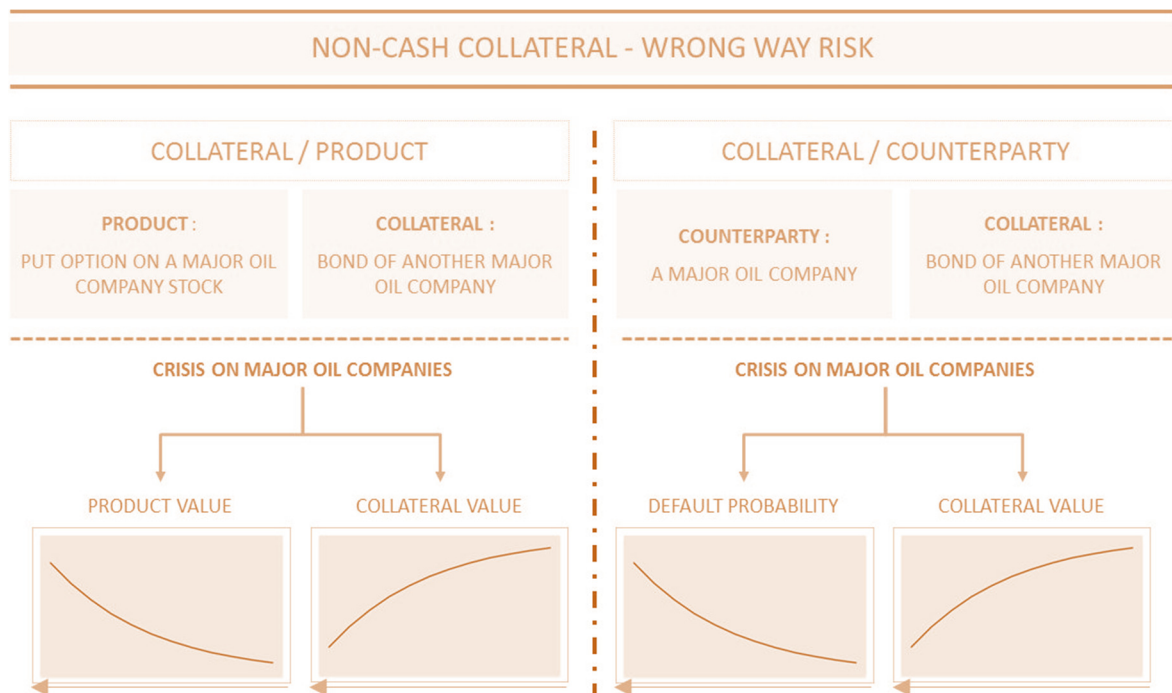
To ensure upstream management and be certain not to hold wrong way positions, the monitoring of these correlations, on top of other considerations, must be ex-ante controlled.

1.3.2 Transforming Securities into Cash

For non-cash collateral, the Wrong Way Risk is a specific risk due to the nature of the collateral securities. It is an inefficiency of the collateral in its main role, which is to guarantee a replacement value in case of default.

The subsequent parts do not address the collateral management in its guarantee role, but the collateral optimization as a liquidity provider.

Firstly, we will study the most intuitive option to provide liquidity, the exchange for cash.

When a dealer holds collateral securities, his first action is to study the options to transform these securities into cash.

The main possibilities to transform non-cash collateral into cash are:

- **Repo operations**: The haircut and the rate of a security loan are determinant. Indeed, the value of a security loan is $SL = S * (1 - H_{SL}) * e^{-r_{SL}T}$, where S is the securities value, H_{SL} is the security loan haircut and r_{SL} the security loan rate.

- **Central bank loans**: These collateralized loans (with low rates) are similar to repo operations. The Central banks accept a wider range of products, particularly since the beginning of the sovereign debt crisis.

- **Re-hypothecation as collateral**: The re-hypothecation as collateral is not a direct transformation into cash like repo or central bank loans, it is a transformation "by replacement". It consists in posting the received non-cash collateral (instead of posting cash) as collateral on other operations.

For valuation, these three cases can be assimilated to the repo case. Indeed, central banks loans are securities loans and re-hypothecation as collateral is equivalent to make a repo operation and post the resulting cash as collateral.

1.3.2.1 Liquidity Value Adjustment

Assuming that securities posted as collateral can be transformed into cash by one of the enumerated possibilities, the Liquidity Value Adjustment for non-cash collateral is similar to cash collateral, with the involved modifications due to non-cash collateral specificities.

We saw above that the security loan value is: $SL = S * (1 - H_{SL}) * e^{-r_{SL}T}$.

Thus, the cash conversion value is: $Cash\ Conversion\ Value = S * (1 - H_{SL})$, and the continuous rate paid on this value is r_{SL}.

On the collateralized part, the buyer receives securities instead of cash. The buyer and the seller have defined in the CSA what type of securities can be posted and their haircuts.

Thus, the value of posted securities is equal to the present value (PV) divided by $(1 - H_{CSA})$, where H_{CSA} is the haircut defined in the CSA and applied to the securities posted as collateral.

$$Securities\ Value = PV\ /\ (1 - H_{CSA})$$

Thus, the cash conversion value of the non-cash collateral is equal to:

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$$Cash\ Conversion\ Value\ (CCV) = PV * (1 - H_{SL}) / (1 - H_{CSA})$$

The security lending market is a collateral market. Thus, the haircut applied on one security is unique. For no arbitrage, dealers must have defined $H_{CSA} = H_{SL}$, then: $CCV = PV$

The security loan rate (r_{SL}) is the rate paid on the cash conversion value, which corresponds to the collateral rate, and then: $Future\ Collateral\ Value = PVe^{r_{SL}T}$.

Following the same reasoning as in the cash collateral case, we obtain that the fully non-cash collateralized operation value is:

$$Fully\ Non\text{-}Cash\ Collateralized\ Operation\ Value = EVe^{-r_{SL}T}$$

The Liquidity Value Adjustment on a partially non-cash collateralized operation is then:

$$LVA = -\left(1 - e^{-\gamma(r_{SL}-r)T}\right)$$, where γ is the collateralization and r_{SL} is the security loan rate.

Thus:

$$PV(with\ LVA) = [1 + LVA] * PV(risk\ free) = \left[1 - \left(1 - e^{-\gamma(r_{SL}-r)T}\right)\right] * PV(risk\ free)$$

$$PV(with\ LVA) = e^{-\gamma(r_{SL}-r)T} * PV(risk\ free) = e^{-\gamma(r_{SL}-r)T} * EVe^{-rT}$$

$$PV(with\ LVA) = EVe^{-[\gamma r_{SL}+(1-\gamma)r]T}$$

1.3.2.2 Funding Value Adjustment

We saw above the pricing of the Liquidity Value Adjustment in the non-cash collateral case. In the same way as for the Liquidity Value Adjustment, the Funding Value Adjustment for non-cash collateral is similar to cash collateral, with the involved modifications due to non-cash collateral specificities.

The Funding Value Adjustment applies only on the non-collateralized part of the operation.
Thus, its own value is not different with cash or non-cash collateral. The only difference is the final value of the operation.

The Funding Value Adjustment on a partially non-cash collateralized operation is:

$$FVA = -\left(1 - e^{-(1-\gamma)(r_{CDS}+r_{Liquidity})T}\right)$$, where r_{CDS} is the CDS Spread rate and $r_{Liquidity}$ is the Bond-CDS basis spread rate.

Thus:

$$PV(with\ LVA\ \&\ FVA) = [1 + FVA] * PV(with\ LVA)$$

$$PV(with\ LVA\ \&\ FVA) = \left[1 - \left(1 - e^{-(1-\gamma)(r_{CDS}+r_{Liquidity})T}\right)\right] * PV(with\ LVA)$$

$$PV(with\ LVA\ \&\ FVA) = e^{-(1-\gamma)(r_{CDS}+r_{Liquidity})T} * PV(with\ LVA)$$

$$PV(with\ LVA\ \&\ FVA) = EVe^{-(1-\gamma)(r_{CDS}+r_{Liquidity})T}e^{-[\gamma r_{SL}+(1-\gamma)r]T}$$

$$PV(with\ LVA\ \&\ FVA) = EVe^{-\left[\gamma r_{SL}+(1-\gamma)(r+r_{CDS}+r_{Liquidity})\right]T}$$

1.3.2.3 Key remarks/findings

We notice the following points:

- The framework presented is only valid on re-hypothecable and transformable into cash assets received as collateral.
- The framework presented is valid with values of recovery >0.
- If the operation is fully collateralized ($\gamma = 100\%$), then FVA = 0.

- The part represented by r_{CDS} alone corresponds to the CVA/DVA adjustment on the MtM (instead of Exposure at Default). It is already comprised in the whole CVA/DVA impact.
- The framework presented does not take into account the possibility of non-recovery of re-hypothecated collateral. This point has been considered in the article: Brigo, D., Capponi, A., Pallavicini, A. & Papatheodorou, V. 2011. *Collateral Margining in Arbitrage-Free Counterparty Valuation Adjustment including Re-Hypotecation and Netting (cf Bibliography* [5])

1.3.3 Liquidity Coverage Ratio Eligibility

As an alternative to transforming securities into cash, instead of directly exchanging non-cash collateral for cash, the dealer can study the eligibility of securities to the Liquidity Coverage Ratio.
The objective is to keep securities eligible as High Quality Liquid Assets (or exchange non eligible securities for eligible securities).

