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# Restructuring and Mitigating the CVA and Its Risk:

## break clauses, ATEs, "one-way" risk, mutual collateral funding

# Restructuring the Counterparty Risk

*The general framework…*

- Bilateral CVA and DVA
- How Basel III treats the *CVA risk* and the *own default risk*
- The counterparty risk and its capital charges

*…and the topics we deal with*

- Be careful with the long-term uncollateralized transactions!
- May some clauses mitigate the risk of such transactions?
- May the "one-way CSA" risk of an originator be restructured?
- Does mutual collateral funding lead to a "regulatory arbitrage"?

# CVA: market and regulators

During the financial crisis, the losses faced by the banks on their derivatives' books originated mainly from credit migration, rather than actual defaults, of the counterparties.

More specifically, the losses have arisen from the increase of the expectation of future credit losses i.e. the CVA or *Credit Valuation Adjustment* of the value of the derivatives.

These unrealized losses impact the P&L account and this is why the Basel Committee has introduced a new capital charge related to the CVA risk.

Bilateral CVA and DVA are market standards, and the accounting rules (IAS 39 - IFRS 13) include them as components of the *fair value measurement*.

# Unilateral CVA (as viewed by B)

➢ A defaultable, B risk free: CVA negatively affects the risk free amount

$$V_B^A(t_0) = V_B^0(t_0) - CVA_B(t_0, T)$$

➢CVA := the loss, as expected by B, for a possible default of A until maturity

*B has a credit exposure at $t_{k-1}$ only when the mtm is (expected to be) positive*

$$CVA_B(t,T) = \sum_{k=1}^{M} L_A \mathbb{P}\left[t_{k-1} \leq \tau_A \leq t_k\right] D(t_0, t_{k-1}) \mathbb{E}\left\{ \left[V_B^0(t_{k-1})\right]^+ \middle| t \right\}$$

*Probability that A defaults within the k-th time slice*

$L_A$ = *Loss-given-default of A*
$D$ = *discount factor*

# Bilateral CVA and DVA (as viewed by B)

- Both A and B defaultable. CVA (DVA) negatively (positively) affects the risk-free mark-to-market:

$$V_B^{AB}(t_0) = V_B^0(t_0) - BCVA_B(t_0,T) + BDVA_B(t_0,T)$$

- CVA := expected (by B) loss when A defaults before B:

$$BCVA_B(t,T) = \sum_{k=1}^{M} L_A \mathbb{P}\left[t_{k-1} \leq \tau_A \leq \min\left(t_k, \tau_B\right)\right] D(t_0, t_{k-1}) \mathbb{E}\left\{ \left[V_B^0(t_{k-1})\right]^+ \middle| t \right\}$$

- DVA := expected (by A) loss when B defaults before A:

$$BDVA_B(t,T) = \sum_{k=1}^{M} L_B \mathbb{P}\left[t_{k-1} \leq \tau_B \leq \min\left(t_k, \tau_A\right)\right] D(t_0, t_{k-1}) \mathbb{E}\left\{ \left[V_A^0(t_{k-1})\right]^+ \middle| t \right\}$$

# The Basel III approach

The Basel Committee:

1. <u>defines new capital charges</u> related to the unilateral CVA risk (without any reduction linked to the *own risk* i.e. the *first-to-default* effect or the DVA);

2. <u>requires the *derecognition* from CET1 of any amount linked to the *own risk*</u> included in the P&L account, both at inception and taking into account any subsequent variation, so that the final impact on CET1 through the P&L account is the full unilateral CVA.

The new capital charges may be computed either with a "standard" or an "advanced" approach, and grossly increase with

- standard appr.: EAD and maturity
- advanced appr.: CDS sensitivity of the CVA

# A double impact on CET1

The new rules allow the hedge of the counterparty risk (with the related mitigation of the capital charge) through CDS and CCDS. The CCDS are standard ISDA derivatives, such that – upon default of the *reference entity* – the *protection seller* pays the mark-to-market of a *reference swap*, if positive, to the *protection buyer*.

Banks having simplified accounting models for the CVA have to update them, facing the related losses.

<u>Example (approx! no compensation!):</u> uncollateralized payer swap vs BBB (w=1%), CDS=100bps, EAD adv, Basel III std

| | **CVA (bps)** | | **CVA risk (bps)** | |
|---|---|---|---|---|
| **mtm** | **5Y** | **10Y** | **5Y** | **10Y** |
| **0%** | 5 | 32 | 11 | 76 |
| **5%** | 18 | 50 | 35 | 105 |
| **10%** | 32 | 72 | 70 | 149 |

# Be careful with…

Long-term, uncollateralized transactions may imply a large counterparty risk and potentially burdensome capital charges. Examples are

- swaps with corporates;
- swaps assisted by "one-way" CSAs.

Corporates usually do not post collateral (they prefer to invest liquidity in their own business…). A "one-way" CSA is an asymmetric collateral agreement with an infinite threshold for one party.

Transactions with a sovereign or a large corporate may be negotiated under "one way" CSAs. Relevant examples are the hedging swap commonly involved in a securitization or covered bond structuring.

**Note that the Basel III (not the accounting) rules explicitly disallow mitigations stemming from rating-triggered clauses.**

# Restructuring the transactions

Effective ways to mitigate the counterparty risk of a transaction, f.i. with a corporate, may require a restructuring of its contractual design:

- **netting agreement**: allows the negative mtm transactions collateralize the positive ones; useful when dealing with a large number of transactions;
- **cross product netting**: allows netting between different products (not just derivatives) with the same counterparty, may lead to a possible cross collateralization; difficult to model;
- **break clauses**: give the right to one or both parties to early unwind the transaction.

Now we focus on break clauses exercisable unconditionally at a predetermined set of dates. Then we deal with other ATEs (Additional Termination Events) like rating-triggered clauses.

# Break clauses

Given that BVA may be positive or negative, at a given break clause date $\hat{t}$ a party exercises if its expected loss BCVA exceeds its expected gain BDVA.

$$\begin{aligned}\hat{V}_B^{AB}(t_0) \quad &= \quad V_B^0(t_0) - BCVA_B(t_0,\hat{t}) + BDVA_B(t_0,\hat{t}) + \\ &\quad\ \mathbb{E}\left\{\mathbb{I}_{\tau>\hat{t}} D(t_0,\hat{t}) \left[BDVA_B(\hat{t},T) - BCVA_B(\hat{t},T)\right]^+\right\}\end{aligned}$$

and the last term is equivalent to

$$\mathbb{E}\left\{\mathbb{I}_{\tau>\hat{t}} D(t_0,\hat{t}) \left[V_B^{AB}(\hat{t}) - V_B^0(\hat{t})\right]^+\right\}$$

We are assuming a risk-free close-out amount, which is a quite realistic hypothesis under ISDA

# Break clauses – cont.

In the case of a *mutual break clause* it is optimal to exercise at the first date, so that

$$\hat{V}^{AB}_{B,mutual}(t_0) = V^0_B(t_0) - BCVA_B(t_0,\hat{t}) + BDVA_B(t_0,\hat{t})$$

The break clause may have relevant impacts on the transaction value and its (unilateral) CVA, mitigating the capital charges because

- under the "standardized approach" the "effective maturity" is shortened to the first *break clause* date;
- under the "advanced approach" the break clause reduces the unilateral CVA sensitivity.

Anyway, a bank may face a P&L (and the regulator may not accept the capital charge mitigation) if the clauses are not optimally exercised.

