

Dynamic behavior of the model

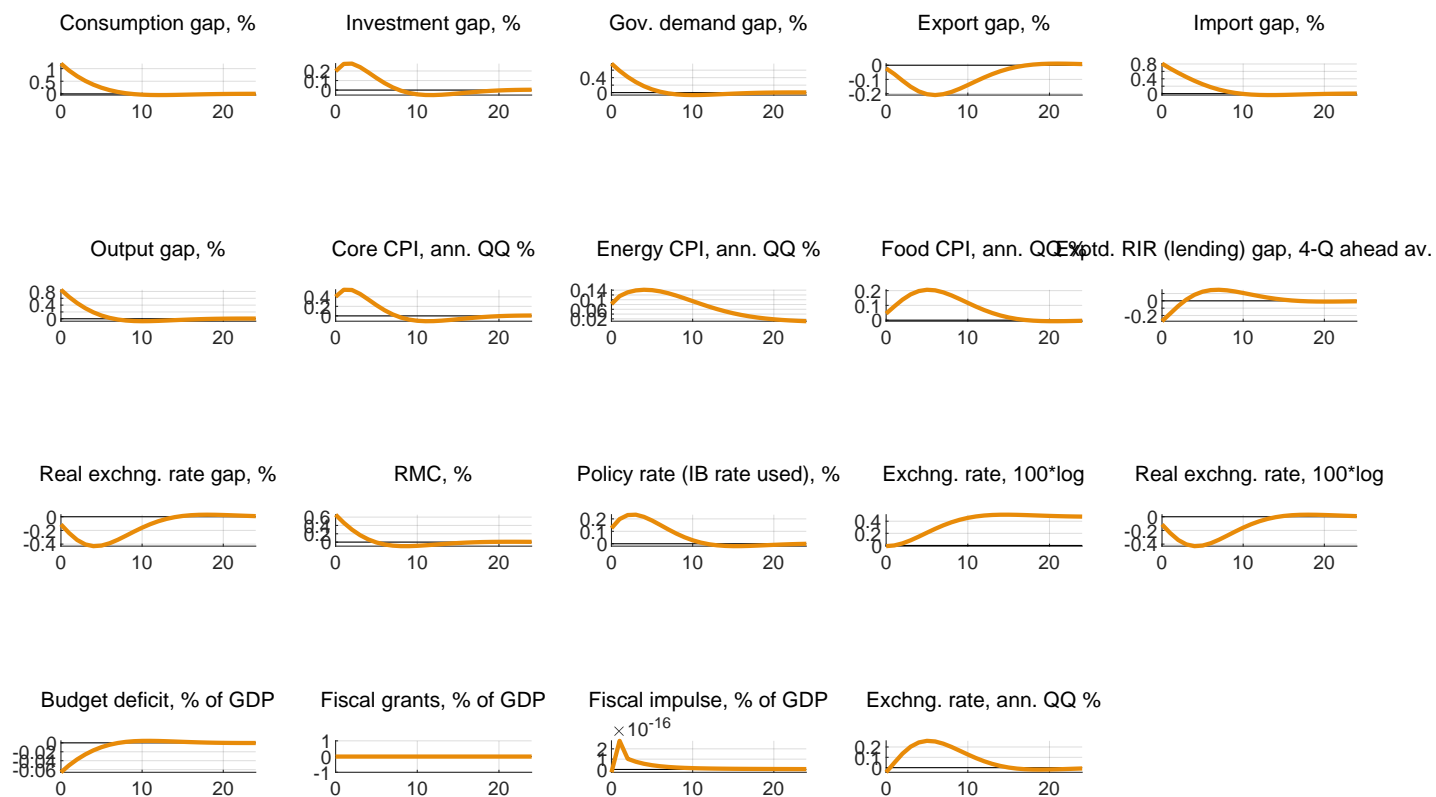
Round: 2023 July main round, time: 06-Dec-2023 15:55:22.

1 Steady states

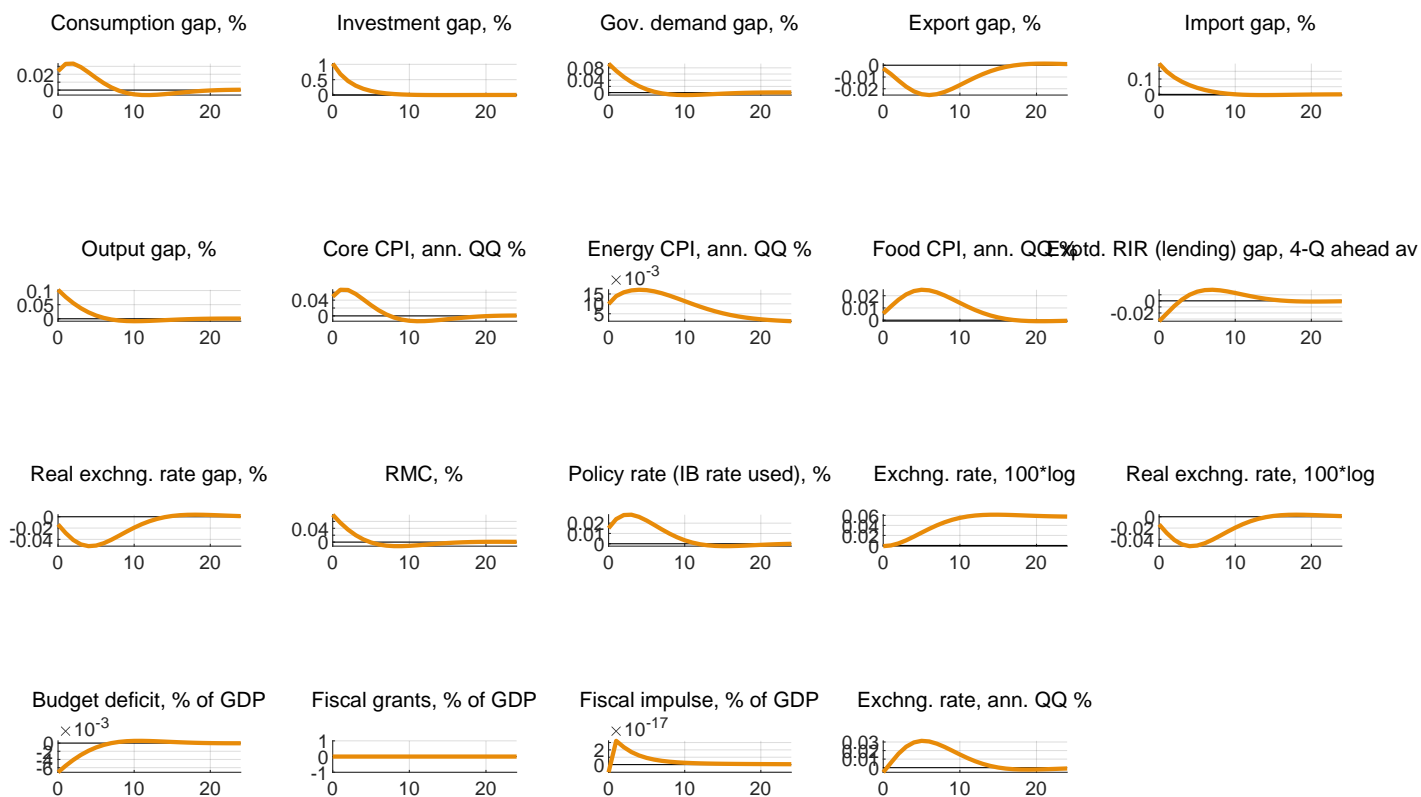
Consumption gap, % [l_cons_gap]	0.00
Investment gap, % [l_inv_gap]	0.00
Gov. demand gap, % [l_gdem_gap]	0.00
Export gap, % [l_exp_gap]	-0.00
Output gap, % [l_y_gap]	0.00
Real exchn. rate gap, % [l_z_gap]	-0.00
RIR (policy) gap, % [r_gap]	-0.00
RMC, % [rmc]	-0.00
Budget deficit, % of GDP [def_y]	11.00
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

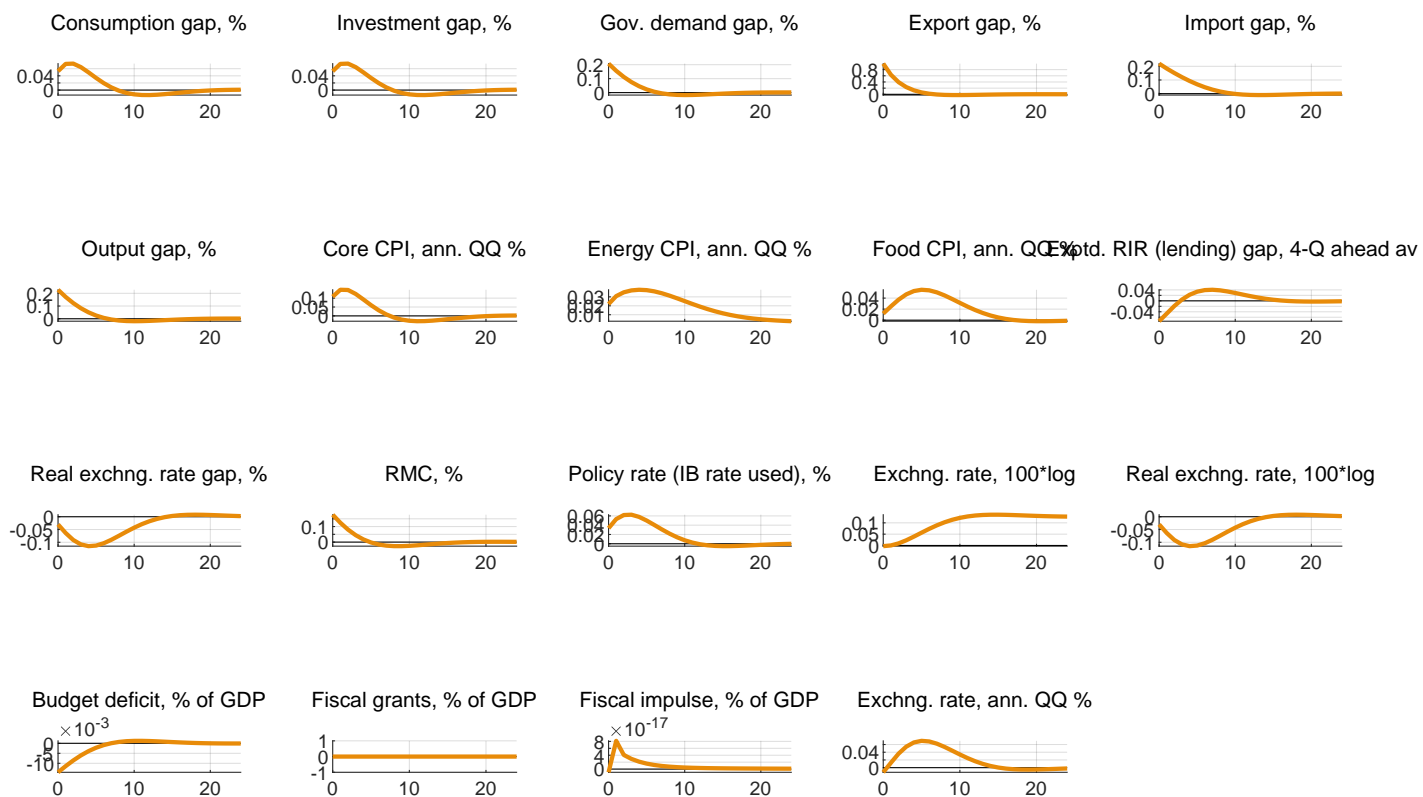
Responses to Cons. gap shock, % [shock_1_cons_gap]



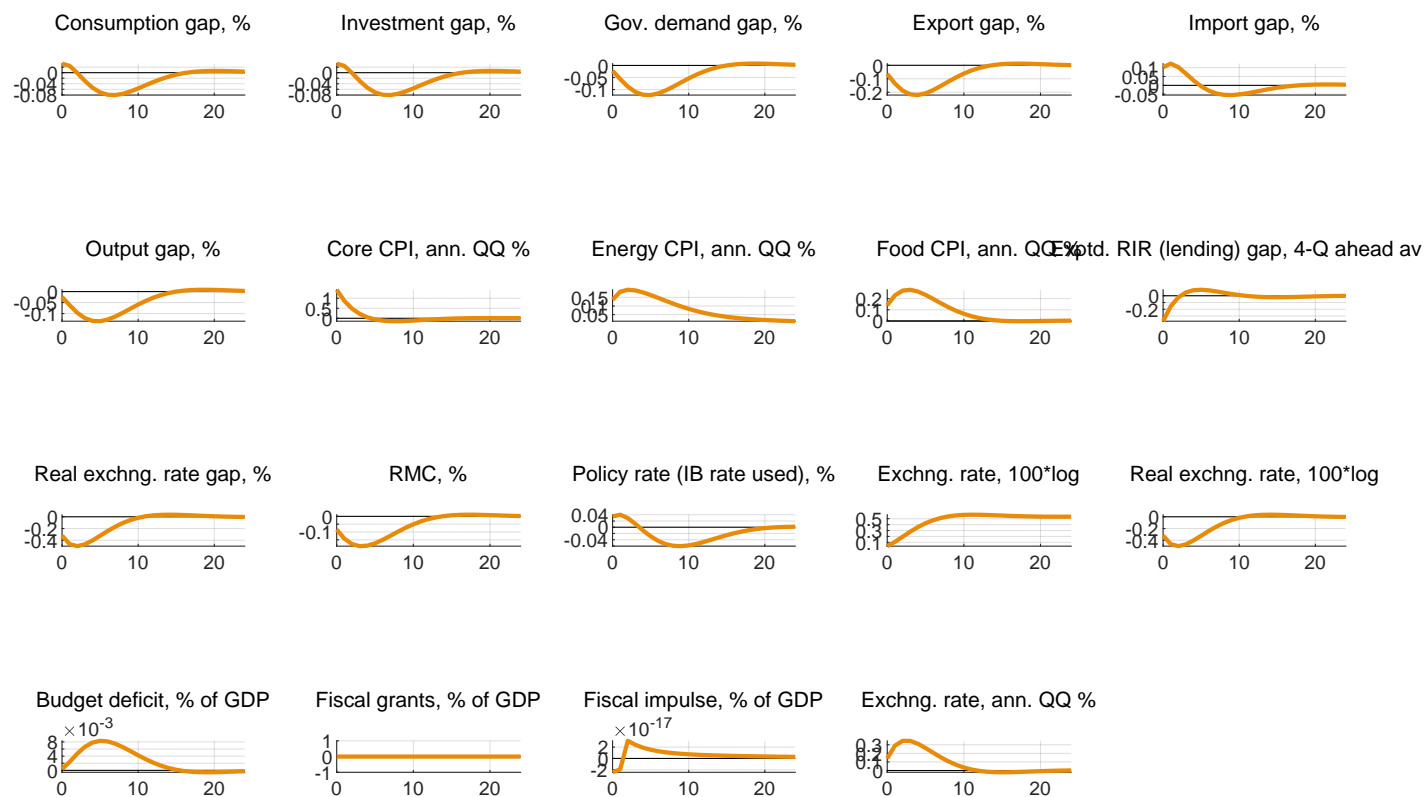
Responses to Inv. gap shock, % [shock_1_inv_gap]



