Unsteady Plot

function zdot = func(t,z)

clc;

W = {0.6 0.0325 -0.5 1.204 1.0662 3.836 0.0004438 0.0115 0.011 0.942 895.10 0.5 1 0.165 0.0455 0.335 0.3};

[span,b,a,rho,MW,MT,Ialpha,Calpha,Ch,Kalpha\_0,Kh,Xalpha,C\_0,C\_1,C\_2,C\_3, C\_4] = deal(W{:});

U = 1.4\*10.902;

Kalpha\_1 = 3.95;

Kalpha\_2 = 107;

Salpha = MW\*Xalpha\*b;

M\_1 = [MT+pi\*rho\*b.^2 Salpha-a\*pi\*rho\*b.^3 0; Salpha-a\*pi\*rho\*b.^3 Ialpha+pi\*(1/8+a^2)\*rho\*b.^4 0; 0 0 1];

D\_1= [Ch+2\*pi\*rho\*b\*U\*(C\_0-C\_1-C\_3) (1+(C\_0-C\_1-C\_3)\*(1-2\*a))\*pi\*rho\*b.^2\*U 2\*pi\*rho\*U.^2\*b\*(C\_1\*C\_2+C\_3\*C\_4); -2\*pi\*(a+ 1/2)\*rho\*b.^2\*(C\_0-C\_1-C\_3)\*U Calpha+(1/2-a)\*(1-(C\_0-C\_1-C\_3)\*(1+2\*a))\*pi\*rho\*b.^3\*U -2\*pi\*rho\*b.^2\*U.^2\*(a+ 1/2)\*(C\_1\*C\_2+C\_3\*C\_4); -1/b a-1/2 (C\_2+C\_4)\*(U/b)];

K\_1 = [Kh 2\*pi\*rho\*b\*U.^2\*(C\_0-C\_1-C\_3) 2\*pi\*rho\*U.^3\*C\_2\*C\_4\*(C\_1+C\_3); 0 Kalpha\_0-2\*pi\*(0.5+a)\*rho\*(C\_0-C\_1-C\_3)\*b.^2\*U.^2 -2\*pi\*rho\*b\*U.^3\*(a+0.5)\*C\_2\*C\_4\*(C\_1+C\_3); 0 -U/b C\_2\*C\_4\*(U.^2)/(b.^2)];

inv\_M\_1 = inv(M\_1);

D\_1\_star = -inv\_M\_1\*D\_1; K\_1\_star = -inv\_M\_1\*K\_1;

B\_U = [0 1 0 0 0 0; K\_1\_star(1,1) D\_1\_star(1,1) K\_1\_star(1,2) D\_1\_star(1,2) K\_1\_star(1,3) D\_1\_star(1,3); 0 0 0 1 0 0; K\_1\_star(2,1) D\_1\_star(2,1) K\_1\_star(2,2) D\_1\_star(2,2) K\_1\_star(2,3) D\_1\_star(2,3); 0 0 0 0 0 1; K\_1\_star(3,1) D\_1\_star(3,1) K\_1\_star(3,2) D\_1\_star(3,2) K\_1\_star(3,3) D\_1\_star(3,3)];

e = eig(B\_U);

[sorted, idx] = sort(real(e));

e = e(idx);

%plot(U,real(e(5)),'b.');

%xlabel('U'); ylabel('Re {\lambda}\_{3}');

% off;

zdot(1) = z(2); zdot(3)= z(4); zdot(5)= z(6);

A = D\_1\_star\*[z(2) z(4) z(6)]' + K\_1\_star\*[z(1) z(3) z(5)]' - inv\_M\_1\*[0 Kalpha\_1\*(z(3)^2) 0]' - inv\_M\_1\* [0 Kalpha\_2\*(z(3)^3) 0]' ;

zdot(2)=A(1); zdot(4)= A(2); zdot(6)= A(3);

zdot = zdot';

[t,x]=ode45('UnsteadyRep',[0 150],[0 .3 0 .3 0 0]);

plot(t,x(:,3))

Quasi-steady

function xdot = func(t,x)

clc;

W = {0.6 0.0325 -0.5 1.204 1.0662 3.836 0.0004438 0.0115 0.011 0.942 895.10 0.5};

[span,b,a,rho,MW,MT,Ialpha,Calpha,Ch,Kalpha\_0,Kh,Xalpha] = deal(W{:});

U = 1.25\*14.35;

Salpha = MW\*Xalpha\*b;

M = [MT+pi\*rho\*b.^2 Salpha-a\*pi\*rho\*b.^3; Salpha-a\*pi\*rho\*b.^3 Ialpha+pi\*(1/8+a^2)\*rho\*b.^4];

D = [Ch+2\*pi\*rho\*b\*U 2\*(1 - a)\*pi\*rho\*b.^2\*U; -2\*pi\*(a + 0.5)\*rho\*b.^2\*U Calpha+a\*(2\*a-1)\*pi\*rho\*b.^3\*U];

K = [Kh 2\*pi\*rho\*b\*U.^2; 0 Kalpha\_0-2\*pi\*(0.5+a)\*rho\*b.^2\*U.^2];

inv\_M = inv(M);

D\_star = -inv\_M\*D; K\_star = -inv\_M\*K;

B\_U = [0 1 0 0; K\_star(1,1) D\_star(1,1) K\_star(1,2) D\_star(1,2); 0 0 0 1; K\_star(2,1) D\_star(2,1) K\_star(2,2) D\_star(2,2)];

e = eig(B\_U);

[sorted, idx] = sort(real(e));

e = e(idx);

% % plot(U,real(e(3)),'b.');

% % xlabel('U'); ylabel('Re {\lambda}\_{3}');

Kalpha\_1 = 3.95;

Kalpha\_2 = 107;

xdot(1) = x(2); xdot(3)= x(4);

A = D\_star\*([x(2) x(4)]') + K\_star\*([x(1) x(3)]')-inv\_M\*([0 Kalpha\_1\*(x(3))^2]') - inv\_M\*([0 Kalpha\_2\*(x(3))^3]') ;

xdot(2)=A(1); xdot(4)= A(2);

xdot = xdot';