LIQUIDITY COVERAGE RATIO

$$\frac{\text{SUM OF HIGH QUALITY LIQUID ASSETS}}{\text{TOTAL NET CASH OUTFLOWS OVER THE NEXT 30 CALENDAR DAYS}} \geq 100\%$$

The idea is that securities eligible as High Quality Liquid Assets (HQLA) are not cash but can replace the cash allocated to the Liquidity Coverage Ratio.

Indeed, with cash being the most liquid asset (in level 1 of High Quality Liquid Assets), it is used in addition of securities to complete the collection of the High Quality Liquid Assets.
Thus, each kept eligible securities free cash from the portfolio of assets dedicated to the LCR.

The High Quality Liquid Assets are composed of two levels of eligible assets:

- **Level 1**: This level includes cash, central bank reserves and certain marketable securities backed by sovereigns and central banks. There is no limit on the extent to which a bank can hold these assets to meet the LCR**. Level 1 Assets are not subject to a haircut.**
- **Level 2**: Assets of this level may not account for more than 40 percent of a bank's total HQLA. A minimum 15 percent haircut is applied to the current market value of each Level 2 asset held in the stock. They are sub-divided into Level 2A and Level 2B:
    - **Level 2A** assets include certain government securities, covered bonds (backed by on-balance sheet mortgages or other loans) and corporate debt securities.
    - **Level 2B** assets include lower rates corporate bonds, residential mortgage-backed securities and equities which meet certain conditions. These assets may not account for more than 15 percent of a bank's total stock of HQLA.

1.3.4   Equity management

When non-cash collateral is kept in the books (eligible to the LCR or not), the dealer usually puts the profits or losses of these assets in the "Accumulated Other Comprehensive Income" (AOCI) subsection of the Equity.

The "Other Comprehensive Income" is the difference between net income as in the Income Statement (Profit or Loss Account) and comprehensive income. It represents certain gains and losses not recognized in the P&L Account. These comprehensive income items are aggregated each earnings period, and thus are gathered in the AOCI statement.

This setting permits to keep securities (High Quality Liquid Assets or illiquid collateral) without hitting the equity base with their profits and losses.

A 58-word footnote in paragraph 52 of the Basel III document proposal revealed that the AOCI filter was under analysis for potential removal. This removal would lead to a huge volatility in the capital.

The Available For Sale Bonds, eligible as High Quality Liquid Assets (sovereign and agency bonds), represent a major part of these kept securities, as their first function is to hedge the deposit-taking business.

The certain development of OTC clearing with Central Counterparties, which admit only best sovereign bonds as non-cash collateral, will increase their scarcity.

The AOCI filter removal, if applied, would further intensify the lack of good quality collateral, as major players will only wish to hold in their books the lowest volatile assets.
Moreover, in our context of low rates, this will cause massive losses when rates will rise back.

To size the impact of this potential change, Bank of America, Citigroup, JPMorgan, Wells Fargo's Available For Sale portfolios accounted for USD 1.1 trillion in Q3 2012, with Mark to Market swings allowing for large CET1 volatility.

These points are currently being discussed with regulators as major banks try to convince them not to remove this filter.

Alternative solutions are being studied, like booking the AFS Bonds in Amortized Cost instead of Fair Value or allowing for both unrealized gains and losses to flow into CET 1.

These answers are not a panacea, as they would not resolve all the problems, or create others (due to the necessary rotation in the AFS Bonds portfolio or the remaining CET1 volatility).

2. Best Practices & Key Organizational Challenges

2.1 Preliminaries: Central Banks Collateral Eligibility practices

As an introduction to this section, we will first review the synthetic results of a comparative study of the evolution of major central banks' Collateral Management policies and associated eligibility criteria between mid-2007 and late 2012. This comparative study is based on the comparison between the practices of Central Banks in terms of collateralization and in particular, eligibility of financial institutions' assets as collateral.

Central Banks Eligibility Practices:
An Example Of The Evolution Towards More Flexibility In The Eligibility Of Key Asset Types

Central Banks per jurisdiction	Type of assets and eligibility as of end-July 2012						Cross-border type	
	Public Sector Securities	Financial Entity Debt	Covered Bonds	Other Asset-Backed	Corporate Debt	Non-Securities	Cross-border issuer	Cross-border currency
Australia	○	◑	●	●	●	-	●	-
Canada	○	-	-	-	-	-	-	-
Eurosystem	○	○	○	○	○	◑	○	●
Japan	◑	●	-	○	◑	◑	○	●
Mexico	○	●	-	●	●	○	●	●
Singapore	◑	-	-	-	-	-	●	●
Sweden	○	●	◑	○	○	-	○	○
Switzerland	○	○	○	-	○	-	◑	◑
United Kigdom	○	●	●	●	●	●	◑	◑
United States	○	○	◑	○	○	◑	○	○

Legend	
○	No evolution in the eligibility criteria: This type of assets was already eligible as collateral before mi-2007
◑	Broadened eligibility criteria: Some assets of this type have been accepted as collateral from 2007 on
●	Recent eligibility of one complete type of assets: Each asset has been accepted between mid-2007 and end-July 2012
-	Ineligibility: None of the assets of this type are eligible

Sources: Bank for Inernational Settlements, *Central bank collateral frameworks and practices (Marc 2013)*; CH GRA internal analysis

In response to the conditions stressing the financial markets between mid-2007 and 2012, Central Banks tend to include more flexibility in terms of eligibility criteria *(cf. table above)*. They tend to widen their range of eligible assets, not only in terms of typology of assets but also in terms of cross-border type of issuer and currency. Furthermore, Central Banks specifically adapted their cross-border arrangements to optimize the eligibility of assets issued in foreign currencies and therefore encourage circulation of liquidity over the borders.

- Bank of Canada included US Treasuries in its set of eligible collateral for its Standing Liquidity Facility in 2008.
- Bank of England and the Swiss National Bank [4] – as leaders in terms of cross-border arrangements even before the crisis – broadened their cross-border eligibility criteria in terms of both cross-border issuer and currency.

Central Banks also tend to take better account of their counterparty risk-profile and credit-worthiness in weighting specifically the terms of their arrangement according to stress and risk indicators:

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[4] It should be mentioned here that the Swiss National Bank had already planned to broaden its set of eligible cross-border arrangements and criteria before 2007 and the financial crisis.

- Impacting valuation haircuts and initial margins according to volatility. A concrete illustration is the Sveriges Riksbank decision to impact higher add-on haircuts for foreign exchange risk for USD- and JPY-denominated collateral to reflect higher FX volatility
- Considering sensitivity and stressed parameters impacting the markets in the haircuts' structure through various characteristics (type, maturity, credit, liquidity of the assets). For example, the Eurosystem added a liquidity category dedicated to marketable assets and made haircuts vary also with credit quality triggers.

The main outcomes of these for our study is to understand that there are various standard levers (among them eligibility criteria) to be considered when dealing with a counterparty and therefore when negotiating collateralization arrangements.

The flexibility and trend of standardization which pushed Central Banks to adapt their conditions towards their dealing counterparty hints what will probably be a key concern in the coming years for the financial services industry.

On top of this, other factors push Collateral Management under scrutiny. To build our set of best practices we adopted different points of view to cover the different scopes and sets of Collateral Management best practices:

- **Optimizing the collateralization** through technical levers and appropriate negotiation of legal contracts & annexes.
- **Improving the organizational business model and cost structure of collateral management** through strategic choices / trade-offs:
  - In terms of articulation of business units and specialized desks,
  - In terms of cost-structure (internalization vs. externalization).

2.2 Overview of the Collateral Management Standard Practices

2.2.1 Current Operational Practices[5]

For the purposes of this paper, we won't enter into much detail on following practices, which increasingly tends to be current practices, especially among large dealers. The synthesis of main current practices that have already impacted the financial services organizations is:

- **Daily portfolio reconciliation:** In 2012, more than 70 percent of large dealers reconcile their portfolio daily (compared to 60.8 percent in 2011).
- **Collateral optimization** (i.e. as defined in the ISDA Margin Survey 2012: definition of haircuts into CSA, ability to post and re-hypothecate, cost of reinvestment and yield, availability of assets): 67 percent of the respondents are already optimizing their collateral.
- **Daily collateral optimization:** More than 71 percent out of the latter 67 percent optimize their collateral on a daily basis.
- **Collateral re-hypothecation:** In 2012, 96 percent of the collateral posted by large dealers was eligible for re-hypothecation. 91 percent out of this was effectively re-used.
- **Usage of ISDA agreements and associated CSA:** 85 percent of OTC transactions were contracted through collateral agreements (i.e. 137,869 active agreements in 2012) out of which 88 percent comprise CSAs and 84 percent are bilateral.