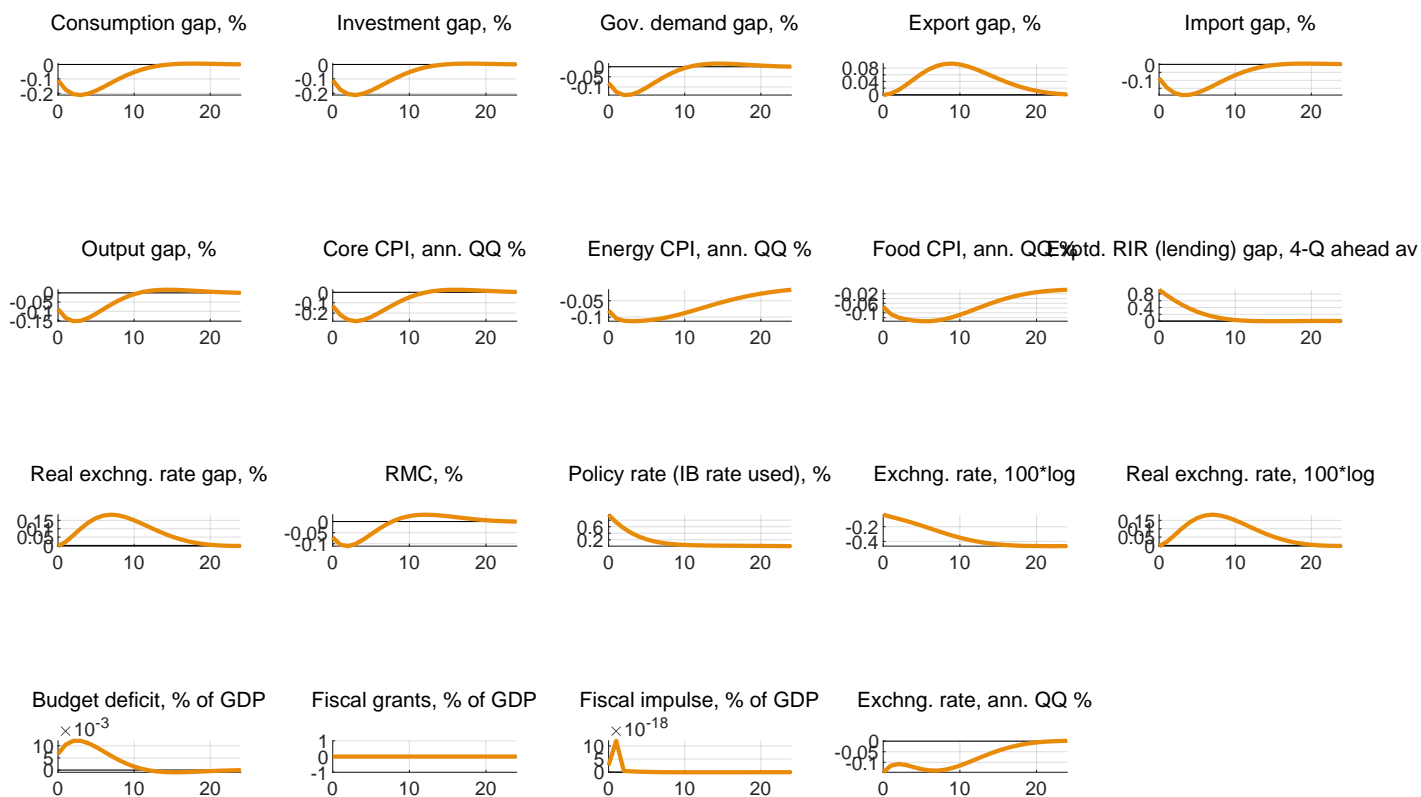
Responses to Export gap shock, % [shock_1_exp_gap]



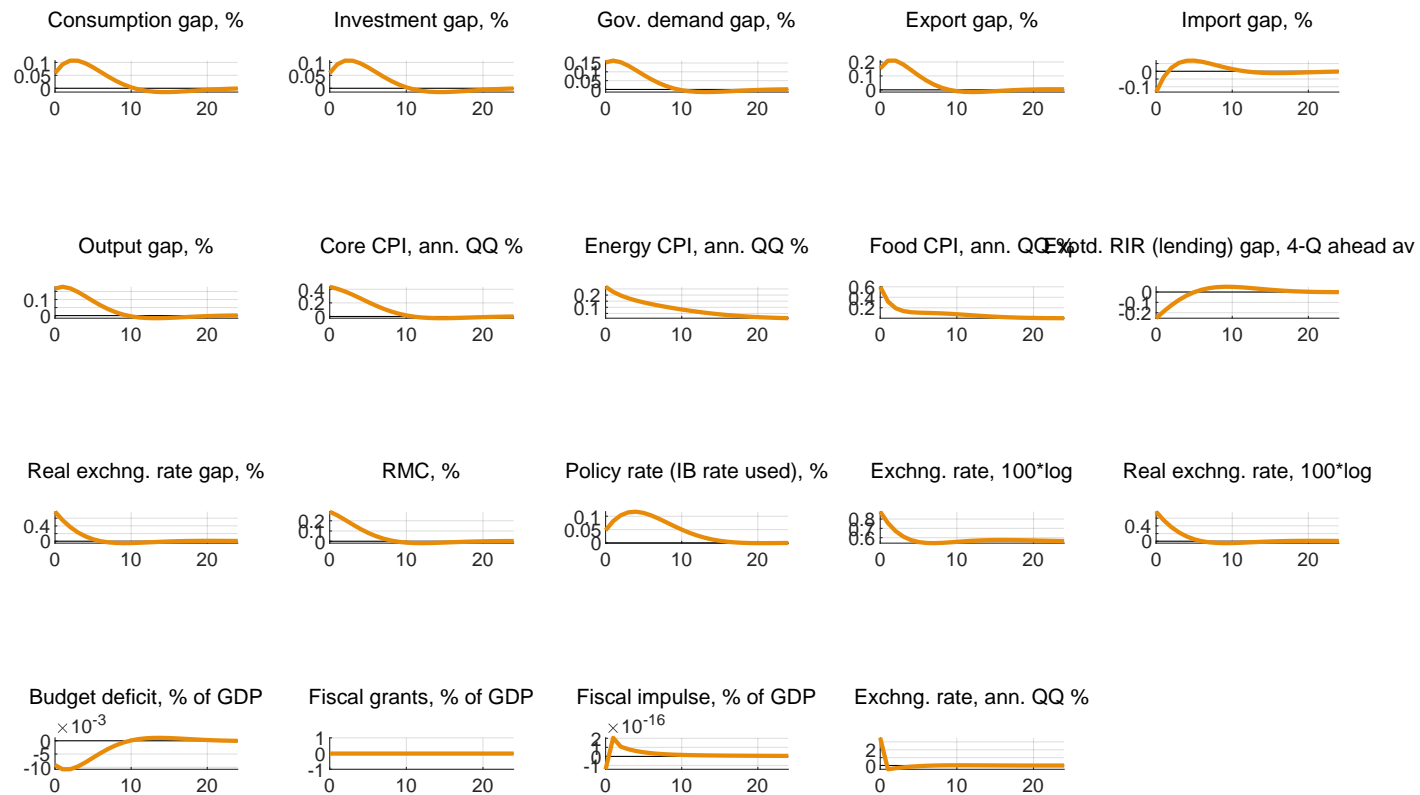
Responses to Core infl. shock, ann. QQ % [shock_dl_cpi_core]



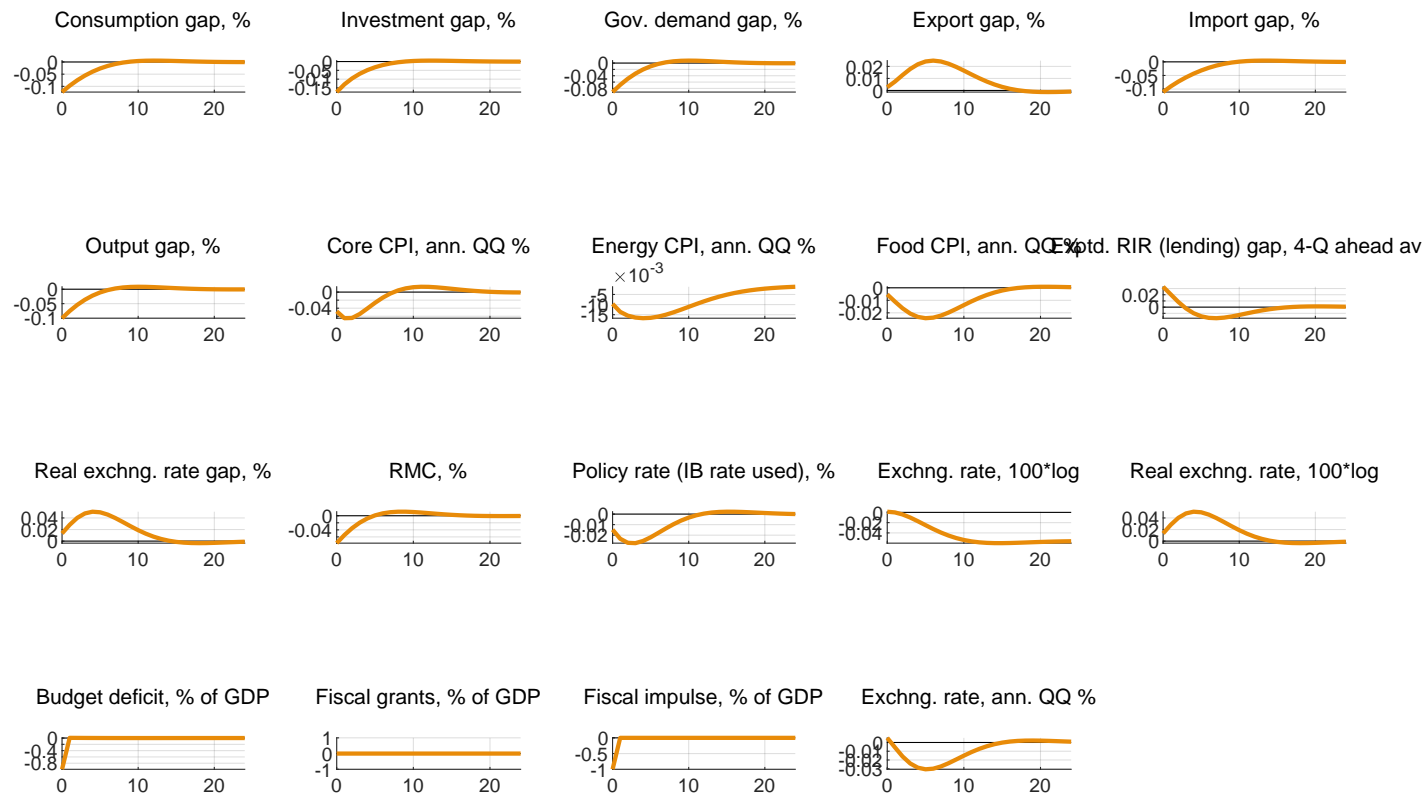
Responses to Policy rate shock, % [shock_i]



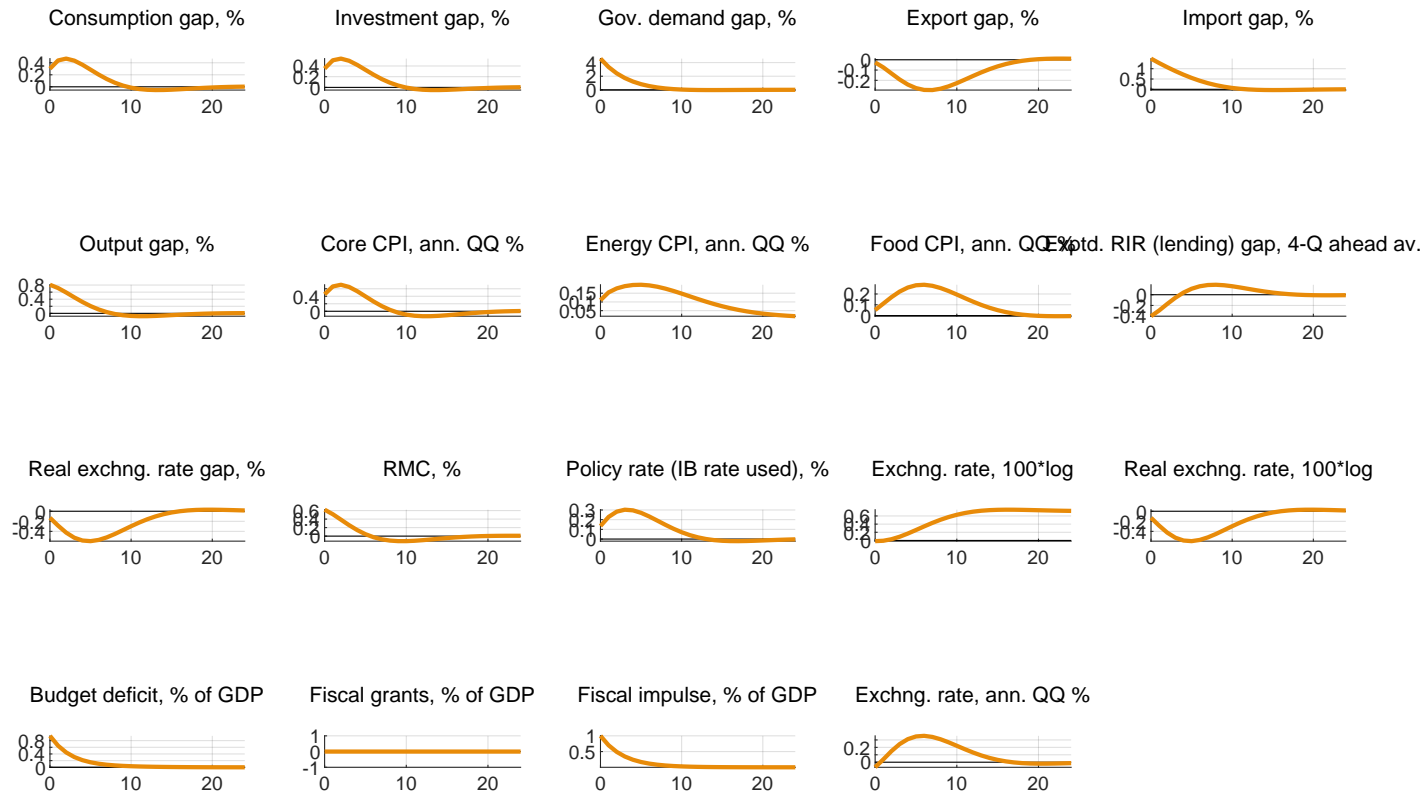
Responses to Exchng. rate shock, 100*log [shock_1_s]



