/* Error Correction Model */

[Linear Model with an AR Error Correction]

$y_t = x_t{}'\beta + v_t$

$v_t = -\phi_1 v_{t-1} - \phi_2 v_{t-2} \cdot \cdot \cdot - \phi_p v_{t-p} + \epsilon_t$

$\epsilon_t \sim N(0, \sigma^2)$

ϕ_i: AR parameters

[Linear Model with Heteroscedastic Error Terms]

$y_t = x_t{}'\beta + \epsilon_t$

$\epsilon_t \sim N(0, \sigma_t^2)$

$\sigma_t^2 = \sigma^2 h_t$

$h_t = l(z_t{}'\eta)$

cf) z_t : variables listed in the HETERO statement

η : parameter vector

$l(.)$: link function

ex) link = exp : $h_t = \exp(z_t{}'\eta)$

link = square : $h_t = (1 + z_t{}'\eta)^2$

link = linear : $h_t = (1 + z_t{}'\eta)$

[Linear Model with ARCH-GARCH Error Terms]

$y_t = x_t{}'\beta + v_t$

$v_t = -\phi_1 v_{t-1} - \phi_2 v_{t-2} \cdot \cdot \cdot - \phi_p v_{t-p} + \epsilon_t$: Error Correction

$\epsilon_t = \sqrt{h_t}\, e_t$

$h_t = \omega + \sum_{i=1}^{q} \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^{p} \gamma_j h_{t-j}$: GARCH(p,q)

$e_t \sim N(0,1)$

ex) the most basic ARCH: q=1, p=0

→ only 1 1agged squared residual is used to estimate the changing residual variance

ex) the basic GARCH(q=1,p=1)

→ 1 1agged squared residual and the most recent past estimate of the residual variance are used to estimate the current residual variance