# Break clauses – settings

Let us refer to the following simplified setting:

- deterministic default intensities (CDS) $\lambda_A$, $\lambda_B$
- no dependence between market risk factors and the time-to-default
- correlated time-to-default between B (investor) and A (counterparty) through a “Gumbel copula”...

$$\mathbb{P}\left(\tau_A > t_A,\ \tau_B > t_B\right) = e^{\left[(\lambda_A t_A)^\theta + (\lambda_B t_B)^\theta\right]^{1/\theta}}$$

... to encompass the first-to-default effect:

$$\mathbb{P}\left(s < \tau_A < \min(\tau_B,\ t))\right) = \frac{\lambda_A^\theta}{\lambda_A^\theta + \lambda_B^\theta} e^{-s\cdot(\lambda_A^\theta + \lambda_B^\theta)^{1/\theta}} \left(1 - e^{-(t-s)\cdot(\lambda_A^\theta + \lambda_B^\theta)^{1/\theta}}\right)$$

Remember: $\theta = 4$ means strong correlation; $\theta = 1$ no correlation

# Break clauses – UBC's time impact (A riskier)

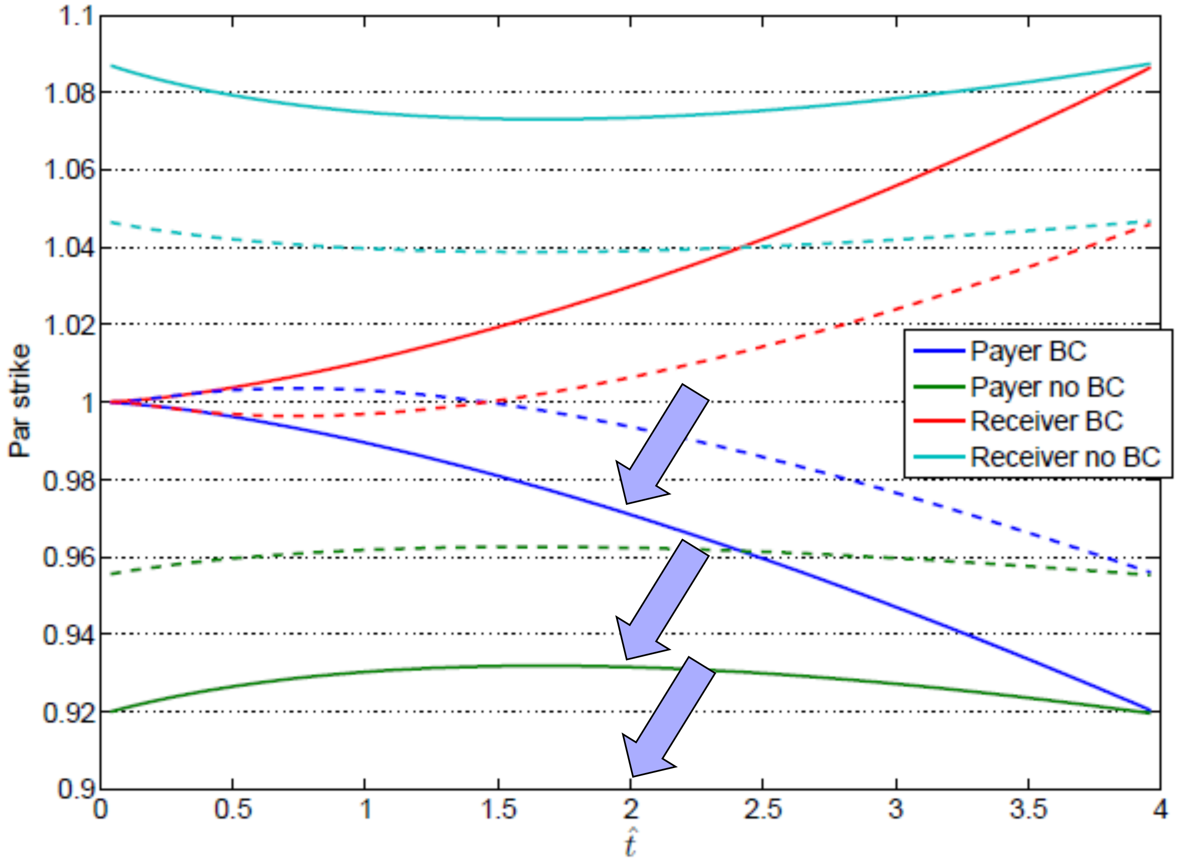



Figure 1: Par strike as a function of $\hat{t}$ for a 4y equity forward with $\lambda_A = 0.1$, $\lambda_B = 0.05$, $\theta = 4$ (full lines) and $\theta = 1$ (dashed lines). As $\hat{t}$ approaches 0 the counterparty risk is completely removed, since it is convenient to exercise the BC as soon as possible, being A the riskier counterparty.

