# **Professor**

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# **Overview and Objectives**

Bayesian methods are increasingly used in econometrics, particularly in the field of macroeconomics. This is a course in advanced Bayesian econometrics with a focus on the multivariate time series models which are commonly used by macroeconomists. It will begin with a discussion of Bayesian Vector Autoregressions (VARs). In addition to coverage of conventional Bayesian approaches, the course will also cover new developments in VAR modelling which use machine learning methods to ensure parsimony in VARs. It is often empirically important to allow for time variation in VAR coefficients and for multivariate stochastic volatility. We show how Bayesian state space methods can do so.

In light of the Big Data revolution, macroeconomists often face the situation where the number of variables under consideration is large relative to the number of observations and conventional econometric methods do not work well. The latter half of the course discusses various methods that can be used with Big Data including factor methods and random compression.

Computational methods are of great importance in modern Bayesian econometrics and these are discussed in in detail. Computer tutorial sessions, using MATLAB, will allow the student to develop the necessary programming skills.

# **Course Outline**

1. Bayesian VARs

Traditional priors such as the Minnesota prior

1. Hierarchical Priors for VARs

These are machine learning applied to VARs

1. TVP-VARs with stochastic volatility

Extending the VAR to allow for coefficients to change and for stochastic volatility

1. Factor Models and Factor Augmented VARs

Factor models are commonly used with Big Data sets with hundreds of macro variables and this lecture covers Bayesian methods for estimating them.

1. Bayesian VARs with Big Data

Recent developments for large VARs and TVP-VARs with Big Data

# **Required Activities**

In addition to 2 hours of lectures each day there will be an hour long computer session each afternoon.

## List of References

Koop, G. and Korobilis, D. (2009). Bayesian Multivariate Time Series Methods for Empirical Macroeconomics, monograph in the Foundations and Trends in Econometrics series.

Koop, G. (2016). Bayesian Methods for Empirical Macroeconomics with Big Data

A Bank of England Technical Handbook: Applied Bayesian Econometrics for Central Bankers (by Blake and Mumtaz)

A European Central Bank Working paper: The BEAR Toolbox (by Dieppe, Legrand and van Roye)

Book of solved exercises: Koop, Poirier and Tobias (2007). Bayesian Econometric Methods, Cambridge University Press.

With the exception of the book of solved exercises, all readings can be downloaded from my website.