

```

1 clear all
2 close all
3
4 % set parameters
5 beta = 0.995;
6 kappa = 1-40^(-1);
7 spF = 0.03;
8 spB = 0.01;
9 psi = 0.81;
10 epsip = 11;
11 epsiw = 11;
12 alpha = 1/3;
13 delta0 = 0.025;
14 g = 0.2;
15 bb = 0.8;
16 bcs = 0.1; % central bank balance sheet / Y
17 bcbGs = 0.9; % percentage of balance sheet holding government bonds
18 by = 0.5; % steady state government debt / GDP
19 levs = 5;
20 sigma = 0.95;
21
22 % solve for steady state
23 Rds = beta^(-1);
24 RFs = (1+spF)^(1/4)*Rds;
25 RBs = (1+spB)^(1/4)*Rds;
26 Qs = (RFs - kappa)^(-1);
27 QBs = (RBs - kappa)^(-1);
28 M1s = beta/(Qs*(1-beta*kappa));
29 M2s = 1 + (M1s-1)*psi;
30 pws = (epsip-1)/epsip;
31 Ks = (alpha*pws/(M2s*(1/beta - (1-delta0))))^(1/(1-alpha));
32 Ys = Ks^(alpha);
33 Is = delta0*Ks;
34 ws = (1-alpha)*pws*Ks^(alpha);
35 delta1 = (alpha*pws*Ks^(alpha-1)/M2s);
36 Cs = (1-g)*Ys - Is;
37 mus = (1/Cs)*(1-beta*bb)/(1-bb);
38 mrss = ((epsiw-1)/epsiw)*ws;
39 chi = mus*mrss;
40 fws = psi*Is/(Qs*(1-kappa));
41 res = bcs*Ys;
42 bcbs = bcbGs*res/QBs;
43 fcbs = (res - QBs*bcbs)/Qs;
44 fs = fws - fcbs;
45 bGs = by*Ys/QBs;
46 bs = bGs - bcbs;
47 ns = (Qs*fs + QBs*bs + res)/levs;
48 ds = Qs*fs + QBs*bs + res - ns;
49 Delta = (RBs - Rds)/(RFs - Rds);
50 phis = (Qs*fs + Delta*QBs*bs)/ns;
51 thetas = (1 - sigma + phis*beta*(1-sigma)*(RFs - Rds))/((1-sigma)*phis -
beta*sigma*phis^2*(RFs - Rds));
52 X = ns - sigma*( (RFs-Rds)*Qs*fs + (RBs - Rds)*QBs*bs + Rds*ns);
53 Omegas = 1 - sigma + sigma*phis*thetas;
54 lams = (thetas/(beta*(RFs - Rds)*(1-sigma + sigma*phis*thetas)) - 1)^(-1);
55
56 % parameters unrelated to steady state
57 phip = 0.75;
58 phiw = 0.75;
59 psik = 2; % capital adjustment cost
60 delta2 = 0.01; % squared term capital adjustment cost
61 eta = 1; % Frisch elasticity
62
63 % Taylor rule
64 rhor = 0.8;
65 phipi = 1.5;
66 phiy = 0.15;
67 sr = 0.0025;
68

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69 % Shock processes
70 rhof = 0.97;
71 rhob = 0.97;
72 sf = 0.01;
73 sb = 0.01;
74 rhoA = 0.9;
75 sA = 0.01;
76 rhot = 0.95;
77 st = 0.01;
78 rhoG = 0.9;
79 sG = 0.01;
80 rhoB = 0.9;
81 sB = 0.9;
82
83
84
85 save param_sw beta kappa spF spB psi epsip epsiw alpha delta0 g bb bcs bcbGs by levs
sigma Rds RFs RBs Qs QBs M1s M2s pws Ks Ys Is ws delta1 Cs mus mrss chi fws res bcbs
fcbs fs bGs bs ns ds Delta phis thetas X Omegas lams phip phiw psik delta2 eta rhor
phipi phiy sr rhof rhob sf sb rhoA sA rhot st rhoG sG rhoB sB
86
87
88 dynare sw_2020 noclearall nolog
89
90
91 figure
92 subplot(3,3,1)
93 plot(fcb_ef, '-k', 'Linewidth', 1.5)
94 title('f_{cb}')
95
96 subplot(3,3,2)
97 plot(logY_ef, '-k', 'Linewidth', 1.5)
98 title('Y')
99
100 subplot(3,3,3)
101 plot(logC_ef, '-k', 'Linewidth', 1.5)
102 title('C')
103
104 subplot(3,3,4)
