Dynamic behavior of the model

Round: 2024 March main round, time: 10-Mar-2024 22:48:33.

1 Steady states

|	
Consumption gap, % [l_cons_gap]	−0.00
Investment gap, % [l_inv_gap]	−0.00
Gov. demand gap, % [l_gdem_gap]	0.00
Export gap, % [l_exp_gap]	−0.00
Output gap, % [l_y_gap]	−0.00
Real exchng. rate gap, % [l_z_gap]	−0.00
RIR (policy) gap, % [r_gap]	0.00
RMC, % [rmc]	−0.00
Budget deficit, % of GDP [def_y]	11.00
Struct. deficit, % of GDP [def_y_str]	11.00
Discr. deficit, % of GDP [def_y_discr]	0.00
Fiscal grants, % of GDP [grants_y]	5.00
Core rel. price gap, % [l_rp_cpi_core_gap]	0.00
Food rel. price gap, % [l_rp_cpi_food_gap]	−0.00
Energy rel. price gap, % [l_rp_cpi_ener_gap]	0.00
Lending premium gap, % [prem_d_gap]	0.00
Inflation target, YY % [d4l_cpi_tar]	4.88
Headline CPI, ann. QQ % [dl_cpi]	4.88
Core CPI, ann. QQ % [dl_cpi_core]	4.48
Food CPI, ann. QQ % [dl_cpi_food]	6.86
Energy CPI, ann. QQ % [dl_cpi_ener]	4.88
Policy rate (IB rate used), % [i]	6.48
Policy rate tnd (IB rate used), % [i_tnd]	6.48
Real interest (policy) rate, % [r]	2.00
RIR (policy) trend, % [r_tnd]	2.00
Core rel. price tnd., ann. QQ % [dl_rp_cpi_core_tnd]	−0.40
Food rel. price tnd., ann. QQ % [dl_rp_cpi_food_tnd]	1.98
Energy rel. price tnd., ann. QQ % [dl_rp_cpi_ener_tnd]	0.00

2 Impulse response functions
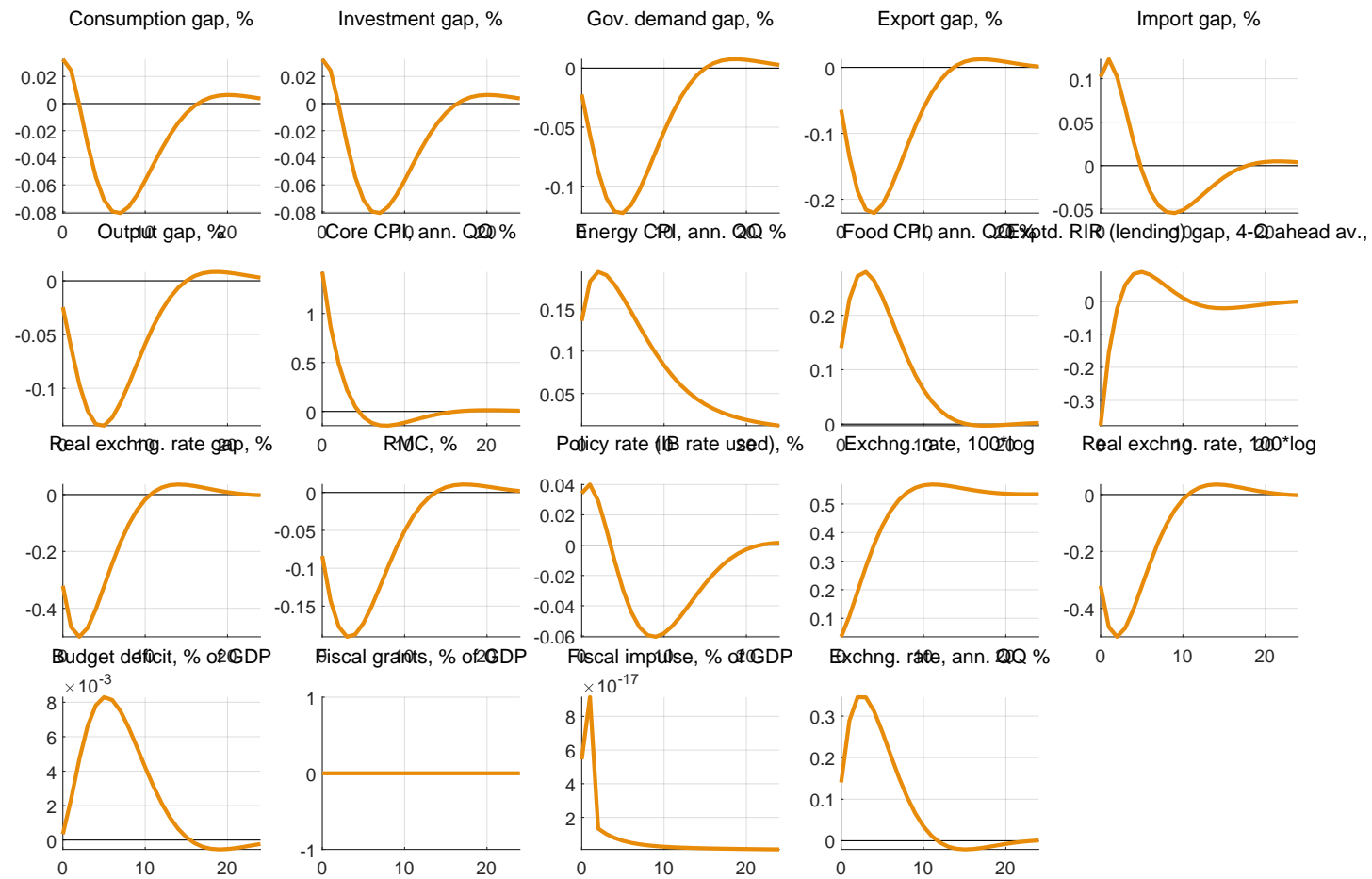
Responses to Cons. gap shock, % [shock_l_cons_gap]
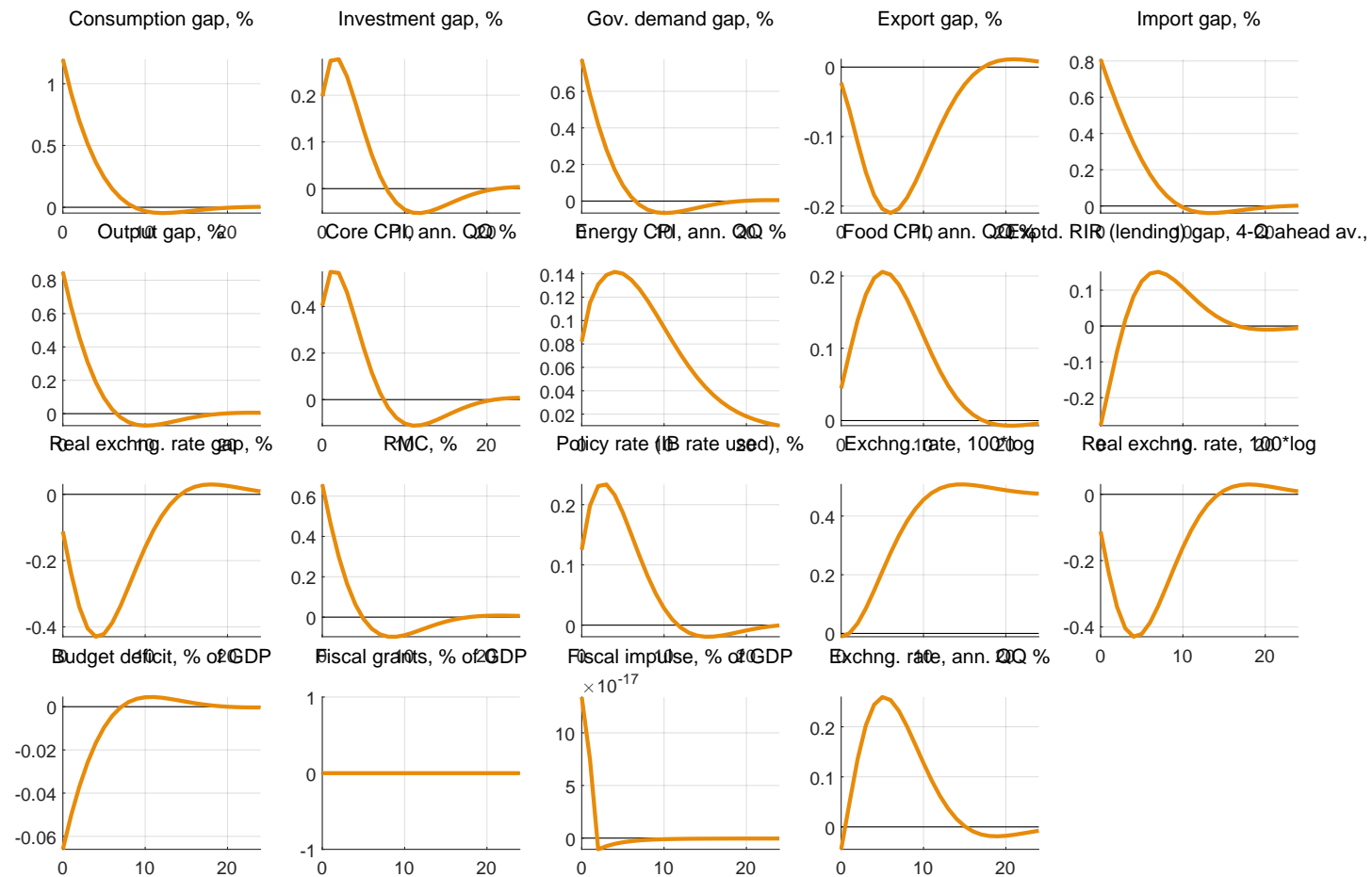
Responses to Inv. gap shock, % [shock_l_inv_gap]
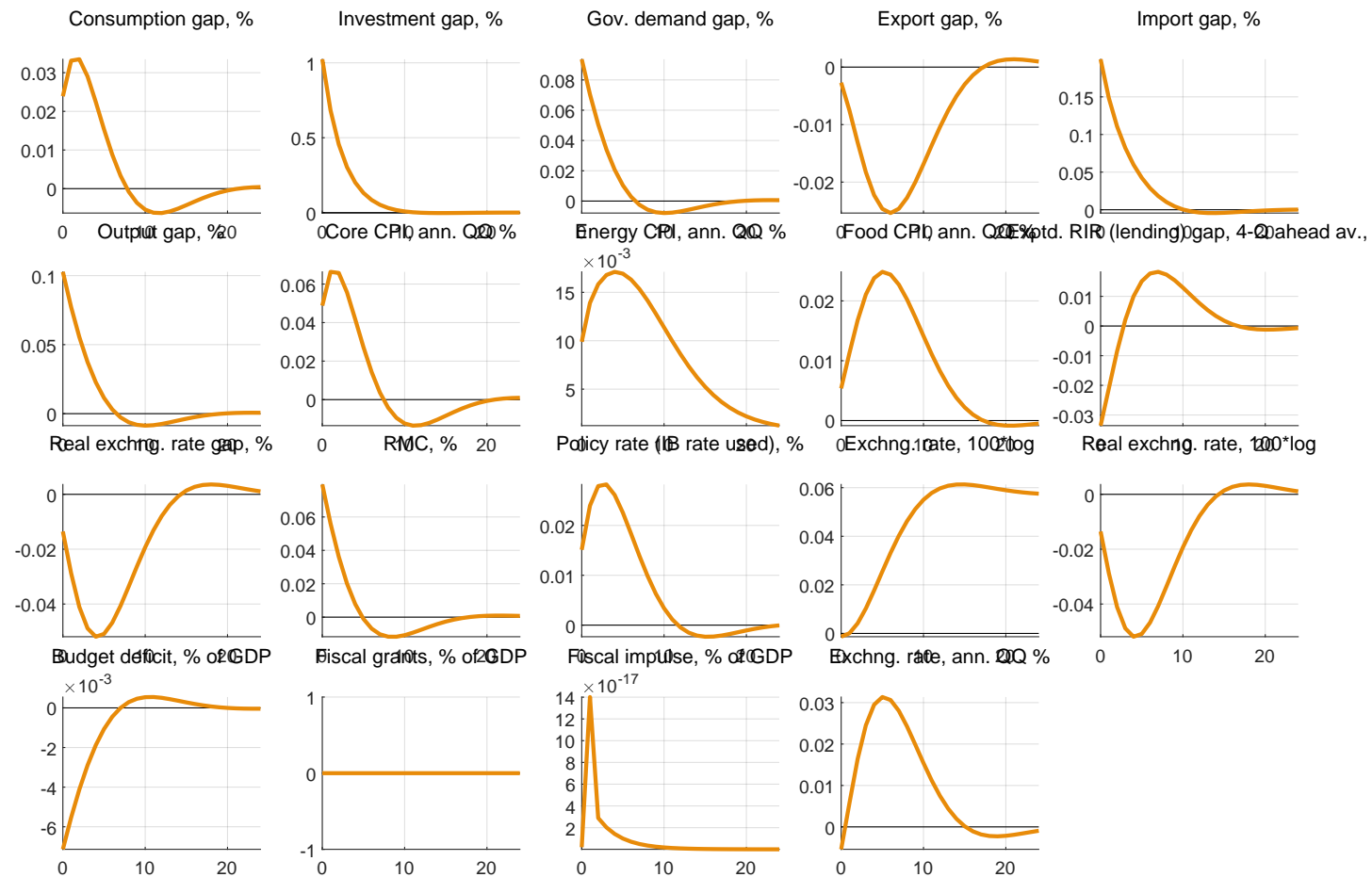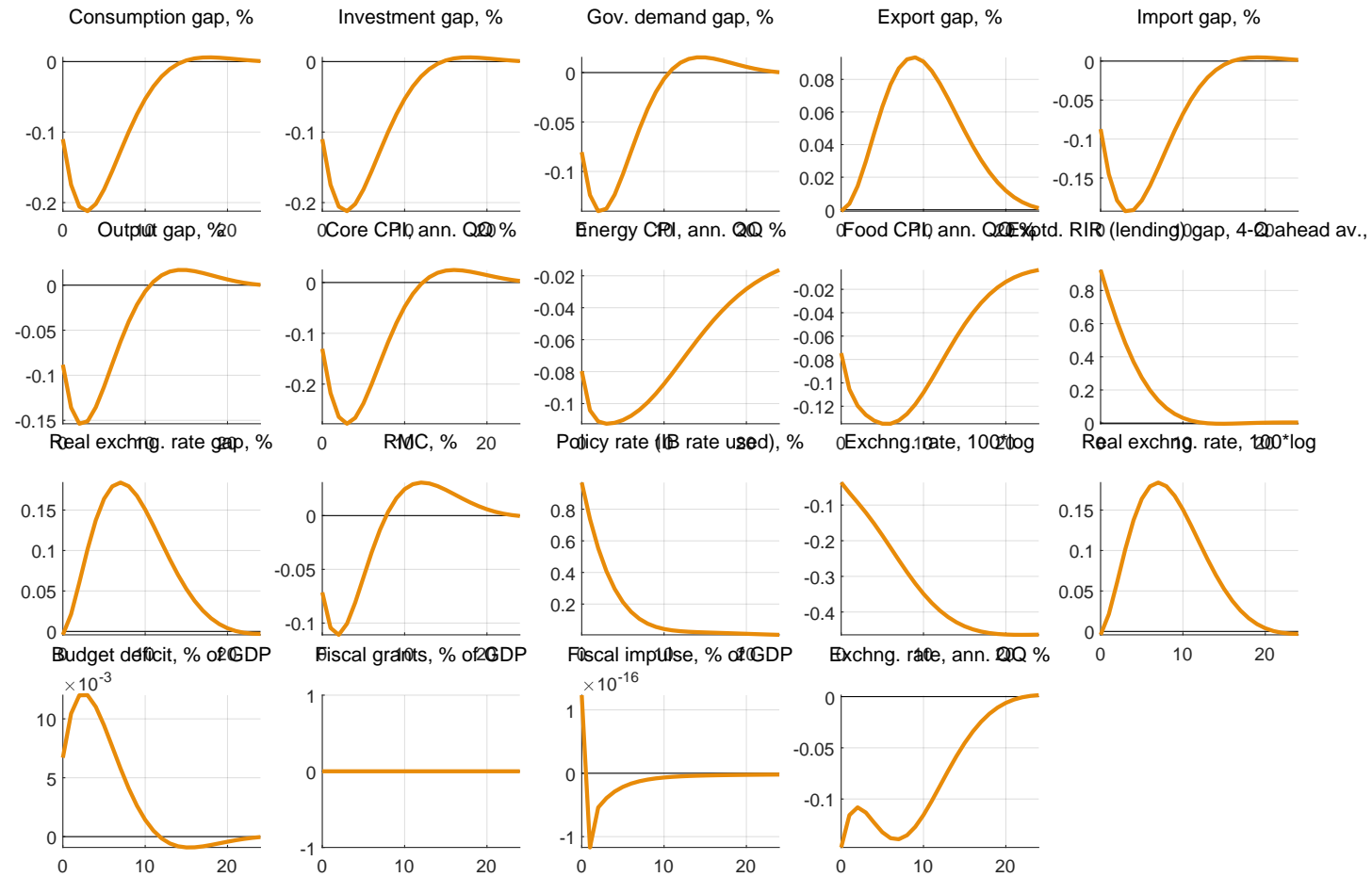
Responses to Export gap shock, % [shock_l_exp_gap]
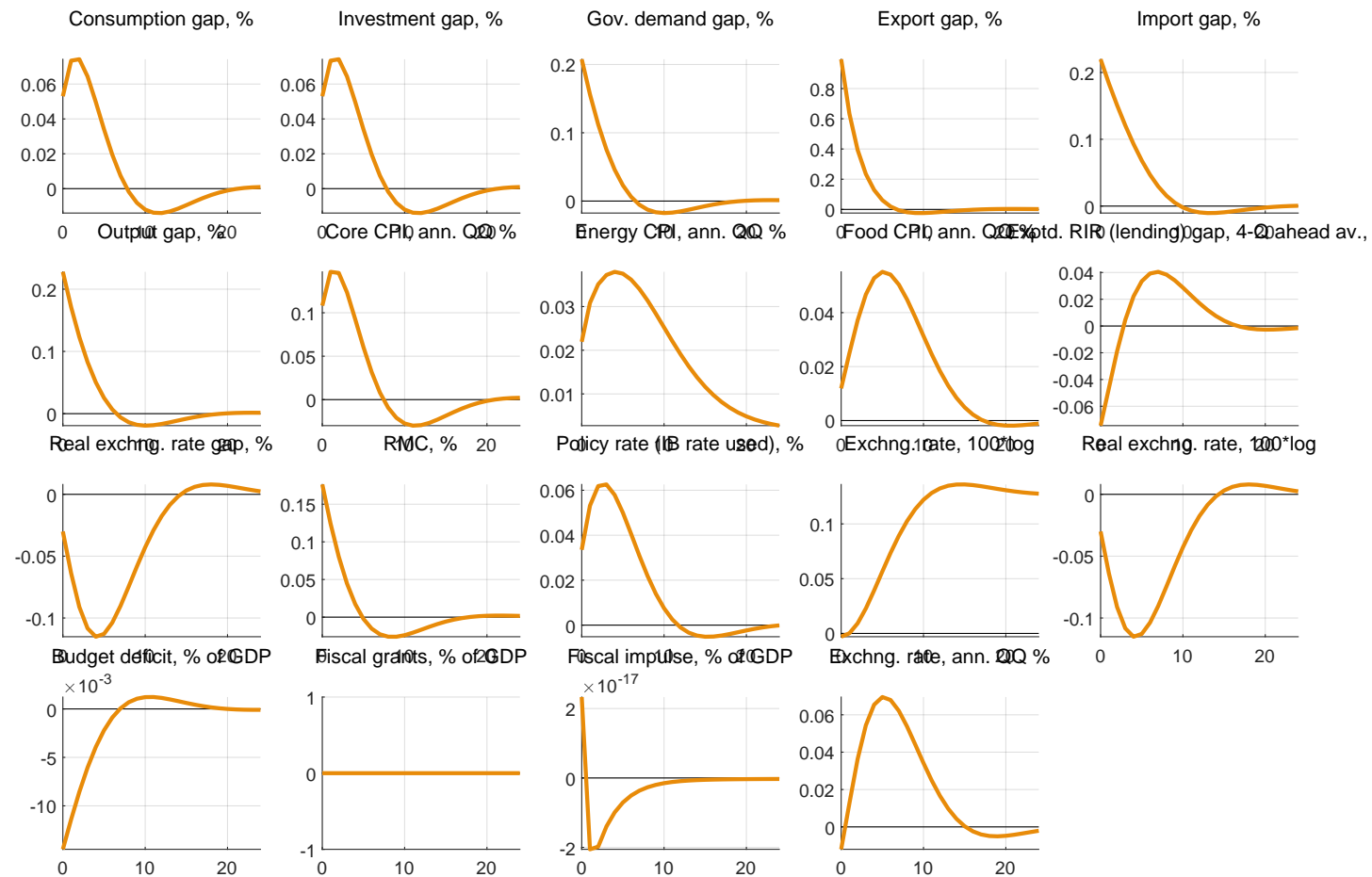
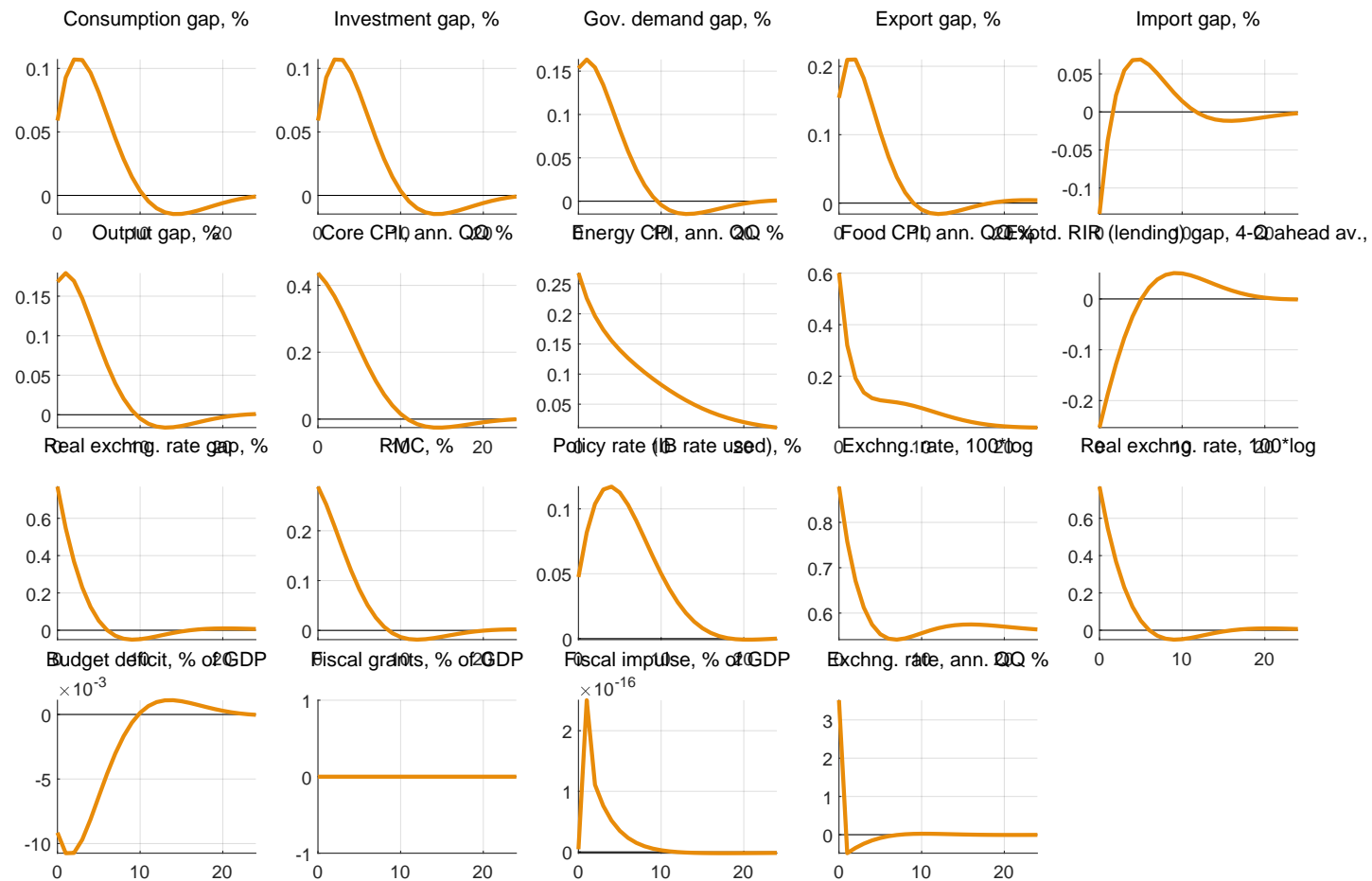## Responses to Core infl. shock, ann. QQ % [shock_dl_cpi_core]
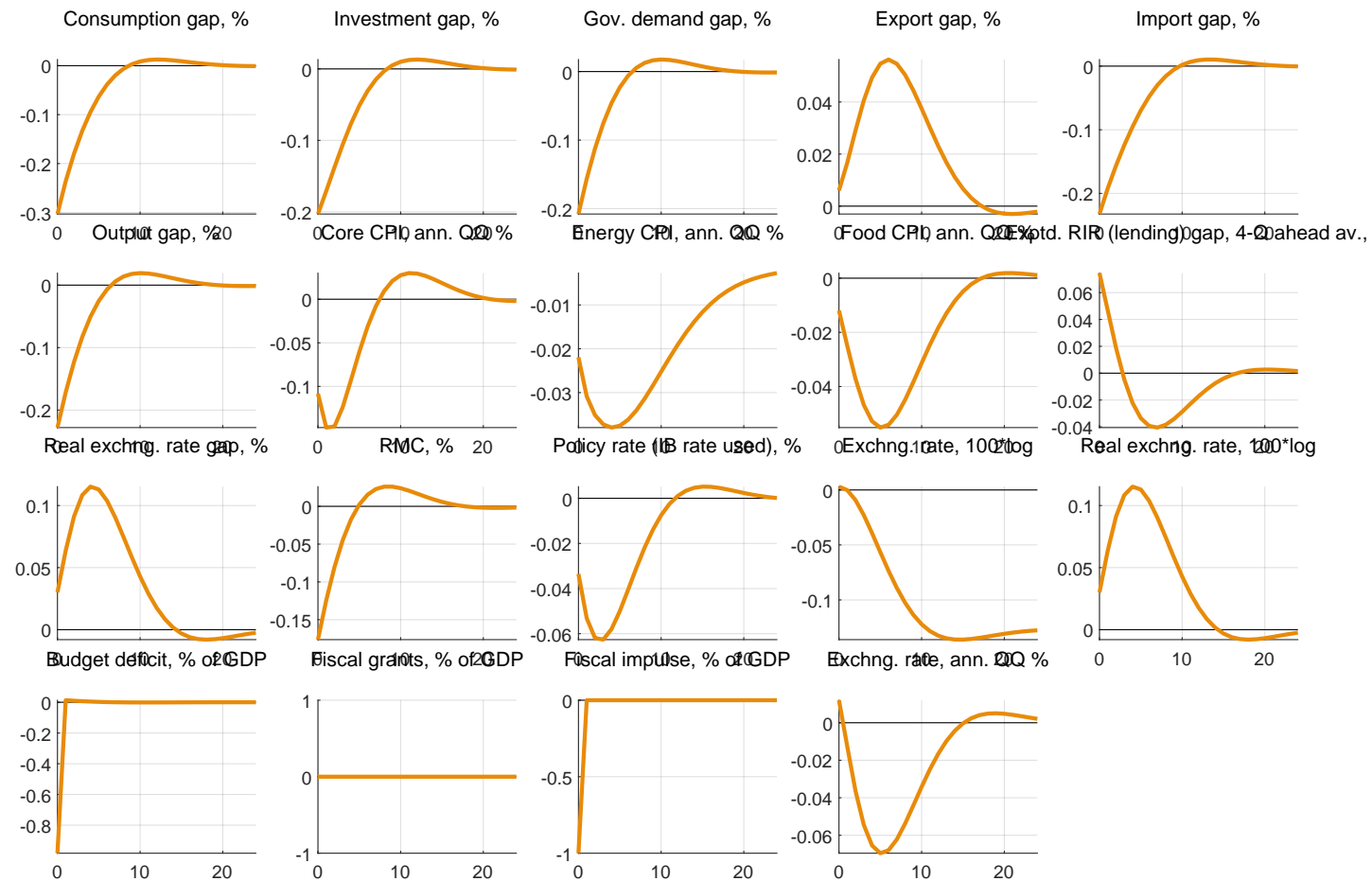
Responses to Policy rate shock, % [shock_i]

Responses to Exchng. rate shock, 100*log [shock_l_s]

Responses to Gov rev. discr. shock, % of GDP [shock_grev_y_discr]

