Swissquote Conference 2012 on Liquidity and Systemic Risk

Discussion of
“A Theoretical and Empirical Comparison of Systemic Risk Measures”

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Overview

- Systemic risk—Let me try to define it:
  - *The impact that the failure of a bank can have on the global financial system and wider economy rather than the risk that a failure can occur*

- Thought-provoking paper

- Existing systemic risk measures might disagree
  - Identifying Systemically Important Financial Institutions (SIFI) based on these measures might be problematic
  - Empirically, the instances where these measures lead to comparable rankings are too few

- Sometimes, they trivially relate to firms’ exposure to market risk
Contributions

• This paper’s contributions

  – Theoretical part—relies on a one-factor model
    * Main conclusion: ranking through betas the same as ranking by some systemic measures—with some nuances
  – Empirical part
    * Applying existing systemic risk measures to data leads to diverse results
Comments

- I would expect more from an innovative paper on systemic risk measures
  - Lacks originality
    - Didn't see any new risk-measure, only a study of existing ones
  - Analytical details are mechanical
  - Empirical findings might not be so surprising either
    - Do the measures studied in this paper really capture systemic risk in the first place
    - I am left with no guidance on further directions

- I'm not saying the paper isn't useful, however, nothing in it strikes me as truly innovative
Model’s review, queries, suggestions
Model

• “Linear market model,”

\[
\begin{align*}
    r_{it} &= \sigma_{it} \left( \rho_{it} \epsilon_{mt} + \sqrt{1 - \rho_{it}^2} \xi_{it} \right) \\
    r_{mt} &= \sigma_{mt} \epsilon_{mt}
\end{align*}
\]

where \( \epsilon_{mt} \) and \( \xi_{it} \) are i.i.d. with zero mean and unit variance

• Btw, shouldn’t we also have that

\[
r_{mt} = \int w_{it} r_{it} di,
\]

for some weighting \( w_{it} \)?
After all, the interpretation of some of the measures you study (MES, see below) relies on the sensitivity of the market index wrt to the weight of any firm \( i_0 \) (say). Define:

\[
ES_{mt}(C) \equiv E(r_{mt}|r_{mt} < C) = \int w_{it} E(r_{it}|r_{mt} < C) \, di,
\]

such that,

\[
MES_{i_0t}(C) \equiv \int (\hat{w}_{it}(i_0) - w_{it}) E(r_{it}|r_{mt} < C) \, di,
\]

where for instance, \( \hat{w}_{it}(i_0) = \frac{1}{2} (w_{it} + \delta(i - i_0)) \), such that,

\[
MES_{i_0t}(C) = \frac{1}{2} [E(r_{i_0t}|r_{mt} < C) - ES_{mt}(C)]
\]

Naturally, it’s only an example, which shows that you might want to consider “cross-equation restrictions” anyway.
Measures

Given the previous “linear market model,” the paper aims to find closed-form expressions to the following three measures of systemic risk,

• Marginal expected shortfall (MES),

\[ \text{MES}_{it} (C) \equiv \mathbb{E}_{t-1} (r_{it} | r_{mt} < C) \]

• Systemic risk measure (SRISK),

\[ \text{SRISK}_{it} (C) \equiv \max \{0, \text{Capital shortfall}_{i} (C)\}, \]

where, assuming that debt cannot be renegotiated in case of market distress,
Capital shortfall \( i \) \((C)\) \(\equiv E_{t-1} \left( -\text{Capital buffer}_i | r_{mt} < C \right)\)
\[\equiv -E_{t-1} \left( W_{it} - \kappa (D_{it} + W_{it}) \right) | r_{mt} < C \]
\[= \kappa E_{t-1} (D_{it} | r_{mt} < C) - (1 - \kappa) E_{t-1} (W_{it} | r_{mt} < C) \]
\[= \kappa D_{it} - (1 - \kappa) W_{it} (1 - \text{MES}_{it} (C)) , \]

and \( \kappa \) is a regulatory capital buffer ratio

- \( \Delta \) Conditional VaR (\( \Delta \text{CoVaR} \))—wrt to the firm being or not in financial distress,

\[\Delta \text{CoVaR}_{it} (\alpha) \equiv \text{CoVaR}_t^{m \mid r_{it} = \text{VaR}(\alpha)} - \text{CoVaR}_t^{m \mid r_{it} = \text{median}} , \]

where,

\[\text{CoVaR}_t^{m \mid r_{it} = \text{VaR}(\alpha)} : P \left( r_m \leq \text{CoVaR}_t^{m \mid r_{it} = \text{VaR}(\alpha)} \mid r_{it} = \text{VaR}(\alpha) \right) = \alpha \]
Closed-form expressions

- They’re in the paper—No point repeating them here

- All in all,
  - MES and SRISK link to firm’s co-movements with the market
    - SRISK obviously also links to leverage
  - $\Delta \text{CoVaR}_{it}$ proportional to $\text{VaR}_{it}$
    - Cross-sectional variation ($i$ for given $t$)
    - Time-series dependence ($t$ for given $i$)
  - Confirmed, empirically
  - Ranking through SRISK vs $\Delta \text{CoVaR}$: anything goes
Extensions

• What happens to your analytical results, once we replace your “linear market model” with a standard factor model,

\[ r_{it} = r_{\text{free}} + \sum_{k=1}^{K} \beta_{ik} \lambda_k + \sum_{k=1}^{K} \beta_{ik} f_{kt} + \epsilon_{mt}, \]

where \( f_{kt} \) are zero-mean factors

• Note, the “linear market model” you have is pretty poor
  
  – How come then your empirical findings are somewhat in line with your theoretical predictions
  
  – Simple, you’re using fitted measures of risk, obtained while imposing as a data generating process your “linear market model”

  * Would be surprised to see empirical results diverging from your theoretical analysis
Empirical part

- Evidence that the systemic risk measures diverge
- Strong statistical links between MES and firms betas
- SRISK links to betas, but also to leverage
A final reflection
What do these "systemic risk measures" fail to measure

- Consider, for example, SRISK—the measure that makes the most economic sense to me
  - It’s increasing in leverage, however, leverage per se doesn’t tell us many things

Short-run aggregate market effects and feedbacks are a tiny part of the story. These measures miss obvious dimensions

- *Interconnectedness*—it’s obviously not just “beta”
- *Cross-jurisdictional activity*
- *Complexity*—fixed income & other OTC products
Backtesting: I

- You might want to backtest your findings & run horse races

- Natural benchmark is the official list of the Global Systemically Important Banks (G-SIB), as understood by the Basel Committee on Banking Supervision
  - We all make reference to it
  - The list might actually affect market behavior
Global Systemically Important Banks, as of November 2012

—List prepared by the Financial Stability Board (G-SIBs in alphabetical order within each bucket)

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<tr>
<th>Bucket 5 (3.5%)</th>
<th>Bucket 2 (1.5%)</th>
<th>Bucket 1 (1.0%)</th>
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<td>Bank of China</td>
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<td>BBVA</td>
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<td>BNP Paribas</td>
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Discussion of Christophe Perignon - Antonio Mele, November 2012
Backtesting: II

- The measures you study might perhaps be relevant for timing reasons
  - The official list receives low frequency updates
  - The three systemic risk measures can be updated at high frequency
  - Do these measures help predict G-SIB in the list?

- How do your results compare with this list
  - Forecasting
  - Nowcasting
Conclusion

• Much is still needed to assess the measures of systemic risk you study
  – Change framework of analysis for the purpose of comparison—factor models
  – Add systemic dimensions such as network effects, scope, complexity of business models, messy books, etc.

• Help supervisors, through horse races & backtests against “official lists”