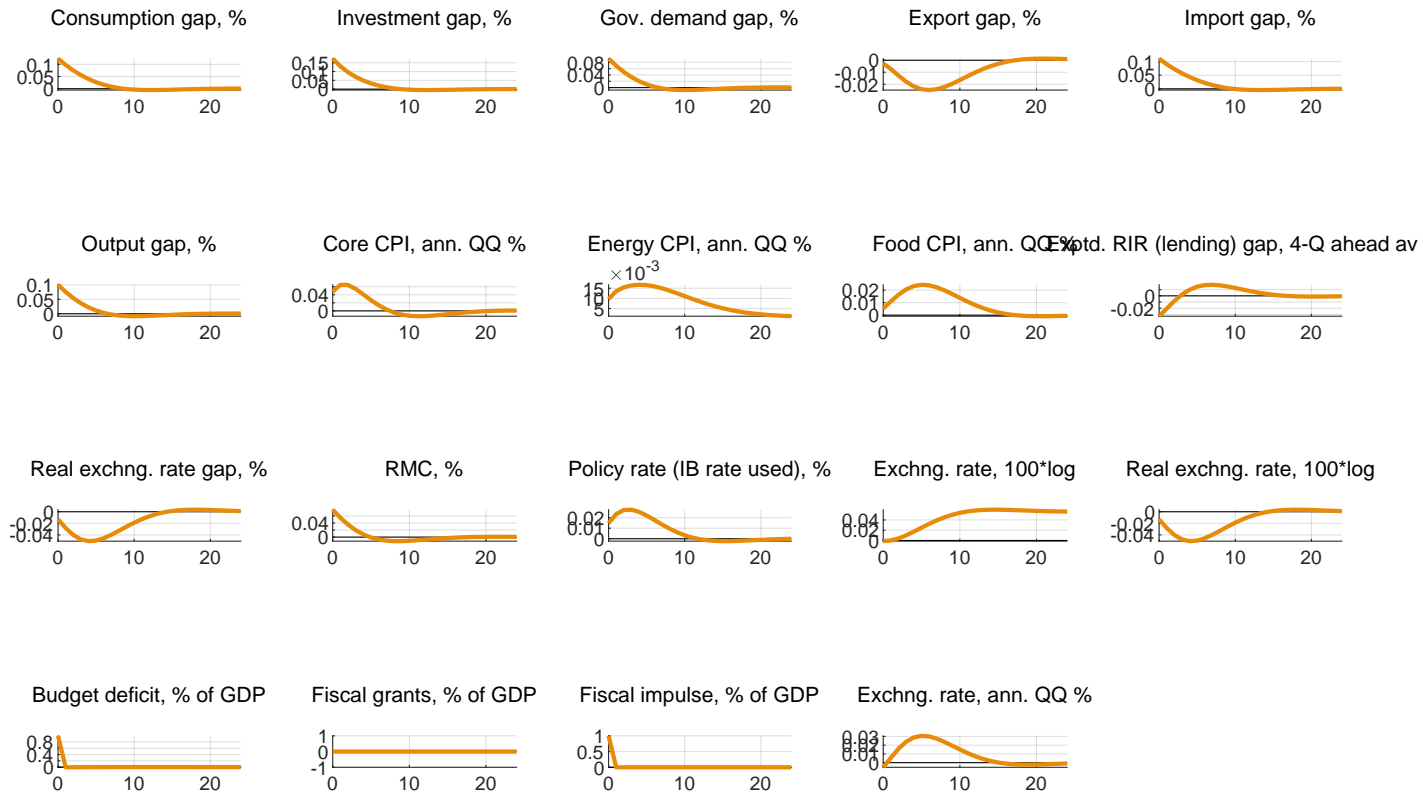
Responses to Gov rev. discr. shock, % of GDP [shock_grev_y_discr]



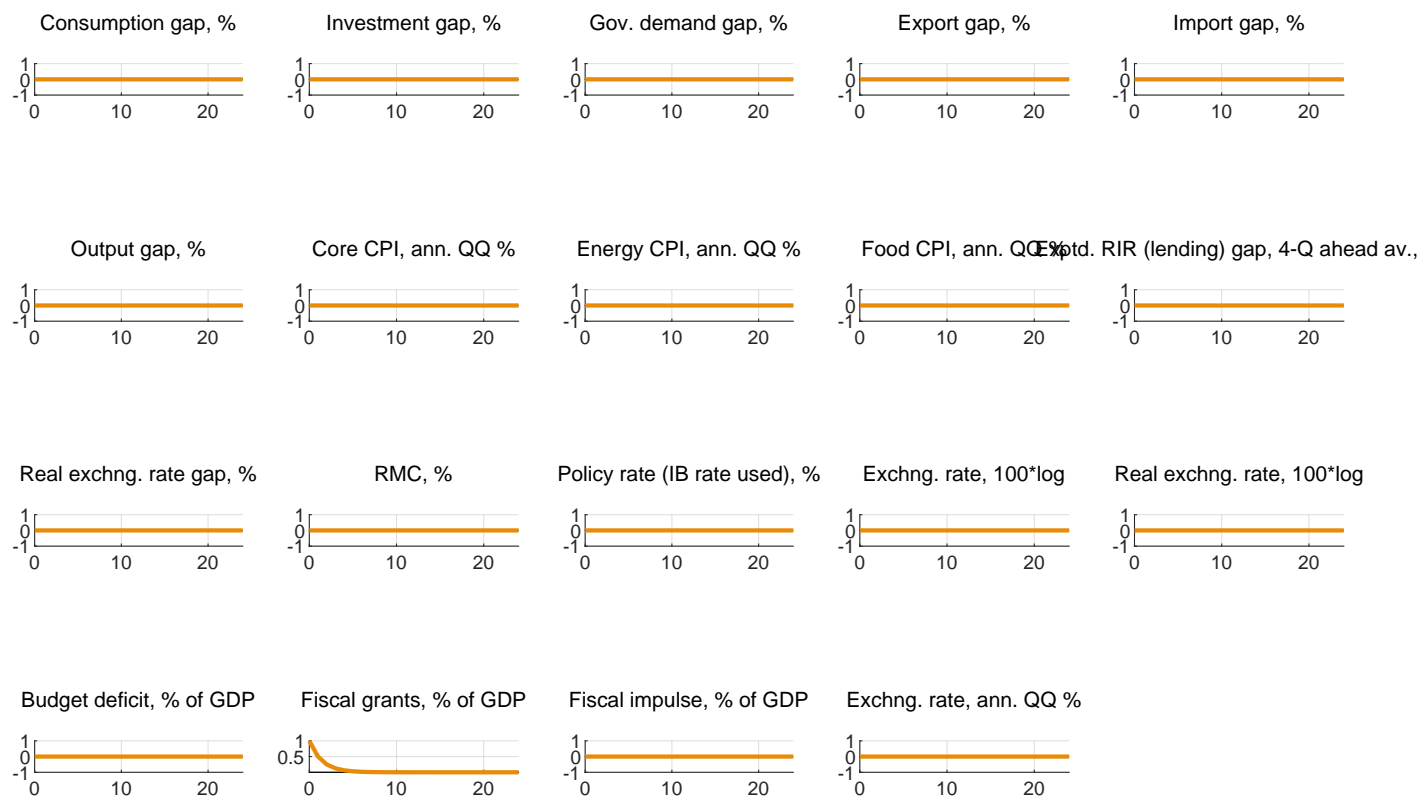
Responses to Gdem. discr. shock, % of GDP [shock_gdem_y_discr]



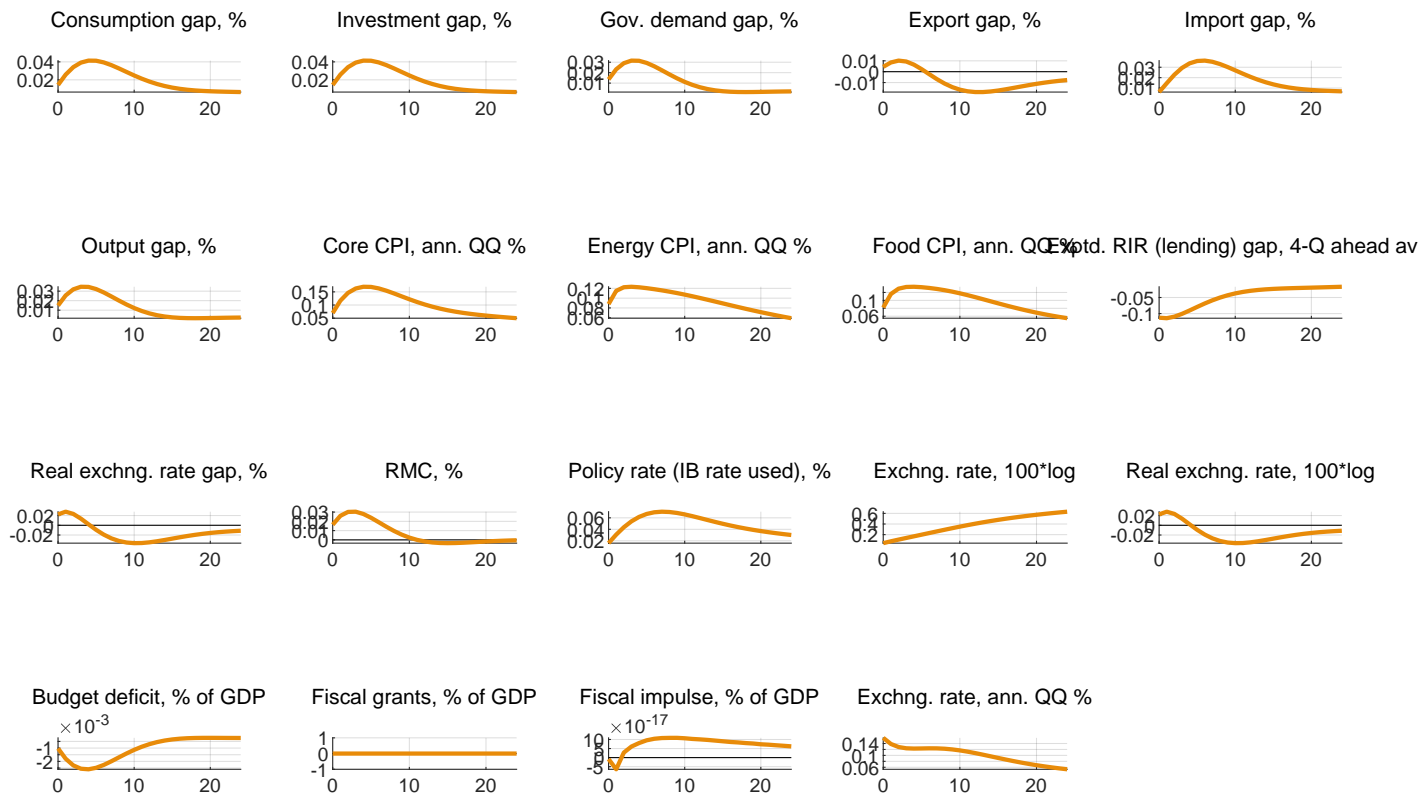
Responses to Gov exp. discr. shock, % of GDP [shock_oexp_y_discr]



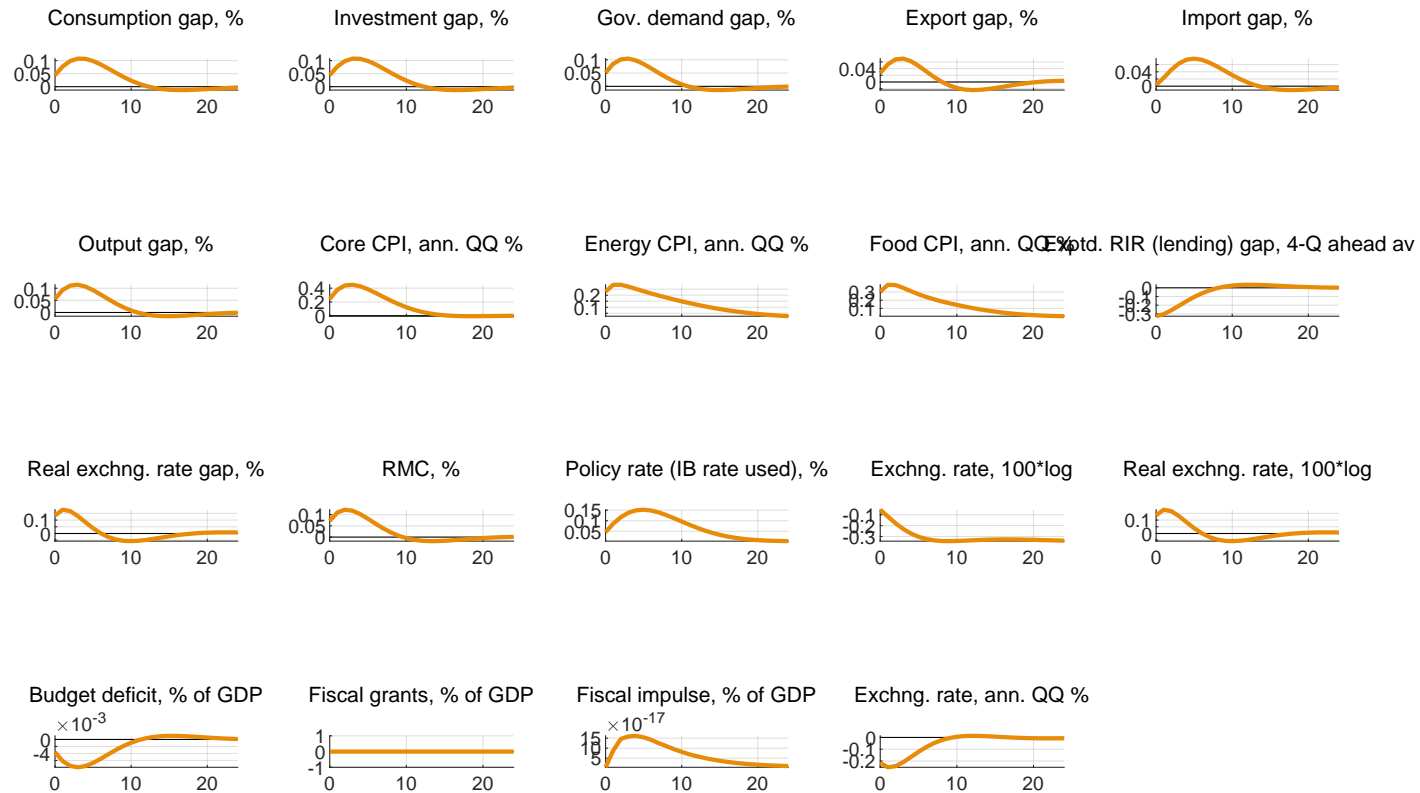
Responses to Fiscal grants, % of GDP [shock_grants_y]



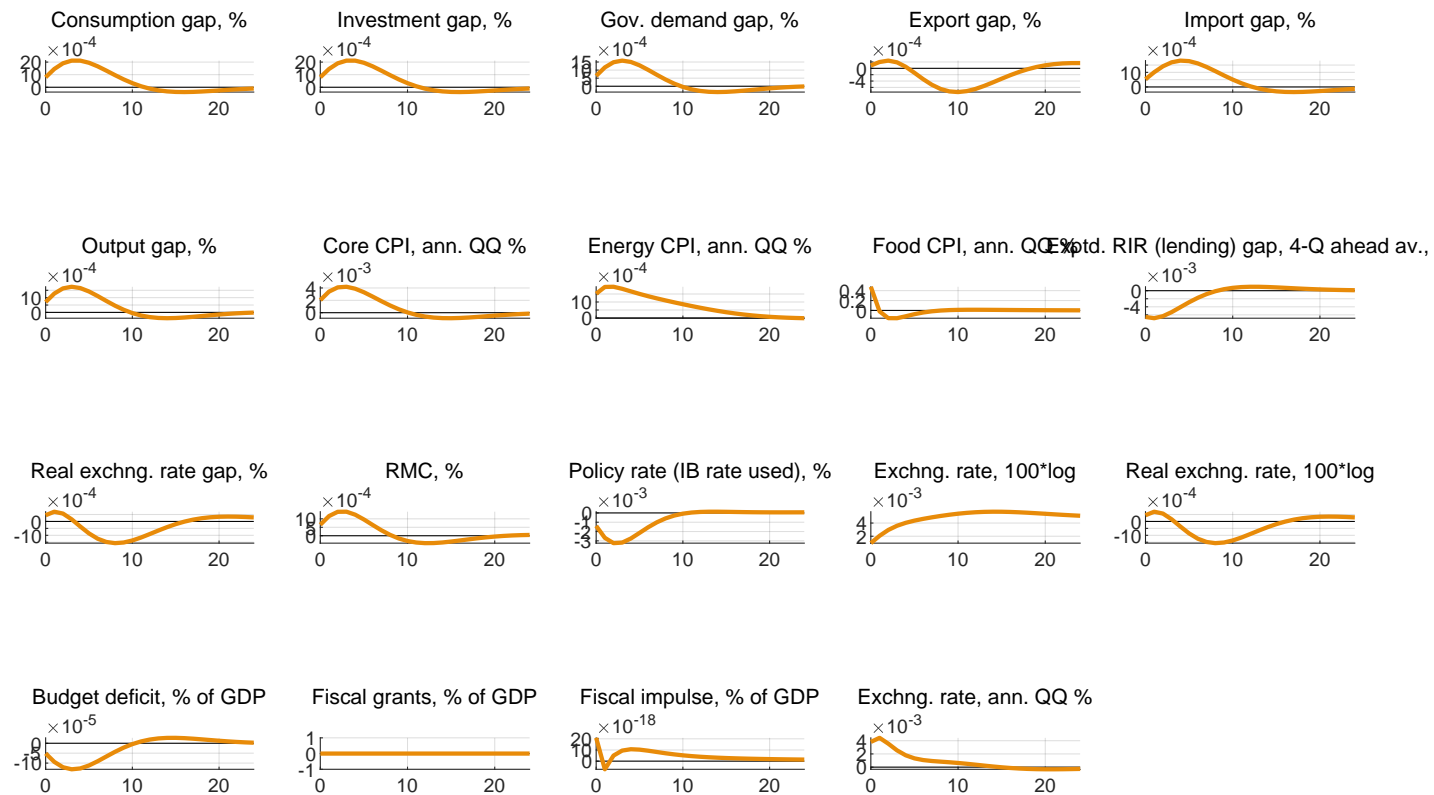
Responses to Foreign intr. rate shock, % [shock_istar]