Responses to Gdem. discr. shock, % of GDP [shock_gdem_y_discr]
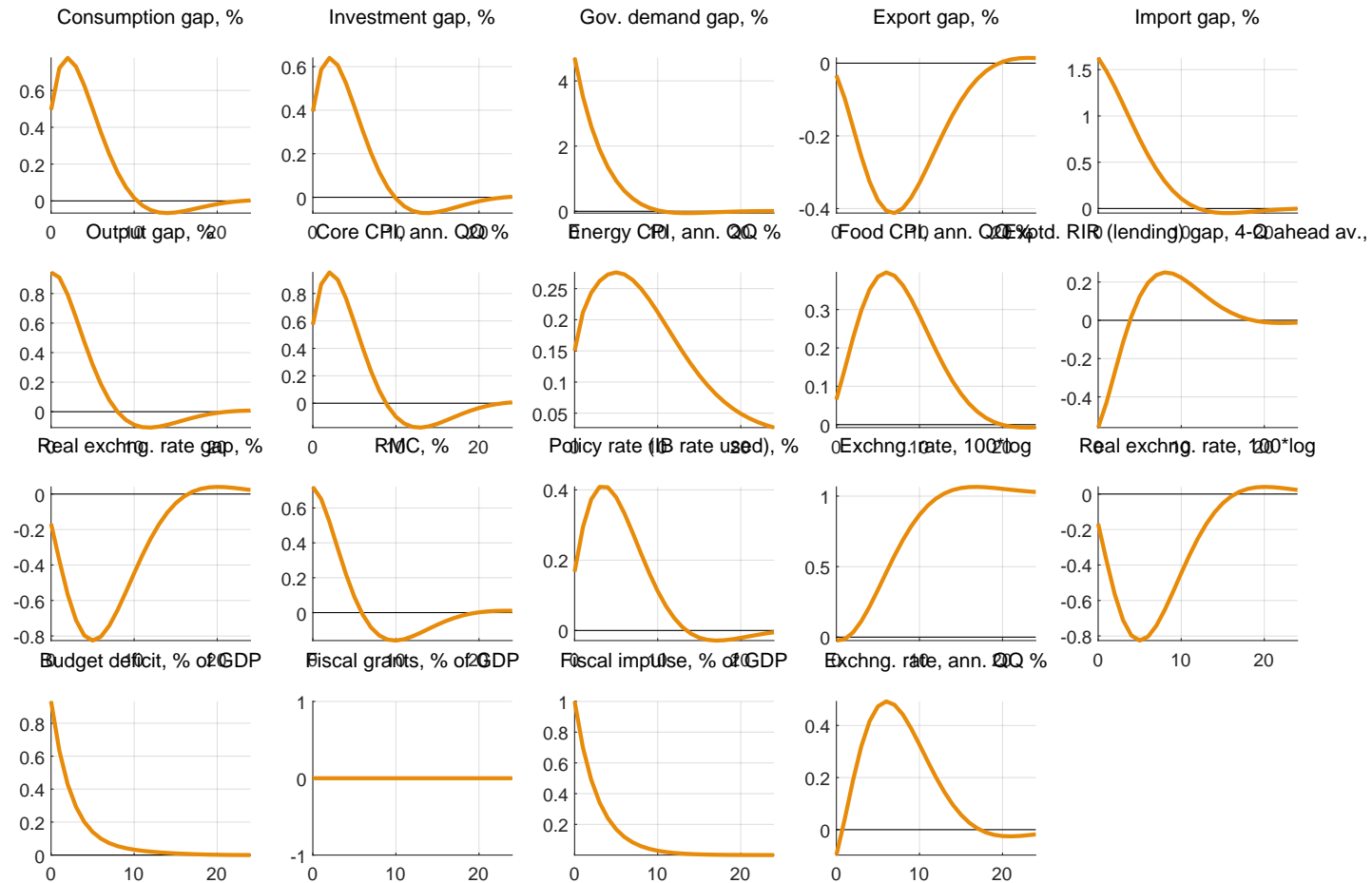
Responses to Gov exp. discr. shock, % of GDP [shock_oexp_y_discr]
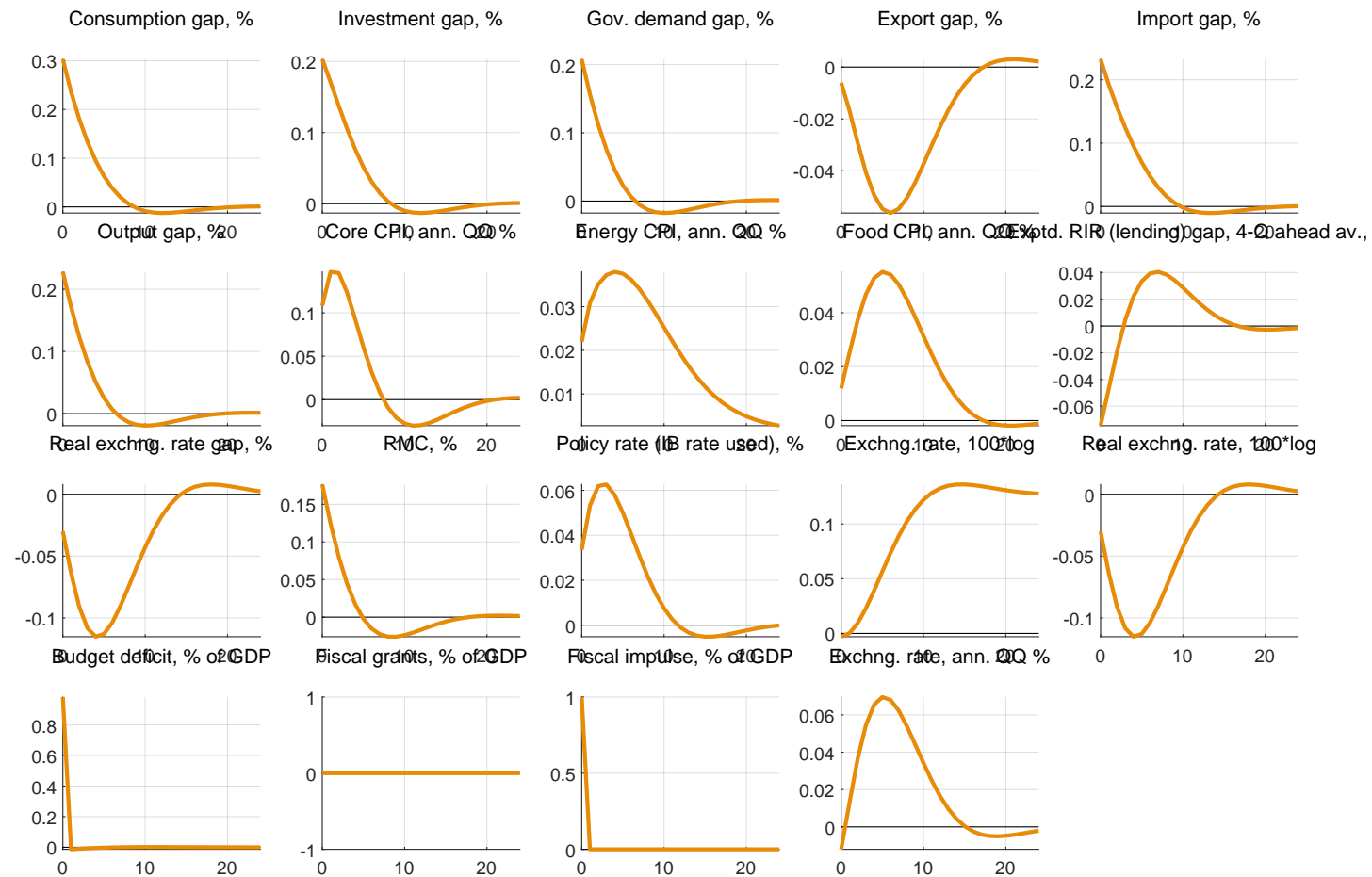
Responses to Fiscal grants, % of GDP [shock_grants_y]
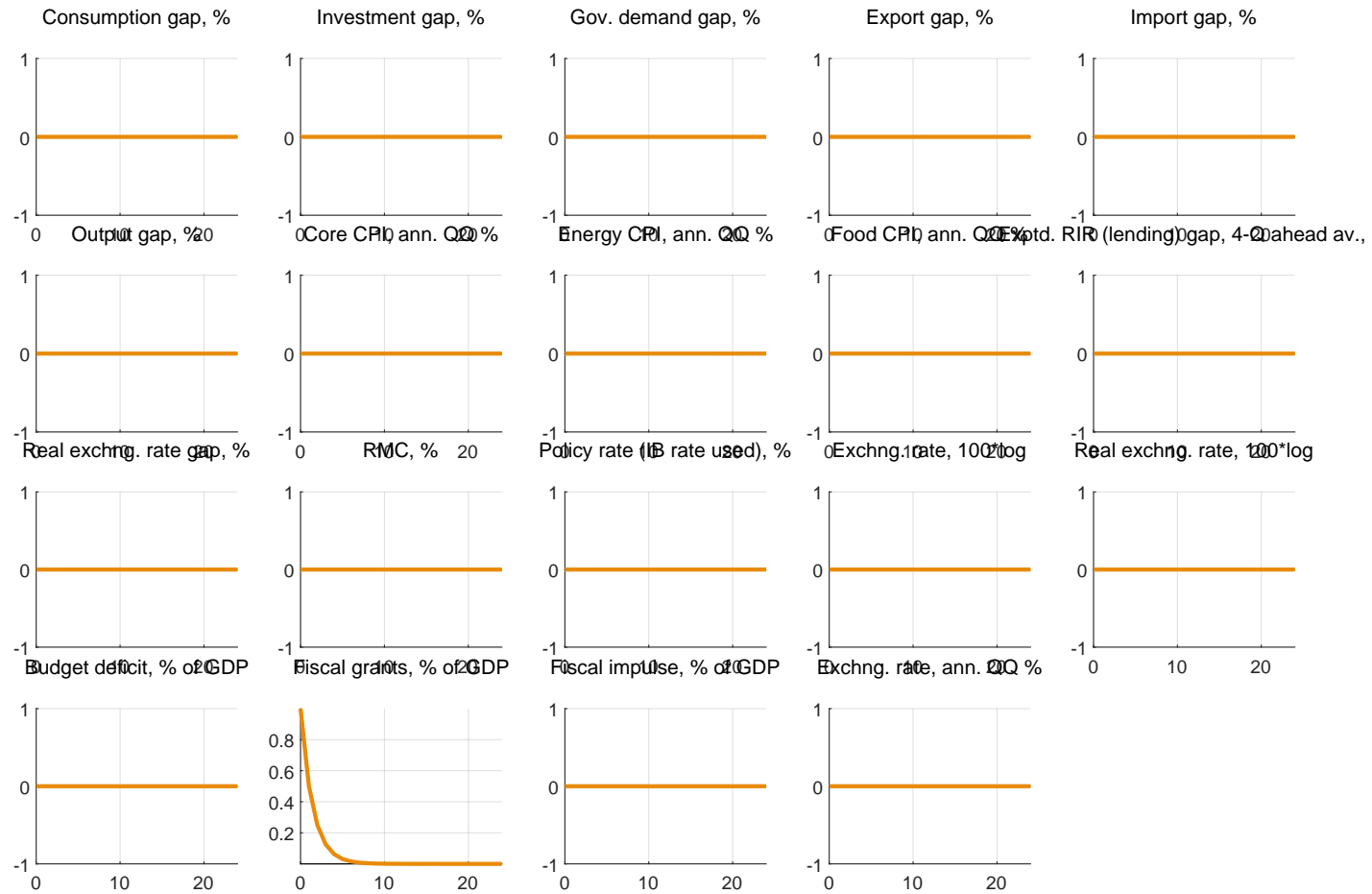
Responses to Foreign intr. rate shock, % [shock_istar]
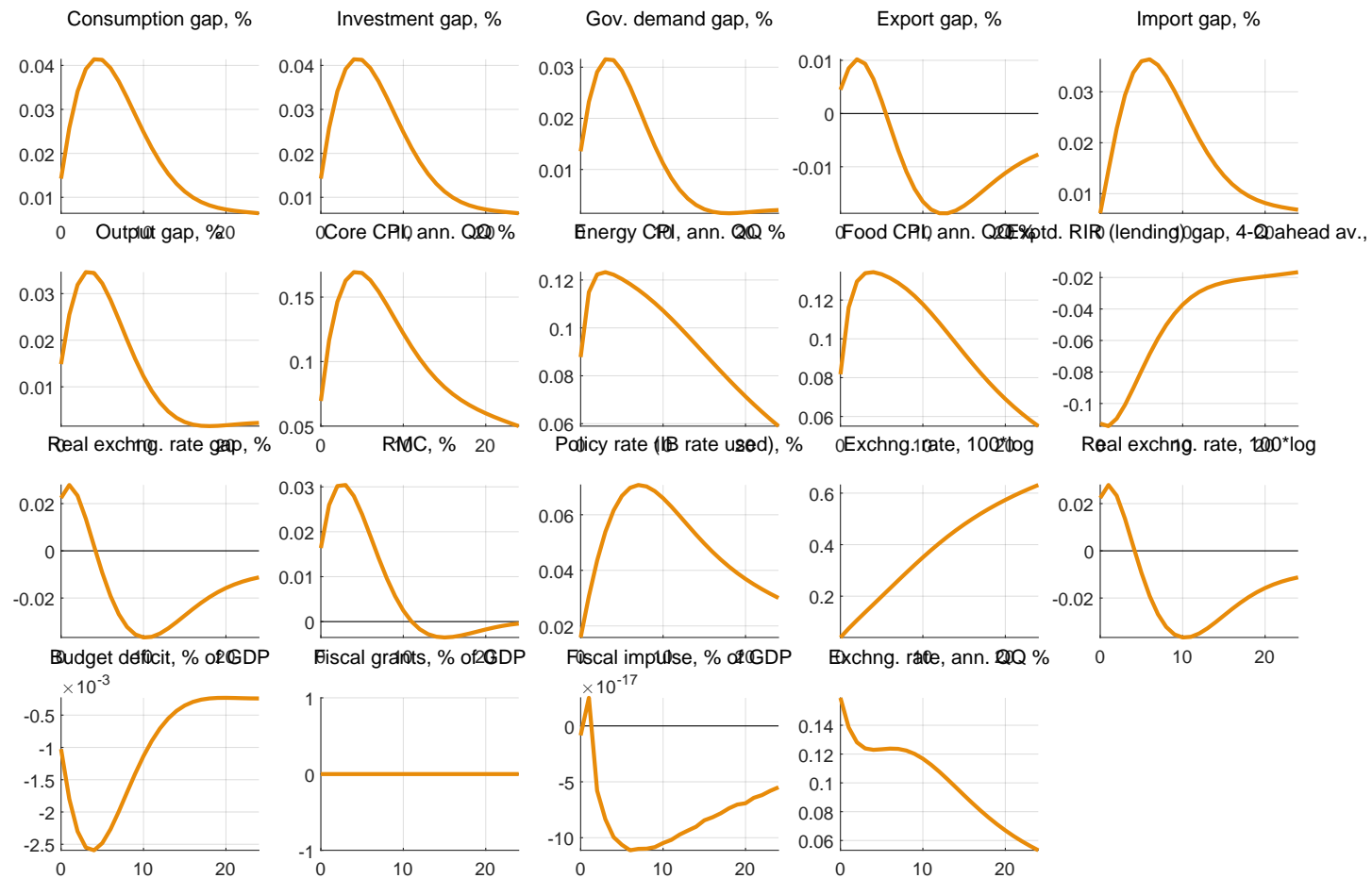
Responses to Foreign CPI shock, ann. QQ % [shock_dl_cpistar]
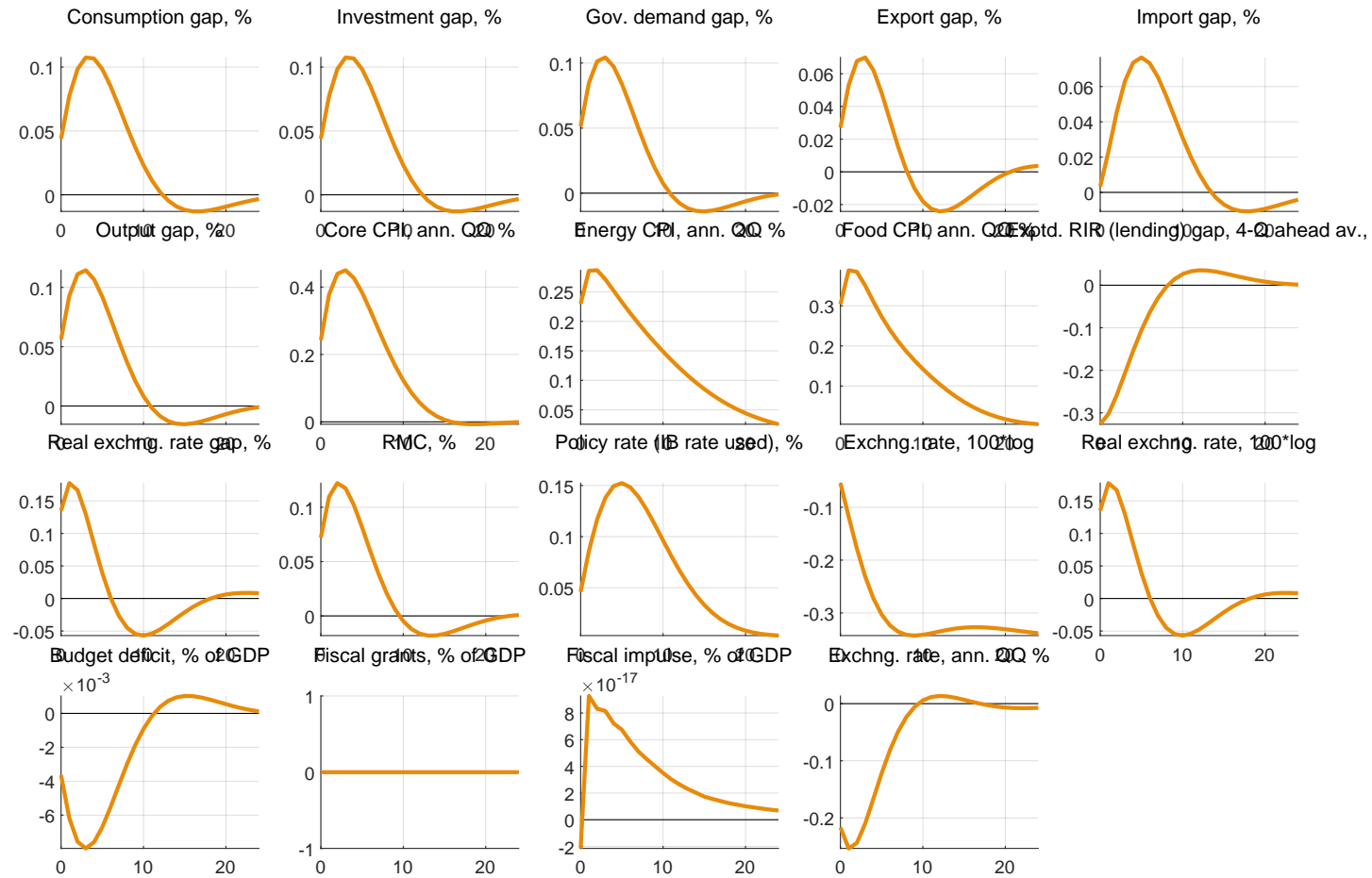
Responses to Foreign rel. food price gap shock, % [shock_l_rp_foodstar_gap]
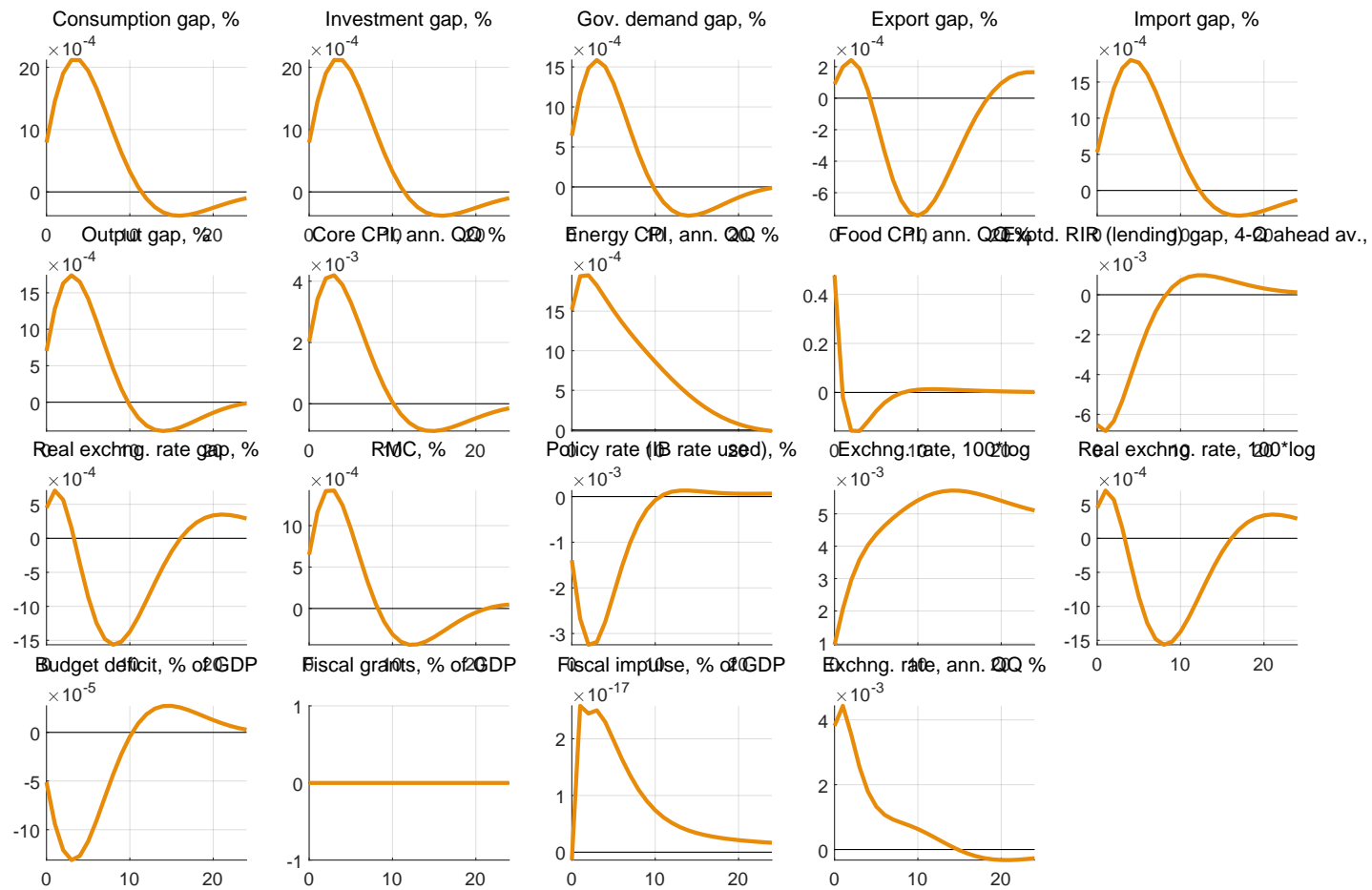
Responses to Foreign rel. ener. price gap shock, % [shock_l_rp_enerstar_gap]
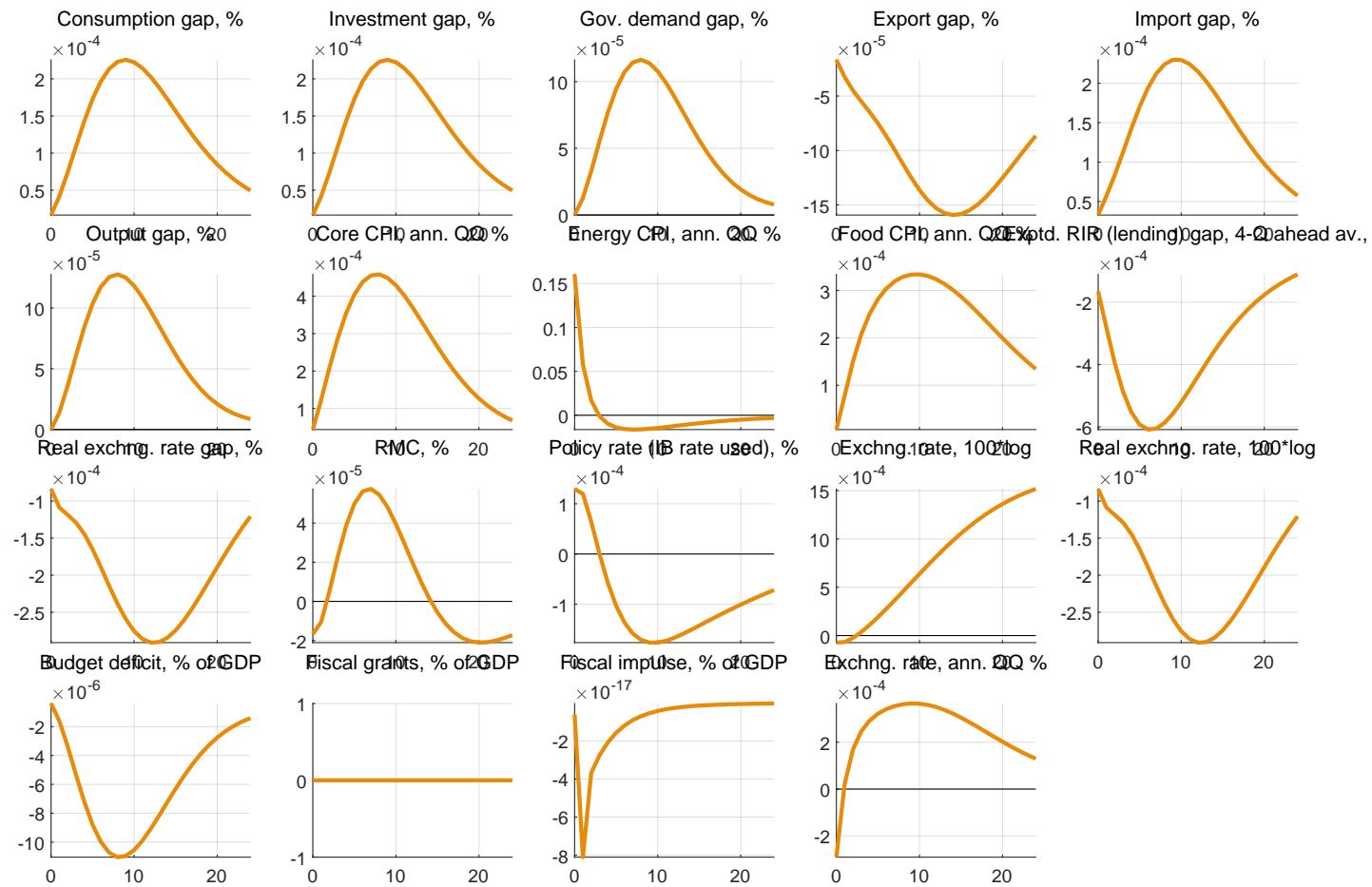
3   Variance decomposition

