

On-line course materials

# MATH38032 - Time Series with Applications

Year: 3 - Semester: 2 - Credit Rating: 10

## Requisites

### *Prerequisites*

This course unit cannot be taken as well as MATH48032 which is a level 4 version of the same course unit.

good background in statistics, particularly hypothesis testing and regression

## Aims

To introduce the basic concepts of the analysis of time series, with emphasis on financial and economic data.

## Brief Description

This course unit covers a variety of concepts and models useful for empirical analysis of time series data.

## Learning Outcomes

On successful completion of this course unit students will

- have understanding of the basic time series concepts;
- be able to build models to time series data and critically assess them using a variety of methods for exploration of time series data, identification and model selection.
- Future topics requiring this course unit

None

## Syllabus

- Introduction and examples of economic and financial time series, asset returns. Basic models: white noise, random walk, AR(1), MA(1). [2]
- Stationary time series. Autocovariance and autocorrelation functions. Linear Prediction. Yule-Walker equations. Estimation of autocorrelation and partial autocorrelation functions. [3]
- Models for stationary time series - autoregressive (AR) models, moving average (MA) models, autoregressive moving average (ARMA) models. Seasonal ARMA models. Properties, estimation and model building. Diagnostic checking. [6]
- Non-stationary time series. Non-stationarity in variance - logarithmic and power transformations. Non-stationarity in mean. Deterministic trends. Integrated time series. ARIMA and seasonal ARIMA models. Modelling seasonality and trend with ARIMA models. [4]
- Filtering, exponential smoothing, seasonal adjustments. [2]
- Non-linear models - threshold AR, bilinear models. Cointegration. [2]
- Multivariate time series. Stationarity, autocorrelation and crosscorrelation. Multivariate autoregressive model. Markov property. Representation of univariate autoregressive models in Markov form. [3]

## Teaching & Learning Process (Hours Allocated To)

<b>Lectures</b>	<b>Tutorials/ Example Classes</b>	<b>Practical Work/ Laboratory</b>	<b>Private Study</b>	<b>Total</b>
22	11	0	67	100

## Assessment and Feedback

End of semester examination: two hours weighting 100%

## Further Reading

- Cryer, Jonathan D and Chan, Kung-Sik. Time Series Analysis with Applications in R. Second edition. Springer, 2008.
- Mills, Terence C. The Econometric Modelling of Financial Time Series. Second edition. Cambridge University Press, 1999.
- Shumway, Robert H and Stoffer, David S. Time Series Analysis and Its Application: With R Examples. Second edition. Springer, 2006.
- Cowpertwait, Paul SP and Metcalfe, Andrew V. Introductory Time Series with R. Springer, 2009.

## Staff Involved

Dr Georgi Boshnakov - Lecturer