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Index sets

$$COUNTRY = \{\mathrm{F}, \mathrm{H}\}$$

1 CONSUMER $c \in COUNTRY$

1.1 Optimisation problem

$$\max_{K_t^{\langle c \rangle}, C_t^{\langle c \rangle}, H_t^{\langle c \rangle}, I_t^{\langle c \rangle}} U_t^{\langle c \rangle} = \beta \mathrm{E}_t \left[U_{t+1}^{\langle c \rangle} \right] + (1 - \eta)^{-1} \left(C_t^{\langle c \rangle \, \mu} \left(1 - H_t^{\langle c \rangle} \right)^{1-\mu} \right)^{1-\eta} \tag{1.1}$$

s.t. :

$$C_t^{\langle c \rangle} + I_t^{\langle c \rangle} + T_t^{\langle c \rangle} = \pi_t^{\langle c \rangle} + TR_t^{\langle c \rangle} + K_{t-1}^{\langle c \rangle} r_t^{\langle c \rangle} + H_t^{\langle c \rangle} W_t^{\langle c \rangle} - \psi^{\langle c \rangle} K_{t-1}^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K_{t-1}^{\langle c \rangle \, -1} I_t^{\langle c \rangle} \right)^2 \quad \left(\lambda_t^{\mathrm{c} \, \langle c \rangle} \right) \tag{1.2}$$

$$K_t^{\langle c \rangle} = I_t^{\langle c \rangle} + K_{t-1}^{\langle c \rangle} \left(1 - \delta^{\langle c \rangle} \right) \quad \left(\lambda^{\mathrm{CONSUMER}^2 \, \langle c \rangle}_{\ t} \right) \tag{1.3}$$

1.2 First order conditions

$$-\lambda^{\mathrm{CONSUMER}^2 \, \langle c \rangle}_{\ t} + \beta \left(\left(1 - \delta^{\langle c \rangle} \right) \mathrm{E}_t \left[\lambda^{\mathrm{CONSUMER}^2 \, \langle c \rangle}_{\ t+1} \right] + \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{c} \, \langle c \rangle} \left(r_{t+1}^{\langle c \rangle} - \psi^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K_t^{\langle c \rangle \, -1} I_{t+1}^{\langle c \rangle} \right)^2 + 2 \psi^{\langle c \rangle} K_t^{\langle c \rangle \, -1} I_{t+1}^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K_t^{\langle c \rangle \, -1} I_{t+1}^{\langle c \rangle} \right) \right) \right] \right) = 0 \quad \left(K_t^{\langle c \rangle} \right) \tag{1.4}$$

$$-\lambda_t^{\mathrm{c} \, \langle c \rangle} + \mu C_t^{\langle c \rangle \, -1+\mu} \left(1 - H_t^{\langle c \rangle} \right)^{1-\mu} \left(C_t^{\langle c \rangle \, \mu} \left(1 - H_t^{\langle c \rangle} \right)^{1-\mu} \right)^{-\eta} = 0 \quad \left(C_t^{\langle c \rangle} \right) \tag{1.5}$$

$$\lambda_t^{\mathrm{c} \, \langle c \rangle} W_t^{\langle c \rangle} + (-1 + \mu) C_t^{\langle c \rangle \, \mu} \left(1 - H_t^{\langle c \rangle} \right)^{-\mu} \left(C_t^{\langle c \rangle \, \mu} \left(1 - H_t^{\langle c \rangle} \right)^{1-\mu} \right)^{-\eta} = 0 \quad \left(H_t^{\langle c \rangle} \right) \tag{1.6}$$

$$\lambda^{\mathrm{CONSUMER}^2 \, \langle c \rangle}_{\ t} + \lambda_t^{\mathrm{c} \, \langle c \rangle} \left(-1 - 2\psi^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K_{t-1}^{\langle c \rangle \, -1} I_t^{\langle c \rangle} \right) \right) = 0 \quad \left(I_t^{\langle c \rangle} \right) \tag{1.7}$$

2 FIRM $c \in \mathcal{COUNTRY}$

2.1 Optimisation problem

$$\max_{K^{\mathrm{d}\langle c\rangle}_t, H^{\mathrm{d}\langle c\rangle}_t, Y^{\langle c\rangle}_t, \pi^{\langle c\rangle}_t} \Pi^{\langle c\rangle}_t = \pi^{\langle c\rangle}_t \tag{2.1}$$

s.t. :

$$Y^{\langle c\rangle}_t = Z^{\langle c\rangle}_t H^{\mathrm{d}\langle c\rangle\,1-\alpha^{\langle c\rangle}}_t K^{\mathrm{d}\langle c\rangle\,\alpha^{\langle c\rangle}}_t \quad \left(\lambda^{\mathrm{FIRM1}\,\langle c\rangle}_t\right) \tag{2.2}$$

$$\pi^{\langle c\rangle}_t = Y^{\langle c\rangle}_t - H^{\mathrm{d}\langle c\rangle}_t W^{\langle c\rangle}_t - r^{\langle c\rangle}_t K^{\mathrm{d}\langle c\rangle}_t \quad \left(\lambda^{\mathrm{FIRM2}\,\langle c\rangle}_t\right) \tag{2.3}$$

2.2 First order conditions

$$-\lambda^{\mathrm{FIRM2}\,\langle c\rangle}_t r^{\langle c\rangle}_t + \alpha^{\langle c\rangle} \lambda^{\mathrm{FIRM1}\,\langle c\rangle}_t Z^{\langle c\rangle}_t H^{\mathrm{d}\langle c\rangle\,1-\alpha^{\langle c\rangle}}_t K^{\mathrm{d}\langle c\rangle\,-1+\alpha^{\langle c\rangle}}_t = 0 \quad \left(K^{\mathrm{d}\langle c\rangle}_t\right) \tag{2.4}$$

$$-\lambda^{\mathrm{FIRM2}\,\langle c\rangle}_t W^{\langle c\rangle}_t + \lambda^{\mathrm{FIRM1}\,\langle c\rangle}_t Z^{\langle c\rangle}_t \left(1-\alpha^{\langle c\rangle}\right) H^{\mathrm{d}\langle c\rangle\,-\alpha^{\langle c\rangle}}_t K^{\mathrm{d}\langle c\rangle\,\alpha^{\langle c\rangle}}_t = 0 \quad \left(H^{\mathrm{d}\langle c\rangle}_t\right) \tag{2.5}$$

$$-\lambda^{\mathrm{FIRM1}\,\langle c\rangle}_t + \lambda^{\mathrm{FIRM2}\,\langle c\rangle}_t = 0 \quad \left(Y^{\langle c\rangle}_t\right) \tag{2.6}$$

$$1 - \lambda^{\mathrm{FIRM2}\,\langle c\rangle}_t = 0 \quad \left(\pi^{\langle c\rangle}_t\right) \tag{2.7}$$

2.3 First order conditions after reduction

$$-r^{\langle c\rangle}_t + \alpha^{\langle c\rangle} Z^{\langle c\rangle}_t H^{\mathrm{d}\langle c\rangle\,1-\alpha^{\langle c\rangle}}_t K^{\mathrm{d}\langle c\rangle\,-1+\alpha^{\langle c\rangle}}_t = 0 \quad \left(K^{\mathrm{d}\langle c\rangle}_t\right) \tag{2.8}$$

$$-W^{\langle c\rangle}_t + Z^{\langle c\rangle}_t \left(1-\alpha^{\langle c\rangle}\right) H^{\mathrm{d}\langle c\rangle\,-\alpha^{\langle c\rangle}}_t K^{\mathrm{d}\langle c\rangle\,\alpha^{\langle c\rangle}}_t = 0 \quad \left(H^{\mathrm{d}\langle c\rangle}_t\right) \tag{2.9}$$

3 EQUILIBRIUM

3.1 Identities

$$\sum_{c \in \mathcal{COUNTRY}} TR^{\langle c\rangle}_t = 0 \tag{3.1}$$

$$c \in \mathcal{COUNTRY}: \quad K^{\mathrm{d}\langle c\rangle}_t = K^{\langle c\rangle}_{t-1} \tag{3.2}$$

$$c \in COUNTRY: \quad H^{\mathrm{d}\langle c \rangle}_t = H^{\langle c \rangle}_t \tag{3.3}$$

$$c \in COUNTRY: \quad T^{\langle c \rangle}_t = G^{\mathrm{d}\langle c \rangle}_t \tag{3.4}$$

$$\lambda^{\mathrm{c}\langle \mathrm{H} \rangle}_t = \lambda^{\mathrm{c}\langle \mathrm{F} \rangle}_t \tag{3.5}$$