Budget deficit, % of GDP [def_y]
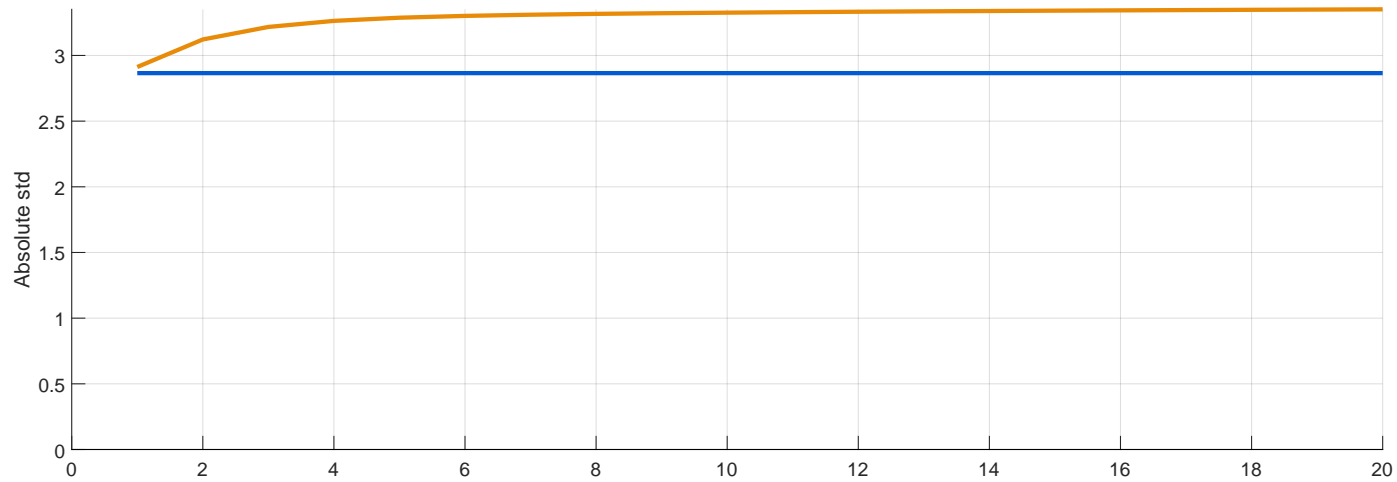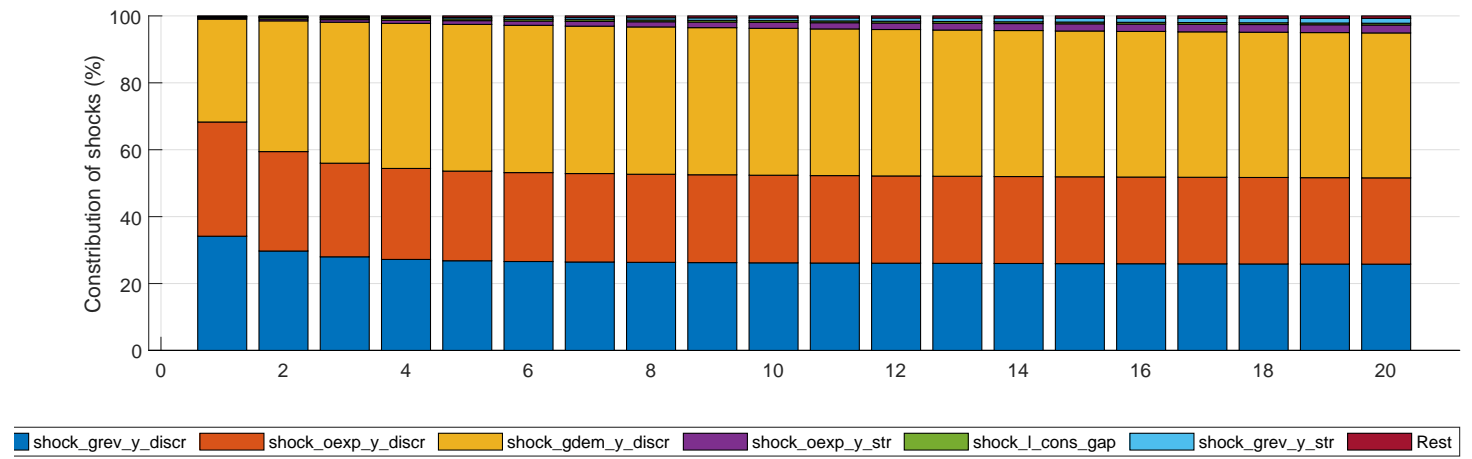
Govt. demand (G&S), % GDP [gdem_y]
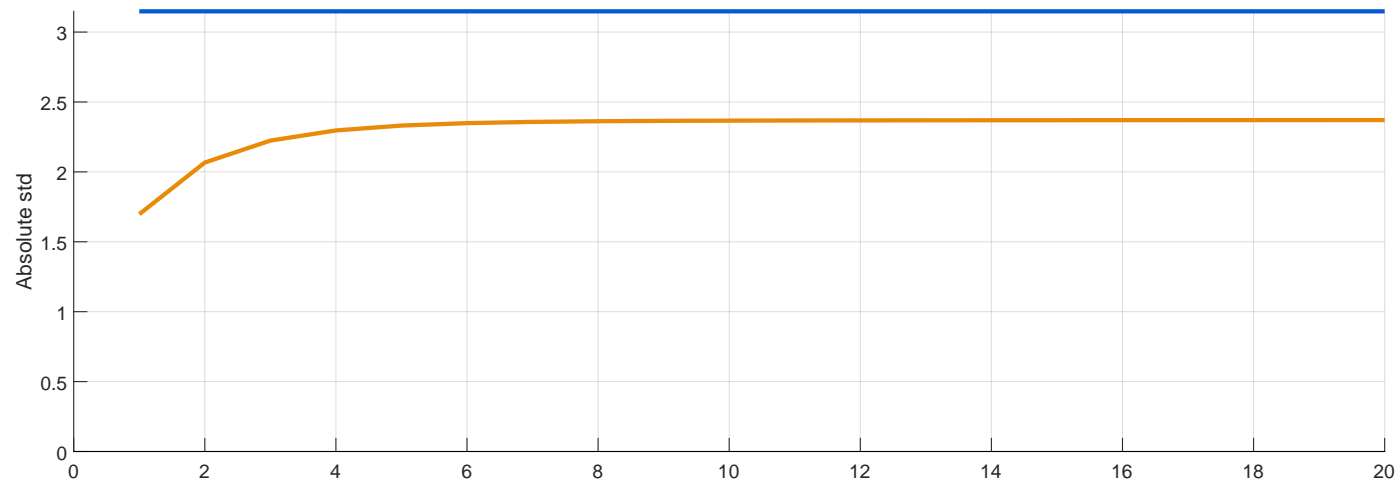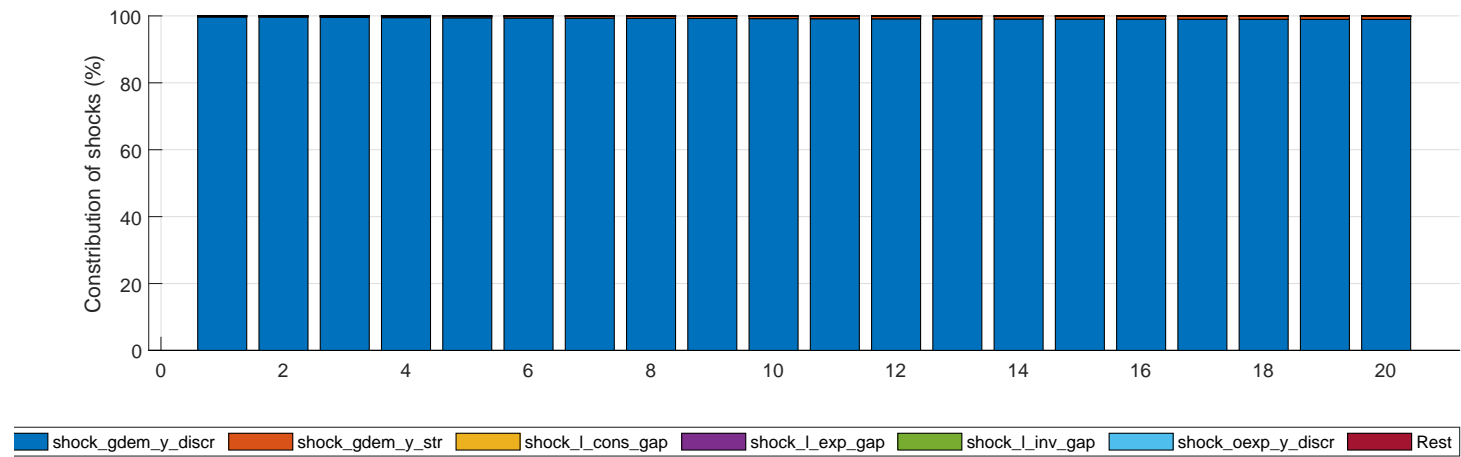
Other govt. exp., % to GDP [oexp_y]
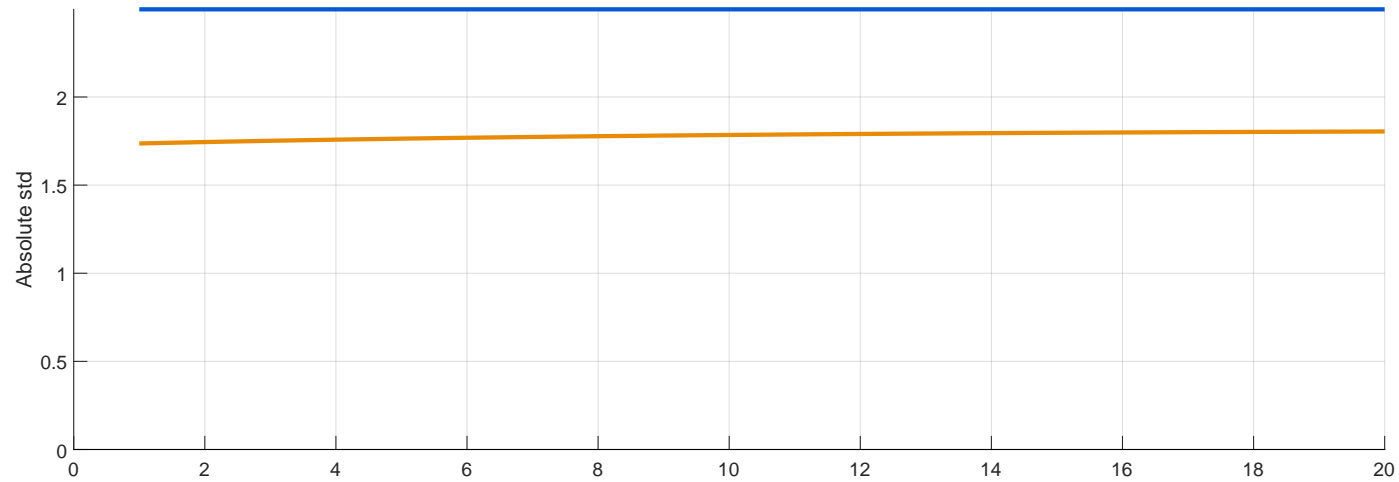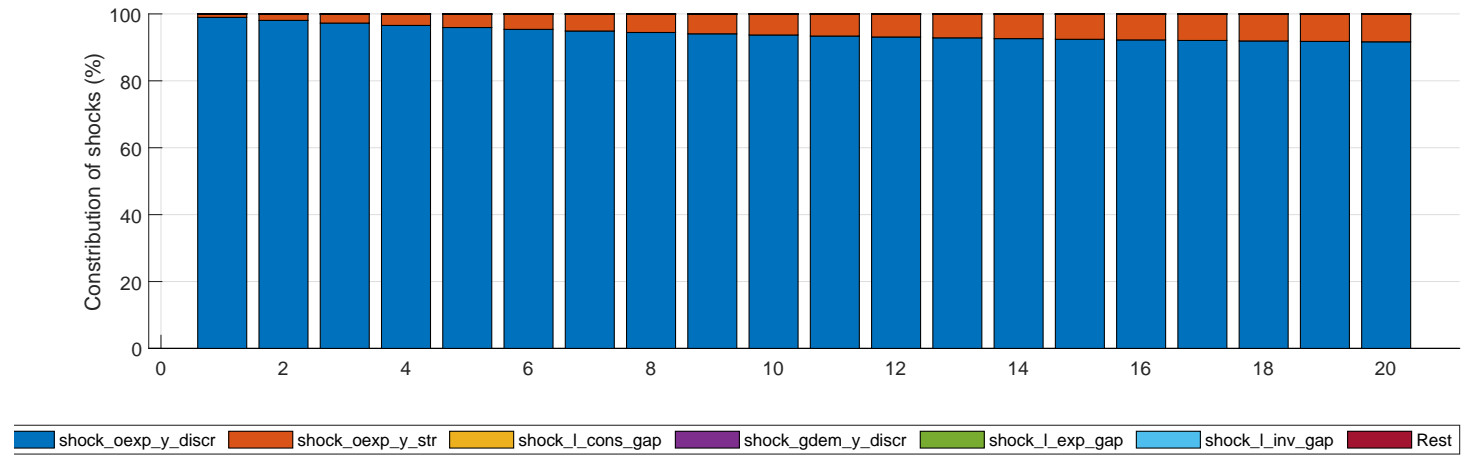
Govt. rev., % of GDP [grev_y]
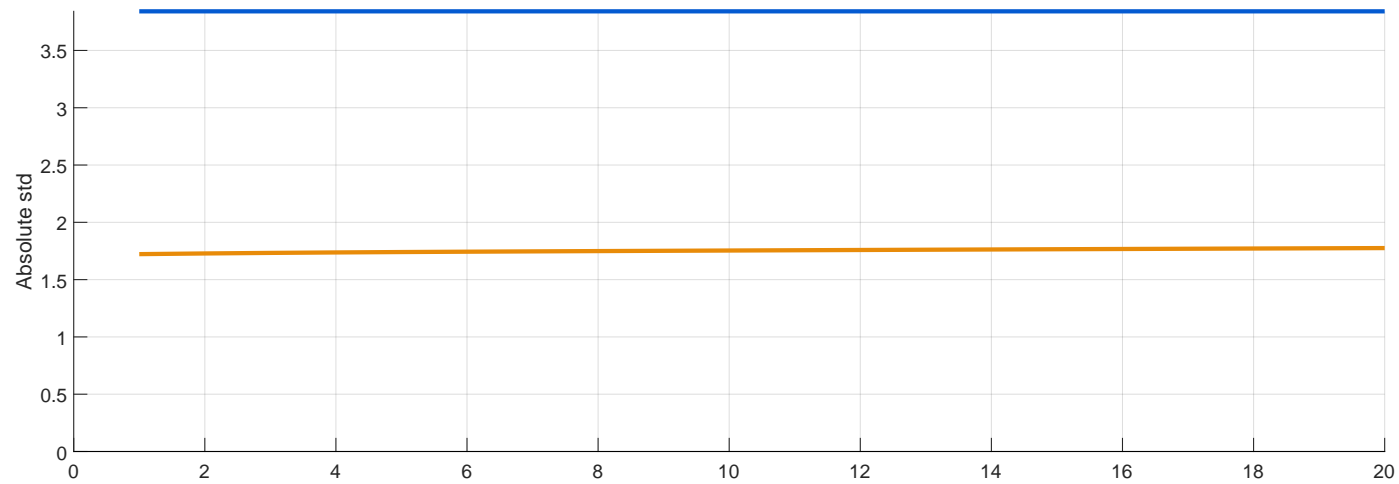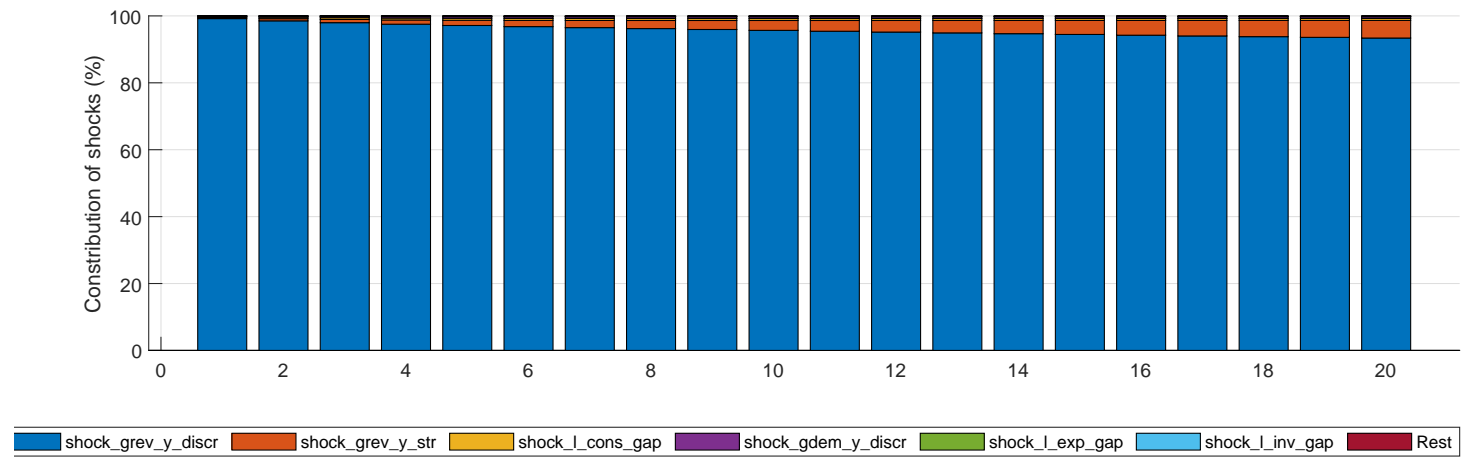
Fiscal grants, % of GDP [grants_y]
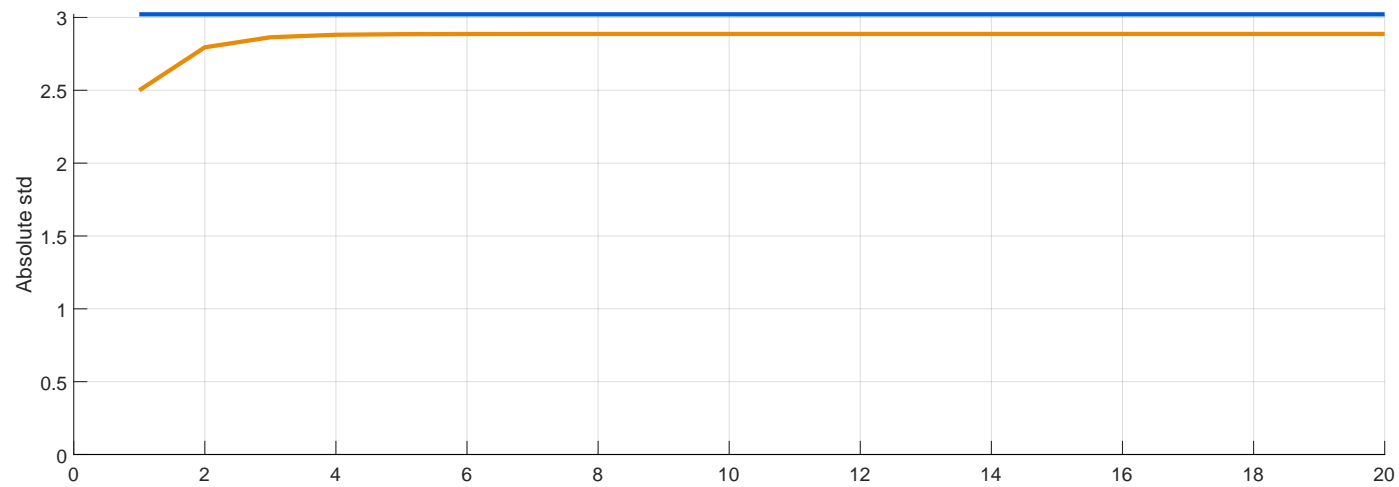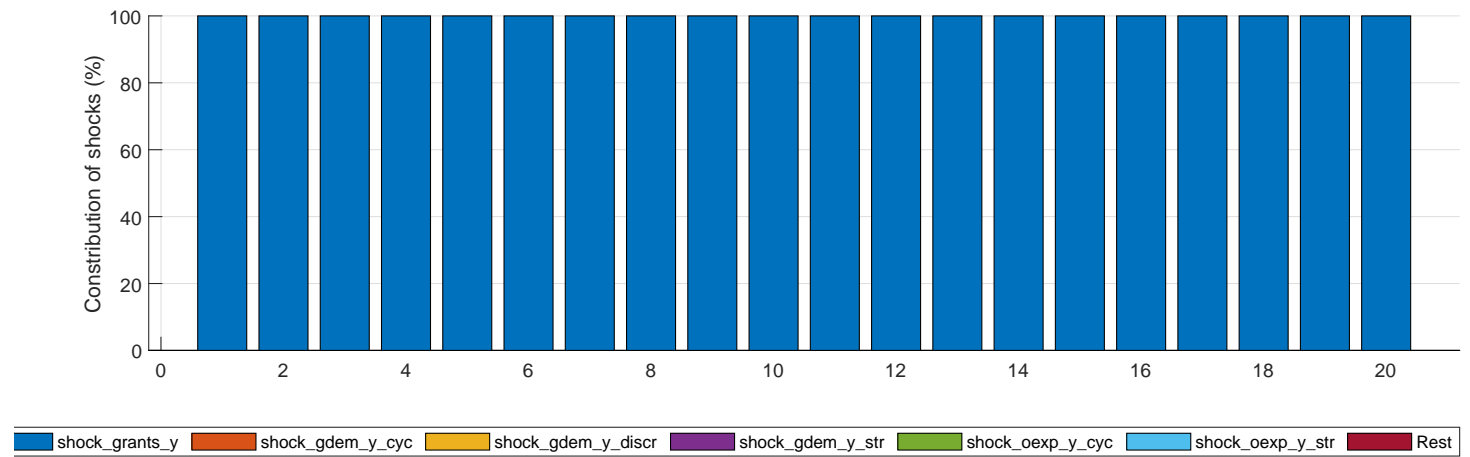
Consumption gap, % [l_cons_gap]
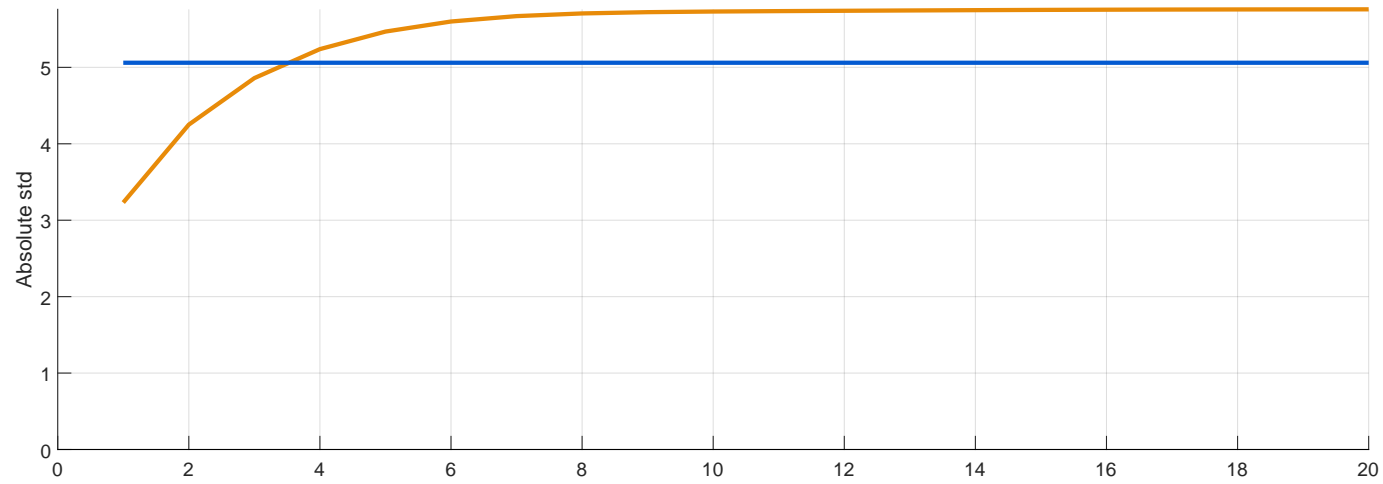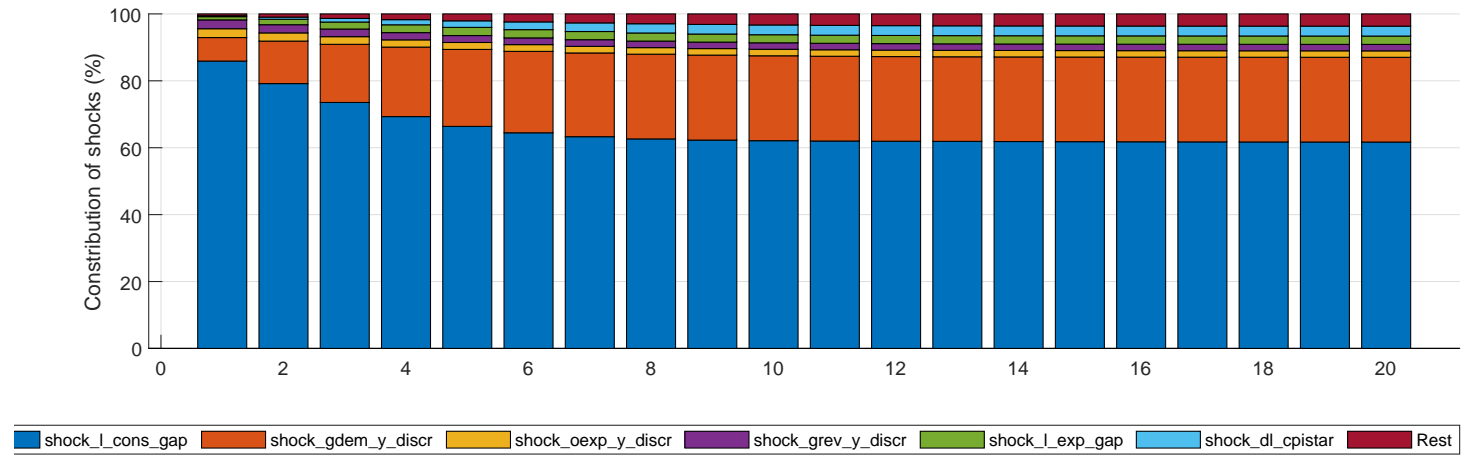
Consumption, ann. QQ % [dl_cons]
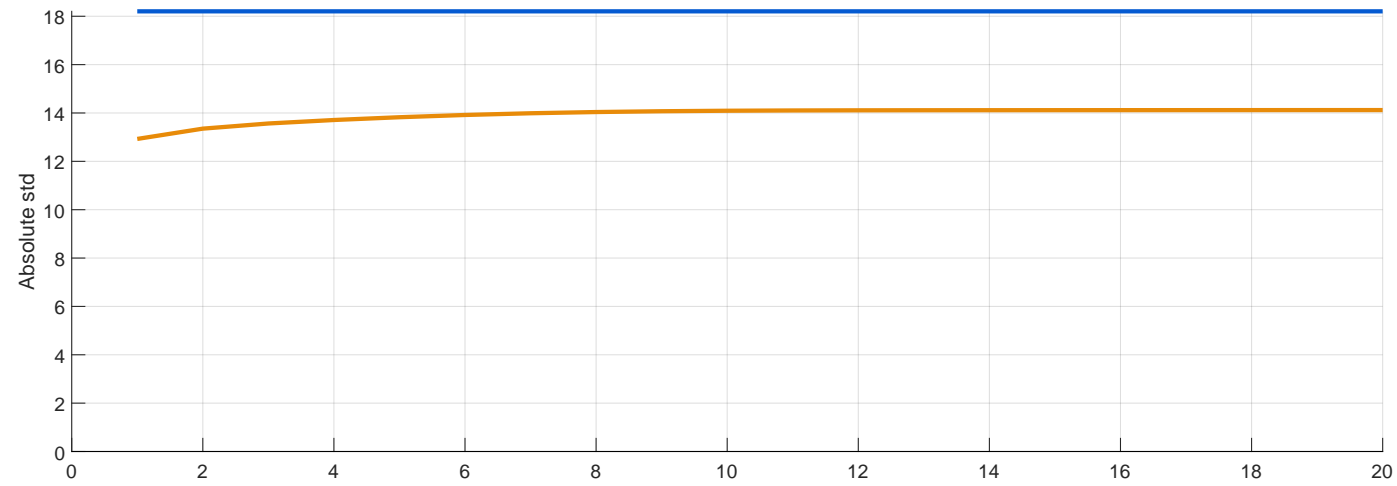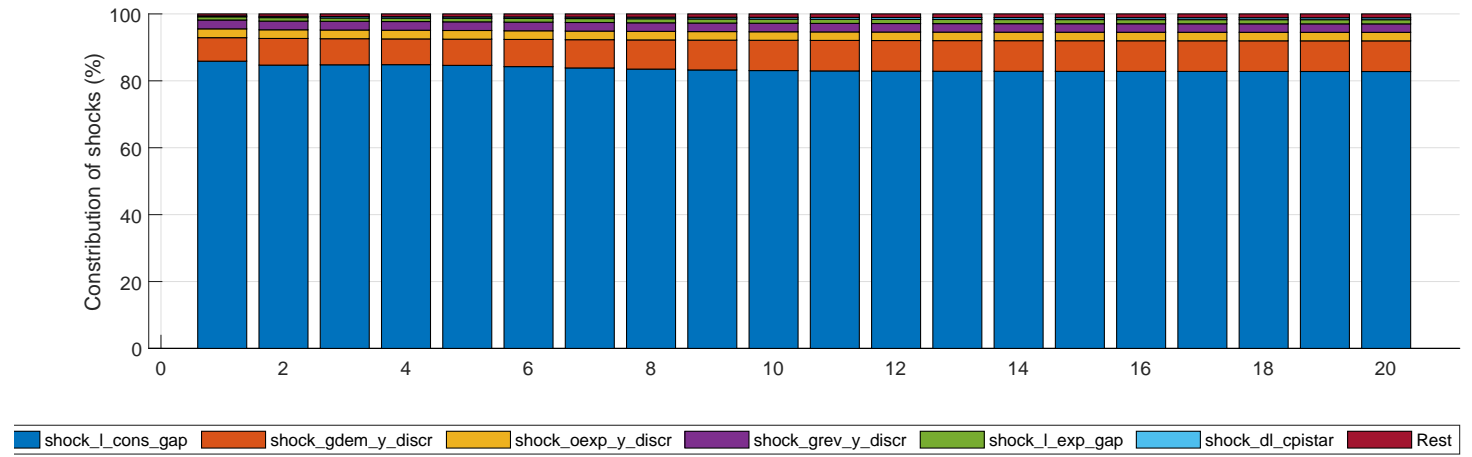
Investment gap, % [l_inv_gap]
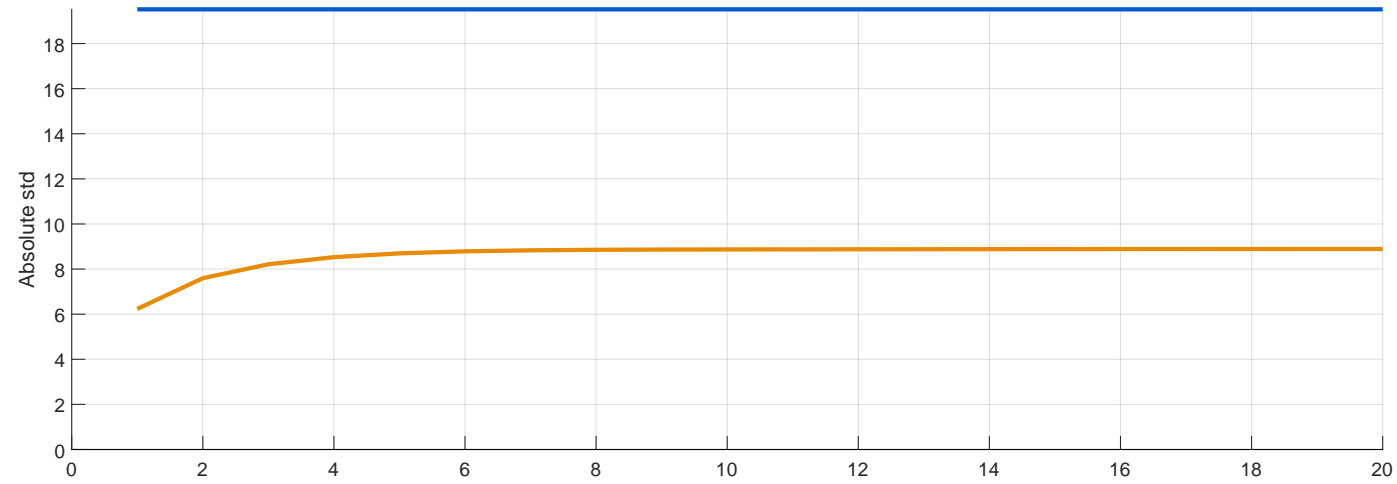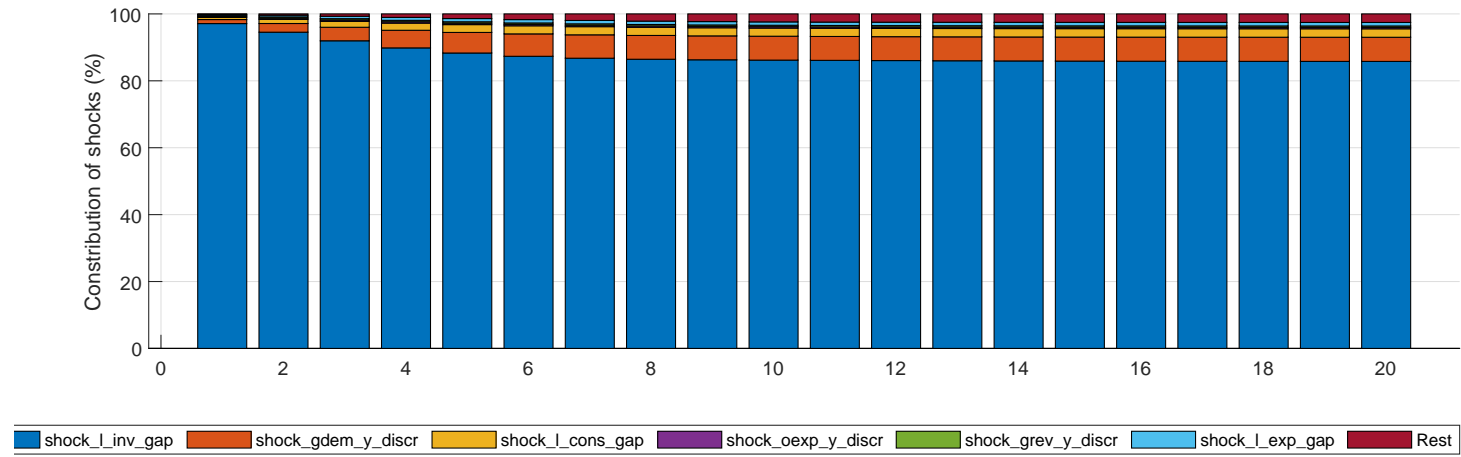
Investment, ann. QQ % [dl_inv]
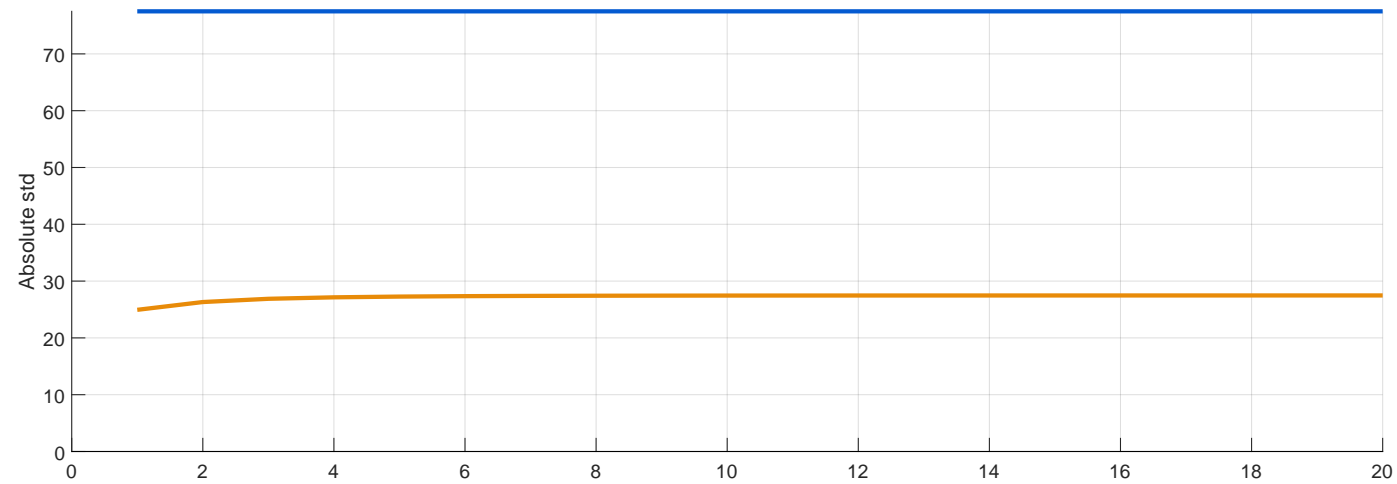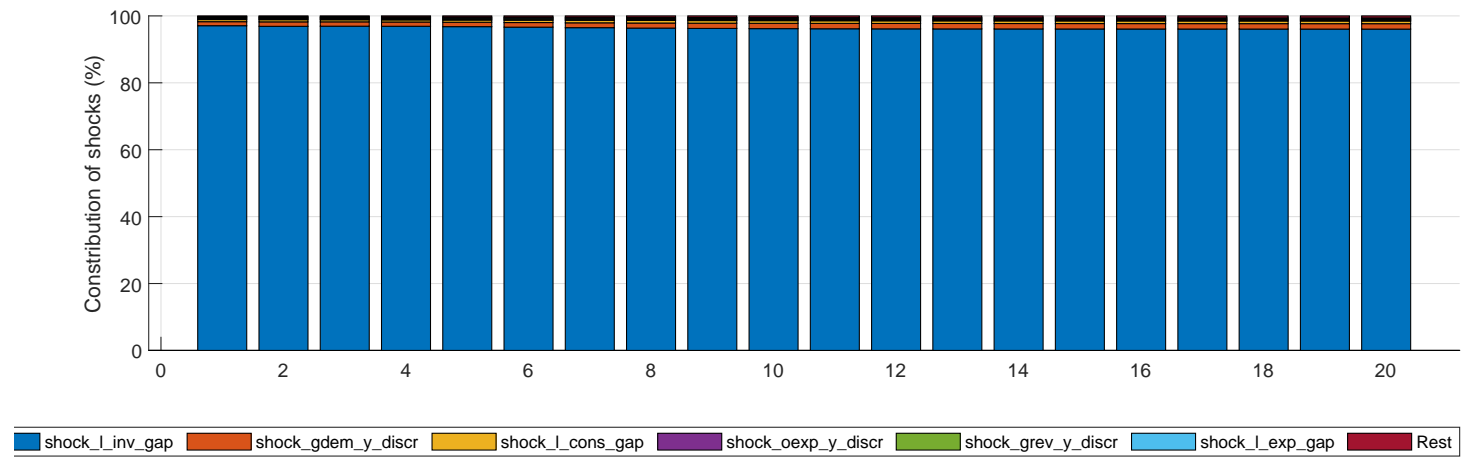
Gov. demand gap, % [l_gdem_gap]
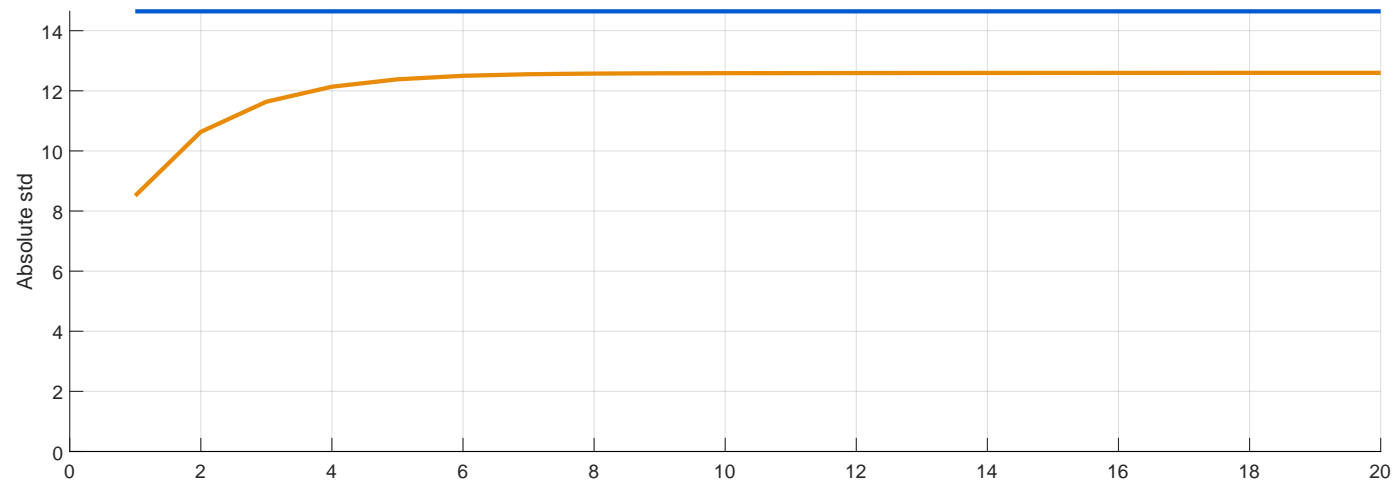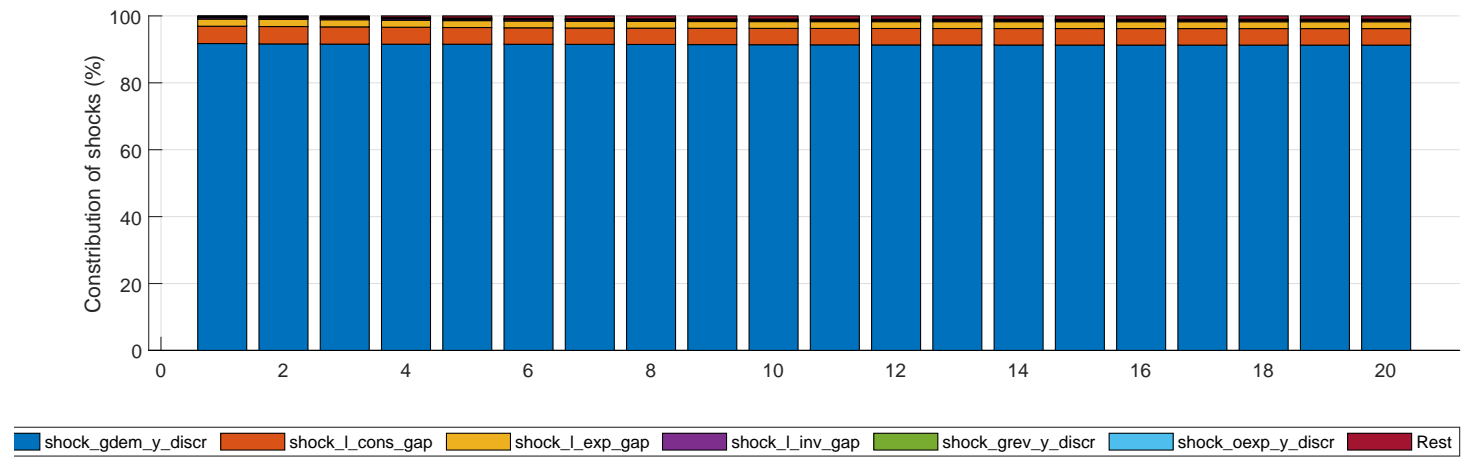
Gov. demand, ann. QQ % [dl_gdem]
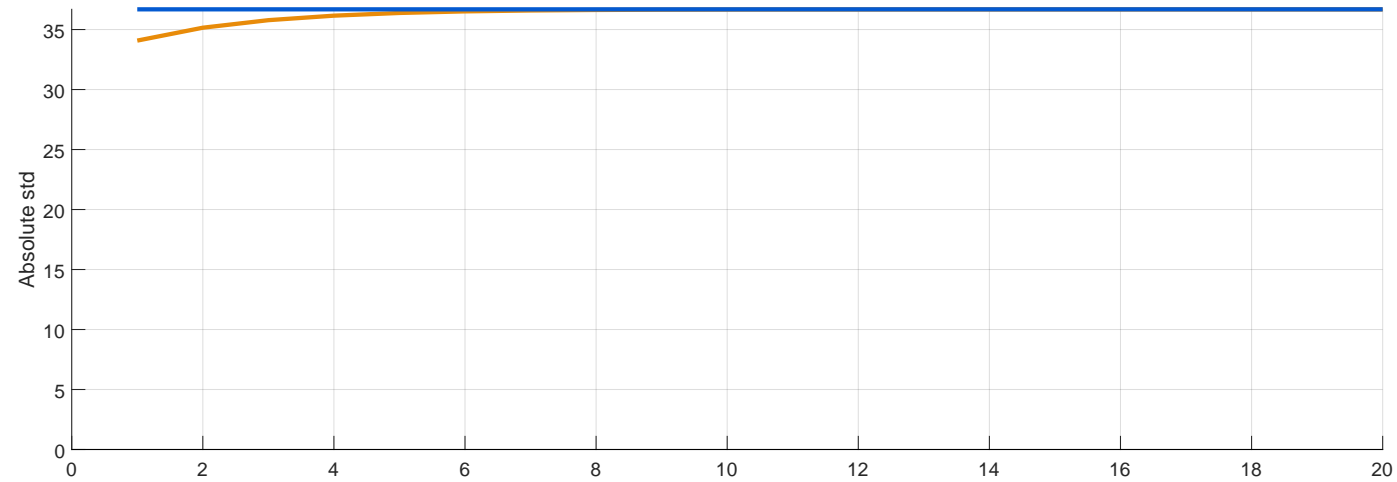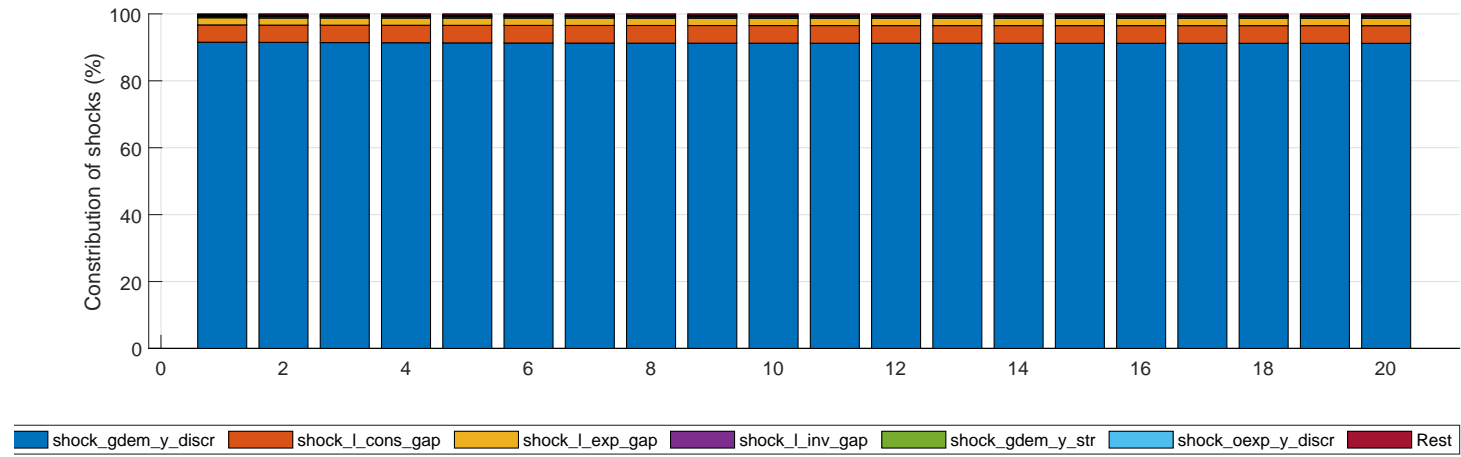
Export gap, % [l_exp_gap]
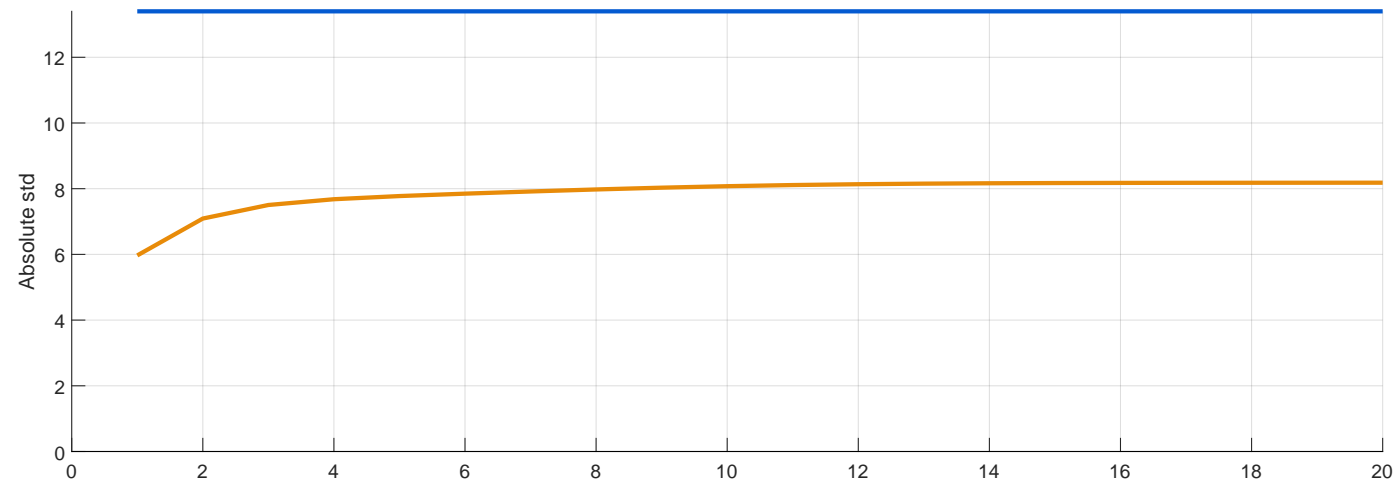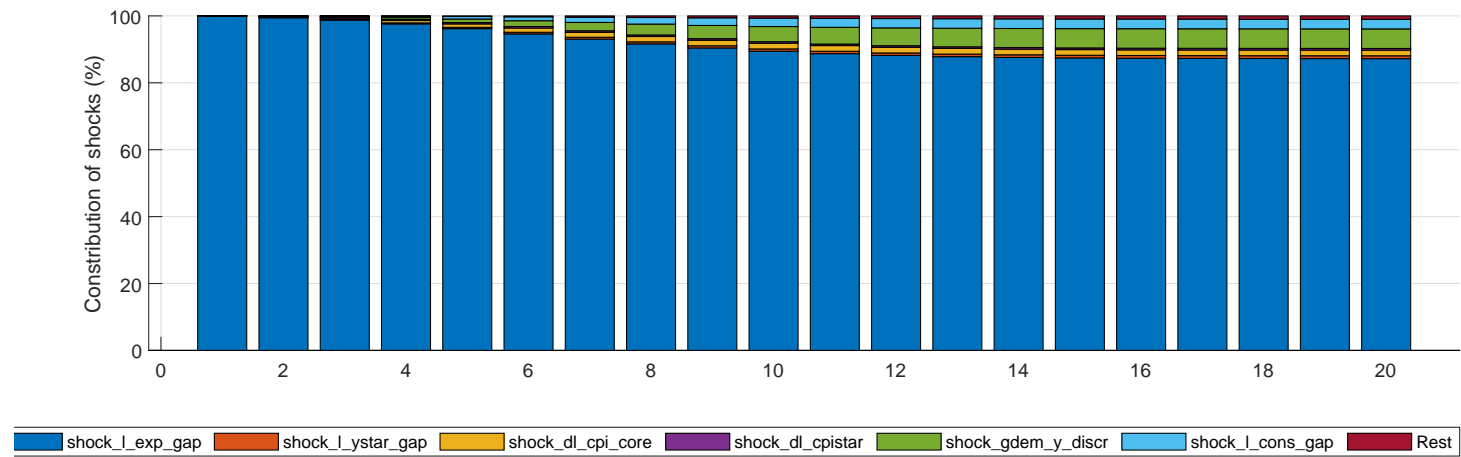
Export, ann. QQ % [dl_exp]
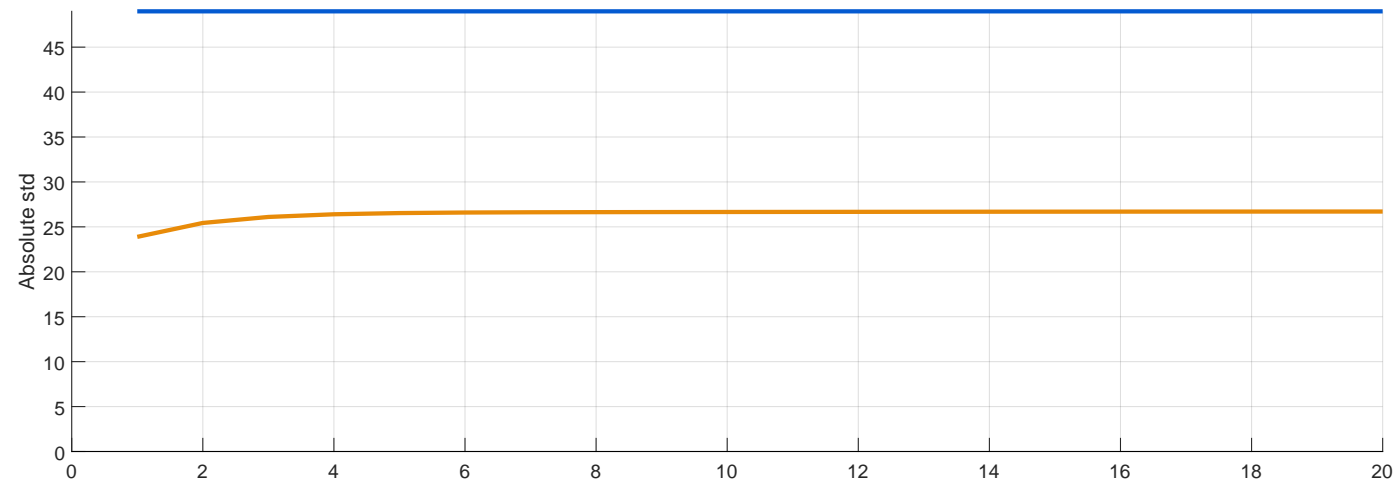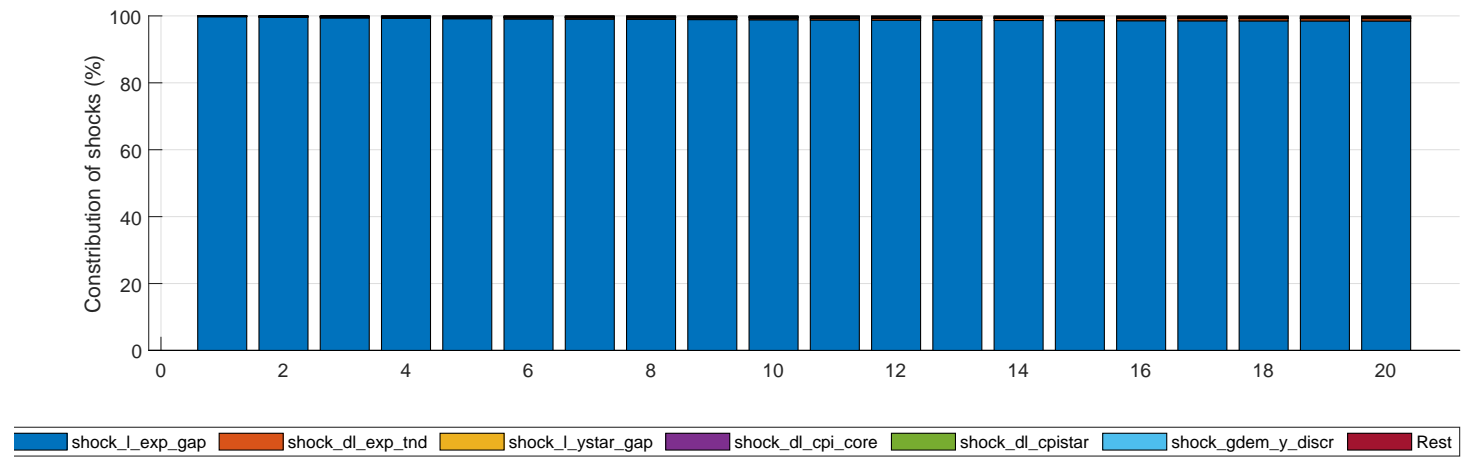
Import gap, % [l_imp_gap]
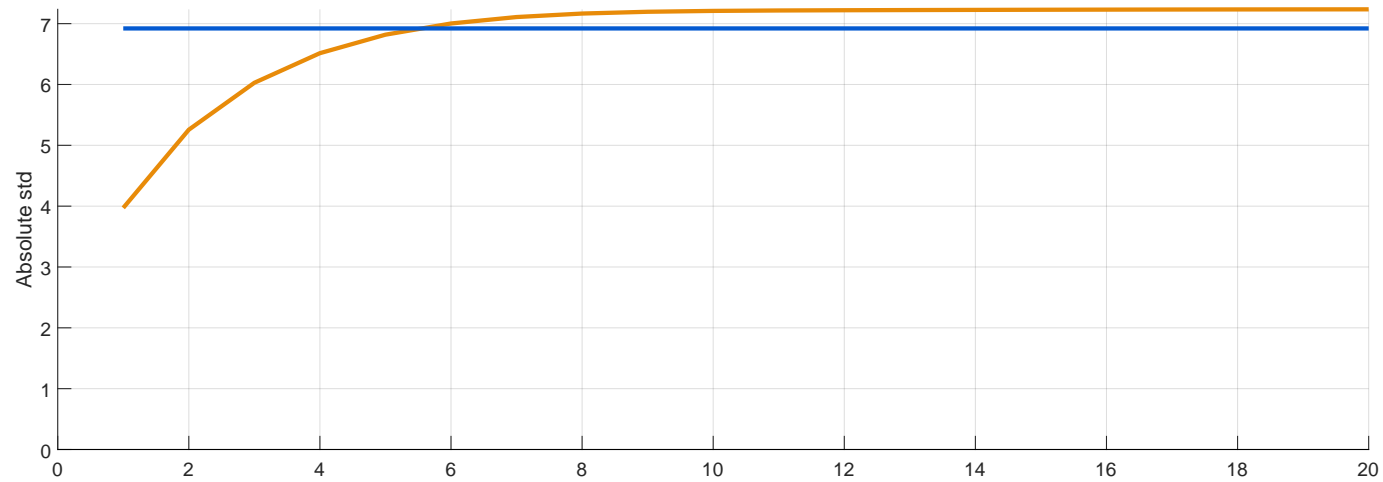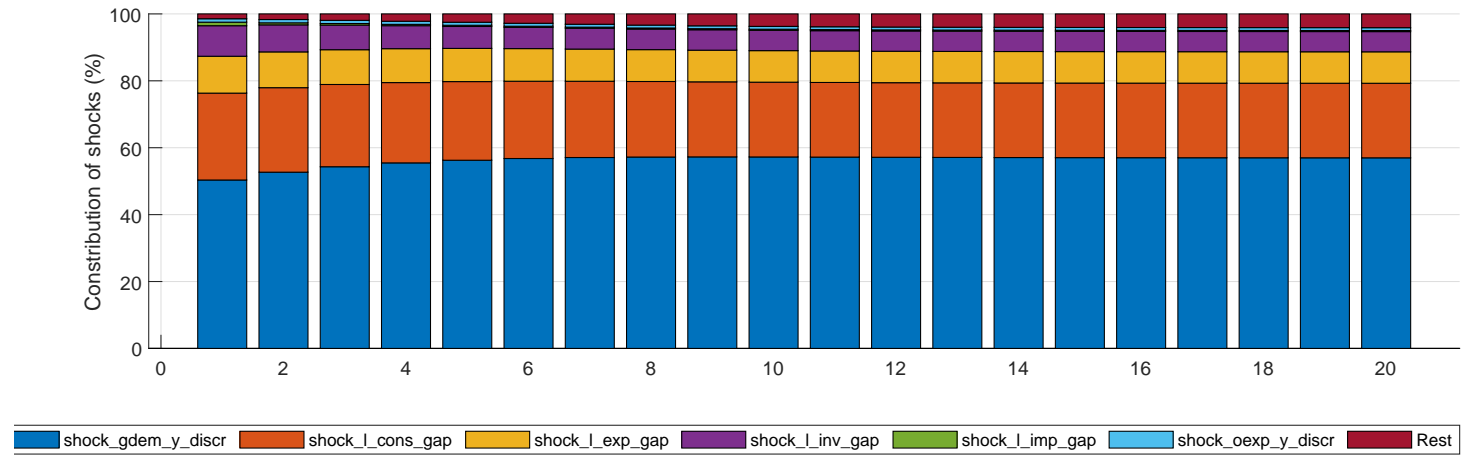
Import, ann. QQ % [dl_imp]
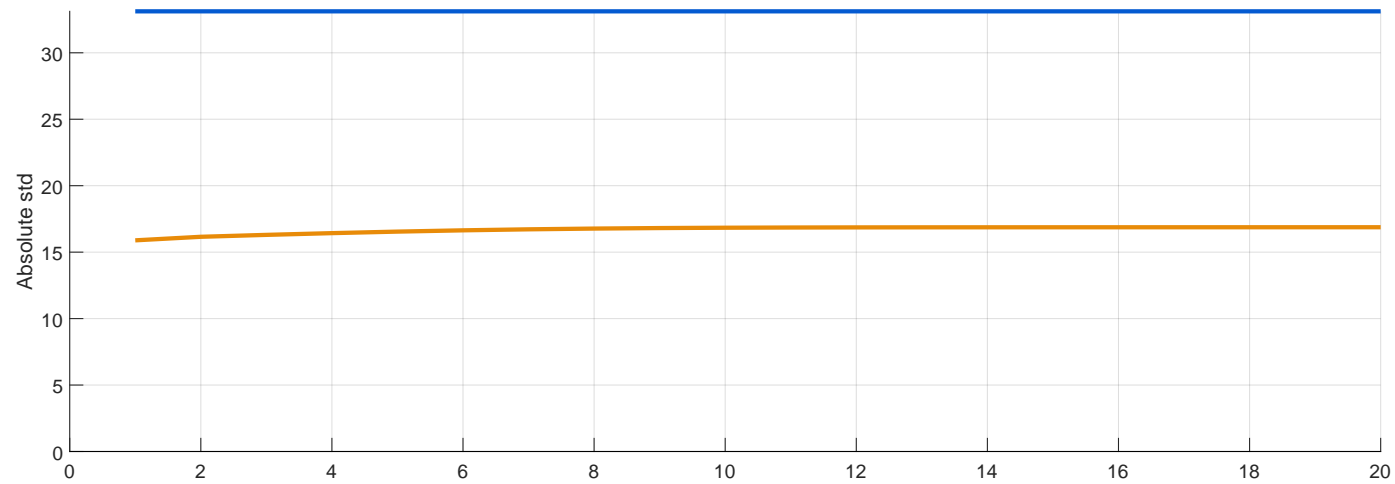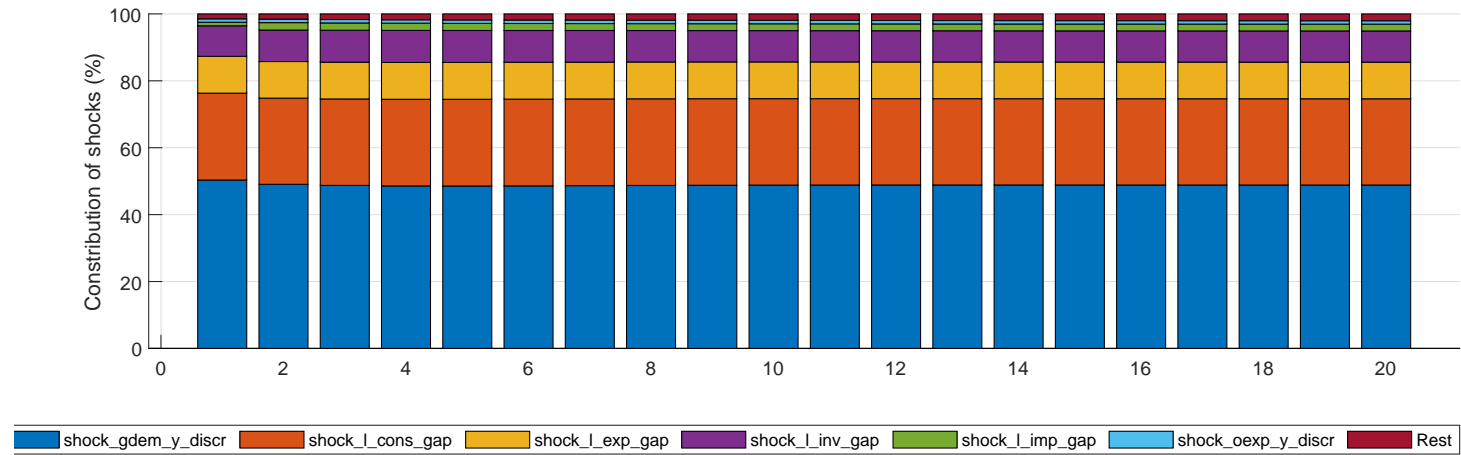
Output gap, % [l_y_gap]
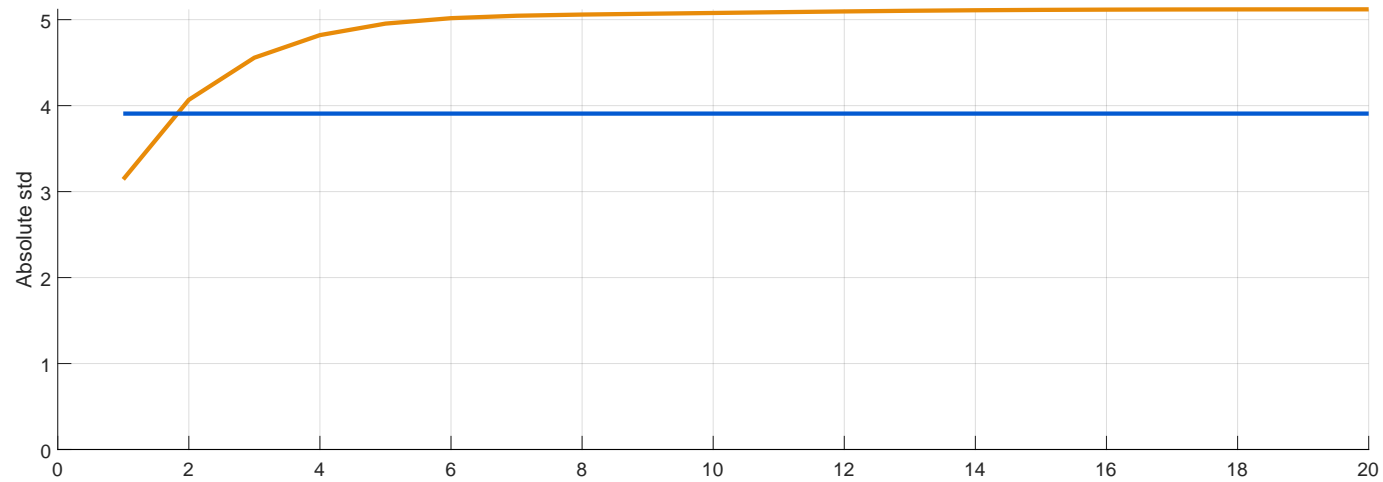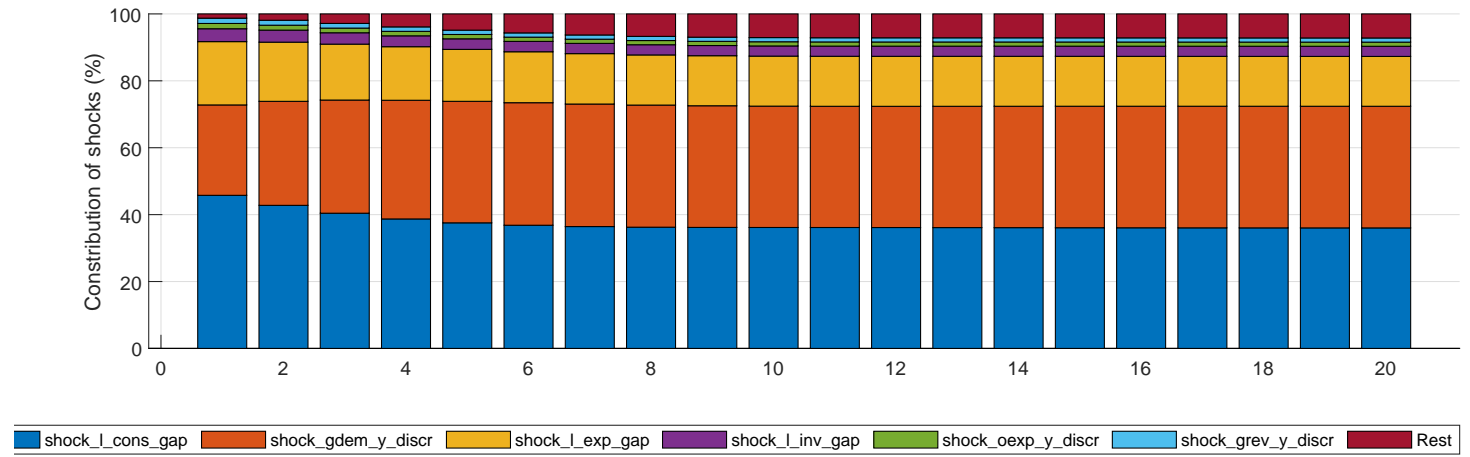
GDP, ann. QQ % [dl_y]
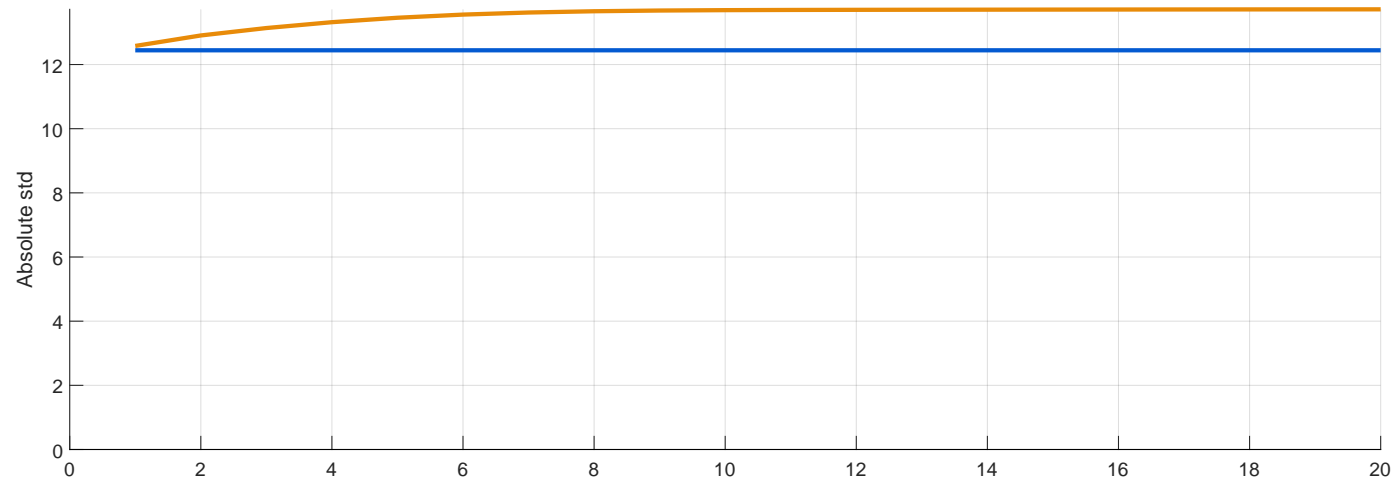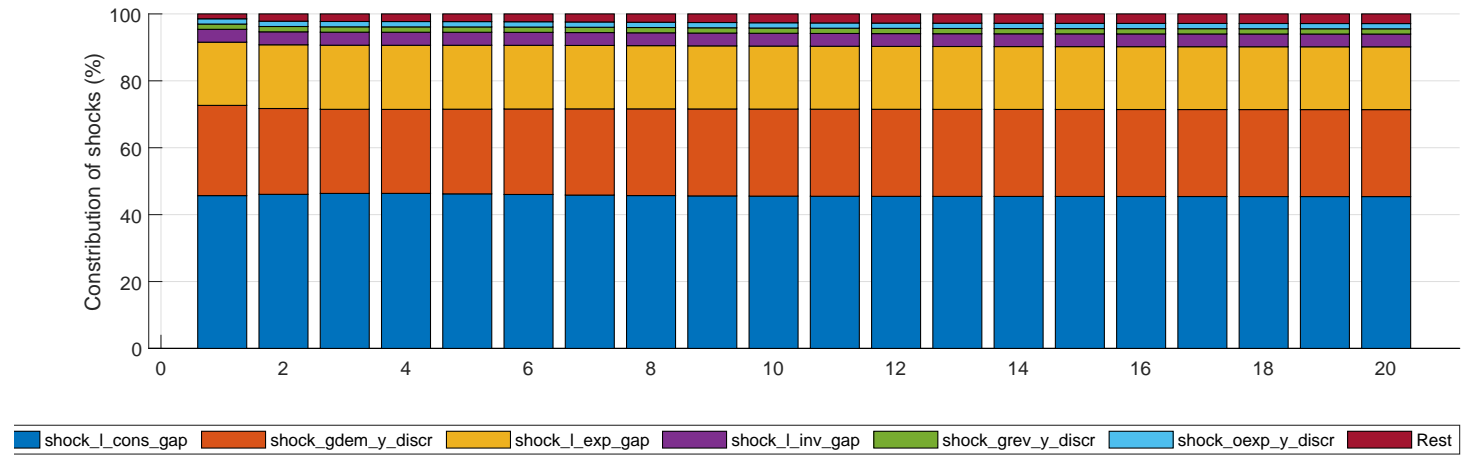
Headline CPI, ann. QQ % [dl_cpi]
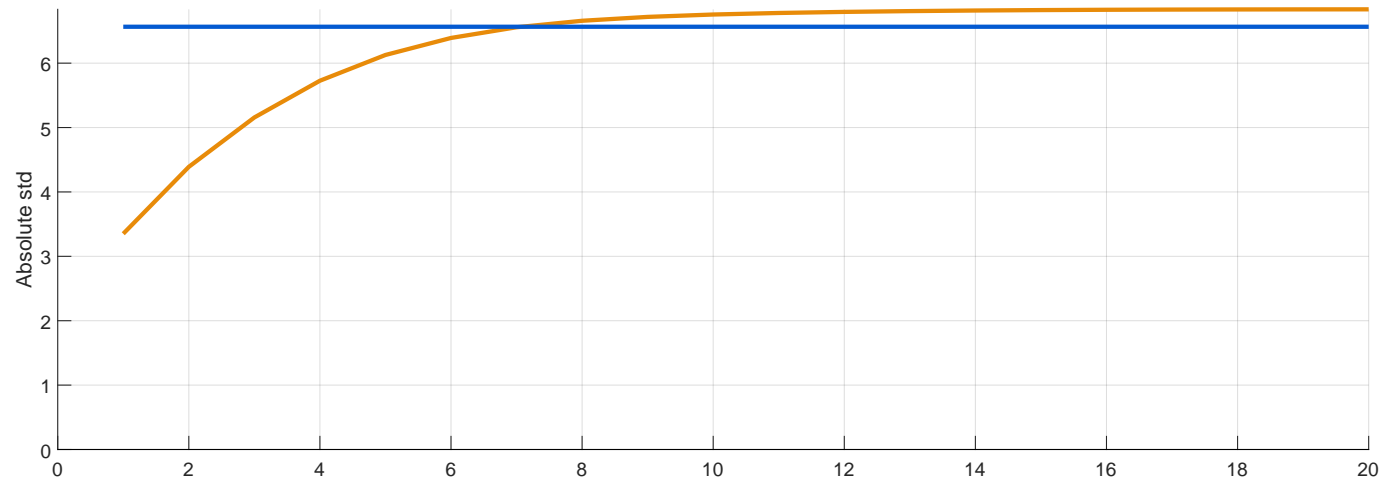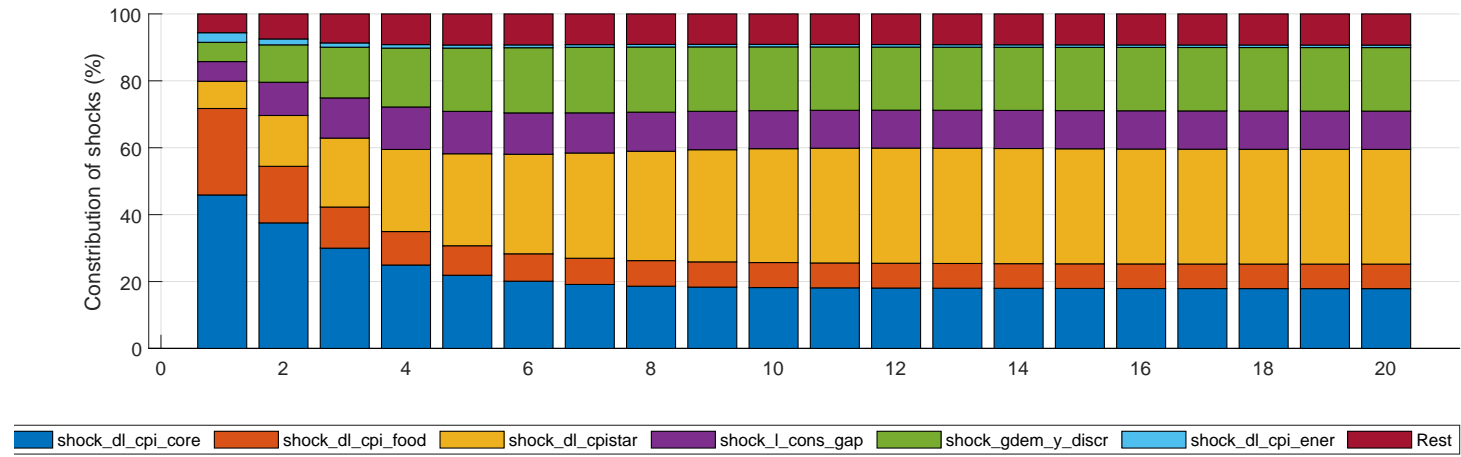
Core CPI, ann. QQ % [dl_cpi_core]
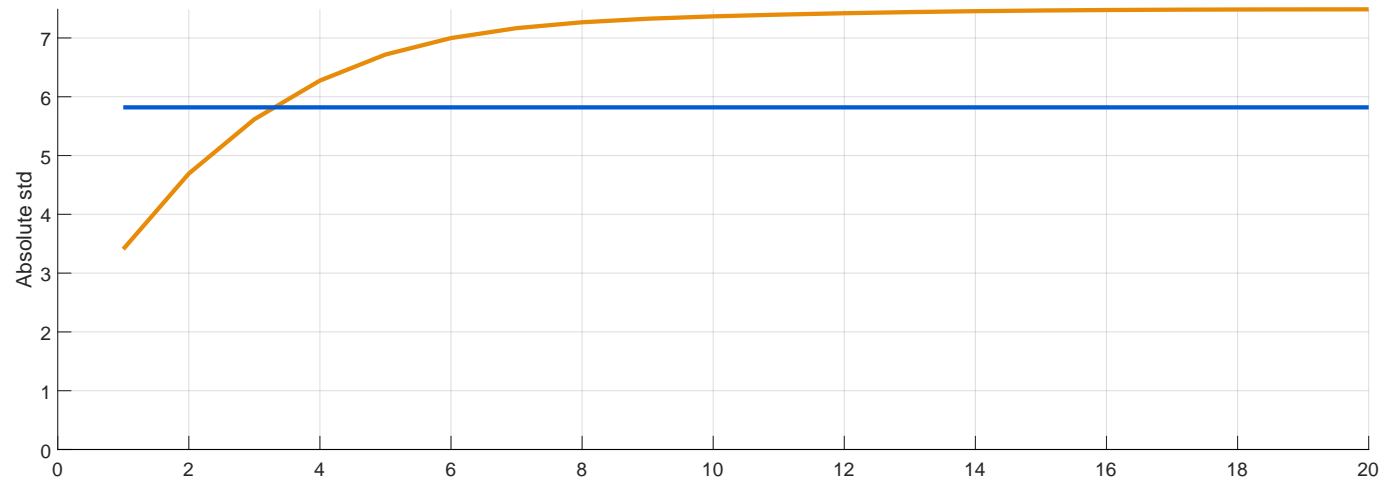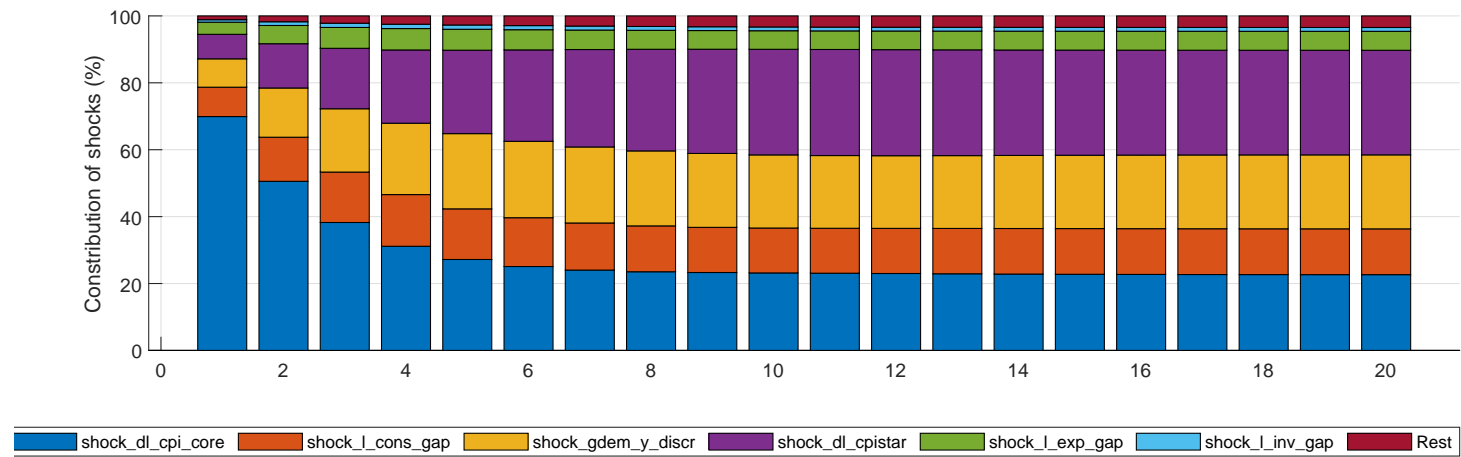
Food CPI, ann. QQ % [dl_cpi_food]
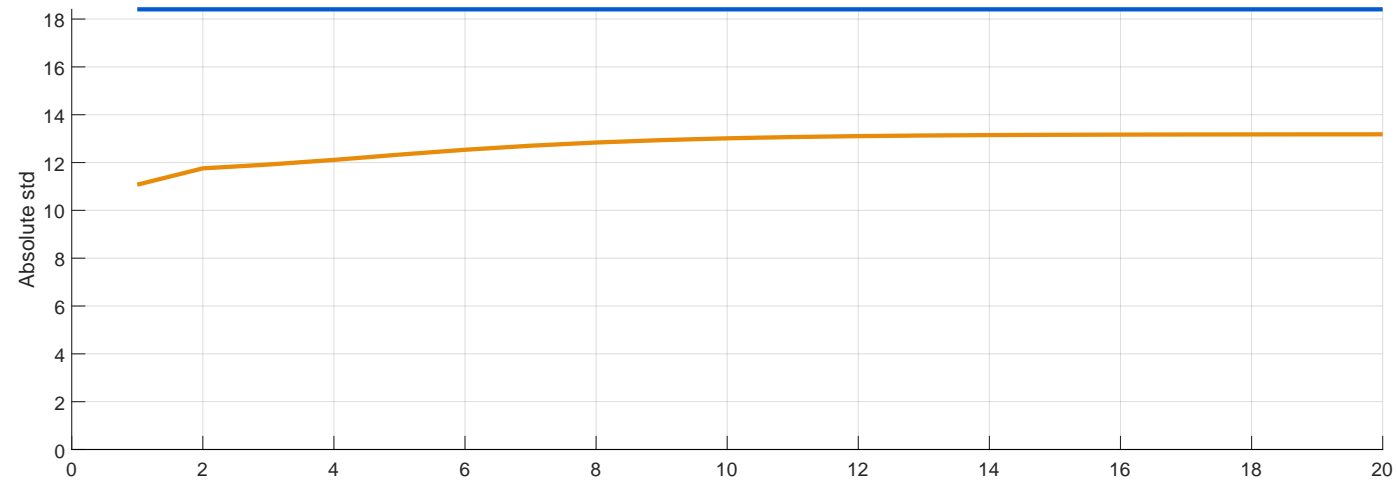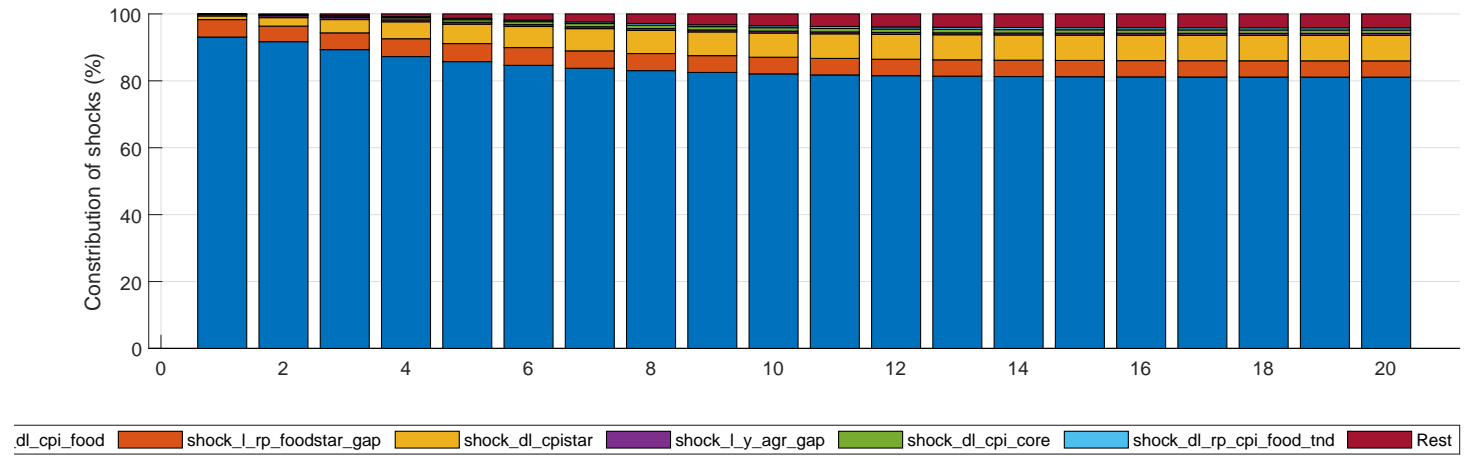
Energy CPI, ann. QQ % [dl_cpi_ener]
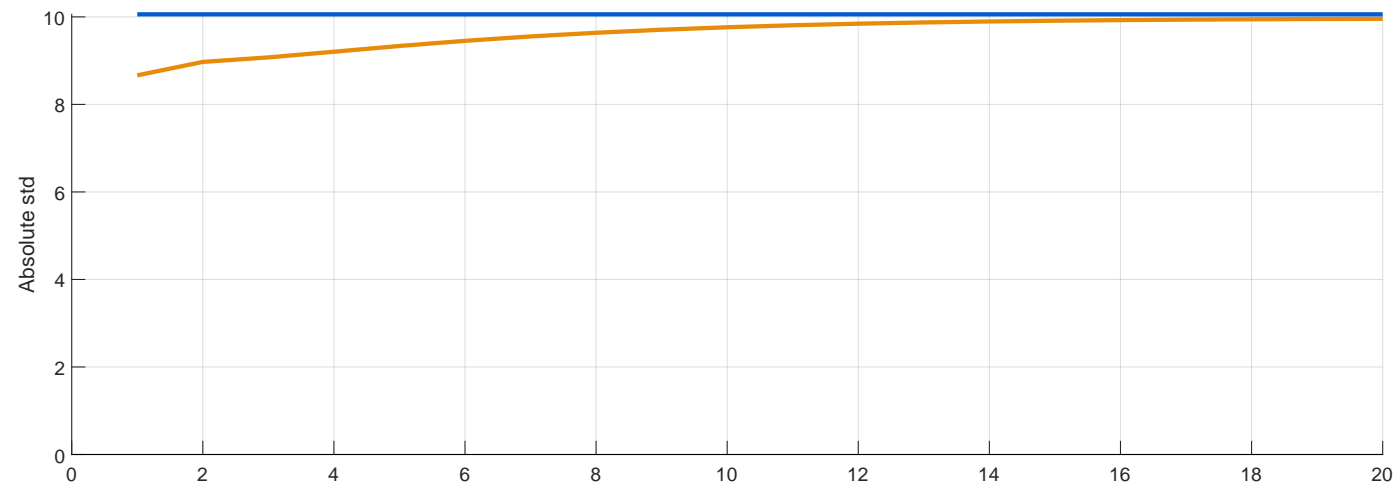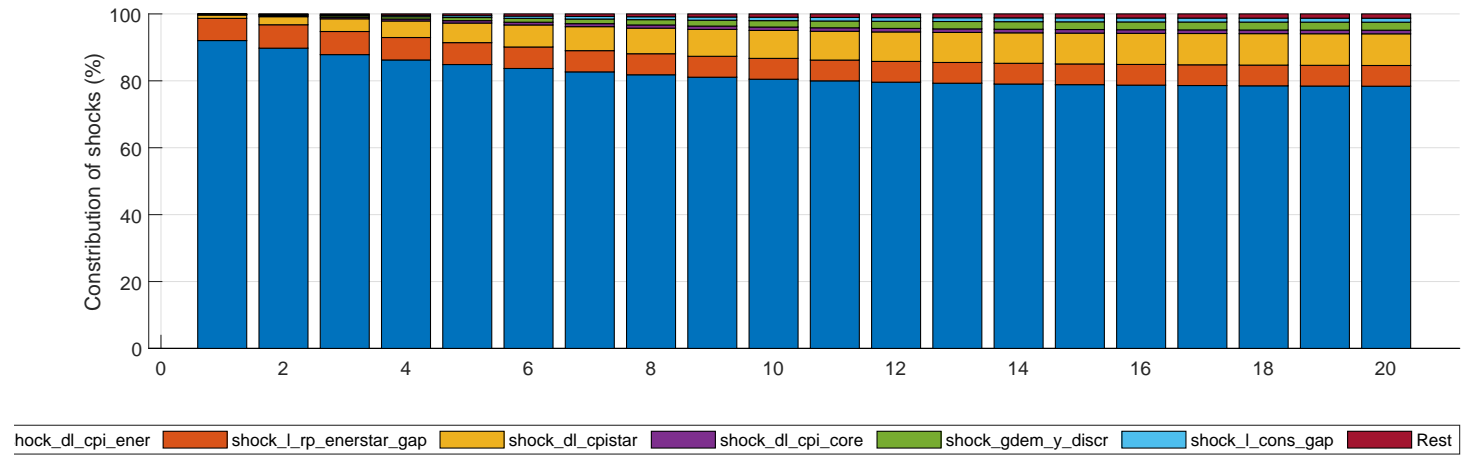
Core rel. price gap, % [l_rp_cpi_core_gap]
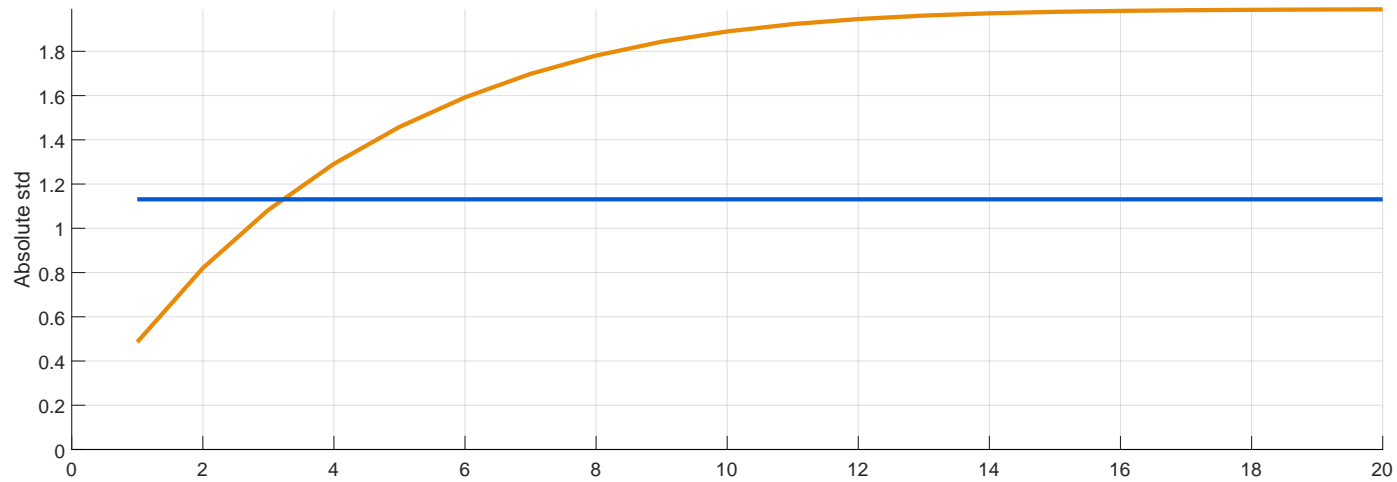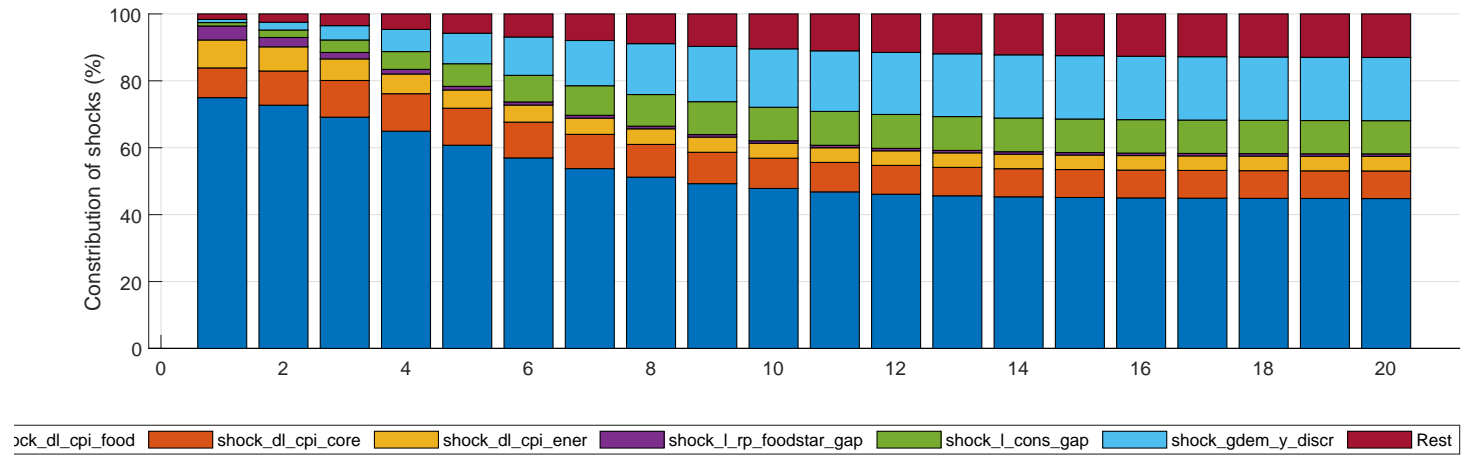
Food rel. price gap, % [l_rp_cpi_food_gap]
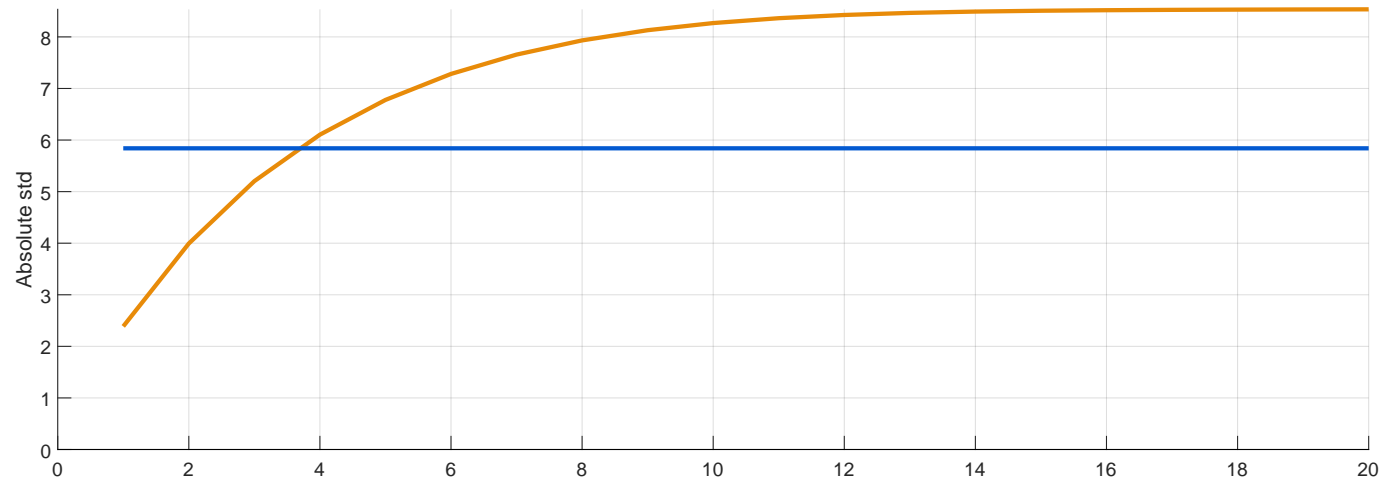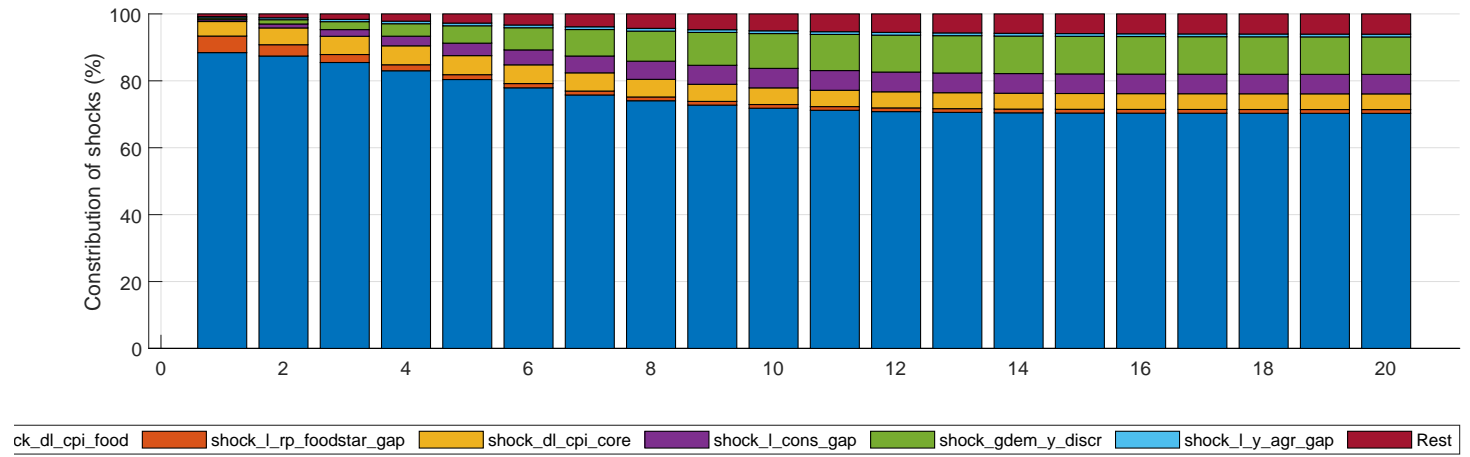
Energy rel. price gap, % [l_rp_cpi_ener_gap]
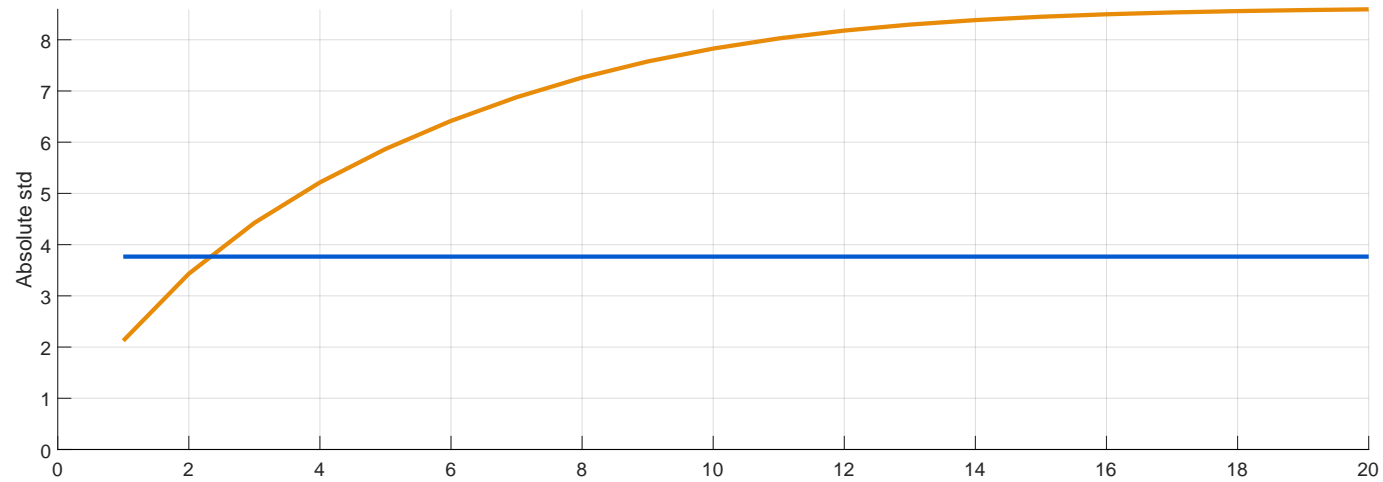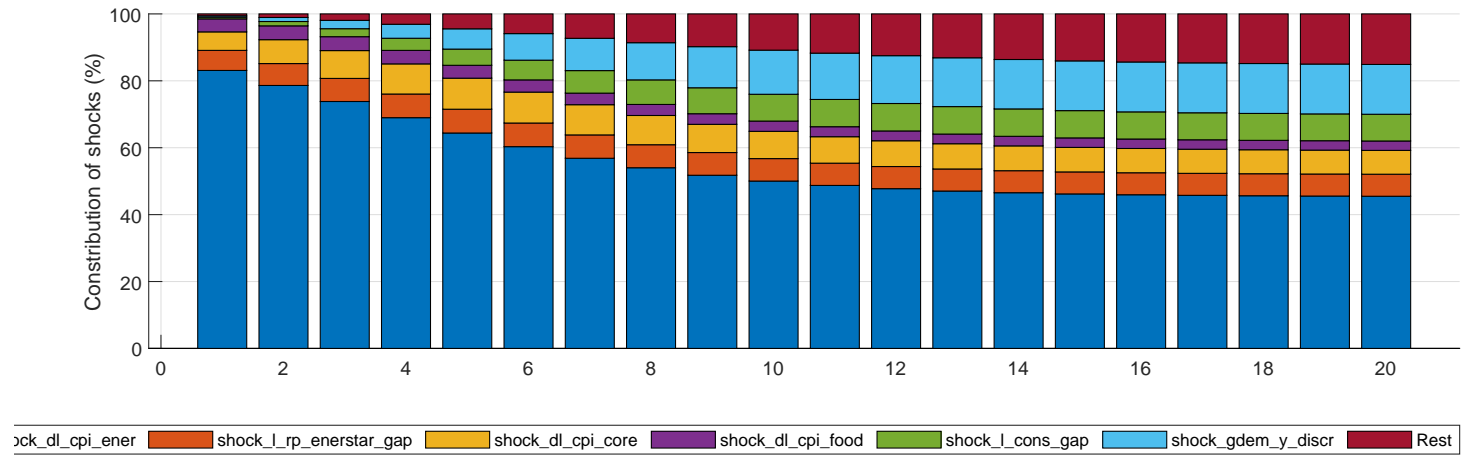
Policy rate (IB rate used), % [i]
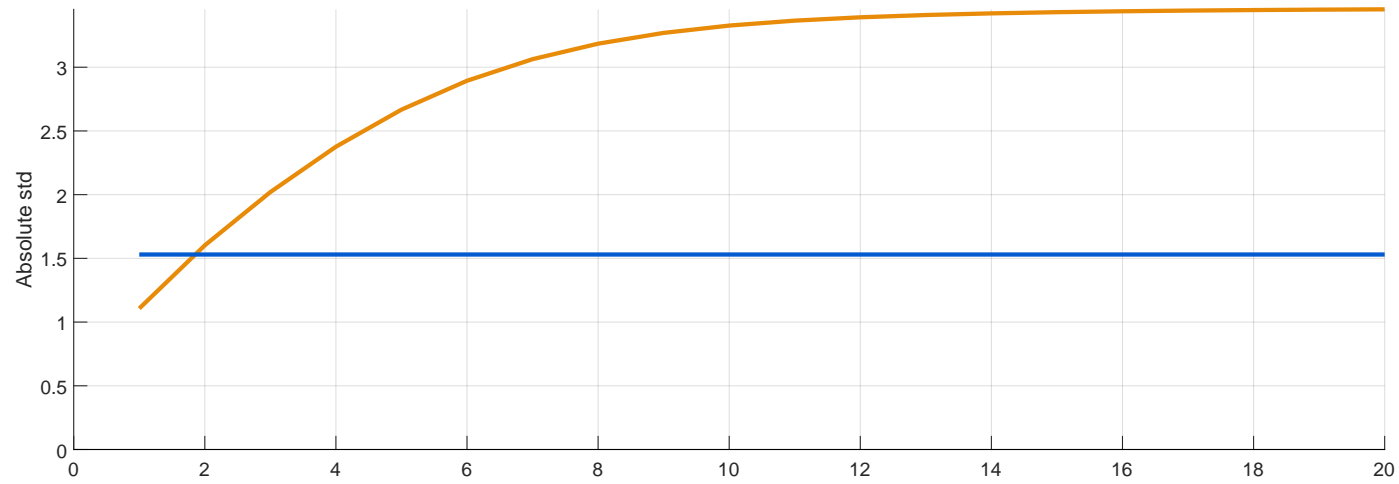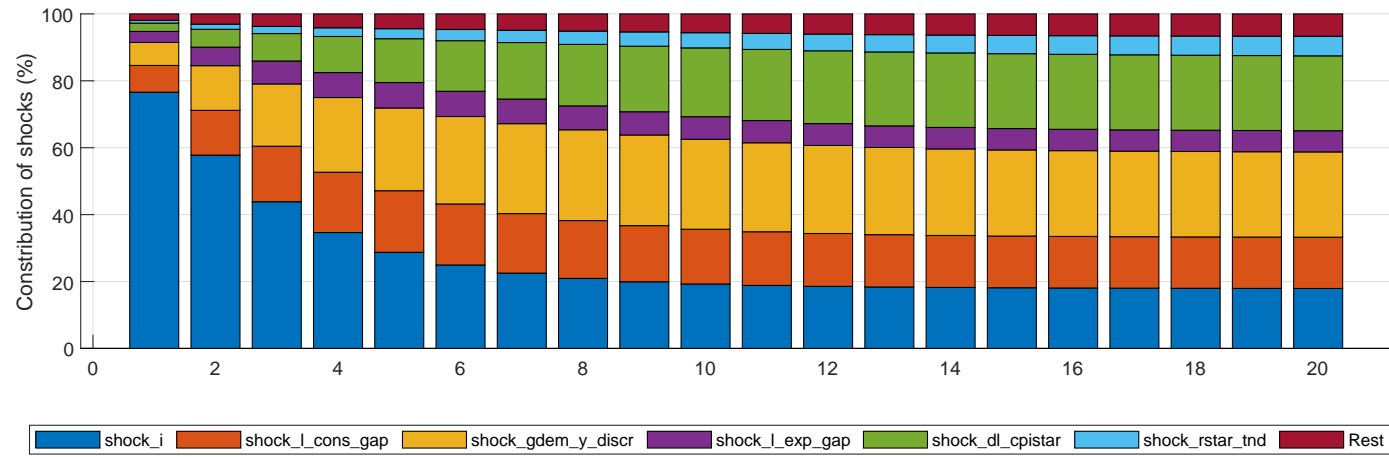
RIR (policy) gap, % [r_gap]
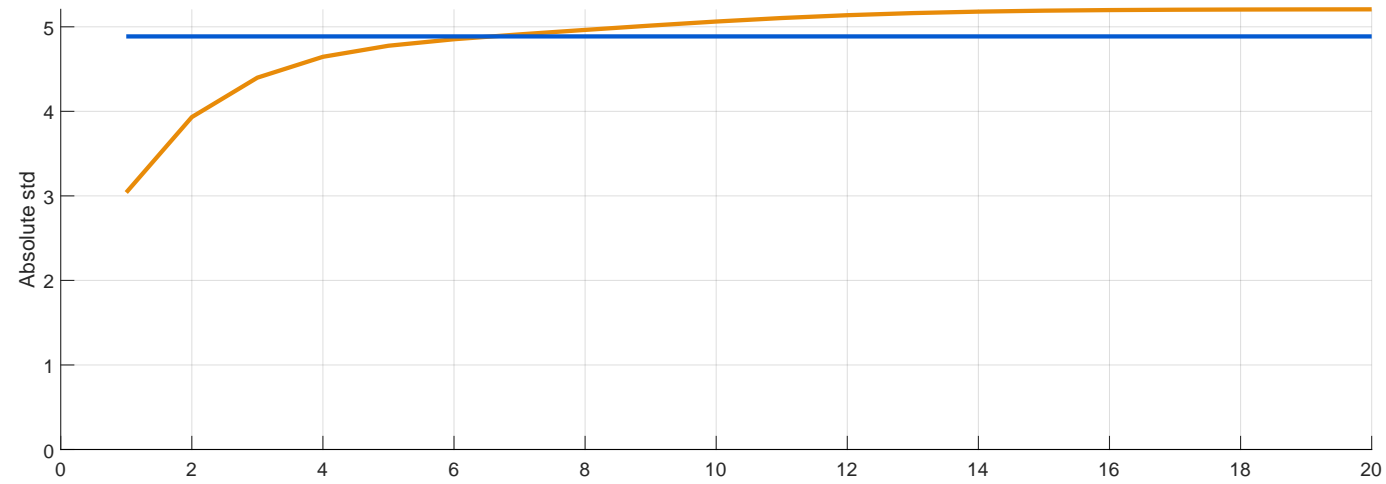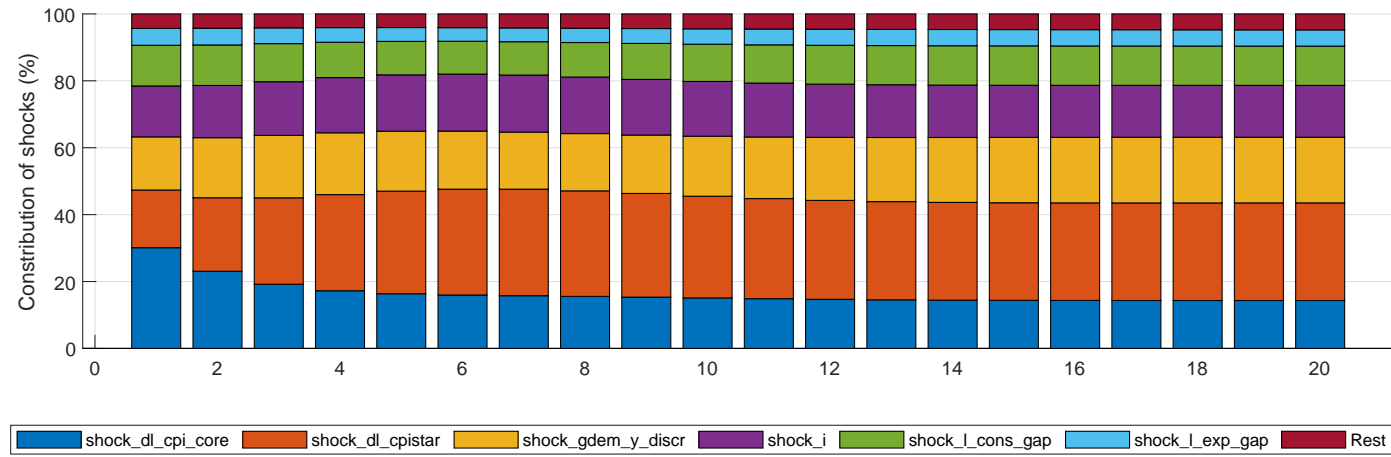
Exchng. rate, 100*log [l_s]
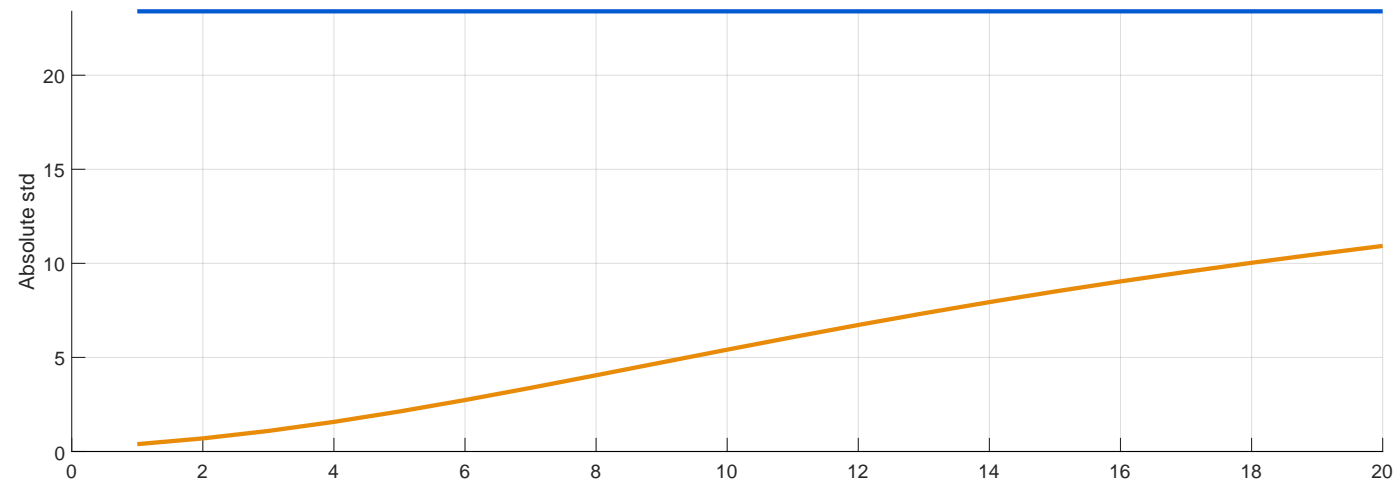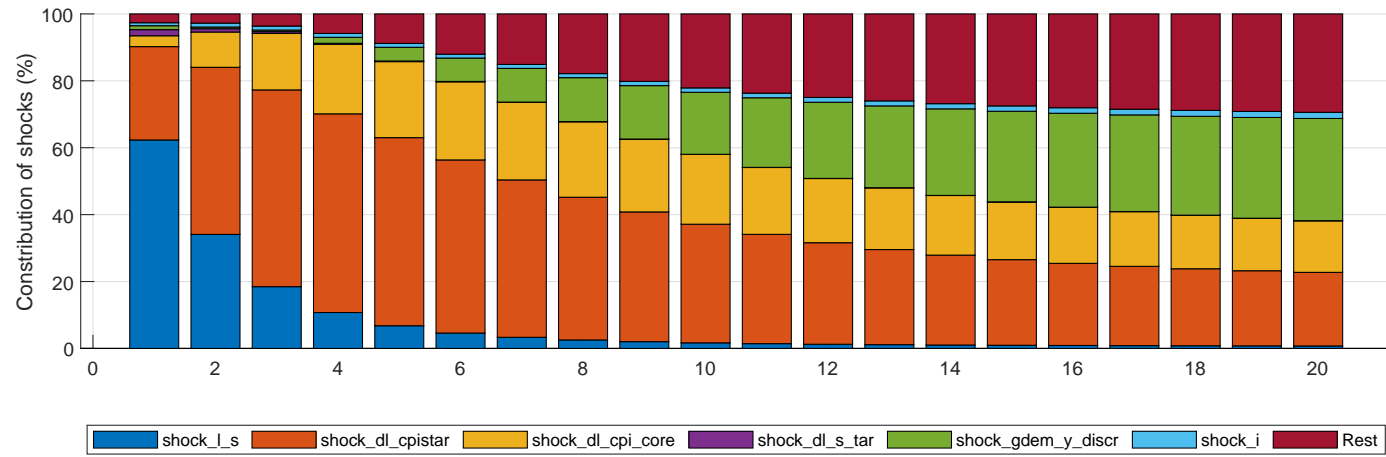
Real exchng. rate gap, % [l_z_gap]
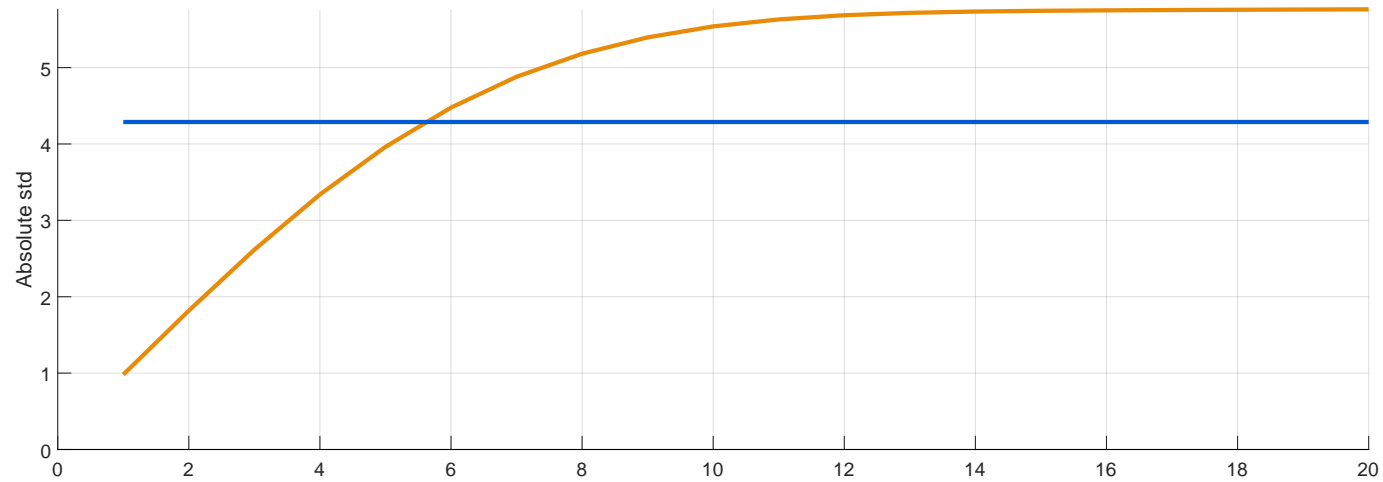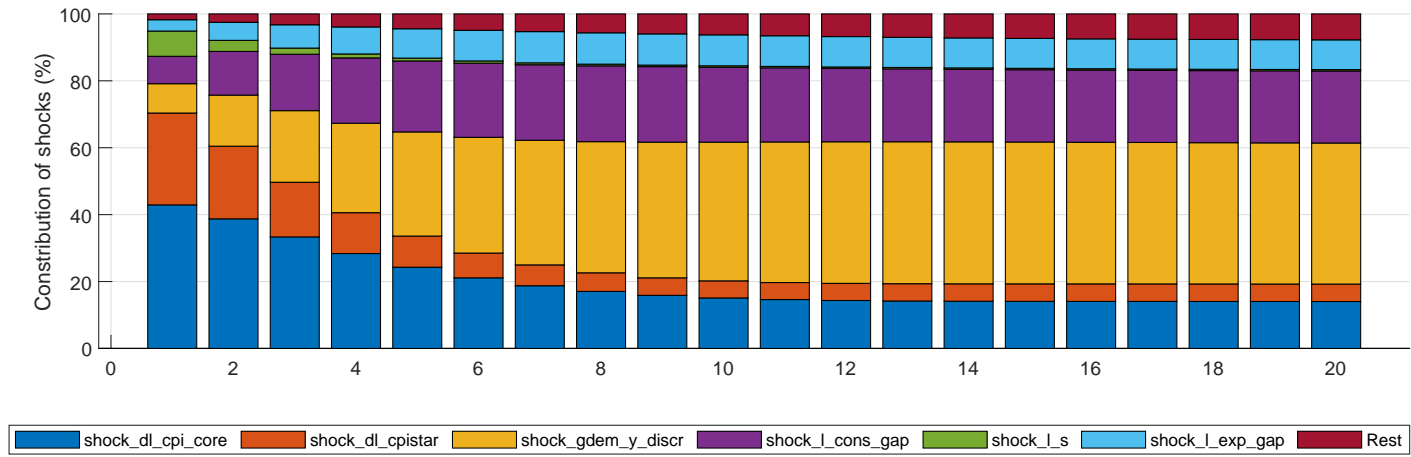
Foreign output gap, % [l_ystar_gap]
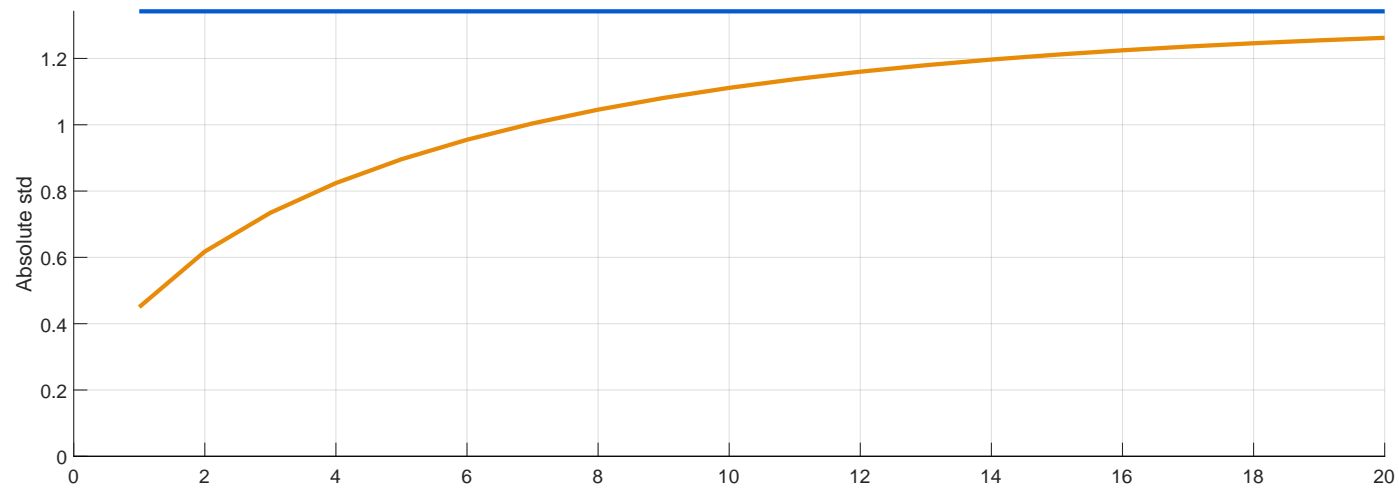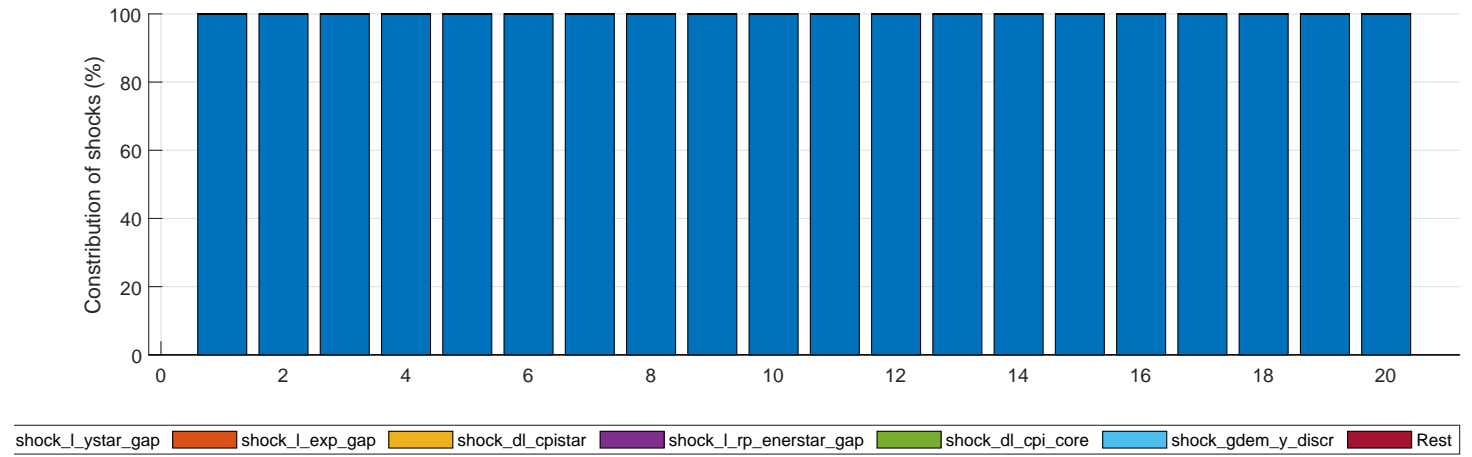
Foreign CPI, ann. QQ % [dl_cpistar]
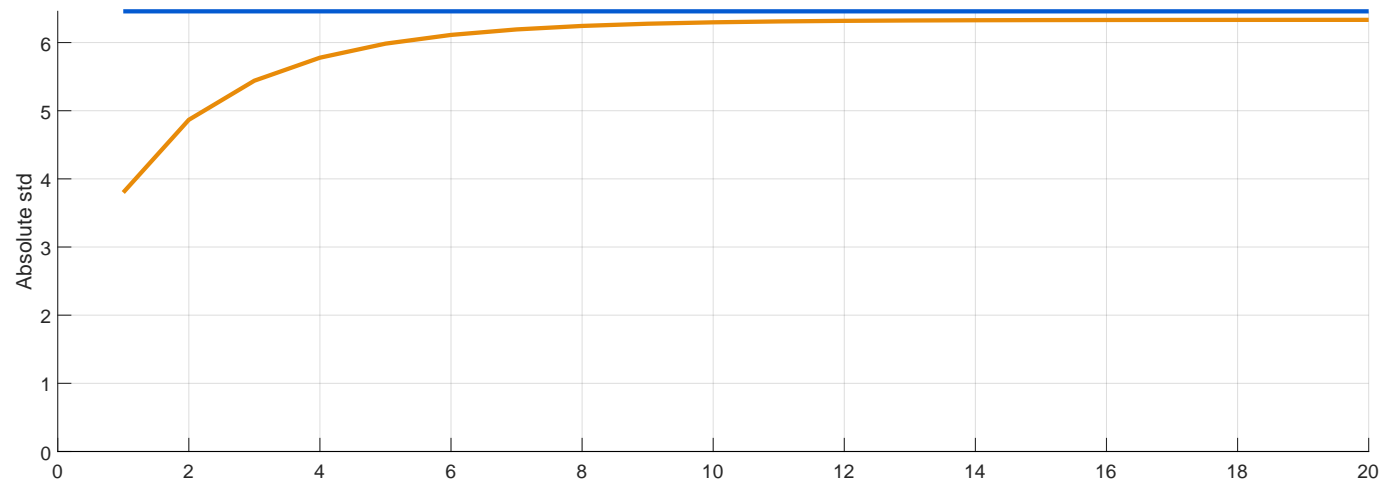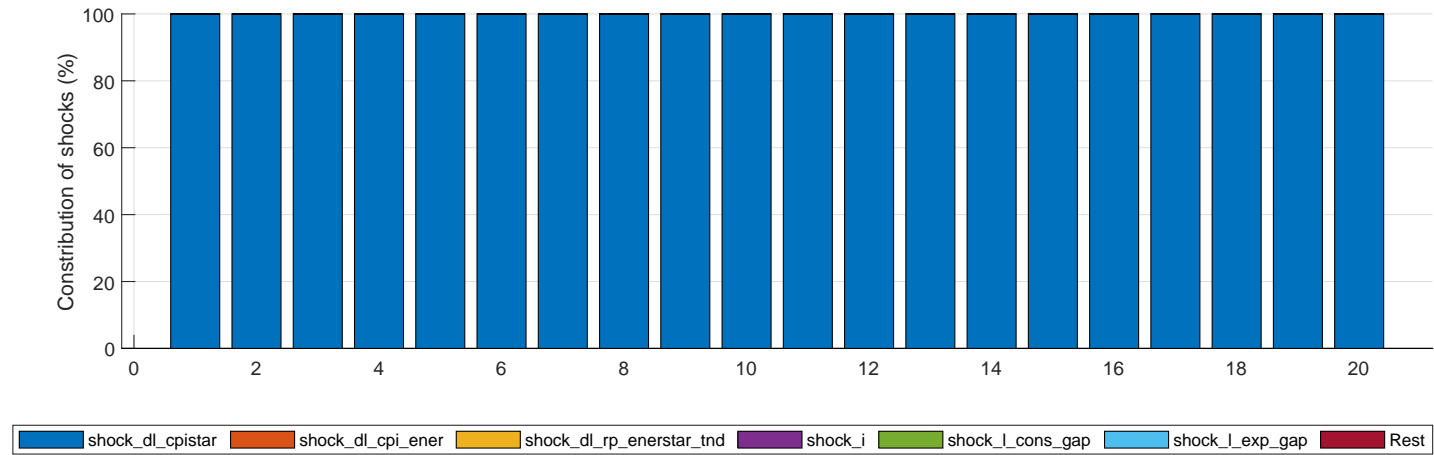
Foreign real interest rate trend, % [rstar_tnd]
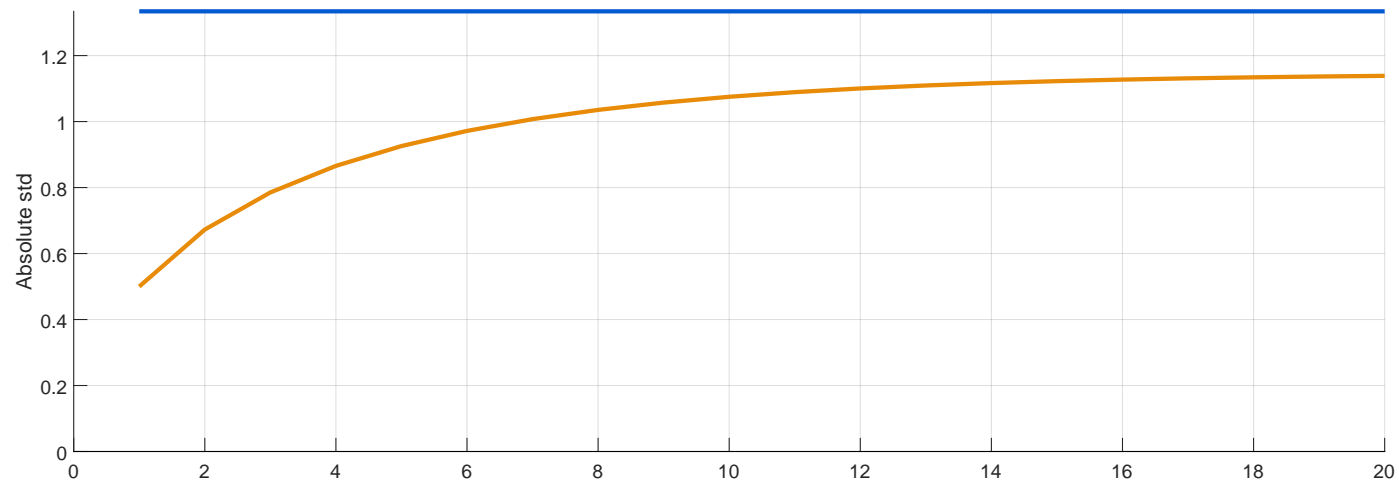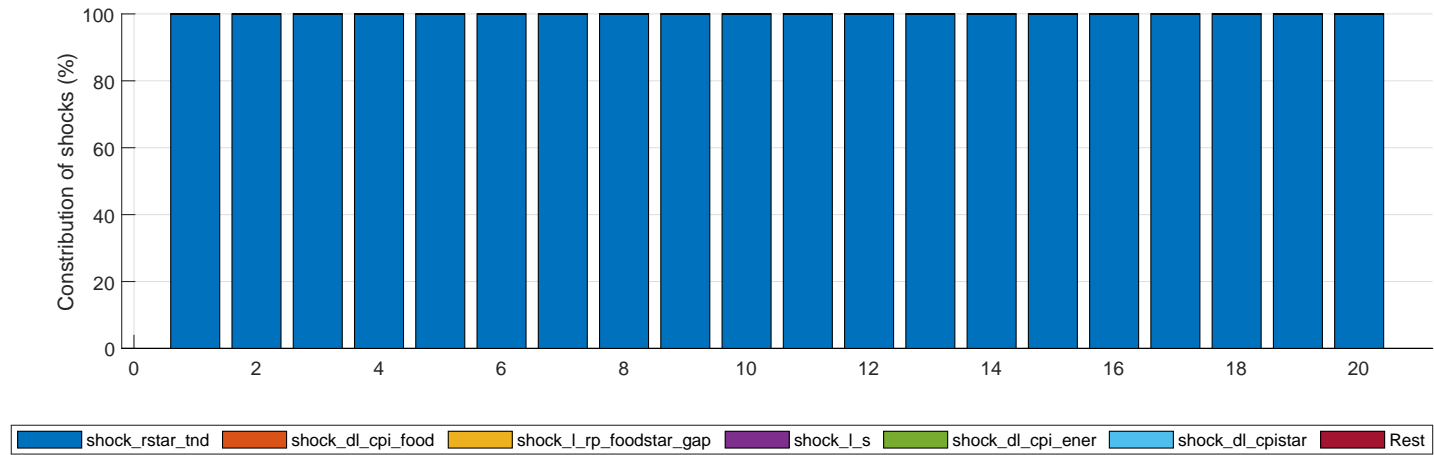
Foreign rel. food price gap, % [l_rp_foodstar_gap]
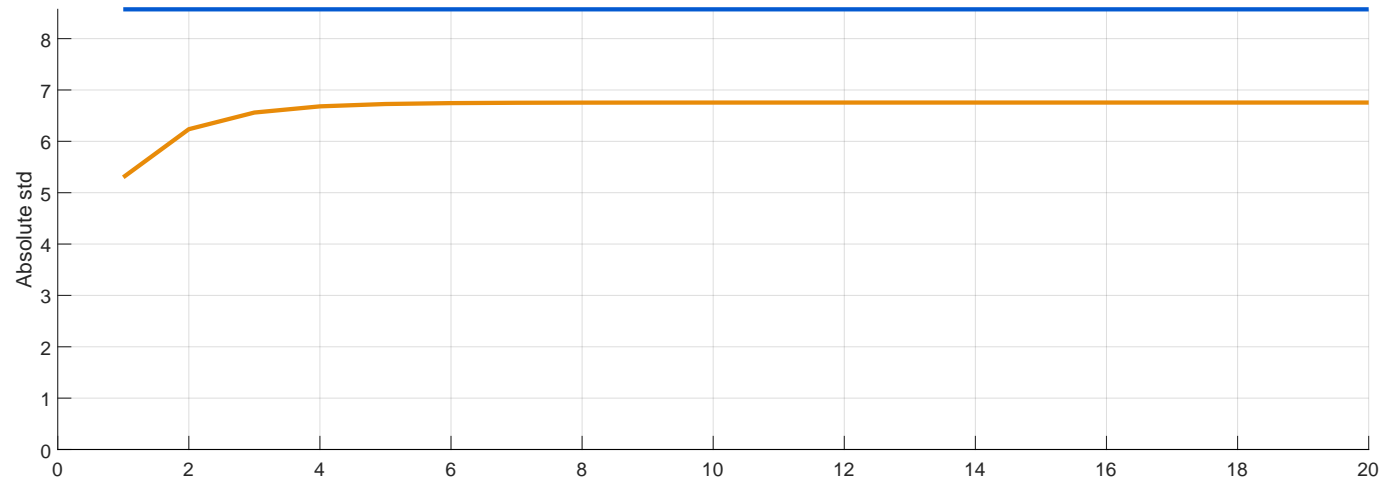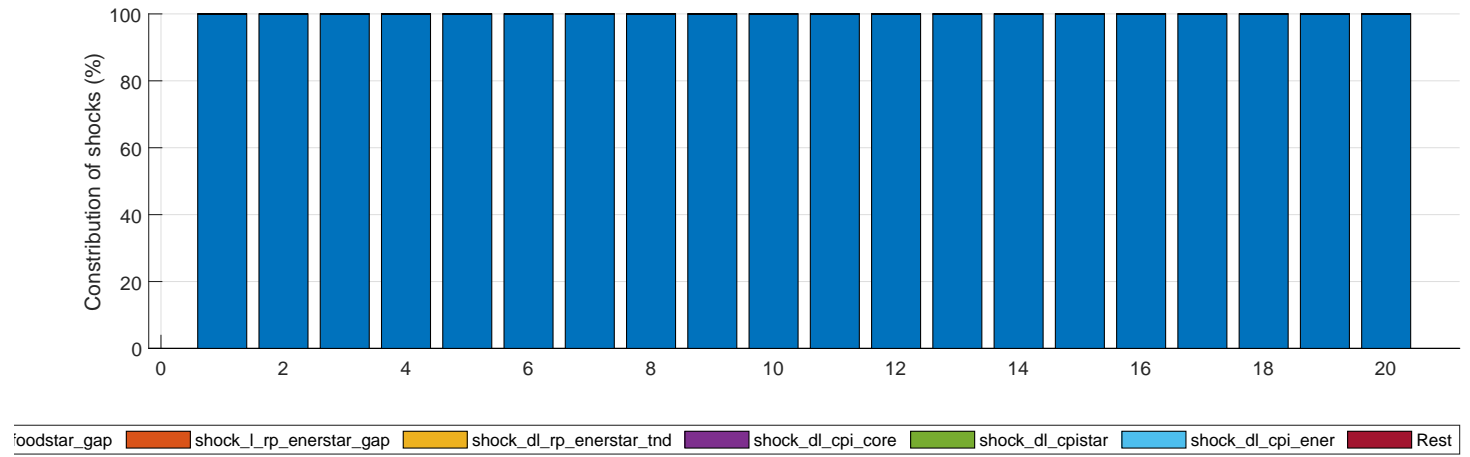
Foreign rel. ener. price gap, % [l_rp_enerstar_gap]
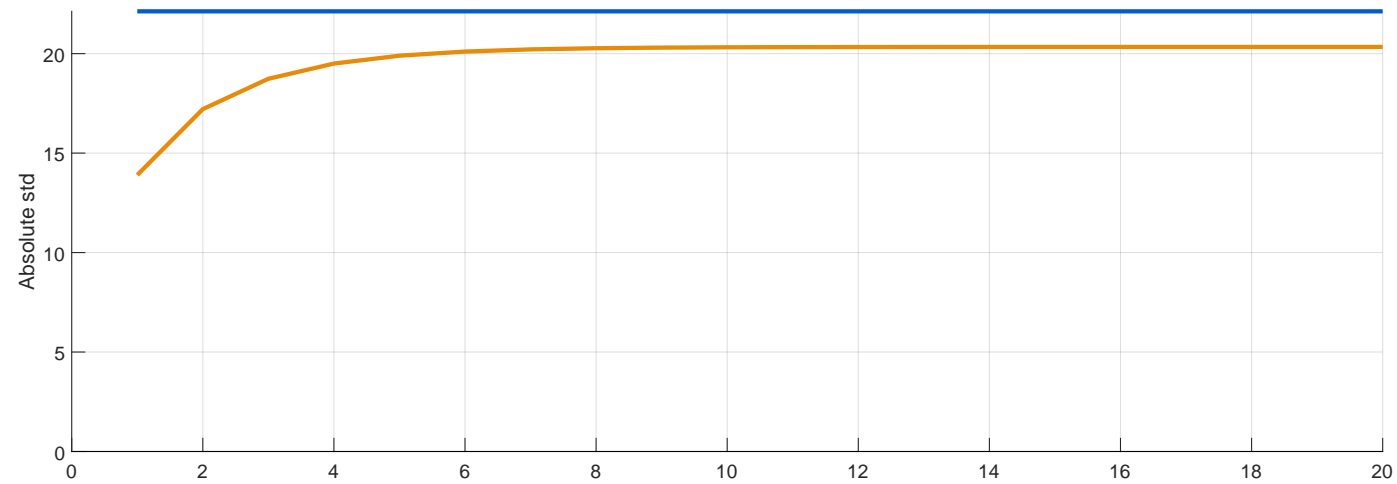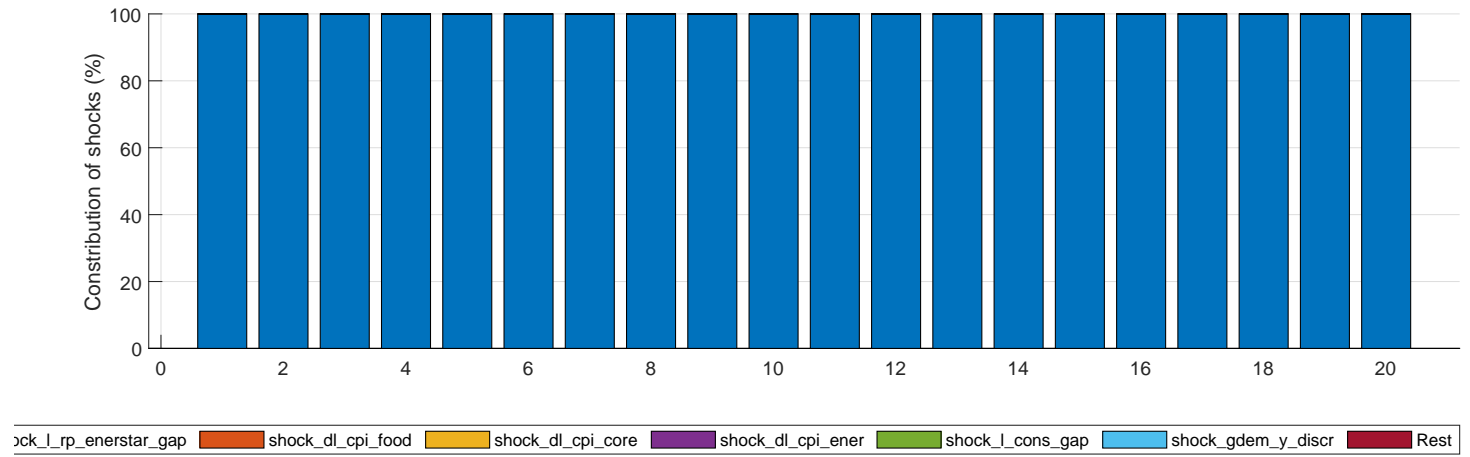
Equations (parameter values taken from setparam.m)

