

Explicit Linear Production Model = ELPM

Model Input/Output

- Input: $N, P_{wf}, q_W, Q_W, Q_O, Q_G, Q_W$
- Output: q_O, q_G, q_W, P

Model Parameters

Model Parameters:

- $M = \{ V_O, y_W, x_W, x_G, y_W, x_J, J_{W0}, k_{ro}^*, n_o, k_{rw}^*, n_w \}$ – totally 11 constants

Restrictions:

- all constants are positive
- $0 < k_{ro}^* < 1, 0 < k_{rw}^* < 1$

Model fitting

Source data corrections:

- one time-array $P_{wf}(t)$

Restrictions:

- $0 < P_{wf, \min} < P_{wf}(t) < P_{wf, \max}$

Goal function:

- $E[M] = w_O [q_O] + w_W [q_W] + w_G [q_G] + w_P [P] + w_f [P_{wf}] \quad \min$

$$[A] = [2 (A-A^*)/(A+A^*)]^2$$

$A(t)$ – model prediction

$A^*(t)$ – historical value (if any)

Weights:

- $w_O + w_W + w_G + w_P + w_f = 1$ (although it is not necessary)

Default settings: $w_O = 0.5$, $w_W = 0.1$, $w_G = 0.1$, $w_P = 0.2$, $w_f = 0.1$

Model function

$$q_O = q_{O1} \quad N \quad | \quad q_{O1} = J_O (P - P_{wf})$$

$$q_W = q_{W1} \quad N \quad | \quad q_{W1} = J_W(t) (P - P_{wf})$$

$$q_G = J_G \quad N \quad | \quad q_{G1} = J_G (P - P_{wf})$$

$$P = P_i + (y_W B_w Q_W + B_o Q_O + x_W B_w Q_W + x_G B_g Q_G) P_i x_P / V_O$$

$$s = Q_O / V_O$$

$$k_{ro}^*(s) = k_{ro}^* (1 - s)^{\eta_o}$$

$$k_{rw}^*(s) = k_{rw}^* s^{\eta_w}$$

$$J_O = k_{ro}^*(s) x_J$$

$$J_W = J_{W0} + k_{rw}^*(s) x_J$$

$$J_G = R_s J_O$$

See Also

[Petroleum Industry / Upstream / Production / Subsurface Production / Field Study & Modelling / Production Analysis / Capacitance Resistance Model \(CRM\) / Capacitance-Resistivity Model \(CRM\) @model](#)

[[Slightly compressible Material Balance Pressure @model](#)]

[[Dynamic fluid properties](#)]