4 EXOG

4.1 Identities

$$c \in COUNTRY: \quad G^{\mathrm{d}\langle c \rangle}_t = \epsilon^{\mathrm{G}\langle c \rangle}_t + \phi^{\mathrm{G}\langle c \rangle} G^{\mathrm{d}\langle c \rangle}_{t-1} \tag{4.1}$$

$$c \in COUNTRY: \quad Z^{\langle c \rangle}_t = e^{\epsilon^{\mathrm{Z}\langle c \rangle}_t + \phi^{\mathrm{Z}\langle c \rangle} \log Z^{\langle c \rangle}_{t-1}} \tag{4.2}$$

5 Equilibrium relationships (before expansion and reduction)

$$-\lambda^{\mathrm{c}\langle \mathrm{F} \rangle}_t + \lambda^{\mathrm{c}\langle \mathrm{H} \rangle}_t = 0 \tag{5.1}$$

$$\sum_{c \in COUNTRY} TR^{\langle c \rangle}_t = 0 \tag{5.2}$$

$$c \in COUNTRY: \quad -K^{\langle c \rangle}_{t-1} + K^{\mathrm{d}\langle c \rangle}_t = 0 \tag{5.3}$$

$$c \in COUNTRY: \quad -\lambda^{\mathrm{CONSUMER}^2 \langle c \rangle}_t + \beta \left(\left(1 - \delta^{\langle c \rangle} \right) \mathrm{E}_t \left[\lambda^{\mathrm{CONSUMER}^2 \langle c \rangle}_{t+1} \right] + \mathrm{E}_t \left[\lambda^{\mathrm{c}\langle c \rangle}_{t+1} \left(r^{\langle c \rangle}_{t+1} - \psi^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K^{\langle c \rangle-1}_t I^{\langle c \rangle}_{t+1} \right)^2 + 2\psi^{\langle c \rangle} K^{\langle c \rangle-1}_t I^{\langle c \rangle}_{t+1} \left(-\delta^{\langle c \rangle} + K^{\langle c \rangle-1}_t I^{\langle c \rangle}_{t+1} \right) \right) \right] \right) = 0 \tag{5.4}$$

$$c \in COUNTRY: \quad \lambda^{\mathrm{CONSUMER}^2 \langle c \rangle}_t + \lambda^{\mathrm{c}\langle c \rangle}_t \left(-1 - 2\psi^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K^{\langle c \rangle-1}_{t-1} I^{\langle c \rangle}_t \right) \right) = 0 \tag{5.5}$$

$$c \in COUNTRY: \quad -\lambda^{\mathrm{c}\langle c \rangle}_t + \mu C^{\langle c \rangle-1+\mu}_t \left(1 - H^{\langle c \rangle}_t \right)^{1-\mu} \left(C^{\langle c \rangle \mu}_t \left(1 - H^{\langle c \rangle}_t \right)^{1-\mu} \right)^{-\eta} = 0 \tag{5.6}$$

$$c \in COUNTRY: \quad -\pi^{\langle c \rangle}_t + \Pi^{\langle c \rangle}_t = 0 \tag{5.7}$$

$$c \in COUNTRY: \quad -r^{\langle c \rangle}_t + \alpha^{\langle c \rangle} Z^{\langle c \rangle}_t H^{\mathrm{d}\langle c \rangle 1-\alpha^{\langle c \rangle}}_t K^{\mathrm{d}\langle c \rangle -1+\alpha^{\langle c \rangle}}_t = 0 \tag{5.8}$$

$$c \in COUNTRY: \quad -G^{\mathrm{d}\langle c \rangle}_t + T^{\langle c \rangle}_t = 0 \tag{5.9}$$

$$c \in COUNTRY: \quad -H^{\langle c \rangle}_t + H^{\mathrm{d}\langle c \rangle}_t = 0 \tag{5.10}$$

$$c \in COUNTRY: \quad -W^{\langle c \rangle}_t + Z^{\langle c \rangle}_t \left(1 - \alpha^{\langle c \rangle} \right) H^{\mathrm{d}\langle c \rangle -\alpha^{\langle c \rangle}}_t K^{\mathrm{d}\langle c \rangle \alpha^{\langle c \rangle}}_t = 0 \tag{5.11}$$

$$c \in \textit{COUNTRY}: \quad -Y_t^{\langle c \rangle} + Z_t^{\langle c \rangle} H_t^{\mathrm{d}\langle c \rangle^{\, 1-\alpha^{\langle c \rangle}}} K_t^{\mathrm{d}\,\langle c \rangle^{\, \alpha^{\langle c \rangle}}} = 0 \tag{5.12}$$

$$c \in \textit{COUNTRY}: \quad Z_t^{\langle c \rangle} - e^{\epsilon_t^{\mathrm{Z}\langle c \rangle} + \phi^{\mathrm{Z}\langle c \rangle} \log Z_{t-1}^{\langle c \rangle}} = 0 \tag{5.13}$$

$$c \in \textit{COUNTRY}: \quad \lambda_t^{\mathrm{c}\langle c \rangle} W_t^{\langle c \rangle} + (-1+\mu) \, C_t^{\langle c \rangle^{\, \mu}} \left(1 - H_t^{\langle c \rangle}\right)^{-\mu} \left(C_t^{\langle c \rangle^{\, \mu}} \left(1 - H_t^{\langle c \rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{5.14}$$

$$c \in \textit{COUNTRY}: \quad -\epsilon_t^{\mathrm{G}\langle c \rangle} + G_t^{\mathrm{d}\,\langle c \rangle} - \phi^{\mathrm{G}\langle c \rangle} G_{t-1}^{\mathrm{d}\,\langle c \rangle} = 0 \tag{5.15}$$

$$c \in \textit{COUNTRY}: \quad I_t^{\langle c \rangle} - K_t^{\langle c \rangle} + K_{t-1}^{\langle c \rangle} \left(1 - \delta^{\langle c \rangle}\right) = 0 \tag{5.16}$$

$$c \in \textit{COUNTRY}: \quad U_t^{\langle c \rangle} - \beta \mathrm{E}_t \left[U_{t+1}^{\langle c \rangle}\right] - (1-\eta)^{-1} \left(C_t^{\langle c \rangle^{\, \mu}} \left(1 - H_t^{\langle c \rangle}\right)^{1-\mu}\right)^{1-\eta} = 0 \tag{5.17}$$

$$c \in \textit{COUNTRY}: \quad -\pi_t^{\langle c \rangle} + Y_t^{\langle c \rangle} - r_t^{\langle c \rangle} K_t^{\mathrm{d}\,\langle c \rangle} - H_t^{\mathrm{d}\,\langle c \rangle} W_t^{\langle c \rangle} = 0 \tag{5.18}$$

$$c \in \textit{COUNTRY}: \quad \pi_t^{\langle c \rangle} - C_t^{\langle c \rangle} - I_t^{\langle c \rangle} - T_t^{\langle c \rangle} + TR_t^{\langle c \rangle} + K_{t-1}^{\langle c \rangle} r_t^{\langle c \rangle} + H_t^{\langle c \rangle} W_t^{\langle c \rangle} - \psi^{\langle c \rangle} K_{t-1}^{\langle c \rangle} \left(-\delta^{\langle c \rangle} + K_{t-1}^{\langle c \rangle^{\, -1}} I_t^{\langle c \rangle}\right)^2 = 0 \tag{5.19}$$

