SFI PhD PROGRAM

Financial Econometrics

Eric Jondeau
University of Lausanne
Department of Finance
021/692 33 49
Eric.Jondeau@unil.ch

Objective of the course

In this course, I will provide a comprehensive knowledge of the econometric tools that are essential to estimate financial models, both for asset pricing and for forecasting purposes.

I will focus on the empirical techniques used most often in the analysis of financial markets and how they are applied to actual market data. The different topics I would like to treat are the following:

[1] Characteristics of Financial Time Series
[2] Modeling Financial Market Volatility
[3] Modeling Non-normality
[4] Extreme Value Theory
[5] Modeling Correlation
[6] Risk Management and Asset Allocation

Methodological part

a) We will model different aspects of the distribution of asset returns: conditional mean, conditional volatility, conditional distribution.

b) For this purpose, we will analyze several estimation techniques: Time Series Analysis, Maximum likelihood (ML), Quasi ML, Extreme Value Theory, and VaR estimation.

Finance part

The different approaches we will consider will be useful for a number of applications in Finance. Modeling the time dependency and the conditional distribution of asset returns has implications:

a) For forecasting asset returns
b) For the pricing of derivatives
c) For risk management (Value-at-Risk computation)
d) For asset allocation (how to allocate wealth when returns are non-normal)

Empirical part

a) We will use the Matlab software for programming.
b) Homework will be based on real-life problems using actual data.

Schedule

There are 14 lectures on Monday, 9am-11am, from September 14th to December 14th in room 118 Extranef. The last session is devoted to the exam.
There are 13 exercise sessions on Monday, 11am-1pm, from September 14th to December 7th in room 118 Extranef.

Students are expected to be as active as possible during the course: Asking questions, proposing answers, discussing papers, proposing links between the course and empirical work… Participation will be taken into account in the final grade.

Grade

The overall grade will given by the formula

FEG * (1 + bonus)

where

FEG is the grade of the 3-hour written exam and bonus is a function of the homework
($0 \leq \text{bonus} \leq 0.3$)

Reading list

Reference textbooks

Jondeau E., S.-H. Poon, and M. Rockinger (2006), Financial Modeling Under Non-Gaussian Distributions, Springer Finance. [JPR]

Campbell J. Y., A. W. Lo, and A. C. MacKinlay (1997), The Econometrics of Financial Markets, Princeton University Press. [CLM]

Tsay R. S. (2005), Analysis of Financial Time Series, Wiley Series in Probability and Statistics.

Hamilton, J. D. (1994), Time Series Analysis, Princeton.

Greene, W. H. (2008), Econometric Analysis, Macmillan.

Papers with ** are compulsory reading.

[1] Characteristics of Financial Time Series

JPR, Chapter 2.
Tsay, Chapter 1.
CLM, Chapter 2.

Christie A. (1982), The Stochastic Behavior of Common Stock Variances: Value, Leverage and Interest Rate Effects, *Journal of Financial Economics*, 10, 407-432.

Cont R. (2001) Empirical properties of asset returns: stylized facts and statistical issues. *Quantitative Finance*, 1, 223-236.

Merton R. (1980), On Estimating the Expected Return on the Market, *Journal of Financial Economics*, 8, 323-362.

Schwert G. (1990), Why Does Stock Market Volatility Change Over Time, *Journal of Finance*, 44, 1115-1153.

[2] Modeling Financial Market Volatility

JPR, Chapter 4.
Tsay, Chapter 3.

**** Bollerslev T. (1986), Generalized Autoregressive Conditional Heteroscedasticity, *Journal of Econometrics*, 31, 307-327.

Bollerslev T., and R. F. Engle (1993), Common Persistence in Conditional Variance. *Econometrica*, 61, 167-186.

**** Engle R. F. (1982), Autoregressive Conditional Heteroskedasticity with Estimates of the

Variance of U.K. Inflation, *Econometrica*, 50, 987-1008.

Engle R. F., D. M. Lilien and R. P. Robbins (1987) Estimating Time Varying Risk Premia in the Term Structure: The ARCH-M Model, *Econometrica*, 55, 391-407.

