

Derivative Transactions – Analysis of Funding and Credit Costs

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Topics

- ▶ Funding analysis
- ▶ Credit analysis
- ▶ Summary
- ▶ Example

Caveat: The opinions expressed here represent the views of Charles Monet. These do not necessarily represent the views of Citigroup.

I. Funding Analysis

▶ Funding issues

- Derivative transactions generate long-term receivables (EPE)
 - These long-term receivables require funding with a bank's long-term debt
- Derivative transactions generate long-term payables (ENE)
 - These long-term liabilities provide long-term funding
 - Can provide significant value for some trades
- Long-term funding is expensive, today
 - It used to be cheap, so its cost was ignored.

▶ What is the economic impact of these receivables and payables?

EPE = Expected positive exposure in each period (receivable)

ENE = Expected negative exposure (payable)

Example #1: Without Collateral

► Assumptions

- Two back-to-back transactions
- Market will rise by Q with probability 50%, or decline by Q with probability 50%
- If the market rises by Q, the profit on Transaction #1 is \$100 and if the market declines by Q the loss on Transaction #1 is \$100.
- Transaction #1 is with Counterparty #1
 - No other transactions with this counterparty
- Similar assumption for Transaction #2

Calculation of EPE and ENE at inception	Transaction #1 Counterparty #1	Transaction #2 Counterparty #2
Initial MTM and receivable	\$0	\$0
MTM if market rises by X	\$100	-\$100
Dividends to be paid if market rises by X (ignoring taxes)	\$100	-\$100
EPE (50% change of \$100 receivable)	\$50	\$50
ENE (50% chance of \$100 payable)	\$50	\$50

Example #1 (Contd.)

- ▶ **Assume market rises by Q**

- ▶ **Transaction #1: MTM and cash flows**
 - Record \$100 profit and pay \$100 dividend

- ▶ **Transaction #2: MTM and cash flows**
 - Record \$100 loss and receive \$100 capital contribution

- ▶ **Balance sheet after the market move**
 - Receivable of \$100 from Counterparty #1
 - Payable of \$100 to Counterparty #2
 - No net need for funding

Example #2: With Collateral

- ▶ **Assume Transaction #2 has bilateral collateral mark with threshold of zero**

New calculation of EPE and ENE at inception	Transaction #1 Counterparty #1	Transaction #2 Counterparty #2
EPE	\$50	\$0
ENE	\$50	\$0

- ▶ **Assume market moves to Q**
- ▶ **Transaction #1 MTM and cash flows**
 - Record \$100 profit and pay \$100 dividend
- ▶ **Transaction #2: MTM and cash flows**
 - Record \$100 loss and receive \$100 capital contribution
 - Post \$100 of collateral to cover the payable
- ▶ **Balance sheet**
 - Receivable of \$100 from Counterparty #1
 - Payable of \$100 to Counterparty #2
 - Receivable of \$100 from Counterparty #2 for collateral posted to them
- ▶ **The balance sheet doesn't balance at this point...**
 - Continued on next page

Example #2 (Contd.)

▶ **The balance sheet doesn't balance at this point...**

- Requires debt financing for \$100
- Maturity of the debt depends on the statistical likelihood of market moves that impact the \$100 receivable.
- Funding need could last to the maturity of the trade.
- However, if the EPE and ENE are unchanged from Slide 5, the current MTM is temporary.
- Funding can be done on short-term basis.

▶ **Required financing does not match with EPE/ENE for this trade**

- Indicates difference between cash flows based on actual market moves and predicted flows based on EPE/ENE
- Ex ante, the chance of a receivable/payable was equal.
 - \$100 of excess funding was just as likely.
- The instability of cash flows versus the expectation creates short-term funding uncertainty...
 - And costs for the treasurer

Example #2: Second Period

▶ Updated expected exposure based on MTM from prior slide

- Recall: Transaction #2 is collateralized
- Assume market move in previous period is expected to be permanent.

Now that the market has moved...	Transaction #1 Counterparty #1	Transaction #2 Counterparty #2
EPE	\$100	\$0
ENE	\$0	\$0

▶ At this point, we expect the funding need to continue...

- Based on the previous example, funding is required to support these two trades.
- Long-term debt is appropriate for the expected difference between the receivable and the payable.
 - The long-term financing need lasts to the statistical maturity of the receivable.
 - Detail of the timing of the expected flows is available from the exposure simulation systems.
- There will be short-term noise because market moves will not equal the expectation.
 - See the previous example
 - Not clear if this noise will diversify across the portfolio of cash flows

II. Credit Risk Analysis

▶ **Credit issues**

- We take credit risk on the receivable from the counterparty.
 - And, our counterparty has credit risk on our payable to them.
- The cost of credit risk for each party equals the CVA at deal inception (roughly)
 - Sum of (NPV of Cpty forward CDS spread_i x EPE_i x Cpty survival probability_i)
 - Ignores rebalancing costs if we actually hedge the exposure

