BANCA D'ITALIA

EUROSISTEMA

Stress Testing of Credit Risk Portfolios
Session 1: Systemic stress

Discussion by
Antonella Foglia – Bank of Italy

BCBS and De Nederlandsche Bank
Amsterdam, 7 March 2008

The discussion represents my personal opinion
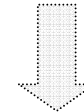and not that of the Bank of Italy

Summary (I)

- ## The "Framework" (RAMSI)

  aims to develop an integrated "suite of models" that allow the
  <u>transmission channels</u> for the financial system stress to be
  mapped out in a comprehensive fashion

Quantified channels	Missing channels

- ## Core idea:

  assets and liabilities of UK banks' <u>balance sheet are modelled in a</u>
  <u>disaggregated fashion</u>

Summary (II)

Quantified channels

Aggregate *assets* distribution

● **First-round impact on**
  – Credit risk, interest rate risk, market risk

● **Second round impact (feedback effects)**
  – Interbank network interactions
  – *ex-post* asset liquidity effect

Missing channels *(under way)*

  – *Ex-ante* asset liquidity effects
  – Funding liquidity risk
  – Feedback effects from the financial sector to the macroeconomy (credit crunch or "financial accelerator effect")

Channels of interaction between <u>market risk</u>, <u>credit risk</u>, <u>interest rate risk</u> *(first round impact)*

dependence on a common set of macroeconomic factors

- *<u>Interest rate risk;</u> expected risk-free yield curve* depends on
  real output (GDP), CPI inflation, real equity prices (EQP), real exchange rate
- *<u>Credit risk:</u> PDs depend on*
  GDP growth, EQP, short-term interest rate
- *<u>Market risk:</u> trading book gains/losses* are determined by
  a change in EQP relative to trend growth and variation of short and long term interest rates

"A Framework for Quantifying Systemic Stability"
Alessandri, Gai, Kapadia, Mora, Puhr

Main comment

"Credit and interest rate risk in the banking book are the two most important risks faced by commercial banks" (Drehmann, Sorensen, Stringa, 2007)

"Credit risk and interest rate risk are on average the first and second most important factors considered by banks when determining economic capital" (Alessandri and Drehmann, 2007)

But:

the model is not able to produce "fundamental defaults" due to credit and interest rate risk

Possible explanations

1. <u>Weak explanatory power of macroeconomic factors</u>

   ➢ Very simplified PD model; "the performance of the PD equation is constrained …"

   ➢ Models that simulate future yield curve based on macroeconomic factors are subject to substantial forecast and estimation errors (Cochrane, 2007)

   ➔ *be more explicit and detailed on the performance of the macroeconomic models*

   ➔ *report how stress scenarios translate into changes of PDs and interest rates*

Possible explanations

2. Credit risk: data or modelling problems

➢ Bankruptcy data not reliable measure of default, so "they are scaled up"

➢ LGD is constant

➢ Portfolio is perfectly granular

➡ *Probably credit risk is underestimated (systematic risk is low; idiosyncratic risk is diversified away)*

➡ *More realistic setting: a lumpy portfolio; cyclical LGD*

Possible explanations

3. Interest rate risk

    ➢ The interest rate is the key macroeconomic variable in the model

    ➢ The model seems able to produce a fall in profit

        ➢ only with a substantial increase in interest rates
        ➢ ... before the start of the gradual repricing of the assets

Sensitivity of results to:

   ➔ *Pricing assumption*
   ➔ *Maturity miss-match of assets and liabilities (passive depositors; non-maturity deposits, different business model)*

"A Framework for Quantifying Systemic Stability" Alessandri, Gai, Kapadia, Mora, Puhr

Main contribution

- RAMSI aims to provide <u>consistent quantitative estimates</u> of the potential scale of vulnerabilities

Overall evaluation

- Trade-off between comprehensiveness and realism
  - Strong simplifying assumptions, for example regarding the responses of financial firms, depositors and policymakers to shocks
  - Lack of data
  - Estimation uncertainty
- Ambitious objective / complicated analytical challenges / so far mainly qualitative results

Summary

- Stress test of 28 German banks based on a Merton-type multi-factor credit risk model
  - Bonti, Kalkbrener, Lotz, Stahl (2006)
  - BCBS WP no.15 *"Studies on credit risk concentration"*

- Stress event: economic downturn in the automobile sector

"Crash Testing German Banks"
Dűllmann and Erdelmeier

Main feature

- A <u>consistent</u> stress test
  - embedded in a full-blown multi-factor credit risk model
  - the stress scenario is translated into movements of "internal" risk drivers
  - <u>as such</u>, the result of the stress is not only a point estimate (EL) but a shift in the whole distribution of losses (other statistics of the distribution)

Main contribution/finding

- highlight "hidden" (sector) concentration risk, due to inter-sector correlation

"Crash Testing German Banks"
Dűllmann and Erdelmeier

Comment: 1 – calibration of the model

- The <u>calibration of the asset correlations/factor weights</u> is crucial for the exact quantification of the impact of the stress
  - Bonti et al. (2006): borrower specific
  - Dullmann, Scheicher, Schmieder (2007): borrower/sector specific
  - this paper: one figure for all borrowers (0.373)

- For all borrowers, the influence of the systematic factors (the sectors) is the same

  ⟶ *Dullmann, Scheicher, Schmieder (2007): averaging correlation underestimates risk*

- *An important issue for supervisors under Pillar II*

"Crash Testing German Banks"
Dűllmann and Erdelmeier

Comment: 2 – application for supervisors

- Main output of the model: a consistent set of (sectoral) stressed PDs

- Recalculate the Basel II risk-weight formula with the stressed PDs

- An estimate of the capital requirement under the IRB stress test

"Crash Testing German Banks"
Dűllmann and Erdelmeier

Comment: 3 – further research ?

- The stress event is defined in terms of a constraint on the production index of a specific sector: a <u>sectoral stress test</u>

- Is this analysis really a "systemic stress" ?
- How a traditional macroeconomic stress scenario, such that implied by the IRB stress test requirement, can be incorporated into this framework ?

- Need:
  - a model linking PDs to macroeconomic variables
  - able to produce a credit loss distribution in baseline and stressed conditions
- For a survey of such methodologies, see the work of the RTF ST group

"Crash Testing German Banks"
Dűllmann and Erdelmeier

Other minor comments

- Is it appropriate to compare the stressed EL with own-funds? EL are covered by earnings first

- The analysis on the infinitely granular portfolio is not particularly "telling"

Overall assessment

The two papers show that the term "stress test" covers a number of quite different analytical techniques

The first paper aims to provide a comprehensive picture of the transmission channels of shocks to the financial system

The second paper provides a consistent model (readily available for supervisory purposes) for stress testing credit risk based on a realistic setting

There is value in cross-fertilization