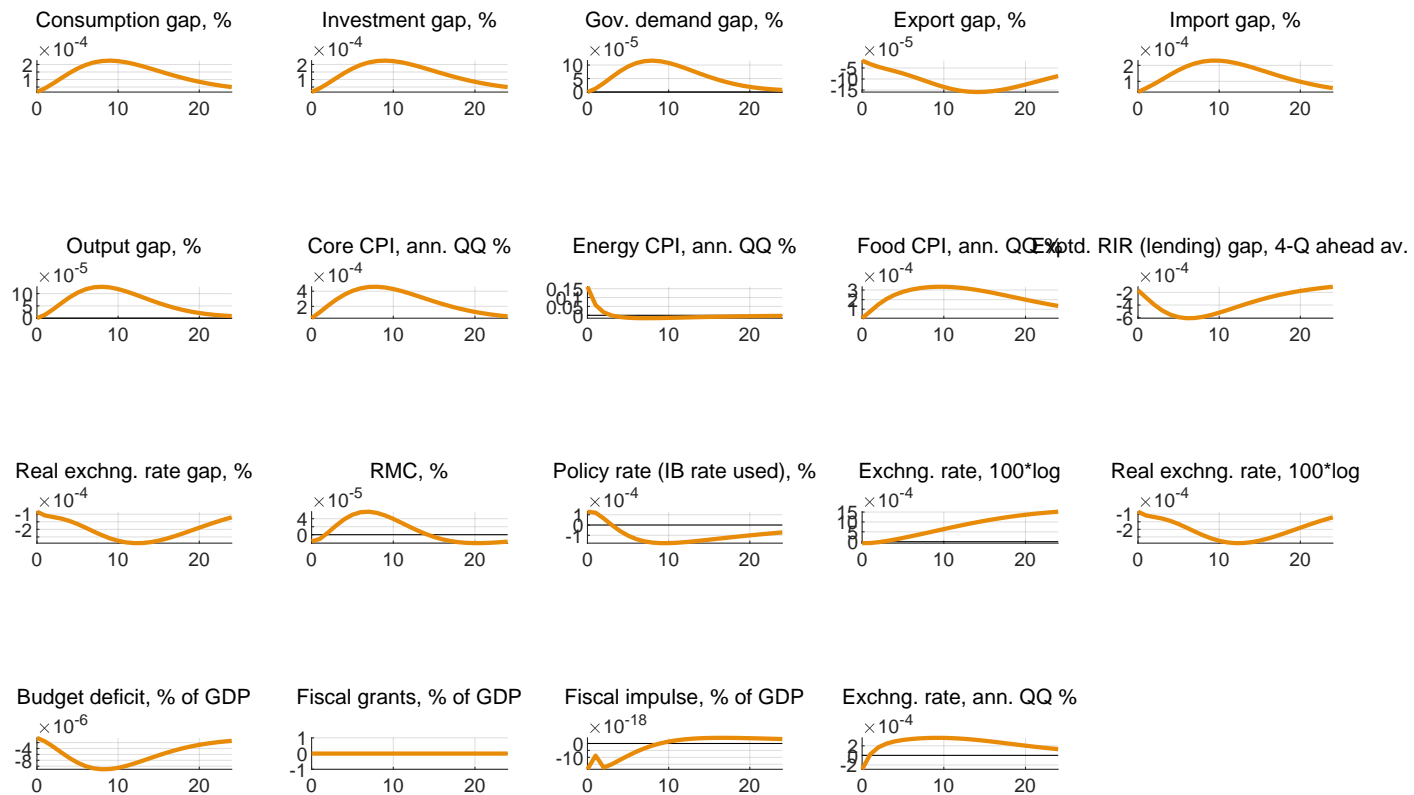
Responses to Foreign CPI shock, ann. QQ % [shock_d1_cpistar]



Responses to Foreign rel. food price gap shock, % [shock_l_rp_foodstar_gap]

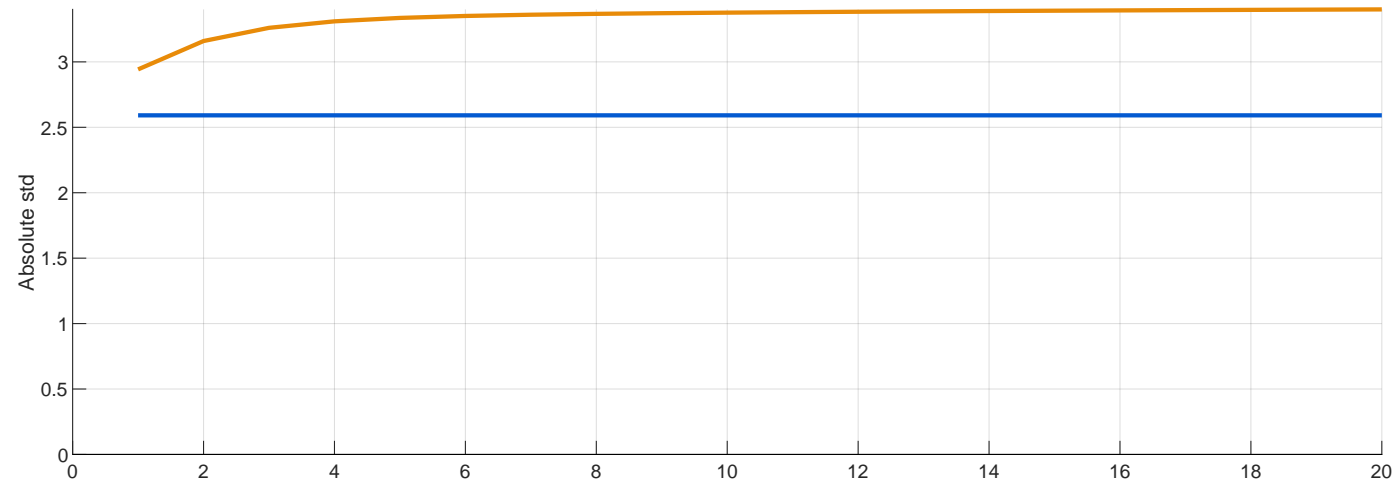
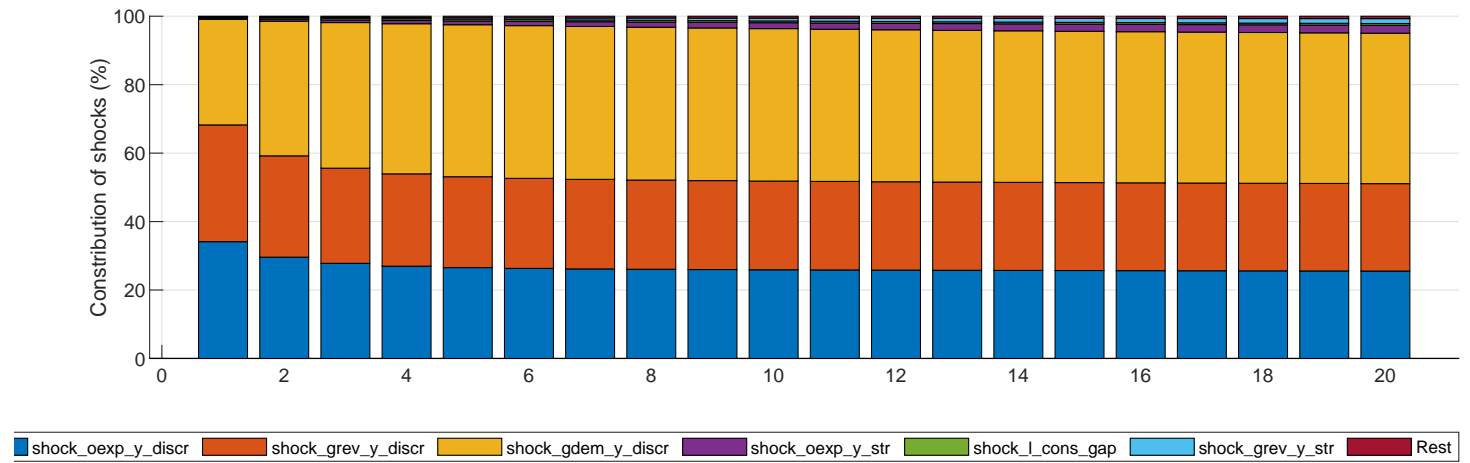


Responses to Foreign rel. ener. price gap shock, % [shock_1_rp_enerstar_gap]

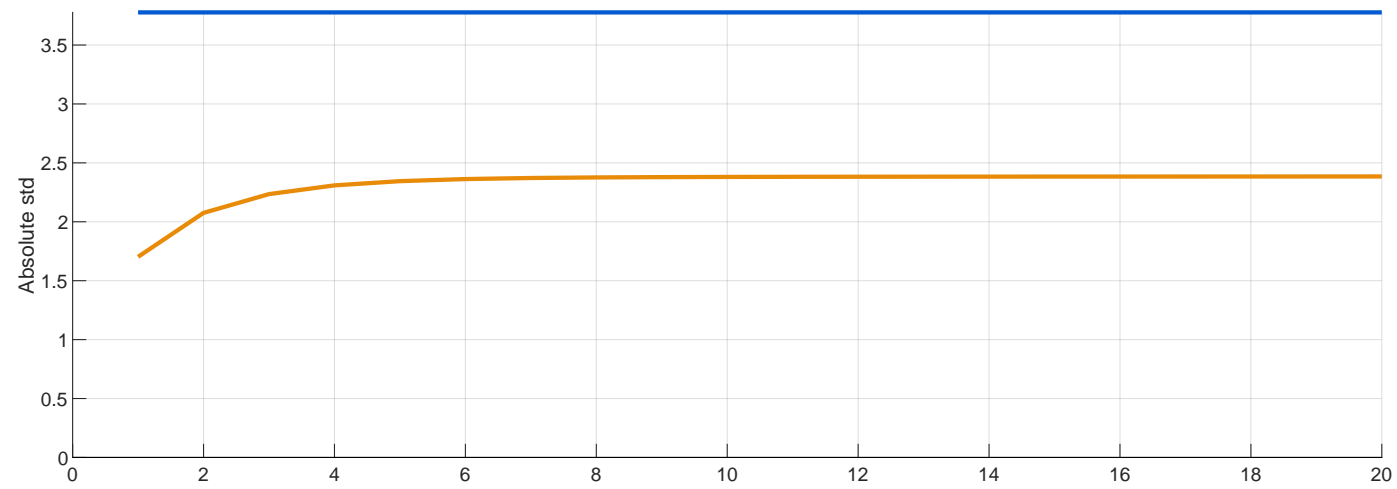
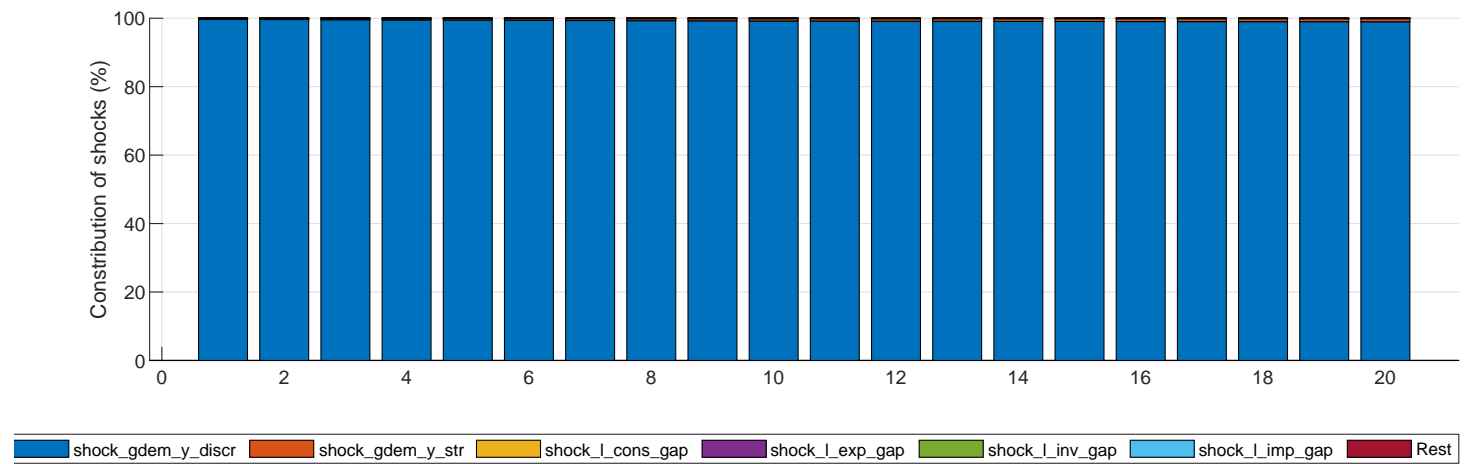