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 1: % -------------------------------------------------
 2: % ------------- Transition variables -------------
 3: % -------------------------------------------------
 4:
 5: !transition_variables
 6:
 7: % ---------------------------------
 8: % -------- Fiscal policy ---------
 9:
10: "Fiscal impulse, % of GDP"  fisc_imp
11:
12: "Budget deficit, % of GDP"    def_y
13: "Struct. deficit, % of GDP"   def_y_str
14: "Cyc. deficit, % of GDP"      def_y_cyc
15: "Discr. deficit, % of GDP"    def_y_discr
16:
17: "Govt. demand (G&S), % GDP"           gdem_y
18: "Struct. govt. demand (G&S), % GDP"   gdem_y_str
19: "Cyc. govt. demand (G&S), % GDP"      gdem_y_cyc
20: "Discr. govt. demand (G&S), % GDP"    gdem_y_discr
21:
22: "Other govt. exp., % to GDP"          oexp_y
23: "Cyc. other govt. exp., % to GDP"     oexp_y_cyc
24: "Struct. other govt. exp., % to GDP"  oexp_y_str
25: "Discr. other govt. exp., % to GDP"   oexp_y_discr
26:
27: "Govt. rev., % of GDP"           grev_y
28: "Struct. govt. rev., % of GDP"   grev_y_str
29: "Cyc. govt. rev., % of GDP"      grev_y_cyc
30: "Discr. govt. rev., % of GDP"    grev_y_discr
31:
32: "Fiscal grants, % of GDP"    grants_y
33:
34: % ---------------------------------------
35: % -------- Components of real GDP --------
36:
37: % ----- Private consumption -----
```