6 Equilibrium relationships (after expansion and reduction)

$$-\lambda_t^{\mathrm{c}\langle \mathrm{F} \rangle} + \lambda_t^{\mathrm{c}\langle \mathrm{H} \rangle} = 0 \tag{6.1}$$

$$-\lambda_t^{\mathrm{c}\langle \mathrm{F} \rangle} + \mu C_t^{\langle \mathrm{F} \rangle^{\, -1+\mu}} \left(1 - H_t^{\langle \mathrm{F} \rangle}\right)^{1-\mu} \left(C_t^{\langle \mathrm{F} \rangle^{\, \mu}} \left(1 - H_t^{\langle \mathrm{F} \rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{6.2}$$

$$-\lambda_t^{\mathrm{c}\langle \mathrm{H} \rangle} + \mu C_t^{\langle \mathrm{H} \rangle^{\, -1+\mu}} \left(1 - H_t^{\langle \mathrm{H} \rangle}\right)^{1-\mu} \left(C_t^{\langle \mathrm{H} \rangle^{\, \mu}} \left(1 - H_t^{\langle \mathrm{H} \rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{6.3}$$

$$-r_t^{\langle \mathrm{F} \rangle} + \alpha^{\langle \mathrm{F} \rangle} Z_t^{\langle \mathrm{F} \rangle} K_{t-1}^{\langle \mathrm{F} \rangle^{\, -1+\alpha^{\langle \mathrm{F} \rangle}}} H_t^{\langle \mathrm{F} \rangle^{\, 1-\alpha^{\langle \mathrm{F} \rangle}}} = 0 \tag{6.4}$$

$$-r_t^{\langle \mathrm{H} \rangle} + \alpha^{\langle \mathrm{H} \rangle} Z_t^{\langle \mathrm{H} \rangle} K_{t-1}^{\langle \mathrm{H} \rangle^{\, -1+\alpha^{\langle \mathrm{H} \rangle}}} H_t^{\langle \mathrm{H} \rangle^{\, 1-\alpha^{\langle \mathrm{H} \rangle}}} = 0 \tag{6.5}$$

$$-W_t^{\langle \mathrm{F} \rangle} + Z_t^{\langle \mathrm{F} \rangle} \left(1 - \alpha^{\langle \mathrm{F} \rangle}\right) K_{t-1}^{\langle \mathrm{F} \rangle^{\, \alpha^{\langle \mathrm{F} \rangle}}} H_t^{\langle \mathrm{F} \rangle^{\, -\alpha^{\langle \mathrm{F} \rangle}}} = 0 \tag{6.6}$$

$$-W_t^{\langle \mathrm{H} \rangle} + Z_t^{\langle \mathrm{H} \rangle} \left(1 - \alpha^{\langle \mathrm{H} \rangle}\right) K_{t-1}^{\langle \mathrm{H} \rangle^{\, \alpha^{\langle \mathrm{H} \rangle}}} H_t^{\langle \mathrm{H} \rangle^{\, -\alpha^{\langle \mathrm{H} \rangle}}} = 0 \tag{6.7}$$

$$-Y_t^{\langle \mathrm{F} \rangle} + Z_t^{\langle \mathrm{F} \rangle} K_{t-1}^{\langle \mathrm{F} \rangle^{\, \alpha^{\langle \mathrm{F} \rangle}}} H_t^{\langle \mathrm{F} \rangle^{\, 1-\alpha^{\langle \mathrm{F} \rangle}}} = 0 \tag{6.8}$$

$$-Y_t^{\langle \mathrm{H} \rangle} + Z_t^{\langle \mathrm{H} \rangle} K_{t-1}^{\langle \mathrm{H} \rangle^{\, \alpha^{\langle \mathrm{H} \rangle}}} H_t^{\langle \mathrm{H} \rangle^{\, 1-\alpha^{\langle \mathrm{H} \rangle}}} = 0 \tag{6.9}$$

$$Z_t^{\langle \mathrm{F}\rangle} - e^{\epsilon_t^{\mathrm{Z}\langle \mathrm{F}\rangle} + \phi^{\mathrm{Z}\langle \mathrm{F}\rangle}\log Z_{t-1}^{\langle \mathrm{F}\rangle}} = 0 \tag{6.10}$$

$$Z_t^{\langle \mathrm{H}\rangle} - e^{\epsilon_t^{\mathrm{Z}\langle \mathrm{H}\rangle} + \phi^{\mathrm{Z}\langle \mathrm{H}\rangle}\log Z_{t-1}^{\langle \mathrm{H}\rangle}} = 0 \tag{6.11}$$

$$\beta\left(-\left(1-\delta^{\langle \mathrm{F}\rangle}\right)\mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{c}\langle \mathrm{F}\rangle}\left(-1-2\psi^{\langle \mathrm{F}\rangle}\left(-\delta^{\langle \mathrm{F}\rangle}+K_t^{\langle \mathrm{F}\rangle^{-1}}I_{t+1}^{\langle \mathrm{F}\rangle}\right)\right)\right] + \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{c}\langle \mathrm{F}\rangle}\left(r_{t+1}^{\langle \mathrm{F}\rangle}-\psi^{\langle \mathrm{F}\rangle}\left(-\delta^{\langle \mathrm{F}\rangle}+K_t^{\langle \mathrm{F}\rangle^{-1}}I_{t+1}^{\langle \mathrm{F}\rangle}\right)^2 + 2\psi^{\langle \mathrm{F}\rangle}K_t^{\langle \mathrm{F}\rangle^{-1}}I_{t+1}^{\langle \mathrm{F}\rangle}\left(-\delta^{\langle \mathrm{F}\rangle}+K_t^{\langle \mathrm{F}\rangle^{-1}}I_{t+1}^{\langle \mathrm{F}\rangle}\right)\right)\right]\right) + \lambda_t^{\mathrm{c}\langle \mathrm{F}\rangle}\left(-1-2\right.$$
$$\tag{6.12}$$

$$\beta\left(-\left(1-\delta^{\langle \mathrm{H}\rangle}\right)\mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{c}\langle \mathrm{H}\rangle}\left(-1-2\psi^{\langle \mathrm{H}\rangle}\left(-\delta^{\langle \mathrm{H}\rangle}+K_t^{\langle \mathrm{H}\rangle^{-1}}I_{t+1}^{\langle \mathrm{H}\rangle}\right)\right)\right] + \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{c}\langle \mathrm{H}\rangle}\left(r_{t+1}^{\langle \mathrm{H}\rangle}-\psi^{\langle \mathrm{H}\rangle}\left(-\delta^{\langle \mathrm{H}\rangle}+K_t^{\langle \mathrm{H}\rangle^{-1}}I_{t+1}^{\langle \mathrm{H}\rangle}\right)^2 + 2\psi^{\langle \mathrm{H}\rangle}K_t^{\langle \mathrm{H}\rangle^{-1}}I_{t+1}^{\langle \mathrm{H}\rangle}\left(-\delta^{\langle \mathrm{H}\rangle}+K_t^{\langle \mathrm{H}\rangle^{-1}}I_{t+1}^{\langle \mathrm{H}\rangle}\right)\right)\right]\right) + \lambda_t^{\mathrm{c}\langle \mathrm{H}\rangle}\left(-1-\right.$$
$$\tag{6.13}$$

$$\lambda_t^{\mathrm{c}\langle \mathrm{F}\rangle}W_t^{\langle \mathrm{F}\rangle} + (-1+\mu)C_t^{\langle \mathrm{F}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{F}\rangle}\right)^{-\mu}\left(C_t^{\langle \mathrm{F}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{F}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{6.14}$$

$$\lambda_t^{\mathrm{c}\langle \mathrm{H}\rangle}W_t^{\langle \mathrm{H}\rangle} + (-1+\mu)C_t^{\langle \mathrm{H}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{H}\rangle}\right)^{-\mu}\left(C_t^{\langle \mathrm{H}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{H}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{6.15}$$

$$-\epsilon_t^{\mathrm{G}\langle \mathrm{F}\rangle} + G_t^{\mathrm{d}\langle \mathrm{F}\rangle} - \phi^{\mathrm{G}\langle \mathrm{F}\rangle}G_{t-1}^{\mathrm{d}\langle \mathrm{F}\rangle} = 0 \tag{6.16}$$

$$-\epsilon_t^{\mathrm{G}\langle \mathrm{H}\rangle} + G_t^{\mathrm{d}\langle \mathrm{H}\rangle} - \phi^{\mathrm{G}\langle \mathrm{H}\rangle}G_{t-1}^{\mathrm{d}\langle \mathrm{H}\rangle} = 0 \tag{6.17}$$

$$I_t^{\langle \mathrm{F}\rangle} - K_t^{\langle \mathrm{F}\rangle} + K_{t-1}^{\langle \mathrm{F}\rangle}\left(1-\delta^{\langle \mathrm{F}\rangle}\right) = 0 \tag{6.18}$$

$$I_t^{\langle \mathrm{H}\rangle} - K_t^{\langle \mathrm{H}\rangle} + K_{t-1}^{\langle \mathrm{H}\rangle}\left(1-\delta^{\langle \mathrm{H}\rangle}\right) = 0 \tag{6.19}$$

$$U_t^{\langle \mathrm{F}\rangle} - \beta\mathrm{E}_t\left[U_{t+1}^{\langle \mathrm{F}\rangle}\right] - (1-\eta)^{-1}\left(C_t^{\langle \mathrm{F}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{F}\rangle}\right)^{1-\mu}\right)^{1-\eta} = 0 \tag{6.20}$$

