

Data & Matlab code for “Economic Catastrophe Bonds”

In Matlab, first run BondPricer.m and then run TranchePricer.m.

masterDATA.csv contains the data

BondPricer.m

Extracts the daily state prices from equity option prices and calibrates the Merton/CAPM credit model by matching the credit spread, equity betas, and pairwise equity return correlations.

Functions called:

- loadDataDefinitions.m (helps organize the datafile)
- computeADPrices.m (extracts the daily state prices from equity option prices)
- calibrator.m (the Merton/CAPM credit model)
- replicator.m (identifies a portfolio of a single index put option and cash that replicates the price of a risky bond)

Datafiles created:

- adPRICES_tanh.mat (contains the daily cross-section of state prices)
- modelPARAMS_cdx_tanh_MERTON.mat (contains the daily calibrated model parameters for the CDX)

TranchePricer.m

Computes (expected) state-contingent tranche payoffs, given the tranche attachment points and the calibrated structural model parameters (asset beta, idiosyncratic volatility and debt-to-asset ratio) of the representative firm's debt is in the underlying bond portfolio (i.e. the CDX). To speed up execution, this code relies on an asymptotic approximation ($N \rightarrow \text{infinity}$) to derive the portfolio payoff. Monte Carlo simulations with $N = 125$ produce qualitatively indistinguishable results.

Functions called:

- loadDataDefinitions.m (helps organize the datafile)
- trancheCoupon.m (converts the price of a risky asset (expressed as a spread over the riskless rate) and its terminal expected payoff, and computes the equivalent running spread for a default swap contract).