$$S_t = E_t \, xi \, A\_s_t \tag{1}$$

$$(1 - H_t)^{1-alpha} \; mu \, alpha \, A\_u_t \left(mu \left(C_t^{alpha} \; (1 - H_t)^{1-alpha} \right)^{phi} + (1 - mu) \left(\frac{1}{S_t} \right)^{phi} \right)^{\frac{1-eta-phi}{phi}} \left(C_t^{alpha} \; (1 - H_t)^{1-alpha} \right)^{phi-1} \; C_t^{alpha-1}$$

$$= (1 - H_{t+1})^{1-alpha} \; mu \, alpha \, beta \, A\_u_{t+1} \left(mu \left(C_{t+1}^{alpha} \; (1 - H_{t+1})^{1-alpha} \right)^{phi} + (1 - mu) \left(\frac{1}{S_{t+1}} \right)^{phi} \right)^{\frac{1-eta-phi}{phi}} \left(C_{t+1}^{alpha} \; (1 - H_{t+1})^{1-alpha} \right)^{phi-1} \; C_{t+1}^{alpha-1} \left(1 \right. \tag{2}$$

$$\left. - \, delta + \frac{1 - tau\_k_t}{1 + tau\_x_t} \, A\_k_{t+1} \, theta \, chi\_h \left(chi\_h \left(A\_k_{t+1} \, K_t^{theta} \, H_{t+1}^{1-theta} \right)^{nu} + (1 - chi\_h) \left(A\_e_{t+1} \, E_{t+1} \right)^{nu} \right)^{\frac{1-nu}{nu}} \left(A\_k_{t+1} \, K_t^{theta} \, H_{t+1}^{1-theta} \right)^{nu-1} \left(\frac{K_t}{H_{t+1}} \right)^{theta-1} \right)$$

$$C_t \; (1 - alpha) = alpha \; (1 - H_t) \; (1 - tau\_marg_t) \; A\_k_t \; (1 - theta) \; chi\_h \left(chi\_h \left(A\_k_t \, K_{t-1}^{theta} \, H_t^{1-theta} \right)^{nu} + (1 - chi\_h) \left(E_t \, A\_e_t \right)^{nu} \right)^{\frac{1-nu}{nu}} \left(A\_k_t \, K_{t-1}^{theta} \, H_t^{1-theta} \right)^{nu-1} \left(\frac{K_{t-1}}{H_t} \right)^{theta} \tag{3}$$

$$y_t = \left(chi\_h \left(A\_k_t \, K_{t-1}^{theta} \, H_t^{1-theta} \right)^{nu} + (1 - chi\_h) \left(E_t \, A\_e_t \right)^{nu} \right)^{\frac{1}{nu}} \tag{4}$$

$$\left(chi\_h\ \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h - \right. \tag{5}$$

$$1)\Big)^{\frac{1}{nu}} \left(\frac{(-(chi\_h-1))}{p_t \left(p_t^{1-sig}\ (1-chi\_h)^{sig} + chi\_h^{sig} \left(\frac{theta\, chi\_h\, A\_k_t \left(\frac{K_{t-1}}{H_t}\right)^{theta-1} \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} - \frac{\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}\ (theta-1) \left(\frac{K_{t-1}}{H_t}\right)^{theta}\ chi\_h\ A\_k_t}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} \right)^{1-sig} \right)^{\frac{1}{sig-1}} \right)^{sig}$$

$$- \left(chi\_h\ \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h - \right.$$

$$1)\Big)^{\frac{1}{nu}}\ sig \left(\frac{chi\_h - 1}{\left(p_t^{1-sig}\ (1-chi\_h)^{sig} + chi\_h^{sig} \left(\frac{theta\, chi\_h\, A\_k_t \left(\frac{K_{t-1}}{H_t}\right)^{theta-1} \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} - \frac{\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}\ (theta-1) \left(\frac{K_{t-1}}{H_t}\right)^{theta}\ chi\_h\ A\_k_t}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} \right)^{1-sig} \right)^{\frac{1}{sig-1}} p_t^2 \right.$$

$$- \left. \frac{(chi\_h-1)\ (1-chi\_h)^{sig}}{p_t\, p_t^{sig} \left(p_t^{1-sig}\ (1-chi\_h)^{sig} + chi\_h^{sig} \left(\frac{theta\, chi\_h\, A\_k_t \left(\frac{K_{t-1}}{H_t}\right)^{theta-1} \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} - \frac{\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}\ (theta-1) \left(\frac{K_{t-1}}{H_t}\right)^{theta}\ chi\_h\ A\_k_t}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} \right)^{1-sig} \right)^{1+\frac{1}{sig-1}}} \right) \left(\left(p_t \left(p_t^{1-sig}\ (1- \right. \right. \right.$$

