Discussion of “Annual VaR from High Frequency Data”

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Discussion by Patrick Tuijp | Ortec Finance, University of Amsterdam | Netspar Pension Day, Utrecht, October 14th, 2016
Summary

- This paper investigates the properties of dynamic models for realized variance.

- Focus: long-term Value-at-Risk and outcome relative to square-root-of-time rule.

Findings:

- A fractional model implies a higher mean of the integrated variance for very long maturities and generates higher volatility of volatility.

- In the setting under consideration, the square-root-of-time rule seems to work approximately well.
Summary (ctd.)

Setup:

- Returns normally distributed conditional on volatility.

- Obtain unconditional density of integrated variance from time series model for the logarithm of realized variance.

- Three different time series models:
  - Heterogeneous autoregressive (HAR), Corsi (2009); includes weekly and monthly average terms to capture long memory in addition to an AR(1) term
  - AR(1)
  - Fractionally integrated (FI), Andersen, Bollerslev, Diebold, and Labys (2003)
Summary (ctd.)

Analyze scaling law under stable distributions

\[ \text{VaR}_T = T^{\frac{1}{\xi}} \text{VaR}_{t+1} \]

through regression

\[ \log \text{VaR}_T = \beta_0 + \beta_1 \log T + u_T \]

Key question: how does relaxing the assumptions of volatility being independent and identical over time affect the square-root-of-time rule (i.e. \( \xi = 2 \))?

Also: alternate model-based approach to derive general scaling law.
Summary (ctd.)

Additional findings:

- Dynamics have a strong influence on long-term Value-at-Risk
- Fractional integration parameter: non-stationary, but mean reverting: $d \in [0.5, 1)$
- AR(1) displays higher first moment of integrated variance compared to HAR, but vastly lower standard deviation.

Conclusions:

- A fractional model implies a higher mean of the integrated variance for very long maturities and generates higher volatility of volatility
- In the setting under consideration, the square-root-of-time rule seems to work approximately well
General comments

- Relevant and topical paper! Issue is key in risk management

- Main comment: what is your benchmark case and why is it appropriate?

- It would help to start with a Monte Carlo analysis and only then consider empirical data

- Some things to explore in a Monte Carlo setting:
  - Impact of relaxing independent vs. identical volatility over time assumption
  - How does the proper scaling rule look in the cases you consider?
  - How does model risk factor in?
Could you provide more intuition on your results? For instance, what is behind the higher mean and lower standard deviation of integrated variance in the AR(1) case relative to HAR?

Would it help to measure the accuracy also by counting the frequency of observations below the threshold as in Beltratti and Morana (1999)?

How do your results that higher persistence (under normality) leads to more conservative VaR estimates relate to Proposition 2 of Dacorogna, Müller, Pictet, and De Vries (2001), which shows that normality itself may be too conservative for VaR at longer horizons?
Why do you look explicitly at stocks with different levels of persistence?

What does your finding of $d \in [0.5, 1)$ (i.e. non-stationary but mean reverting) imply for the appropriateness of the AR(1) and HAR models for your data?

Why do you use $\alpha = 0.6$ for your Local Whittle Estimator for $d$?

In your Table 10, you find values of the tail index / stability index $\xi \in [1.96, 2.22]$. Are these large deviations from the square root case $\xi = 2$ or not?

Could you provide more background on your proposed general scaling law in your equations (17) and (18)?
Conclusion

- Highly relevant paper for risk managers, especially given the regulatory framework
- Many results and analyses, quite extensive in its coverage
- Would like to see a clear (Monte Carlo?) benchmark case as a background against which to evaluate the many results in the paper
- Could use more on what the separate impact is of relaxing different assumptions