3 Variance decomposition

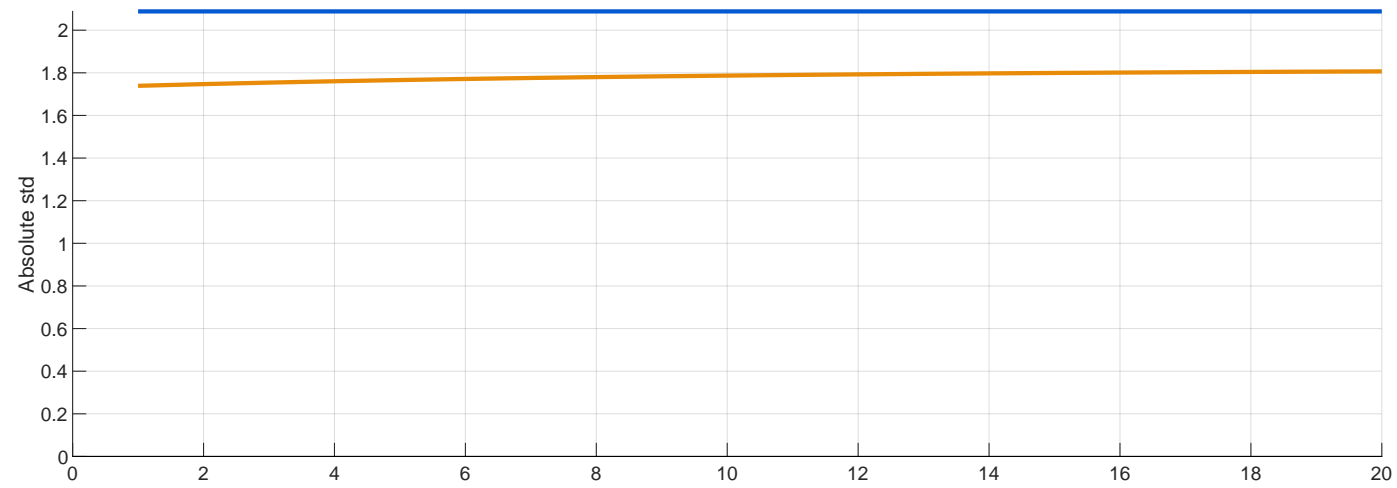
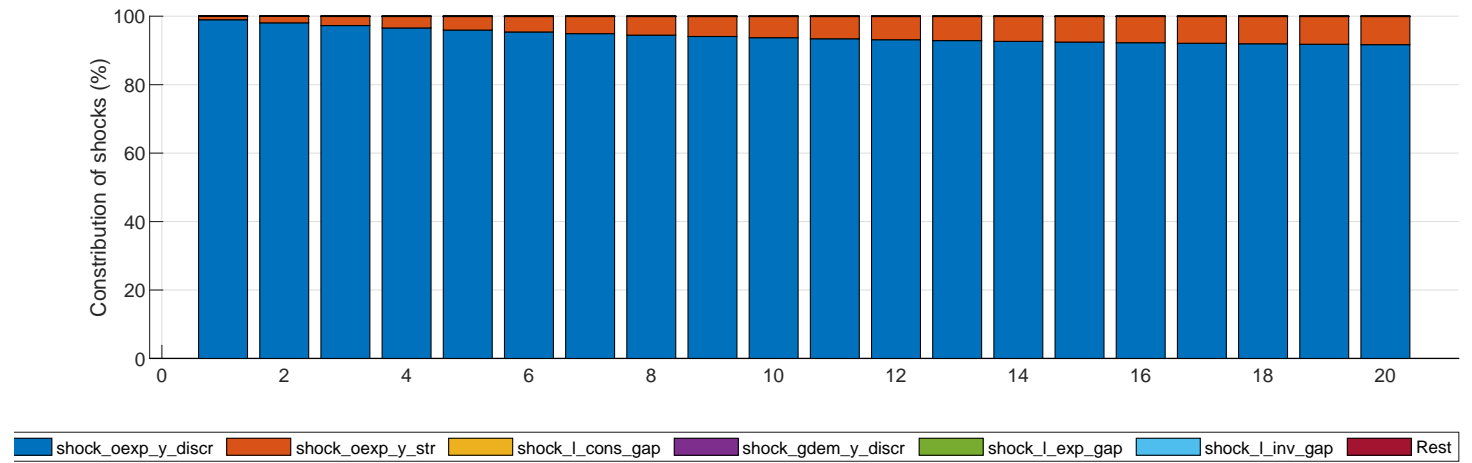
Budget deficit, % of GDP [def_y]



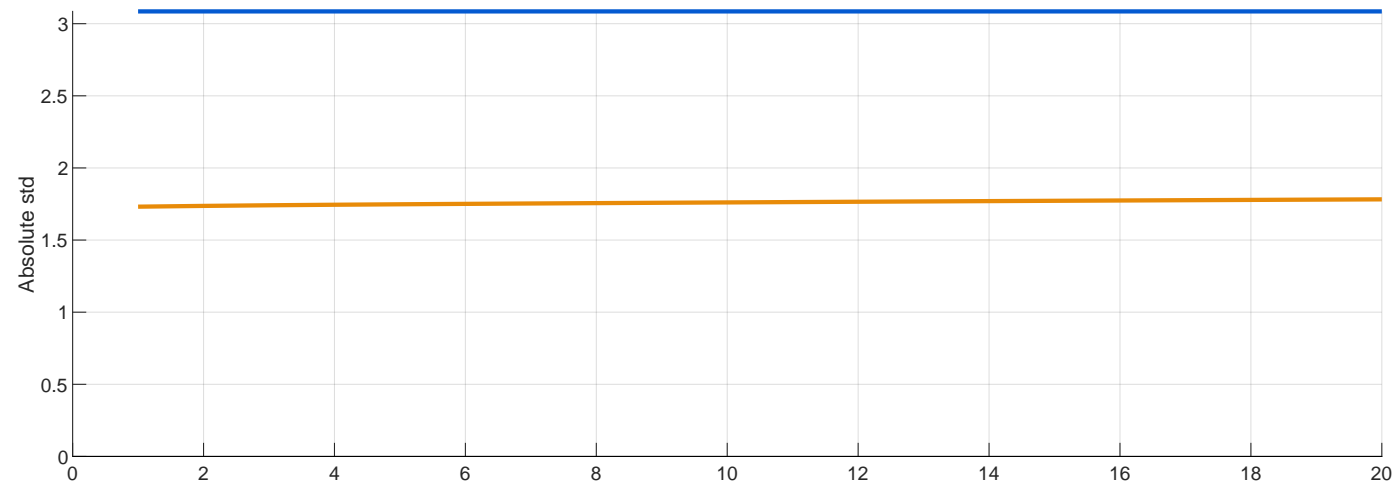
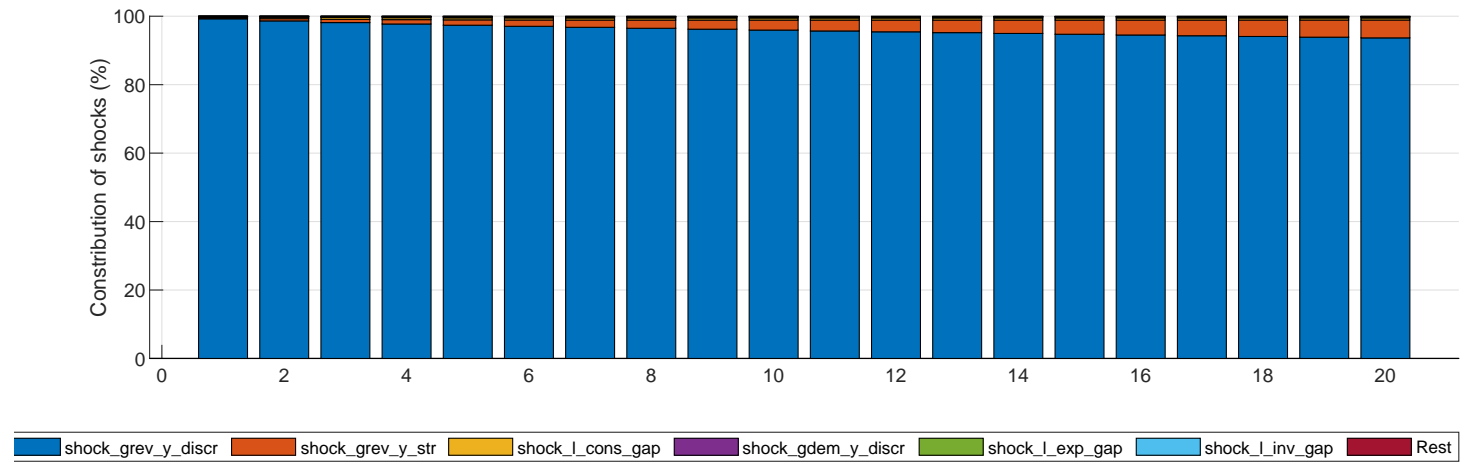
Govt. demand (G&S), % GDP [gdem_y]



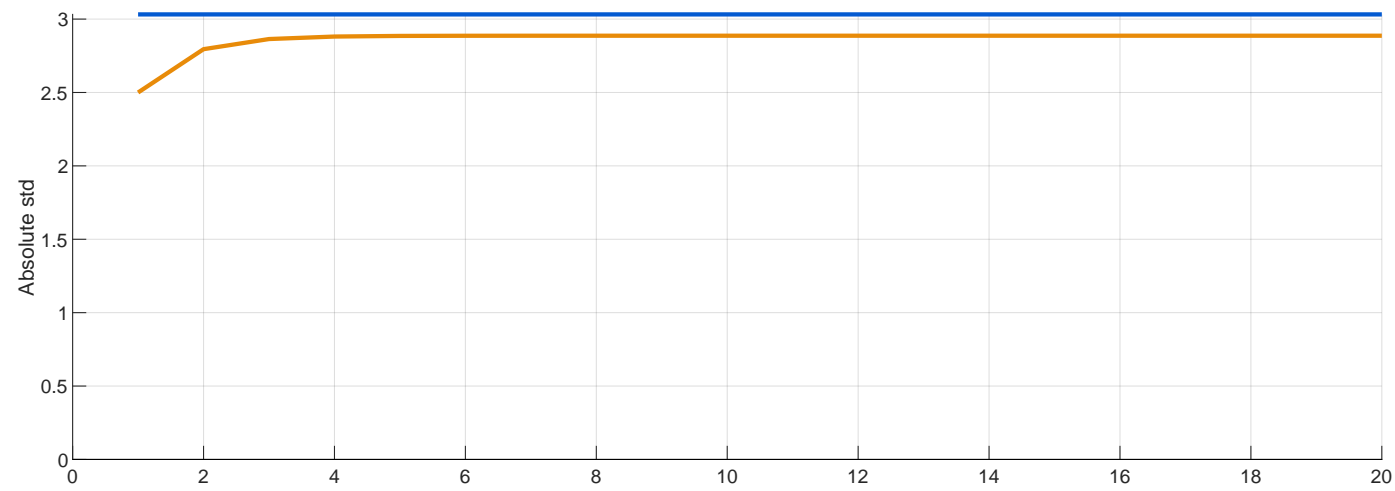
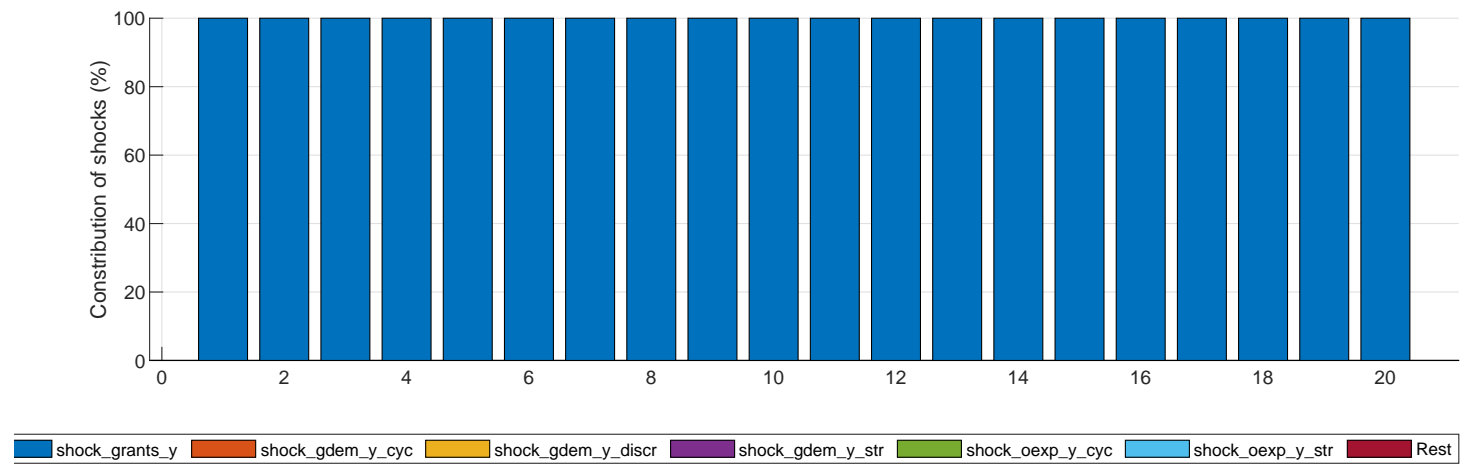
Other govt. exp., % to GDP [oexp_y]



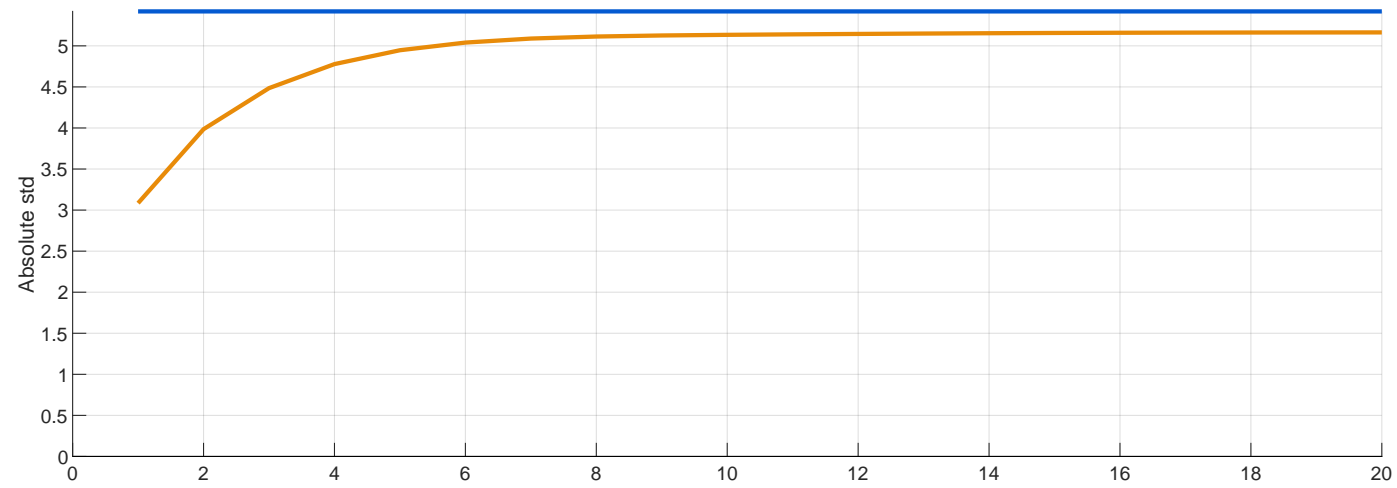
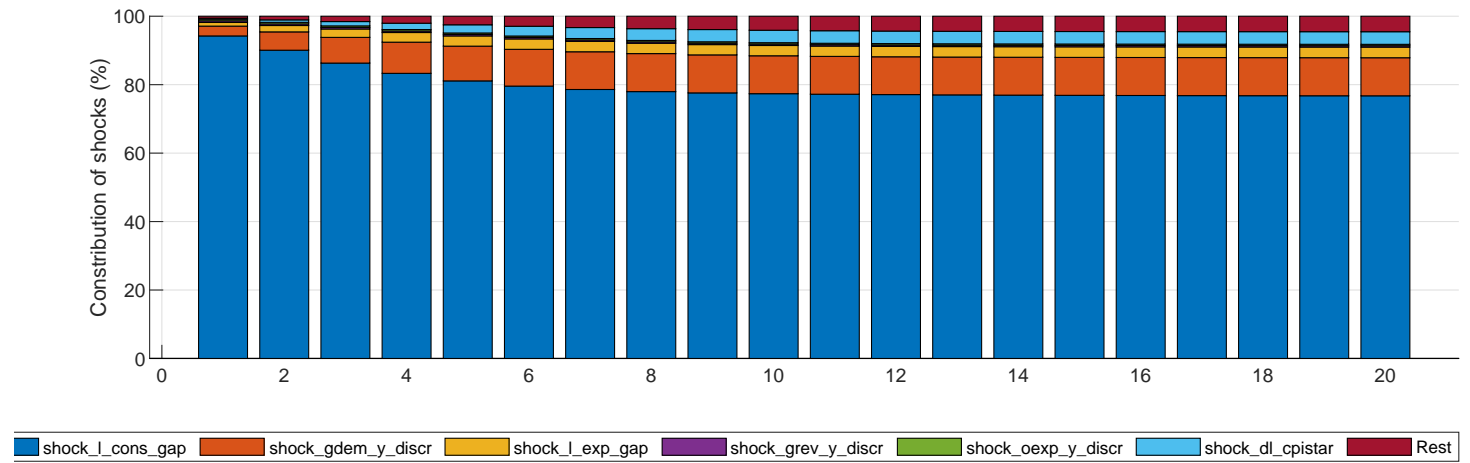
Govt. rev., % of GDP [grev_y]



