Discussion of

The Lead-Lag Relationship between VIX Futures and SPX Futures

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Lead-lag relationship

One market often follows the movements of another with a time delay

- e.g., SPX vs. SPX futures/options; SPX vs. SPX-tracking ETFs

Why do we observe lead-lag patterns?

(1) Information channel: some markets might reflect information faster

(2) Hedging channel: market makers' hedging activities create a cross-market relation

This paper focuses on the latter channel between VIX futures vs. SPX futures

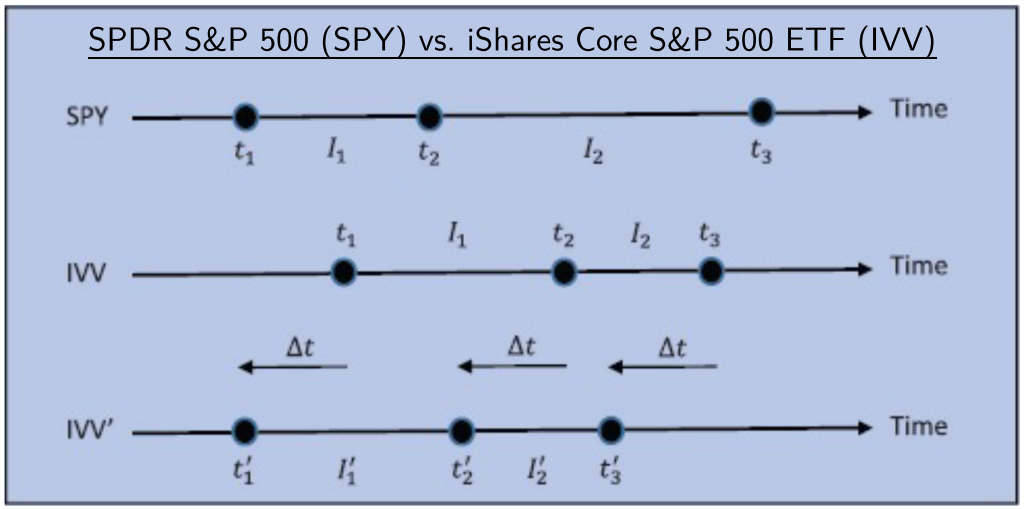
- Very relevant topic with policy implications
- Pitfalls of dealers' hedging/rebalancing
  - "Gamma traps" (DeSimone, 2020); "Vol-mageddon" (Augustin, Cheng & Van den Bergen, 2021)

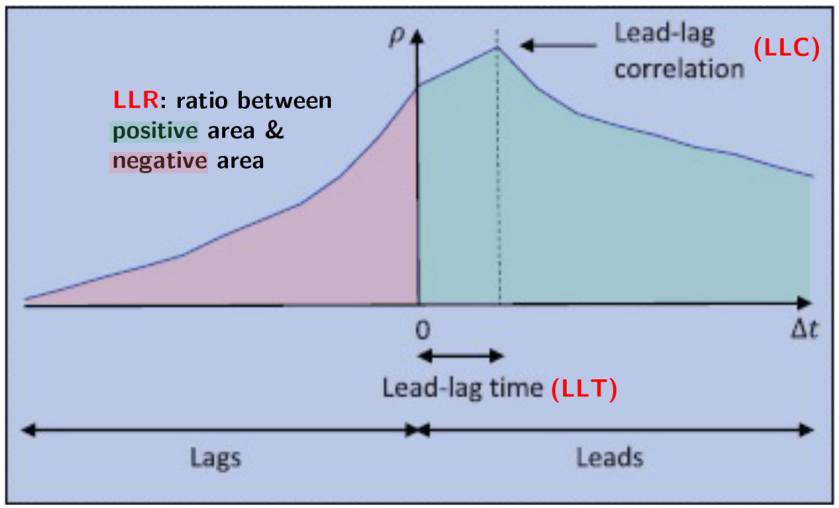
Methodology

Ultra-high-frequency data (tick data in milliseconds)

- Main challenge: non-synchronously observed data points
- Solution: correlation curve (Hayashi & Yoshida, 2005; Hoffmann, Rosenbaum & Yoshida, 2013)

An illustrative example (Dao, McGroarty & Urquhart, 2018)



