$$
\begin{aligned}
c &= 1, 2 && \text{(Condition)} \\
l &= 1, ..., L_c && \text{(ORF)} \\
m &= 1, ..., M_{cl} && \text{(Repeat)} \\
n &= 1, ..., N_{clm} && \text{(Time point)}
\end{aligned}
$$

Time point level

$$
\begin{aligned}
y_{clmn} &\sim \mathrm{N}(\hat{y}_{clmn}, (\nu_{cl})^{-1}) & \hat{y}_{clmn} &= f(x_{clmn}; K_{clm}, r_{clm}, P) \\
K_{clm} &= e^{(Log\ K^*_{clm} + K^{batch}_b)} & r_{clm} &= e^{(Log\ r^*_{clm} + r^{batch}_b)} \\
\nu_{cl} &= e^{(Log\ \nu^*_{cl} + \nu^{batch}_b)}
\end{aligned}
$$

Repeat level

$$
\begin{aligned}
Log\ K^*_{clm} &\sim \mathrm{N}(\alpha_c + K^o_l + \delta_l \gamma_{cl}, (\tau^K_{cl})^{-1}) I_{(-\infty, 0]} & Log\ \tau^K_{cl} &\sim \mathrm{N}(\tau^{K,p}_c, (\sigma^{\tau,K}_c)^{-1}) I_{[0,\infty)} \\
Log\ r^*_{clm} &\sim \mathrm{N}(\beta_c + r^o_l + \delta_l \omega_{cl}, (\tau^r_{cl})^{-1}) I_{(-\infty, 3.5]} & Log\ \tau^r_{cl} &\sim \mathrm{N}(\tau^{r,p}_c, (\sigma^{\tau,r}_c)^{-1})
\end{aligned}
$$

ORF level

$$
\begin{aligned}
e^{K^o_l} &\sim t(K^p, (\sigma^{K,o})^{-1}, 3) I_{[0,\infty)} & Log\ \sigma^{K,o} &\sim \mathrm{N}(\eta^{K,o}, (\psi^{K,o})^{-1}) \\
e^{r^o_l} &\sim t(r^p, (\sigma^{r,o})^{-1}, 3) I_{[0,\infty)} & Log\ \sigma^{r,o} &\sim \mathrm{N}(\eta^{r,o}, (\psi^{r,o})^{-1}) \\
Log\ \nu^*_{cl} &\sim \mathrm{N}(\nu_\mu, (\sigma^\nu)^{-1}) & Log\ \sigma^{\nu} &\sim \mathrm{N}(\eta^{\nu}, (\psi^{\nu})^{-1}) \\
\delta_l &\sim Bern(p) \\
e^{\gamma_{cl}} &= \begin{cases} 1 & \text{if } c = 0; \\ t(1, (\sigma^\gamma)^{-1}, 3) I_{[0,\infty)} & \text{if } c = 1. \end{cases} & Log\ \sigma^{\gamma} &\sim \mathrm{N}(\eta^{\gamma}, \psi^{\gamma}) \\
e^{\omega_{cl}} &= \begin{cases} 1 & \text{if } c = 0; \\ t(1, (\sigma^\omega)^{-1}, 3) I_{[0,\infty)} & \text{if } c = 1. \end{cases} & Log\ \sigma^{\omega} &\sim \mathrm{N}(\eta^{\omega}, \psi^{\omega})
\end{aligned}
$$

Condition level

$$
\begin{aligned}
\alpha_c &= \begin{cases} 0 & \text{if } c = 0; \\ \mathrm{N}(\alpha^\mu, \eta^\alpha) & \text{if } c = 1. \end{cases} & \beta_c &= \begin{cases} 0 & \text{if } c = 0; \\ \mathrm{N}(\beta^\mu, \eta^\beta) & \text{if } c = 1. \end{cases} \\
\tau^{K,p}_c &\sim \mathrm{N}(\tau^{K,\mu}, (\eta^{\tau,K,p})^{-1}) & Log\ \sigma^{\tau,K}_c &\sim \mathrm{N}(\eta^{\tau,K}, (\psi^{\tau,K})^{-1}) \\
\tau^{r,p}_c &\sim \mathrm{N}(\tau^{r,\mu}, (\eta^{r,p})^{-1}) & Log\ \sigma^{\tau,r}_c &\sim \mathrm{N}(\eta^{\tau,r}, (\psi^{\tau,r})^{-1})
\end{aligned}
$$

Population level

$$
\begin{aligned}
Log\ K^p &\sim \mathrm{N}(K^\mu, (\eta^{K,p})^{-1}) & Log\ r^p &\sim \mathrm{N}(r^\mu, (\eta^{r,p})^{-1}) \\
\nu^p &\sim \mathrm{N}(\nu^\mu, (\eta^{\nu,p})^{-1}) & Log\ P &\sim \mathrm{N}(P^\mu, (\eta^P)^{-1})
\end{aligned}
$$

Batch level

$$
\begin{aligned}
K^{batch}_b &\sim \mathrm{N}(0, (\eta^{K,p})^{-1}) & r^{batch}_b &\sim \mathrm{N}(0, (\eta^{r,p})^{-1})
\end{aligned}
$$