```
38:
39: "Consumption gap, %"            l_cons_gap
40: "Exptd. cons. gap, %"           e_l_cons_gap
41: "Consumption, 100*log"          l_cons
42: "Consumption, ann. QQ %"        dl_cons
43: "Consumption, YY %"             d4l_cons
44: "Consumption tnd., 100*log"     l_cons_tnd
45: "Consumption tnd., ann. QQ %"   dl_cons_tnd
46: "Consumption tnd., YY %"        d4l_cons_tnd
47:
48: % ----- Private investment -----
49:
50: "Investment gap, %"             l_inv_gap
51: "Exptd. investment gap, %"      e_l_inv_gap
52: "Investment, 100*log"           l_inv
53: "Investment, ann. QQ %"         dl_inv
54: "Investment, YY %"              d4l_inv
55: "Investment tnd., 100*log"      l_inv_tnd
56: "Investment tnd., ann. QQ %"    dl_inv_tnd
57: "Investment tnd., YY %"         d4l_inv_tnd
58:
59: % ----- Government demand for G&S -----
60:
61: "Gov. demand gap, %"            l_gdem_gap
62: "Gov. demand, 100*log"          l_gdem
63: "Gov. demand, ann. QQ %"        dl_gdem
64: "Gov. demand, YY %"             d4l_gdem
65: "Gov. demand, tnd., 100*log"    l_gdem_tnd
66: "Gov. demand, tnd., ann. QQ %"  dl_gdem_tnd
67: "Gov. demand, tnd., YY %"       d4l_gdem_tnd
68:
69: % ----- Exports of G&S -----
70:
71: "Export gap, %"                 l_exp_gap
72: "Exptd. export gap, %"          e_l_exp_gap
73: "Export RMCI, %"                rmci_exp
74: "Export, 100*log"               l_exp
75: "Export, ann. QQ %"             dl_exp
76: "Export, YY %"                  d4l_exp
77: "Export tnd., 100*log"          l_exp_tnd
```

