Numerical Methods Bootcamp

Friday Assignment
The Mortensen-Pissarides Model in Continuous Time

For this problem set, you are asked to solve the Diamon-Mortensen-Pissarides model in continuous time with risk-averse firm owners. For simplicity, I will assume that real wages are sticky, such that profits, π_t, are exogenously given. In Δ-units of time, the model is given by the equations

$$J_t = \Delta\pi_t + (1-\Delta\rho)\frac{u'(c_{t+\Delta})}{u'(c_t)}J_{t+\Delta}(1-\Delta\delta), \tag{1}$$

$$\Delta\kappa = \Delta h(\theta_t)J_t, \tag{2}$$

$$\Delta c_t = \Delta(n_t - \kappa\theta_t(1-n_t)), \tag{3}$$

$$n_{t+\Delta} = (1-n_t)\Delta f(\theta_t) + (1-\Delta\delta)n_t, \tag{4}$$

where $f(\cdot)$ and $h(\cdot)$ refer to the job-finding rate and job-filling rate, respectively.

Part A. Derive the continuous time equivalents to equations (1)-(4).

Part B. Attached with this assignment is one program `DMP.m` which solves the model using "regular" value function iteration using a clunky way of calculating derivatives.

Your job today is to

(i) Change the solution method to the implicit method.

(ii) Rewrite the program using derivatives that uses forward and backward differences depending on the sign of the "drift".