Homework Assignment # 7

Carlos Rangel

```
% This file implements the Algorithm described on ...
    page 3

% Initial Guess for p and V0
params;
pnew = (1/2)*(NU+ repmat(c,1,L));
Vnew = (pnew-repmat(c,1,L))./(1-BETA);

% Stopping Criteria
eps = 1e-3;

% Counter for iterations
iter = 0;

% To enter first iteration
diff = 10000;

% dampening parameter
lambda = 1;
```

```
lambda = 1
```

Enter the loop and perform the necessary iterations until convergence

```
% Options
options = optimoptions('fsolve', 'Display', 'none');
while diff > eps
 Vold = Vnew;
 pold = pnew;
 % Obtain updated value for the prices

 % Set strategy for player 2
 p2 = pold';

 % Define first order conditions given this ...
     strategy for player 2
 fun =@(p1) focs(p1, p2, Vold);

 % Update prices
 pnew = fsolve(fun, pold, options);
```

```
    % Update the Value of V
    Vnew = NextV(pnew,p2, Vold);

    % Compute maximum differences between Values and ...
        Policies
    diff = max( max(max( ...
        abs(Vnew-Vold)./(1 + abs(Vnew)))), ...
        max(max(abs(pnew-pold)./(1 + abs(pnew)))));

    % Dampening
    Vnew = lambda*Vnew + (1-lambda)*Vold;
    pnew = lambda*pnew + (1-lambda)*pold;

    % Increase Number of iterations
    iter = iter + 1;

end
iter
```

