Contagion from market price impact: a price-at-risk perspective

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Paper - motivation and goals

Motivation

- Common holdings of assets implies that fire-sale of an asset by one entity (due to whatever reason) ...
- ... can cause losses to other entities holding those assets at marked-to-market valuations (even without any direct link to the former entity) and ...
- ... lead to spirals of price declines.

Two goals of this paper are to quantify the

- price impact of fire-sales
- attendant systemic-risk implications

Paper - intuition and findings

Intuition

- Price impact of trades depends on market depth / liquidity imbalances.
- Contagion across entities depends on the degree and nature of portfolio similarities.

Key findings

- Price impact of sales is non-linear, i.e. concave in volume
- Price impact is heterogeneous (lower for bonds than equities)
  - Assuming homogeneous impact overstates contagion
- Analysis informs
  - investors in building well diversified and resilient portfolios
  - regulators in assessing the risk of contagion

Paper - approach

- Start from theory (e.g. Kyle, 1985)
- Adopt a general price impact function (as opposed to linear) $\Psi(v) = B(1 - e^{-v\lambda/B})$
- Overall impact net of buy- and sell-led volumes (unobserved) $R(v_s, v_b) = \Psi(v_b) - \Psi(v_s)$
- Key idea: When $v_s >> v_b \rightarrow 0$, $R(v_s, v_b) \rightarrow -\Psi(v_s)$
- Quantile regression (i) addresses outliers while (ii) capturing the volume-impact link at different impact quantiles and (iii) controlling for market trends $R_t^q = \beta^q(1 - exp(-s.V_t)) + \alpha R_{sys,t}$

Overall comment

- Topical issue
  - March 2020 sell-off in money market funds
  - Failure of SVB in March 2023 and the de-pegging of USDC stablecoin
- Empirical analysis disciplined by theory
  - The authors carefully go through the foundations of market micro-structure before estimating the price impact
- Transparent analysis
  - Facilitates replication and real-time monitoring by policymakers
- Recommended reading!

Flow induced trade pressures

- Distinguishing between buyer-led versus seller-led volumes is understandably elusive
- Coval and Stafford (JFE, 2007) (and the literature that followed) use a proxy based on a flow-induced-trade measure of selling or buying pressure to estimate price impact

$$\text{Pressure}_{i,t} = \frac{\sum_f (max(0, \Delta Holdings_{j,i,t}) | large\_inflows) - (max(0, -\Delta Holdings_{j,i,t}) | large\_outflows)}{Avg\_Volume_{i,t-12:t-6}}$$

- It would be useful to discuss the pros and cons of each approach
- Could the authors sharpen their estimation using the strategy above?

Pro-rata liquidation

Typical liquidity management strategies of institutional investors (eg mutual funds)

- Horizontal cut - reduce liquid assets to meet redemptions
- Vertical cut - reduce more and less liquid assets proportionally

The choice depends on a host of factors such as

- Ex-ante liquidity buffers (eg cash ratio)
- Whether the redemption shock is one-off or persistent
- Trade-off: use liquidity today or preserve for tomorrow?

Evidence on investors' preferred approach is mixed (eg Jiang, Li and Wang, JFQA 2021) $\rightarrow$ could the authors vary the pro-rata liquidation assumption and assess how the risk of contagion changes?

Nature of non-linearity

- The paper posits a concave relationship between sales volume and price impact:
  $p(v) = p_0 + \Psi(v), \quad \Psi''(v) < 0$
- What does this imply for the type of non-linearity in the loss a seller incurs:
  $loss(v_s) = v_s p_0 - v_s p(v_s) \rightarrow convex?$
- It could be insightful to discuss how this loss function affects contagion – does convexity exacerbate it?
- Relatedly, the role of anticipation effects in potentially exacerbating the contagion analysis could be discussed.

Minor comments

- How is *indirect financial contagion* different from the *fire-sale externality*? My sense is that the latter terminology is well established already, and it will be useful to contrast the two.
- I found the literature review to be focused on somewhat older studies. Perhaps the more recent ones, such as those studying the sell-off in March 2020, could be included.
- Though it becomes clear later, v could be defined when first mentioned in Eq(1)
- Boundary in Eq(4) and Figure 1 can be described better.
- The discussion of Potters and Bouchaud (2003), linear price impact and convex hull, all of which are not part of the main analysis, can be shorter so that a reader reaches the Quantile regression section more quickly. Also, it may be clarified upfront that these are largely for context.