$$U_t^{\langle \mathrm{H}\rangle} - \beta\mathrm{E}_t\left[U_{t+1}^{\langle \mathrm{H}\rangle}\right] - (1-\eta)^{-1}\left(C_t^{\langle \mathrm{H}\rangle\,\mu}\left(1-H_t^{\langle \mathrm{H}\rangle}\right)^{1-\mu}\right)^{1-\eta} = 0 \tag{6.21}$$

$$-C_t^{\langle \mathrm{F}\rangle} - G_t^{\mathrm{d}\langle \mathrm{F}\rangle} - I_t^{\langle \mathrm{F}\rangle} - TR_t^{\langle \mathrm{H}\rangle} + Y_t^{\langle \mathrm{F}\rangle} - \psi^{\langle \mathrm{F}\rangle}K_{t-1}^{\langle \mathrm{F}\rangle}\left(-\delta^{\langle \mathrm{F}\rangle}+K_{t-1}^{\langle \mathrm{F}\rangle^{-1}}I_t^{\langle \mathrm{F}\rangle}\right)^2 = 0 \tag{6.22}$$

$$-C_t^{\langle \mathrm{H}\rangle} - G_t^{\mathrm{d}\langle \mathrm{H}\rangle} - I_t^{\langle \mathrm{H}\rangle} + TR_t^{\langle \mathrm{H}\rangle} + Y_t^{\langle \mathrm{H}\rangle} - \psi^{\langle \mathrm{H}\rangle}K_{t-1}^{\langle \mathrm{H}\rangle}\left(-\delta^{\langle \mathrm{H}\rangle}+K_{t-1}^{\langle \mathrm{H}\rangle^{-1}}I_t^{\langle \mathrm{H}\rangle}\right)^2 = 0 \tag{6.23}$$

7 Steady state relationships (before expansion and reduction)

$$-\lambda_{\mathrm{ss}}^{\mathrm{c}\langle\mathrm{F}\rangle} + \lambda_{\mathrm{ss}}^{\mathrm{c}\langle\mathrm{H}\rangle} = 0 \tag{7.1}$$

$$\sum_{c\in\mathcal{COUNTRY}} TR_{\mathrm{ss}}^{\langle c\rangle} = 0 \tag{7.2}$$

$$c\in\mathcal{COUNTRY}: \quad -K_{\mathrm{ss}}^{\langle c\rangle} + K_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} = 0 \tag{7.3}$$

$$c\in\mathcal{COUNTRY}: \quad -\lambda_{\mathrm{ss}}^{\mathrm{CONSUMER}^2\,\langle c\rangle} + \beta\left(\lambda_{\mathrm{ss}}^{\mathrm{CONSUMER}^2\,\langle c\rangle}\left(1-\delta^{\langle c\rangle}\right) + \lambda_{\mathrm{ss}}^{\mathrm{c}\langle c\rangle}\left(r_{\mathrm{ss}}^{\langle c\rangle} - \psi^{\langle c\rangle}\left(-\delta^{\langle c\rangle} + I_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle-1}\right)^2 + 2\psi^{\langle c\rangle}I_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle-1}\left(-\delta^{\langle c\rangle} + I_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle-1}\right)\right)\right) = 0 \tag{7.4}$$

$$c\in\mathcal{COUNTRY}: \quad \lambda_{\mathrm{ss}}^{\mathrm{CONSUMER}^2\,\langle c\rangle} + \lambda_{\mathrm{ss}}^{\mathrm{c}\langle c\rangle}\left(-1 - 2\psi^{\langle c\rangle}\left(-\delta^{\langle c\rangle} + I_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle-1}\right)\right) = 0 \tag{7.5}$$

$$c\in\mathcal{COUNTRY}: \quad -\lambda_{\mathrm{ss}}^{\mathrm{c}\langle c\rangle} + \mu C_{\mathrm{ss}}^{\langle c\rangle-1+\mu}\left(1-H_{\mathrm{ss}}^{\langle c\rangle}\right)^{1-\mu}\left(C_{\mathrm{ss}}^{\langle c\rangle\mu}\left(1-H_{\mathrm{ss}}^{\langle c\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{7.6}$$

$$c\in\mathcal{COUNTRY}: \quad -\pi_{\mathrm{ss}}^{\langle c\rangle} + \Pi_{\mathrm{ss}}^{\langle c\rangle} = 0 \tag{7.7}$$

$$c\in\mathcal{COUNTRY}: \quad -r_{\mathrm{ss}}^{\langle c\rangle} + \alpha^{\langle c\rangle}Z_{\mathrm{ss}}^{\langle c\rangle}H_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,1-\alpha^{\langle c\rangle}}K_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,-1+\alpha^{\langle c\rangle}} = 0 \tag{7.8}$$

$$c\in\mathcal{COUNTRY}: \quad -G_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} + T_{\mathrm{ss}}^{\langle c\rangle} = 0 \tag{7.9}$$

$$c\in\mathcal{COUNTRY}: \quad -H_{\mathrm{ss}}^{\langle c\rangle} + H_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} = 0 \tag{7.10}$$

$$c\in\mathcal{COUNTRY}: \quad -W_{\mathrm{ss}}^{\langle c\rangle} + Z_{\mathrm{ss}}^{\langle c\rangle}\left(1-\alpha^{\langle c\rangle}\right)H_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,-\alpha^{\langle c\rangle}}K_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,\alpha^{\langle c\rangle}} = 0 \tag{7.11}$$

$$c\in\mathcal{COUNTRY}: \quad -Y_{\mathrm{ss}}^{\langle c\rangle} + Z_{\mathrm{ss}}^{\langle c\rangle}H_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,1-\alpha^{\langle c\rangle}}K_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle\,\alpha^{\langle c\rangle}} = 0 \tag{7.12}$$

$$c\in\mathcal{COUNTRY}: \quad Z_{\mathrm{ss}}^{\langle c\rangle} - e^{\epsilon_{\mathrm{ss}}^{\mathrm{Z}\langle c\rangle} + \phi^{\mathrm{Z}\langle c\rangle}\log Z_{\mathrm{ss}}^{\langle c\rangle}} = 0 \tag{7.13}$$

$$c\in\mathcal{COUNTRY}: \quad \lambda_{\mathrm{ss}}^{\mathrm{c}\langle c\rangle}W_{\mathrm{ss}}^{\langle c\rangle} + (-1+\mu)\,C_{\mathrm{ss}}^{\langle c\rangle\mu}\left(1-H_{\mathrm{ss}}^{\langle c\rangle}\right)^{-\mu}\left(C_{\mathrm{ss}}^{\langle c\rangle\mu}\left(1-H_{\mathrm{ss}}^{\langle c\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{7.14}$$

$$c\in\mathcal{COUNTRY}: \quad -\epsilon_{\mathrm{ss}}^{\mathrm{G}\langle c\rangle} + G_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} - \phi^{\mathrm{G}\langle c\rangle}G_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} = 0 \tag{7.15}$$

$$c\in\mathcal{COUNTRY}: \quad I_{\mathrm{ss}}^{\langle c\rangle} - K_{\mathrm{ss}}^{\langle c\rangle} + K_{\mathrm{ss}}^{\langle c\rangle}\left(1-\delta^{\langle c\rangle}\right) = 0 \tag{7.16}$$

$$c\in\mathcal{COUNTRY}: \quad U_{\mathrm{ss}}^{\langle c\rangle} - \beta U_{\mathrm{ss}}^{\langle c\rangle} - (1-\eta)^{-1}\left(C_{\mathrm{ss}}^{\langle c\rangle\mu}\left(1-H_{\mathrm{ss}}^{\langle c\rangle}\right)^{1-\mu}\right)^{1-\eta} = 0 \tag{7.17}$$

$$c\in\mathcal{COUNTRY}: \quad -\pi_{\mathrm{ss}}^{\langle c\rangle} + Y_{\mathrm{ss}}^{\langle c\rangle} - r_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle} - H_{\mathrm{ss}}^{\mathrm{d}\langle c\rangle}W_{\mathrm{ss}}^{\langle c\rangle} = 0 \tag{7.18}$$

$$c\in\mathcal{COUNTRY}: \quad \pi_{\mathrm{ss}}^{\langle c\rangle} - C_{\mathrm{ss}}^{\langle c\rangle} - I_{\mathrm{ss}}^{\langle c\rangle} - T_{\mathrm{ss}}^{\langle c\rangle} + TR_{\mathrm{ss}}^{\langle c\rangle} + r_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle} + H_{\mathrm{ss}}^{\langle c\rangle}W_{\mathrm{ss}}^{\langle c\rangle} - \psi^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle}\left(-\delta^{\langle c\rangle} + I_{\mathrm{ss}}^{\langle c\rangle}K_{\mathrm{ss}}^{\langle c\rangle-1}\right)^2 = 0 \tag{7.19}$$