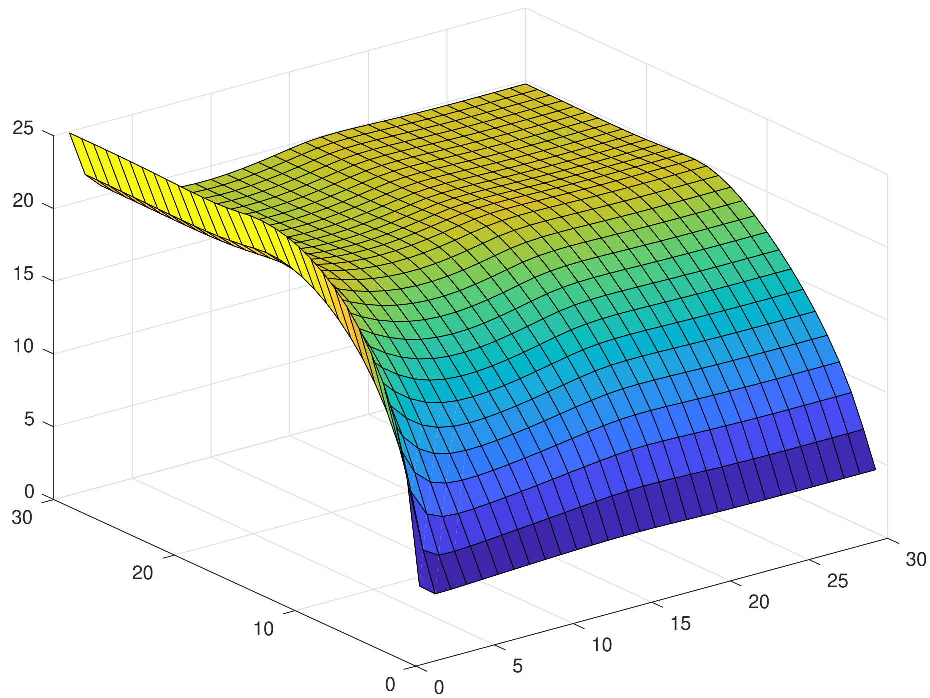
```
iter = 122
```

```
diff
```

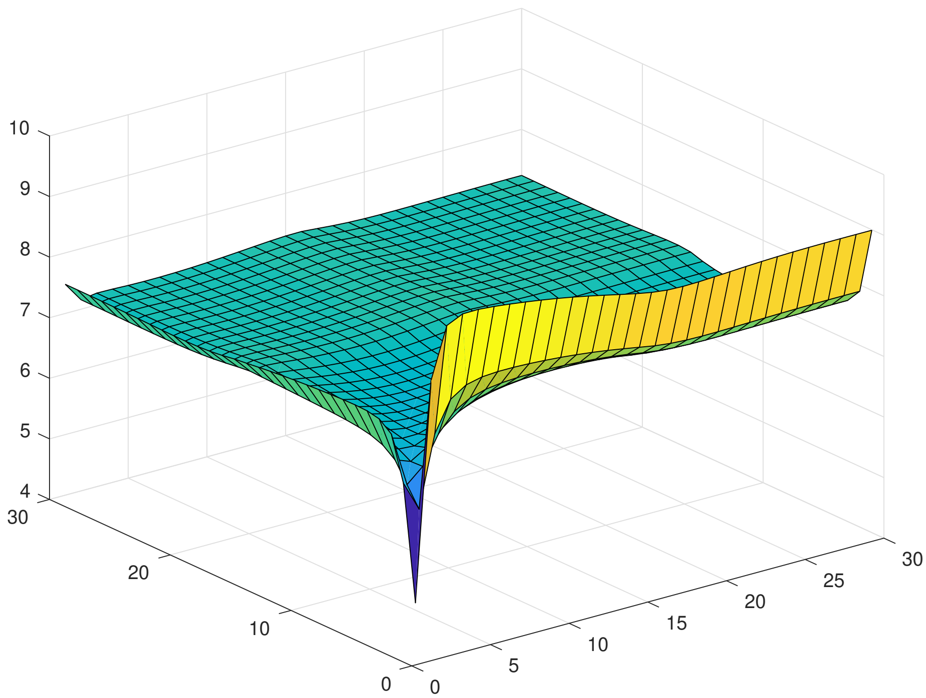
```
diff = 9.2252e-04
```

Plot the Value Function and Policy Function

```
% Value Function Plot
surf(omegas,omegas, Vnew)
```



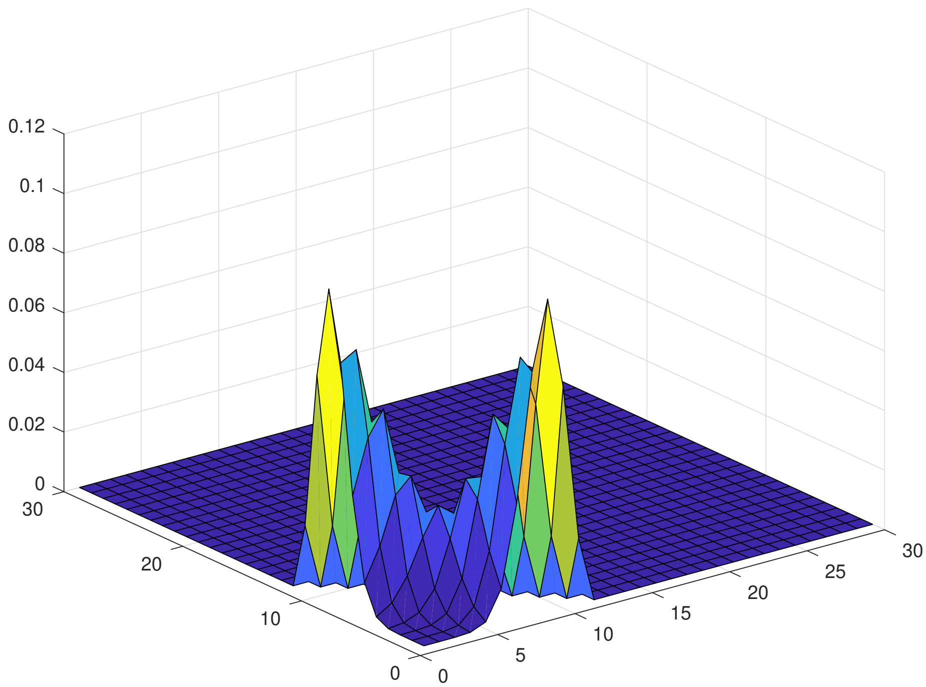

```
% Policy function plot
surf(omegas, omegas, pnew)
```



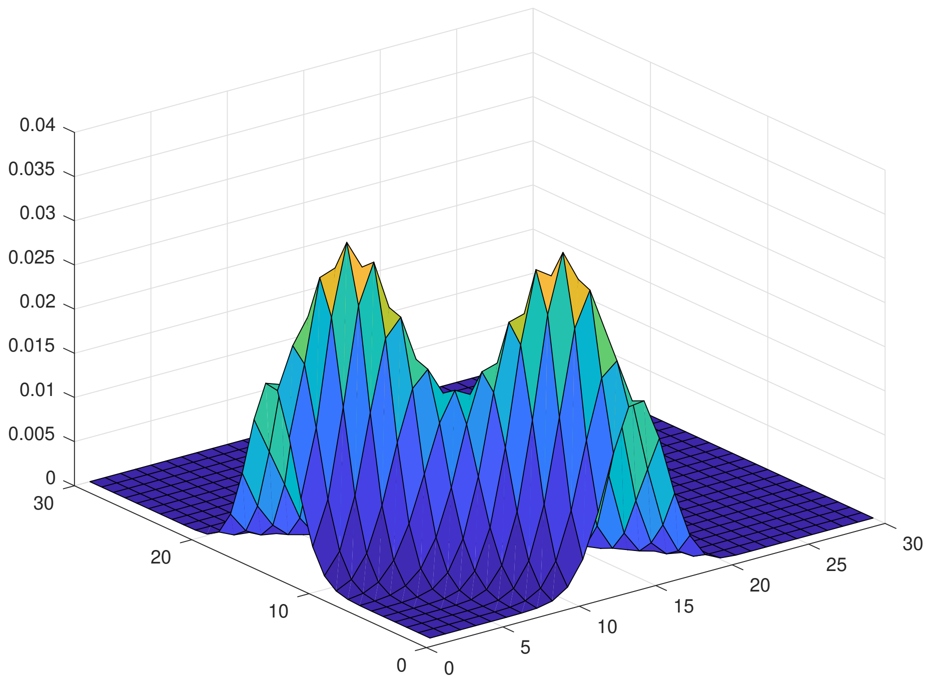
Q2. Starting from state (1,1), plot the distribution of states a three dimensional plot) after 10, 20, and 30 periods.

```
% Calculate D1
D1 = getD(pnew, pnew');

% Calculate D2
D2 = getD(pnew', pnew);

% Calculate D0
D0 = 1./(1 + exp(NU-pnew) + exp(NU-pnew'));

% Convert the D's into ((L*L) x 1) vectors
D1_vector = reshape(D1',L*L,1);
D2_vector = reshape(D2',L*L,1);
D0_vector = reshape(D0',L*L,1);

% Calculate Transition Probabilities for ...
    (q1,q2) = (1,0)
P_1_0 = kron(PI(:,:,2), PI(:,:,1));
```

