Measuring Systemic Risk

Discussion

by

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I. Comments on "Banks' Non-Interest Income and Systemic Risk" by Brunnermeier, Dong, and Palia

- Analyzes quarterly data from 1986 to 2008 on listed U.S. banks.
- Systemic risk is measured as the ΔCoVaR or SES of bank asset returns (de-levered bank stock returns).
- Main findings: Banks that have greater ΔCoVaR or SES have:

1. greater non-interest income, including trading income or I-banking and VC income.
2. greater size (log assets).
3. lower capital.
4. greater market-to-book value of equity.

- Banks with greater trading income prior to the 2007-2009 crisis had lower returns during the crisis.

Similar Analysis for European Banks

- Olivier De Jonghe in "Back to the Basics in Banking? A Micro-Analysis of Banking System Stability" *JFI* 2010 analyzes listed European banks from 1992 to 2007.
- Systemic risk is measured by a bank's "tail beta": the probability of a crash (extreme loss) in a bank's stock price conditional on a crash in a European bank or market stock index.
- Main findings: Banks that have greater tail betas have:

1. more non-interest income, particularly commission/fee income and trading income.
2. greater size (log assets).
3. lower capital.

Other Comments

- Regression results are similar when either ΔCoVaR or SES is the dependent variable. Yet their correlation is only 0.15. Why?
  1. Conditioning: ΔCoVaR (*SES*) is based on the distribution of aggregate (*a given bank's*) losses conditional on a given bank's (*aggregate*) losses. Tail beta is similar to SES.
  2. Assets versus capital: ΔCoVaR (*SES*) is based on given proportional loss on banks' assets (*equity capital*).

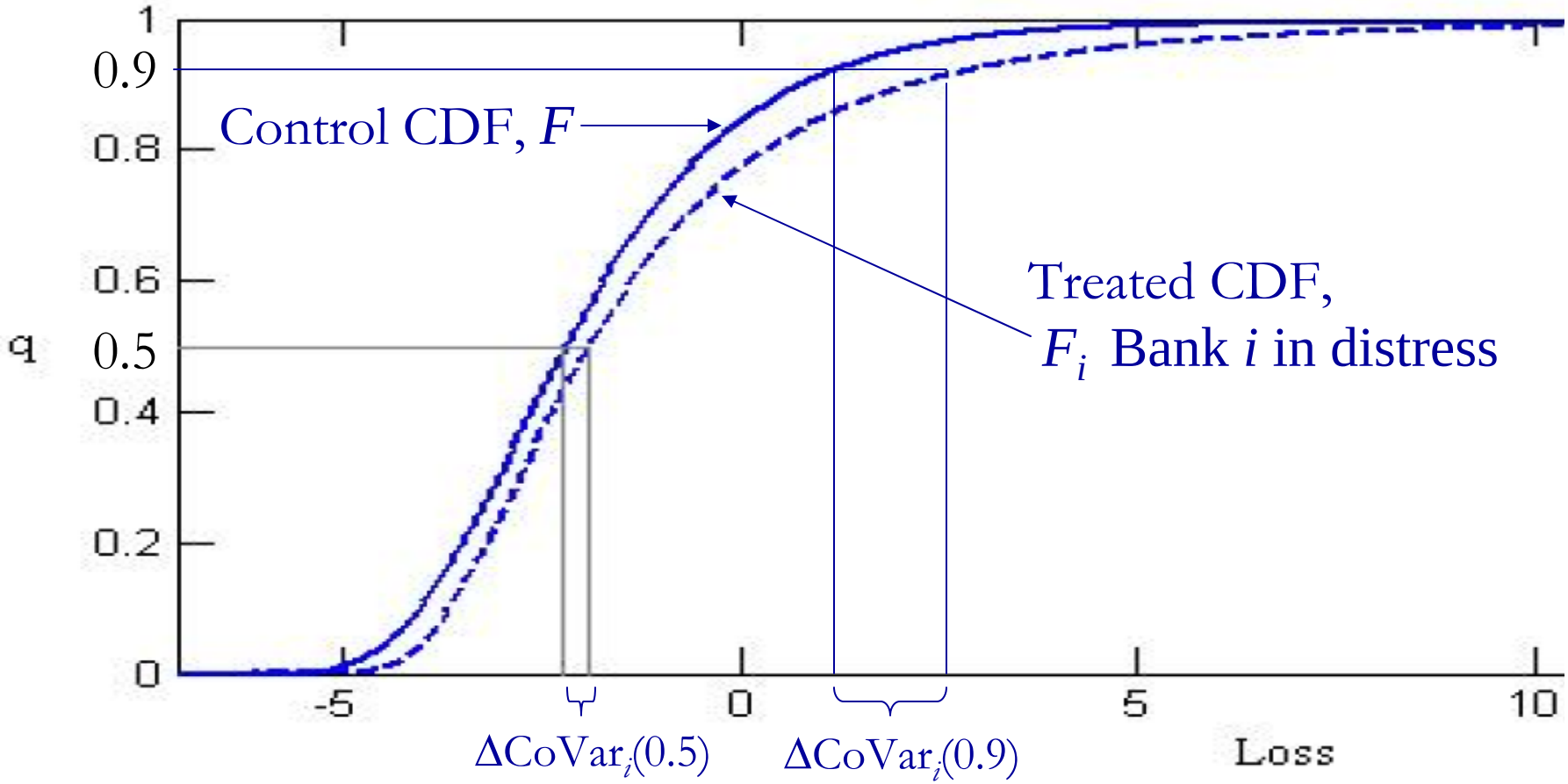
- Results may support a "narrowing" of banking by having insured deposits fund only "traditional" or "retail" bank activities (e.g., UK's ICB ring-fencing proposal).