# Break clauses – B riskiness and the UBC

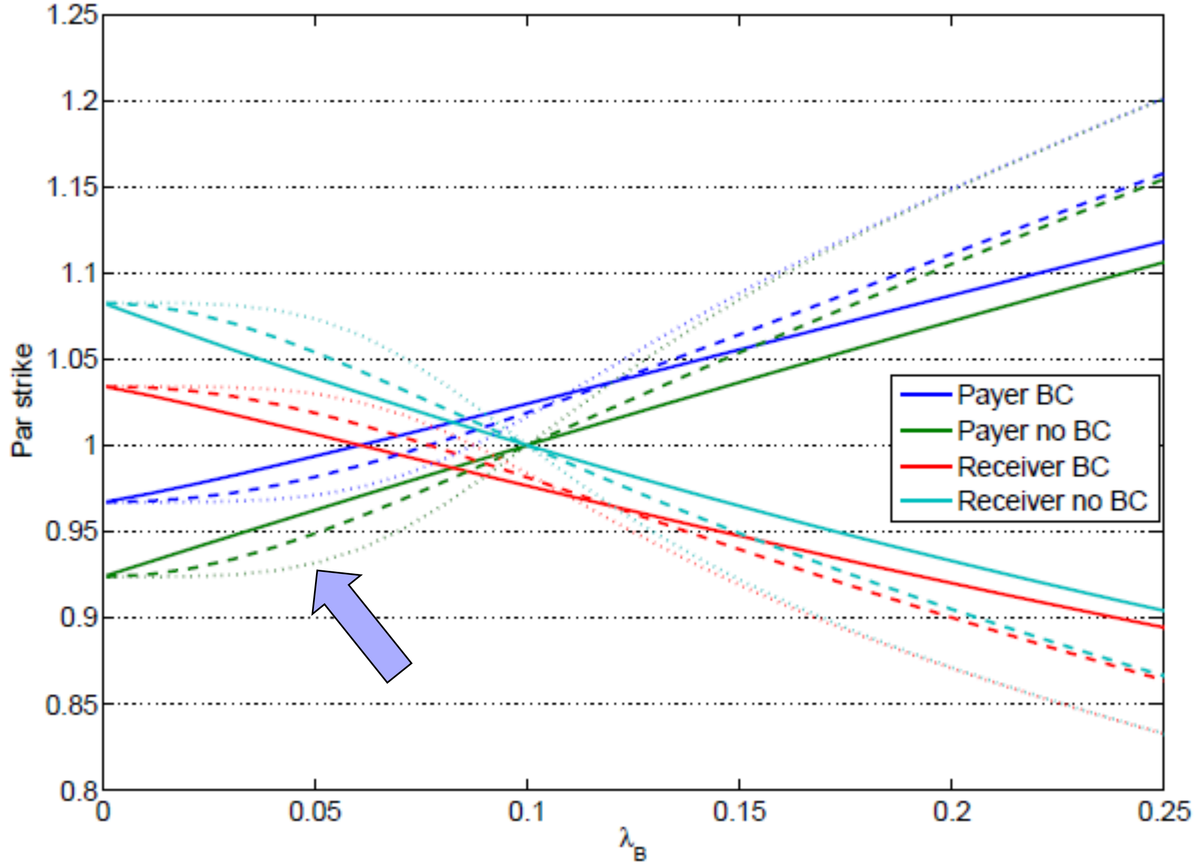



Figure 2: Par strike as a function of $\lambda_B$ for an equity forward with $\lambda_A = 0.1$, $T = 4$, $\hat{t} = 2$, $\theta = 1$ (full lines), $\theta = 2$ (dashed lines) and $\theta = 4$ (dotted lines). The correction due to the BC decreases as $\lambda_B$ grows larger than $\lambda_A$ and goes to zero faster for large $\theta$.

# Break clauses – UBC's time impact (A riskier)

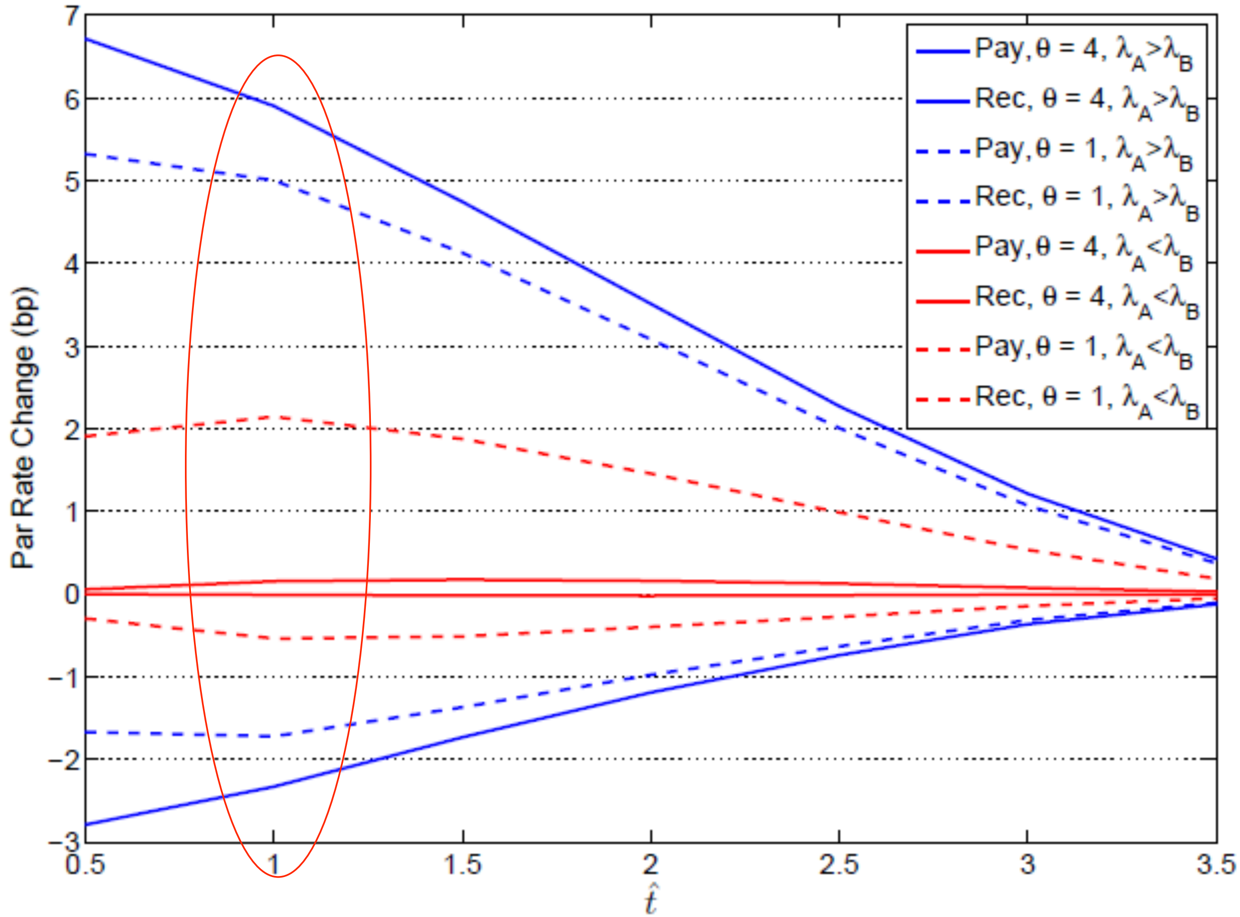



Figure 3: Par rate change with respect to the no BC case as a function of $\hat{t}$ for a 4y payer (positive) and receiver (negative) IRS with $\lambda_A = 0.1$, $\lambda_B = 0.05$ (blue) and $\lambda_A = 0.05$, $\lambda_B = 0.1$ (red), $\theta = 4$ (full lines) and $\theta = 1$ (dashed lines). The effect of the BC is larger for $\hat{t}$ close to 0, for $\lambda_A < \lambda_B$ and for the payer.