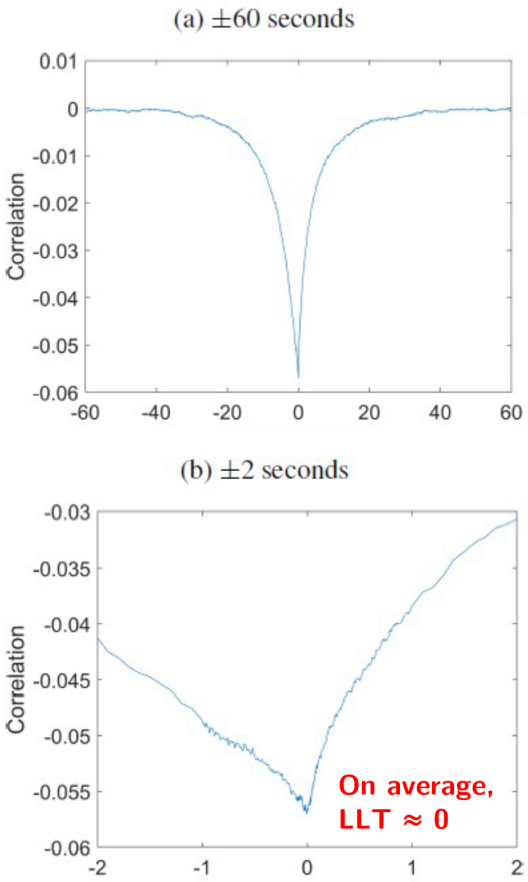


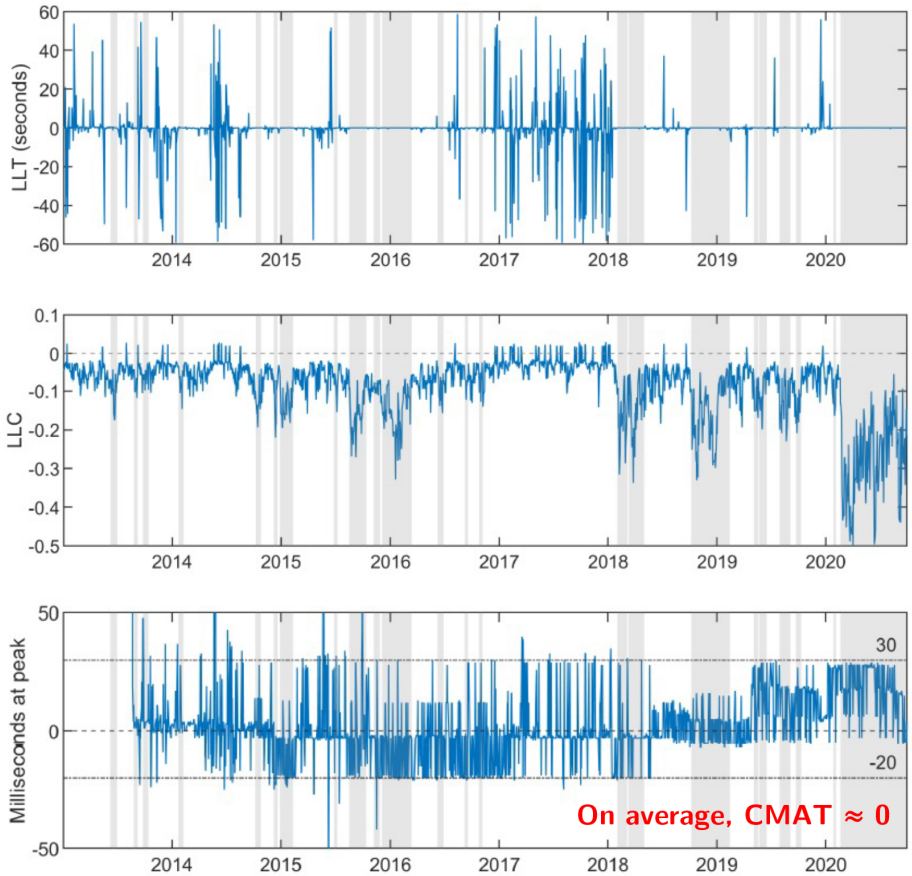
We can measure co-occurrences of market activities instead of price comovements

- CMAT and PCMA (Dobrev & Schaumburg, 2017)

Comment 1: Do we observe a clear lead-lag pattern?

