



Course and Examination Fact Sheet: Spring Semester 2020

6,270: Introduction to Time Series Modelling

ECTS credits: 6

Overview examination/s

(binding regulations see below)

Decentral - Oral examination (individual) (50%, 15 mins.)

Decentral - Oral examination (individual) (50%, 15 mins.)

Attached courses

Timetable -- Language -- Lecturer

[6,270,1.00 Introduction to Time Series Modelling](#) -- Englisch -- [Aurino Francesco](#), [Fengler Matthias](#)

Course information

Course prerequisites

Statistics knowledge at the level of the HSG Bachelor in Economics course "Statistics".

Learning objectives

Students will gain the basic, fundamental knowledge needed to understand the main concepts in time series and financial econometrics. We will teach students how to deal with possible practical applications related to the analysis of a (financial) time series basic characteristics, going from data acquisition, the identification and filtering of eventual non-stationary components, to the estimation of a suitable time series process. Moreover, students will learn how to choose and use the different packages and commands available in the free R software.

Course content

This course is aimed at students who wish to gain a working knowledge of time series and forecasting methods as applied in economics, finance, engineering, and the natural and social sciences. The emphasis is on methods and the analysis of data sets. The core of the course covers the identification and estimation of trend and seasonal components, as well as the theory underlying ARMA, and ARIMA processes. Turning to specific topics in financial econometrics, the class covers the basic facts of asset returns, market efficiency and the predictability of asset returns, ARCH and GARCH models, and market microstructure and high-frequency data. Theoretical exercises as well as practical implementations in R for the analysis of real and simulated datasets are discussed during the exercise sessions.

Course structure

1. Introduction

2. Basic Concepts

Estimation and elimination of trend and seasonality components; Tests for the estimated residual sequence.

3. Stationary Processes

Basic properties; Linear Processes; Wold Decomposition.

4. ARMA models

Definition and basic properties of ARMA models; autocorrelation function (ACF) and partial autocorrelation function (PACF).

5. Modeling and prediction with ARMA processes

Preliminary estimation; Yule-Walker equations; Maximum-likelihood estimation (MLE); Order selection; Diagnostic checking.

6. Non-stationary time series models

ARIMA models; Unit roots tests in time series models



7. Prices, returns, and volatility

Computing prices, returns, and volatility

8. Stylized facts of asset returns

normality tests; tail index regression; dependence structure of returns

9. Conditional heteroscedasticity

ARCH models, GARCH models

10. Forecasting

prediction of volatility

11. Market Microstructure

elements of high-frequency data; Roll's model; realized variance

Course literature

- F. Audrino, Lecture Notes on Studynet (mandatory).
- M. Fengler, Slides on Studynet (mandatory).
- Brockwell, P.J. and Davis, R.A. (2002), *Introduction to Time Series and Forecasting*, 2nd edition, Springer Texts in Statistics (available online at Researchgate). This is the main reference book used to prepare the slides.
- Tsay, R.S. (2010), *Analysis of Financial Time Series*, 3rd edition, Wiley Series in Probability and Statistics (<http://faculty.chicagobooth.edu/ruey.tsay/teaching/fts3/>).
- Hamilton, J.D. (1994), *Time Series Analysis*, Princeton University Press.
- Enders, W. (2010), *Applied Econometric time series*, Wiley & Sons.
- Franke, Härdle, Hafner (2015), *Statistics of Financial Markets*, Springer-Verlag

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form

Decentral - Oral examination (individual) (50%, 15 mins.)

Remark

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Examination-aid rule

Extended Closed Book

The use of aids is limited; any additional aids permitted are exhaustively listed under "Supplementary aids". Basically, the following is applicable:

- At such examinations, all the pocket calculators of the Texas Instruments TI-30 series and mono- or bilingual dictionaries (no subject-specific dictionaries) without hand-written notes are admissible. Any other pocket calculator models and any electronic dictionaries are inadmissible.
- In addition, any type of communication, as well as any electronic devices that can be programmed and are capable of communication such as notebooks, tablets, PDAs, mobile telephones and others, are inadmissible.
- Students are themselves responsible for the procurement of examination aids.

Supplementary aids



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Examination languages

Question language: English

Answer language: English

2. Examination sub part (2/2)

Examination time and form

Decentral - Oral examination (individual) (50%, 15 mins.)

Remark

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Examination-aid rule

Extended Closed Book

The use of aids is limited; any additional aids permitted are exhaustively listed under "Supplementary aids". Basically, the following is applicable:

- At such examinations, all the pocket calculators of the Texas Instruments TI-30 series and mono- or bilingual dictionaries (no subject-specific dictionaries) without hand-written notes are admissible. Any other pocket calculator models and any electronic dictionaries are inadmissible.
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- Students are themselves responsible for the procurement of examination aids.

Supplementary aids

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Examination languages

Question language: English

Answer language: English

Examination content

Part I: (oral exam)

1. Introduction

2. Basic Concepts

Estimation and elimination of trend and seasonality components; Tests for the estimated residual sequence.

3. Stationary Processes

Basic properties; Linear Processes; Wold Decomposition.

4. ARMA models

Definition and basic properties of ARMA models; autocorrelation function (ACF) and partial autocorrelation function (PACF).

5. Modeling and prediction with ARMA processes

Preliminary estimation; Yule-Walker equations; Maximum-likelihood estimation (MLE); Order selection; Diagnostic checking.

6. Non-stationary time series models

ARIMA models; Unit roots tests in time series models

PART II (oral exam)

7. Prices, returns, and volatility

Computing prices, returns, and volatility

8. Stylized facts of asset returns

normality tests; tail index regression; dependence structure of returns

9. Conditional heteroscedasticity

ARCH models, GARCH models

10. Forecasting

prediction of volatility

11. Market Microstructure



elements of high-frequency data; Roll's model; realized variance

Examination relevant literature

Part I:

F. Audrino, Lecture Notes available on Studynet at the beginning of the term.

Part II:

Slides of Matthias Fengler

Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW21) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination type starting from the beginning of the bidding on 23 January 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 16 March 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 6 April 2020

Please consult the fact sheet again after these deadlines have expired.