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[5] *Each figure mentioned in this paragraph comes from the ISDA 2012 Margin Survey, issued in May, 2012.*

Two types of practices have been distinguished:
- **Usage of collateral:** As stressed above (cf. *paragraph 2.1*), considerations over eligibility of collateral are reshaping the collateral landscape.
- **Management of Thresholds, Independent Amounts and Variation Margins:** As key amounts composing Credit Support Amounts and enabling flexibility between counterparties.

2.2.2 Usage of Collateral: Cash and Government Securities

Traditionally, cash and government securities have always been predominant types of assets used as collateral. The 2012 ISDA Margin Survey estimated they **represented 90.4% of collateral received and 96.8% of collateral delivered**, **and cash represented 80% of the collateral**.

2.2.3 Levers of Collateralization: Independent Amount Practices

Independent Amount (IA) are commonly used on the market under Direct Dealer Unrestricted IA Holding, which is the direct owner of IA and can re-use / re-invest these amounts (cf. description of IA Holding models part 2.4.2). As a matter of fact,
- IA is in 74 to 80 percent of cases delivered with Variation Margin (VM) without segregation requirements (depending on received or delivered IA, by large dealers specifically or by every dealer in general);
- 17.4% of the IA received are held in custody by Tri-Party Custodian;
- When receiving IA, large dealers are more eager to use the service of a custodian to segregate their IA (in volume, 10.2% of all dealers received IA vs. only 0.6% of large dealers).

2.2.3.1 Preliminaries to Considering Application of Independent Amount

It should be stressed that any transaction is not eligible to apply any type of arrangement.

(i) Considering the type of OTC transactions
As mentioned above, using CSA annexes under ISDA contracts became more and more usual during these last years. Though figures tend to vary according to:
- **The type of deal:** Typically, 54 percent of short-term FX products (less risky and not worth to collateralize considering the time and costs of collateralization) were traded under an ISDA with a CSA, compared to 93 percent of CDS contracts – which are credit risk reduction products and considered riskier transactions.
- **The type of dealing counterparty:** FX deals are often traded by non-financial industries which tend to trade less under ISDA with associated CSA annexes.

As a consequence OTC transactions that are not governed by a standard ISDA contracts (such as Commodities and FX products) won't be encompassed in the scope of our best practices.

(ii) Considering the type of legal jurisdictions and applicable form of collateralization
There are differences in the usage of contracts according to region and countries. The most current forms of collateralization provided upon ISDA contracted trades and supported by CSA annexes are Security Interest or Title Transfer.

Segregation and best practices concerning holding of Independent Amount and Variation Margin are actually applicable only under Security Interest form.

Considering Security Interest Versus Title Transfer Form Of Collateralization:
Main Principles & Key Outcomes

Type of CSA	Security Interest		Title transfer	
	New York Law Credit Support Annex		English Law Credit Support Annex	
Definition	Provides the receiver with **the right and guarantee** to dispose from the collateral delivered **upon the occurrence of a credit event or other contractually defined enforcement events.**		Provides the receiver with **direct transfer of propriety** as soon as the collateral is delivered to the counterparty or escrow agent.	
Direct Implication	Receiver <u>does not own the collateral</u> unless there is occurrence of an enforcement / credit event.		Receiver <u>becomes the direct owner and therefore user</u> of collateral as soon as it is delivered.	
Regional / Country usage	Most current form of collateralization **in the US and Asia.** 90% associated to an Unrestricted Holding of IA (consequently authorizing re-hypothecation of collateral).		Most current form of collateralization **in Europe.**	
Specific Agreements To Proprietary Limitations	Yes	No	Yes	No
1) Segregation of IA and VM	Upon any Indirect Holding of IA model	Upon Unrestricted Holding of IA model	In some specific legal complex constructions, **though not recommended**	By essence, as the receiver is the proprietary at collateral delivery
2) Collateral Re-Hypothecation	Upon Segregated Direct Dealer Holding of IA	Upon any other Indirect Holding of IA models	Yes	Yes
Estimation of the Contract Flexibility	High		Limited	
Key Findings	- Flexibility is provided through **standardization of specific clauses by appropriate entities** (such as ISDA) or business lawyers (provisioning in case of default, different types of holding of IA arrangements / segregation business models etc.)		- Title transfer imply by essence an outright transfer of ownership at collateral delivery. - **Segregation and other forms of proprietary limitations will need to be applied through complex legal constructions.**	

<u>Sources:</u> International Swap & Derivatives Association, *Independent Amount White Paper,* March, 1st, 2010 (Release2.0), CH GRA internal analysis

2.3 Best practices towards superior management of contract terms, complementary to liquidity and funding strategy

We will focus on:
- Contractually-defined amounts impacting exposure, as Independent Amount and Thresholds.
- The types of business models and conditions in which such amounts are hold, taking into consideration externalization, segregation and delivery conditions.
- Various forms of delivery / property and segregation of these contractual amounts.

Following our comparison between typical European and US contractual practices, counterparties should be able to freely choose their forms of contract considering their needs (e.g. a European Transfer Title form of collateralization is not adapted to segregation of IA / VM).

Best Practice (Contract flexibility enabling flexible negotiation)

Any dealer should be authorized and free to define with the dealing counterparty the terms of their transactions independently from their jurisdictions.

The essential resources to be provided for drafting a first version of the contract should be:
*   - A set of applicable standardized clauses (provisions, contract enforcement in case of default, agreements regarding proprietary limitations, remuneration rate of collateral etc.),*
*   - The support of legal specialists or at least appropriate entities.*

Other inputs should be part of the agreements negotiation, particularly information regarding:
*   - Risk profiles and strategies of the counterparties,*
*   - Risk that the parties are willing to take or hedge,*
*   - Agreements and actions to be taken in the event of default.*

Note regarding segregation considerations: Before beginning with segregation, as one of the key levers of collateralization, we should stress one important point: Variation Margin shouldn't be considered segregated, because its aggregation mitigates the risk (e.g. by netting).

Note regarding Independent Amount: As we stressed earlier separating valuation considerations for both cash and non-cash collateral, it should be highlighted that best practices concerning segregation of Independent Amount apply to non-cash collateral.

2.3.1 Key collateralization levers: definitions, main characteristics and purposes

The main components of a collateralized exposure are: Credit Support Amount, Variation Margin, Independent Amount, Thresholds. The terms and valuation are specified within the ISDA contract.

Every definition provided below is based on the contractual definitions specified upon the contracts and annexes of a standard New York Law CSA and consequently based on ISDA definitions and other sources specified in the bibliography.

Definition: **Credit Support Amount** (CSA) is the amount of collateral delivered on a periodical basis (market practices is daily, especially by large dealers). The amount to be delivered is exchanged between the counterparties; the Pledger (or the Delivering Party) will deliver the due amount to the Receiver (also known as the Secured Party).

Definition: **The threshold amount** is an unsecured credit exposure that the parties are prepared to accept before asking for collateral.

It can be defined as either a fixed or variable currency amount that changes in response to changes in the credit rating of the party concerned. Ideally, threshold amounts are set at relatively low levels in order to maximize credit risk mitigation.

Definition: The **Independent Amount,** (also called Initial Margin[6],) is an additional credit support amount that is required over and above the market value of the trade portfolio.

It can be defined as any amount that the parties agree, expressed as a fixed currency amount, a percentage of the notional, or a computation of value-at-risk. Independent Amount can be defined at the level of the portfolio between two parties, or uniquely for each individual transaction.
The main purpose of the independent amount is to cover the anticipated market movement during any potential liquidation process.

Thus $\textit{\textbf{Credit Support Amount}}\,(t) = \max(0, E(t) - Tp) + \sum_P IA(t) - \sum_{SP} IA(t)$

And $\textit{\textbf{Variation Margin}}\,(t) = CSA(t) - CSA\,(t-1)$

Where t is the date of delivery,
The involved parties in the contract are as follows: the Pledger P and the Secured Party SP,
$E(t)$ is the Exposure of the Secured Party,
$\sum IA(t)$ is the sum of aggregated Independent Amount applicable and due on t time
Tp is the Threshold of the Pledger

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[6] The Independent Amount applies mostly for bilateral agreements whereas Initial Margin is associated with cleared trades through Clearing Houses.

Therefore the valuation and level of collateralization will mainly depend on the amount and characteristics of the Independent Amount and Threshold. These amounts can be understood as "buffers" that increase or decrease the Credit Support Amount. They are deeply correlated to the overall credit exposure, counterparty creditworthiness and risk profile.

- Independent Amount increases the value of posted collateral, and is considered as a form of financial guarantee, as an additional part of collateral to protect the Counterparty against residual risks.
- On the contrary, Threshold reduces the overall exposure, which implies the Counterparty accepts to keep a certain amount of risks within its books.

Best Practices (Proprietary Arrangements)

Independent Amount and Threshold are antagonist principles and tend to cancel each other out when contracted under the same agreements.

These arrangements are a key step of negotiation where clauses and terms of the agreements (such as Independent Amounts and Thresholds) should reflect the risk strategies of each counterparty, as Independent Amounts and Thresholds are the illustration of how much risk each counterparty is willing to respectively secure with a guarantee or take.