# Break clauses – B riskiness and the UBC

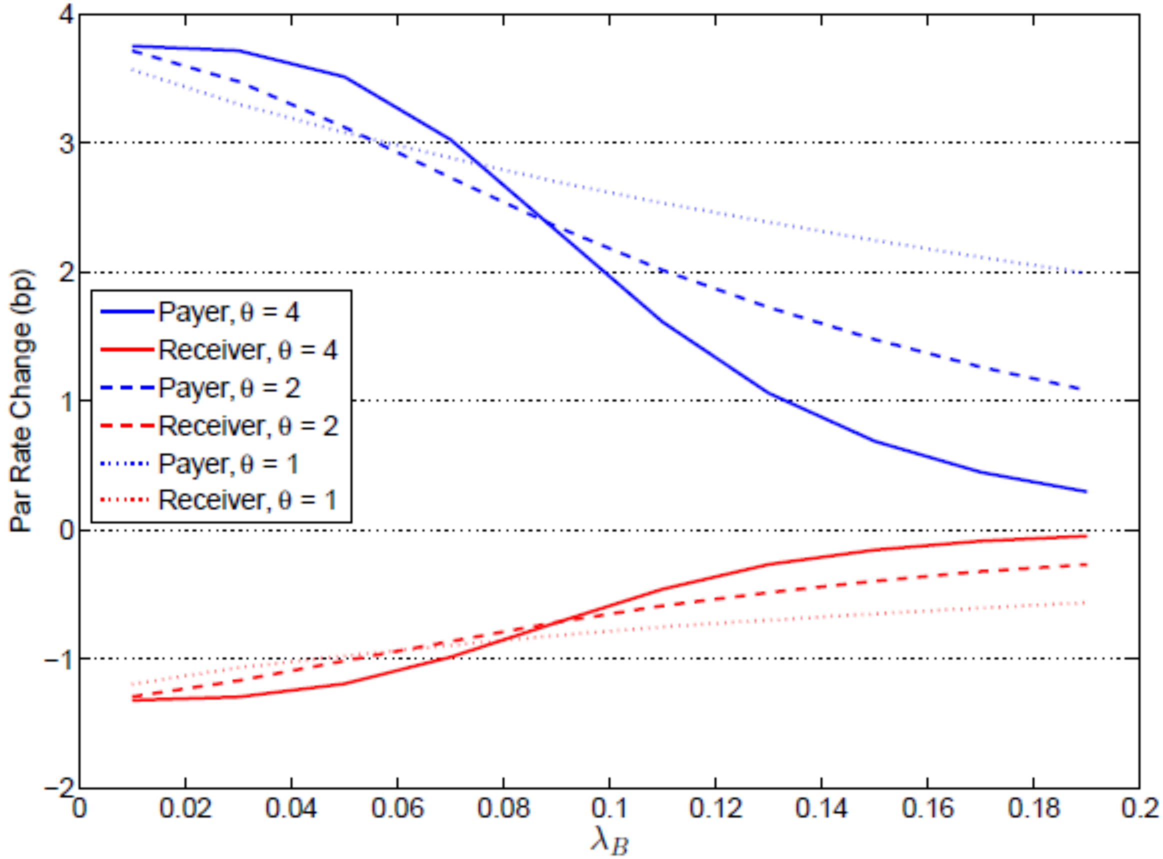



Figure 4: Par rate change with respect to the no BC case as a function of $\lambda_B$ for a payer (blue) and receiver (red) IRS with $\lambda_A = 0.1$, $T = 4$, $\hat{t} = 2$, $\theta = 4$ (full lines), $\theta = 2$ (dashed lines) and $\theta = 1$ (dotted lines). The correction due to the BC decreases as $\lambda_B$ grows larger than $\lambda_A$ and goes to zero faster for large $\theta$.

# Break clauses – equity forward

| $\theta$ | Payer | | | | Receiver | | | |
|---|---|---|---|---|---|---|---|---|
| | $T=4,\hat{t}=1$ | $T=4$ | $T=2,\hat{t}=1$ | $T=2$ | $T=4,\hat{t}=1$ | $T=4$ | $T=2,\hat{t}=1$ | $T=2$ |
| 1 | 0,90 | -3,23 | 0,43 | -0,81 | -0,90 | 3,37 | -0,43 | 0,82 |
| 2 | 0,24 | -4,42 | 0,16 | -1,09 | -0,24 | 4,70 | -0,16 | 1,12 |
| 3 | 0,06 | -5,33 | 0,06 | -1,31 | -0,06 | 5,75 | -0,06 | 1,36 |
| 4 | 0,01 | -5,91 | 0,02 | -1,45 | -0,01 | 6,42 | -0,02 | 1,51 |
| 5 | 0,00 | -6,23 | 0,01 | -1,53 | 0,00 | 6,80 | -0,01 | 1,59 |

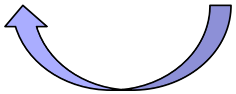


Table 1: Par strike difference (in percent) for various $\theta$ for $T=4$ and $T=2$ equity forwards with $\lambda_A=0.1$, $\lambda_B=0.05$, with and without a BC in $\hat{t}=1$ with respect to the 1y case with no BC. The BC reduces the 4 years and the 2 years cases to the 1y with no BC.

# Break clauses – unilateral multiple clauses

| $\hat{t}$ | $\lambda_A$ | $\lambda_B$ | $\theta$ | Payer swap (bp) | Receiver swap (bp) | $\hat{t}$ | $\lambda_A$ | $\lambda_B$ | $\theta$ | Payer swap (bp) | Receiver swap (bp) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 2 3 | 0,1 | 0,05 | 4 | 6,0 | -2,4 | 1 2 3 | 0,05 | 0,1 | 4 | 0,2 | 0 |
| 1 2 | 0,1 | 0,05 | 4 | 5,9 | -2,4 | 1 2 | 0,05 | 0,1 | 4 | 0,2 | 0 |
| 1 | 0,1 | 0,05 | 4 | 5,9 | -2,3 | 1 | 0,05 | 0,1 | 4 | 0,2 | 0 |
| 2 3 | 0,1 | 0,05 | 4 | 3,5 | -1,2 | 2 3 | 0,05 | 0,1 | 4 | 0,2 | 0 |
| 2 | 0,1 | 0,05 | 4 | 3,5 | -1,2 | 2 | 0,05 | 0,1 | 4 | 0,2 | 0 |
| 3 | 0,1 | 0,05 | 4 | 1,2 | -0,4 | 3 | 0,05 | 0,1 | 4 | 0,1 | 0 |
| 1 2 3 | 0,1 | 0,05 | 1 | 5,3 | -2 | 1 2 3 | 0,05 | 0,1 | 1 | 2,4 | -0,7 |
| 1 2 | 0,1 | 0,05 | 1 | 5,3 | -1,9 | 1 2 | 0,05 | 0,1 | 1 | 2,4 | -0,7 |
| 1 | 0,1 | 0,05 | 1 | 5,0 | -1,7 | 1 | 0,05 | 0,1 | 1 | 2,1 | -0,5 |
| 2 3 | 0,1 | 0,05 | 1 | 3,1 | -1 | 2 3 | 0,05 | 0,1 | 1 | 1,5 | -0,4 |
| 2 | 0,1 | 0,05 | 1 | 3,1 | -1 | 2 | 0,05 | 0,1 | 1 | 1,5 | -0,4 |
| 3 | 0,1 | 0,05 | 1 | 1,1 | -0,3 | 3 | 0,05 | 0,1 | 1 | 0,5 | -0,1 |

Table 2: Effect of multiple BCs for a 4 years swap. See text for parameters' values. The par rate change with respect to the no-BC case is driven essentially by the time to the first BC.

