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## Literature Review

**[CDC2004] Redundant Wavelet Filter Banks on the Half-Axis with Applications to Signal Denoising with Small Delays**

Summary.

A wavelet transform on the negative half real axis is developed. Aim is to perform causal wavelet processing, such as signal denoising, without delay. Nonetheless, in practice some boundary effects occur and thus a small amount of delay is required to reduce them.

Highlight.

* The definition of half-axis is given “**the half axis in this contextrepresenting past, known values of the signal**”.
* It hints how wavelet is used in practice, by delaying signal to obtain more data beyond current time point.
* Section 3A describe method. This paper do an extrapolation of signal beyond the right boundary.
* **Might be useful when combined with paper [PA2009] to get rid of boundary effects**

**[PA2009] A new indicator of imminent occurrence of drawdown in the stock market**

Summary.

By simply examining the pattern of the wavelet transform coefficients, an index (a real number between 0 and 1) is proposed to aggregate the information provided by the wavelet coefficients.

Highlight.

* This is the original paper that proposed zeta.
* DJA 1927 up to the crash of 1929
* IBOVSPA during crisis 2008
* **Suffer from boundary effect: ’coefficients calculated at edge of signal is distorted because only half of data (signal prior to that day but not after) is available’**

**[OBA2009] Extracting S&P500 and NASDAQ volatility: The Credit Crisis of 2007-2008**

Summary.

Particle filtering is used to estimate volatility during the credit crisis. Estimates from a pure *stochastic volatility model* (*with and without) jumps*, GARCH, and also VIX, VXN are compared with each other. Three time series are daily data for Standard and Poor’s S&P500 index (or simply SP500), the Nasdaq NDX100 index (or simply NASDAQ) and the financial index XLF for 2007.

Highlight.

* Tables and figures start from page 15
  + During crisis (August 2007), SV/SVJ react to new information quicker than GARCH(1,1) (Figure 5)
* Section 4 describe empirical results
  + The author says about market price of volatility risk (?). He described that **SV and SVJ have better higher estimates of that quantity at some specific period, and this is justified by subsequent increases and volatility spikes later.** This sounds much like this quantity should predict spikes in volatility

**[CSDA2007] Simulation-based sequential analysis of Markov switching stochastic volatility models**

Summary.

We propose a simulation-based algorithm for inference in stochastic volatility models with possible regime switching in which the regime state is governed by a first-order Markov process. Using auxiliary particle filters we developed a strategy to sequentially learn about states and parameters of the model. The methodology is tested against a synthetic time series and validated with a real financial time series: the IBOVESPA stock index (São Paulo Stock Exchange).

Highlight.

* Figure 13: Algorithm can tell which volatility regime the IBOVESPA is in. Although, the indicator (regime signal) may lag the market, it may enable us to do some further analysis about how long high/low regime will last.

## Next Steps

At the moment, we’ve got one signal from wavelet approach. Because the signal itself is imperfect by boundary effect we might put into our list a task of fixing it. Caveat: it might be time consuming to look under the hood and modify wavelet transform, whereas we could just feed delayed price signal into wavelet transform and get delayed zeta indicator. Alternatively, we could try seeking signal/improve volatility estimation by looking SV and SVJ. Right now, I have started coding Markov switching SV model, once it is complete, we might look whether or not regime signal is of any use?