[1] [2] . [3]

[1]

[2]

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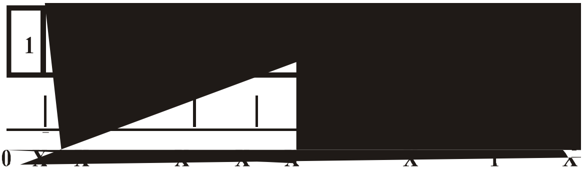

p- N_p n- N_n
N_p N_n

- -

i $i+1$

$$H=\sum_{\substack{t=n,p\\ i_t=1,..N_t}} H_{ti_t}=\sum_{\substack{t=n,p\\ i_t=1,..N}}\left[\psi_{1i_t}\left(\frac{j}{\kappa_{ti_t}}q_{ti_t}-\frac{j\alpha_{ti_t}T_t}{\kappa_{ti_t}}\right)+\psi_{2i_t}\left(-\frac{j}{\sigma_{ti_t}}+\alpha_{ti_t}\frac{j}{\kappa_{ti_t}}q_{ti_t}-\frac{j\left(\alpha_{ti_t}\right)^2T_t}{\kappa_{\alpha_{ti_t}}}\right)\right],$$

(4)

ψ_{1i_t} ψ_{2i_t} - T q

$$\begin{cases}\dfrac{\partial\psi_{1i_t}}{\partial t}=\psi_{1i_t}\dfrac{j\alpha_{i_t}}{\kappa_{i_t}}R_{1i_t}+\psi_{2i_t}\dfrac{j\alpha_{i_t}^2}{\kappa_{i_t}}R_{2i_t}\\ \dfrac{\partial\psi_{2i_t}}{\partial t}=\dfrac{j}{\kappa_{i_t}}\psi_{1i_t}-\dfrac{j\alpha_{i_t}}{\kappa_{i_t}}\psi_{2i_t}\end{cases},\ t=n,p;i=1,2,..N_t \qquad (5)$$

$$R_{1i_t}=\left(1+T_t\frac{d\ln\alpha_{i_t}}{dT_t}-\frac{d\ln\kappa_{i_t}}{dT_t}\left(T_t-\frac{q_{i_t}}{\alpha_{i_t}}\right)\right),$$

(6)

$$R_{2i_t}=R_{1i_t}+\frac{d\ln\alpha_{i_t}}{dT_t}\left(T_t-\frac{q_{i_t}}{\alpha_{i_t}}\right)-\frac{1}{Z_{i_t}}\frac{d\ln\sigma_{i_t}}{dT_t} \qquad (7)$$

$$Z_{i_t}=\frac{\alpha_{i_t}^2\sigma_{i_t}}{\kappa_{i_t}}. \qquad (8)$$

$$J=\sum_{t=n,p}\ln\left(\frac{q_{tN_t}(1-0)q_{t1}(x_1-0)q_{t2}(x_2-0)..q_{tN_t}\left(x_{t(N_t-1)}-0\right)}{q_{t1}(0+0)q_{t2}(x_2+0)q_{t3}(x_3+0)..q_{tN_t}\left(x_{t(N_{t-1})}+0\right)}\right). \qquad (9)$$

(2)

$\bar{J}$

$$\bar{J}=J+\sum_{t=n,p}\lambda_{1t}\left(T_{1t}(0+0)-T_c\right)+\sum_{t=n,p}\lambda_{2t}\left(T_{N_t}(1-0)-T_h\right)+$$
$$+\sum_{\substack{t=n,p\\ i_t=1,..N_t}}\left[\lambda_{3t_i}\left(T_{t(i-1)}\left(x_{t(i-1)}-0\right)-T_{ti}\left(x_{t(i-1)}+0\right)+\delta_{ti}\right)\right]\quad. \qquad (10)$$

$$\psi_{2t}(x_{ti}) = -\frac{1}{q_{ti}(x_{ti})}, t = n, p,\ i = 1,..,N_t,$$

$$\psi_{1t_{(i-1)}}\left(x_{t_{(i-1)}} - 0\right) = \psi_{1t_i}\left(x_{t_{(i-1)}} + 0\right),\ t = p, i = 1,2,..N_p; t = n, i = 1,2,..N_n. \quad (11)$$

j_{opt}

$$j_{opt} = \frac{\sum\limits_{\substack{t=n,p\\ i_t=1,..N_t}} \psi_{2t_i}\alpha_{t_i}T_i \Big|_{(x_{ini})_{ti}}^{(x_{end})_{ti}}}{\sum\limits_{\substack{t=n,p\\ i_t=1,..N_t}} \int_{(x_{ini})_{ti}}^{(x_{end})_{ti}} \left[\left(\frac{\psi_{2t_i}}{\sigma_{t_i}}\left(1 - Z_{t_i}T_t\right) - \frac{q_{t_i}\psi_{1t_i}}{\kappa_{t_i}}\right) + \frac{\psi_{2t_i}T_t}{\kappa_{t_i}}\frac{d\alpha_{t_i}}{dT_t}\left(q_{t_i} - \alpha_{t_i}T_t\right)\right]dx}, \quad (12)$$

$(x_{ini})_{ti}$ $(x_{end})_{ti}$

$N_p = N_n = 1$

$$j_{opt} = \frac{\alpha\sigma\left(T_h - T_c\right)}{1 + \sqrt{1 + Z\left(T_h - T_c\right)/2}}\ [4].$$

$j^{(0)}$

$q_{t_1}(0)^{(0)}$ $t = n, p$ $q_{t_1}(0)$

$T_{t_{N_t}} = T_h, t = n, p$

$\psi_{2t_i}, t = n, p;\ i = 1,2..N_t$

$\psi_{1t_i}, t = n, p;\ i = 1,2..N_t$

$j^{(1)}$

$\psi_{1t_i}, t = n, p;\ i = 1,2..N_t$

$x_{t_i}, t = n, p;\ i = 1,2..(N-1)_t$

$\psi_{1t_i}(x)$

$$E = \sum_{\substack{t=n,p\\ i=1,..,N_t}} \int_{x_{t(i-1)}}^{x_{ti}} \alpha(T_t)\frac{dT_i}{dx_i}\,dx_i\ . \tag{13}$$

$$R = \sum_{\substack{t=n,p\\ i=1,..,N_t}} \int_{x_{t(i-1)}}^{x_{ti}} \rho(T_t)\frac{dx_i}{dT_i}\,dT_i \tag{14}$$

1.

2.
i

3. -

4.