On average, LLT $\simeq$ 0 and CMAT $\simeq$ 0



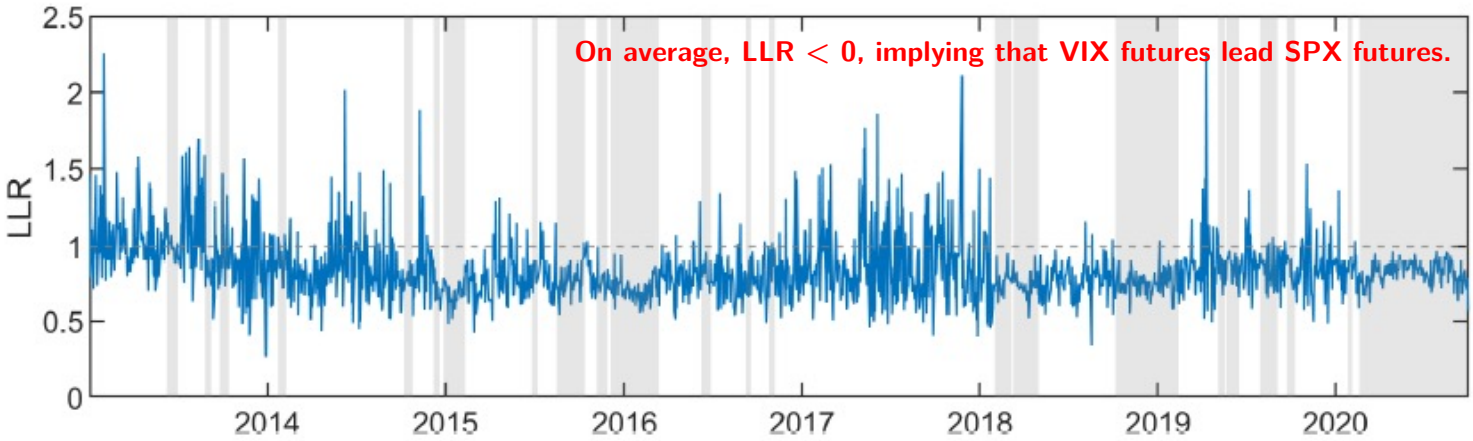


Moreover, LLC (lead-lag strength) becomes high whenever LLT $\simeq$ 0

- The correlation between the two markets is strongest when LLT $\simeq$ 0

Comment 2: LLR vs. LLT/CMAT

Hence, the paper's empirical analysis mainly relies on LLR



- It is a bit self-serving to say that LLR is a "more robust measure of the lead-lag relation" because LLR produces more favorable results

Can we say VIX futures lead SPX futures because LLR < 0 (when LLT $\simeq 0$)?

- The authors argue that other market activities "could strengthen VIX futures' lead while pushing the LLT towards zero"
- It would be nice to elaborate on this, making the mechanism clear

Comment 3: Cross-market activities

The paper argues that cross-market activities mainly drive the lead-lag pattern

- LLR is regressed on $\text{PCMA}_t \cdot 1_{\{\text{CMAT}_t \leq 0\}}$ and $\text{PCMA}_t \cdot 1_{\{\text{CMAT}_t > 0\}}$
- Main result: LLR is loaded on $\text{PCMA}_t \cdot 1_{\{\text{CMAT}_t \leq 0\}}$ with a negative sign

But, CMAT is also a lead-lag measure

$$\begin{cases} \text{VIX futures lag} & \Rightarrow \quad \text{LLR} > 0 \quad \text{and} \quad \text{PCMA}_t \cdot 1_{\{\text{CMAT}_t \leq 0\}} = 0 \\ \text{VIX futures lead} & \Rightarrow \quad \text{LLR} \leq 0 \quad \text{and} \quad \text{PCMA}_t \cdot 1_{\{\text{CMAT}_t \leq 0\}} > 0 \end{cases}$$

- Thus, the negative sign might be a mechanical outcome

Another issue: LLR is also loaded on $\text{PCMA}_t \cdot 1_{\{\text{CMAT}_t > 0\}}$ with a negative sign

- This is odd and inconsistent with the paper's story
- Perhaps, this is why the authors do not regress LLR on PCMA itself?

Comment 4: Interpretation of the lead-lag relationship

Hidden premise: VIX futures' lead comes from hedging activities

- I feel like there is a logical gap here
- What about the volatility feedback effect?

One simple thing to check

- The authors find that uninformed VIX futures trading (e.g., rebalancing of VIX ETPs) does affect SPX futures' prices
- Do we observe a stronger lead-lag relationship on those rebalancing days?

Conclusion

- Interesting paper!
- Understanding the relation between the two markets is important
- The paper will benefit from a consistent story that can tie things together
- I am looking forward to reading the next version!