Comments on

Contagion models for credit risk

- Default Contagion in Large Homogeneous Portfolios, A. Herbertsson
- Contagion in Affine Default Processes, A. Dassios and P. Sculli

Why contagion models ?

In the usual base correlation or copula models,

- We use an exogeneous dependance structure between default times

- Credit spreads of survival names do not jump at default times

In contagion models:

-The dependance structure is derived from the default intensity dynamics

- By construction, credit spreads of survival names jump at default times

Intensity Specification

The contagion effect can be read on the intensity specification

-Single credit event *(default):* M firms, For name *i*, $N_i(t)$ the default indicator:

$$l_i(t, N_1(t), N_2(t), ..., N_m(t)) = a_i + \sum_{j \neq i} b_{i,j} N_j(t)$$

$$b_{i,j} > 0$$
$$b_{i,j} < 0$$
$$b_{i,j} = 0$$

- The « *homogeneous* » assumption made by **Herbertsson**

$$l(t, N_1(t), N_2(t), ..., N_m(t)) = a + \sum_j b_j N_j(t)$$

$$b_j > 0 ?$$
$$b_j < 0 ?$$

- The « strong homogeneous » assumption made by **Laurent et al. (2007)**

$$l(t, N_1(t), N_2(t), ..., N_m(t)) = a + b \sum_j N_j(t)$$

- More complex extension to Multiple **credit events** proposed by **Dassios and Sculli** – Possible self infection

Resolution step

- **Herbertsson:** connexion between contagion models and Markov Chain, with a simple generator matrix Q
- Then, a lot of available closed form expressions
  - multivariate default and survival distributions
  - Formulas for credit derivatives (CDS, CDO tranche spreads ….)

………… « just » from matrix exponential computation

- **Dassios and Sculli:** The resolution involves the *Infinitesimal generator A* (*infinite dimension matrix*)
- Marginal and Bivariate Survival probabilities are available from the generating function
- Computation of Moments of the default intensities
- Enough for calibration ?

Calibration step

- **Herbertsson:** First reduce the number of parameters in the intensity specification:

6 parameters instead of *m-1*

$$l(t, N_1(t), N_2(t), \ldots, N_m(t)) = a + \sum_j b_j N_j(t)$$

- Then, use market data on CDO tranche spreads to calibrate the remaining parameters: 7 market prices for 7 parameters

- The calibration problem is:

$$\min_q \sum_{j=1}^{7} \left[C_{j,theoretical}(T;q) - C_{j,market}(T) \right]^2$$

- Result: Exact fit of market data

Questions on calibration

- First, on the last assumption made on the *b* parametrers

  What are the results if we only use less than 7 betas ?

- Second, on the prices used in the calibration step

  Have we enough liquidity on market price of CDO tranche spreads?

- More generally, the two papers focus on pricing.

  Can we implement a replicating strategies in these 2 frameworks ?