IV SUMMER SCHOOL | ONLINE

MODELLING AND FORECASTING ENERGY MARKETS

31 August - 11 September 2020

SUMMER SCHOOL CODE

I-SS12-OL

DATE AND LOCATION

Due to the current COVID-19 situation, the 2020 edition of this Summer school will now be offered ONLINE, on a part-time basis from the 31st August to the 11th September 2020. To this end, this year's programme has been transformed into a series of module based daily sessions scheduled Monday to Friday from 5.00 pm to 8.00 pm Central European Summer Time (CEST).

PREREQUISITES

Participants should have a knowledge of the inferential statistics and introductory econometrics techniques illustrated in Wooldridg, J. M (2019) and or Brooks. C (2019). More specifically, participants must be familiar with linear regression analysis, inference, regression misspecification issues and time series concepts of autocorrelation, stationarity and volatility.

Participants are not however, required to be familiar with the statistical software Stata.

In the last two decades, the deregulation of energy markets and the increasing adoption of renewable energy have resulted in significant volatility of both energy price and demand worldwide. The modelling and forecasting of energy demand and price has therefore become of utmost importance, not only to energy producers themselves, but also to commodity traders and financial analysts focusing on the energy sector. The statistical features of energy data, which tends to follow periodic patterns and exhibit spikes, non-constant means and non-constant variances, renders the task of forecasting and modelling of energy data somewhat challenging.

The objective of TStat's "Modelling and Forecasting Energy Markets" Summer School is therefore to provide participants with the specific analytical tools to undertake a rigorous and in-depth analysis of both prices and demand in international energy markets. The programme covers a wide range of econometric methods currently available to researchers and practitioners, such as: i) univariate and multivariate time series models to estimate and forecast prices and demand and ii) univariate and multivariate GARCH models for the estimation and forecast of price volatility and risk management in energy markets.

Following TStat's training philosophy, the teaching style features both theoretical sessions, where participants are given the intuition behind the choice of a specific technique, and several practical sessions using Stata. In this manner, the course leaders are able to bridge the "often difficult" gap between abstract theoretical methodologies, and the practical issues one encounters when dealing with real data.

The Summer School opens with a full-immersion module on energy data analysis with the statistical software Stata, which aims at developing the necessary practical skills to actively participate in the applied sessions during the course of the week.

The 2020 edition also includes an extended Case Study Group session during which participants will either work in small groups on a short applied case study analysis or on a presentation of their own research work using the techniques illustrated during the course of the week. Course leaders will discuss with participants the appropriateness of the methodologies adopted in their case study, the interpretation of the results obtained and also to indicate potential problems to be aware of given the characteristics of the underlying data, as well as providing feedback and guidance on possible future developments of individual research agendas.

At the end of the school participants are expected to be in a position to autonomously conduct energy markets analysis, with the aid of the Stata routines developed specifically for the Summer School. In particular, participants will be able to evaluate which econometric method is more appropriate to the analysis in hand and will be able to test the appropriateness of their estimated model and the robustness of the results obtained.

MODELLING AND FORECASTING ENERGY MARKETS

TARGET AUDIENCE

Researchers and professionals working either: i) in the energy and related sectors, needing to model energy price and demand, and ii) on trading desks in financial institutions. Economists based in research policy institutions. Students and researchers in engineering, econometrics and finance needing to learn the econometrics methods and tools applied in this field.

PROGRAMME

MODULE 1 — ENERGY DATA ANALYSIS WITH STATA

SESSION I:
AN INTRODUCTION TO STATA
31st August 2020

1. Using Stata interactively and understanding the basics of Stata's language syntax
2. Fundamental data management tasks in Stata: importing datasets, renaming and relabelling variables, creating new variables, dealing with string variables, data aggregation
3. Date and time functions for working with time series in Stata
4. Saving your work: log files and do files

SESSION II:
ENERGY DATA ANALYSIS
1st September 2020

1. Graphical analysis of energy time series: creating line plots, histograms, correlograms, scatter plots with Stata
2. Descriptive Statistics in Stata
3. Test for autocorrelation and heteroscedasticity
4. Normality test
5. Non-stationarity and unit root tests

MODULE 2 — MODELLING AND FORECASTING ENERGY PRICE AND DEMAND

SESSION I:
UNIVARIATE TIME SERIES MODELS
FOR ENERGY PRICESAND DEMAND
(ELECTRICITY, CRUDE OIL, NATURAL GAS...)
2nd September 2020

1. Univariate time series models for modelling and forecasting energy data (ARMA, ARIMA, ARFIMA, SARIMA)
2. Markov switching models for capturing stable and spiky regimes in energy prices
3. Practical applications: estimating and forecasting energy price and demand with univariate models in Stata

SESSION II:
MULTIVARIATE TIME SERIES MODELS FOR
ENERGY PRICES
AND DEMAND (ELECTRICITY, CRUDE OIL,
NATURAL GAS...)
3rd September 2020

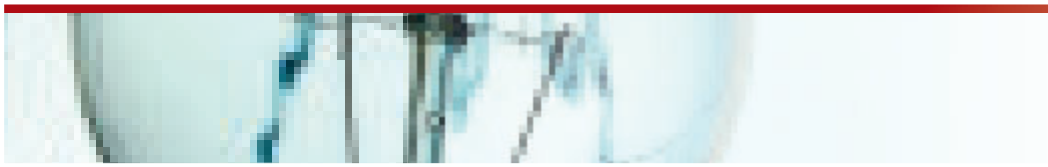
1. Vector autoregressive (VAR) models for forecasting energy prices and for understanding interdependences between energy markets
2. Granger predictability of energy prices
3. Practical applications: fitting VAR models with Stata