$$+ \left(\frac{(-(chi\_h-1))}{p_t \left(p_t^{1-sig}\ (1-chi\_h)^{sig} + chi\_h^{sig} \left(\frac{theta\, chi\_h\, A\_k_t \left(\frac{K_{t-1}}{H_t}\right)^{theta-1} \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} - \frac{\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}\ (theta-1) \left(\frac{K_{t-1}}{H_t}\right)^{theta}\ chi\_h\ A\_k_t}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} \right)^{1-sig} \right)^{\frac{1}{sig-1}} \right)^{sig-1} \left(\left(\frac{}{\left(p_t^{1-sig}\ (1- \right. \right. \right.$$

$$- \left. \frac{(chi\_h-1)\ (1-chi\_h)^{sig}}{p_t\, p_t^{sig} \left(p_t^{1-sig}\ (1-chi\_h)^{sig} + chi\_h^{sig} \left(\frac{theta\, chi\_h\, A\_k_t \left(\frac{K_{t-1}}{H_t}\right)^{theta-1} \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} - \frac{\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu-1}\ (theta-1) \left(\frac{K_{t-1}}{H_t}\right)^{theta}\ chi\_h\ A\_k_t}{\left(chi\_h \left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\right)^{\frac{nu-1}{nu}}} \right)^{1-sig} \right)^{1+\frac{1}{sig-1}}} \right) \left(chi\_h \right.$$

$$\left(K_{t-1}^{theta}\ A\_k_t\ H_t^{1-theta}\right)^{nu} - (E_t\ A\_e_t)^{nu}\ (chi\_h-1)\Big)^{\frac{1}{nu}}\ sig\ (p_t - xi\, tau\_d_t) = \left(chi\_h^{sig} \left(A\_k_t\ (1-theta)\ chi\_h\ \left(chi\_h\ \left(A\_k_t\ K_{t-1}^{theta}\ H_t^{1-theta}\right)^{nu} + (1-chi\_h)\ (E_t\ A\_e_t)^{nu}\right)^{\frac{1-nu}{nu}} \right.\right.$$

$$\left(A\_k_t\ K_{t-1}^{theta}\ H_t^{1-theta}\right)^{nu-1}\ \left(\frac{K_{t-1}}{H_t}\right)^{theta} + \left(\frac{K_{t-1}}{H_t}\right)^{theta-1}\ A\_k_t\, theta\, chi\_h\ \left(chi\_h\ \left(A\_k_t\ K_{t-1}^{theta}\ H_t^{1-theta}\right)^{nu} + (1-chi\_h)\ (E_t\ A\_e_t)^{nu}\right)^{\frac{1-nu}{nu}}\ \left(A\_k_t\ K_{t-1}^{theta}\right.$$

$$\left.\left. H_t^{1-theta}\right)^{nu-1}\right)^{1-sig} + (1-chi\_h)^{sig}\ \left(A\_e_t\ (1-chi\_h)\ \left(chi\_h\ \left(A\_k_t\ K_{t-1}^{theta}\ H_t^{1-theta}\right)^{nu} + (1-chi\_h)\ (E_t\ A\_e_t)^{nu}\right)^{\frac{1-nu}{nu}}\ (E_t\ A\_e_t)^{nu-1}\right)^{1-sig}\right)^{\frac{1}{1-sig}}$$

$$p_t = A\_e_t\ (1 - chi\_h)\ \left(chi\_h\ \left(A\_k_t\ K_{t-1}^{theta}\ H_t^{1-theta}\right)^{nu} + (1 - chi\_h)\ (E_t\ A\_e_t)^{nu}\right)^{\frac{1-nu}{nu}}\ (E_t\ A\_e_t)^{nu-1} \tag{6}$$

$$y_t = C_t + K_t - (1 - delta)\ K_{t-1} \tag{7}$$

$$z\_k_t = rho\_k\, z\_k_{t-1} + rho\_e\, z\_e_{t-1} + eps\_k_t \tag{8}$$

$$A\_k_t = exp\,(z\_k_t) \tag{9}$$

$$z\_e_t = rho\_k\, z\_k_{t-1} + rho\_e\, z\_e_{t-1} + eps\_e_t \tag{10}$$

$$A\_e_t = exp\,(z\_e_t) \tag{11}$$

$$z\_u_t = rho\_u\, z\_u_{t-1} + eps\_u_t \tag{12}$$

$$A\_u_t = exp\,(z\_e_t) \tag{13}$$

$$z\_x_t = rho\_x\, z\_x_{t-1} + eps\_x_t \tag{14}$$

$$A\_x_t = exp\,(z\_x_t) \tag{15}$$

$$z\_s_t = rho\_s\, z\_s_{t-1} + eps\_s_t \tag{16}$$

$$A\_s_t = exp\,(z\_s_t) \tag{17}$$

$$E_t = Ehat_t + eps\_m_t \tag{18}$$