

Remarks on Stress Testing Counterparty Risk

Paul Glasserman
Columbia Business School

Stress Testing Model Symposium
Federal Reserve Bank of Boston

September 13-14, 2012

Preliminaries

- Two types of counterparty risk
 - Losses from counterparty defaults
 - Mark-to-market losses from deteriorating credit quality of counterparties ← **My remarks limited to this type**
- MtM losses quantified through CVA = credit value adjustment
- CVA seeks to measure the *market price* today for off-loading these MtM losses over the next year (or 5-10 years)
 - This is fundamentally different from VaR, which seeks to measure a risk rather than a price
- CVA stress loss = CVA in stress scenario - CVA in baseline scenario

Different Types of Counterparties

From the perspective of a dealer

- Other dealers
 - Netting agreement likely; gross vs. net exposure
 - Collateral agreement likely, but collateral can be delayed or disputed when needed most
- Clients
 - Corporates
 - Hedge funds and other asset managers
 - Sovereigns – create special kind of wrong-way risk
 - Exposure to counterparty may be hedged through CDS
- Central Counterparty
 - Presumably assumed risk-free unless the scenario specifically stresses the CCP (though CCP exposure may get nonzero risk weight)

CVA

- Basel III defines CVA for a single counterparty to be a sum over dates t of

$\text{LGD} \times (\text{Expected Positive Exposure at } t) \times (\text{PD at } t) \times (\text{Discount Factor for } t)$

- Expected Positive Exposure = expected amount owed by counterparty after netting (a massive calculation); sensitive to volatility
- Importantly, LGD and PD are to be calculated from market prices – CDS if available
 - These are “risk-neutral” pricing values, not empirical values
 - This is important in specifying stressed values; won’t necessarily match stressed PDs – in fact, shouldn’t
- Stress scenario:
 - Shock exposure
 - Shock counterparty credit