MODULE 3 — COINTEGRATION AND UNOBSERVED COMPONENT MODELS

SESSION I:
COINTEGRATION MODELS OF ENERGY
DEMAND (ELECTRICITY, CRUDE OIL,
NATURAL GAS...)
4th September 2020

1. An introduction to the theory of cointegration
2. Cointegration models for energy data: autoregressive distributed lag models and error correction models. The Engle & Granger procedure and the Johansen's approach
3. Practical applications: Estimating energy demand models with Stata

https://www.tstattraining.eu/training/modelling-energy-markets-online/



TStat

SESSION II:
UNOBSERVED COMPONENT ENERGY MODELS (ELECTRICITY, CRUDE OIL, NATURAL GAS...)
7th September 2020

1. Unobserved component models to decompose energy demand time series into trend, seasonal, cyclical, and idiosyncratic components
2. Practical applications: estimating the underlying energy demand trend

MODULE 4 ENERGY MARKETS VOLATILITY

SESSION I:
UNIVARIATE GARCH MODELS FOR ESTIMATING AND FORECASTING ENERGY PRICES VOLATILITY (ELECTRICITY, CRUDE OIL, NATURAL GAS...)
8th September 2020

1. ARCH, GARCH, GARCH-in-mean and IGARCH models for energy prices
2. Inverse leverage effect in energy markets. Estimating asymmetric GARCH models (SAARCH, EGARCH, GJR, TGARCH, APARCH)
3. Practical applications: testing for inverse leverage effect in energy markets and fitting symmetric and asymmetric GARCH models with Stata

SESSION II:
APPLIED CASE STUDY GROUP ANALYSIS
9th September 2020

1. During the informal Study Case study session, participants will be encouraged to present their own research agenda. Course leaders will be on hand to discuss the appropriateness of specific methodologies, interpretation and discussion of the results obtained, as well as providing feedback and guidance on possible future developments of individual research agendas.

MODULE 5 RISK MANAGEMENT TOOLS FOR ENERGY MARKETS

SESSION I:
MULTIVARIATE GARCH MODELS FOR ENERGY PRICES VOLATILITY ((ELECTRICITY, CRUDE OIL, NATURAL GAS...)
10th September 2020

1. VECH and Diagonal VECH model, Constant Conditional Correlation (CCC) model, Dynamic Conditional Correlation Model (DCC) by Engle (2002) and Dynamic Conditional Correlation Model (DCC) by Tse and Tsui (2002)
2. Practical applications: testing for interdependencies between energy markets volatility using CCC and DCC models

SESSION II:
RISK MANAGEMENT TOOLS
11th September 2020

1. Value-at-Risk (VaR) to measure market risk of energy markets: Parametric VaR, historical simulation VaR, Monte Carlo VaR
2. Backtesting procedures: unconditional coverage, independence, conditional coverage, and duration based tests of independence
3. Practical applications: Value-at-Risk estimation of oil market with Stata

SUGGESTED PRE SCHOOL READINGS

Financial Econometrics Using Stata, Boffelli, S. e Urga, G. (2016) Stata Press

Introductory Econometrics: A Modern Approach, 7th Edition, Wooldridge, J.M. (2019) Cengage Learning and/or

Introductory Econometrics for Finance, 4th Edition, C.Brooks, (2019) Cambridge University Press

MODELLING AND FORECASTING ENERGY MARKETS

REGISTRATION FEES

The Summer School fee amounts to:

Students*: € 945.00
Academic: € 1795.00
Commercial: € 2845.00

*To be eligible for student prices, participants must provide proof of their full-time student status for the current academic year.

Fees are subject to VAT (applied at the current Italian rate of 22%). Under current EU fiscal regulations, VAT will not however applied to companies, Institutions or Universities providing a valid tax registration number.

The number of participants is limited to 15. Places will be allocated on a first come, first serve basis. The Summer school will only be confirmed when at least 8 people have enrolled.

Course fee covers: teaching materials (handouts, databases and the Stata routines developed specifically for the program; a temporary licence of Stata valid for 30 days from the beginning of the school.

REGISTRATION DEADLINE

Individuals interested in attending this summer school must return their completed registration forms to TStat by e-mail (training@tstat.eu) by the 1st August 2020.

Further details regarding our registration procedures, including our commercial terms and conditions, can be found at https://www.tstattraining.eu/training/modelling-energy-markets-online/

COURSE LEADERS

Dr Elisabetta PELLINI, Centre for Econometric Analysis, Cass Business School, London (UK)

Professor Giovanni URGA, Centre for Econometric Analysis, Cass Business School, London (UK) and Bergamo University (Italy)

CONTACTS

Monica Gianni
TStat Training | Kleebergstraße, 8
D-60322 Frankfurt am Main

TStat S.r.l. | Via Rettangolo, 12-14
I-67039 Sulmona (AQ)
T. +39 0864 210101

training@tstat.eu

www.tstattraining.eu
www.tstat.eu