8 Steady state relationships (after expansion and reduction)

$$-\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle} + \lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle} = 0 \tag{8.1}$$

$$-\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle} + \mu C_{\text{ss}}^{\langle\text{F}\rangle -1+\mu}\left(1-H_{\text{ss}}^{\langle\text{F}\rangle}\right)^{1-\mu}\left(C_{\text{ss}}^{\langle\text{F}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{F}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{8.2}$$

$$-\lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle} + \mu C_{\text{ss}}^{\langle\text{H}\rangle -1+\mu}\left(1-H_{\text{ss}}^{\langle\text{H}\rangle}\right)^{1-\mu}\left(C_{\text{ss}}^{\langle\text{H}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{H}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{8.3}$$

$$-r_{\text{ss}}^{\langle\text{F}\rangle} + \alpha^{\langle\text{F}\rangle} Z_{\text{ss}}^{\langle\text{F}\rangle} H_{\text{ss}}^{\langle\text{F}\rangle\,1-\alpha^{\langle\text{F}\rangle}} K_{\text{ss}}^{\langle\text{F}\rangle\,-1+\alpha^{\langle\text{F}\rangle}} = 0 \tag{8.4}$$

$$-r_{\text{ss}}^{\langle\text{H}\rangle} + \alpha^{\langle\text{H}\rangle} Z_{\text{ss}}^{\langle\text{H}\rangle} H_{\text{ss}}^{\langle\text{H}\rangle\,1-\alpha^{\langle\text{H}\rangle}} K_{\text{ss}}^{\langle\text{H}\rangle\,-1+\alpha^{\langle\text{H}\rangle}} = 0 \tag{8.5}$$

$$-W_{\text{ss}}^{\langle\text{F}\rangle} + Z_{\text{ss}}^{\langle\text{F}\rangle}\left(1-\alpha^{\langle\text{F}\rangle}\right) H_{\text{ss}}^{\langle\text{F}\rangle\,-\alpha^{\langle\text{F}\rangle}} K_{\text{ss}}^{\langle\text{F}\rangle\,\alpha^{\langle\text{F}\rangle}} = 0 \tag{8.6}$$

$$-W_{\text{ss}}^{\langle\text{H}\rangle} + Z_{\text{ss}}^{\langle\text{H}\rangle}\left(1-\alpha^{\langle\text{H}\rangle}\right) H_{\text{ss}}^{\langle\text{H}\rangle\,-\alpha^{\langle\text{H}\rangle}} K_{\text{ss}}^{\langle\text{H}\rangle\,\alpha^{\langle\text{H}\rangle}} = 0 \tag{8.7}$$

$$-Y_{\text{ss}}^{\langle\text{F}\rangle} + Z_{\text{ss}}^{\langle\text{F}\rangle} H_{\text{ss}}^{\langle\text{F}\rangle\,1-\alpha^{\langle\text{F}\rangle}} K_{\text{ss}}^{\langle\text{F}\rangle\,\alpha^{\langle\text{F}\rangle}} = 0 \tag{8.8}$$

$$-Y_{\text{ss}}^{\langle\text{H}\rangle} + Z_{\text{ss}}^{\langle\text{H}\rangle} H_{\text{ss}}^{\langle\text{H}\rangle\,1-\alpha^{\langle\text{H}\rangle}} K_{\text{ss}}^{\langle\text{H}\rangle\,\alpha^{\langle\text{H}\rangle}} = 0 \tag{8.9}$$

$$Z_{\text{ss}}^{\langle\text{F}\rangle} - e^{\phi^{\text{Z}\langle\text{F}\rangle}\log Z_{\text{ss}}^{\langle\text{F}\rangle}} = 0 \tag{8.10}$$

$$Z_{\text{ss}}^{\langle\text{H}\rangle} - e^{\phi^{\text{Z}\langle\text{H}\rangle}\log Z_{\text{ss}}^{\langle\text{H}\rangle}} = 0 \tag{8.11}$$

$$\beta\left(\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle}\left(r_{\text{ss}}^{\langle\text{F}\rangle}-\psi^{\langle\text{F}\rangle}\left(-\delta^{\langle\text{F}\rangle}+I_{\text{ss}}^{\langle\text{F}\rangle}K_{\text{ss}}^{\langle\text{F}\rangle\,-1}\right)^2+2\psi^{\langle\text{F}\rangle}I_{\text{ss}}^{\langle\text{F}\rangle}K_{\text{ss}}^{\langle\text{F}\rangle\,-1}\left(-\delta^{\langle\text{F}\rangle}+I_{\text{ss}}^{\langle\text{F}\rangle}K_{\text{ss}}^{\langle\text{F}\rangle\,-1}\right)\right)-\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle}\left(-1-2\psi^{\langle\text{F}\rangle}\left(-\delta^{\langle\text{F}\rangle}+I_{\text{ss}}^{\langle\text{F}\rangle}K_{\text{ss}}^{\langle\text{F}\rangle\,-1}\right)\right)\left(1-\delta^{\langle\text{F}\rangle}\right)\right)+\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle}\left(-1-2\psi^{\langle\text{F}\rangle}\left(-\delta^{\langle\text{F}\rangle}+\right.\right. \tag{8.12}$$

$$\beta\left(\lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle}\left(r_{\text{ss}}^{\langle\text{H}\rangle}-\psi^{\langle\text{H}\rangle}\left(-\delta^{\langle\text{H}\rangle}+I_{\text{ss}}^{\langle\text{H}\rangle}K_{\text{ss}}^{\langle\text{H}\rangle\,-1}\right)^2+2\psi^{\langle\text{H}\rangle}I_{\text{ss}}^{\langle\text{H}\rangle}K_{\text{ss}}^{\langle\text{H}\rangle\,-1}\left(-\delta^{\langle\text{H}\rangle}+I_{\text{ss}}^{\langle\text{H}\rangle}K_{\text{ss}}^{\langle\text{H}\rangle\,-1}\right)\right)-\lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle}\left(-1-2\psi^{\langle\text{H}\rangle}\left(-\delta^{\langle\text{H}\rangle}+I_{\text{ss}}^{\langle\text{H}\rangle}K_{\text{ss}}^{\langle\text{H}\rangle\,-1}\right)\right)\left(1-\delta^{\langle\text{H}\rangle}\right)\right)+\lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle}\left(-1-2\psi^{\langle\text{H}\rangle}\left(-\delta^{\langle\text{H}\rangle}\right.\right. \tag{8.13}$$

$$\lambda_{\text{ss}}^{\text{c}\langle\text{F}\rangle}W_{\text{ss}}^{\langle\text{F}\rangle} + (-1+\mu)C_{\text{ss}}^{\langle\text{F}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{F}\rangle}\right)^{-\mu}\left(C_{\text{ss}}^{\langle\text{F}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{F}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{8.14}$$

$$\lambda_{\text{ss}}^{\text{c}\langle\text{H}\rangle}W_{\text{ss}}^{\langle\text{H}\rangle} + (-1+\mu)C_{\text{ss}}^{\langle\text{H}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{H}\rangle}\right)^{-\mu}\left(C_{\text{ss}}^{\langle\text{H}\rangle\,\mu}\left(1-H_{\text{ss}}^{\langle\text{H}\rangle}\right)^{1-\mu}\right)^{-\eta} = 0 \tag{8.15}$$

$$G_{\text{ss}}^{\text{d}\langle\text{F}\rangle} - \phi^{\text{G}\langle\text{F}\rangle}G_{\text{ss}}^{\text{d}\langle\text{F}\rangle} = 0 \tag{8.16}$$

$$G_{\text{ss}}^{\text{d}\langle\text{H}\rangle} - \phi^{\text{G}\langle\text{H}\rangle}G_{\text{ss}}^{\text{d}\langle\text{H}\rangle} = 0 \tag{8.17}$$

$$I_{\text{ss}}^{\langle \text{F} \rangle} - K_{\text{ss}}^{\langle \text{F} \rangle} + K_{\text{ss}}^{\langle \text{F} \rangle} \left(1 - \delta^{\langle \text{F} \rangle} \right) = 0 \tag{8.18}$$