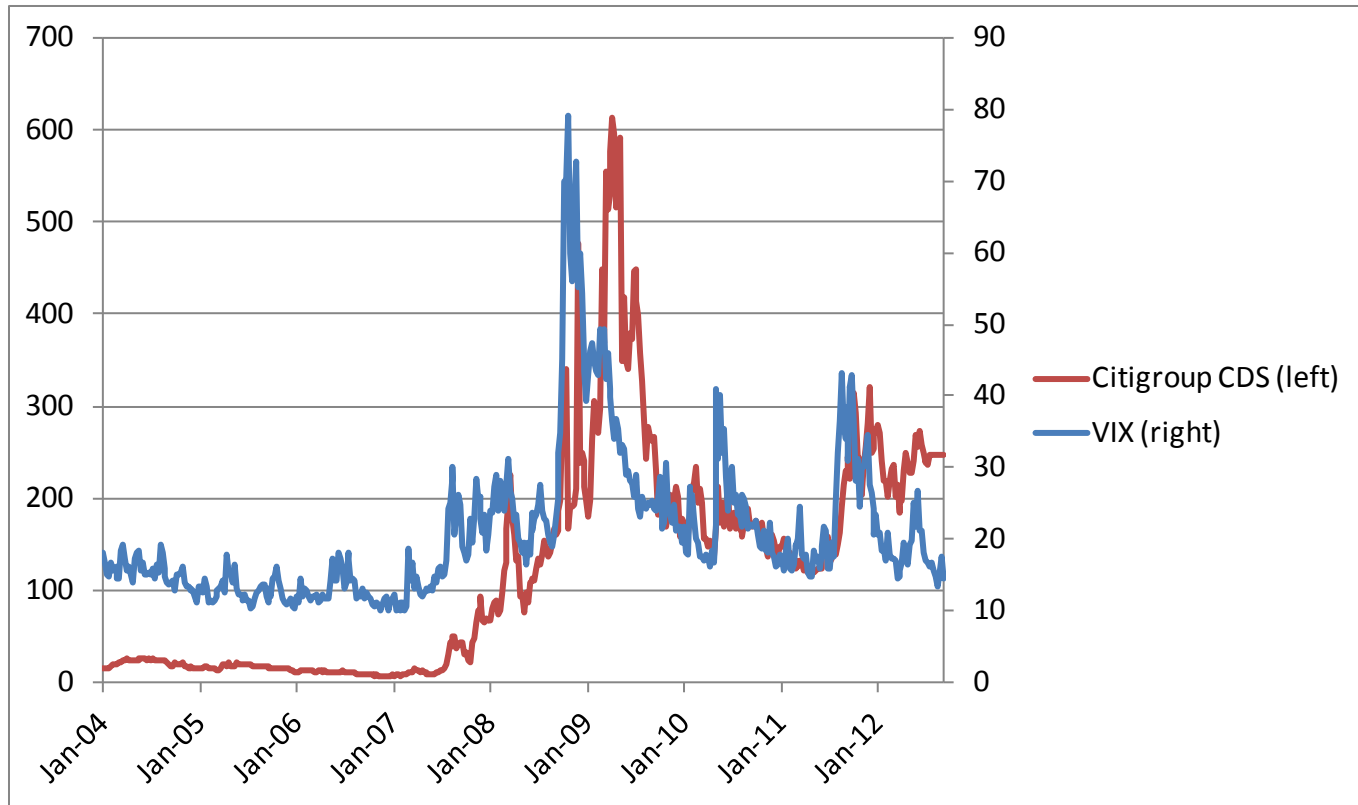
Wrong-Way Risk

- The Basel formula assumes independence of market and credit risk in multiplying

(Expected Positive Exposure at t) x (PD at t)

- Wrong-way risk is captured by multiplying by an “alpha” factor of 1.4, which banks can try to lower to 1.2
- Even if we assume that 1.2-1.4 is a reasonable correction in a basic CVA calculation, it doesn’t follow that it would be reasonable in a stress scenario
- Stress scenario:
 - Shock exposure
 - Shock counterparty credit spread
 - Shock dependence to capture increased wrong-way risk?

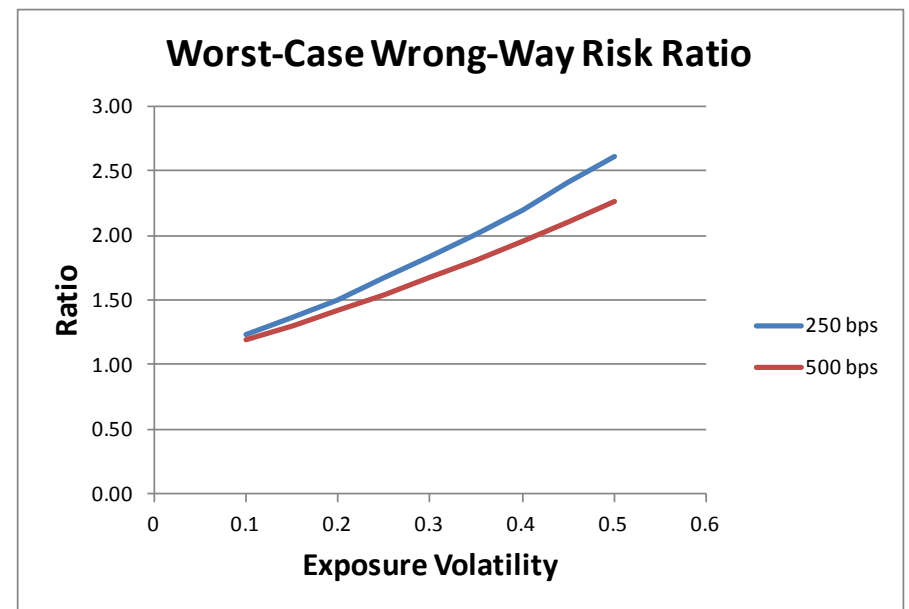
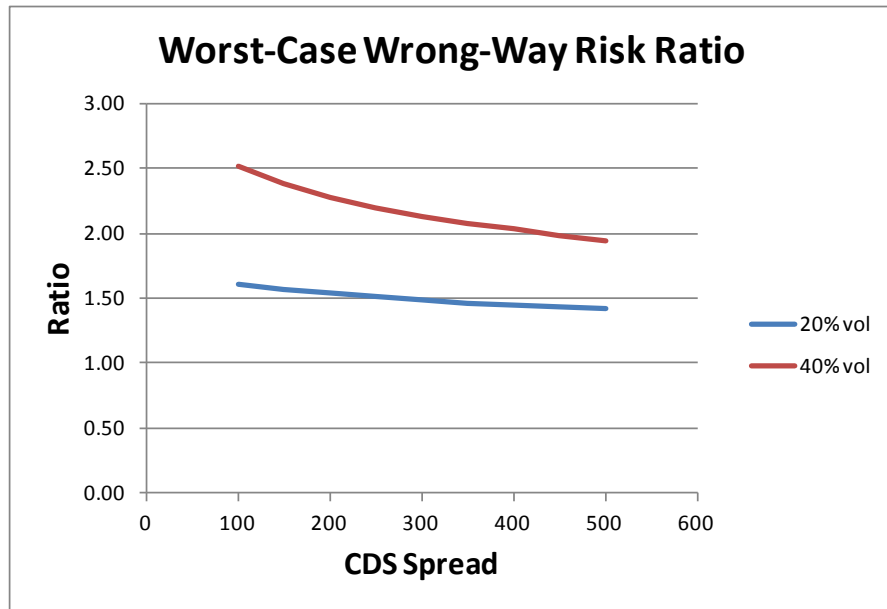
Illustration: VIX and Citigroup CDS Spread