▶ **Two different views of a transaction from credit perspective**

- Transaction pricing: always bilateral
 - During a price negotiation, sophisticated parties will settle on the net of the two credit charges.
 - Neither party can achieve what they need to offset the full cost of credit.
 - Therefore: pricing is on a bilateral basis, both at trade inception and trade unwind
- Financial impact of transaction over the life of the deal, if no unwind
 - Cumulative profit for a transaction is on the unilateral basis
 - The credit exposure to the counterparty has to be hedged at a cost...
 - Or, there is an equivalent cost of capital if the credit risk is not hedged.
 - However, there is no financial gain from the risk that the counterparty takes to us

Credit Risk Analysis: 2 Views of Deal Economics

▶ Example of the two views

- Derivative trade with a counterparty with the same rating as ours
- No net credit payment: deal priced at mid-market
 - This is consistent with the bilateral view of credit costs
- We buy a CDS to hedge the counterparty's credit risk
- The risk-free flows have zero NPV
- The CDS cost has to be paid
- There is no profit on our own debt unless we pay it off below par
- Result: total transaction produces a loss over its life
 - This is consistent with the unilateral view of the credit costs

▶ Reconciliation of the two views

- At trade inception, there is a liability CVA
 - Equals Sum of (NPV of Your forward CDS spread_i x ENE_i x Your survival probability_i)
- There is also a negative theta in each time period as that liability CVA amortizes towards zero over the life of the deal.
- The NPV of these theta losses equals the up-front “profit” on the liability CVA
- These losses only exist because we have a different conditional statement
 - Pricing is computed unconditionally by both counterparties
 - Our own deal analysis is conditioned on ourselves not defaulting

Credit Risk Analysis: Marking Debt to Market

- ▶ **Bilateral advocates believe that the discount on one's own debt represents an economic profit.**

- If this were true, these would be good times...
- Bank debt sells for much less than par
- For bilateral advocates, this is the time to lock in profits

- ▶ **How to make a profit if one's debt is selling at a discount:**

- Go bankrupt
 - Few people are advocating this for their own institution.
- Take cash and buy back debt below par
 - When the crisis hits, everyone is desperate to conserve cash.
- Issue new debt and buy back old debt at a discount
 - This doesn't produce a profit. The NPV of the new debt equals the NPV of the old debt.
- Sell the business
 - The purchaser will buy at the bilateral price.
 - Nobody is advocating this for their own bank.
 - In any case, nobody is bidding to buy.

- ▶ **Conclusion**

- The bilateral model is a liquidation model of the transaction or the firm.
- The unilateral model is a going-concern model.
- If you intend to stay in business, the unilateral model reflects the economics.

III. Summary: Value of a Derivative Transaction

<i>Simplified for clarity</i>	Traditional bilateral view: pricing	Combined view of funding and credit: economics to your firm over deal's lifetime
Credit risk on counterparty	Sum of (NPV of EPE_i x Cpty forward CDS spread _i x Cpty survival probability _i) Equals CVA at deal inception	Same as traditional bilateral view
Credit benefit on one's own default risk	Sum of (NPV of ENE_i x Your forward CDS spread _i x Your survival probability _i)	Zero. There is no credit benefit from your own default risk.
Funding cost of the receivable	Not considered	Sum of (NPV of EPE_i x Your forward bond spread _i)
Funding benefit of the payable	Not considered	Sum of (NPV of ENE_i x Your forward bond spread _i)

IV. Example: Impact Is Much Bigger Today

Assumptions:

- ▶ Receivable balance: \$1 million each year for 5 years
- ▶ Payable balance: \$500,000 each year for 5 years
- ▶ Discount rate: zero, for simplicity

	Good old days	Today
Cpty CDS spread (running)	50 bps	200 bps
Bank's CDS spread (running)	10 bps	200 bps
Bank's borrowing cost	10 bps	300 bps

Costs: negative Benefits: positive	Traditional bilateral view	Credit & funding view	Traditional bilateral view	Credit & funding view
Receivable CVA: <i>Credit exposure to cpty.</i>	\$-25 \$1m x 50 bp x 5	\$-25 \$1m x 50 bp x 5	\$-100 \$1m x 200 bp x 5	\$-100 \$1m x 200 bp x 5
Liability CVA <i>Cpty credit exposure to us</i>	2.5 \$.5m x 10 mp x 5	0 No credit	50 \$.5m x 200 bp x 5	0 No credit
Funding cost of receivable <i>Receivable needs L-T funding</i>	0 Not included	-5 \$1m x 10 bp x 5	0 Not included	-150 \$1m x 300 bp x 5
Funding benefit of payable <i>Liability is L-T funding source</i>	0 Not included	2.5 \$.5m x 10 bp x 5	0 Not included	75 \$0.5m x 300 bp x 5
Total economics	-22.5	-27.5	-50	-175

Appendix #1: Can Earnings Fund Receivables?

▶ Possible concern re: cash flow analysis on Pages 3-7

- Can't the business finance the receivable with its own earnings?
- There is no cash outflow, so the receivable can be financed for free.

▶ Theoretical response #1: Interest value of the receivable

- A business can't retain its own earnings to finance its receivables for free.
- A dollar of earnings with a cash remittance is not the same as a dollar of earnings without a cash remittance.
- The difference in value is the interest earnings (funding value) of the cash.