# Break clauses – UBC and the CVA risk

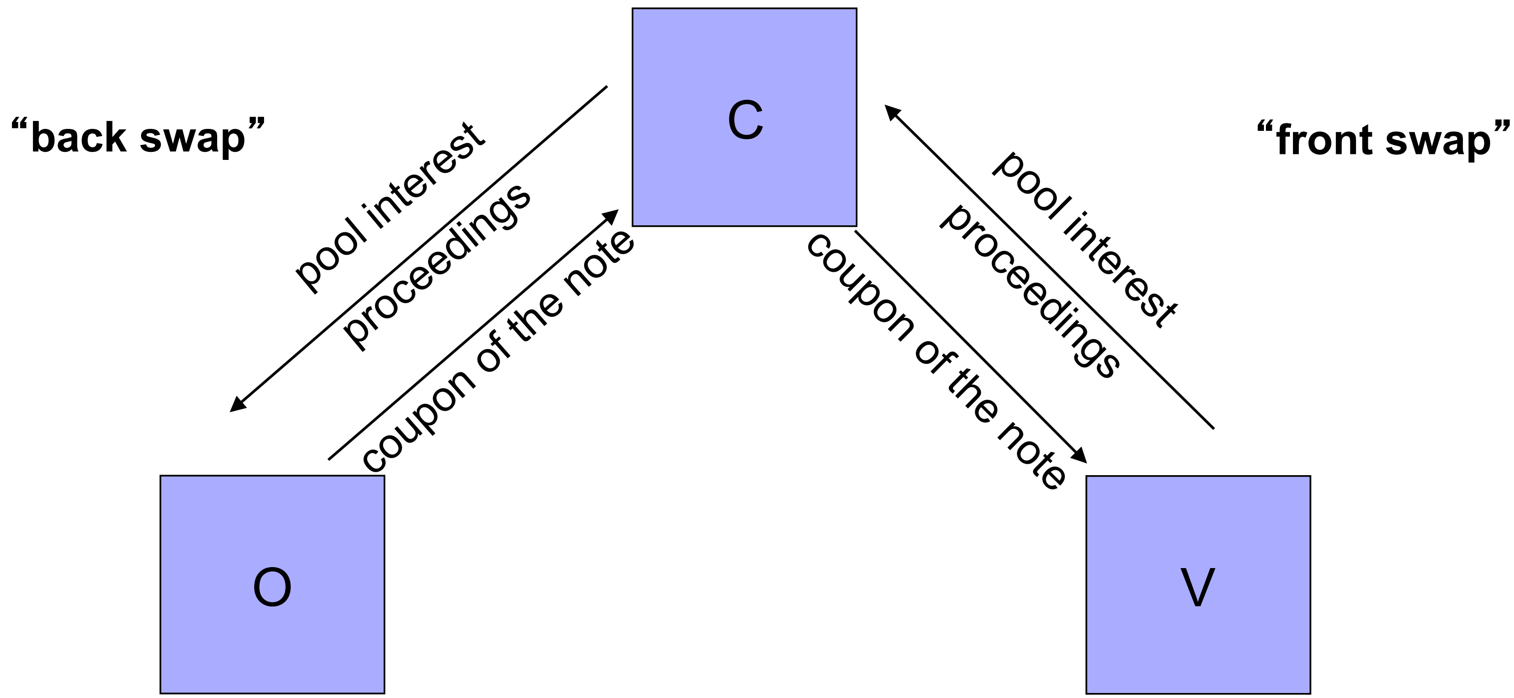
Even if a break clause is unilateral, the CVA risk is reduced, essentially because EAD reduces – note that the latter is related to the CVA sensitivity (approx: recall the CVA formula in slide 4 and use CDS~PD·LGD).

| $\lambda_A$ | $\lambda_B$ | $\theta$ | Payer UCVA sensitivity | | Receiver UCVA sensitivity | |
|---|---|---|---|---|---|---|
| | | | with BC | no BC | with BC | no BC |
| 0,05 | 0,1 | 4 | 1,634 | 2,812 | 1,094 | 1,321 |
| 0,05 | 0,1 | 1 | 1,459 | 2,812 | 0,892 | 1,321 |
| 0,1 | 0,05 | 4 | 1,209 | 2,244 | 0,728 | 1,089 |
| 0,1 | 0,05 | 1 | 1,234 | 2,244 | 0,748 | 1,089 |
| 0,1 | 0,1 | 4 | 1,260 | 2,244 | 0,753 | 1,089 |
| 0,1 | 0,1 | 1 | 1,260 | 2,244 | 0,753 | 1,089 |

Table 3: Comparison of sensitivities of UCVA with respect to $\lambda_A$ (in bps) with and without BC.

# “Back-swap” of a securitization

In a securitization or covered bond structuring, usually the Originator (O) hedges back the hedging interest rate swap between the Vehicle (V) and a third Counterparty (C).



# The “Back-swap” and its risk

The Vehicle is generally “squeezed” of liquidity. This is why rating agencies require a “front swap”. For the same reason, V cannot post collateral, then the “front swap” must be assisted by a “one way CSA”.

Therefore the Counterparty itself enters in the “back swap” that is referenced to another “one-way” CSA, otherwise the Originator would have to pay the C’s cost of funding the collateral.

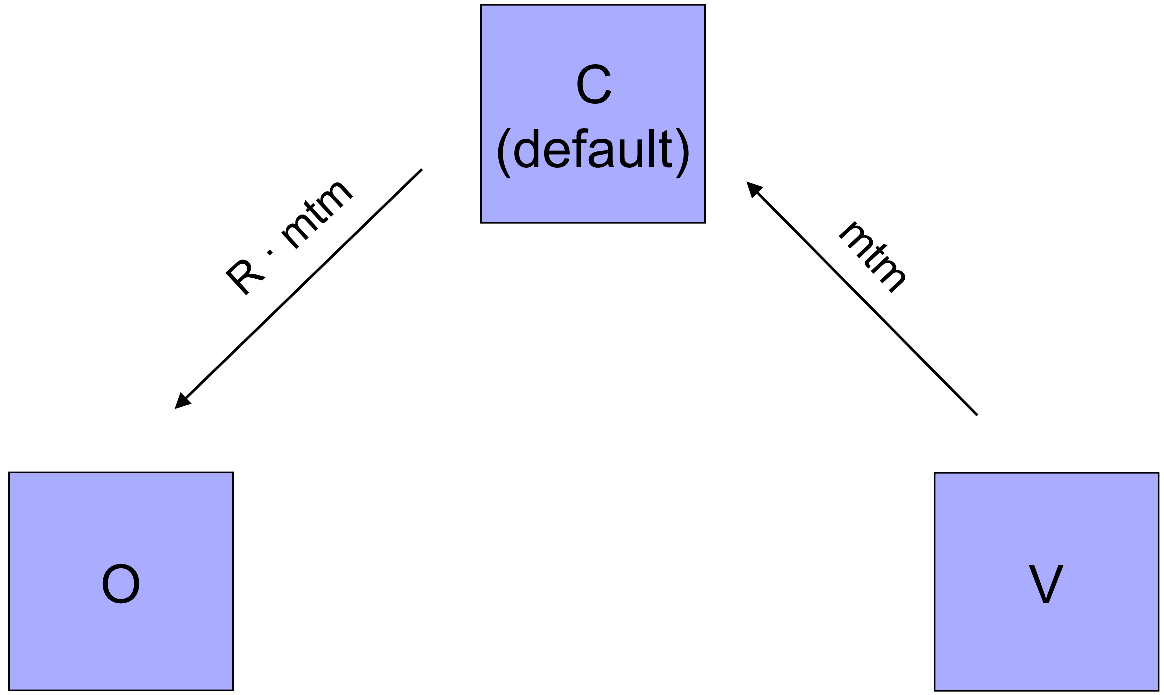
This is generally not a viable solution: the fees would become too large (from few bps to dozens of bps or even more).

The CCR exposure faced by the Originator is not compensated by the corresponding negative exposure of the Vehicle, even in the case they belong to the same financial Group.

# “Back-swap”: mtm>0, C defaults

In case of default of C when the mark-to-market is positive for the Originator, the latter faces a loss equal to –LGD·mtm.

