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clc


% SECTION #1: CHOIX DES PARAMÈTRES
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% Paramètres: préférences et technologie
alpha = 0.36;  beta = 0.99;  delta = 0.025;

% Paramètres: processus stochastique
rho = 0.95;  sigmae = 0.007;  mu = 0;  multiple = 3;

% Paramètres: grille (capital, chocs)
zpoints = 9;  kpoints = 500; % kpoints pair
ratio_k_inf = 0.8;  ratio_k_sup = 1.2;

% Paramètres: convergence
tolerance = 1e-4;

% Paramètres: simulation
periodes = 1000;
index_capital_init = kpoints / 2;  index_choc_init = (zpoints+1) / 2;


% SECTION #2: MISE EN PLACE DES GRILLES
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kstat = (beta * alpha / (1-beta*(1-delta))) ^ (1/(1-alpha));
cstat = kstat^alpha - delta*kstat;

k_inf = ratio_k_inf * kstat;                    k_sup = ratio_k_sup * kstat;
moitie_inf = linspace(k_inf,kstat,kpoints/2);  moitie_sup = linspace(kstat,k_sup,kpoints/2);
k = union(moitie_inf,moitie_sup);

[z, zprob] = tauchen(zpoints,mu,rho,sigmae,multiple);


% SECTION #3: AVANT LA BOUCLE DE CONVERGENCE
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capital = repmat(k', [1,kpoints]);
choc = exp(z);

production = choc * k.^alpha;
production = repmat(production, [1,1,kpoints]);
production = permute(production, [2,1,3]);

investissement = capital' - (1-delta) * capital;
investissement = repmat(investissement, [1,1,zpoints]);
investissement = permute(investissement, [1,3,2]);

consommation = production - investissement;
utilite = log(consommation);
consommation_negative = find(consommation <= 0);
utilite(consommation_negative)= -1e10;


% SECTION #4: BOUCLE DE CONVERGENCE
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Valeur = repmat(log(cstat)/(1-beta),[kpoints,zpoints]);
comparaison = ones(kpoints,zpoints);

while max(abs(comparaison(:))) > tolerance
    EV = Valeur * zprob';
    EV = repmat(EV, [1,1,kpoints]);
    EV = permute(EV, [3,2,1]);
    EB = utilite + beta * EV;

    TValeur = max(EB,[],3);
    comparaison = TValeur - Valeur;
    Valeur = TValeur;
end

[Valeur, regle] = max(EB,[],3);


% SECTION #5: SIMULATION
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[~, z_state] = markov(zprob,periodes+1,index_choc_init,z');
[~, z_index] = max(z_state);

k_index(1) = index_capital_init;  k_simule(1) = k(k_index(1));

for i = 2:periodes+1
    k_index(i) = regle(k_index(i-1),z_index(i-1));
end
k_simule = k(k_index);

inv_simule = k_simule(2:end) - (1-delta) * k_simule(1:end-1);
k_simule = k_simule(1:periodes);
y_simule = exp(z(z_index))' .* k_simule.^alpha;
consommation_simulee = y_simule - inv_simule;


% SECTION #6: GRAPHIQUES
%%%%%%%%%%%%%%%%%%%%%%%%%

figure(1)
plot(y_simule);
xlabel('périodes')
ylabel('production')

figure(2)
plot(consommation_simulee);
xlabel('périodes')
ylabel('consommation')

figure(3)
plot(inv_simule);
xlabel('périodes')
ylabel('investissement')
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