$$I_{\text{ss}}^{\langle \text{H} \rangle} - K_{\text{ss}}^{\langle \text{H} \rangle} + K_{\text{ss}}^{\langle \text{H} \rangle} \left(1 - \delta^{\langle \text{H} \rangle} \right) = 0 \tag{8.19}$$

$$U_{\text{ss}}^{\langle \text{F} \rangle} - \beta U_{\text{ss}}^{\langle \text{F} \rangle} - (1 - \eta)^{-1} \left(C_{\text{ss}}^{\langle \text{F} \rangle \mu} \left(1 - H_{\text{ss}}^{\langle \text{F} \rangle} \right)^{1-\mu} \right)^{1-\eta} = 0 \tag{8.20}$$

$$U_{\text{ss}}^{\langle \text{H} \rangle} - \beta U_{\text{ss}}^{\langle \text{H} \rangle} - (1 - \eta)^{-1} \left(C_{\text{ss}}^{\langle \text{H} \rangle \mu} \left(1 - H_{\text{ss}}^{\langle \text{H} \rangle} \right)^{1-\mu} \right)^{1-\eta} = 0 \tag{8.21}$$

$$-C_{\text{ss}}^{\langle \text{F} \rangle} - G_{\text{ss}}^{\text{d}\,\langle \text{F} \rangle} - I_{\text{ss}}^{\langle \text{F} \rangle} - TR_{\text{ss}}^{\langle \text{H} \rangle} + Y_{\text{ss}}^{\langle \text{F} \rangle} - \psi^{\langle \text{F} \rangle} K_{\text{ss}}^{\langle \text{F} \rangle} \left(-\delta^{\langle \text{F} \rangle} + I_{\text{ss}}^{\langle \text{F} \rangle} K_{\text{ss}}^{\langle \text{F} \rangle \,-1} \right)^2 = 0 \tag{8.22}$$

$$-C_{\text{ss}}^{\langle \text{H} \rangle} - G_{\text{ss}}^{\text{d}\,\langle \text{H} \rangle} - I_{\text{ss}}^{\langle \text{H} \rangle} + TR_{\text{ss}}^{\langle \text{H} \rangle} + Y_{\text{ss}}^{\langle \text{H} \rangle} - \psi^{\langle \text{H} \rangle} K_{\text{ss}}^{\langle \text{H} \rangle} \left(-\delta^{\langle \text{H} \rangle} + I_{\text{ss}}^{\langle \text{H} \rangle} K_{\text{ss}}^{\langle \text{H} \rangle \,-1} \right)^2 = 0 \tag{8.23}$$

∞

9 Steady-state values

	Steady-state values
$\lambda^{\mathrm{c}^{\mathrm{F}}}$	0.3934
$\lambda^{\mathrm{c}^{\mathrm{H}}}$	0.3934
r^{F}	0.0351
r^{H}	0.0351
C^{F}	0.9578
C^{H}	0.9578
$G^{\mathrm{d}^{\mathrm{F}}}$	0
$G^{\mathrm{d}^{\mathrm{H}}}$	0
H^{F}	0.2645
H^{H}	0.2645
I^{F}	0.3816
I^{H}	0.3816
K^{F}	15.2627
K^{H}	15.2627
TR^{H}	0
U^{F}	-125.6048
U^{H}	-125.6048
W^{F}	3.0384
W^{H}	3.0384
Y^{F}	1.3393
Y^{H}	1.3393
Z^{F}	1
Z^{H}	1

10 The solution of the perturbation

10.1 P

$$
\begin{array}{c}
\begin{array}{cccccc}
G^{\mathrm{d}^{\mathrm{F}}}_{t-1} & G^{\mathrm{d}^{\mathrm{H}}}_{t-1} & K^{\mathrm{F}}_{t-1} & K^{\mathrm{H}}_{t-1} & Z^{\mathrm{F}}_{t-1} & Z^{\mathrm{H}}_{t-1}
\end{array}\\
\begin{array}{c}
G^{\mathrm{d}^{\mathrm{F}}}\\
G^{\mathrm{d}^{\mathrm{H}}}\\
K^{\mathrm{F}}\\
K^{\mathrm{H}}\\
Z^{\mathrm{F}}\\
Z^{\mathrm{H}}
\end{array}
\left(\begin{array}{cccccc}
0.95 & 0 & 0 & 0 & 0 & 0\\
0 & 0.95 & 0 & 0 & 0 & 0\\
-0.1542 & -0.1542 & 0.9454 & 0.0244 & 2.2856 & -1.0704\\
-0.1542 & -0.1542 & 0.0244 & 0.9454 & -1.0704 & 2.2856\\
0 & 0 & 0 & 0 & 0.95 & 0\\
0 & 0 & 0 & 0 & 0 & 0.95
\end{array}\right)
\end{array}
$$

10.2 Q

$$
\begin{array}{c}
\begin{array}{cccc}
\epsilon^{\mathrm{Z}^{\mathrm{F}}} & \epsilon^{\mathrm{Z}^{\mathrm{H}}} & \epsilon^{\mathrm{G}^{\mathrm{F}}} & \epsilon^{\mathrm{G}^{\mathrm{H}}}
\end{array}\\
\begin{array}{c}
G^{\mathrm{d}^{\mathrm{F}}}\\
G^{\mathrm{d}^{\mathrm{H}}}\\
K^{\mathrm{F}}\\
K^{\mathrm{H}}\\
Z^{\mathrm{F}}\\
Z^{\mathrm{H}}
\end{array}
\left(\begin{array}{cccc}
0 & 0 & 1 & 0\\
0 & 0 & 0 & 1\\
2.4059 & -1.1267 & -0.1623 & -0.1623\\
-1.1267 & 2.4059 & -0.1623 & -0.1623\\
1 & 0 & 0 & 0\\
0 & 1 & 0 & 0
\end{array}\right)
\end{array}
$$

10.3   R

	$G_{t-1}^{d^F}$	$G_{t-1}^{d^H}$	K_{t-1}^F	K_{t-1}^H	Z_{t-1}^F	Z_{t-1}^H
λ^{c^F}	0.1022	0.1022	−0.0091	−0.0091	−0.1072	−0.1072
λ^{c^H}	0.1022	0.1022	−0.0091	−0.0091	−0.1072	−0.1072
r^F	0.0044	0.0044	−0.0012	−0.0004	0.0497	−0.0046
r^H	0.0044	0.0044	−0.0004	−0.0012	−0.0046	0.0497
C^F	−0.1525	−0.1525	0.0187	0.0136	0.3448	0.1599
C^H	−0.1525	−0.1525	0.0136	0.0187	0.1599	0.3448
H^F	0.0554	0.0554	0.0023	−0.0049	0.2054	−0.0581
H^H	0.0554	0.0554	−0.0049	0.0023	−0.0581	0.2054
I^F	−0.1542	−0.1542	−0.0296	0.0244	2.2856	−1.0704
I^H	−0.1542	−0.1542	0.0244	−0.0296	−1.0704	2.2856
TR^H	−0.475	0.475	0.053	−0.053	−0.7338	0.7338
U^F	−3.1408	−3.1408	0.1608	0.2366	0.053	8.3603
U^H	−3.1408	−3.1408	0.2366	0.1608	8.3603	0.053
W^F	−0.2547	−0.2547	0.0689	0.0227	1.9424	0.2672
W^H	−0.2547	−0.2547	0.0227	0.0689	0.2672	1.9424
Y^F	0.1684	0.1684	0.0422	−0.015	1.8966	−0.1767
Y^H	0.1684	0.1684	−0.015	0.0422	−0.1767	1.8966

10.4   S

	ϵ^{Z^F}	ϵ^{Z^H}	ϵ^{G^F}	ϵ^{G^H}
λ^{c^F}	−0.1128	−0.1128	0.1075	0.1075
λ^{c^H}	−0.1128	−0.1128	0.1075	0.1075
r^F	0.0523	−0.0049	0.0046	0.0046
r^H	−0.0049	0.0523	0.0046	0.0046
C^F	0.3629	0.1683	−0.1605	−0.1605
C^H	0.1683	0.3629	−0.1605	−0.1605
H^F	0.2163	−0.0612	0.0583	0.0583
H^H	−0.0612	0.2163	0.0583	0.0583
I^F	2.4059	−1.1267	−0.1623	−0.1623
I^H	−1.1267	2.4059	−0.1623	−0.1623
TR^H	−0.7724	0.7724	−0.5	0.5
U^F	0.0557	8.8003	−3.3061	−3.3061
U^H	8.8003	0.0557	−3.3061	−3.3061
W^F	2.0446	0.2812	−0.2681	−0.2681
W^H	0.2812	2.0446	−0.2681	−0.2681
Y^F	1.9964	−0.186	0.1773	0.1773
Y^H	−0.186	1.9964	0.1773	0.1773

