

Bayesian time series analysis via dynamic linear models

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<https://hedibert.org/wp-content/uploads/2025/06/short-course-UC3.pdf>

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OUTLINE

PART ONE

- Bayesian ingredients
- Bayesian model criticism

PART TWO

- Bayesian computation
- Bayesian regularization

PART THREE

- Bayesian factor modeling
- Dynamic linear models

PART FOUR

- Time-varying variance modeling
- Time-varying covariance modeling

1. Bayesian ingredients

- Tiago Mendonca's shiny for the physicists example
- Physicists A, B, C and D: Normal model and 4 priors
- Sequential Bayes: Bernoulli-Beta & Uniform-Pareto
- Bayesian logistic regression

2. Bayesian model criticism

- Posterior odds, Bayes factor and prior predictive
- Reversible jump MCMC
- Bayesian model averaging
- Posterior predictive criterion
- Deviance information criterion

3. Bayesian computation

- Weight vs height: outlier, Gaussian vs Student's t errors
- Learning the degree of freedom
- Banana-shape posterior: Posterior inference via SIR
- Normal vs skew-normal distributions: an exercise in Bayesian learning
- Bayesian learning of correlation in bivariate normal data via SIR algorithm
- SIR, scale mixture of normals and raoblackwellization
- Sampling from the log-chi-square distribution - SIR

- [Nonlinear regression: SIR, MCMC and MC methods](#)
- [Threshold AR \(TAR\) model: Gibbs and Metropolis steps](#)
- [Revisiting regression with autocorrelated errors: SIR vs Gibbs](#)
- [Hamiltonian Monte Carlo](#)
 - [HMC: A toy example introduction](#)
 - [Stan/rstan for HMC-based posterior inference](#)
 - [HMC & STAN - Nonlinear regression illustration \(R script + STAN script\)](#)
 - [HMC & STAN - AR\(1\) model with Student's t errors](#)

4. Bayesian regularization

- [Gaussian linear regression model - Gibbs sampler for conditionally conjugate prior](#)
- [Boston housing data: ML and Bayesian inference](#)
- [Gaussian linear regression model - Gibbs sampler for conditionally conjugate prior](#)
- [Return on education - Gaussian linear model with conjugate prior](#)
- [AR\(p\) models - Bayesian updating with conjugate prior vs Gibbs sampler](#)
- [Subset selection via BIC and regularizing priors \(macro data\)](#)

5. Factor modeling

6. Dynamic linear models

- [Dynamic linear regression](#)
- [Hidden Markov model: Variance switching](#)
- [Steve Scott's Bayesian structural time series \(BSTS\) R package](#)
- [My brief tutorial of the BSTS package](#)
- [Dynamic modeling of NO3 time series via BSTS \(data\)](#)

7. Time-varying variance modeling

- [Bayesian GARCH](#)
- [Stochastic volatility \(SV\) models](#)
- [SV in R via stochvol package](#)
- [Student's t GARCH\(1,1\) model via STAN](#)
- [Gaussian and Student's t SV models via STAN](#)
- [Bayesian SV model with various error distributions \(R package stochvol\)](#)

8. Time-varying covariance modeling

- [Factor stochastic volatility \(FSV\) models \(R package factorstochvol\)](#)
- [Example 1: FSV with 2 variables and 1 factor](#)
- [Example 2: FSV with 6 variables and 2 factors](#)
- [Example 3: SV and dynamic conditional correlation \(DCC\)](#)