Suggests increased co-movements as well as increase in levels

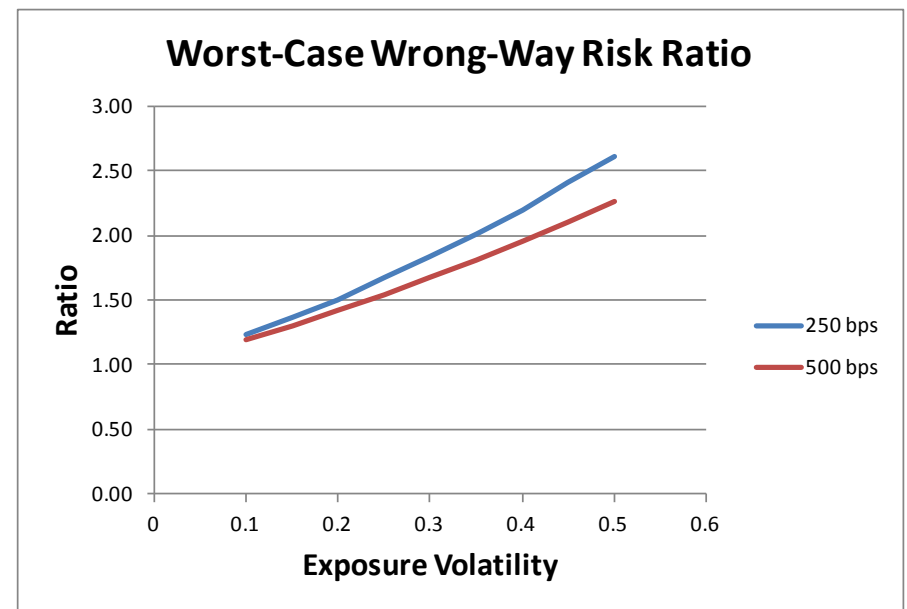
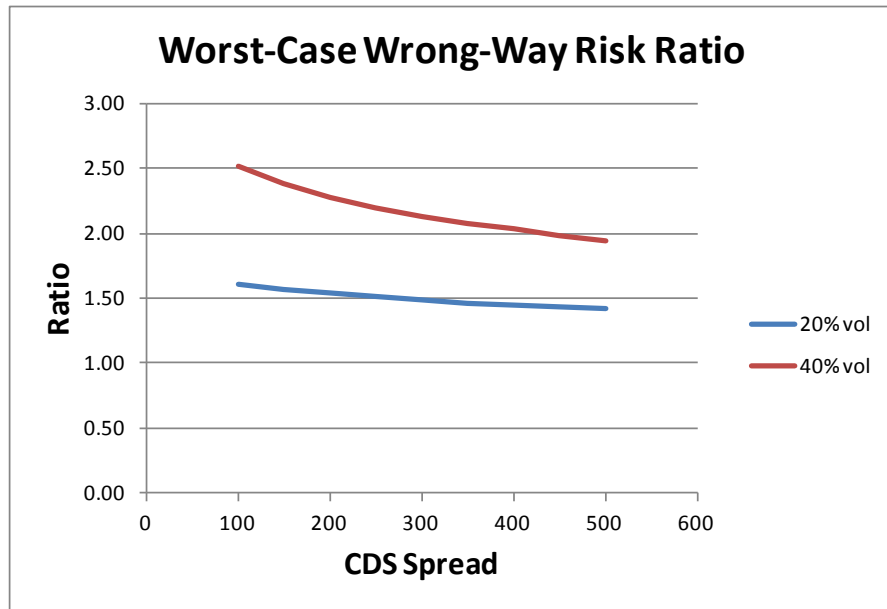
Simple Example

