$$\begin{cases} S_t = \gamma^{(s_t)}_{2,\Phi_t} + \gamma^{(s_t)}_{1,\Phi_t} S_{t-1} + \gamma^{(s_t)}_{3,\Phi_t} \epsilon_t, \quad , \epsilon_t \sim N(0, \Sigma) \\ y_t = E + F S_t \end{cases}$$