

```

1 clear all
2 close all
3
4 % set parameters
5 sigma = 1; % inverse EIS
6 chi = 1; % inverse Frisch
7 beta = 0.99; % discount factor
8 phi = 0.75; % calvo parameters
9 zeta = ((1-phi)*(1-phi*beta))/phi; % slop coefficient in PC
10 psi = 0.2; % government spending share
11 rhoa = 0.9; % AR productivity
12 rhog = 0.9; % AR government spending
13 phipi = 1.5; % taylor rule coefficient
14 gamma = (chi*(1-psi)+sigma)/(1-psi);
15
16 % g shock
17 T = 20; % length of IRFs
18 H = 11; % period when ZLB lifts, peg lenfth is this minus 1
19 g_irf = zeros(T,1);
20 for j = 1:T
21     g_irf(j,1) = rhog^(j-1);
22 end
23 rf_irf = -(sigma/(1-psi))*(psi*chi*(1-psi)/(chi*(1-psi)+sigma))*(rhog-1)*g_irf;
24
25 pi_irf = zeros(T,1);
26 x_irf = zeros(T,1);
27
28 % last period before liftoff
29 x_irf(H-1,1) = ((1-psi)/sigma)*rf_irf(H-1,1);
30 pi_irf(H-1,1) = gamma*zeta*x_irf(H-1,1);
31
32 % now iterate backwards
33 for j = 2:H-1
34     x_irf(H-j,1) = x_irf(H-j+1,1) - ((1-psi)/sigma)*(-pi_irf(H-j+1,1) - rf_irf(H-j));
35     pi_irf(H-j,1) = gamma*zeta*x_irf(H-j,1) + beta*pi_irf(H-j+1,1);
36 end
37
38 i_irf = zeros(T,1);
39 for j = H:T
40     i_irf(j,1) = rf_irf(j,1);
41 end
42
43 yf_irf = (psi*sigma/(chi*(1-psi)+sigma))*g_irf;
44 y_irf = x_irf + yf_irf;
45
46
47
48 % plot optimal and ZLB irfs
49 t = 1:T;
50
51 figure
52 subplot(2,3,1)
53 plot(g_irf, '-k', 'Linewidth', 2)
54 title('g')
55
56 subplot(2,3,2)
57 plot(t, x_irf, 'k', t, zeros(T,1), '--b', 'Linewidth', 2)
58 title('x')
59
60 subplot(2,3,3)
61 plot(t, pi_irf, 'k', t, zeros(T,1), '--b', 'Linewidth', 2)
62 title('\pi')
63
64 subplot(2,3,4)
65 plot(t, i_irf, 'k', t, rf_irf, '--b', 'Linewidth', 2)
66 title('i')
67
68 subplot(2,3,5)
69 plot(t, (1/psi)*y_irf, 'k', t, (1/psi)*yf_irf, '--b', 'Linewidth', 2)

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```

70 title('y')
71 legend('ZLB','No ZLB')
72
73
74 % a shock
75 a_irf = zeros(T,1);
76 for j = 1:T
77     a_irf(j,1) = rhoa^(j-1);
78 end
79 rf_irf2 = (sigma/(1-psi))*( (1+chi)*(1-psi)/(chi*(1-psi)+sigma) )*(rhoa-1)*a_irf;
80
81 pi_irf2 = zeros(T,1);
82 x_irf2 = zeros(T,1);
83
84 % last period before liftoff
85 x_irf2(H-1,1) = ((1-psi)/sigma)*rf_irf2(H-1,1);
86 pi_irf2(H-1,1) = gamma*zeta*x_irf2(H-1,1);
87
88 % now iterate backwards
89 for j = 2:H-1
90     x_irf2(H-j,1) = x_irf2(H-j+1,1) - ( (1-psi)/sigma )*(-pi_irf2(H-j+1,1) -
91         rf_irf2(H-j));
92     pi_irf2(H-j,1) = gamma*zeta*x_irf2(H-j,1) + beta*pi_irf2(H-j+1,1);
93 end
94
95 i_irf2 = zeros(T,1);
96 for j = H:T
97     i_irf2(j,1) = rf_irf2(j,1);
98 end
99
100 yf_irf2 = ( (1+chi)*(1-psi)/(chi*(1-psi)+sigma) )*a_irf;
101 y_irf2 = x_irf2 + yf_irf2;
102
103 figure
104 subplot(2,3,1)
105 plot(a_irf,'-k','Linewidth',2)
106 title('a')
107
108 subplot(2,3,2)
109 plot(t,x_irf2,'k',t,zeros(T,1),'--b','Linewidth',2)
110 title('x')
111
112 subplot(2,3,3)
113 plot(t,pi_irf2,'k',t,zeros(T,1),'--b','Linewidth',2)
114 title('\pi')
115
116 subplot(2,3,4)
117 plot(t,i_irf2,'k',t,rf_irf2,'--b','Linewidth',2)
118 title('i')
119
120 subplot(2,3,5)
121 plot(t,y_irf2,'k',t,yf_irf2,'--b','Linewidth',2)
122 title('y')
123 legend('ZLB','No ZLB')

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