- 1 year horizon, lognormal exposure, flat CDS term structure
- Market stress scenario combines higher volatility and wider spreads
- Worst-case WWR when exposure and default time are co-monotonic



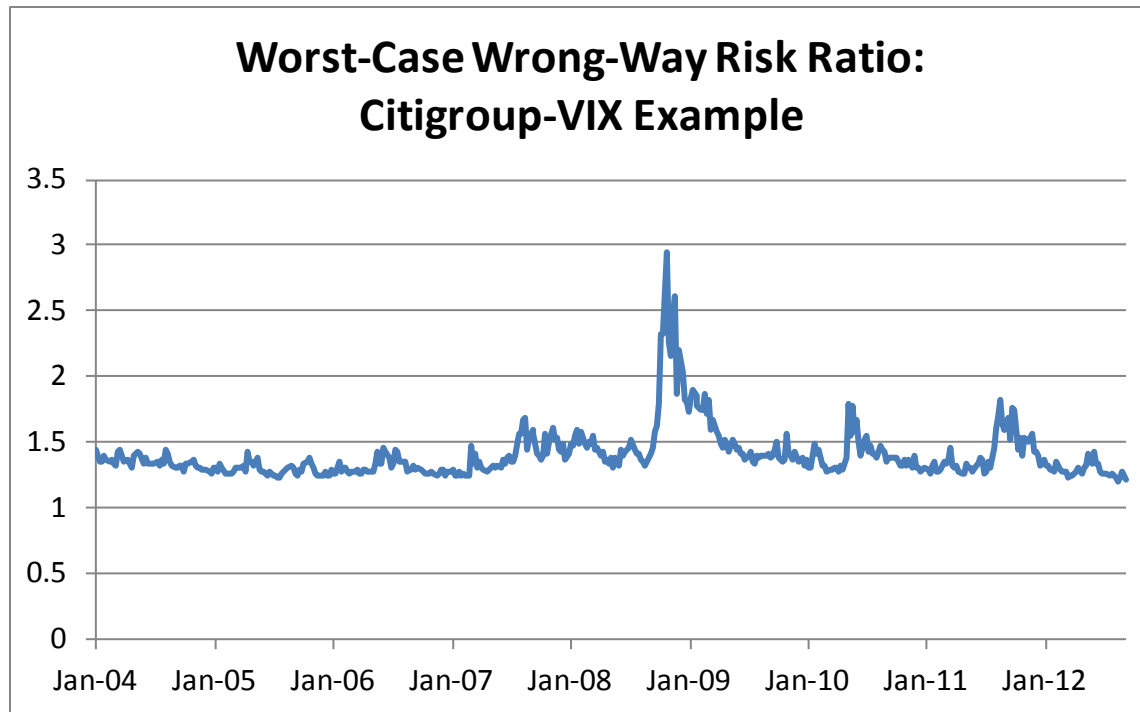
Simple Example

- Back-of-the-envelope stress: When levels move from (CDS=250, vol=20%) to (CDS=500, vol=40%), move multiplier from Basel value of 1.4 to worst case of 1.9



Citigroup-VIX Example

- If exposure volatility = $2/3$ of VIX, the 1.4 is about right most of the time, but spikes in volatility increase the worst-case wrong-way risk



Questions and Observations

- Worst-case wrong-way risk can be calculated more generally, but it requires some model of the exposure (and default time)
- For bank trading books, what is the impact of increasing dependence as opposed to just shocking market and credit risk? CCAR implicitly puts correlation in shocks rather than in CVA conditional on shocks.
- If my credit deteriorates more than my counterparty's, I don't experience a MtM loss. Should this be incorporated into stress scenario CVA? (Logically, yes; conservatively, no.) Same question for right-way risk.
- If yes, then what constitutes a coherent scenario? Each bank sees a different set of counterparties stressed.
- How and where to account for CVA hedging (B sells me a CDS on A to hedge my counterparty risk to A) – three-way wrong-way risk.