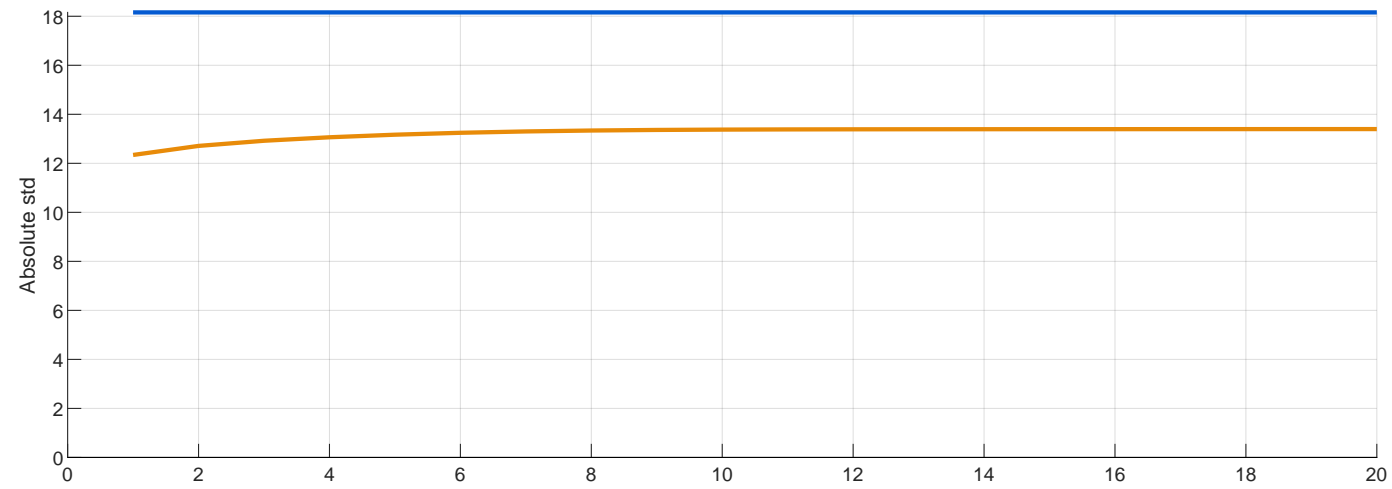
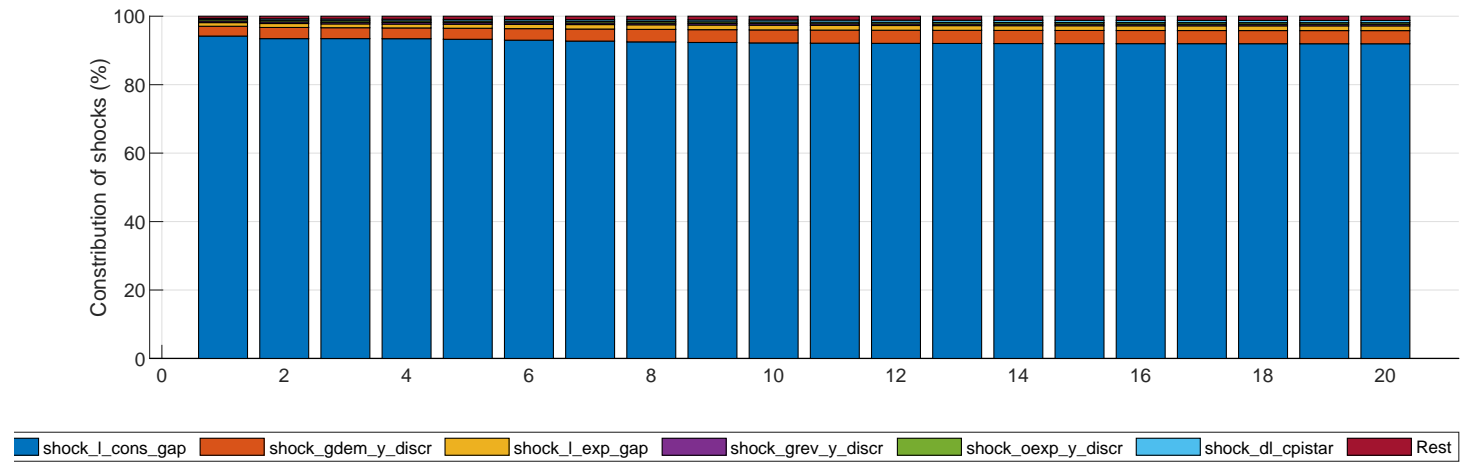
Fiscal grants, % of GDP [grants_y]



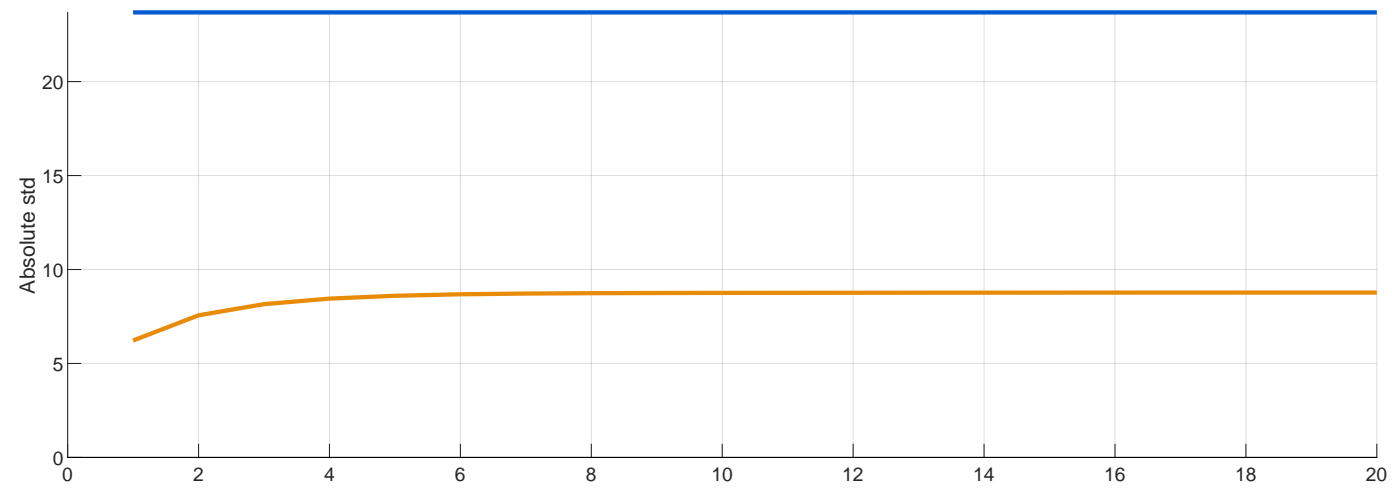
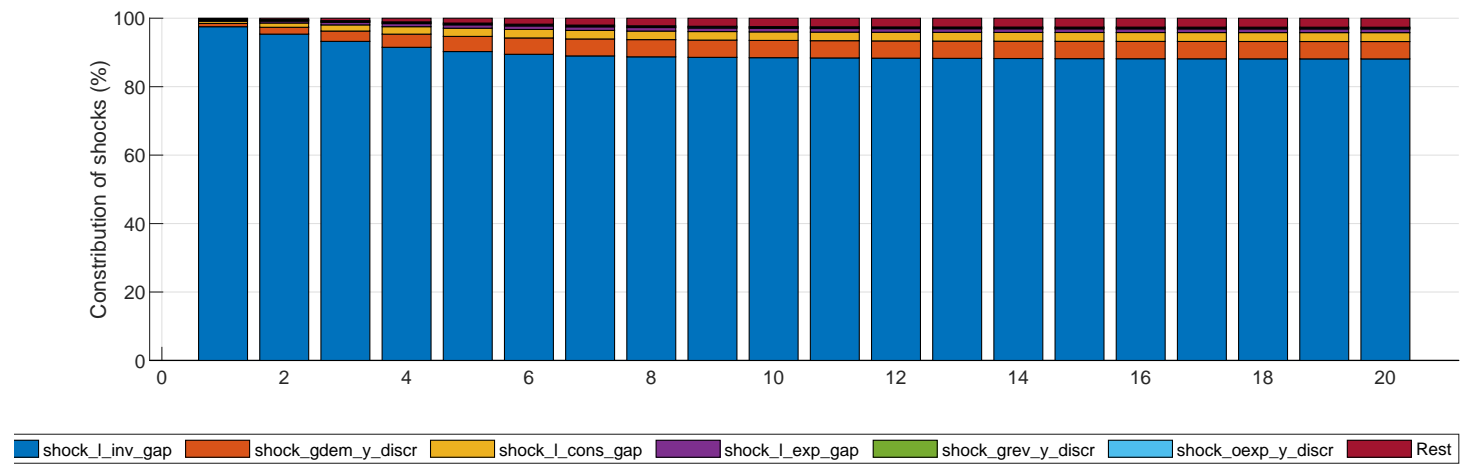
Consumption gap, % [l_cons_gap]



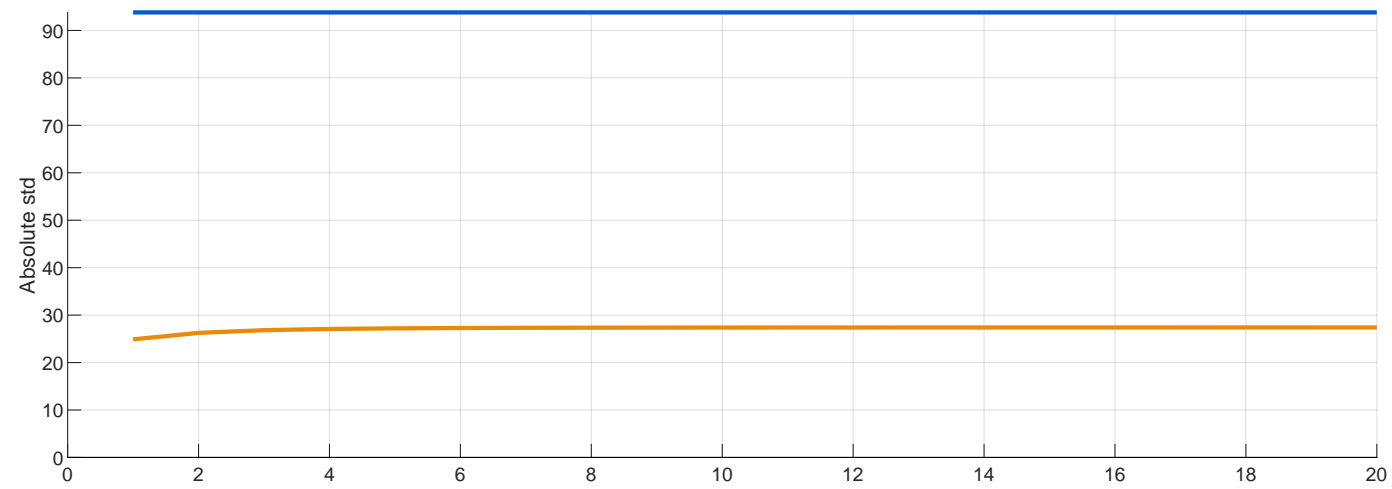
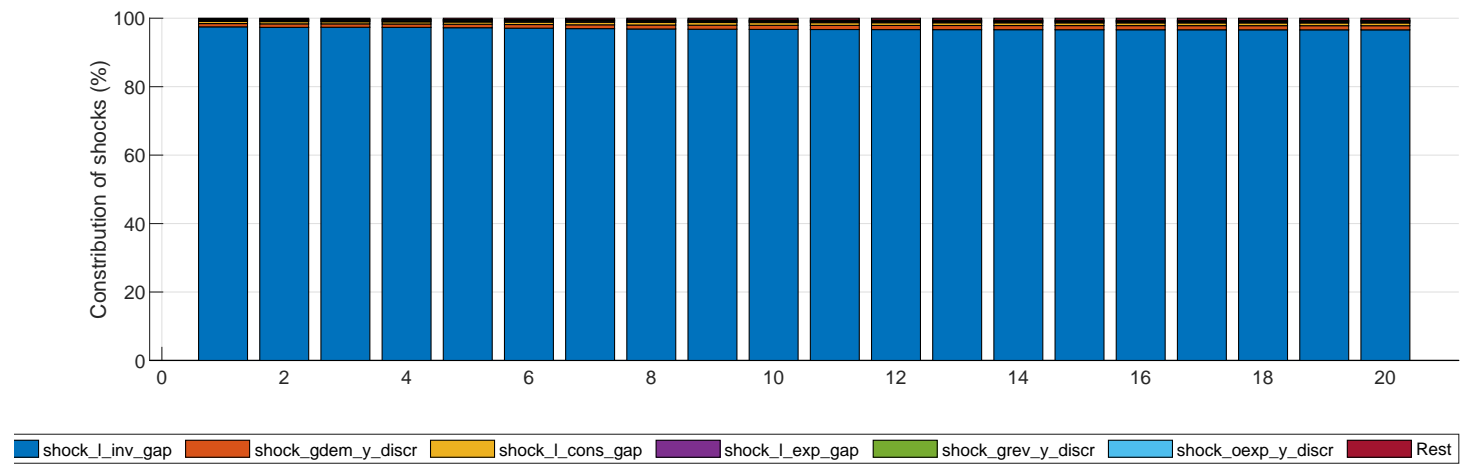
Consumption, ann. QQ % [dl_cons]



