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,"

$$\begin{cases} r_{it} = \sigma_{it}\left(\rho_{it}\epsilon_{mt} + \sqrt{1-\rho_{it}^2}\xi_{it}\right) \\ r_{mt} = \sigma_{mt}\epsilon_{mt} \end{cases}$$

  where ϵ_{mt} and ξ_{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:

$$\mathrm{ES}_{mt}(C) \equiv E(r_{mt}|\, r_{mt} < C) = \int w_{it} E(r_{it}|\, r_{mt} < C)\, di,$$

$$\text{such that, } \mathrm{MES}_{i_0 t}(C) \equiv \int (\hat{w}_{it}(i_0) - w_{it})\, E(r_{it}|\, r_{mt} < C)\, di,$$

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

$$\mathrm{MES}_{i_0 t}(C) = \frac{1}{2}\left[E(r_{i_0 t}|\, r_{mt} < C) - \mathrm{ES}_{mt}(C)\right]$$

- 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),

$$\mathrm{MES}_{it}(C) \equiv E_{t-1}(r_{it} | r_{mt} < C)$$

- Systemic risk measure (SRISK),

$$\mathrm{SRISK}_{it}(C) \equiv \max\{0, \text{Capital shortfall}_i(C)\},$$

where, assuming that debt cannot be renegotiated in case of market distress,

$$\begin{aligned}\text{Capital shortfall}_i\,(C) &\equiv E_{t-1}\left(-\text{Capital buffer}_i \middle|\, r_{mt} < C\right)\\ &\equiv -E_{t-1}\left(W_{it} - \kappa\left(D_{it} + W_{it}\right) \middle|\, r_{mt} < C\right)\\ &= \kappa E_{t-1}\left(D_{it} \middle|\, r_{mt} < C\right) - \left(1-\kappa\right) E_{t-1}\left(W_{it} \middle|\, r_{mt} < C\right)\\ &= \kappa D_{it} - \left(1-\kappa\right) W_{it}\left(1 - \text{MES}_{it}\left(C\right)\right),\end{aligned}$$

and κ is a regulatory capital buffer ratio

- Δ Conditional VaR (ΔCoVaR)—wrt to the firm being or not in financial distress,

$$\Delta\text{CoVaR}_{it}\left(\alpha\right) \equiv \text{CoVaR}_t^{m|r_{it}=\text{VaR}(\alpha)} - \text{CoVaR}_t^{m|r_{it}=\text{median}},$$

where,

$$\text{CoVaR}_t^{m|r_{it}=\text{VaR}(\alpha)} : P\left(r_m \leq \text{CoVaR}_t^{m|r_{it}=\text{VaR}(\alpha)} \middle|\, r_{it} = \text{VaR}\left(\alpha\right)\right) = \alpha$$

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
  - ΔCoVaR$_{it}$ proportional to VaR$_{it}$
    - Cross-sectional variation (i for given t)
    - Time-series dependence (t for given i)
  - Confirmed, empirically
  - Ranking through SRISK vs ΔCoVaR: 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 obiously 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)

Bucket 5 (3.5%)
(Empty)

Bucket 4 (2.5%)
Citigroup
Deutsche Bank
HSBC
JP Morgan Chase

Bucket 3 (2.0%)
Barclays
BNP Paribas

Bucket 2 (1.5%)
Bank of America
Bank of New York Mellon
Credit Suisse
Goldman Sachs
Mitsubishi UFJ FG
Morgan Stanley
Royal Bank of Scotland
UBS

Bucket 1 (1.0%)
Bank of China
BBVA
Groupe BPCE
Group Crédit Agricole
ING Bank
Mizuho FG
Nordea
Santander
Société Générale
Standard Chartered
State Street
Sumitomo Mitsui FG
Unicredit Group
Wells Fargo

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"