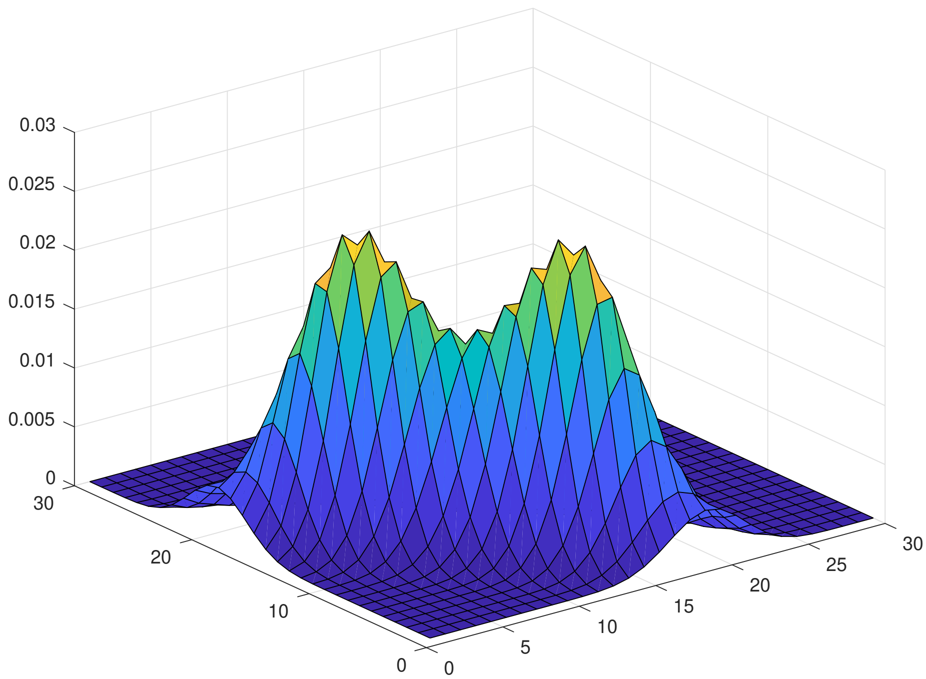
```
% Calculate Transition Probabilities for ...
    (q1,q2) = (0,1)
P_0_1=kron(PI(:,:,1), PI(:,:,2));

% Calculate Transition Probabilities for (q1, ...
    q2) = (0,0)
P_0_0=kron(PI(:,:,1), PI(:,:,1));

% Calculate final transition Probability P
P=D1_vector.*P_1_0 + D2_vector.*P_0_1 + ...
    D0_vector.*P_0_0;

% Create initial distribution
q=zeros(1, L*L);
q(1,1) = 2;

% Distribution of states after 10 periods
q10=q*(P^10);

% As a matrix
q10_matrix=reshape(q10,L,L)';

% Distribution of states after 20 periods
q20=q*(P^20);

% As a matrix
q20_matrix=reshape(q20,L,L)';

% Distribution of states after 30 periods
q30=q*(P^30);

% As a matrix
q30_matrix=reshape(q30,L,L)';

% Plot these distributions

% For q10
surf(omegas, omegas, q10_matrix)
```




```
% For q20
surf(omegas, omegas, q20_matrix)
```




```
% For q30
surf(omegas, omegas, q30_matrix)
```



Compute and plot the stationary distribution of states

```
% Criteria for finding a distribution that ...
    converges to a stationary one
eps_criteria = 1e-5;

% Old distribution
q_old = q;

% New Distribution
q_new = q*(P^300);

% Difference between old and new distribution
diff_dist = max(abs(q_new-q_old));

while diff_dist > eps
     q_old = q_new;
     q_new = q_old*P;
     diff_dist = max(abs(q_new-q_old))
end
```

```
diff_dist = 1.4345e-05
```

```
q_stat=q_new;

% As a matrix
q_stat_matrix=reshape(q_new,L,L)';

% Plot
surf(omegas, omegas, q_stat_matrix);
```