****** Engle R. F., and V. K. Ng (1993), Measuring and Testing the Impact of News on Volatility, *Journal of Finance*, 48, 1749-1801.

Glosten R. T., R. Jaganathan, and D. Runkle (1993), On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks, *Journal of Finance*, 48, 1779-1801.

Nelson D. B. (1991), Conditional Heteroskedasticity in Asset Returns: A New Approach, *Econometrica*, 59, 347-370.

[3] Modeling Non-normality

JPR, Chapter 5.

Bollerslev T. (1987), A Conditionally Heteroskedastic Time Series Model for Speculative Prices and Rates of Return, *Review of Economics and Statistics*, 69, 542-547.

****** Diebold F. X., T. A. Gunther and A. S. Tay (1998), Evaluating Density Forecasts with Applications to Financial Risk Management, *International Economic Review*, 39(4), 863-883.

****** Engle R. F., and G. Gonzalez-Rivera (1991), Semi-Parametric ARCH Models, *Journal of Business and Economic Statistics*, 9, 345-359.

Gouriéroux C., A. Monfort, and A. Trognon (1984), Pseudo Maximum Likelihood Methods: Theory, *Econometrica*, 52, 680-700.

****** Hansen B. E. (1994), Autoregressive Conditional Density Estimation, *International Economic Review*, 35, 705-730.

Jondeau E., and M. Rockinger (2000), Gram-Charlier Densities, *Journal of Economic Dynamics and Control*, 25, 1457-1483.

Jondeau E., and M. Rockinger (2003), Conditional Volatility, Skewness, and Kurtosis: Existence, Persistence, and Comovements, *Journal of Economic Dynamic and Control*, 27, 1699-1737.

****** Newey W., and D. Steigerwald (1997), Asymptotic Bias for Quasi Maximum Likelihood Estimators in Conditional Heteroskedasticity Models, *Econometrica*, 65, 587-599.

[4] Extreme Value Theory

JPR, Chapter 7.
Tsay, Chapter 7.

Jondeau E. and M. Rockinger (2003), Testing for Differences in the Tails of Stock-Market Returns, *Journal of Empirical Finance*, 10, 559-581.

Kearns P. and A. Pagan (1977), Estimating the Density Tail Index for Financial Time Series,

Review of Economics and Statistics, 79, 171-175.

****** Longin, F.M. (1996), The Asymptotic Distribution of Extreme Stock Market Returns, *Journal of Business*, 69, 383-408.

McNeil A. J., and R. Frey (2000), Estimation of Tail-related Risk Measures for Heteroscedastic Financial Time series: an Extreme Value Approach, *Journal of Empirical Finance*, 7, 271–300.

McNeil A. J., and T. Saladin (1997), The Peaks over Thresholds Method for Estimating High Quantiles of Loss Distributions, mimeo, ETH Zentrum.

[5] Modeling Correlation

JPR, Chapter 6.
Tsay, Chapter 9.

****** Bollerslev T. (1990), Modeling the Coherence in Short-run Nominal Exchange Rates: A Multivariate Generalized ARCH Model, *Review of Economics and Statistics*, 72, 498-505.

Bollerslev T., R. F. Engle, and J. M. Wooldridge (1992), A Capital Asset Pricing Model with Time-Varying Covariances, *Journal of Political Economy*, 96, 116-131.

Engle R. F., and F. Kroner (1995), Multivariate Simultaneous Generalized ARCH, *Econometric Theory*, 11, 122-150.

Engle R. F., V. K. Ng, and M. Rothschild (1990), Asset Pricing with a Factor-ARCH Covariance Structure: Empirical Estimates for Treasury Bills, *Journal of Econometrics*, 45, 213-238.

** Engle R. F., and K. Sheppard (2001), Theoretical and Empirical Properties of Dynamic Conditional Correlation Multivariate GARCH, NBER Working Paper 8554.

****** Kroner K. F., and V. K. Ng (1998), Modeling Asymmetric Comovements of Asset Returns, *Review of Financial Studies*, 11, 817-844