Discussion of Bayesian tail risk interdependence using quantile regression

P. Giudici[†]
[†]University of Pavia

Fourth International Conference in memory of
Carlo Giannini
University of Pavia, 25–26 March 2014

Main contributions

The paper addresses the problem of estimating the Conditional VaR in a Bayesian framework, using quantile regression, both in a time-invariant and in a time-varying framework.

From a methodological viewpoint, it extends Brunnermeier's CoVar (2011) in a dynamic way and providing a Bayesian version.

From an applied viewpoint, it allows a better understanding of systemic risk, estimating tail dependences between pairs of institutions (or between an institution and its reference market)

From a computational viewpoint, it provides two Gibbs sampling algorithms. For the static model, exploiting the representation of ALD distributions as location-scale mixtures of normals; for the dynamic model, using a Gaussian state space representation

Remarks: CoVaR Definition

$$\mathbb{P}(Y_k \leq \mathrm{CoVaR}_{k|j}^{\mathbf{x},\tau} \mid \mathbf{X} = \mathbf{x}, Y_j = \mathrm{VaR}_j^{\mathbf{x},\tau}) = \tau. \tag{1}$$

The CoVaR by definition captures the dependency between TWO institutions, or between one institution and the reference market.

Such dependence may be spurious.

What about a partial dependence approach, conditional on ALL institutions?

Remarks: The model

$$y_{j,t} = \mathbf{x}_t^\mathsf{T} \boldsymbol{\theta}_j + \epsilon_{j,t} \quad (2)$$

$$y_{k,t} = \mathbf{x}_t^\mathsf{T} \boldsymbol{\theta}_k + \beta y_{j,t} + \epsilon_{k,t}, \quad (3)$$

where $\epsilon_{j,t} \sim \mathcal{AL}(\tau, 0, \sigma_j)$ $\epsilon_{j,k} \sim \mathcal{AL}(\tau, 0, \sigma_k)$ are independent Asymmetric Laplace distributions.

May be interesting to introduce a dependence structure between the $\epsilon_{j,t}$

Remarks: Prior distributions

Assumption:

$$\pi\left(\boldsymbol{\gamma}\right)=\pi\left(\boldsymbol{\theta}\right)\pi\left(\beta\right)\pi\left(\sigma_j\right)\pi\left(\sigma_k\right), \tag{4}$$

Independence between θ and β may be unrealistic. Can it be removed?

In the paper $(\theta_j, \theta_k)^T \sim N(\theta, \Sigma)$ with $\Sigma = diag(\Sigma_j, \Sigma_k)$. This also may be unrealistic. Can it be removed?

Remarks: the Gibbs sampler

The authors propose a Gibbs sampler that exploits the representation of ALD distributions as a location-scale mixture of Normals

It would be interesting to examine convergence diagnostics of the algorithm, given the high complexity of the proposed models.

Remarks: Application

The application considers co-movements between institutions belonging to the S&P500 Composite Index, with different sectors included.

Macroeconomic regressors are mostly financial. Why not controlling for real regressors?

The authors find a relevant effect of sectors, with evidence of a sector specific effect on systemic risk. Why not include explicitly in the model such a systemic effect?

Conclusions

It is a well written, stimulating and timely paper, which contains important advances.

We have suggested some possible extensions, it would be nice to hear whether and how they could be implemented.