In anticipation to *Part 2.4 Organizational Impacts*, it should be noted that negotiation of arrangements as a key part of deal initiation, should closely be handled together with:

- **Front Office:** Considering parameters involved in deal, collateralization pricing, and negotiating the collateral agreement terms
- **Risk Management:** Analysis of the deal's risks, comprising the collateral risk-profile (including the analysis of the CSA terms as Independent Amounts and Thresholds)
- **To a lesser extent Legal & Compliance:** Supporting Front Office and Risk Management inputs and validating the appropriate clauses to suit the counterparty's needs.

2.3.2 Strategic Trade-offs when entering into an OTC transaction under standardized agreements:

The negotiations between counterparties can be interpreted as a trade-off between Segregation and Re-hypothecation, as it confronts two antagonist principles:

- On the one hand, it ensures the propriety of delivered assets and perfection of claims,
- On the other hand, it optimizes the return of posted collateral in authorizing re-hypothecation.

2.3.2.1 Mitigation of Legal risks vs. Funding / Liquidity optimization

The financial crisis provided many examples of counterparties - hedge funds for example - engaged in transactions with "too-big-to-fail" institutions that were unable to get back their collateral pledge for various reasons:

- Collateral pledged was locked-up in the bankruptcy process with the defaulting counterparty;
- Collateral pledged had been re-hypothecated and was not eligible anymore;
- Other debtors / counterparties were proprietary in the collateral recovery process, etc.

These events encompassed legal risks. We will define these risks and identify how dealers are currently mitigating and considering these legal risks.

Legal risks represent the risk that collateral cannot be recovered in case of a default (approaching default e can also be considered in some jurisdictions). Four types of legal risks have been identified. For the purposes of this paper, we will focus on the first three, as the fourth requires a strong legal background.

1. **Perfection risk:** Inability to achieve deal perfection by a counterparty, i.e. the counterparty can't identify legal ownership when defaulting (or in approaching situation of default).
2. **Ineligible collateral r:**
   - **Risk of re-characterization:** The collateral becomes ineligible and possibly re-characterized. As a consequence, it would be locked-up within bankruptcy proceedings in the defaulting counterparty's jurisdiction laws.
   - **Risk of priority:** The collateral pledged cannot be returned because the dealing counterparty has a prior claim on this same amount.
3. **Enforcement risk:** The dealing counterparty does not return the whole amount of collateral. This can happen if the laws within the dealing counterparty's legal jurisdiction is lax regarding enforcement of contracts or in case of political pressures on certain types of financial deals and practices.
4. **(Contract) Obsolescence Risk: T**he contract and annexes (if any) are:
   - Too long, resulting in operational delays and incapacity for F/O operators to trade (additional potential risk of opportunity) ;
   - Out-dated, resulting in room for contract breaches or inefficient coverage of transactions through legal agreements etc.

There are many types of legal risks that should be considered when entering into an OTC transaction. Furthermore, these risks – as they are strongly correlated to IA and the level of collateralization – indirectly impact the calculation and valuation of LVA and FVA charges. Although the chances of these risks occurring are low, the following example illustrates the potential significant losses that can incur.

The Lehman Brothers' case precisely illustrates how debtors might suffer from consequent losses because 1) their IAs were over-estimated, providing an over-collateralized exposure towards Lehman 2) their IAs were held by Lehman directly and eligible for re-hypothecation.

When Lehman entered into bankruptcy 1) the IAs held under re-hypothecation had been locked-up in Lehman's bankruptcy proceedings, 2) some of these IAs being over-estimated by the counterparties, the gap between their amount and the fair amount to be returned is significant, implying significant losses once the bankruptcy proceedings are finished.

Best practice (Legal risks and collateralization level assessment)

Considering the impact of Legal Risks on collateral exposure and IA, should be reminded as a best practice, as the consequences in terms of potential losses can be critical. Furthermore, collateralization level and estimation of the amount of IA should be strongly related to the next best practice.

There are two strategies to mitigate legal risks, and are complementary to one another, i.e. dealing counterparties can choose to both segregate and limit re-hypothecation.

(i) Segregation:

- Externalizing the ownership of IAs and therefore considering the type of business model (third party involved or not (cf. organizational part)
  - Via third party custodian services or tri-party agreements (also involving a third-party custodian which won't be an affiliate of the involved counterparties in the transaction).
- Considering ownership of Independent Amount and Variation Margin in Security Interest Contracts: (Segregation is further specified in legal arrangements, the dealer will be the direct holder of IA but not under unrestricted conditions)
  - Segregation of IA and VM cash flows at the delivery date
  - Segregation in cash pools of IA and VM
  - Segregation in terms of typology of assets (e.g. VM delivered in cash and IA delivered in ear-marked securities for a better propriety tracking).

(ii) Limiting / Forbidding Re-hypothecation:
  - Re-hypothecation can be limited or tracked through ear-marked assets.
  - Re-hypothecation can simply be forbidden in the contract. Under such conditions, collateral will be restricted to the Custodian cash pools and won't be remunerated.

2.3.2.2 Liquidity and Funding Strategy

Other key elements, studied in the next chapter, include Liquidity and Funding Management, whichcan only be considered upon authorized re-hypothecation. Best practices are described below:

Best Practices (Valuation)

1) *Separate cash and non-cash collateral as cash has specific characteristics which can impact valuation parameters and monitoring.*

2) *When considering both cash and non-cash collateral:*
   a) *Distinguish collateral quality: Since cash is the best type of collateral, it should be kept; securities and other eligible assets should be posted.*
   b) *Weight appropriately the amount of risks (and impacted provisions / charges) to be considered when entering into a transaction with counterparty.*
   Adjustments such as CVA / DVA, LVA, FVA should represent the actual level of risks and costs the contract will involve.
   c) *From this, the dealer can deduce real value of the contract, its hedging costs, and can choose, accordingly to its collateral business model (i.e. internal or external management, direct / indirect holding of IA etc.) to impact the client's price or not.*

3) *Considering non-cash collateral:*
   a) *Upstream monitoring of Wrong Way Risks, (cf. part 1.3.1 Wrong Way Risk)*
   b) *Following the steps of the "optimization of collateral transformation" defined earlier:*
      i) *Transformat into cash if possible (cf. part 1.3.2);*
      ii) *If not possible, LCR eligibility of the assets (cf. Part 1.3.3);*
      iii) *If not eligible, not hurting the Equity base (cf. Part 1.3.4).*

Furthermore, our analysis is heavily dependent on the optimization of the collateral circuit. Below is an illustration of Collateral Management best practices, with regards to Collateral Circuit optimization.

Optimization of the Collateral Circuit: overview of CH GRA best practices

1) Traditionally handled by Treasury desks, see discussion regarding the organizational impacts of Collateral Management evolution part 2.4
Sources: Penney, J., June 2011, Collateral Management Best practices for Broker-Dealers, CH GRA internal analysis
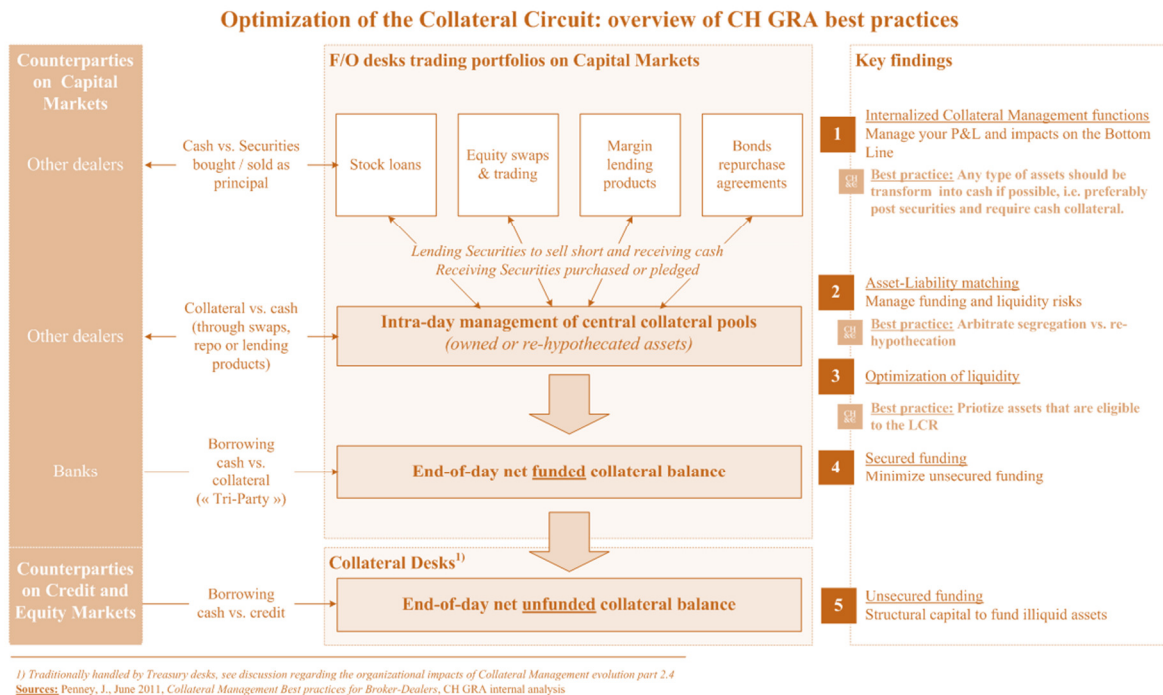
2.4 Organizational Impacts

2.4.1 Internal Collateral Management

Here we distinguish between existing / standard functions, assuming CIBs business models have already internalized these functions; from recent / new keys functions that have emerged since the financial crisis, as well as discuss the growing concerns that have put Collateral Management under scrutiny.

