Motivation

- Apply CreditMetrics-type model, „best practice“ in the industry
- Spill-over to other sectors captured by inter-sector correlations Stress
- Sectoral and name concentrations automatically captured scenario
- More informative than a „point scenario“ because a range of industry downturns in a specific sector is considered
- Credit register of the Deutsche Bundesbank allows consistent application for a sample of banks‘ credit portfolios
Key idea: Stressing core factor(s)

- See Bonti, Kalkbrener, Lotz, and Stahl, Journal of Credit Risk, 2006

- Plausible scenario because based on economic forecast
- Consistent stress results because generated by using a model
- Reportable because only a single risk factor changed

Data

- Source: German credit register of loans ≥ 1.5m €
- Select corporate loans
- Borrowers are considered on a „borrower unit“ basis
- Sample of 28 banks
  - 12 private banks
  - 13 public sector banks (8 Landesbanken)
  - 3 cooperative sector banks
- Every bank has at least 1,200 borrowers included in credit register
- Sample covers more than 75% of total exposure in the credit register
- Market capitalization 1.4 bn € - 50 bn €
Sectoral breakdown...

... of bank sample and total credit register; Industry Classification Benchmark (ICB)

Correlation with automobile sector
Definition of stress events

- Input: de-trended log returns of automobile production index
- Stress forecast: production index return of -10%

Portfolio credit risk model

- CreditMetrics-type model
- \( Y_i \): Unobservable default trigger variable

\[
Y_i = r \cdot X_{s(i)} + \sqrt{1-r^2} \cdot \varepsilon_i
\]

Systematic risk \quad \text{Idiosyncratic risk}

- Default probability: \( P(Y_i < c_i) = N(c_i) \) where \( c_i \) is default barrier

- Portfolio loss \( L_n \):

\[
L_n = \sum_{i=1}^{n} w_i \cdot LGD_i \cdot 1_{\{Y_i \leq c_i\}}
\]
Stress impact on risk factors

Automobile sector (core factor)

Capital goods and servicing (peripheral factor)

Before Stress

After Stress

7 March 2008

Relative impact of sectoral stress on Expected Loss (EL) and Economic Capital (EC)

UL based on 99.9%-quantile
Impact of inter-sector correlation

- Average portfolio share of financial services sector: 40 %
- Relatively high correlation with automobile sector: 66 %

→ Increase of economic capital mainly driven by inter-sector correlations

Results

- Risk measures increase
  - EL by 70 – 80%
    - But increase below 2.5% if only impact on stressed sector considered
  - Economic capital by 10 – 20%

- Capital ratios CR reduced on average from 12% to 11.6% under stress conditions

\[ CR^{Stress} = \frac{\text{Capital} - EL^{Stress}\% \cdot \text{total exposure}}{\text{Risk weighted assets} + 12.5 \cdot \text{market risk VaR}} \]
Sensitivity analysis

- Portfolio infinitely granular in every sector
  - Only marginal impact on EL results
  - Economic capital on average 16% lower than in original portfolio but relative increase due to stress quite similar
- Highest asset corelations estimated over 2 years from 1995 - 2006
  - Higher relative increase in EL (78-93%)
  - Lower increase in economic capital (6-16%)
  - Moderately lower capital ratios (on average 11.5%)

Outlook

- Main lessons
  - Inter-sector correlations play key role in measuring impact of single-sector stress on credit portfolio
  - Increase in EL swamps increase in economic capital under stress
  - Capital ratios under stress on average still well above regulatory minimum level
- Further research
  - Refinement of stress scenario
  - Impact of heterogeneity in default probabilities
  - Impact of sector scheme