CLO Modeling Scenario Proposal

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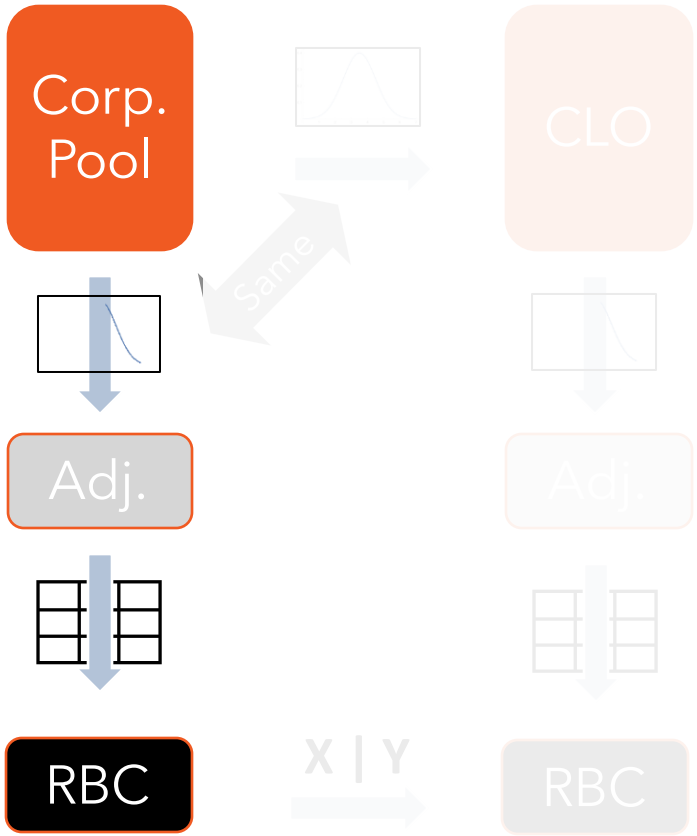
Introduction

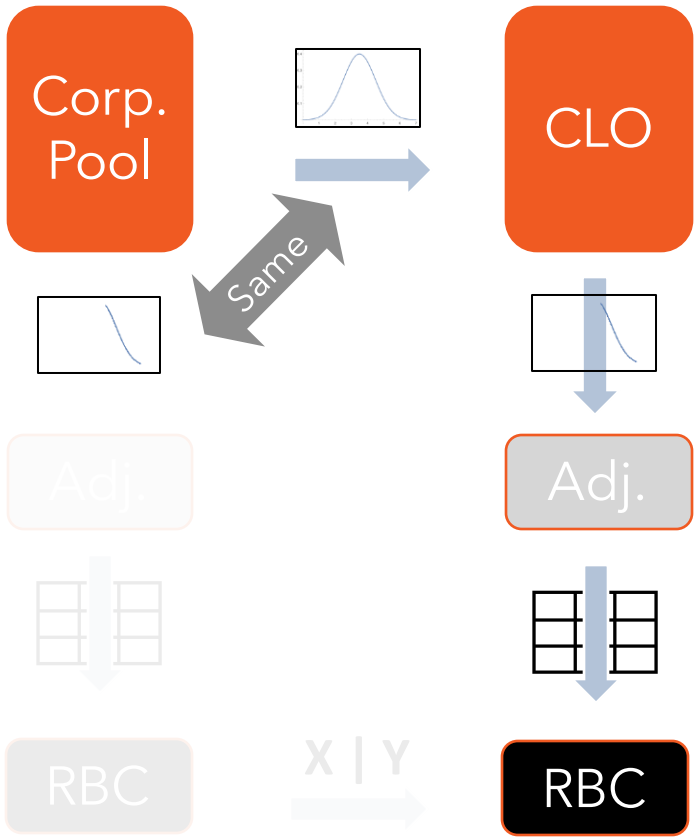
- The main goal of using multiple scenarios is to create a proxy for a distribution to test the performance of each tranche.
- For a pool of corporate credits, the distribution has a mean based on the historical default mean and a distribution shaped by correlation.
  - CLO modeling methodologies also start with determining the shape of corporate defaults/losses.
- Moody's Analytics also simulated a corporate pool to set RBC levels.
- We are seeking to leverage this work by conditionally matching the underlying distribution via RBC.