2.4.1.1 Overview of current organizational practices and advancements

To begin, we will illustrate the organizational impacts by identifying key functions of existing organizations. Once described, we will identify key advancements of these functions:

- **Initiation of the deal / Negotiation with the Counterparty:** In our first chapter *(Collateral Risks & Valuation),* we explained that the pricing of a deal with a Counterparty is more complex with CVA/DVA or LVA & FVA. To reformulate what we mentioned earlier, these adjustments are logically correlated to Independent Amounts and Thresholds because they are all linked to the exposure of the Counterparty.
    - **Market / Best practice:** This is why as an organizational market practice / best practice, CVA and DVA desks currently adjoin the other trading desks. This practice is particularly observable on products encompassing credit risks such as IR swaps and CDS where CVA / DVA and LVA / FVA needs to be calculated at the pricing stage of the deal.
- **Funding (both secured and unsecured):** As a key step of the collateralization, funding of derivatives trades and portfolio became a strategic function as the resource of banks and financial institutions were put under pressure. Funding issues on trading portfolios were traditionally handled by the Treasury desk.

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- **Market/Best practice:** 60 percent[7] of dealers on the financial markets dedicated a central funding desk to optimize the F/O trading desks' derivatives portfolio.
- **Monitoring and reporting (Risk Management and Regulatory requirements):** Recent regulations put much pressure on financial institutions in terms of both risk monitoring and reporting. Furthermore, new capital requirements have also been added in the forms of supplementary buffers and provisions.
  - **Market practice:** Risk management departments are handling these new mandates since they already have the market and portfolio data needed to actively monitor and measure risks.

Best practice (Risk Management)

Wrong Way Risk: As mentioned earlier part 1.3.1 Wrong Way Risk, the follow up of both forms of WWR is becoming critical. WWR is a specific and complex form of correlation, and needs to be specifically addressed by Risk departments.

Limit Management: As described in the target organization diagram, risk concepts such as limits and excess limits should be managed together and include CVA / DVA and LVA / FVA charges. For optimal management, limits on CVA/DVA, LVA and FVA should be defined, as the measurement indicators exist.

2.4.1.2 A trend towards centralization of the new collateral-related functions:

As aforementioned in paragraph 2.4.1.1, there is an on-going trend to centralize Collateral-related functions, which are being migrated to centralized entities adjoined to the F/O trading desks.
This is the case for the following activities:
- Funding activities (secured or unsecured) on trading portfolios
- Management of disputes and netting agreements which should be more frequently and actively monitored by the centralized Front Office Collateral desks =, instead of the Back Office Collateral desks.

2.4.1.3 Key findings: Organizational Evolutions and Transformations

To summarize our key findings thus far, we've drawn an illustrative example (cf. next page), which depicts the internal collateral life-cycle and reflects notable trends currently transforming CIB models:
1. **Strategic Macro-functions of Collateral Management:** From Valuation and Monitoring to Regulatory Requirements.
2. **Key Steps of Deal Management:** From initiation to dispute management, and identification of every transaction risk.
3. **Collateral Management Governance & Interactions:** Identifies how collateral management should be articulated to Risk Committees to ensure coherent management of collateralization levels and risk exposures.

The new centralized desks created to manage valuation adjustments and related matters, have the following responsibilities:

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[7] According to a Survey handled by Deloitte in partnership with Solum Financial Partners, (February 2013) *"Counterparty Risk and CVA Survey, Current market practice around counterparty risk regulation, CVA management and funding"*

(i) Collateral desks

- Collateral desks handle operations collateral and liquidity management, as well as collateral risk monitoring (such as correlation risks, WWR).

- Collateral desks also perform:
  - **Collateral Monitoring**
    - Specific Analysis: Eligibility, liquidity and concentration
    - Monitoring: WWR & potential portfolio correlations, and the set of limits (exposures, coverage rates and collateral portfolio together with the Collateral desk)
  - **LVA & Valuation**
    - Modeling
    - CollVA - Collateral Value Adjustment
    - Implementation of a set of limits.

(ii) CVA / DVA desks

- CVA / DVA desks handle adjustments on CVA / DVA and Funding Value (interconnected with CVA / DVA, cf. Chapter One).

- CVA / DVA desks have additional tasks which may include:
  - FVA Pricing and Management;
    - Modeling
    - Bond-CDS basis management (monitoring / hedging)
    - Calibration / Pricing;
    - Implementation of a set of limits.

Organizational Impacts of Collateralization Practices on the Internal Functions of Investment Banking Firms

Legend

1. Strategic Macro-Functions of Collateral Management
- Regulatory Reporting & Provisioning
- (Excess) Limit Management
- Deal Processing (Clearing and Settlement)
- Management of netting & collateral agreements
- Valuation & Monitoring

2. Key steps of the Deal Management
- Management of the relationship with the Counterparty along the life-cycle of the transaction
- Post-trade Management and Monitoring
- Reporting & Regulatory impacts / requirements

3. Collateral Management Governance & Interactions
- Key relationships between the different stakeholders within the CIB organization
- **Desks centralisation trend to F/O:** CVA/DVA and Funding desks creation as specialised units
- **Risk Committees:** Define and arbitrate in case of key events (limit excess, credit events, disputes etc.)

Management of Counterparty Relationships Along The Transaction Life-Cycle | **Post-Trade Management & Monitoring**

	Negotiation	Confirmation	Settlement	Post-Trade Management	Monitoring	Management of Excess Limit	Reportings & Regulatory Requirements

Front Office

CVA/DVA — Collateral Desks

- CVA / DVA Management
- LVA valuation
- Collateral Monitoring

Management of the set of limits
Checking of the pre-deal limits

Negotiation with Counterparty
- Negotiation of terms of the contract
- Valuation and deal pricing

Desk Collat

P&L monitoring and follow-up
- P&L monitorting
- P&L follow-up

Management of Excess limits
- Coordination with Risk
- Alert receptions
- Excess management

Middle Office

Clearing

Collateralization processing

Transactions settlement

Margin calls management

Dispute resolution
Management / review of Netting & Collateral Agreements

P&L reconciliation

Back Office

Risk Committees

Counterparty analysis
Evaluation of Creditworthiness, Counterparty rating based on risk-/stress- parameters

Preparation of the set of limits
for decision / allocation (Risk Committee)

Decision & Limit allocation by the Committees

Management of the set of limits
- Limit monitoring for per type of Risks (Market, Credit, Counterparty Credit Risks)
- Collection of data for the Limit monitoring

Collateral Monitoring
- **Key parameters:** Eligibility, liquidity, concentration, haircuts
- **Key indicators:** Rating and creditworthiness, Stress tests

Other types of monitoring
- Monitoring of the WWR
- Monitoring of disputes
- *Watchlists and Provisioning (monitoring of P&L impacts)*

Limit Monitoring
- Checking limits
- Validation and analysis of limit excesses
- Management and reporting of alerts

Reportings *(to be circulated to decisionary instances)*
- Limit reporting (per type of limit/risk, counterparty, country etc.)
- Reporting in case of limit excess
- Other specific reporting and alerts to be monitored

Regulatory impacts
- Regulatory reporting
- Capital requirements
- Risk Provisioning
- Other requirements (e.g. LCR eligibility)

Risk Management

Legal & Compliance

Support contract management according to negotiating terms and directives from Front Office Trading desks
- **At the drafting stage:** Check coherence and accuracy of the wording and legal clauses
- **Data storage:** Keep good record of the contracts and updated agreements / clauses

Sources: CH GRA internal analysis

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2.4.2   External Collateral Management

2.4.2.1 Models for Unrestricted Holding of Independent Amounts

There are three models used to hold / segregate Independent Amounts:

(i)   Direct Dealer Holding the IA

- **Description**: The dealing counterparty receiving the collateral should hold it.
- **Pros**:
    - Re-hypothecation flexibility: The counterparties can choose to re-use the collateral or not, and specify the type of reinvestment and yield within the contract (cf. below).
    - Reinvestment flexibility: The dealer can directly use the collateral posted and arrange with the posting counterparty on a fixed referenced interest rate of return.
    - Speed of recovery in case of default: The counterparties can dispose quickly of the pledged claims / collateral if eligible / available.
    - Low operational costs: There is generally no associated fee for holding / posting collateral under this type of model.
- **Cons**
    - High uncertainty in terms of legal risks in case of default: As the type of IA holding is unrestricted, there is a risk that the Dealer uses the posted collateral in a high risk market and loses the collateral. Collateral would, in such a situation, become ineligible in the event of default.
- **Recommendations**: The counterparty posting collateral should :
    - Ensure the transaction time of the propriety and the eligibility of collateral.
    - Apply a recovery rate on re-hypothecated collateral, (cf. Chapter One).

