Capturing Volatility from Large Price Moves: Generalized Range Theory and Applications

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Abstract

I introduce a novel high-frequency volatility estimator based on large price moves, which constitutes a generalization of the range. Just like the standard range maximizes a single price difference on the observed price path, the generalized range maximizes the sum of multiple price differences. It provides a new link between recent advances in high-frequency volatility estimation and the long-established efficiency of the range. I develop an asymptotic theory for the generalized range in a jump-diffusion setting, originating a family of strongly consistent diffusive volatility estimators that are robust to jumps. This theory tackles maximization on a time grid not previously studied in the volatility literature and uncovers valuable distributional properties of price peaks and troughs.

On simulated data, the generalized range behaves in accordance with the derived theory and compares favorably to other known estimators of diffusive volatility that are robust to jumps. On real data, the generalized range is largely robust to microstructure noise when calculated on bid-ask quotes and proves valuable for intraday jump detection and short-term forecasting of stock return volatility. In a model-free environment, the capability of the generalized range to identify large zig-zag price moves appears to be directly applicable to relative value arbitrage strategies.

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