

# Country Portfolios: Notes on DYNARE example code

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These notes outline a version of the two-country endowment models used as examples in Devereux and Sutherland (2010, 2011).

## Model Equations

- The NFA equation for home agents:

$$NFA_t = NFA_{t-1}r_{B_2,t} + Y_{1,t} - C_{1,t} + \alpha_{1,t-1}(r_{E_1,t} - r_{B_2,t}) + \alpha_{2,t-1}(r_{E_2,t} - r_{B_2,t}) + \alpha_{3,t-1}(r_{B_1,t} - r_{B_2,t}) \quad (1)$$

- Endowments:

$$\log Y_{K_1,t} = \zeta_K \log Y_{K_1,t-1} + \varepsilon_{1,t} \quad \log Y_{K_2,t} = \zeta_K \log Y_{K_2,t-1} + \varepsilon_{2,t} \quad (2)$$

$$\log Y_{L_1,t} = \zeta_L \log Y_{L_1,t-1} + \varepsilon_{3,t} \quad \log Y_{L_2,t} = \zeta_L \log Y_{L_2,t-1} + \varepsilon_{4,t} \quad (3)$$

- Money supplies:

$$\log M_{1,t} = \zeta_M \log M_{1,t-1} + \varepsilon_{5,t} \quad \log M_{2,t} = \zeta_M \log M_{2,t-1} + \varepsilon_{6,t} \quad (4)$$

- Resource constraint:

$$Y_{1,t} = Y_{K_1,t} + Y_{L_1,t} \quad Y_{2,t} = Y_{K_2,t} + Y_{L_2,t} \quad (5)$$

$$C_{1,t} + C_{2,t} = Y_{1,t} + Y_{2,t} \quad (6)$$

- Money demand:

$$M_{1,t} = P_{1,t}Y_{1,t}, \quad M_{2,t} = P_{2,t}Y_{2,t} \quad (7)$$

- Return on bonds:

$$r_{B_1,t} = \frac{1}{Z_{1,t-1}P_{1,t}} \quad r_{B_2,t} = \frac{1}{Z_{2,t-1}P_{2,t}} \quad (8)$$

- Return on equities:

$$r_{E_1,t} = \frac{Y_{K_1,t}}{Z_{3,t-1}} \quad r_{E_2,t} = \frac{Y_{K_2,t}}{Z_{4,t-1}} \quad (9)$$

- Home and foreign households' first order conditions for asset holdings:

$$C_{1,t}^{-\rho} = \beta E_t [C_{1,t+1}^{-\rho} r_{E_1,t+1}] \quad C_{1,t}^{-\rho} = \beta E_t [C_{1,t+1}^{-\rho} r_{E_2,t+1}] \quad (10)$$

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$$C_{2,t}^{-\rho} = \beta E_t [C_{2,t+1}^{-\rho} r_{E_1,t+1}] \quad C_{2,t}^{-\rho} = \beta E_t [C_{2,t+1}^{-\rho} r_{E_2,t+1}] \quad (12)$$

$$C_{2,t}^{-\rho} = \beta E_t [C_{2,t+1}^{-\rho} r_{B_1,t+1}] \quad C_{2,t}^{-\rho} = \beta E_t [C_{2,t+1}^{-\rho} r_{B_2,t+1}] \quad (13)$$

Of the eight first-order conditions in (10) to (13) only five appear explicitly in the DYNARE code. The other three are (implicitly) incorporated into the Devereux-Sutherland solution algorithm and thus determine equilibrium portfolio holdings.

## References

- [1] Devereux, M and A Sutherland (2010) "Country Portfolio Dynamics" *Journal of Economic Dynamics and Control*, 34, 1325-1342.
- [2] vereux, M and A Sutherland (2011) "Country Portfolios in Open Economy Macro Models" *Journal of the European Economic Association*, 9, 337-369.