(ii) Segregation with a Third-Party Custodian

- **Description**: A custodian is holding the segregated IA exchanged bilaterally by both counterparties. The mandates of the custodian can vary from strictly holding collateral, to fully managing it across all the collateral management lifecycle.
- **Pros**:
    - High traceability of collateral: Under tri-party agreements, collateral posted amounts are optimally segregated on the books of both Dealer and Tri-Party Agent.
    - Partial to Full Management of Collateral Services by the Custodian: Depending on the offer type, the Custodian's level of collateral management can be customized from limited to a full range of Collateral Management related mandates. In this case, counterparties can take advantage from outsourcing on heavy / highly technical tasks (e.g. monitoring of complex cash flows, valuation, mitigation strategies etc.)
- **Cons**
    - Operational costs: The costs of collateral services provided by the Custodian can widely vary. Furthermore, Third-Party fees should be added on top of these costs.
    - Variable to long delays for seizure of the collateral: In the event of default, the delays and efficiency to retrieve the pledged collateral have proved to be inconsistent.
- **Recommendations**: The contract terms should clearly specify the Custodian's scope of intervention and mandates. The operational costs should be indexed on the level of services offered by the Custodian and suit each of the dealing counterparties.

(iii) Segregation through a Tri-Party Deal Agreement

- **Description:** This model is close to (ii) *Segregation with a Third Party Custodian*. The only major difference is the type of contract, which in this case is a three-way contract, settled between both counterparties and the "Tri-Party Collateral Agent" (acting as the Third Party Custodian) which is mandated to hold and manage collateral posted by both counterparties.
- **Pros and Cons:** Please refer to the above (ii) *Segregation with a Tri-Party Custodian*. It should be noted that:
    - The operational costs can eventually vary between (ii) and (iii) depending on the types of service offerings proposed in the contracts.
    - The settlement of pledged collateral in case of default is proven hazardous in some cases upon Tri-Party Collateral Agent Holding of Collateral.

2.4.3 Illustrative Example of Best Practices, Considering External vs. Internal Holding IA

There are three major criteria of best practices used to strategically evaluate models for holding Independent Amounts (and at a wider extent, collateral in general i.e. VM and IA):

Best Practices (Strategies of IA Holding) *(1/2)*

(i) Ownership of the Posted Collateral

- *Administrative Information*
    - *To clarify collateral management between counterparties, a term sheet should at least be updated on a regular basis with account numbers, localization / jurisdiction of the holding entity and collateral movements.*
- *Ownership*
    - *In general, ownership and eligibility of collateral should be checked regularly to mitigate legal risks in the event of default, such as priority and non-eligibility of collateral.*
    - *For non-cash collateral in particular, these assets can be ear-marked to ensure a better monitoring of the localization of assets. This option enables to secure collateral management when re-hypothecation is authorized.*
- *Restrictions*
    - *Restriction on Variation Margin should not be allowed (as mentioned and justified earlier p. 19). As a matter of fact segregation of IAs should be specified in a dedicated legal annex where VM and IA collateral management are considered as separate cash flows.*
    - *Restrictions on IAs encompass many options providing for more or less restricting schemes. The typology of assets, frequency of delivery and segregation of cash pools (different as for VM) are key criteria that can enable to leverage more precisely the holding of IA.*

Best Practices (Strategies of IA Holding) (2/2)

(ii) Speed of Recovery

- *Recovery conditions are highly variable across jurisdictions and depend on various criteria and application of laws in the event of default and bankruptcy. To avoid locked-up amount of pledged collateral in the defaulting books of the counterparty, some key criteria should be specifically considered:*
  - *Risk profile of the counterparty and impacts on the exposure*
  - *Recovery rate in the event of default*
  - *Seizure of pledged collateral*
- *Necessary legal documents and enforceability of contracts in the applicable jurisdiction in the event of default should be prepared to minimize delays in seizure / return of pledged collateral.*

(iii) Operational Costs

Costs of collateral outsourcing should be weighted considering two major sources of costs / investments:

- *The costs and investments necessary for proper internal IA holding and collateral management.*
- *The deal requirements (linked to negotiated terms of the contract or to regulations, e.g. frequency of valuation, frequency of portfolio reconciliation, frequency of margin calls etc.). These requirements can imply expensive investments in terms of system and human resources for monitoring and modeling.*

To conclude, a single perfect model does not exist; instead, there are different models, each offering a large variety of options. This flexibility is a key advantage for counterparties, but can also become a weakness in the event of default if the counterparty underestimated some of the above listed criteria.

Furthermore the risks and financial losses are even higher considering the event of default and the extreme case of bankruptcy, when the timeline to get back the collateral can become widely uncertain, as illustrated during the financial crisis. This implies financial markets will have to rely more and more on their risk functions to model different impacts in terms of financial losses (e.g. estimation of recovery rates, speed of seizure of collateral) and identify different types of default scenarios.

2.4.4 Strategic Trade-offs to Address IA Holding Model

The Strategic Holding Of Collateral And Independent Amount:
An Arbitrage Of Key Parameters To Be Considered Upon Security Interest Form Of Collateralization

	Applicable type of Holding of IA upon Security Interest form of collateralization				
	Direct Dealer / Unrestricted	Segregated Direct Dealer Holding of IA	Segregated Direct Affiliate Dealer Holding of IA	Third Party Custodian Dealer Holding of IA	Tri-Party Collateral Agent / Custodian Holding of IA
Dealing conditions and parameters					
Involvement of a Third Party in the bilateral negotiation	No	No	Dealer Afiliate as Holder of the collateral	Custodian	Tri-Party Agent
Typology of OTC contract	Bilateral[1]	Bilateral[1]	Bilateral[1]	Bilateral	Tri-partite
Criteria to arbitrate IA Holding					
I) Ownership of the Posted Collateral					
1) Segregation	No	Yes	Yes	Yes	Yes
Options					
- In terms of Collateral Flows: IA segregated, (i.e. considering segregation of VM and IA)	✖	✔	✔	✔	✔
- On books of a Third Party	✖	✖	✔	✔	✔
- In different cash pools	✖	✔	✔	✔	✔
2) Re-hypothecation	Yes	No	No	No	No
Options					
- Considering a unique collateral flow where at delivery date t, $CF(t) = VM(t) + IA(t)$	✔	✖	✖	✖	✖
- Considering 2 separate Collateral Flows respectively for VM and IA	✔	✖	✖	✖	✖
II) Speed of Recovery in the event of default					
If End User defaults					
1) Dealer seizure of IA	Instant	Instant	Fast	Fast	Variable
If Dealer defaults					
2) End User recovery of IA	Slow Uncertain (can be << 50%)	Varies	Varies	Slow	Moderate to Fast
Recovery rate		Varies	Varies	Close to 100%	Close to 100%
III) Return and Liquidity Optimization					
1) Reinvestment / Yield[2] *(Reinvesting re-hypothecable IA at the direction and benefits of the End User)*	Yes	No	No	No	No
Options					
- Negotiated rate of return	✔	✖	✖	✖	✖
- Indexed rate of return on a reference rate	✔	✖	✖	✖	✖
2) External Operational Costs	No	No	No	Yes	Yes
To be considered in case of outsourcing:					
- Costs of externalization of collateral	Lowest	Low	Low	Moderate	High
- Third Party / Custodian fees	✖	✖	✖	✔	✔

1) Could be unilateral though market practices is bilateral
2) Only applies if Collateral is re-hypocated

Sources: ISDA Independent Amount Margin Survey White Paper (March 2010); CH GRA internal analysis

2.5 Impact on Stakeholders: Future Business Opportunities & Issues

Here we will analyze two types of services and their respective long term impacts on business opportunities for stakeholders.

CCPs offering custodian services will be heavily impacted by future regulations. The margin amounts posted is expected to grow significantly in the coming years. These changes will cause stakeholders to question whether:

- The CCPs are able to absorb the demand of all financial markets stakeholders? If yes, will the degree of services provided be sufficient to appropriately mitigate the various types of risks involved?
- These structures are sufficiently capitalized to support the event of default at large scales if a financial crisis occurs and spreads all across the financial markets?

On the other hand, the Financial Services Industry and Investment Banking firms specifically understand that the new robust requirements and cash scarcity generate a true opportunity for their Collateral Management Services.

