Macroeconometrics: ECOM90007

by Tomasz Woźniak • Department of Economics • University of Melbourne

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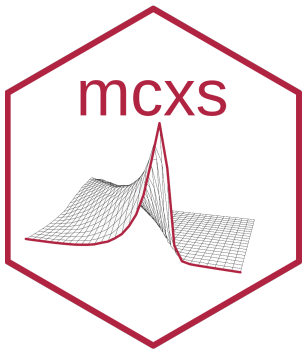

Outline.

Decision-making at central banks, economic governance institutions, and consulting firms relies on advanced empirical analyses of economic data. This subject facilitates working with a cutting-edge econometric methodology for empirical macroeconomic research. Topics covered include forecasting economic outcomes using large data sets, analysing the dynamic effects of structural shocks on the business cycle and the labour market, and forecasting CO2 emissions for the 21st century. They provide evidence-based background for shaping the economic policy of a country. Finally, the focus is on learning programming and project management skills that facilitate performing reproducible econometric analyses in **RStudio**, **R**, **Quarto**, **git**, and **GitHub**.

Contact Details.

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Lecture Times.

Wednesdays 5:45 – 7:15 pm in FBE Building Theater 4
Thursdays 3:15 – 4:45 pm in FBE Building Theater 2

Consultations.

Wednesdays, 4:30 – 5:30 pm FBE 350

Subject Resources.

All subject resources will be made available on Canvas and include:

- Lecture slides
- R files for the reproduction of results from the lectures
- Online textbook by Tomasz
- Online repositories with lecture materials
- Template repository for the research project
- *Introduction to R* Canvas module and other resources for learning R

Introduction to R.

The objective of the complementary four sessions is to facilitate the beginning of working and computer programming with R.

The sessions are available online via a separate Canvas module that is not graded.

Session 1: Introduction to R
Session 2: Basic programming in R
Session 3: Numerical integration
Session 4: Numerical optimisation
Session 5: Quarto documents
Session 6: Project development with git and GitHub
Session 7: Working with template repository on GitHub

Syllabus.

		Concepts and Tools
1	1	What's macroeconometrics?
	2	Maximum likelihood estimation
2	3	Bayesian estimation
	4	Numerical optimization and integration
3	5	Understanding unit-rooters
	6	Macroeconometric research themes
		Macroeconomic Forecasting with Fat Data
4	7	Vector Autoregressions
	8	Bayesian VARs
		Test 1
5	9	Forecasting with Bayesian VARs
	10	Forecasting with Large Bayesian VARs
		Modeling Effects of Monetary Policy
6	11	Structural Vector Autoregressions
	12	Structural VAR tools
		Test 2
7	13	Bayesian estimation of Structural VARs
	14	Modeling effects of monetary policy
		Modeling Trend Inflation
8	15	Unobserved Component models
	16	Bayesian estimation using precision sampler
9	17	Modeling trend inflation
		Modeling Conditional Heteroskedasticity
	18	Stochastic Volatility models
10	19	Bayesian estimation using auxiliary mixtures
		Topics in Climate Change
	20	Forecasting CO_2 Emissions for the 21st Century
		Research Project Presentations
11	21	Presentations
12	22	Presentations
		Lecturer's Research Presentation
	24	Robust macroeceonometric modelling
	24	`bsvars` package presentation

Assessment.

The table presents an overview of the assessment.

RP stands for **R**esearch **P**roject

Week	Task	Grade
4	**Test 1:** Concepts and Tools	10%
5	**RP1:** question, data, model, hypothesis	10%
6	**Test 2:** Bayesian Estimation	10%
8	**RP2:** estimation procedure and algorithm	10%
10	**RP3:** empirical analysis	10%
4–10	Learning repository contribution	10%
11	**RP Presentation**	10%
12+	**RP Final report**	30%

Short Tests.

Two 30-minute long tests are taking place in weeks 4 and 6.

Each of them is worth 10% of the final grade.

Learning Repository Contribution.

A contribution to the learning repository on the *Bayesian estimation of autoregressions* is worth 10% of the final grade.

Research Project.

A semester-long individual research project is worth 70% of the final grade.

The development of the project throughout the semester includes small intermediate part submissions **PR1**–**PR3**. Each of these parts includes the submission of the proposal, providing feedback on peer submissions, and implementation of the received feedback from peers and lecturer.

The report includes the proposal of a model with original features, derivation and coding of the Bayesian estimation procedure, and empirical investigation answering the proposed question or hypothesis.

The report can be developed on one of three themes:

1. Forecasting with Bayesian VARs
2. Assessing policy effects with Structural VARs
3. Trend and cycle analysis with Unobserved Component models

The **Presentation** focuses on the preliminary empirical analyses.

the **RP** final submission is in the examination period.

Learning outcomes.

At the completion of the subject students will be able to:

LO1: Develop original econometric methodology for applied macroeconomic analyses

LO2: Propose econometric techniques and models to verify hypotheses that inform fiscal or monetary policy

LO3: Derive Bayesian estimation procedure for the newly proposed macroeconometric model

LO4: Write computer programs in R that implement the derived estimation procedure

LO5: Apply the computer program in the forecasting or structural analyses of Australian macroeconomic data

LO6: Transparently create econometric data analysis using the newly proposed methodology in a fully reproducible report developed collaboratively

Generic skills.

At the completion of the subject students will also be able to:

GS1: Obtain and format data from the original sources in an automated workflow

GS2: Document the essential data properties and incorporate them in the econometric modelling

GS3: Handle statistical distributions of parameters and forecasted values to make the econometric analysis feasible

GS4: Apply linear algebra operations and basic statistical theory to facilitate model estimation, hypothesis verification, and reliable forecasting

GS5: Create visualisations of data and estimation results that inform economic interpretations

GS6: Use functional programming to implement econometric procedures

GS7: Propose economic interpretations based on the empirical evidence

GS8: Obtaining, providing, and implementing constructive and actionable feedback

GS9: Managing a programming and data analysis project using git and GitHub

GS10: Communicating research outcomes in plain language and using visualisations