

PhD Course in High Frequency Data Econometrics

Course description

The course covers topics from the recent developments in high-frequency econometrics.

We will review the econometrics of non-parametric estimation of the variation of asset prices. This very active literature has been stimulated by the recent advent of complete records of transaction prices, quote data and order books. The interaction of the new data sources with new econometrics methodology is leading to a paradigm shift in one of the most important areas in econometrics: Volatility measurement, modeling and forecasting using high-frequency data.

Careful data cleaning is one of the most important aspects of volatility estimation from high-frequency data. The most challenging problem in this context is dealing with various forms of market frictions, which obscure the latent price from the econometrician. We will characterize types of statistical models of friction and discuss how econometricians have been attempting to overcome them. The main data focus will be on the TAQ data base.

Software: For the computer exercises we will be using Matlab. You are well come to use any alternatives that you prefer, but we will only provide guidance and example code for Matlab.

Course lecturers

Associate Professor Kim Christensen, Aarhus University
Professor Asger Lunde, Aarhus University
Peter Reinhard Hansen, University of North Carolina

Location: [Building 2632, 242](#) (link)

Lunch from 12-13 every day - served in Glassalen, [2628, 1st floor](#) (link)

Course dinner: Tuesday, 26 September at 18:30

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Course agenda

Day 1	<p>Morning session (9-12):</p> <ul style="list-style-type: none">- Lecture (Theory, PRH): Volatility estimation using high frequency data. Realized variance under various forms of noise.- Lecture (Theory, PRH): Volatility estimation using high frequency data. Noise robust estimators. <p>Afternoon session (13-16):</p> <ul style="list-style-type: none">- Lecture (Empirical, AL): Simulation of continuous stochastic processes and estimation of integrated variance- Exercises: Simple estimations on simulated or cleaned TAQ data.
Day 2	<p>Morning session (9-12):</p> <ul style="list-style-type: none">- Lecture (Theory, KC): Volatility estimation in models with jumps: estimators, separation of risk, and jump testing. <p>Afternoon session (13-16):</p> <ul style="list-style-type: none">- Lecture (Empirical, KC): Implementation on noisy high-frequency data: Pre-averaging- Exercises: Volatility estimation in models with jumps <p>Course dinner</p>
Day 3	<p>Morning session (9-12):</p> <ul style="list-style-type: none">- Lecture (Theory, PRH): Multivariate topics. Volatility and covolatility estimation using high frequency data.- Lecture (Empirical, AL): TAQ data. Extraction, characteristics, cleaning and properties. <p>Afternoon session (13-16):</p> <ul style="list-style-type: none">- Exercises: TAQ data
Day 4	<p>Morning session (9-12):</p> <ul style="list-style-type: none">- Lecture (Theory, PRH): Volatility modeling and forecasting using high frequency data. Realized GARCH and related models.- Lecture (Theory, PRH): Volatility modeling and forecasting using high frequency data. Model evaluation. <p>Afternoon session (13-16):</p> <ul style="list-style-type: none">- Exercises: Volatility modeling and forecasting using high frequency data (Realized GARCH).

Suggested reading

If you are a newbie to this topic it is probably wise to read a little bit before the course start. Below are some survey references that not overly technical:

Andersen, T. G. & Benzoni, L. (2009), Realized Volatility, in Andersen, Davis, Kreiss & Mikosch, eds, 'Handbook of Financial Time Series', Springer Verlag, pp. 555–576.

Hansen, P. R. & Lunde, A. (2011), Forecasting volatility using high-frequency data, in M. Clements & D. Hendry, eds, 'The Oxford Handbook of Economic Forecasting', Oxford: Blackwell, chapter 19, pp. 525–556

The two next reference are highly relevant, but also slightly more involved.

Hansen, P. R. & Lunde, A. (2006), 'Realized Variance and Market Microstructure Noise', Journal of Business and Economic Statistics 24, 127–218. The 2005 Invited Address with Comments and Rejoinder.

Barndorff-Nielsen, O. E., Hansen, P. R., Lunde, A. & Shephard, N. (2009), 'Realised kernels in practice: Trades and quotes', Econometrics Journal 12.