We identified two major topics that should draw dealing counterparties and, at a wider extent, financial market stakeholders' interests:

- **Over Speculation:** The example of Lehman's over speculation and bankruptcy showed that Investment Banking firms could see Collateral Management as an opportunity to yield strong returns, especially when considering new opportunities offered by the young market of Collateral Management services (though some pioneers such as Bank of New York Mellon opened the path to such services in the early 80s).
- **Manipulation of Counterparties and Service Offerings:** Following the recent events described in this article, major investment banking firms such as JP Morgan and Bank of America reacted by proposing "collateral transformation" services. These allowed collateral trading by offering the possibility to swap lower-rated securities not qualified to regulatory standards in return for a loan of Treasuries / other assets that are eligible.
  - Investment banks are leading the OTC derivatives market (largest dealing portfolio of OTC derivatives with a commingled value of USD$ 140 trillion). However, stakeholders are proposing collateral optimization for the same market to cover the same products.
  - This activity is becoming more and more profitable even under the current tight and stressed market conditions, sparking conflicts of interest and temptation to manipulate products in order to take advantage of collateral trading to hide risks.
  - For the moment, regulators across the world have not considered regulating such activities. A recent article stressed that the problem will probably be addressed once more experience is gained on such practices.

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3. Collateral Arbitrage

3.1 Preliminaries

The major players in the OTC derivatives market have developed, in addition to the best practices of collateral optimization exposed above, a set of collateral arbitrages.

These arbitrages can be split in two categories:
- **Classic Collateral Arbitrage**: Making asymmetric collateral agreements to receive more collateral (in cash preferably) than posted. The dealer uses his advantageous position to persuade smaller players to conclude imbalanced collateral agreements.
- **Back-to-Back Collateral Arbitrage**: Dealing back-to-back operations to receive cash and post securities. The dealer has a buy position on a cash collateralized product and a sell position on the same non-cash collateralized product.

The purpose of these arbitrages is to optimize the collateral portfolio to obtain the highest positive net cash collateral balance. This net cash collateral balance constitutes a low rate re-financing pool.
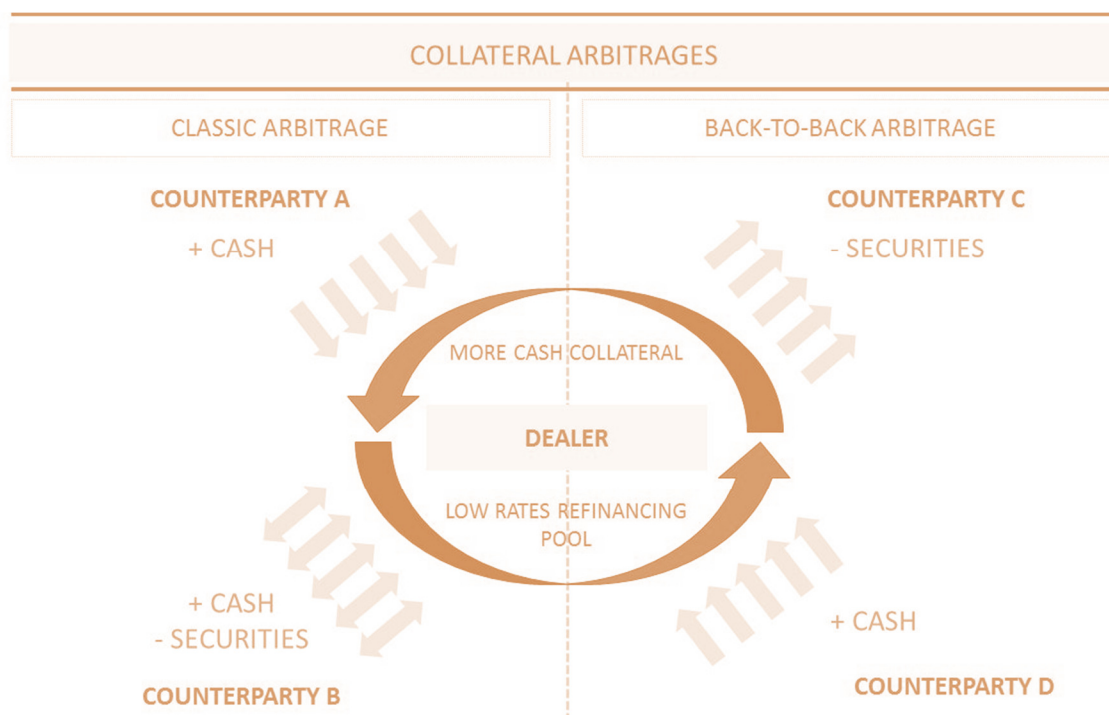

As an example of collateral arbitrage, in December 2009, Goldman Sachs's $110 billion net collateral balance was almost three times the amount it had attracted from depositors at its regulated bank subsidiaries. This collateral could have earned the bank an annual return of $878 million, assuming it was financed at the Fed funds effective rate of 0.15 percent and reinvested in two-year Treasury notes yielding 0.948 percent (at that time).

3.2 Classic Collateral Arbitrage

The finest dealers have a negotiating power that creates advantages when dealing with hedge-funds. They use their advantage to coerce asset managers to accept asymmetrical collateral agreements. These asymmetrical contracts can have several features:

- The counterparty agrees to a unilateral contract on bilateral potential exposure deals
- The counterparty consents to unfair haircuts (comparatively to the repo market)
- The counterparty has to post more cash collateral than the dealer
- The counterparty has to post cash collateral while the dealer can post non-cash collateral

This kind of unfair arrangement, called "classic collateral arbitrage" enables dealers to capture cash collateral (funded at low collateral rate) from small asset managers.
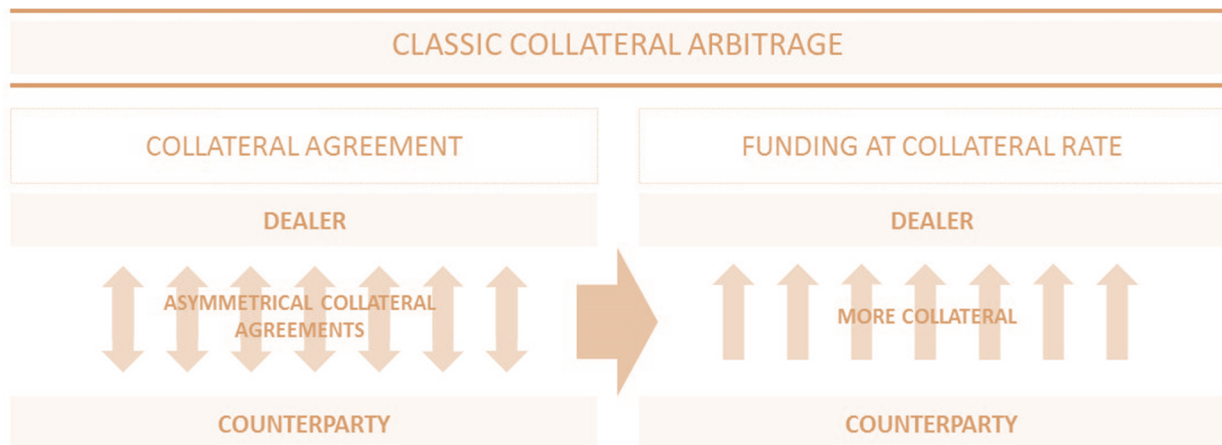
3.3 Back-to-Back Collateral Arbitrage

This kind of collateral arbitrage is an arbitrage we call "pure collateral arbitrage", in contrast to the classic collateral arbitrage described above. In this case of arbitrage, deals are not done to generate a payoff, but to uniquely transform non-cash collateral to cash.

The Back-to-Back Collateral Arbitrage consists in dealing back-to-back deals with two counterparties, with cash collateral received on the buy side and non-cash collateral posted on the sell side.

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3.3.1 Valuation of the Back-to-Back Collateral Arbitrage

There are different ways to use non-cash collateral:
- Transformation into cash
- Replacement of cash in the Liquidity Coverage Ratio
- Securities held by default (non-transformable into cash and ineligible to the LCR)

These options have to be taken into account when deciding to engage in collateral arbitrage. Indeed, the dealer will receive cash from one counterparty and post an equivalent value of securities to the other. From the dealer's perspective, arbitrage can be seen as replacing a certain amount of securities with cash, where back-to-back products only impact the arbitrage with their potential exposure (greater exposure means greater collateral value).

The collateral value is equal to the present value, thus, in all the cases described above, the cash collateral value is $Cash\ Collateral\ Value = Present\ Value$ and the non-cash collateral value is:

$Non\ Cash\ Collateral\ Value = Present\ Value\ /\ (1 - H_{CSA})$, where H_{CSA} is the haircut defined in the CSA and applied to the securities posted as collateral.

In the following sections, we will study the three different valuation cases of the arbitrage, according to the non-cash collateral usage.

Prior to this, we recall that the cash collateral side is independent of the posted securities side and the securities' possible uses. Thus, the cash collateral value is:

$Cash\ Collateral\ Value = e^{-r_C T}\ Expected\ Value$, where r_C is the cash collateral rate.