```
 78: "Export tnd., ann. QQ %"  dl_exp_tnd
 79: "Export tnd., YY %"       d4l_exp_tnd
 80:
 81: % ----- Imports of G&S -----
 82:
 83: "Import gap, %"           l_imp_gap
 84: "Import, 100*log"         l_imp
 85: "Import, ann. QQ %"       dl_imp
 86: "Import, YY %"            d4l_imp
 87: "Import tnd., 100*log"    l_imp_tnd
 88: "Import tnd., ann. QQ %"  dl_imp_tnd
 89: "Import tnd., YY %"       d4l_imp_tnd
 90:
 91: % ----- GDP -----
 92:
 93: "Output gap, %"           l_y_gap
 94: "Exptd. output gap, %"    e_l_y_gap
 95: "GDP, 100*log"            l_y
 96: "GDP, ann. QQ %"          dl_y
 97: "GDP, YY %"               d4l_y
 98: "GDP tnd., 100*log"       l_y_tnd
 99: "GDP tnd., ann. QQ %"     dl_y_tnd
100: "GDP tnd., YY %"          d4l_y_tnd
101:
102: % ----- Agricultural output -----
103:
104: "Agric. output gap, %"           l_y_agr_gap
105: "Exptd. agric. output gap, %"    e_l_y_agr_gap
106: "Agric. GDP, 100*log"            l_y_agr
107: "Agric. GDP, ann.QQ %"           dl_y_agr
108: "Agric. GDP, YY %"               d4l_y_agr
109: "Agric. GDP tnd., 100*log"       l_y_agr_tnd
110: "Agric. GDP tnd., ann.QQ %"      dl_y_agr_tnd
111: "Agric. GDP tnd., YY %"          d4l_y_agr_tnd
112:
113: % -----------------------
114: % -------- Prices --------
115:
116: % ----- Headline CPI
117:
```