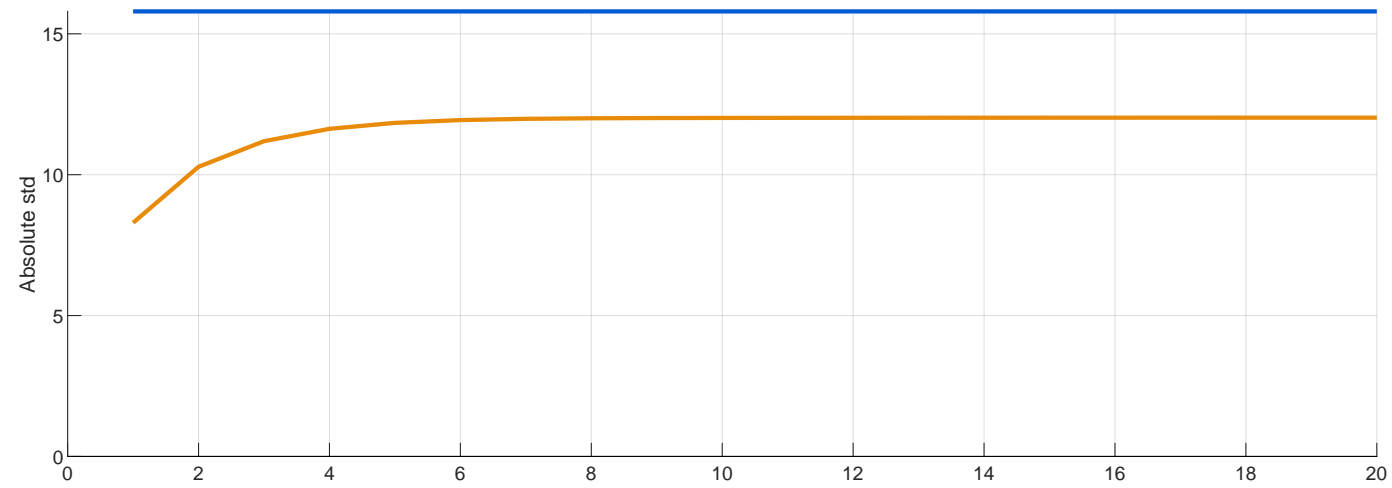
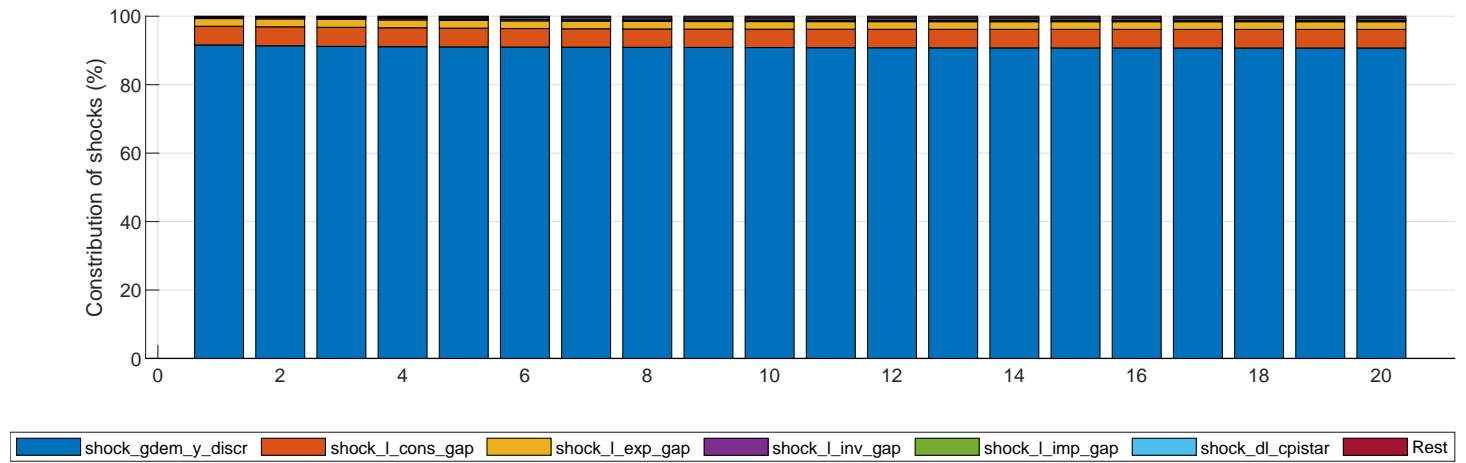
Investment gap, % [l_inv_gap]



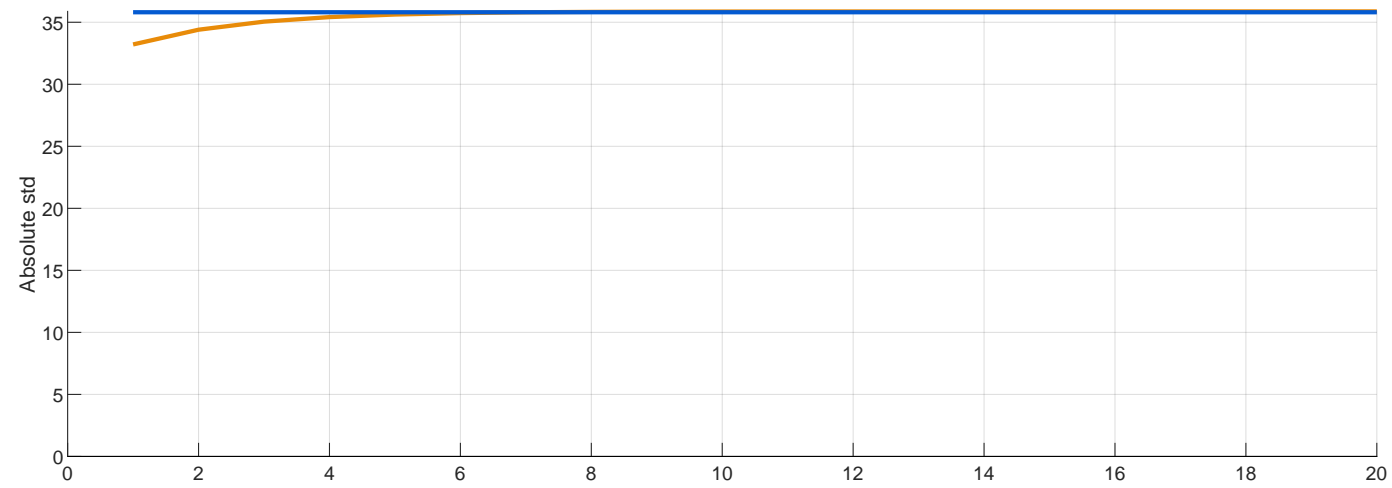
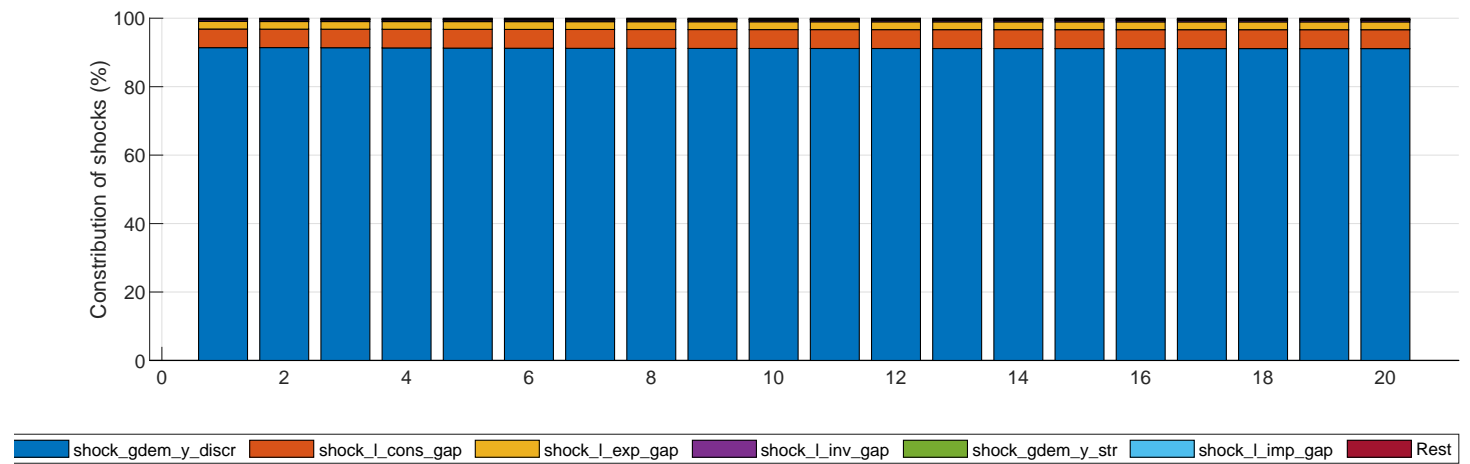
Investment, ann. QQ % [dl_inv]



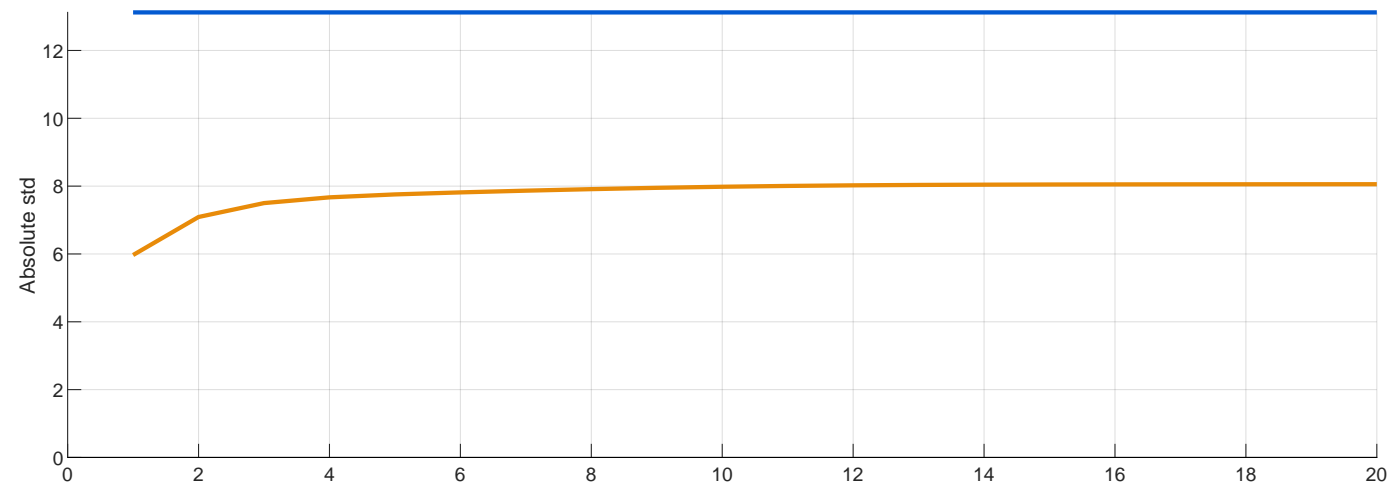
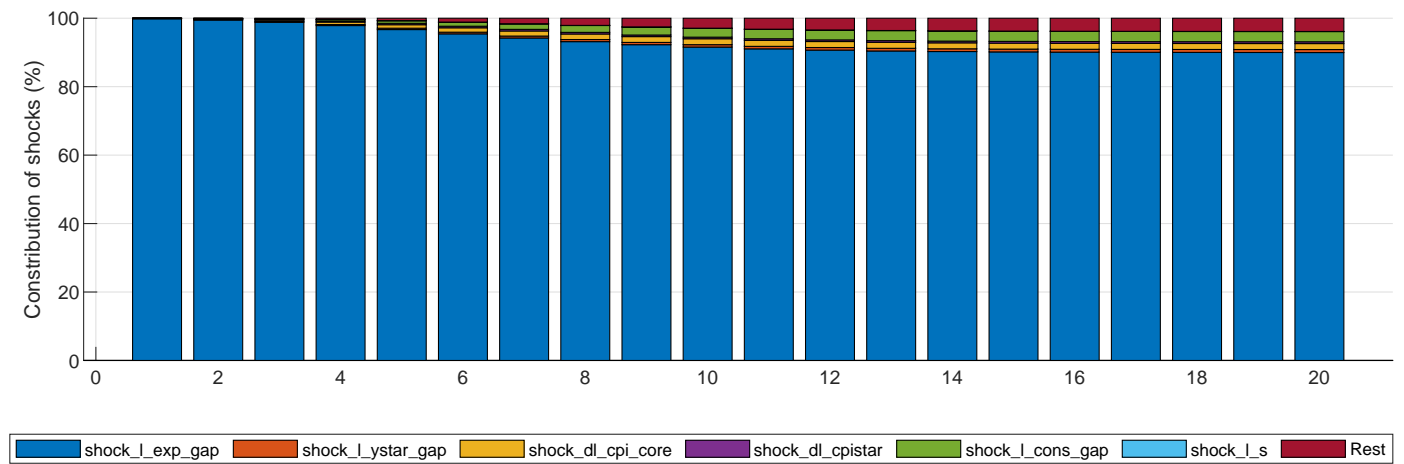
Gov. demand gap, % [l_gdem_gap]



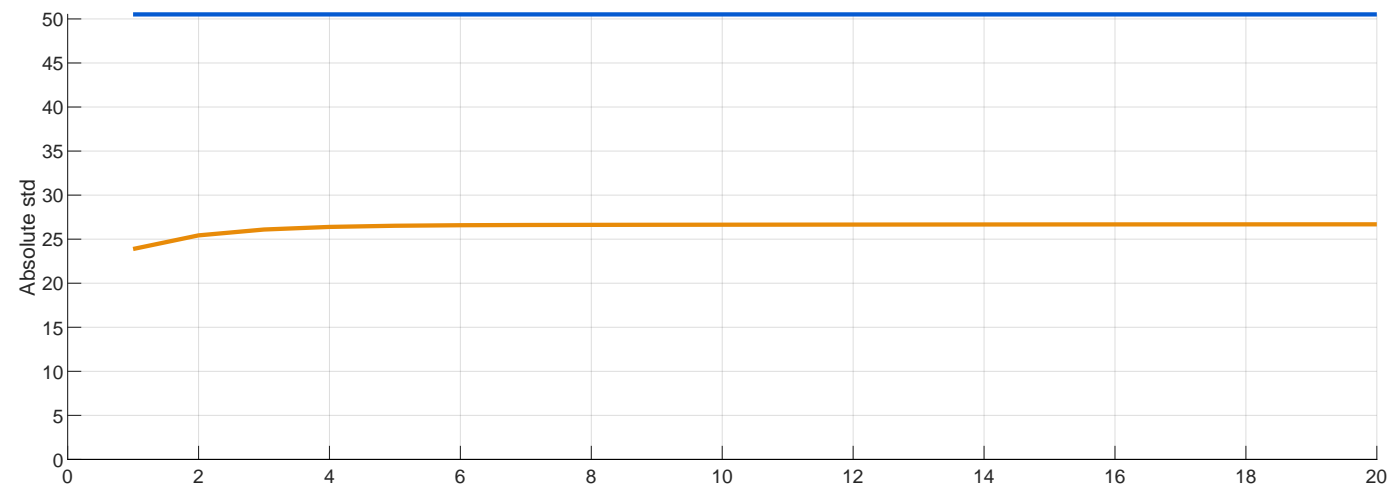
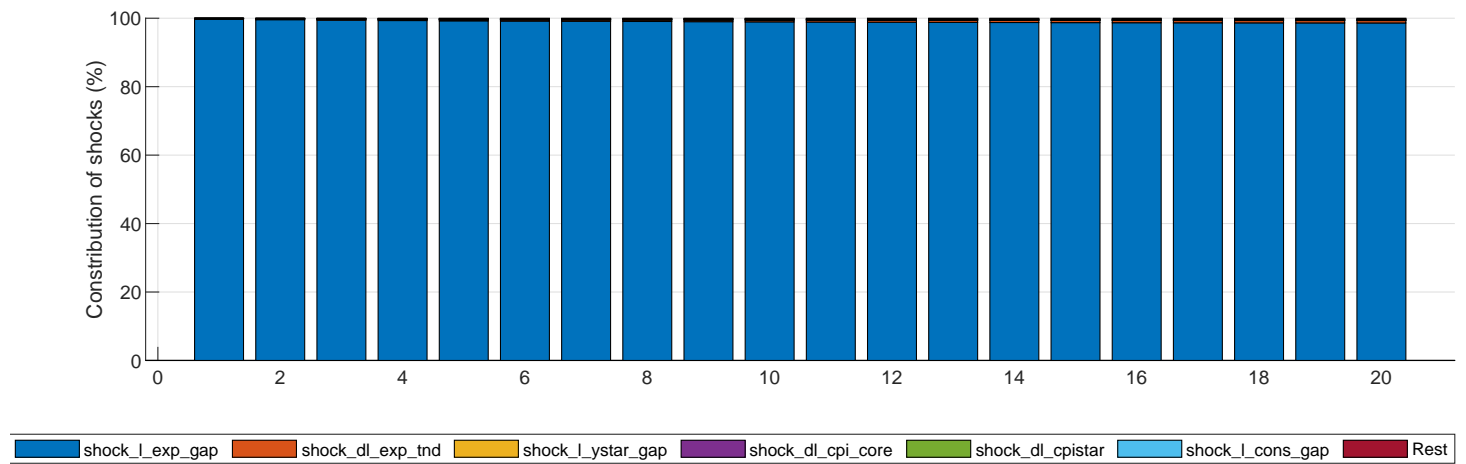
Gov. demand, ann. QQ % [dl_gdem]