To summarize, we have the following situation:
- The Dealer receives the cash collateral posted by Counterparty A:

  $Cash\ Collateral\ Value = e^{-r_C T}\ Expected\ Value$
- The Dealer posts Non-Cash Collateral to Counterparty B:

  $Non\ Cash\ Collateral\ Value = Securities\ Value = Present\ Value\ /\ (1 - H_{CSA})$

3.3.1.1 Case 1: Securities intended to be transformed into cash

The securities posted as collateral are transformed into cash, where their security loan value, as seen in Chapter One, is:

$Cash = S * (1 - H_{SL}) * e^{-r_{SL} T}$, where S is the securities value, H_{SL} is the security loan haircut and r_{SL} the security loan rate.

Thus, the **cash equivalent value of the non-cash collateral (CEV of NCC)** is:

$$CEV\ of\ NCC = S * (1 - H_{SL}) = Present\ Value * \frac{(1 - H_{SL})}{(1 - H_{CSA})}$$

We saw in Chapter One that $H_{CSA} = H_{SL}$, the security lending market being a collateral market (we assume that there is not an additional classic collateral arbitrage in the same deal), thus:

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$$CEV \ of \ NCC = Present \ Value$$

The security loan rate is r_{SL}, thus:

$$Non\text{-}Cash\ Collateral\ Value = Expected\ Value * e^{-r_{SL}T}$$

This is the replacement formula of transformable-into-cash securities, posted as collateral by the seller. It is equal to the LVA base formula for the buyer, which makes perfect sense.

Thus, the **P&L** of the back-to-back collateral arbitrage with transformable securities is:

$$P\ \&\ L = Cash\ Collateral\ Value \text{-} Non\text{-}Cash\ Collateral\ Value$$

$$P\ \&\ L = EVe^{-r_C T} - EVe^{-r_{SL}T}$$

$$P\ \&\ L = EV\left(e^{-r_C T} - e^{-r_{SL}T}\right)$$

Thus, $P\&L > 0$ only if $r_{SL} > r_C$.

Transformable securities can be posted in the back-to-back collateral arbitrage only if $r_{SL} > r_C$.

The inverse deal (posting cash for transformable assets) is profitable if $r_C > r_{SL}$.

3.3.1.2 Case 2: Securities Intended to be Kept as High Quality Liquid Assets

The securities eligible as High Quality Liquid Assets replace cash retained for the Liquidity Coverage Ratio. These securities can then be assimilated to cash (no specific conversion formula).

As presented in Chapter One, level 1 assets are not subject to a haircut but level 2 assets have a minimum haircut rate of 15 percent.

Thus, the non-cash collateral value is:

For level 1 securities:

$$Non\text{-}Cash\ Collateral\ Value = \frac{e^{-r_C T}\ Expected\ Value}{\left(1 - H_{CSA}\right)} = Expected\ Value * e^{-r_C T - \ln\left(1 - H_{CSA}\right)}$$

For level 2 securities:

$$Non\text{-}Cash\ Collateral\ Value = \frac{e^{-r_C T}\ Expected\ Value}{\left(1 - H_{CSA}\right)}\left(1 - H_{LCR}\right)$$

$$Non\text{-}Cash\ Collateral\ Value = Expected\ Value * e^{-r_C T + \ln\left(\frac{1 - H_{LCR}}{1 - H_{CSA}}\right)}$$

Where H_{LCR} is the haircut applied to these securities in the Liquidity Coverage Ratio.

Thus, the P&L of the back-to-back collateral arbitrage with securities eligible as High Quality Liquid Assets is:

For level 1 securities:

$$P \& L = Cash\ Collateral\ Value - Non - Cash\ Collateral\ Value$$

$$P \& L = e^{-r_C T} EV - EVe^{-r_C T - \ln(1-H_{CSA})} = EV\left[e^{-r_C T} - e^{-r_C T - \ln(1-H_{CSA})} \right] = EVe^{-r_C T}\left[1 - e^{-\ln(1-H_{CSA})} \right]$$

By definition, $0 \leq H_{CSA} \leq 1$, thus $-\ln\left(1-H_{CSA}\right) > 0$ and $P \& L < 0$.

Securities eligible as level 1 High Quality Liquid Assets must not be posted in the back-to-back collateral arbitrage. The inverse deal (posting cash for level 1 assets) is profitable.

For level 2 securities:

$$P \& L = Cash\ Collateral\ Value - Non - Cash\ Collateral\ Value$$

$$P \& L = e^{-r_C T} EV - EV * e^{-r_C T + \ln\left(\frac{1-H_{LCR}}{1-H_{CSA}}\right)} = EV\left[e^{-r_C T} - e^{-r_C T + \ln\left(\frac{1-H_{LCR}}{1-H_{CSA}}\right)} \right] = EVe^{-r_C T}\left[1 - e^{\ln\left(\frac{1-H_{LCR}}{1-H_{CSA}}\right)} \right]$$

By definition, $0 \leq H_{LCR} \leq 1$ and $0 \leq H_{CSA} \leq 1$, thus $P \& L > 0$ only if $H_{LCR} > H_{CSA}$.

Securities eligible as level 2 High Quality Liquid Assets can be posted in the back-to-back collateral arbitrage, only if $H_{LCR} > H_{CSA}$. The inverse deal (posting cash for level 2 assets) is profitable if $H_{CSA} > H_{LCR}$.

3.3.1.3 Case 3: Securities Held by Default

The securities held by default cannot be transformed into cash. They do not have a cash equivalent value of the non-cash collateral. They cannot be used in the arbitrage strategy.

3.3.1.4 Summary

VALUATION OF THE BACK-TO-BACK COLLATERAL ARBITRAGE
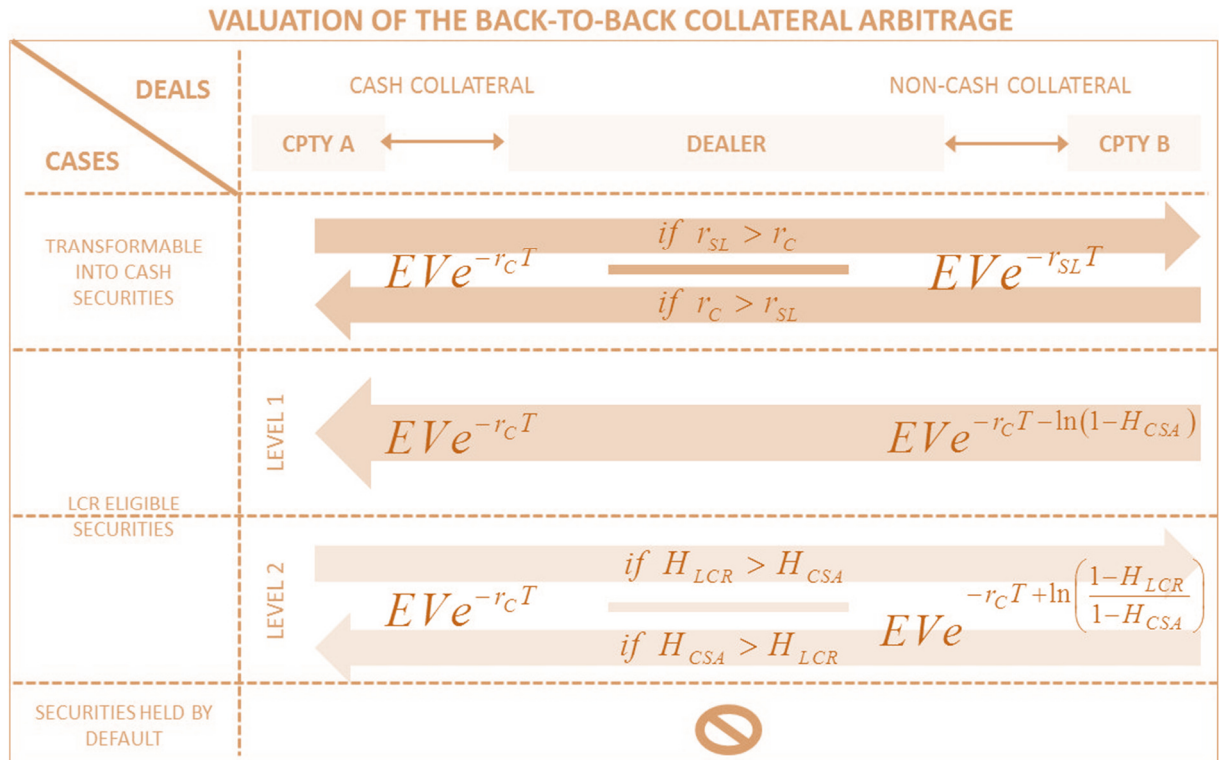
3.3.1.5 Key Remarks and Findings

We notice the following points:

- Contrary to expected results, arbitrage can be profitable in both ways (receiving and posting the cash / non-cash collateral), and not only in receiving cash and posting securities. Profitability strongly depends on the various possible uses of securities.
- As presented in Chapter One, the Funding Value Adjustment applies only to the non-collateralized part of the operation. It has no link with the Back-to-Back Collateral Arbitrage.

Moreover, arbitrage is only risk-free if the deals are fully collateralized; otherwise the arbitrageur is exposed to counterparty risk on each back-to-back counterparty. Thus, to achieve risk-free arbitrage, we considered a fully collateralized operation ($\gamma = 100\%$, FVA=0).

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