105 plot(logI_ef, '-k', 'Linewidth', 1.5)
106 title('I')
107
108 subplot(3,3,5)
109 plot(logLd_ef, '-k', 'Linewidth', 1.5)
110 title('L_{d}')
111
112 subplot(3,3,6)
113 plot(logPi_ef, '-k', 'Linewidth', 1.5)
114 title('\pi')
115
116 subplot(3,3,7)
117 plot(logRd_ef, '-k', 'Linewidth', 1.5)
118 title('r^{d}')
119
120 subplot(3,3,8)
121 plot(logQ_ef, '-k', 'Linewidth', 1.5)
122 title('Q')
123
124 subplot(3,3,9)
125 plot(exr_ef, '-k', 'Linewidth', 1.5)
126 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
127 legend('Private QE')
128
129 figure
130 subplot(3,3,1)
131 plot(bcb_eb, '-k', 'Linewidth', 1.5)
132 title('b_{cb}')
133
134 subplot(3,3,2)

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135 plot(logY_eb, '-k', 'Linewidth', 1.5)
136 title('Y')
137
138 subplot(3,3,3)
139 plot(logC_eb, '-k', 'Linewidth', 1.5)
140 title('C')
141
142 subplot(3,3,4)
143 plot(logI_eb, '-k', 'Linewidth', 1.5)
144 title('I')
145
146 subplot(3,3,5)
147 plot(logLd_eb, '-k', 'Linewidth', 1.5)
148 title('L_{d}')
149
150 subplot(3,3,6)
151 plot(logPi_eb, '-k', 'Linewidth', 1.5)
152 title('\pi')
153
154 subplot(3,3,7)
155 plot(logRd_eb, '-k', 'Linewidth', 1.5)
156 title('r^{d}')
157
158 subplot(3,3,8)
159 plot(logQ_eb, '-k', 'Linewidth', 1.5)
160 title('Q')
161
162 subplot(3,3,9)
163 plot(exr_eb, '-k', 'Linewidth', 1.5)
164 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
165 legend('Public QE')
166
167
168 figure
169 subplot(3,3,1)
170 plot(theta_et, '-k', 'Linewidth', 1.5)
171 title('\theta')
172
173 subplot(3,3,2)
174 plot(logY_et, '-k', 'Linewidth', 1.5)
175 title('Y')
176
177 subplot(3,3,3)
178 plot(logC_et, '-k', 'Linewidth', 1.5)
179 title('C')
180
181 subplot(3,3,4)
182 plot(logI_et, '-k', 'Linewidth', 1.5)
183 title('I')
184
185 subplot(3,3,5)
186 plot(logLd_et, '-k', 'Linewidth', 1.5)
187 title('L_{d}')
188
189 subplot(3,3,6)
190 plot(logPi_et, '-k', 'Linewidth', 1.5)
191 title('\pi')
192
193 subplot(3,3,7)
194 plot(logRd_et, '-k', 'Linewidth', 1.5)
195 title('r^{d}')
196
197 subplot(3,3,8)
198 plot(logQ_et, '-k', 'Linewidth', 1.5)
199 title('Q')
200
201 subplot(3,3,9)
202 plot(exr_et, '-k', 'Linewidth', 1.5)
203 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')

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204 legend('Credit Shock')
205
206 figure
207 subplot(3,3,1)
208 plot(bG_eB, '-k', 'Linewidth',1.5)
209 title('b_{G}')
210
211 subplot(3,3,2)
212 plot(logY_eB, '-k', 'Linewidth',1.5)
213 title('Y')
214
215 subplot(3,3,3)
216 plot(logC_eB, '-k', 'Linewidth',1.5)
217 title('C')
218
219 subplot(3,3,4)
220 plot(logI_eB, '-k', 'Linewidth',1.5)
221 title('I')
222
223 subplot(3,3,5)
224 plot(logLd_eB, '-k', 'Linewidth',1.5)
225 title('L_{d}')
226
227 subplot(3,3,6)
228 plot(logPi_eB, '-k', 'Linewidth',1.5)
229 title('\pi')
230