11   Statistics of the model

11.1   Moments

	Steady-state value	Std. dev.	Variance	Loglinear
r^H	0.0351	0.0051	0	N
C^H	0.9578	0.034	0.0012	N
G^{d^H}	0	0.0922	0.0085	N
H^H	0.2645	0.0249	0.0006	N
I^H	0.3816	0.2411	0.0581	N
K^H	15.2627	0.8242	0.6794	N
TR^H	0	0.1586	0.0252	N
U^H	-125.6048	0.7839	0.6144	N
W^H	3.0384	0.1864	0.0348	N
Y^H	1.3393	0.2022	0.0409	N
Z^H	1	0.0922	0.0085	N

11.2 Correlation matrix

	r^{H}	C^{H}	$G^{\mathrm{d^H}}$	H^{H}	I^{H}	K^{H}	TR^{H}	U^{H}	W^{H}	Y^{H}	Z^{H}
$\lambda^{\mathrm{c^F}}$	-0.226	-0.8587	0.315	-0.0583	-0.2102	-0.1567	0	-0.6538	-0.5296	-0.2516	-0.3535
$\lambda^{\mathrm{c^H}}$	-0.226	-0.8587	0.315	-0.0583	-0.2102	-0.1567	0	-0.6538	-0.5296	-0.2516	-0.3535
r^{F}	-0.0642	0.1313	0.0458	-0.109	-0.4976	-0.1459	-0.6228	0.7667	0.0158	-0.0616	-0.034
r^{H}	1	0.6587	0.5543	0.9181	0.8885	0.1933	0.6228	-0.2736	0.8886	0.9342	0.9831
C^{F}	0.1313	0.6746	-0.2132	-0.072	-0.0901	-0.1031	-0.2407	0.8996	0.351	0.0977	0.2227
C^{H}	0.6587	1	0.06	0.5617	0.5915	0.393	0.2407	0.3136	0.8895	0.7121	0.769
$G^{\mathrm{d^F}}$	0.0458	-0.2132	0	0.0932	-0.27	-0.1198	-0.493	0.1309	-0.072	0.0289	0
$G^{\mathrm{d^H}}$	0.5543	0.06	1	0.6253	0.3906	0.1507	0.493	-0.3895	0.3801	0.5447	0.5
H^{F}	-0.109	-0.072	0.0932	-0.2342	-0.5149	-0.4537	-0.4687	0.6968	-0.1711	-0.2157	-0.1368
H^{H}	0.9181	0.5617	0.6253	1	0.8128	0.5124	0.4687	-0.4445	0.8777	0.9809	0.9273
I^{F}	-0.4976	-0.0901	-0.27	-0.5149	-0.8058	-0.1844	-0.8168	0.848	-0.3366	-0.4582	-0.447
I^{H}	0.8885	0.5915	0.3906	0.8128	1	0.2307	0.8168	-0.5013	0.7916	0.829	0.8743
K^{F}	-0.1459	-0.1031	-0.1198	-0.4537	-0.1844	-0.7884	0.1498	0.4338	-0.3103	-0.4093	-0.2156
K^{H}	0.1933	0.393	0.1507	0.5124	0.2307	1	-0.1498	-0.2587	0.5107	0.5274	0.3254
TR^{H}	0.6228	0.2407	0.493	0.4687	0.8168	-0.1498	1	-0.534	0.3983	0.4544	0.5503
U^{F}	0.7667	0.8996	0.1309	0.6968	0.848	0.4338	0.534	-0.0945	0.906	0.8031	0.8435
U^{H}	-0.2736	0.3136	-0.3895	-0.4445	-0.5013	-0.2587	-0.534	1	-0.0639	-0.3034	-0.1974
W^{F}	0.0158	0.351	-0.072	-0.1711	-0.3366	-0.3103	-0.3983	0.906	0.1089	-0.0625	0.0534
W^{H}	0.8886	0.8895	0.3801	0.8777	0.7916	0.5107	0.3983	-0.0639	1	0.9542	0.9576
Y^{F}	-0.0616	0.0977	0.0289	-0.2157	-0.4582	-0.4093	-0.4544	0.8031	-0.0625	-0.1601	-0.0637
Y^{H}	0.9342	0.7121	0.5447	0.9809	0.829	0.5274	0.4544	-0.3034	0.9542	1	0.9679
Z^{F}	-0.034	0.2227	0	-0.1368	-0.447	-0.2156	-0.5503	0.8435	0.0534	-0.0637	0
Z^{H}	0.9831	0.769	0.5	0.9273	0.8743	0.3254	0.5503	-0.1974	0.9576	0.9679	1

11.3 Autocorrelations

	$t-1$	$t-2$	$t-3$	$t-4$	$t-5$
r^{H}	0.7036	0.4561	0.2537	0.0926	-0.0318
C^{H}	0.7497	0.5288	0.3382	0.1774	0.0454
$G^{\mathrm{d^H}}$	0.7133	0.4711	0.2711	0.1098	-0.0163
H^{H}	0.7476	0.5249	0.3327	0.171	0.0384
I^{H}	0.698	0.4473	0.2437	0.0826	-0.0407
K^{H}	0.9564	0.8523	0.7094	0.5455	0.3748
TR^{H}	0.7199	0.4816	0.2831	0.1217	-0.0057
U^{H}	0.7308	0.4987	0.303	0.1419	0.0127
W^{H}	0.748	0.5257	0.334	0.1726	0.0403
Y^{H}	0.7475	0.5248	0.3327	0.171	0.0385
Z^{H}	0.7133	0.4711	0.2711	0.1098	-0.0163

11.4 Variance decomposition

	$\epsilon^{\mathrm{Z^F}}$	$\epsilon^{\mathrm{Z^H}}$	$\epsilon^{\mathrm{G^F}}$	$\epsilon^{\mathrm{G^H}}$
r^{H}	0.0022	0.9869	0.0055	0.0055
C^{H}	0.0587	0.6565	0.1424	0.1424
$G^{\mathrm{d^H}}$	0	0.25	0	0.75
H^{H}	0.0506	0.8796	0.0349	0.0349
I^{H}	0.2139	0.7803	0.0029	0.0029
K^{H}	0.2084	0.7853	0.0031	0.0031
TR^{H}	0.4367	0.4367	0.0633	0.0633
U^{H}	0.7325	0.0408	0.1133	0.1133
W^{H}	0.0054	0.9676	0.0135	0.0135
Y^{H}	0.0212	0.9689	0.005	0.005
Z^{H}	0	1	0	0

12 Statistics of the model

12.1 Moments relative to moments of the reference variable

	Steady-state value relative to Y^{H}	Std. dev. relative to Y^{H}	Variance relative to Y^{H}	Loglinear
$\lambda^{\mathrm{c}^{\mathrm{F}}}$	0.2937	0.0745	0.0055	N
$\lambda^{\mathrm{c}^{\mathrm{H}}}$	0.2937	0.0745	0.0055	N
r^{F}	0.0262	0.0251	0.0006	N
r^{H}	0.0262	0.0251	0.0006	N
C^{F}	0.7151	0.1683	0.0283	N
C^{H}	0.7151	0.1683	0.0283	N
$G^{\mathrm{d}^{\mathrm{F}}}$	0	0.4558	0.2077	N
$G^{\mathrm{d}^{\mathrm{H}}}$	0	0.4558	0.2077	N
H^{F}	0.1975	0.1233	0.0152	N
H^{H}	0.1975	0.1233	0.0152	N
I^{F}	0.2849	1.1922	1.4214	N
I^{H}	0.2849	1.1922	1.4214	N
K^{F}	11.3957	4.0759	16.613	N
K^{H}	11.3957	4.0759	16.613	N
TR^{H}	0	0.7845	0.6155	N
U^{F}	-93.7814	3.8762	15.0251	N
U^{H}	-93.7814	3.8762	15.0251	N
W^{F}	2.2686	0.9219	0.8499	N
W^{H}	2.2686	0.9219	0.8499	N
Y^{F}	1	1	1	N
Y^{H}	1	1	1	N
Z^{F}	0.7466	0.4558	0.2077	N
Z^{H}	0.7466	0.4558	0.2077	N