▶ Theoretical response #2: Equity's role in the balance sheet

- Equity is supposed to be a long-term funding source.
- If earnings are declared without an accompanying remittance, that sort of equity would not be a long-term funding source.
 - Such equity is tied up supporting the receivable that was created when it was declared.

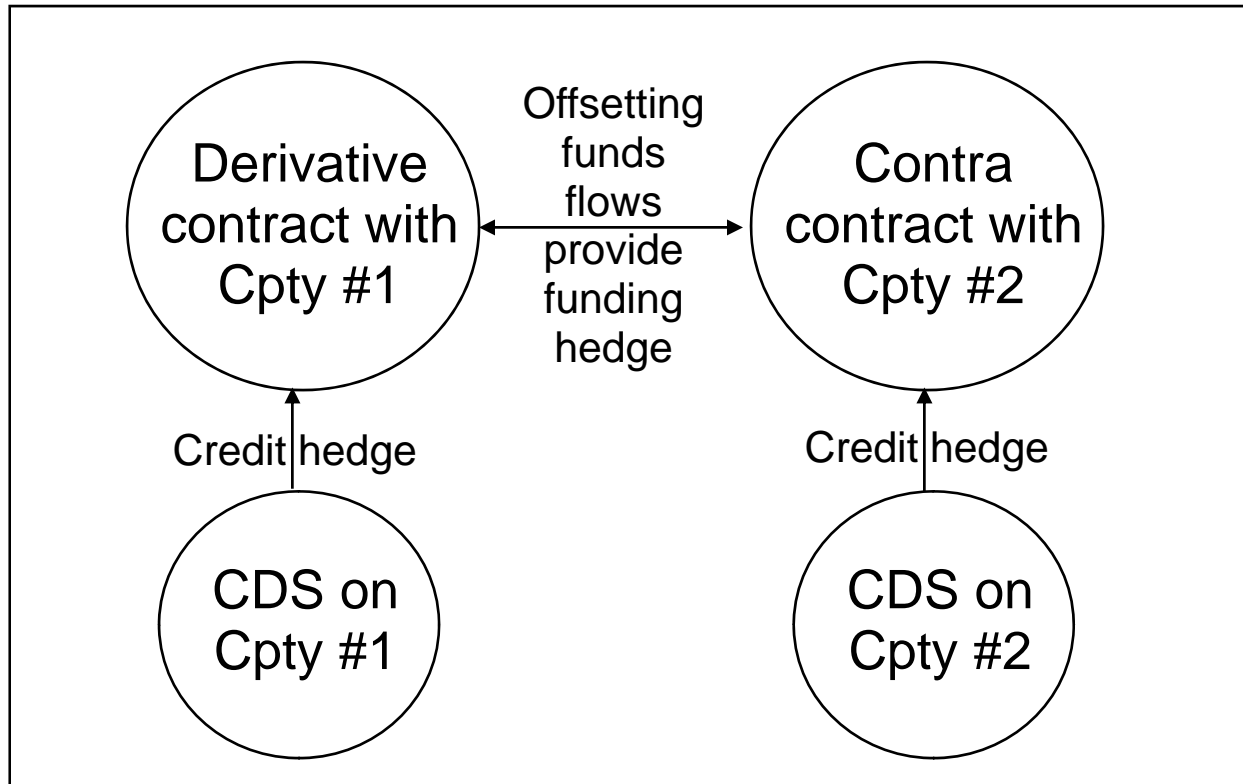
▶ Practical response: Funding costs are the same either way

- Even if you ignore dividends, in Example #1, there is no net cash flow.
 - Therefore, there is no net funding cost.
- In Example #2, there is a net negative cash flow to post collateral
 - That outflow requires funding.
- The net amount to be funded still equals the difference between the payable and the receivable.

Appendix #2: Credit Risk Analysis: Riskless SPE

- ▶ **Assume we have 2 offsetting trades with 2 different counterparties**
 - And put them in an SPE
 - See next page for diagram
- ▶ **Our goal: make the SPE riskless**
 - The SPE is already riskless with respect to funding
 - Each trade offsets the funding risk of the other
 - But, the SPE is not riskless with respect to default events
- ▶ **The appropriate hedge is to purchase a CDS on each counterparty and put it in the SPE**
 - This protects each counterparty from the other's default
 - Ignore for a moment the uncertainty in the outstanding amount of the exposure
 - At this point, the structure is riskless
 - If a counterparty defaults, the receivable is covered by the CDS.
 - This ignores friction costs to replace the contract.
 - Your bank's spread is now irrelevant to the economics of the SPE
 - Before the SPE was formed, it would have appeared that you was achieving an economic benefit equal to the ENE multiplied by your own debt spread.
 - One could argue that our counterparties are better off, because they now have a riskless deal, not credit risk to us.
 - But, we are not worse off. We had to pay our payables in any case.

Credit Risk Analysis: Diagram of Riskless SPE



- No funding risk: fully hedged
- No credit risk: fully hedged