Original Simulation Approach



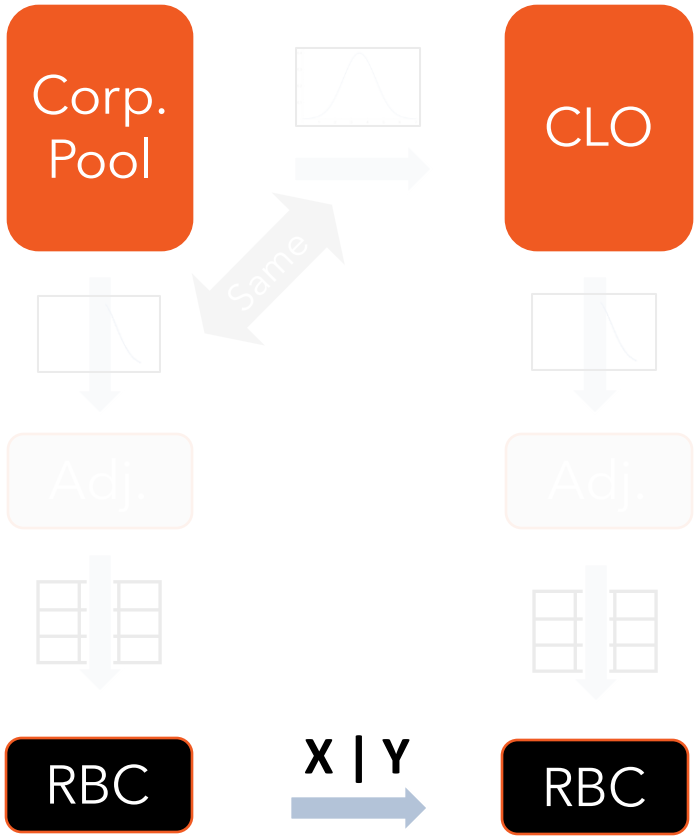
- To determine the risk from a pool of corporate credits, the Academy and Moody's simulated the defaults and recoveries across a range of scenarios.
  - This is also the first step in modeling a CLO – a pool of corporate credits.
- These cash flows were further adjusted for tax and other considerations.
- The result of this work was a distribution from which a pre-determined percentile was chosen.

Full Simulation Approach for CLOs



- One potential approach would be to do a full simulation of the CLO:
  1. Run a simulation on the corporate pool
  2. For each simulation run the cash flows through the waterfall (may need a term structure as well)
  3. Make adjustments (tax, etc.) to the resulting cashflows.
  4. Select the relevant percentile from results.
- This approach is generally not used due to its computational intensity and marginal benefit.
  - The closest approach is that of S&P/Fitch which run a single set of simulations and then compares the resulting cumulative rates to the distribution of portfolio performance.

Proposed Approach for CLOs



- Staff believes that the proposed approach is the most efficient for modeling CLOs
  - Until such time as RBCIRE comes up with an alternative.
- Instead of re-running the corporate simulation, we seek to match the conditional distribution by matching the RBC level.
  - This approach maintains the 96th percentile level implicit in the original simulation.
  - Since we don't have the original simulation, we need to assume the shape of the curve around the desired level.

Proposed Scenarios

Scenario	Default	Recovery	Notes	
1	Hist – 2 σ	Hist		
2	Hist – 1 σ	Hist		
3	Hist	Hist		
4	Hist + 1 σ	Hist		
5	Hist + 2 σ	Hist		
6	Hist	Stress		
7	Hist + 1 σ	Stress		The probability for these tail scenarios is expected to be ≤ **2%**
8	Hist + 2 σ	Stress		
9	Hist + 2 σ	[0.75] Stress	Prob ≤ 25 bps	
10	Hist + 2 σ	[0.5] Stress	Prob ≤ 10 bps	

Scenarios and Notes

- We are open to further discussions on the scenarios. Specifically:
  1. What should the probabilities be?
  2. Do we need more scenarios, especially in the middle of the distribution?
- The proposed matching approach is
  - Sum of RBC on collateral plus threshold ("error term") term; VS
  - Sum of risk in each tranche, calculated as MAX (P&I loss, mapped RBC). Mapped RBC is to the mid point currently used by RMBS/CMBS.
  - Currently using Par Assets – Par Liabilities for Residuals "face"
- We are likewise looking for comments on the matching algorithm as well
  1. What should be the threshold / error term?
  2. Generally, comments on the matching mechanism.

Next Steps

- Posting Cash Flows
- Posting .eco files
- Post detailed comparisons with CRP methodologies

Comparison: big three methodologies

	Moody's	S&P	Fitch
Corporate (Asset side)	Based on Idealized Default Curve and worst case weighted average portfolio rating ("WARF") ; Diversity Score heuristic provides correlation. Output is binomial distribution.	Based on actual pool; Inputs are rating, maturity and industry. Simulation is run with explicit correlation matrix. Output is cumulative default rate required for each CLO rating.	Similar to S&P. Based on actual pool; Inputs are rating, maturity, industry and recovery. Simulation is run with explicit correlation matrix. Output is RDR required for each CLO rating.
CLO (Liabilities)	All relevant binomial default scenarios are run to calculate the EL of each tranche – mapped back to the Idealized Curve.	The break-even default rate is calculated for each tranche – assigned rating is based on above simulation.	The break-even default rate is calculated for each tranche – assigned rating is based on above simulation.