12.2 Correlations with the reference variable

	Y^{H}_{t-5}	Y^{H}_{t-4}	Y^{H}_{t-3}	Y^{H}_{t-2}	Y^{H}_{t-1}	Y^{H}_{t}	Y^{H}_{t+1}	Y^{H}_{t+2}	Y^{H}_{t+3}	Y^{H}_{t+4}	Y^{H}_{t+5}
$\lambda^{\mathrm{c}^{\mathrm{F}}}$	0.0871	0.052	0.0027	-0.0629	-0.147	-0.2516	-0.2295	-0.2021	-0.1717	-0.1403	-0.1092
$\lambda^{\mathrm{c}^{\mathrm{H}}}$	0.0871	0.052	0.0027	-0.0629	-0.147	-0.2516	-0.2295	-0.2021	-0.1717	-0.1403	-0.1092
r^{F}	-0.0996	-0.107	-0.1091	-0.1039	-0.0889	-0.0616	0.001	0.0457	0.0755	0.0931	0.1011
r^{H}	0.1644	0.2797	0.415	0.5699	0.7436	0.9342	0.583	0.301	0.0807	-0.0854	-0.2047
C^{F}	-0.0881	-0.0765	-0.0547	-0.0202	0.0296	0.0977	0.0894	0.0807	0.0719	0.063	0.0543
C^{H}	-0.0428	0.0529	0.1742	0.3236	0.5025	0.7121	0.5623	0.4245	0.3008	0.1923	0.0996
$G^{\mathrm{d}^{\mathrm{F}}}$	-0.0492	-0.0463	-0.0384	-0.0243	-0.0024	0.0289	0.0335	0.0357	0.0359	0.0346	0.0321
$G^{\mathrm{d}^{\mathrm{H}}}$	0.0486	0.1179	0.2018	0.3009	0.4154	0.5447	0.3727	0.2295	0.1132	0.0212	-0.0489
H^{F}	-0.0311	-0.065	-0.1021	-0.1409	-0.1796	-0.2157	-0.1962	-0.1689	-0.1372	-0.1037	-0.0706
H^{H}	0.0572	0.1869	0.3437	0.5287	0.7415	0.9809	0.7249	0.5007	0.3086	0.1482	0.0177
I^{F}	-0.1696	-0.2254	-0.2844	-0.3447	-0.4037	-0.4582	-0.2427	-0.0758	0.0488	0.1375	0.196
I^{H}	0.1811	0.2834	0.4007	0.532	0.6757	0.829	0.5004	0.239	0.0372	-0.1128	-0.2185
K^{F}	0.0822	0.0142	-0.0694	-0.1685	-0.2824	-0.4093	-0.4701	-0.4805	-0.4542	-0.4026	-0.3353
K^{H}	-0.2716	-0.1819	-0.0602	0.097	0.2922	0.5274	0.6606	0.714	0.707	0.6563	0.576
TR^{H}	0.2452	0.2926	0.3394	0.3838	0.4232	0.4544	0.1448	-0.0813	-0.2373	-0.3358	-0.3881
U^{F}	0.0493	0.1549	0.2828	0.4337	0.6074	0.8031	0.583	0.3934	0.2336	0.1021	-0.003
U^{H}	-0.1146	-0.1545	-0.1956	-0.2359	-0.2729	-0.3034	-0.189	-0.0953	-0.0206	0.0369	0.0793
W^{F}	-0.0682	-0.0802	-0.0881	-0.0896	-0.0821	-0.0625	-0.0566	-0.0465	-0.0341	-0.0208	-0.0075
W^{H}	0.0068	0.1338	0.2908	0.4794	0.7006	0.9542	0.7261	0.5224	0.3447	0.1932	0.0675
Y^{F}	-0.0471	-0.0732	-0.0995	-0.1244	-0.1455	-0.1601	-0.1455	-0.1244	-0.0995	-0.0732	-0.0471
Y^{H}	0.0385	0.171	0.3327	0.5248	0.7475	1	0.7475	0.5248	0.3327	0.171	0.0385
Z^{F}	-0.0898	-0.0993	-0.1037	-0.101	-0.0886	-0.0637	-0.022	0.0101	0.0338	0.0502	0.0605
Z^{H}	0.106	0.2292	0.3768	0.5495	0.747	0.9679	0.6563	0.3977	0.1884	0.0235	-0.1016

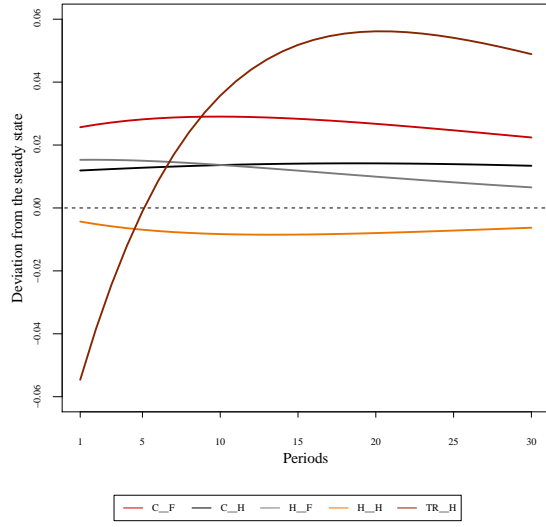# 13 Impulse response functions

13.1 Shock ϵ^{Z^F}

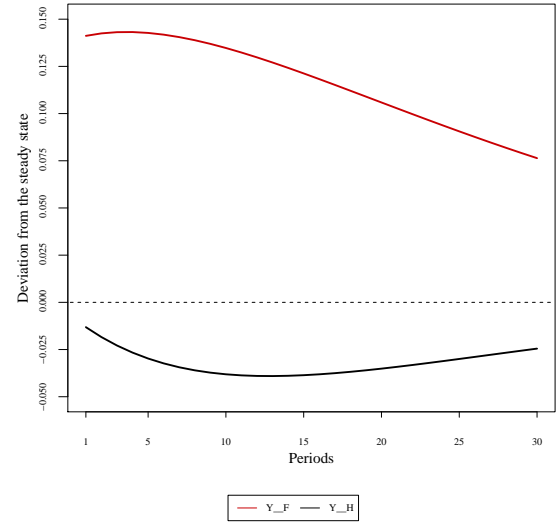Figure 1: Impulse response function for ϵ^{Z^F} shock

Figure 2: Impulse response function for ϵ^{Z^F} shock

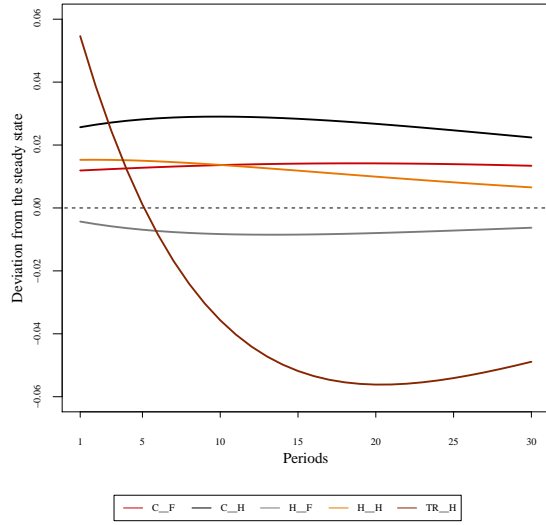## 13.2   Shock ϵ^{Z^H}

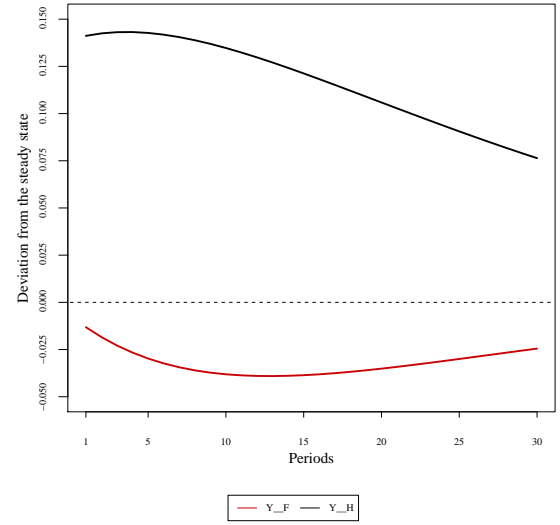

Figure 3: Impulse response function for ϵ^{Z^H} shock

Figure 4: Impulse response function for ϵ^{Z^H} shock