Markov Switching Models

Markov Switching models are a family of statistical models in which parameters of a time series process change over time according to a latent Markov chain.

Let $\{Y_t\}_{t=1}^T$ be an observed time series and $\{S_t\}_{t=1}^T$ a latent state variable taking values in $\{1, \dots, M\}$, with M, the number of regimes.

Transition matrix $P = [p_{ij}]$ with $p_{ij} = P(S_t = j \mid S_{t-1} = i)$

Then, we have

$$Y_t \mid S_t = m, \theta_m \sim f(Y_t \mid \theta_m)$$

with θ_m: regime-specific parameters and f is a distribution from some parametric family.

Common example: Markov Switching Autoregressive basic model:

$$Y_t = \mu_{S_t} + \sum_{j=1}^{p} \phi_{S_t, j} Y_{t-j} + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma^2)$$

Successful domains of application: electricity price forecasting, business cycle analysis, returns/volatility/asset pricing modelling, inflation dynamics modelling...

See: Frühwirth-Schnatter (2006), Finite Mixture and Markov switching Models