TIME SERIES MODELLING AND FORECASTING USING STATA

GENERAL DESCRIPTION

Time Series data is today available for a wide range of several phenomena in Business, Finance, Economics, Public Health, the Political and Social Sciences. The aim of TStat Training's Times Series Modelling and Forecasting Course is therefore, to provide researchers and professionals with the standard tool kit required for the analysis of time series data in Stata. As such the program has been developed to offer an overview of the most commonly used methods for analysing, modelling and forecasting the dynamic behaviour of time series data, offering practical examples of empirical modelling using real-world data. The course begins with an introduction to Stata's basic time series commands, before moving onto the analysis of time series features and to univariate time series models. Sessions 3 and 4 instead focus on the estimation of both multivariate time series models with stationary and nonstationary data and univariate models of volatility.

In common with TStat's training philosophy, throughout the course theory and methods are illustrated in an intuitive way and are complemented by practical exercises undertaken in Stata, during which the course tutor discusses and highlights potential pitfalls and the advantages of individual techniques. Particular attention is also given to both the interpretation and presentation of empirical results. In this manner, the course leader is able to bridge the "often difficult" gap between theory and practice of time series modelling and forecasting.

Upon completion, it is expected that participants are able to autonomously implement the statistical methods discussed during the course to their own data, customizing when necessary, the Stata *do-file* routines specifically developed for the course.

TARGET AUDIENCE

Researchers and professionals working in financial institutions, policy institutions, research departments of utilities, governments, corporations, Ph.D and Master students in biostatistics, economics, finance, engineering, psychology, social and political sciences needing to implement time series data analysis methods.

PREREQUISITES

Participants are required to have a good working knowledge of:

- Linear regression model definition and assumptions
- Ordinary Least Squares (OLS) estimation. Properties of OLS
- Inference in the linear regression model: confidence intervals, t-test, F-test
- Violation of the linear regression model assumptions: heteroscedasticity, serial correlation, functional form misspecification, non-Normality. Consequences of violations and remedies
- Diagnostic analysis of regression: tests for heteroscedasticity, test for serial correlation, Normality test, Ramsey's RESET
- Regression with time series data. Concepts of lagged variable and differenced variable
- Dynamic models

Those needing to refresh these concepts are referred to:

- Hill, R.C., Griffiths, W.E., and G.C. Lim (2018). Principles of Econometrics, 5th Edition. Wiley
- Stock, J.H., and Watson, M.W. (2019). Introduction to Econometrics, 4th edition, Pearson
- Wooldridge, J.M. (2020). Introductory Econometrics: A Modern Approach, 7th Edition, Cengage Learning

PROGRAM

SESSION I: WORKING WITH TIME SERIES IN STATA

1. A quick introduction to Stata for time series data:
   - Creating and formatting date variables using date and time functions and time-series declaration
   - Using Stata time-series operators to create lags, leads, differences, seasonal differences, percentage changes

2. Graphical analysis of time series:
   - Creating and examining line plots to understand the behaviour of series over time
   - Creating and examining correlograms to assess dependence in time series
   - Creating and examining histograms to evaluate Normality
3. Descriptive statistics analysis of time series:
   - Unit root test: Augmented Dickey Fuller Test and DFGLS test
   - White Noise test
   - Normality test

SESSION II: UNIVARIATE TIME SERIES MODELS

1. Univariate Time Series Models: theoretical elements
   - Autoregressive model (AR)
   - Moving Average model (MA)
   - Autoregressive Moving Average Model (ARMA)
   - Autoregressive Integrated Moving Average Model (ARIMA)
   - Seasonal ARIMA models (SARIMA)
2. ARIMA modelling in practice: using the Box-Jenkins approach to model real-world economic time series
   - Examining the sample autocorrelation function and the sample partial autocorrelation function
   - Estimation of ARIMA models
   - Model diagnostic analysis and model selection using information criteria
3. Forecasting with ARIMA models
4. An introduction to Markov-Switching Models
   - Markov-switching dynamic regression
   - Markov-switching autoregression

SESSION III: MULTIVARIATE TIME SERIES MODELS

1. Multivariate Time Series Models - Vector Autoregression (VAR): theoretical elements
2. VAR modelling in practice:
   - Lag order selection
   - Estimation
   - Diagnostic checking: autocorrelation, stationarity and normality
3. Granger causality and impulse response function analysis
4. Forecasting with VAR models
5. Nonstationary time series: spurious regressions versus cointegration
   - Concepts of long-run equilibrium relationships and short-run relationships
   - Vector Error Correction Model (VECM)
   - Testing for cointegration in regressions: a residuals-based test
6. Engle and Granger two-step method
7. Testing for cointegration and estimating cointegrating relationships with the Johansen's approach

SESSION IV: MODELLING AND FORECASTING VOLATILITY IN TIME SERIES MODELS

1. Time-varying volatility:
   - Visual inspection of time-varying volatility (i.e. volatility clustering) and leptokurtosis with line plots and histograms
   - ARCH test
2. Modelling volatility of financial time series:
   - ARCH model: estimation and diagnostic checking
   - Extension to the ARCH model: GARCH model, estimation and diagnostic checking
   - ARCH-in-Mean model
   - Modelling the asymmetric impact of news on volatility: Asymmetric GARCH models (EGARCH, GJR-GARCH, TGARCH, APARCH)
   - Model selection
3. Forecasting volatility with GARCH models

SUGGESTED READING (PRE - AND POST-COURSE)

Becketti, S. (2020). Introduction to Time Series Using Stata. Stata Press Publication.

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

DATES AND LOCATION

The 2023 edition of this training course will be offered ONLINE on a part-time basis on the 16th-17th and 23rd-24th of March. To this end, programme includes a series of sessions based on 4 modules from 10:00 am to 1:30 pm Central European Time (CET).

REGISTRATION FEES

Students*: € 710.00
Ph.D Students: € 910.00
University: € 1010.00
Commercial: € 1345.00

*To be eligible for student prices, participants must provide proof of their **full-time** student status for the current academic year. Our standard policy is to provide all **full-time students**, be they Undergraduates or Masters students, access to student participation rates. Part-time master and doctoral students who are also currently employed will however, be allocated academic status.

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 8. Places, will be allocated on a first come, first serve basis. The course will be officially confirmed, when at least 5 individuals are enrolled.

Course fees cover: course materials (handouts, Stata *do files* and datasets to be used during the course), a temporary licence of Stata valid for 30 days from the beginning of the course.

Individuals interested in attending the training course should contact TStat Training to ask for a registration form. The completed application must then be returned to TStat by the 6th March 2023.

Further details regarding our registration procedures, including our commercial terms and conditions, can be found at **https://www.tstattraining.eu/training/time-series-modelling-forecasting-stata-ol/.**

CONTACT INFORMATION:

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