5
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6
Apêndice

```
% RESOLUCAO DO METODO DE BELLMAN VIA ITERACAO DA FUNCAO VALOR

% Todas as variáveis que forem comentadas com * podem ser alteradas

% Definicao dos parametros para iteracao

tolerancia1 = 1e-4;      % * tolerancia absoluta (para V0-V1)
tolerancia2 = 1e-4;      % * tolerancia relativa (para (V0-V1)/V0)
iter_max = 50;         % * numero maximo de iteracoes

% Definicao dos parametros do modelo

k = 0.1;                    % *
delta = 1;                  % *
beta = 0.9;                 % *

% Construcao do grid da variavel de estado x

x_min = -100;                % *
x_max = 100;                 % *
x_inc = 1;                   % *
x = x_min:x_inc:x_max;
n = length(x);

% Construcao do grid do choque w

w_min = -5;                 % *
```

```
    w_max = 5;                  % *
    cte = 100;                  % *
    d = (w_max-w_min)/cte;
    w = w_min:d:w_max;
    m = length(w);

    % Distribuicao Normal para o choque

    C = [3.4 0 ; 0 3.4];       % * matriz de var-cov
    mu = [0 0]';               % * media

    z = zeros(m,m);
    c = 1/(2*pi*sqrt(det(C)));
    S = inv(C);

    for i = 1 : m
        for j = 1 : m
            xvec = [w(j) ; w(i)];
            z(j,i) = d * c * exp(-0.5 * (xvec-mu)' * S *
(xvec-mu)) / normpdf( w(i),mu(2),sqrt(C(2,2)) );
        end
    end

    P = z;                      % matriz de probabilidades

    % Parte nao recursiva da Equacao de Bellman

    for p = 1 : m
        for q = 1 : n
            for d = 1 : n
                F(d,q,p) = -(k/2)*(x(d) - x(q) - w(p))^2 -
(delta/2)*x(d)*min(0,x(d));      % Calcula F
            end
        end
    end

    % Parte recursiva da Equacao de Bellman
```

```
    V0 = zeros(m,n);
    iter = 1;
    teste1 = 1;
    teste2 = 1;

    while ~( teste1 == 0 | teste2 < tolerancia2 | iter >
iter_max)

        for p = 1 : m
            for d = 1 : n
                G(d,:,p) = V0(:,d)'*P(:,p) * ones(1,n);
            end
        end

        [V1 , V1_pos] = max(F + beta*G);

        v = []; v_pos = [];

        for p = 1 : m
            v = [v ; V1(:,:,p)];
            v_pos = [v_pos ; V1_pos(:,:,p)];
        end

        V1 = v;
        V1_pos = v_pos;

        DV = abs(V1-V0);
        teste1 = max(any(abs(V0-V1) > tolerancia1));
            if ( min(min(abs(V0))) ~= 0 )
            teste2 = max(max(abs((V0-V1)./V0)));
        end

        V0 = V1;
        iter = iter + 1;
    end
```

```
    % Calcula u

    u   =   x(V1_pos)'   -   kron(w,ones(length(x),1))   -
kron(x',ones(1,length(w)));

    % Grafico de x0, w, x1

    figure;
    mesh(x,w,x(V1_pos));
    xlabel('X_{0}');
    ylabel('\omega');
    zlabel('X_{1}');

    % Calcula xt e ut

    T = 12;                     % * Dimensao temporal
    x0_pos = 136;               % * x0 inicial

    X(:,1) = V1_pos(:,x0_pos);

    for t = 2 : T
        for i = 1 : m
            X(i,t) = V1_pos(i,X(i,t-1));
            U(i,t-1) = x(X(i,t)) - x(X(i,t-1)) - w(i);
        end
    end

    % Grafico de t, xt, w

    figure;
    mesh(1:T,w,x(X));
    xlabel('t');
    ylabel('\omega');
    zlabel('X_{t}');

    % Grafico de x0, w, u0
```

```
figure;
mesh(x,w,u');
xlabel('X_{0}');
ylabel('\omega');
zlabel('U_{0}');

% Grafico de t, ut, w

figure;
mesh(1:T-1,w,U);
xlabel('t');
ylabel('\omega');
zlabel('U_{t}');

% Define sequencia de choques e respectivos ut para x0
inicial dado acima

%w_pos = unidrnd(m,1,T-1);    % * Define sequencia de
choques possiveis do grid (1 linha, T-1 valores nas colunas,
maximo de m diferentes valores)
w_pos = [42 49 28 3 54 41 57 52 39 37 51 54];

for t = 1 : T-1
    u_T_w(t) = U(w_pos(t),t);
end

% Grafico de t, ut para x0 inicial dado

figure;
plot(1:T-1,u_T_w);
xlabel('t');
ylabel('U_{t}');
```