```
118: "Headline CPI, 100*log"          l_cpi
119: "Headline CPI, ann. QQ %"        dl_cpi
120: "Exptd. Headline CPI, ann. QQ %"  e_dl_cpi
121: "Headline CPI, YY %"             d4l_cpi
122:
123: % ----- Core CPI -----
124:
125: "Core CPI, 100*log"             l_cpi_core
126: "Core CPI, ann. QQ %"           dl_cpi_core
127: "Exptd. Core CPI, ann. QQ %"   e_dl_cpi_core
128: "Core CPI, YY %"                d4l_cpi_core
129:
130: % ----- Food CPI -----
131:
132: "Food CPI, 100*log"            l_cpi_food
133: "Food CPI, ann. QQ %"          dl_cpi_food
134: "Exptd. Food CPI, ann. QQ %"  e_dl_cpi_food
135: "Food CPI, YY %"               d4l_cpi_food
136:
137: % ----- Energy CPI -----
138:
139: "Energy CPI, 100*log"          l_cpi_ener
140: "Energy CPI, ann. QQ %"         dl_cpi_ener
141: "Exptd. energy CPI, ann. QQ %"  e_dl_cpi_ener
142: "Energy CPI, YY %"              d4l_cpi_ener
143:
144: % --------------------------------
145: % -------- Relative prices --------
146:
147: % ----- Real marginal cost gap -----
148:
149: "RMC, %"  rmc
150:
151: % ----- Core/headline relative prices -----
152:
153: "Core rel. price, 100*log"         l_rp_cpi_core
154: "Core rel. price, ann. QQ %"       dl_rp_cpi_core
155: "Core rel. price, YY %"            d4l_rp_cpi_core
156: "Core rel. price gap, %"           l_rp_cpi_core_gap
157: "Core rel. price tnd., 100*log"    l_rp_cpi_core_tnd
```

```
158: "Core rel. price tnd., ann. QQ %"    dl_rp_cpi_core_tnd
159: "Core rel. price tnd., YY %"         d4l_rp_cpi_core_tnd
160:
161: "Dir. ext. eff. in core, ann. QQ %" dl_cpi_core_direct
162:
163: % ----- Food/headline relative prices -----
164:
165: "Food rel. price, 100*log"           l_rp_cpi_food
166: "Food rel. price, ann QQ. %"         dl_rp_cpi_food
167: "Food rel. price, YY %"              d4l_rp_cpi_food
168: "Food rel. price gap, %"             l_rp_cpi_food_gap
169: "Food rel. price tnd., 100*log"      l_rp_cpi_food_tnd
170: "Food rel. price tnd., ann. QQ %"    dl_rp_cpi_food_tnd
171: "Food rel. price tnd., YY %"         d4l_rp_cpi_food_tnd
172:
173: "Dir. ext. eff. in food, ann. QQ %" dl_cpi_food_direct
174:
175: % ----- Energy/headline relative prices -----
176:
177: "Energy rel. price, 100*log"         l_rp_cpi_ener
178: "Energy rel. price, ann. QQ %"       dl_rp_cpi_ener
179: "Energy rel. price, YY %"            d4l_rp_cpi_ener
180: "Energy rel. price gap, %"           l_rp_cpi_ener_gap
181: "Energy rel. price tnd., 100*log"    l_rp_cpi_ener_tnd
182: "Energy rel. price tnd., ann. QQ %"  dl_rp_cpi_ener_tnd
183: "Energy rel. price tnd., YY %"       d4l_rp_cpi_ener_tnd
184:
185: "Dir. ext. eff. in energy, ann. QQ %" dl_cpi_ener_direct
186:
187: % --------------------------------
188: % -------- Monetary policy --------
189:
190: % ----- Nominal interest rate -----
191:
192: "Policy rate (IB rate used), %"      i
193: "Policy rate tnd (IB rate used), %" i_tnd
194:
195: % ----- Real interest rate -----
196:
197: "Real interest (policy) rate, %"              r
```

```
198: "RIR (policy) gap, %"                         r_gap
199: "Exptd. RIR (policy) gap, %"                  e4_r_gap
200: "Exptd. RIR (lending) gap, 4-Q ahead av., %"  r4_gap
201: "RIR (policy) trend, %"                       r_tnd
202:
203: % ----- Lending premium -----
204:
205: "Lending premium, %"      prem_d
206: "Lending premium gap, %"  prem_d_gap
207:
208: % ----- Inflation target -----
209:
210: "Inflation target, YY %"            d4l_cpi_tar
211: "Headline CPI dev, 4-Q ahead YY %"  d4l_cpi_dev
212:
213: "Impl. core infl. target, YY %"   d4l_cpi_core_tar
214: "Impl. food infl. target, YY %"   d4l_cpi_food_tar
215: "Impl. ener. infl. target, YY %"  d4l_cpi_ener_tar
216:
217: % ----- Real monetary condition index -----
218:
219: "RMCI cons., %"     rmci_cons
220: "RMCI invest., %"   rmci_inv
221:
222: % ------------------------------
223: % --------- Exchange rate --------
224:
225: % ----- Nominal exchange rate ------
226:
227: "Exchng. rate, 100*log"         l_s
228: "Exchng. rate, ann. QQ %"       dl_s
229: "Exchng. rate, YY %"            d4l_s
230: "Exptd. exchng. rate, 100*log"  e_l_s
231:
232: "Exchng rate target, ann. QQ %"   dl_s_tar
233:
234: % ----- Sovereign risk premium -----
235:
236: "Risk premium, %"   prem
237:
```

```
238: % ----- Real exchange rate -----
239:
240: "Real exchng. rate, 100*log"          l_z
241: "Real exchng. rate, ann. QQ %"        dl_z
242: "Real exchng. rate, YY %"             d4l_z
243: "Exptd. RER, ann. QQ %"              e_dl_z
244: "Real exchng. rate trend, 100*log"    l_z_tnd
245: "Real exchng. rate trend, ann. QQ %"  dl_z_tnd
246: "Real exchng. rate trend, YY %"       d4l_z_tnd
247: "Exp. RER trend., ann. QQ %"         e_dl_z_tnd
248: "Real exchng. rate gap, %"           l_z_gap
249:
250: % -------- Money demand --------
251:
252: "Money, 100*log"                     l_md
253: "Real money, 100*log"               l_rmd
254: "Real money, ann. QQ %"             dl_rmd
255: "Real money, YY %"                  d4l_rmd
256: "Change of velocity, ann. QQ %"     dl_v
257:
258: % --------------------------------
259: % -------- External variables --------
260:
261: % ----- External demand -----
262:
263: "Foreign output gap, %"   l_ystar_gap
264:
265: % ----- Foreign prices -----
266:
267: "Foreign CPI, 100*log"          l_cpistar
268: "Foreign CPI, ann. QQ %"        dl_cpistar
269: "Foreign CPI, YY %"             d4l_cpistar
270: "Exptd. foreign CPI, 100*log"   e_dl_cpistar
271:
272: % ----- Foreign interest rate -----
273:
274: "Foreign interest rate, %"            istar
275: "Foreign real interest rate trend, %"   rstar_tnd
276:
277: % ----- World food prices -----
```

```
278:
279: "Foreign food price, 100*log"      l_foodstar
280: "Foreign food price, ann. QQ %"    dl_foodstar
281: "Foreign food price, YY %"         d4l_foodstar
282:
283: "Foreign rel. food price, 100*log"     l_rp_foodstar
284: "Foreign rel. food price, ann. QQ %"   dl_rp_foodstar
285: "Foreign rel. food price, YY %"        d4l_rp_foodstar
286:
287: "Foreign rel. food price gap, %"   l_rp_foodstar_gap
288:
289: "Foreign rel. food price tnd., 100*log"     l_rp_foodstar_tnd
290: "Foreign rel. food price tnd., ann. QQ %"   dl_rp_foodstar_tnd
291: "Foreign rel. food price tnd., YY %"        d4l_rp_foodstar_tnd
292:
293: % ----- World energy prices -----
294:
295: "Foreign ener. price, 100*log"      l_enerstar
296: "Foreign ener. price, ann. QQ %"   dl_enerstar
297: "Foreign ener. price, YY %"         d4l_enerstar
298:
299: "Foreign rel. ener. price, 100*log"      l_rp_enerstar
300: "Foreign rel. ener. price, ann. QQ %"   dl_rp_enerstar
301: "Foreign rel. ener. price, YY %"        d4l_rp_enerstar
302:
303: "Foreign rel. ener. price gap, %"    l_rp_enerstar_gap
304:
305: "Foreign rel. ener. price tnd., 100*log"     l_rp_enerstar_tnd
306: "Foreign rel. ener. price tnd., ann. QQ %"   dl_rp_enerstar_tnd
307: "Foreign rel. ener. price tnd., YY %"        d4l_rp_enerstar_tnd
308:
309: % ----------------------------------------------
310: % ------------- Transition shocks --------------
311: % ----------------------------------------------
312:
313: !transition_shocks
314:
315: "Fiscal grants, % of GDP"    shock_grants_y⟨σ=2.5⟩
316:
317: "Gdem. cyc. shock, % of GDP"     shock_gdem_y_str⟨σ=0.075⟩
```

```
318: "Gdem. str. shock, % of GDP"      shock_gdem_y_cyc⟨σ=0⟩
319: "Gdem. discr. shock, % of GDP"   shock_gdem_y_discr⟨σ=1.7321⟩
320:
321: "Gov exp. cyc. shock, % of GDP"      shock_oexp_y_str⟨σ=0.1732⟩
322: "Gov exp. str. shock, % of GDP"      shock_oexp_y_cyc⟨σ=0⟩
323: "Gov exp. discr. shock, % of GDP"    shock_oexp_y_discr⟨σ=1.7321⟩
324:
325: "Gov rev. str. shock, % of GDP"      shock_grev_y_str⟨σ=0.1⟩
326: "Gov rev. cyc. shock, % of GDP"      shock_grev_y_cyc⟨σ=0⟩
327: "Gov rev. discr. shock, % of GDP"    shock_grev_y_discr⟨σ=1.7321⟩
328:
329: "Cons. gap shock, %"              shock_l_cons_gap⟨σ=2.5⟩
330: "Inv. gap shock, %"              shock_l_inv_gap⟨σ=6⟩
331: "Export gap shock, %"            shock_l_exp_gap⟨σ=6⟩
332: "Import gap shock, %"            shock_l_imp_gap⟨σ=0.5⟩
333: "Output gap shock, %"            shock_l_y_gap⟨σ=0.0001⟩
334: "Agric. output gap shock, %"   shock_l_y_agr_gap⟨σ=0.3⟩
335:
336: "Core infl. shock, ann. QQ %"      shock_dl_cpi_core⟨σ=2⟩
337: "Food infl. shock, ann. QQ %"      shock_dl_cpi_food⟨σ=9⟩
338: "Energy infl. shock, ann. QQ %"   shock_dl_cpi_ener⟨σ=7.1⟩
339: "CPI discr. shock, 100*log"        shock_l_cpi⟨σ=0.0001⟩
340:
341: "Policy rate shock, %"        shock_i⟨σ=1⟩
342: "Lending premium shock, %"   shock_prem_d_gap⟨σ=0.8⟩
343:
344: "Exchng. rate shock, 100*log"            shock_l_s⟨σ=0.35⟩
345: "Exchng. rate target shock, ann. QQ %"  shock_dl_s_tar⟨σ=0.3⟩
346:
347: "Real money dem. shock, ann. QQ %"  shock_dl_rmd⟨σ=1⟩
348: "Chng. of vel. shock, ann. QQ %"    shock_dl_v⟨σ=0.1⟩
349:
350: "Cons. tnd. shock, ann. QQ %"    shock_dl_cons_tnd⟨σ=0.25⟩
351: "Inv. tnd. shock, ann. QQ %"     shock_dl_inv_tnd⟨σ=0.5⟩
352: "Export shock, ann. QQ %"        shock_dl_exp_tnd⟨σ=0.75⟩
353: "Import tnd. shock, ann. QQ %"   shock_dl_imp_tnd⟨σ=0.25⟩
354:
355: "CPI target shocck, YY %"                   shock_d4l_cpi_tar⟨σ=0.1⟩
356: "Food rel. price. tnd. shock, ann. QQ %"    shock_dl_rp_cpi_food_tnd⟨σ=0.5⟩
357: "Energy rel. price. tnd. shock, ann. QQ %"  shock_dl_rp_cpi_ener_tnd⟨σ=0.15⟩
```

```
358: "RER tnd. shock, ann. QQ %"              shock_dl_z_tnd⟨σ=0.1⟩
359: "Premium shock, %"                       shock_prem⟨σ=0.1⟩
360: "Agric. output tnd. shock, %"            shock_dl_y_agr_tnd⟨σ=0.06⟩
361:
362: "Foreign output gap shock, %"                 shock_l_ystar_gap⟨σ=0.45⟩
363: "Foreign CPI shock, ann. QQ %"                shock_dl_cpistar⟨σ=3.8⟩
364: "Foreign intr. rate shock, %"                 shock_istar⟨σ=0.45⟩
365: "Foreign rel. food price gap shock, %"        shock_l_rp_foodstar_gap⟨σ=5.3⟩
366: "Foreign rel. ener. price gap shock, %"       shock_l_rp_enerstar_gap⟨σ=13.9⟩
367: "Foreign rel intr. rate rtnd. shock, %"       shock_rstar_tnd⟨σ=0.5⟩
368: "Foreign rel. food price tnd. shock, ann. QQ %"  shock_dl_rp_foodstar_tnd⟨σ=0.5⟩
369: "Foreign rel. ener. price tnd. shock, ann. QQ %"  shock_dl_rp_enerstar_tnd⟨σ=2.5⟩
370:
371: % ----------------------------------------
372: % -------------- Parameters --------------
373: % ----------------------------------------
374:
375: !parameters
376:
377: % ------------------------------
378: % -------- Steady states --------
379:
380: "steady state govt rev in % of GDP"          ss_grev_y_str⟨21⟩
381: "steady state govt other exp in % of GDP"     ss_oexp_y_str⟨6⟩
382: "steady state govt other exp in % of GDP"    ss_gdem_y_str⟨26⟩
383:
384: "SS of borrowing ratio, % of GDP"   ss_bor_str⟨6⟩
385: "SS of FCY debt share"              ss_debt_fcy_rat⟨0.846154⟩
386: "SS of fiscal grants ratio, % GDP"  ss_grants_y⟨5⟩
387:
388: "SS of FCY gov. debt. intr. prem., %" ss_prem_debt_fcy⟨NaN⟩
389: "SS of LCY gov. debt. intr. prem., %" ss_prem_debt_lcy⟨NaN⟩
390:
391: "SS of GDP growth, ann. QQ %"        ss_dl_y_tnd⟨7.23207⟩
392: "SS of agric.GDP growth, ann. QQ %" ss_dl_y_agr_tnd⟨7.23207⟩
393:
394: "CPI target, YY %"                   ss_d4l_cpi_tar⟨4.87902⟩
395: "SS of food rel. price, ann. QQ %"  ss_dl_rp_cpi_food_tnd⟨1.98026⟩
396: "SS of ener. rel. price, ann. QQ %" ss_dl_rp_cpi_ener_tnd⟨0⟩
397:
```

```
398: "SS of RER depr., ann. QQ %"  ss_dl_z_tnd⟨0⟩
399: "SS of risk premium, %"        ss_prem⟨2⟩
400: "SS of lending premium, %"     ss_prem_d⟨8.5⟩
401:
402: "SS of chng. of vel., ann. QQ %"  ss_dl_v⟨−2.02027⟩
403:
404: % --------------------------------------
405: % -------- Cyclical coefficients --------
406:
407: % ----- Fiscal parameters -----
408:
409: "Fiscal, grants. persist."                    d7⟨0.5⟩
410:
411: " grev_y_cyc response to cons * rev/GDP"      v1⟨0.012⟩
412: " grev_y_cyc response to imports * rev/GDP"   v2⟨0.006⟩
413: " grev_y_cyc response outputgap * rev/GDP"    v3⟨0.02⟩
414: " grev_y_str, lag"                            v4⟨0.99⟩
415:
416: "oexp_y_cyc,lag %"                            u1⟨0⟩
417: "oexp_y_cyc response output gap * oexp/GDP"   u2⟨0.012⟩
418: "oexp_y_str, lag %"                           u3⟨0.95⟩
419:
420: "gdem_y_cyc (Govt demand G&S), lag"           t1⟨0⟩
421: "gdem_y_cyc response outputgap * gdem/GDP"     t2⟨0.023⟩
422: "gdem_y_str (Govt demand G&S), lag"           t3⟨0.95⟩
423: "gdem_y_discr (Govt demand G&S), lag"         t4⟨0.7⟩
424:
425: "gdem_y_discr in fiscal impulse" s1⟨1⟩
426:
427: % ----- GDP components -----
428:
429: "Consumption gap, lag"               a1_cons⟨0.65⟩
430: "Consumption gap, expect."           a2_cons⟨0⟩
431: "Consumption gap, RMCI"              a3_cons⟨0.1⟩
432: "Consumption gap, output gap"        a4_cons⟨0.2⟩
433: "Consumption gap, fisc. imp."        a5_cons⟨0.25⟩
434: "Consumption gap, domestic in RMCI" a6_cons⟨1⟩
435:
436: "Investment gap, lag"                a1_inv⟨0.65⟩
437: "Investment gap, expect."            a2_inv⟨0⟩
```

```
438: "Investment gap, RMCI(RIR, RER)"    a3_inv⟨0.1⟩
439: "Investment gap, output gap"        a4_inv⟨0.2⟩
440: "Investment gap, fisc. imp."        a5_inv⟨0.15⟩
441: "Investment gap, domestic in RMCI"  a6_inv⟨1⟩
442:
443: "Export gap, lag"                   a1_exp⟨0.65⟩
444: "Export gap, expect."               a2_exp⟨0⟩
445: "Export gap, RMCI(RIR, REER)"       a3_exp⟨0.2⟩
446: "Export gap, foreign dem."          a5_exp⟨0.3⟩
447: "Export gap, domestic in RMCI"      a6_exp⟨0⟩
448:
449: "Import gap, REER coeffient"        a1_imp⟨0.3⟩
450:
451: "Agric.output gap AR(1)"            r1_y_agr⟨0.4⟩
452:
453: % ----- Phillips curves -----
454:
455: "Core Phillips curve, lag"              b1⟨0.45⟩
456: "Core Phillips curve, RMC"              b2⟨0.2⟩
457: "Core Phillips curve, direct imp."      b3⟨0.05⟩
458: "Core Phillips curve, domestic in RMC"  b4⟨0.8⟩
459:
460: "Food Phillips c., lag"                    bf1⟨0.35⟩
461: "Food Phillips c.,RMC indirect importprice" bf2⟨0.1⟩
462: "Food Phillips c.,direct importprice"       bf3⟨0.1⟩
463: "+Food Phillips c., agric.output gap neg."  bf4⟨1.5⟩
464:
465: "Energy Phillips curve, lag"          be1⟨0.25⟩
466: "Energy Phillips curve, RMC"          be2⟨0.04⟩
467: "Energy Phillips curve, direct imp."  be3⟨0.02⟩
468:
469: % ----- Monetary policy rule -----
470:
471: "Policy rule, lag"            c1⟨0.8⟩
472: "Policy rule, inflation"      c2⟨0.5⟩
473: "Policy rule, output gap"     c3⟨0.5⟩
474: "Policy rule, FX target"      c4⟨0⟩
475: "Inflation target, persist."  c5⟨0.9⟩
476: "Lending premium, lag"        c6⟨0.9⟩
477:
```

```
478: % ----- Exchange rate -----
479:
480: "Exchng rate, UIP"              e1⟨0.2⟩
481: "Exchng rate expect., forward"  e2⟨0.2⟩
482: "Premium, persist."             e3⟨0.9⟩
483: "Exchng rate target, persist."  e4⟨0⟩
484: "Exchng rate target, infl. dev." e5⟨0.3⟩
485: "Exchng rate target, REER gap"  e6⟨0.85⟩
486:
487: % ----- Money demand -----
488:
489: "Real money dem., lag"          m1⟨0.7⟩
490: "Real money dem., interest rate" m2⟨0.5⟩
491: "Change velocity,lag"           m3⟨0.9⟩
492:
493: % ------------------------
494: % -------- Weights --------
495:
496: "Import gap, cons.share imports"     w_imp_cons⟨0.445714⟩
497: "Import gap, inv.share imports"      w_imp_inv⟨0.156⟩
498: "Import gap, govdemand share imports" w_imp_gdem⟨0.276⟩
499: "Import gap, exp.share imports"      w_imp_exp⟨0.122286⟩
500:
501: "GDP gap, cons. share GDP"      w_y_cons⟨0.78⟩
502: "GDP gap, inv. share GDP"       w_y_inv⟨0.13⟩
503: "GDP gap, govdemand share GDP"  w_y_gdem⟨0.23⟩
504: "GDP gap, exp. share GDP"       w_y_exp⟨0.21⟩
505: "GDP gap, imp. share GDP"       w_y_imp⟨0.35⟩
506:
507: "Weight of core in CPI"   w_core⟨0.7747⟩
508: "Weight of food in CPI"   w_food⟨0.1577⟩
509: "Weight of energy in CPI" w_ener⟨0.0676⟩
510:
511: % -----------------------------------
512: % -------- Trend persistences --------
513:
514: "Cons. tnd. persist."           r_cons⟨0.95⟩
515: "Inv. tnd. persist."            r_inv⟨0.95⟩
516: "Gov. demand, tnd. persist."    r_gdem⟨0.95⟩
517: "Export tnd. persist."          r_exp⟨0.95⟩
```