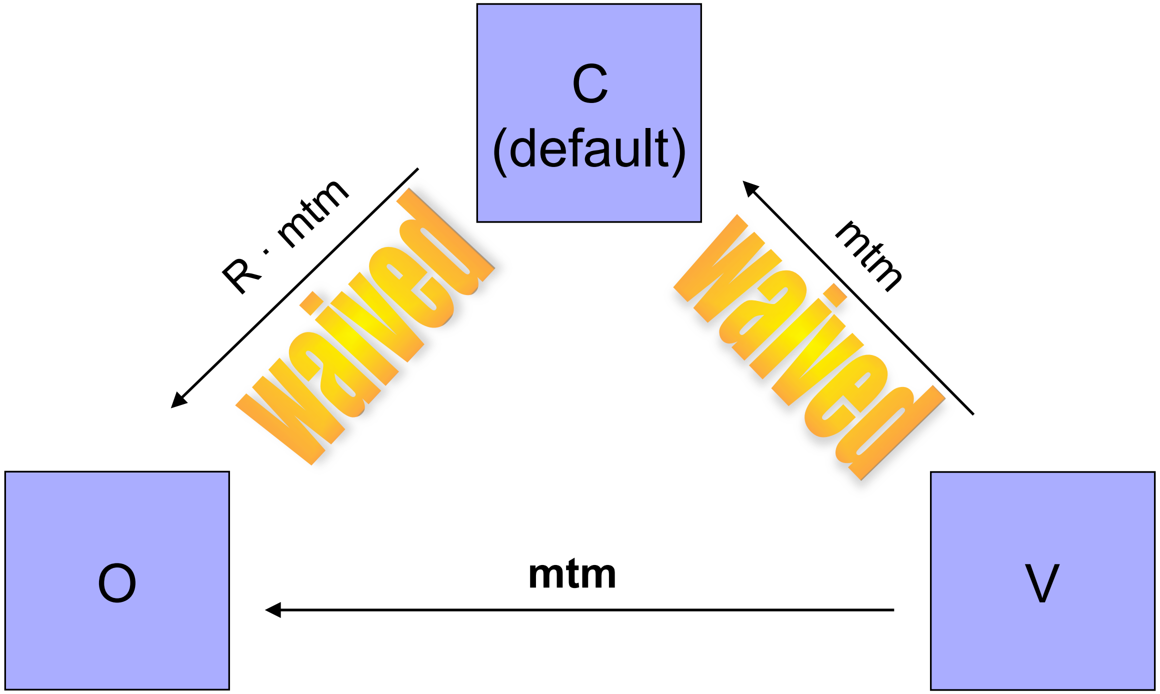
The Vehicle does not suffer any loss or liquidity shock, and the mtm due to C comes from the Replacement Transaction.



# Restructuring

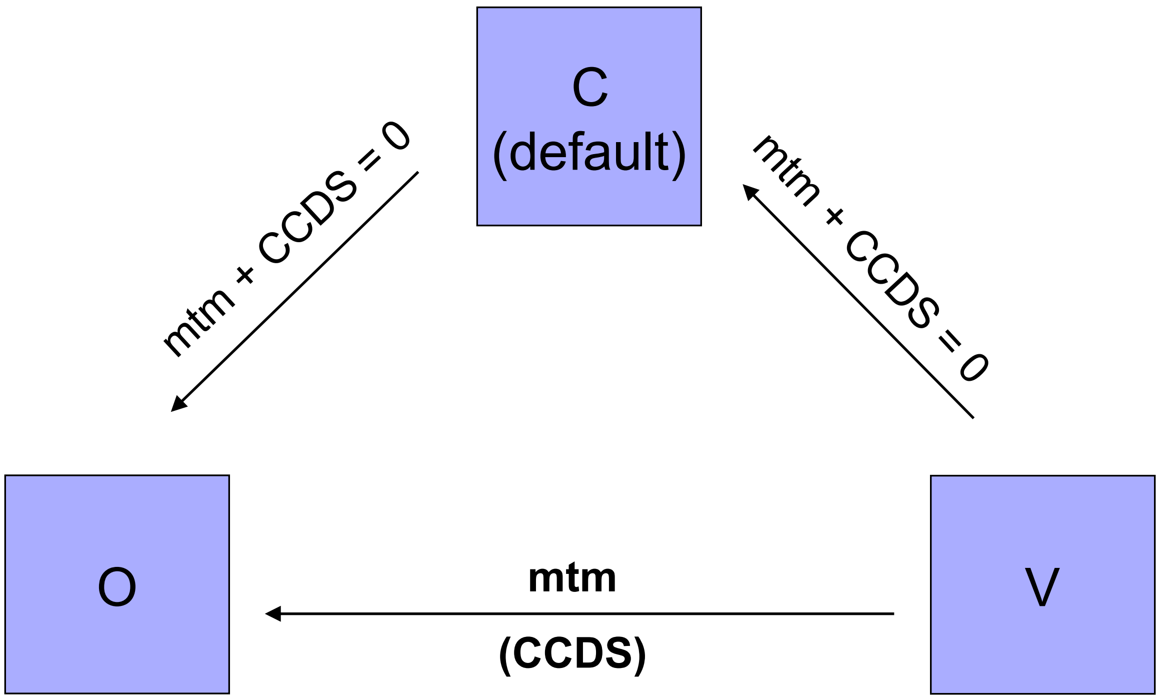
<u>Three Party Agreement:</u> In case of default of C and if mtm>0

- O waives the mtm due by C
- C waives to the mtm due by V
- V gives back the mtm to O



# Restructuring (corrige)

The Three Party Agreement may be realized using three CCDS referenced to the “back swap” and C. Each CCDS should net with the IRS between the parties, if any. Note that in this way C sells protection on itself – but in a fully collateralized fashion.



# Rating triggered clauses

The IRSs involved in a securitization or covered bond issue are generally equipped by rating triggered clauses defining Additional Termination Events (ATEs).

For instance, if the counterparty's rating falls below a certain rating threshold, she should provide a collateral; a further downgrade gives the party long the clause the right of unwind the transaction.

These clauses mitigate the counterparty risk, giving protection against the default risk arising from subsequent downgrades. The jump to default remains unhedged.

Regulators explicitely disallow rating triggered clauses as capital mitigant.

However, the rating triggered clauses may be priced, leading to a (possibily large) CVA mitigation.

# Rating triggered clauses – cont.

After choosing a suitable calibrating CDS portfolio...

| Emittente | Issuer Rating S&P (Moodys) | Ticker CDS 10Y | PD 10Y Moody's (pts) | CDS 10Y (bps) | PD 10Y mkt imp (pts) |
|---|---|---|---|---|---|
| KFW | AAA (Aaa) | GERMAN CDS USD SR 10Y | 0.52 | 53.4050 | 9.44 |
| Münchener Rückversicherungs AG | AA- (Aa3) | MUNRE CDS EUR SR 10Y | 1.76 | 67.4 | 11.39 |
| Credit Suisse AG | A- (A2) | CRDSUI CDS EUR SR 10Y | 3.68 | 99.58 | 16.42 |
| Natixis | A (A2) | KNFP CDS EUR SR 10Y | 3.68 | 138.6050 | 22.19 |
| Banco Santander SA | BBB (Baa2) | SANTAN CDS EUR SR 10Y | 7.80 | 170.99 | 26.91 |
| Banco Sabadell SA | BB (Ba1) | SABADELL CDS EUR SR 10Y | 20.93 | 211.15 | 31.47 |
| Banca Monte dei Paschi di Siena SpA | NR (B2) | MONTE CDS EUR SR 10Y | 39.46 | 378.565 | 48.73 |
| National Bank of Greece SA | CCC (Caa1) | ETEGA CDS EUR SR 10Y | 68.39 | 715.4946 | 70.86 |

# Rating triggered clauses – cont.

... the historical ($P$) transition matrix may be tilted to incorporate the observable risk premium ($Q$)

$$M^P = \exp \Lambda^P = \begin{pmatrix} 88.76 & 11.03 & 0.21 & 0 & 0 & 0 & 0 & 0 \\ 0.67 & 88.22 & 10.17 & 0.78 & 0.06 & 0 & 0.03 & 0.07 \\ 0.08 & 4.98 & 87.46 & 6.15 & 0.93 & 0.14 & 0.08 & 0.18 \\ 0.16 & 0.63 & 5.87 & 87.55 & 4.08 & 1.12 & 0.2 & 0.39 \\ 0 & 0 & 0.86 & 10.64 & 77.65 & 7.13 & 2.38 & 1.34 \\ 0.17 & 0 & 0.94 & 0.51 & 9.6 & 76.2 & 8.82 & 3.76 \\ 0 & 0 & 0 & 0 & 0 & 14.25 & 67.14 & 18.61 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 100 \end{pmatrix}$$

$$\Lambda^Q = \Xi \cdot \Lambda^P \qquad \qquad \Xi = diag(\xi_1, \ldots, \xi_K)$$

... in order to match the CDS quotations of the calibrating portfolio...

