Stress Testing of Credit Risk Portfolios
Amsterdam, 7 March 2008

Session 4
Latent variables

Discussion of papers by:
- G. Jiménez; J. Mencía
- J. Koopman, A. Lucas, B.Schwab

Outline

I.   Background and motivation of the two papers

II.   Main objective and lines of the Jimenez&Mencia paper

III.   New estimations techniques proposed by the Koopman&Lucas&Schwaab paper

IV.   Some concluding remarks

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I. Background and motivation

❖ **Questions raised among the "stress testing community"**

– Work on institution-based information but address system-wide stability issues

➔ *How to link micro-based information to a macro-prudential assessment*

– Measure interdependencies within the financial sector and interactions between real and financial sector, including second round effects.

➔ *How to better take account of individual incentives, cross sector and cross border effects and also potential feedback effects*

– Make sure to be as consistent and comprehensive as possible, in order to encompass a majority of risks borne by banks, and take account of correlations between the different risk factors potentially affecting their balance sheets

➔ *How to build a comprehensive framework for stress testing without caricaturing excessively the different risks at stake*

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I. Background and motivation

❖ **Contagion and interdependencies are clearly a concern for supervisors and financial stability actors**

- **Contagion: portfolios' and banks' interdependencies** is clearly the stumbling block of all the reflexion that has been generated recently in the field of stress testing (namely credit risk)

- **Papers presented here take part to that discussion**
  →**understand** correlations between default events

- **Supervisory issue** : the main difficulty to cope with default's interdependency consists in finding the right balance between a good assessment and monitoring of risk profile and risk taking by individual banks, in order to limit potential contagion of
  - *Individual defaults of credit counterparties to others*
  - *As a result, sequential individual defaults of banks' (**domino effects**).*

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I. Background and motivation

❖ **What has been done so far to address the policy implications of these challenges for loan portfolios' stress testing?**

Basel II framework:

– **As regards credit risk** : the basel II Pillar 1 framework takes account of both of idiosyncratic and macro risk factors (But risk factors' correlations issue still at stake)

– May not take account of concentration risk in corporate credit portfolios

– **Thus, pillar 2 requirements** to banks: develop a comprehensive stress testing framework to address those different supplementary risks (like concentration, liquidity etc.) in an integrated manner, and relate results to economic capital.

– Better assessment and monitoring of credit risk transfer markets and liquidity related issues

I. Background and motivation

❖ **Both presentations address these challenges**

❖ **Propose original solutions around one assumption : the existence of latent factors**

→ better explain correlations in default events and, as a result, contagion,

→ include the effects of latent factors in the risk assessment.

❖ **Discussion**

1. *Jimenez & Mencia*: **"Modelling the distribution of credit losses with observable and latent factors".** Develop a basel II based credit risk model, also allowing for unobservable factors that help explain contagion accross sectors of credit counterpart.

2. *Koopman, Lucas&Schwaab* : **"Common factors for frailty correlated default".** Develop original econometric techniques to take account of common unobserved components of conditional PDs, in addition to the known and observed ones (macro)

II. Jimenez & Mencia

"Modelling the distribution of credit losses with observable and latent factors"

❖ **A Basel II anchored credit risk model, with k sectors of counterparts**

– obtain a **credit losses distribution** that takes account of sector correlation, through common unobservable risk factors to different sectors.

– use or derive information on **Basel II type parameters** (default frequency, LGDs, EADs) as well as the number of loans by sector

– Both the number of loans and the default frequency dynamics, by sector, may depend on 4 types of factors :

  • Persistence

  • Macro observable risk factors

  • Idiosyncratic factor

  • 2 Common (to different sectors) unobservable (no data) risk factors

II. Jimenez & Mencia

"Modelling the distribution of credit losses with observable and latent factors"

❖ **Estimation and simulation of the model**

Kalman filter used to estimate the unobserved factors : compute the expected value of latent factors given information up to "t-1" + adjust for uncertainty of the estimate.

❖ **Empirics : make extensive use of spanish credit register**

- <u>data used</u> : default frequency, amount of loans by sector (>6000€), mortgages, consumer loans etc
- <u>econometric estimates</u> of the models explaining the dynamics of default frequency & the growth of loans + simulations of credit loss distribution from the model.

❖ **Main results from introducing latent factors**

- ❖ latent risk factor **highly significant** for all sectors.
- ❖ Latent risk factors are **relevant control variables**
- ❖ **higher UL** when introducing latent factors

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II. Jimenez & Mencia

"Modelling the distribution of credit losses with observable and latent factors"

❖ **Policy implications**

– Sector correlations increase the amount of UL

– These latent factors may account for **contagion**

– Robust framework to **implement credit risk macro ST** and obtain reliable results from changes in GDP/interest rates on credit risk measurement, including potential contagion effect.

– Basel II compliant as regards pillar 1 and also tackle pillar 2 issues

❖ **Remarks/questions**

– Change in interest rates does not appear to be as significant as expected.

– Step further to try identify these latent factors : would be of great interest for supervisors in order to better understand where to put their efforts?

III. Koopman & Lucas & Schwaab
"Common factors for frailty correlated defaults"

❖ **A new econometric model to account for unobserved credit risk factors**

–   Objective: **model default dependancies** accross individual counterparties or sectors

–   Explained variable is Conditionnal default probabilities (logit transformation) : explained by a signal

–   3 sources of signalling :

•   **idiosyncratic,**

•   **macro common factors**

•   **unobserved component** (that could again yield for cross sector contagion

❖ **Model is first completely satistically solved (state space non-gaussian framework)**

-   Important part of the paper

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III. Koopman & Lucas & Schwaab
"Common factors for frailty correlated defaults"

❖ **Empirics**

– 2 sources of **data** :

  - *time series panel from the FED database*

  - *S&P credit pro database for firms' default information (+ rating migrations)*

– **PCA to the macro data** set to extract the 2 principal macro factors

– Fixed effects estimates

❖ **Main results obtained**

– Through **out of sample prediction** of the model for CDP

– Objective : accuracy of predicted CDP given that observed default fractions are just a crude measure of true CPD of a certain cross section at a given point in time

→**Forecast error is lower when introduce unobserved credit risk factors**

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III. Koopman & Lucas & Schwaab
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❖ **Policy implications/use of the model**

- May be a very useful framework for supervisors estimating credit risk

- Relevant PDs estimates

- Room for macro stress testing ?

❖ **Remarks and questions**

- Still have some difficulties to understand **how the unobserved factors are captured in the empirics** (like a residual?)

- **More applications** may be **needed** to better understand how that framework functions (stress testing exercises)

- **Question** on results of the fixed effect estimates :

  - Cohort explanation : younger companies may have a lower default frequency : may be biaised by the fact that the companies are still there? French experience : a high rate a young companies experience default very quickly...

IV. Concluding remarks

❖ **In the (short) history of credit risk stress testing, we clearly stand at a "turning point":**

  ❖ **systemic implications** of credit risk

  ❖ **Second round effects of individual events**

  ❖ These new models or methodologies are also **facilitated by the developments of new or recently adapted techniques** (from other fields of interest) for that purpose (econometrics and simulation techniques)

  ❖ ST models appear to develop along Basel II implementation process (Pillar II issues treated in a pillar I type framework)

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