II. Comments on "Measuring and Testing for the Systemically Important Financial Institutions" by Castro and Ferrari

- The paper equates ΔCoVaR to the difference between "treated" and "control" (untreated) quantile functions:

1. The inverse of the "control" quantile function is the unconditional cumulative distribution function (CDF) of financial stock index losses, F.
2. The inverse of the "treated" quantile function is the CDF of financial stock index losses conditional on bank i's distress, F_i.
3. If τ is the probability of losses less than a threshold, then $\Delta\text{CoVaR}(\tau) = F_i^{-1}(\tau) - F^{-1}(\tau)$.

CDFs of Financial Stock Index Losses



- Test statistics are derived for two hypotheses:
  1. H_0: $\Delta CoVar_i(\tau) = 0$ (Bank i is systemically significant)
  2. H_0: $CoVar_i(\tau) > CoVar_j(\tau)$ (Bank i is more systemic than Bank j)

Comments on Empirical Results

- Considers European banks A, B, C with assets of €1,572 billion, €102 billion, and €10 billion, respectively.
- For $\tau \in [0.90, 0.99]$, $\Delta\text{CoVar}_i(\tau) = 0$ is rejected for i = A and B but not C.
- For $\tau \in [0.90, 0.99]$, $\text{CoVar}_i(\tau) > \text{CoVar}_j(\tau) = 0$ is rejected for all combinations of banks i and j.
- For $\tau \in [0.10, 0.99]$, $\text{CoVar}_i(\tau) > \text{CoVar}_j(\tau) = 0$ is not rejected for ij combinations AB, AC, and BC.
- It is surprising that the largest bank is not significantly more systematic than the smallest for the most extreme 10% of losses. Tail events too infrequent to distinguish?

III. Comments on "Measuring Systemic Risk and Assessing Systemic Importance in Global and Regional Financial Markets Using the ESS-Indicator by Lahmann and Kaserer

- The ESS-indicator is based on the Vasicek (1987) SRF portfolio model where each bank defaults if its assets fall below a threshold:

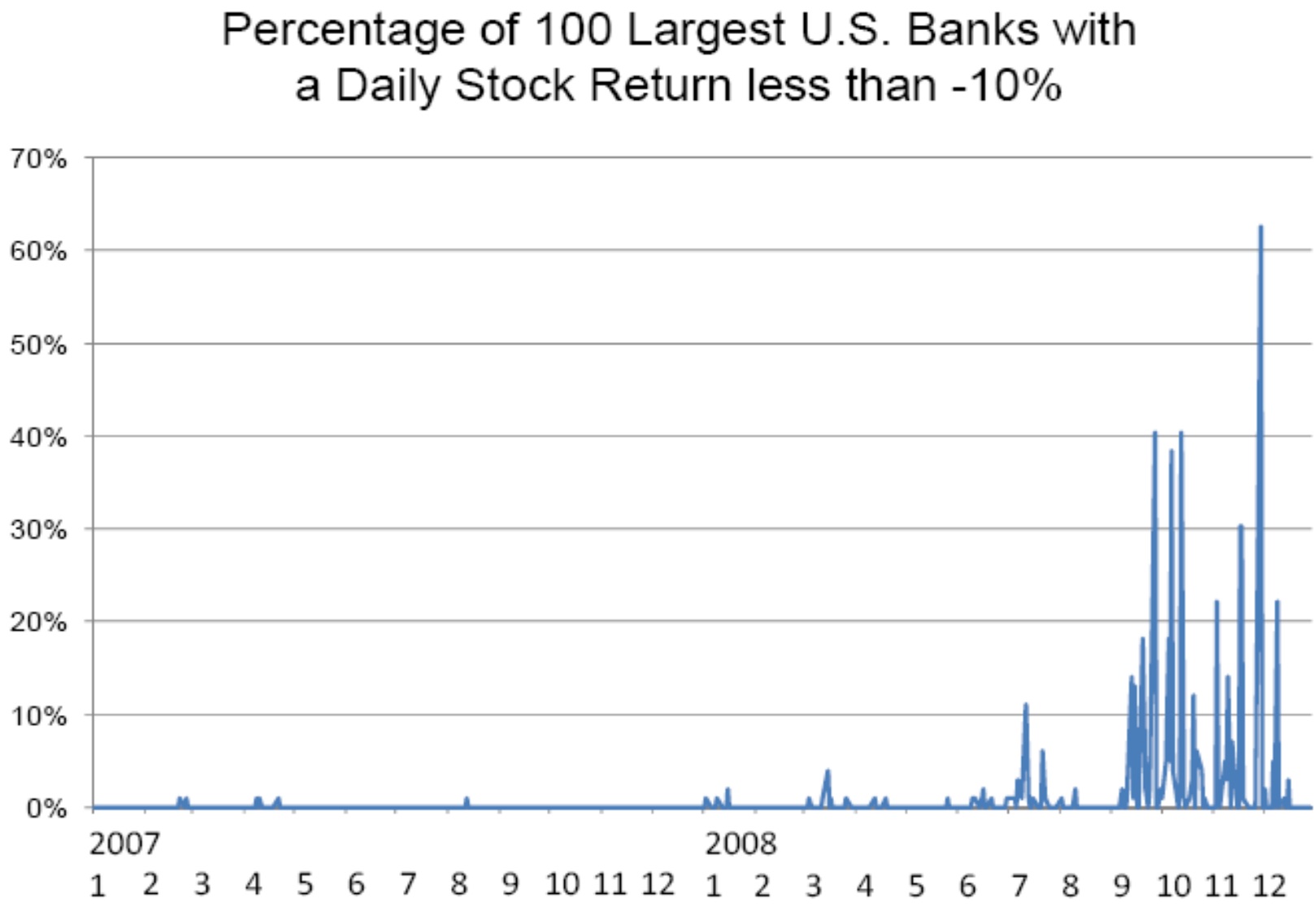
1. Each bank's risk-neutral expected default frequency (EDF) is estimated from its 5-year CDS spread, given a 55% LGD.
2. Asset correlations between banks' i and j, $\rho_i\rho_j$, are estimated from 50 days of prior daily bank stock returns.
3. At each date, K Monte Carlo simulations of banks' assets are done to calculate bank i's loss, $l_{i,k}$, and aggregate losses, L_k, $k = 1,\ldots,K$.

- Then bank i's relative systemic loss contribution, c_i is defined as

$$c_i = \sum_{k=1}^{K} \frac{l_{i,k}}{L_k} \quad \text{when } L_k > SLT = 10\% \text{ aggregate bank liabilities}$$

Comments on ESS Estimation

- Correlations are estimated from daily stock returns over the prior 50 trading days. Might actual correlations rise more rapidly during a financial crisis situation?
- Might CDS spreads on senior bank debt underestimate risk-neutral EDFs if banks are viewed as TBTF?
- Might LGDs on senior debt vary across countries depending on depositor preference laws?
- Simulation assumes a normal distribution for asset returns over the next year. But asset returns appear to "jump" during a financial crisis (have fatter tails than normal). Jumps could be simulated.


Percentage of 100 Largest U.S. Banks with
a Daily Stock Return less than -10%
70%
60%
50%
40%
30%
20%
10%
0%
2007
2008
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12

Conclusions

- Systemic risk encompasses both contagion (domino effects) and systematic risk (correlation in asset or capital returns across banks).
- These papers' market value-based estimates of systemic risk do not directly distinguish between the two.
- Reforms can differ depending on the source of systemic risk:
  1. Contagion risk reforms include central clearing of derivatives, ring-fencing of activities, living wills, and greater transparency.
  2. Systematic risk reforms include making capital charges and deposit insurance premia reflect risk-neutral expected losses (Kupiec (2004) and Pennacchi (2006)).