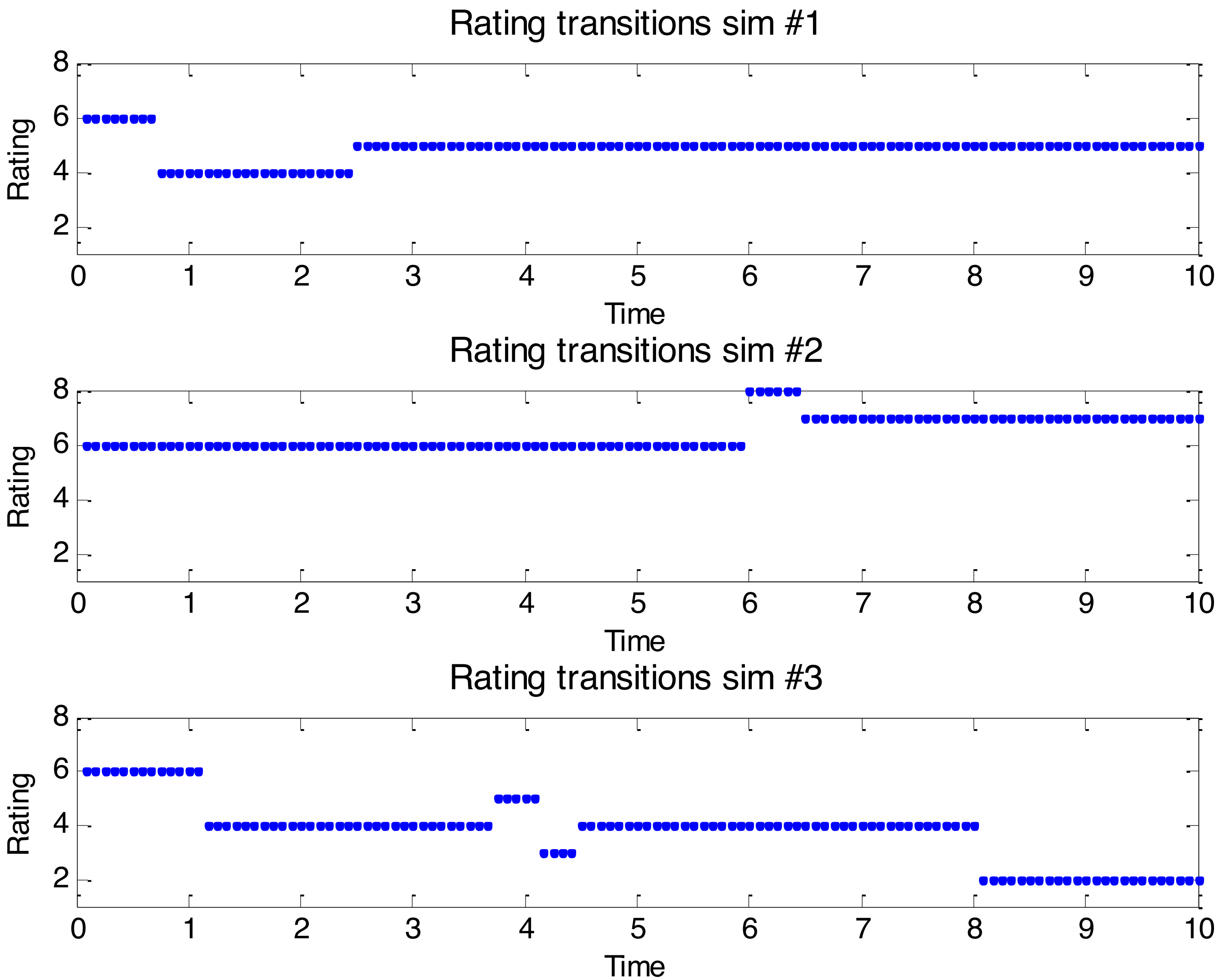
# Rating triggered clauses – cont.

... through the best fit for the coefficient $\xi$ ...

| Rating | $\xi$ | Theoretical CDS (bps) | Market CDS (bps) |
|---|---|---|---|
| AAA | 6.1 | 53 | 53 |
| AA | 2.6 | 67 | 67 |
| A | 2.9 | 100 | 100 |
| BBB | 27.5 | 171 | 171 |
| BB | 1.2 | 211 | 211 |
| B | 1.8 | 379 | 379 |
| C | 0.7 | 716 | 715 |

... then, after performing Monte Carlo simulations for the rating transitions ....

# Rating triggered clauses – cont.



# Rating triggered clauses – cont.

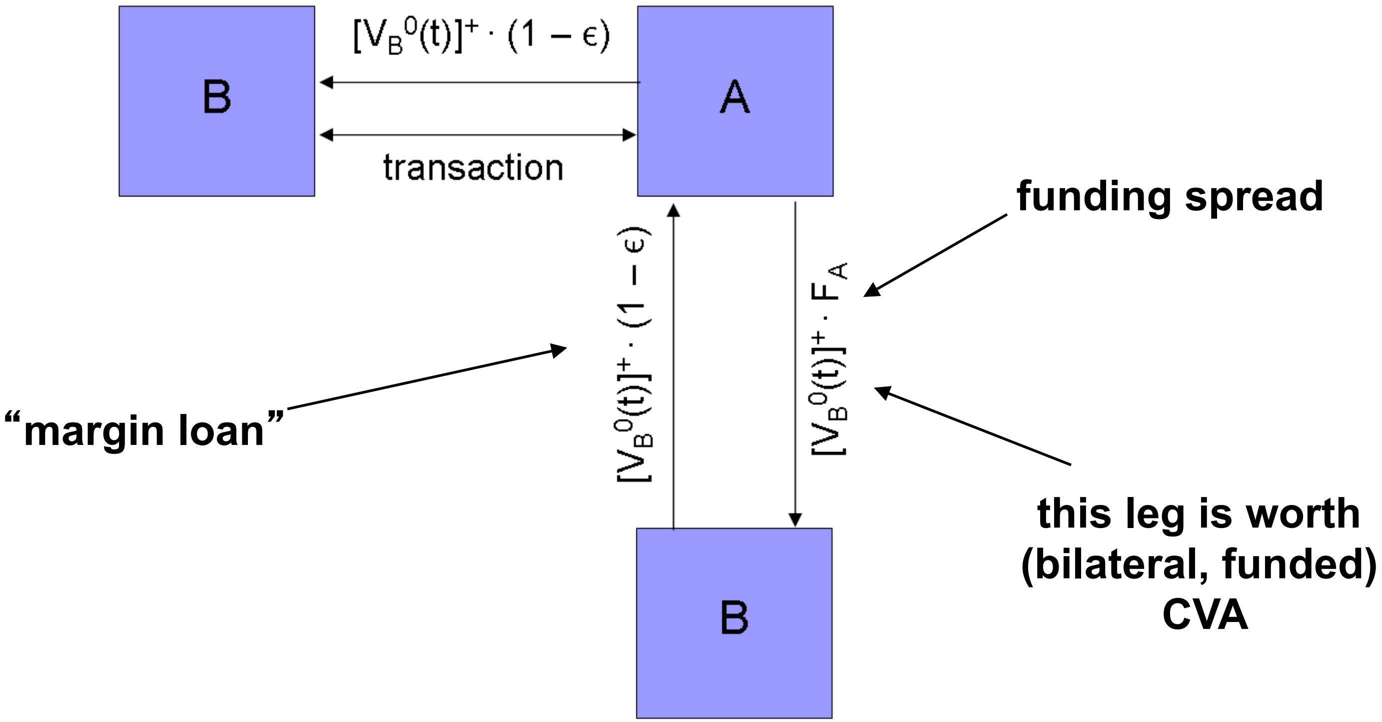
... we are able to calculate the counterparty's default probability for any future time interval in case of no ATE, and a possible large impact on the CVA arises ...