```
518: "Import tnd. persist."             r_imp⟨0.95⟩
519: "Agric.output tnd. persist."       r2_y_agr⟨0.8⟩
520: "RER tnd. persist."                r_z⟨0.95⟩
521: "Food rel. price tnd. persist."    r_rp_food⟨0.9⟩
522: "Energy rel. price tnd. persist."  r_rp_ener⟨0.9⟩
523:
524: % -------------------------------------------
525: % -------- Foreign block parameters --------
526:
527: "SS of foreign CPI, ann. QQ %"              ss_dl_cpistar⟨1.98026⟩
528: "SS of foreign real intr. rate, %"          ss_rstar_tnd⟨0⟩
529: "SS of foreign rel. food price, ann. QQ %"  ss_dl_rp_foodstar_tnd⟨0⟩
530: "SS of foreign rel. ener. price, ann. QQ %" ss_dl_rp_enerstar_tnd⟨0⟩
531:
532: "foreign demand persist."          r_ystar⟨0.94⟩
533: "foreign CPI persist."             r_cpistar⟨0.8⟩
534: "foreign interest rate persist."   r_istar⟨0.95⟩
535: "for. interest rate tnd. persist." r_rstar_tnd⟨0.9⟩
536: "for. rp food persist."            r_rp_foodstar_gap⟨0.62⟩
537: "for. rp energy persist."          r_rp_enerstar_gap⟨0.73⟩
538: "for. rp food tnd. persist."       r_rp_foodstar_tnd⟨0.9⟩
539: "for. rp energy tnd. persist."     r_rp_enerstar_tnd⟨0.9⟩
540:
541: % -------------------------------------------------
542: % ------------- Transition equations -------------
543: % -------------------------------------------------
544:
545: !transition_equations
546:
547: % -------------------------------
548: % -------- Fiscal policy --------
549:
550: grants_y    = d7⟨0.5⟩ * grants_y {-1} + (1-d7⟨0.5⟩) * ss_grants_y⟨5⟩ + shock_grants_y⟨σ=2.5⟩;
551:
552: grev_y = grev_y_str + grev_y_cyc + grev_y_discr;
553: grev_y_cyc = v1⟨0.012⟩ * l_cons_gap + v2⟨0.006⟩ * l_imp_gap + v3⟨0.02⟩ * l_y_gap + shock_grev_y_cyc⟨σ=0⟩;
554: grev_y_str = ...
555:           + v4⟨0.99⟩ * grev_y_str{-1} ...
556:           + (1-v4⟨0.99⟩) * ss_grev_y_str⟨21⟩ ...
557:           + shock_grev_y_str⟨σ=0.1⟩;
```

```
558: grev_y_discr = shock_grev_y_discr⟨σ=1.7321⟩;
559:
560: oexp_y = oexp_y_str + oexp_y_cyc + oexp_y_discr;
561: oexp_y_cyc = u1⟨0⟩ * oexp_y_cyc{-1} - u2⟨0.012⟩ * l_y_gap + shock_oexp_y_cyc⟨σ=0⟩;
562: oexp_y_str = ...
563:    + u3⟨0.95⟩ * oexp_y_str{-1} ...
564:    + (1-u3⟨0.95⟩) * ss_oexp_y_str⟨6⟩ ...
565:    + shock_oexp_y_str⟨σ=0.1732⟩;
566: oexp_y_discr = shock_oexp_y_discr⟨σ=1.7321⟩;
567:
568: gdem_y = gdem_y_str + gdem_y_cyc + gdem_y_discr;
569: gdem_y_cyc = t1⟨0⟩ * gdem_y_cyc{-1} - t2⟨0.023⟩ * l_y_gap + shock_gdem_y_cyc⟨σ=0⟩;
570: gdem_y_str = ...
571:     + t3⟨0.95⟩ * gdem_y_str{-1} ...
572:     + (1-t3⟨0.95⟩) * ss_gdem_y_str⟨26⟩ ...
573:     + shock_gdem_y_str⟨σ=0.075⟩;
574: gdem_y_discr = t4⟨0.7⟩ * gdem_y_discr{-1} + shock_gdem_y_discr⟨σ=1.7321⟩;
575:
576: l_gdem/100 = log(gdem_y / 100) + l_y/100;
577: l_gdem_tnd/100 = log(gdem_y_str / 100) + l_y_tnd/100;
578:
579: def_y       = gdem_y       + oexp_y       - grev_y;
580: def_y_str   = gdem_y_str   + oexp_y_str   - grev_y_str;
581: def_y_cyc   = gdem_y_cyc   + oexp_y_cyc   - grev_y_cyc;
582: def_y_discr = gdem_y_discr + oexp_y_discr - grev_y_discr;
583:
584: fisc_imp = ...
585:    + s1⟨1⟩ * gdem_y_discr  + oexp_y_discr  - grev_y_discr ...
586:    + def_y_str - def_y_str{-1};
587:
588: % ---------------------------
589: % -------- Real demand --------
590:
591: % ----- Consumption gap -----
592: % (note fisc_imp is indirect effect of l_gdem_gap)
593:
594: l_cons_gap = ...
595:    + a1_cons⟨0.65⟩ * l_cons_gap{-1} ...
596:    + a2_cons⟨0⟩ * e_l_cons_gap ...
597:    - a3_cons⟨0.1⟩ * rmci_cons ...
```

```
598:    + a4_cons⟨0.2⟩ * l_y_gap ...
599:    + a5_cons⟨0.25⟩ * fisc_imp ...
600:    + shock_l_cons_gap⟨σ=2.5⟩;
601:
602: rmci_cons = a6_cons⟨1⟩ * r4_gap + (1 - a6_cons⟨1⟩) * -l_z_gap;
603:
604: e_l_cons_gap = l_cons_gap{+1};
605:
606: % ----- Investment gap -----
607: %  (note fisc_imp is indirect effect of l_gdem_gap)
608:
609: l_inv_gap = ...
610:    + a1_inv⟨0.65⟩ * l_inv_gap{-1} ...
611:    + a2_inv⟨0⟩ * e_l_inv_gap ...
612:    - a3_inv⟨0.1⟩ * rmci_inv ...
613:    + a4_inv⟨0.2⟩ * l_y_gap ...
614:    + a5_inv⟨0.15⟩ * fisc_imp ...
615:    + shock_l_inv_gap⟨σ=6⟩;
616:
617: rmci_inv = a6_inv⟨1⟩ * r4_gap + (1 - a6_inv⟨1⟩) * -l_z_gap;
618:
619: e_l_inv_gap = l_inv_gap{+1};
620:
621: % ----- Export gap -----
622:
623: l_exp_gap = ...
624:    + a1_exp⟨0.65⟩ * l_exp_gap{-1} ...
625:    + a2_exp⟨0⟩ * e_l_exp_gap ...
626:    - a3_exp⟨0.2⟩ * rmci_exp ...
627:    + a5_exp⟨0.3⟩ * l_ystar_gap ...
628:    + shock_l_exp_gap⟨σ=6⟩;
629:
630: rmci_exp = a6_exp⟨0⟩ * r4_gap + (1 - a6_exp⟨0⟩) * - l_z_gap;
631:
632: e_l_exp_gap = l_exp_gap{+1};
633:
634: % ----- Import gap -----
635: % (RER added same for all importdemands,coeff REER>0,so -a1_imp)
636:
637: l_imp_gap = ...
```

```
638:     + w_imp_cons⟨0.445714⟩  * l_cons_gap ...
639:     + w_imp_inv⟨0.156⟩    * l_inv_gap ...
640:     + w_imp_gdem⟨0.276⟩   * l_gdem_gap ...
641:     + w_imp_exp⟨0.122286⟩    * l_exp_gap ...
642:     - a1_imp⟨0.3⟩     *  l_z_gap ...
643:     + shock_l_imp_gap⟨σ=0.5⟩;
644:
645: % ----- Output gap -----
646: % (note direct effect of l_gdem_gap on l_y_gap)
647:
648: l_y_gap = ...
649:    + w_y_cons⟨0.78⟩   * l_cons_gap ...
650:    + w_y_inv⟨0.13⟩    * l_inv_gap ...
651:    + w_y_gdem⟨0.23⟩   * l_gdem_gap ...
652:    + w_y_exp⟨0.21⟩    * l_exp_gap ...
653:    - w_y_imp⟨0.35⟩    * l_imp_gap ...
654:    + shock_l_y_gap⟨σ=0.0001⟩;
655:
656: e_l_y_gap = l_y_gap{+1};
657:
658: % -----------------------------------------
659: % --------- Agricultural output gap --------
660:
661: l_y_agr_gap = r1_y_agr⟨0.4⟩ * l_y_agr_gap{-1} + shock_l_y_agr_gap⟨σ=0.3⟩;
662:
663: e_l_y_agr_gap = l_y_agr_gap{+1};
664:
665: % -----------------------
666: % --------- Prices --------
667:
668: % ----- Core Phillips curve -----
669:
670: dl_cpi_core = ...
671:    + b1⟨0.45⟩ * dl_cpi_core{-1} ...
672:    + (1 - b1⟨0.45⟩ - b3⟨0.05⟩) * (e_dl_cpi_core) ...
673:    + b3⟨0.05⟩ * dl_cpi_core_direct ...
674:    + b2⟨0.2⟩ * rmc ...
675:    + shock_dl_cpi_core⟨σ=2⟩;
676:
677: rmc = b4⟨0.8⟩ * l_y_gap + (1 - b4⟨0.8⟩) * l_z_gap;
```

```
678:
679: dl_cpi_core_direct = dl_cpistar + dl_s - dl_z_tnd;
680:
681: e_dl_cpi_core = dl_cpi_core{+1};
682:
683: l_rp_cpi_core = l_cpi_core - l_cpi;
684:
685: % ----- Food Phillips curve -----
686: % agric. output gap in food inflation, with coeff as BNR-IMF -0.5
687:
688: dl_cpi_food = ...
689:    + bf1⟨0.35⟩ * dl_cpi_food{-1} ...
690:    + (1 - bf1⟨0.35⟩ - bf3⟨0.1⟩) * (e_dl_cpi_food) ...
691:    + bf3⟨0.1⟩ * dl_cpi_food_direct ...
692:    + bf2⟨0.1⟩ * (l_rp_foodstar_gap + l_z_gap + l_rp_cpi_core_gap - l_rp_cpi_food_gap) ...
693:    - bf4⟨1.5⟩ * l_y_agr_gap ...
694:    + shock_dl_cpi_food⟨σ=9⟩;
695:
696: dl_cpi_food_direct = dl_foodstar - dl_rp_foodstar_tnd + dl_s - dl_z_tnd ...
697:    - dl_rp_cpi_core_tnd + dl_rp_cpi_food_tnd;
698:
699: e_dl_cpi_food = dl_cpi_food{+1};
700:
701: l_rp_cpi_food = l_cpi_food - l_cpi;
702:
703: % ----- Energy Phillips curve -----
704:
705: dl_cpi_ener = ...
706:    + be1⟨0.25⟩ * dl_cpi_ener{-1} ...
707:    + (1 - be1⟨0.25⟩ - be3⟨0.02⟩) * (e_dl_cpi_ener)...
708:    + be3⟨0.02⟩ * dl_cpi_ener_direct ...
709:    + be2⟨0.04⟩ * (l_rp_enerstar_gap + l_z_gap  + l_rp_cpi_core_gap - l_rp_cpi_ener_gap)
710:    + shock_dl_cpi_ener⟨σ=7.1⟩;
711:
712: dl_cpi_ener_direct = dl_enerstar - dl_rp_enerstar_tnd + dl_s - dl_z_tnd ...
713:    - dl_rp_cpi_core_tnd + dl_rp_cpi_ener_tnd;
714:
715: e_dl_cpi_ener = dl_cpi_ener{+1};
716:
717: l_rp_cpi_ener = l_cpi_ener - l_cpi;
```

```
718:
719: % ----- Headline CPI level -----
720:
721: l_cpi = w_core⟨0.7747⟩ * l_cpi_core + w_food⟨0.1577⟩ * l_cpi_food + w_ener⟨0.0676⟩ * l_cpi_ener + shock_l_cpi⟨σ=0.0001⟩;
722:
723: e_dl_cpi = dl_cpi{+1};
724:
725: 0 = w_core⟨0.7747⟩ * l_rp_cpi_core_gap + w_food⟨0.1577⟩ * l_rp_cpi_food_gap + w_ener⟨0.0676⟩ * l_rp_cpi_ener_gap;
726:
727: % -------------------------------------
728: % -------- Monetary policy --------
729: % (standard, except ER deviation, but coeff=0)
730:
731: % ----- Inflation forecast based rule -----
732:
733: i = c1⟨0.8⟩ * i{-1} + (1 - c1⟨0.8⟩) * ( ...
734:    + i_tnd ...
735:    + c2⟨0.5⟩ * d4l_cpi_dev ...
736:    + c3⟨0.5⟩ * l_y_gap ...
737:    + c4⟨0⟩ * (dl_s - dl_s_tar) ...
738:    ) ...
739:    + shock_i⟨σ=1⟩;
740:
741: d4l_cpi_dev = d4l_cpi{+4} - d4l_cpi_tar;
742:
743: i_tnd = r_tnd + d4l_cpi_tar + dl_rp_cpi_core_tnd;
744:
745: % ----- Real interest rate -----
746:
747: r = i - e_dl_cpi_core;
748:
749: r_tnd = rstar_tnd + prem + e_dl_z_tnd;
750:
751: r4_gap = (r_gap + r_gap{+1} + r_gap{+2} + r_gap{+3}) / 4  + prem_d_gap;
752:
753: e4_r_gap = (r_gap + r_gap{+1} + r_gap{+2} + r_gap{+3}) / 4;
754:
755: % ----- Lending premium -----
756:
757: prem_d = prem_d_gap + ss_prem_d⟨8.5⟩;
```

```
758:
759: prem_d_gap = c6⟨0.9⟩ * prem_d_gap{-1} + shock_prem_d_gap⟨σ=0.8⟩;
760:
761: % ----- Inflation target -----
762:
763: d4l_cpi_tar = c5⟨0.9⟩ * d4l_cpi_tar{-1} + (1 - c5⟨0.9⟩) * ss_d4l_cpi_tar⟨4.87902⟩ + shock_d4l_cpi_tar⟨σ=0.1⟩;
764:
765: d4l_cpi_core_tar = d4l_cpi_tar + d4l_rp_cpi_core_tnd;
766:
767: d4l_cpi_food_tar = d4l_cpi_tar + d4l_rp_cpi_food_tnd;
768:
769: d4l_cpi_ener_tar = d4l_cpi_tar + d4l_rp_cpi_ener_tnd;
770:
771: % ------------------------------
772: % -------- Exchange rate --------
773: % (UIP & move to ER-target, det. by RER-tnd & target infl.diff.)
774:
775: l_s = ...
776:    + e1⟨0.2⟩ * (e_l_s - (i - istar - prem)/4) ...
777:    + (1 - e1⟨0.2⟩) * (l_s{-1} + dl_s_tar/4) ...
778:    + shock_l_s⟨σ=0.35⟩;
779:
780: e_l_s = ...
781:    + e2⟨0.2⟩ * l_s{+1} ...
782:    + (1 - e2⟨0.2⟩) * (l_s{-1} + 2*(dl_z_tnd + d4l_cpi_tar + dl_rp_cpi_core_tnd - ss_dl_cpistar⟨1.98026⟩)/4);
783:
784: prem = e3⟨0.9⟩ * prem{-1} + (1 - e3⟨0.9⟩) * ss_prem⟨2⟩ + shock_prem⟨σ=0.1⟩;
785:
786: dl_s_tar = e4⟨0⟩ * dl_s_tar{-1} + (1 - e4⟨0⟩) * ( ...
787:    dl_z_tnd + d4l_cpi_tar + dl_rp_cpi_core_tnd - ss_dl_cpistar⟨1.98026⟩ - e5⟨0.3⟩ * d4l_cpi_dev - e6⟨0.85⟩ * l_z_gap ...
788:    ) + shock_dl_s_tar⟨σ=0.3⟩;
789:
790: l_z = l_s + l_cpistar - l_cpi_core;
791:
792: e_dl_z = dl_z{+1};
793:
794: e_dl_z_tnd = dl_z_tnd{+1};
795:
796: % ----------------------------------
797: % ------- Real money demand --------
```

```
798: % (function of nominal i dev., cp. BNR: change in r-tnd)
799:
800: l_rmd = l_md - l_cpi;
801:
802: dl_rmd = ...
803:    + m1⟨0.7⟩ * dl_rmd{-1} ...
804:    + (1 - m1⟨0.7⟩) * (dl_y - dl_v + m2⟨0.5⟩ * (i - i_tnd)) ...
805:    + shock_dl_rmd⟨σ=1⟩;
806:
807: dl_v = m3⟨0.9⟩ * dl_v{-1} + (1 - m3⟨0.9⟩) * ss_dl_v⟨−2.02027⟩ + shock_dl_v⟨σ=0.1⟩;
808:
809: % -----------------------
810: % -------- Trends --------
811: % (weights for output-tnd are same as for output-gap)
812:
813: dl_cons_tnd    = r_cons⟨0.95⟩  * dl_cons_tnd{-1} + (1 - r_cons⟨0.95⟩)  * ss_dl_y_tnd⟨7.23207⟩ + shock_dl_cons_tnd⟨σ=0.25⟩;
814: dl_inv_tnd     = r_inv⟨0.95⟩   * dl_inv_tnd{-1}  + (1 - r_inv⟨0.95⟩)   * ss_dl_y_tnd⟨7.23207⟩ + shock_dl_inv_tnd⟨σ=0.5⟩;
815: dl_exp_tnd     = r_exp⟨0.95⟩   * dl_exp_tnd{-1}  + (1 - r_exp⟨0.95⟩)   * ss_dl_y_tnd⟨7.23207⟩ + shock_dl_exp_tnd⟨σ=0.75⟩;
816: dl_imp_tnd     = r_imp⟨0.95⟩   * dl_imp_tnd{-1}  + (1 - r_imp⟨0.95⟩)   * ss_dl_y_tnd⟨7.23207⟩ + shock_dl_imp_tnd⟨σ=0.25⟩;
817:
818: dl_y_tnd = ...
819:    + w_y_cons⟨0.78⟩  * dl_cons_tnd ...
820:    + w_y_inv⟨0.13⟩   * dl_inv_tnd ...
821:    + w_y_gdem⟨0.23⟩  * dl_gdem_tnd ...
822:    + w_y_exp⟨0.21⟩   * dl_exp_tnd ...
823:    - w_y_imp⟨0.35⟩   * dl_imp_tnd;
824:
825: dl_y_agr_tnd  =  r2_y_agr⟨0.8⟩  * dl_y_agr_tnd{-1} + (1 - r2_y_agr⟨0.8⟩) * ss_dl_y_agr_tnd⟨7.23207⟩ + shock_dl_y_agr_tnd⟨σ=0.06⟩; % no role yet
826:
827: dl_z_tnd      = r_z⟨0.95⟩ * dl_z_tnd{-1} + (1 - r_z⟨0.95⟩)  * ss_dl_z_tnd⟨0⟩   + shock_dl_z_tnd⟨σ=0.1⟩;
828:
829: dl_rp_cpi_food_tnd  = r_rp_food⟨0.9⟩ * dl_rp_cpi_food_tnd{-1} + (1 - r_rp_food⟨0.9⟩) * ss_dl_rp_cpi_food_tnd⟨1.98026⟩ + shock_dl_rp_cpi_food_tnd
830: dl_rp_cpi_ener_tnd  = r_rp_ener⟨0.9⟩ * dl_rp_cpi_ener_tnd{-1} + (1 - r_rp_ener⟨0.9⟩) * ss_dl_rp_cpi_ener_tnd⟨0⟩ + shock_dl_rp_cpi_ener_tnd⟨σ=
831:
832: % --------------------------------
833: % -------- External sector ---------
834:
835: l_ystar_gap   = r_ystar⟨0.94⟩ * l_ystar_gap{-1} + shock_l_ystar_gap⟨σ=0.45⟩;
836:
837: dl_cpistar    = r_cpistar⟨0.8⟩ * dl_cpistar{-1} + (1 - r_cpistar⟨0.8⟩) * ss_dl_cpistar⟨1.98026⟩ + shock_dl_cpistar⟨σ=3.8⟩;
```

```
838: e_dl_cpistar  = dl_cpistar{+1};
839:
840: istar          = r_istar⟨0.95⟩ * istar{-1} + (1 - r_istar⟨0.95⟩) * (ss_rstar_tnd⟨0⟩ + ss_dl_cpistar⟨1.98026⟩) + shock_istar⟨σ=0.45⟩;
841: rstar_tnd      = r_rstar_tnd⟨0.9⟩ * rstar_tnd{-1} + (1 - r_rstar_tnd⟨0.9⟩) * ss_rstar_tnd⟨0⟩ + shock_rstar_tnd⟨σ=0.5⟩;
842:
843: l_rp_foodstar = l_foodstar - l_cpistar;
844: l_rp_enerstar = l_enerstar - l_cpistar;
845:
846: l_rp_foodstar_gap   = r_rp_foodstar_gap⟨0.62⟩ * l_rp_foodstar_gap{-1} + shock_l_rp_foodstar_gap⟨σ=5.3⟩;
847: l_rp_enerstar_gap   = r_rp_enerstar_gap⟨0.73⟩ * l_rp_enerstar_gap{-1} + shock_l_rp_enerstar_gap⟨σ=13.9⟩;
848:
849: dl_rp_foodstar_tnd = r_rp_foodstar_tnd⟨0.9⟩ * dl_rp_foodstar_tnd{-1} + (1 - r_rp_foodstar_tnd⟨0.9⟩) * ss_dl_rp_foodstar_tnd⟨0⟩ + shock_dl_rp_f
850: dl_rp_enerstar_tnd = r_rp_enerstar_tnd⟨0.9⟩ * dl_rp_enerstar_tnd{-1} + (1 - r_rp_enerstar_tnd⟨0.9⟩) * ss_dl_rp_enerstar_tnd⟨0⟩ + shock_dl_rp_e
851:
852: % -------------------------------------
853: % -------- Trend/gap identities --------
854:
855: !for
856:   l_y, l_y_agr, l_cons, l_inv, l_exp, l_imp, l_gdem,
857:   r, l_z
858:   l_rp_cpi_food, l_rp_cpi_ener, l_rp_cpi_core,
859:   l_rp_foodstar, l_rp_enerstar
860: !do
861:   !transition_equations
862:     ? = ?_tnd + ?_gap;
863: !end
864:
865: % ----------------------------
866: % -------- Growth rates --------
867:
868: !for
869:   y, y_tnd, cons, cons_tnd, inv, inv_tnd, gdem, gdem_tnd, exp, exp_tnd, imp, imp_tnd
870:   y_agr, y_agr_tnd,
871:   cpi, cpi_core, cpi_food, cpi_ener
872:   rp_cpi_food, rp_cpi_ener, rp_cpi_core, rp_cpi_food_tnd, rp_cpi_ener_tnd, rp_cpi_core_tnd
873:   s, z, z_tnd
874:   rmd
875:   cpistar, foodstar, enerstar
876:   rp_foodstar, rp_enerstar, rp_foodstar_tnd, rp_enerstar_tnd
877: !do
```

```
878:    !transition_equations
879:      dl_?  = 4 * (l_? - l_?{-1});
880:      d4l_? = (l_? - l_?{-4});
881: !end
882:
883: % -------------------------------------------------------------
884: % ------------- Measurement variables/equations --------------
885: % -------------------------------------------------------------
886:
887: % ----------------------------------
888: % -------- Hard observations --------
889:
890: !for
891:   def_y, grants_y, grev_y
892:   l_y, l_y_agr, l_cons, l_gdem, l_inv, l_exp, l_imp
893:   l_cpi, l_cpi_core, l_cpi_food, l_cpi_ener
894:   i, prem_d, l_s, l_md
895:   l_ystar_gap, l_cpistar, istar, rstar_tnd
896:   l_foodstar, l_enerstar
897:   l_rp_foodstar_gap, l_rp_enerstar_gap
898: !do
899:   !measurement_variables
900:     obs_?
901:   !measurement_equations
902:     obs_? = ?;dl_cpi_core
903: !end
904:
905: % -----------------------------------------
906: % -------- Expert/judgemental tunes --------AK added Oct 13, def_y, grev_y
907:
908: !for
909:   gdem_y, oexp_y, def_y, grev_y
910:   gdem_y_str, oexp_y_str, grev_y_str
911:   gdem_y_cyc, oexp_y_cyc, grev_y_cyc
912:   grev_y_discr, oexp_y_discr, gdem_y_discr
913:   l_y_tnd, l_cons_tnd, l_inv_tnd, l_gdem_tnd, l_exp_tnd, l_imp_tnd
914:   d4l_cpi_tar, l_rp_cpi_food_tnd, l_rp_cpi_ener_tnd
915:   dl_cpi_core, dl_cpi_food, dl_cpi_ener, dl_cpi
916:   r_tnd, l_z_tnd, prem, dl_s_tar
917:   def_y_str, def_y_discr, grants_y
```

```
918:    l_y_gap, l_cons_gap, l_inv_gap, l_gdem_gap, l_exp_gap, l_imp_gap
919:    l_y_agr_gap
920:    l_z_gap
921:    l_y, d4l_y
922:    dl_s
923: !do
924:    !measurement_variables
925:        tune_?
926:    !measurement_equations
927:        tune_? = ?;
928: !end
929:
930: % --------------------------------------------------------------------------------
931: % --------- Auxiliary variables/equations for shock tuning in the filter ---------
932:
933: !for
934:    shock_dl_cons_tnd⟨σ=0.25⟩
935:    shock_dl_cpi_ener⟨σ=7.1⟩
936:    shock_dl_cpi_core⟨σ=2⟩
937: !do
938:    !transition_variables
939:        aux_?
940:    !transition_equations
941:        aux_? = ?;
942:    !measurement_variables
943:        tune_?
944:    !measurement_equations
945:        tune_? = aux_?;
946: !end
947:
948: % ----------------------------------------------
949: % ------------- Reporting equations -------------
950: % ----------------------------------------------
951:
952: !parameters
953:
954: "Share of import prices in CPI"            mu_pimp⟨0.35⟩
955: "Share of export prices in GDP deflator"  mu_pexp⟨0.2⟩
956:
957: "share of fcy debt in total debt"         r_debt_fcy_rat⟨0.9⟩
```

```
958: "interest rate fcy debt persistence"    r_debt_fcy_intrate_pers⟨0.9⟩
959: "interest rate lcy debt persistence"    r_debt_lcy_intrate_pers⟨0.9⟩
960:
961: gamma_r⟨0.5⟩
962: gamma_k⟨0.5⟩
963: gamma_BP_tnd⟨0.9⟩
964: % AK 7/14/23 replace k_bar by l_BP_tnd; % log(BP)=k, BP cum inflows mln$,
965: % BP does not go to fixed ss level k_bar=log(6500), but to trend
966: % with initial value trend set equal to actual in readData
967:
968: "Import share in consumption"   lam_imp_cons⟨0.2⟩
969: "Import share in investment"    lam_imp_inv⟨0.42⟩
970: "Import share in govdemand"     lam_imp_gdem⟨0.42⟩
971: "Import share in exports"       lam_imp_exp⟨0.20381⟩
972:
973: !reporting_equations
974:
975: % True percentages (added Oct 28, '22)
976: !for
977:   y, cons, inv, gdem, exp, imp
978:   cpi, cpi_core, cpi_food, cpi_ener
979:   s, z
980: !do
981:   pct_?   = exp(dl_?/100)*100 - 100;
982:   pct4_?  = exp(d4l_?/100)*100 - 100;
983: !end
984:
985: !for
986:   i, r
987: !do
988:   pct_?   = exp(?/100)*100 - 100;
989: !end
990:
991: % Levels exchange rate and nominal money demand
992: s   = exp(l_s/100);
993: md  = exp(l_md/100);
994: dl_md = 4*(l_md - l_md{-1}); % ak 7/15/23 must[dbFcats be annualized
995:
996: % Deflators (recall: all annualized, *4)
997:
```

```
 998: dl_pexp = dl_pexpstar + dl_s;
 999: dl_pimp = dl_pimpstar + dl_s;
1000:
1001: dl_pdom = (dl_cpi - mu_pimp⟨0.35⟩ * dl_pimp) / (1 - mu_pimp⟨0.35⟩);
1002:
1003: dl_py   = mu_pexp⟨0.2⟩ * dl_pexp + (1 - mu_pexp⟨0.2⟩) * dl_pdom;
1004: % deflator for govt demand assumed equal to dl_cpi_core to simplify
1005:
1006: % Nominal growth rates (recall:all annualized, *4)
1007:
1008: dl_nexp = dl_exp  + dl_pexp;
1009: dl_nimp = dl_imp  + dl_pimp;
1010: dl_ny   = dl_y    + dl_py;
1011: dl_ngdem = dl_gdem + dl_cpi_core;
1012: dl_ncons = dl_cons + dl_cpi_core; % 4/19 AK for ratios (% to nom GDP)
1013: dl_ninv  = dl_inv  + dl_cpi_core;
1014:
1015: % Nominal levels exports, imports, GDP
1016:
1017: nexp    = exp(log(nexp{-1}) + dl_nexp/100/4);
1018: nimp    = exp(log(nimp{-1}) + dl_nimp/100/4);
1019: ny      = exp(log(ny{-1}) + dl_ny/100/4); % get ny{-1} etc from dbAUX to have start value forecast
1020: ngdem   = exp(log(ngdem{-1}) + (dl_ngdem/100)/4); % idem
1021: ncons   = exp(log(ncons{-1}) + dl_ncons/100/4); % 4/19/23 AK for ratios
1022: ninv    = exp(log(ninv{-1}) + dl_ninv/100/4);
1023:
1024: tb_rat  = (nexp - nimp) / ny *100;
1025:
1026: % Capital account (Ostry/Ghosh/Chamon,2012:log(BP)=k; define rstar here, not done in model)
1027: % 7/14/23 trend eq for ss cumul capital inflows in line with real GDP, instead of k_bar
1028: rstar = istar - e_dl_cpistar;
1029: % first evaluate trend
1030: dl_BP_tnd = gamma_BP_tnd⟨0.9⟩ * dl_BP_tnd{-1} + (1-gamma_BP_tnd⟨0.9⟩) * ss_dl_y_tnd⟨7.23207⟩;
1031: l_BP_tnd = dl_BP_tnd/4 + l_BP_tnd{-1};
1032: % then evaluate level
1033: l_BP  = l_BP{-1} + gamma_r⟨0.5⟩ * ( (r - rstar - prem)/4 - e_dl_z ) ...
1034:     - gamma_k⟨0.5⟩ * (l_BP{-1} - l_BP_tnd);
1035: dBP_usd = exp(l_BP/100) - exp(l_BP{-1}/100);
1036:
1037: % evaluate debt and deficit first before rest of BOP and MON
```

```
1038: % ak debt changes with deficit-/-grants, nb def_y and grants are over Q-GDP, as is debt
1039: debt_y = ...
1040:    + debt_lcy_y{-1} * (1) / exp(dl_ny/400) ...
1041:    + debt_fcy_y{-1} * exp(dl_s/400) / exp(dl_ny/400) ...
1042:    + def_y - grants_y;
1043:
1044: debt_fcy_rat = r_debt_fcy_rat⟨0.9⟩ * debt_fcy_y{-1} / debt_y{-1} + (1 - r_debt_fcy_rat⟨0.9⟩) * ss_debt_fcy_rat⟨0.846154⟩;
1045:
1046: debt_fcy_y = debt_fcy_rat * debt_y;
1047:
1048: debt_lcy_y = debt_y - debt_fcy_y; % residual
1049:
1050: def_lcy_y = debt_lcy_y - debt_lcy_y{-1} * (1) / exp(dl_ny/400);
1051:
1052: def_fcy_y = debt_fcy_y - debt_fcy_y{-1} * exp(dl_s/400) / exp(dl_ny/400);
1053:
1054: % ak we need interest-rate update equations:
1055: % i_debt_fcy = r_debt_fcy_intrate_pers * i_debt_fcy{-1} + (1 -
1056: % r_debt_fcy_intrate_pers) * (ss_rstar_tnd + ss_dl_cpistar + ss_prem_debt_fcy)
1057: % i_debt_lcy = r_debt_lcy_intrate_pers * i_debt_lcy{-1} + (1 -
1058: % r_debt_lcy_intrate_pers) * (i_tnd + ss_prem_debt_lcy)
1059:
1060: intp_fcy_y = i_debt_fcy{-1}/400 * debt_fcy_y{-1} * exp(dl_s/400) / exp(dl_ny/400);
1061:
1062: intp_lcy_y = i_debt_lcy{-1}/400 * debt_lcy_y{-1} * (1) / exp(dl_ny/400);
1063:
1064: % External flow equilibrium (current account (RM=E-M) converted to mln $)
1065: % still need evaluate levels govt interest payments in usd for BOP
1066: dBG_usd = ( ( (def_fcy_y/100) * ny) /s ) * 1000; % for bor deficit RWFbln then to $mln
1067: NFG_usd = ( ( (grants_y/100)  * ny) /s ) * 1000; % net foreign grants govt RWFbln then to $mln
1068:
1069: dNFA_usd = (nexp - nimp) / s * 1000 + NFG_usd + dBG_usd + dBP_usd;
1070:
1071: % ak 7/15/23 trace monetary flows, share of bank in domestic financing deficit
1072: def_lcy_bank_y = 0.5 * def_lcy_y; % nb still over Q GDP in %!
1073: NCG = NCG{-1} + (def_lcy_bank_y/100) * ny;
1074:
1075: NFA = NFA{-1} + dNFA_usd * s/1000; % ignores ER valuation changes
1076:
1077: % Monetary flow equilibrium in bln RWF, private credit residual
```

```
1078: dNCP = diff(md) - dNFA_usd * s / 1000 - diff(NCG);
1079:
```