CIDE Summer School of Econometrics 1999

Financial Market Volatility and High-Frequency Data

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This five lecture course will cover a number of recent developments in the modeling and pricing of financial market volatility and the analysis of high-frequency rates of return. The coverage is highly selective and centered on my own research interests. We will start by a survey of the extant ARCH and stochastic volatility literature, followed by a discussion of long-memory, or fractionally integrated, volatility models. In addition to our discussion of the statistical properties of the various models, we shall highlight their practical relevance from an asset pricing perspective. While most of the earlier empirical findings in this literature were based on daily, or longer horizon, returns, high-frequency intradaily data have recently become available for a wide variety of different financial instruments and markets. The empirical analyses of such data present a number of new and unique statistical challenges. Meanwhile, the high-frequency, or tick-by-tick, data clearly hold the promise of important new insights into what types of information moves prices and the efficiency of financial markets. Maybe more surprisingly, the high-frequency data also allow for much more accurate ex-post volatility measurements and modeling of the longer-run interdaily dynamic dependencies.
I will assume a working knowledge of basic statistics and time series analysis, although I do plan to briefly review some standard frequency domain procedures. The discussion will be focussed on the (*) readings, but material from the other papers will also be covered.

I. ARCH and Stochastic Volatility Models

(*) Tim Bollerslev, Ray Y. Chou and Kenneth F. Kroner (1992), "ARCH Modeling in Finance: A Review of the Theory and Empirical Evidence," *Journal of Econometrics*, Vol.52, No.1, pp.5-59.
Tim Bollerslev, Robert F. Engle and Daniel B. Nelson (1994), "ARCH Models," in *Handbook of Econometrics* Vol.IV (eds. Robert F. Engle and Daniel McFadden). Amsterdam: North Holland Press.
(*) Tim Bollerslev and Robert J. Hodrick (1995), "Financial Market Efficiency Tests," in *Handbook of Applied Econometrics* Vol.I (eds. M. Hashem Pesaran and Michael Wickens). London: Basil Blackwell.
Torben G. Andersen and Tim Bollerslev (1998), "ARCH and GARCH Models," in *Encyclopedia of Statistical Sciences* Vol.II (eds. Samuel Kotz, Campbell B. Read and David L. Banks). New York: John Wiley and Sons Inc.

II. Modeling and Pricing Long-Memory in Financial Market Volatility

(*) Richard T. Baillie, Tim Bollerslev and Hans O. Mikkelsen (1996), "Fractionally Integrated Generalized Autoregressive Conditional Heteroskedasticity," *Journal of Econometrics*, Vol.74, pp.3-30.
Tim Bollerslev and Hans O. Mikkelsen (1996), "Modeling and Pricing Long-Memory in Stock Market Volatility," *Journal of Econometrics*, Vol.73, No.1, pp.151-184.
(*) Tim Bollerslev and Hans O. Mikkelsen (1999), "Long-Term Equity AnticiPation Securities

and Stock Market Volatility Dynamics," *Journal of Econometrics*, forthcoming.
(*) Richard T. Baillie and Tim Bollerslev (1998), "The Forward Premium Anomaly is not as Bad as You Think," unpublished manuscript, Department of Economics, Duke University.

III. High-Frequency Returns, Intraday Periodicities, and Macroeconomic Announcement Effects

(*) Torben G. Andersen and Tim Bollerslev (1997), "Intraday Periodicity and Volatility Persistence in Financial Markets," *Journal of Empirical Finance*, Vol.4, No.2-3, pp.115-158.
(*) Torben G. Andersen and Tim Bollerslev (1998), "DM-Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer-Run Dependencies," *Journal of Finance*, Vol.53, No.1, pp.219-265.
Torben G. Andersen and Tim Bollerslev (1998), "Towards a Unified Framework for High- and Low-Frequency Return Volatility Modeling," *Statistica Neerlandica*, Vol.52, No.3, pp.273-302.
(*) Torben G. Andersen, Tim Bollerslev and Ashish Das (1999), "Testing for Market Microstructure Effects in Intraday Volatility: Revisiting the Tokyo FX Experiment," unpublished manuscript, Department of Economics, Duke University.
Torben G. Andersen, Tim Bollerslev and Jun Cai (1999), "Intraday and Interday Volatility in the Nikkei 225 Index," unpublished manuscript, Department of Economics, Duke University.
Tim Bollerslev, Jun Cai and Frank M. Song (1999), "Intraday Periodicity, Long-Memory Volatility, and Macro Announcements in the U.S. Treasury Bond Market," unpublished manuscript, Department of Economics, Duke University.

IV. High-Frequency Returns and Longer-Run Volatility Dependencies

(*) Torben G. Andersen and Tim Bollerslev (1997), "Heterogeneous Information Arrivals and Return Volatility Dynamics: Uncovering the Long-Run in High Frequency Returns," *Journal of Finance*, Vol.52, No.3, pp.975-1005.
(*) Tim Bollerslev and Peter D. Jubinski (1999), "Equity Trading Volume and Volatility: Latent Information Arrivals and Common Long-Run Dependencies," *Journal of Business and Economic Statistics*, Vol.17, No.1, pp.9-21.
(*) Tim Bollerslev and Jonathan H. Wright (1998), "Estimating Long-Memory Volatility Dependencies: The Role of High-Frequency Data," unpublished manuscript, Department of Economics, Duke University.
Tim Bollerslev and Jonathan H. Wright (1998), "Frequency Domain Inference for Speculative Return Volatility Dynamics," unpublished manuscript, Department of Economics, Duke University.

V. Modeling and Forecasting Financial Market Volatility: The Role of High-Frequency Data

*) Torben G. Andersen and Tim Bollerslev (1998), "Answering the Skeptics: Yes, Standard Volatility Models do Provide Accurate Forecasts," *International Economic Review*, Vol.39, No.4, pp.885-905.
(*) Torben G. Andersen, Tim Bollerslev, Francis X. Diebold and Paul Labys (1999), "The Distribution of Exchange Rate Volatility," NBER Working Paper No.6961.
(*) Torben G. Andersen, Tim Bollerslev and Steve Lange (1998), "Forecasting Financial Market Volatility: Sample Frequency vis-à-vis Forecast Horizon," unpublished manuscript, Department of Economics, Duke University.
Torben G. Andersen, Tim Bollerslev, Francis X. Diebold and Paul Labys (1999), "The Dynamics of Risk: A VAR for VaR," unpublished manuscript, Department of Economics, Duke University.