231 subplot(3,3,7)
232 plot(logRd_eB, '-k', 'Linewidth',1.5)
233 title('r^{d}')
234
235 subplot(3,3,8)
236 plot(logQ_eB, '-k', 'Linewidth',1.5)
237 title('Q')
238
239 subplot(3,3,9)
240 plot(exr_eB, '-k', 'Linewidth',1.5)
241 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
242 legend('Gov. Debt Shock')
243
244 figure
245 subplot(3,3,1)
246 plot(G_eG, '-k', 'Linewidth',1.5)
247 title('G')
248
249 subplot(3,3,2)
250 plot(logY_eG, '-k', 'Linewidth',1.5)
251 title('Y')
252
253 subplot(3,3,3)
254 plot(logC_eG, '-k', 'Linewidth',1.5)
255 title('C')
256
257 subplot(3,3,4)
258 plot(logI_eG, '-k', 'Linewidth',1.5)
259 title('I')
260
261 subplot(3,3,5)
262 plot(logLd_eG, '-k', 'Linewidth',1.5)
263 title('L_{d}')
264
265 subplot(3,3,6)
266 plot(logPi_eG, '-k', 'Linewidth',1.5)
267 title('\pi')
268
269 subplot(3,3,7)
270 plot(logRd_eG, '-k', 'Linewidth',1.5)
271 title('r^{d}')
272

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```

273 subplot(3,3,8)
274 plot(logQ_eG, '-k', 'Linewidth',1.5)
275 title('Q')
276
277 subplot(3,3,9)
278 plot(exr_eG, '-k', 'Linewidth',1.5)
279 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
280 legend('Gov. Spending Shock')
281
282 figure
283 subplot(3,3,1)
284 plot(A_eA, '-k', 'Linewidth',1.5)
285 title('A')
286
287 subplot(3,3,2)
288 plot(logY_eA, '-k', 'Linewidth',1.5)
289 title('Y')
290
291 subplot(3,3,3)
292 plot(logC_eA, '-k', 'Linewidth',1.5)
293 title('C')
294
295 subplot(3,3,4)
296 plot(logI_eA, '-k', 'Linewidth',1.5)
297 title('I')
298
299 subplot(3,3,5)
300 plot(logLd_eA, '-k', 'Linewidth',1.5)
301 title('L_{d}')
302
303 subplot(3,3,6)
304 plot(logPi_eA, '-k', 'Linewidth',1.5)
305 title('\pi')
306
307 subplot(3,3,7)
308 plot(logRd_eA, '-k', 'Linewidth',1.5)
309 title('r^{d}')
310
311 subplot(3,3,8)
312 plot(logQ_eA, '-k', 'Linewidth',1.5)
313 title('Q')
314
315 subplot(3,3,9)
316 plot(exr_eA, '-k', 'Linewidth',1.5)
317 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
318 legend('Productivity Shock')
319
320
321 figure
322 subplot(3,3,1)
323 plot(logRd_er, '-k', 'Linewidth',1.5)
324 title('r^{d}')
325
326 subplot(3,3,2)
327 plot(logY_er, '-k', 'Linewidth',1.5)
328 title('Y')
329
330 subplot(3,3,3)
331 plot(logC_er, '-k', 'Linewidth',1.5)
332 title('C')
333
334 subplot(3,3,4)
335 plot(logI_er, '-k', 'Linewidth',1.5)
336 title('I')
337
338 subplot(3,3,5)
339 plot(logLd_er, '-k', 'Linewidth',1.5)
340 title('L_{d}')
341

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```
342 subplot(3,3,6)
343 plot(logPi_er, '-k', 'Linewidth', 1.5)
344 title('\pi')
345
346 subplot(3,3,7)
347 plot(logQ_er, '-k', 'Linewidth', 1.5)
348 title('Q')
349
350 subplot(3,3,8)
351 plot(exr_er, '-k', 'Linewidth', 1.5)
352 title('E_{t}r_{t+1}^{F} - r_{t}^{d}')
353 legend('Monetary Shock')
354
```