| **Rating** | **Unilateral CVA (no trigger)** | **Bilateral CVA (no trigger)** | **Unilateral CVA (trigger BB)** | **Bilateral CVA (trigger BB)** |
|---|---|---|---|---|
| A | 9.22 | 7.08 | 2.74 | 2.09 |

... here for a real case of a 10Y swap assisted by a collateralization clause below BB, expressed as a percentage of the expected exposure.

# Mutual collateral funding

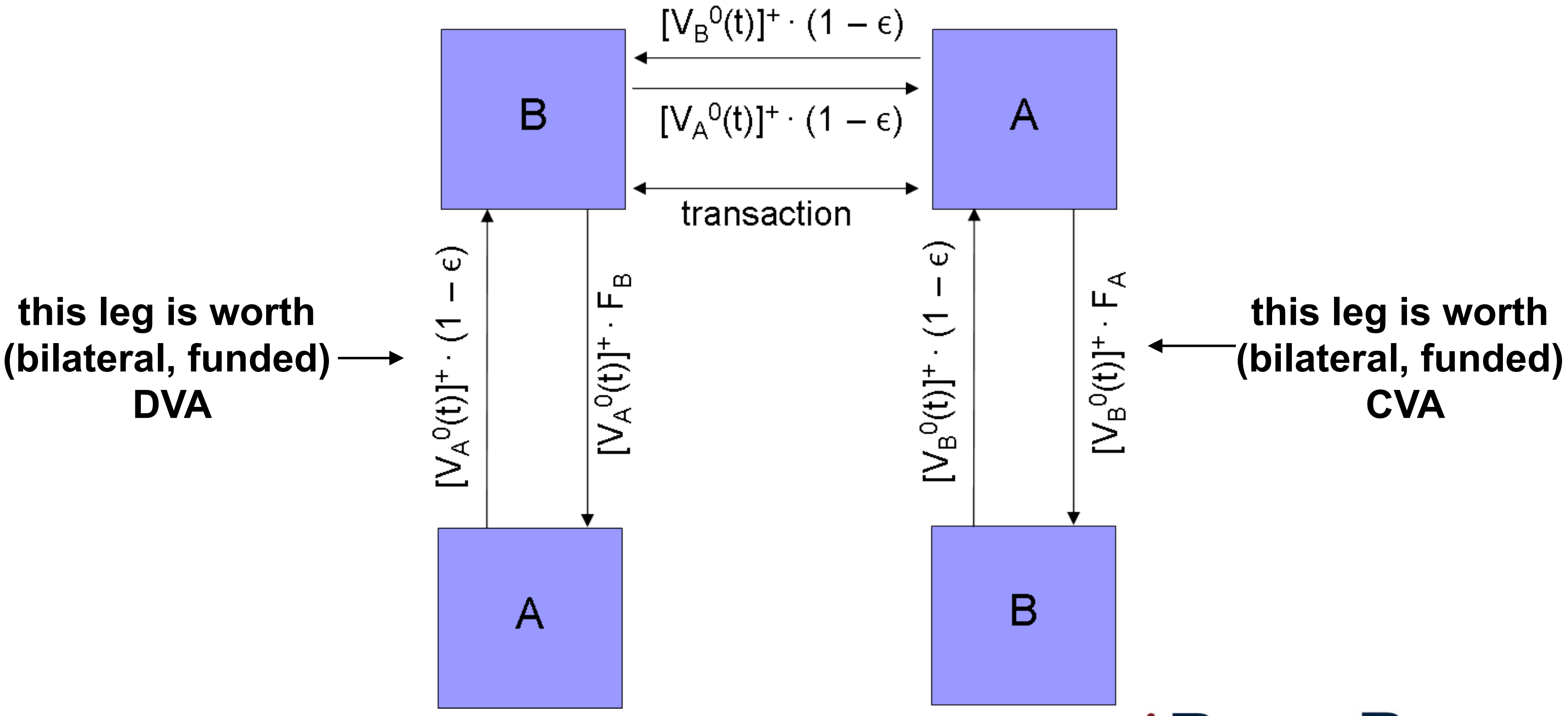
Suppose B risk free. An uncollateralized transaction between A and B may be restructured into a collateralized one, with B funding the collateral to A, with rehypothecation. The two structures are financially equivalent. The vertical leg in the figure represents a committed loan.



# Mutual collateral funding - cont

Even in a bilateral setup, an uncollateralized transaction may be restructured into a collateralized one, and two mutual loans.

A CVA risk capital charge is not required for loans. Does this represent a way to skip Basel III?



# Conclusions

- Effective ways to mitigate the counterparty risk and the related capital charge may require restructuring

- In case of a long term, uncollateralized transaction, the *break clauses* and the rating-triggered ATEs may be effective to reduce the CVA and its risk (but no regulatory allowance for the latter as a capital mitigant...)

- The asymmetric counterparty risk faced by the Originator of a securitization or covered bond may be hedged through a chain of CCDSs

- An uncollateralized swap may be replicated by a portfolio made by the collateralized swap (with rehypothecation) and two mutual loans

- Restructuring a transaction through this method may be viewed as a way to skip the Basel III rules in some cases

# References


- **Break clauses**

  L. Giada and C. Nordio, *"Breaking break clauses"*, Mar 2013, RISK Magazine, a w.p. version at http://ssrn.com/abstract=2055251

- **Rating triggered clauses – unpublished, see:**

  D. Lando, *"Credit Risk Modeling: Theory and Applications"*, 2004, Princeton series in finance

  R. Zhou, *"Counterparty risk subject to additional termination event clauses"*, Mar 2013, Journal of Credit Risk

- **Hedging the "one-way" risk**

  L. Giada and C. Nordio, *"Hedging the 'One-Way CSA' Counterparty Risk in a CDO"*, 2013, http://ssrn.com/abstract=2345710

  L. Giada and C. Nordio, *"Tackling counterparty risk with CDS"*, Mar 2014, Creditflux

- **Mutual collateral funding**

  L. Giada and C. Nordio, *"Funded Bilateral Valuation Adjustment", 2012,* http://ssrn.com/abstract=2172338

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