

Bayesian Diagnostic of Hidden Markov Structural Equation Models with Missing Data—Web Supplement Material

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(1) Setting Files

- `def_con.h`: The definition of the model.

Notation	Description
NO	Sample size+1, e.g. $n = 1000$, NO=1001.
NT	Time points+1
NC2	Number of hidden states+1
NY2	Dimension of the observed variables+1
NK2	Dimension of latent variables+1
NM2	Dimension of dependent latent variables+1
NZ2	Dimension of independent latent variables+1
NB2	Number of terms in the structural equation+1
NX	Dimension of discrete fixed covariates+1
NP2	Total number of unknown parameters+1
MCAX	Total MCMC iterations
GNUM	Burn-in iterations
SS	Thinning value
sigmu	Prior precision (the inverse of variance) of the intercept
sigly	Prior precision of the factor loadings
sigphi	Prior precision of the coefficients in the missing mechanism model
siggam	Prior precision of the coefficients related to the discrete fixed covariates in the transition model
sigalp	Prior precision of the intercepts in the transition model
sigalp2	Prior precision of the parameters related to the initial probabilities

RAN_PER	Random permutation sampler: 1; otherwise: 0
POS2	Location of the intercept for permutation sampler
MAR	Ignorable missing: 1; non-ignorable missing: 0
NON	Nonlinear structural equation: 1; linear structural equation: 0

- ind.txt: The indicator file.
 - The indicator matrix of the factor loading matrix. 1 for free parameters and 0 for fixed parameters.
- Prior.txt: Prior specification file. For $s = 1, \dots, S$ rows,
 - The location hyperparameters, $\tilde{\alpha}_{sj}$, for ψ_{sj} , $j = 1, \dots, p$.
 - The shape hyperparameters, $\tilde{\beta}_{sj}$, for ψ_{sj} , $j = 1, \dots, p$.
 - The location hyperparameters, $\tilde{\alpha}_{\delta sj}$, for $\psi_{\delta sj}$, $j = 1, \dots, q_1$.
 - The shape hyperparameters, $\tilde{\beta}_{\delta sj}$, for $\psi_{\delta sj}$, $j = 1, \dots, q_1$.
 - The degree of freedom in Wishart distribution, ρ_s , for Φ_s^{-1} .
 - The scale matrix (lower triangular matrix) in Wishart distribution, R_s , for Φ_s^{-1} .
- Accept.txt: Tuning parameters to control the acceptance rate.
 - Tuning parameter for the coefficients related to the discrete fixed covariates in the transition model, φ .
 - Tuning parameters for the initial probabilities and intercepts in the transition model, τ_s and ζ_{us} , $u, s = 1, \dots, S$.
 - Tuning parameters for the parameters in the missing mechanism.
 - Tuning parameters for the latent variables.
 - Tuning parameters for the missing observation $y_{.j}$, $j = 1, \dots, p$.
- int.txt: Initial values for the MCMC algorithm.
 - The loading matrices, Λ_s , $s = 1, \dots, S$.
 - The intercepts, μ_s , $s = 1, \dots, S$.

- The error variances in measurement equation, ψ_{sj} , $j = 1, \dots, p$; $s = 1, \dots, S$.
 - The coefficients in the structural equation Γ_s , $s = 1, \dots, S$.
 - The error variances in structural equation, $\psi_{\delta s, j}$, $j = 1, \dots, q$; $s = 1, \dots, S$.
 - The covariance matrix (lower triangular matrix) of independent latent variables, Φ_s , $s = 1, \dots, S$.
 - The parameters in the non-ignorable missing mechanism.
- main.c: The main file.
 - Lines 258—260; 473—475: Nonlinear terms (XIB) in the structural equations. You may modify these terms according to your model.
 - tomeqa.c
 - Lines 26—28: Nonlinear terms (GXIB) in the structural equations. You may modify these terms according to your model.
 - calG2.c
 - Lines 37—42: G_s in the paper. You may modify this matrix according to your model.

(2) Data Files

- YO.txt: Observed variable data files, the reading subscript order is i, t, j , $i = 1, \dots, n$; $t = 1, \dots, T$; $j = 1, \dots, p$. Note: The missing entries should be given initial values beforehand.
- IYY.txt: Missing indicators corresponding to YO.txt.
- AZ.txt: Fixed covariates in the transition model.

(3) Run the Program

- a) Prepare the data files: YO.txt, IYY.txt, and AZ.txt.
- b) Prepare the setting files and modify the settings according to your model.
- c) Compile main.c using g++ or any other C compilers to obtain main.exe or other

execute files (platform dependent) in your working directory.

d) Run main.exe or other execute files (platform dependent) to obtain the result files.

(4) Results Files

- EALP1.txt, EALP2.txt, ...: The estimates for the initial probabilities and intercepts in the transition model, τ_s and ζ_{us} , $u, s = 1, \dots, S$.
- EBI1.txt, EBI2.txt, ...: The estimates for the unknown coefficients in the structural equations, Γ_s , $s = 1, \dots, S$.
- EGAM1.txt, EGAM2.txt, ...: The estimates for the coefficients related to the discrete fixed covariates in the transition model, φ .
- ELY1.txt, ELY2.txt, ...: The estimates for the unknown elements in loading matrices, Λ_s , $s = 1, \dots, S$.
- EMU1.txt, EMU2.txt, ...: The estimates for μ_s , $s = 1, \dots, S$.
- EPHI1.txt, EPHI2.txt, ...: The estimates for lower triangular matrix of Φ_s , $s = 1, \dots, S$.
- EPHIY1.txt, EPHIY2.txt, ...: The estimates for the unknown coefficients in the non-ignorable missing mechanism.
- EPSD1.txt, EPSD2.txt, ...: The estimates for $\psi_{\delta,sj}$, $j = 1, \dots, q$; $s = 1, \dots, S$.
- EPSX1.txt, EPSX2.txt, ...: The estimates for ψ_{sj} , $j = 1, \dots, p$; $s = 1, \dots, S$.
- The files with prefix "S": The standard error estimates for the corresponding parameters.
- log.txt: The log file containing the acceptance rate and the running time.
- FI_S1.txt, FI_S2.txt: The FI scores of the observations under perturbation schemes 1 and 2.
- FI_stru.txt, FI_miss.txt, FI_tran.txt, FI_prior.txt: The FI scores for the structural equation, the missing mechanism, the transition pattern, and the prior inputs.

This is the end of readme.