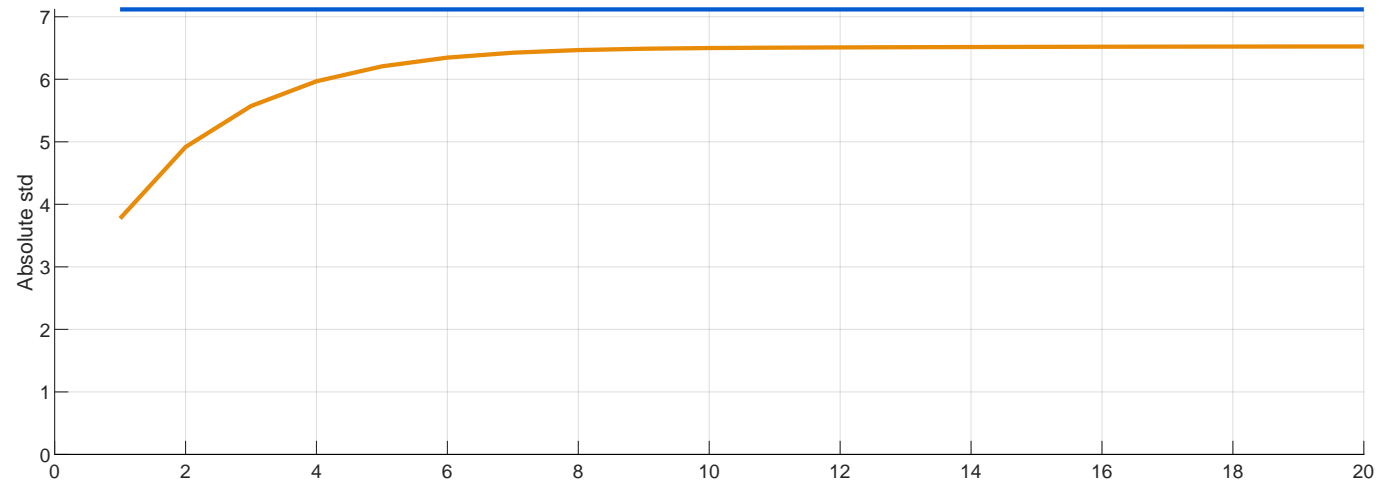
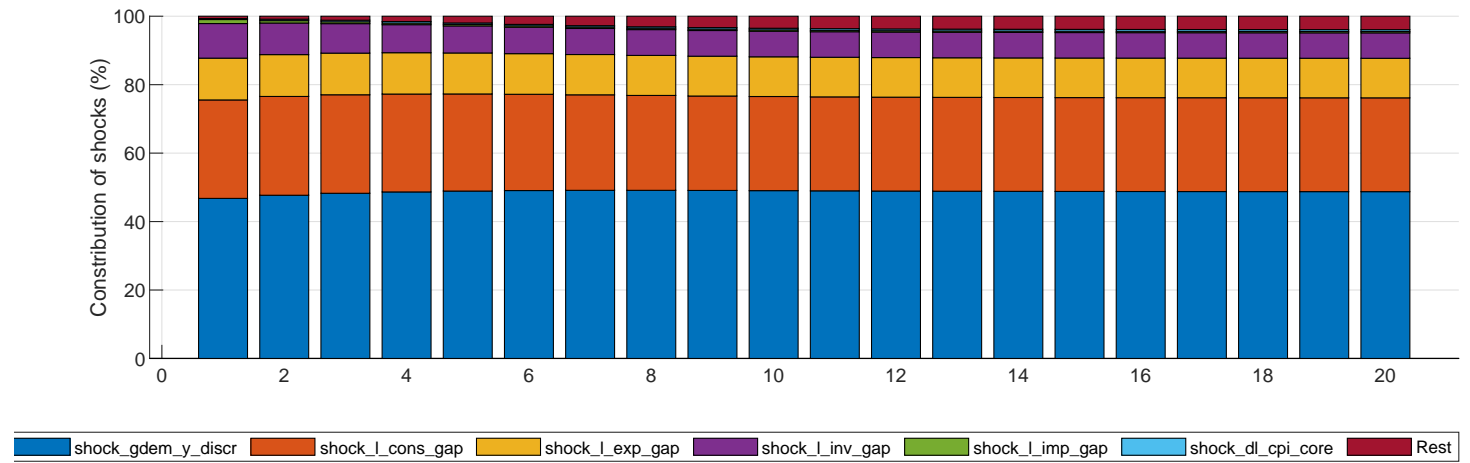
Export gap, % [l_exp_gap]



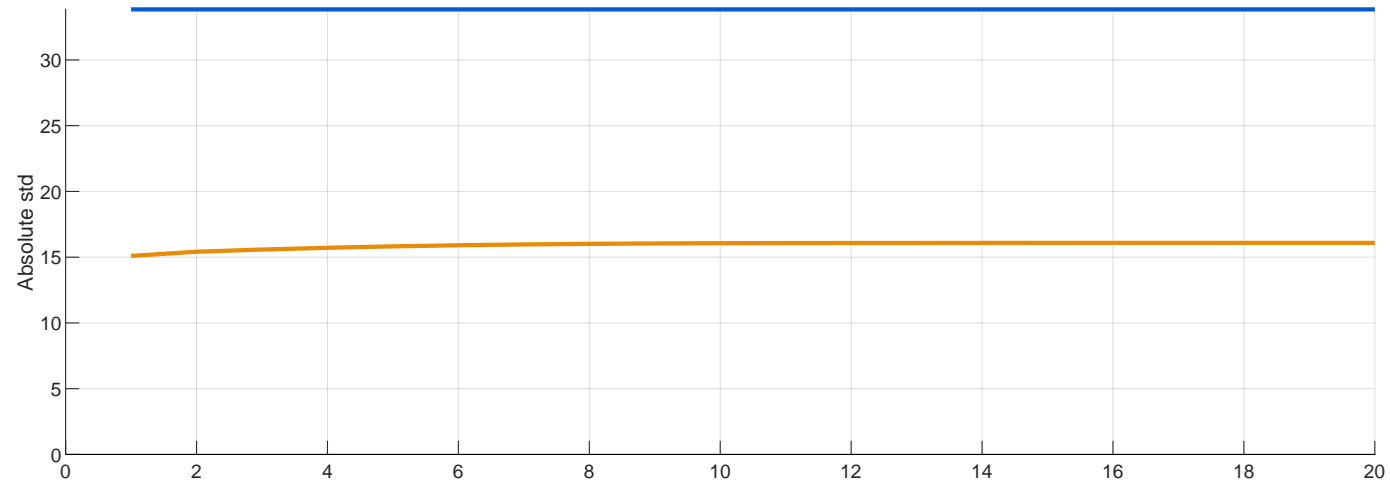
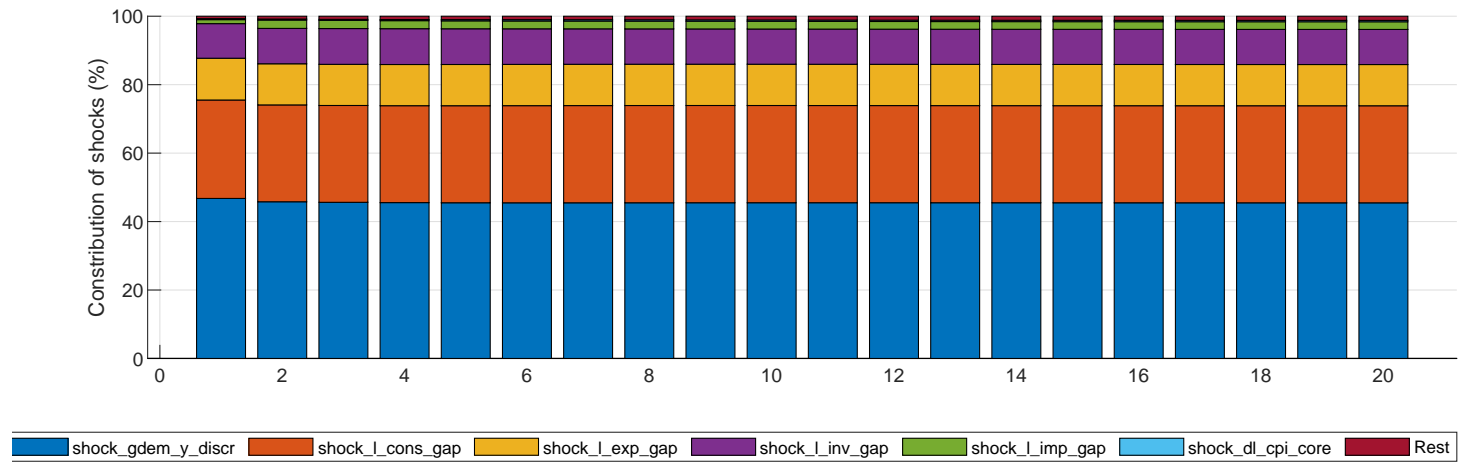
Export, ann. QQ % [dl_exp]



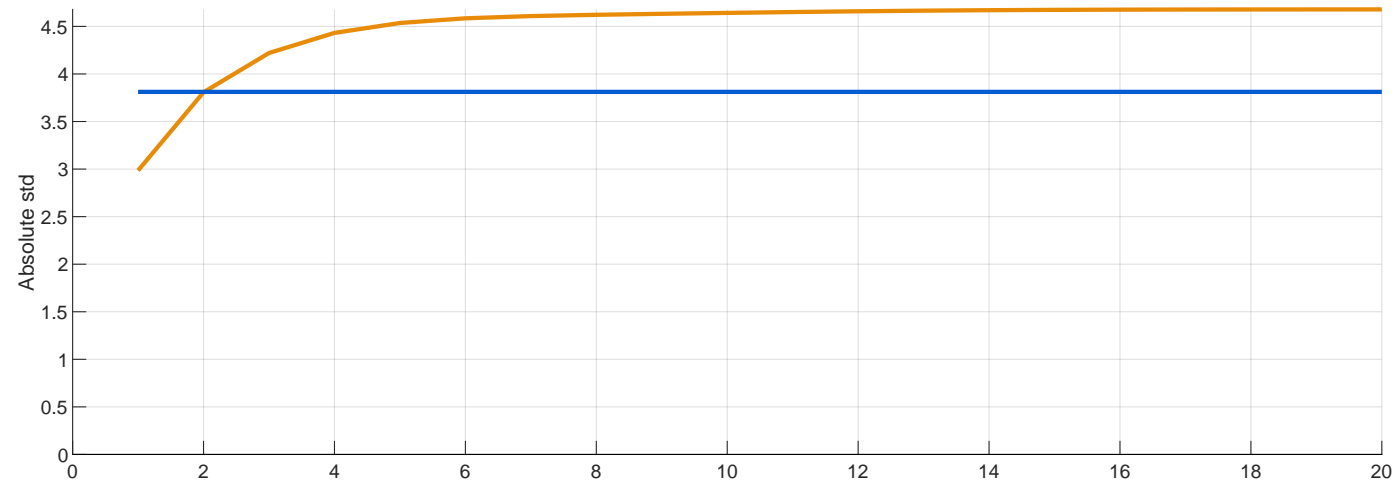
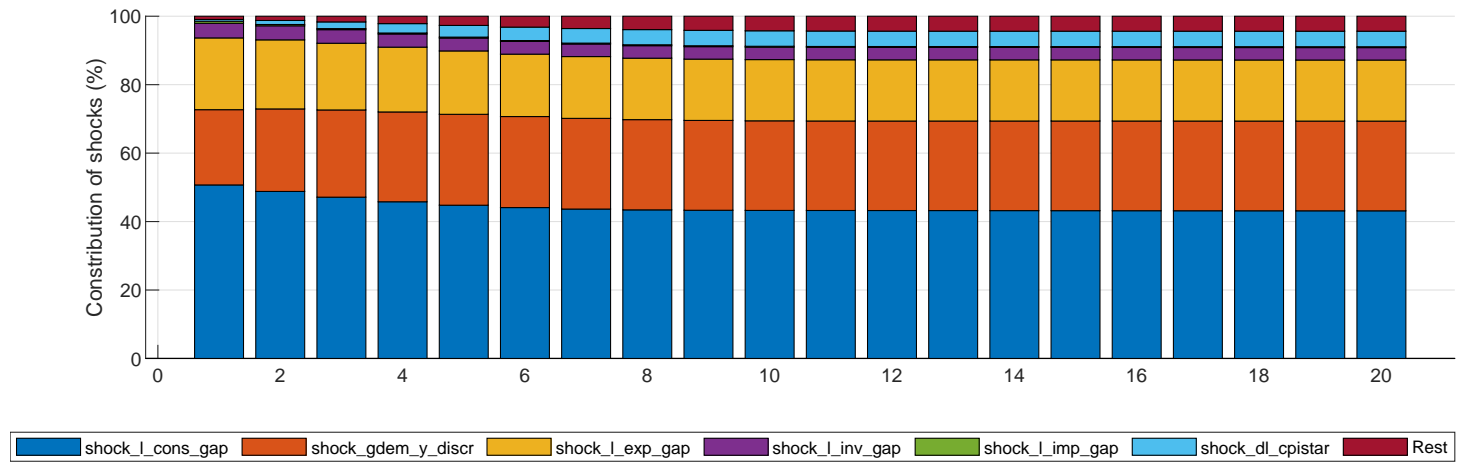
Import gap, % [l_imp_gap]



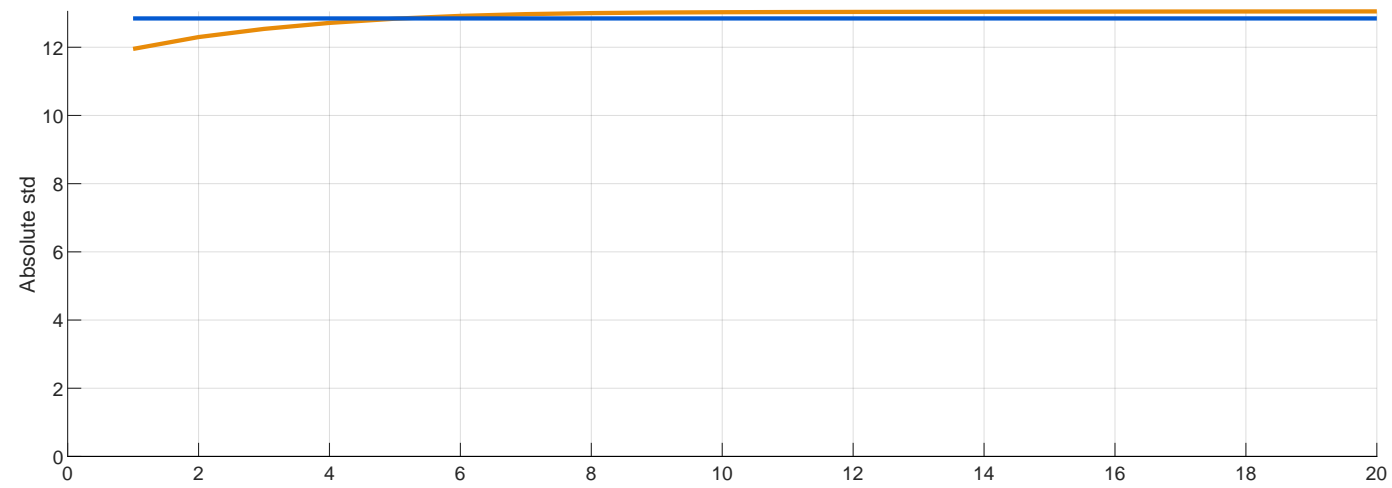
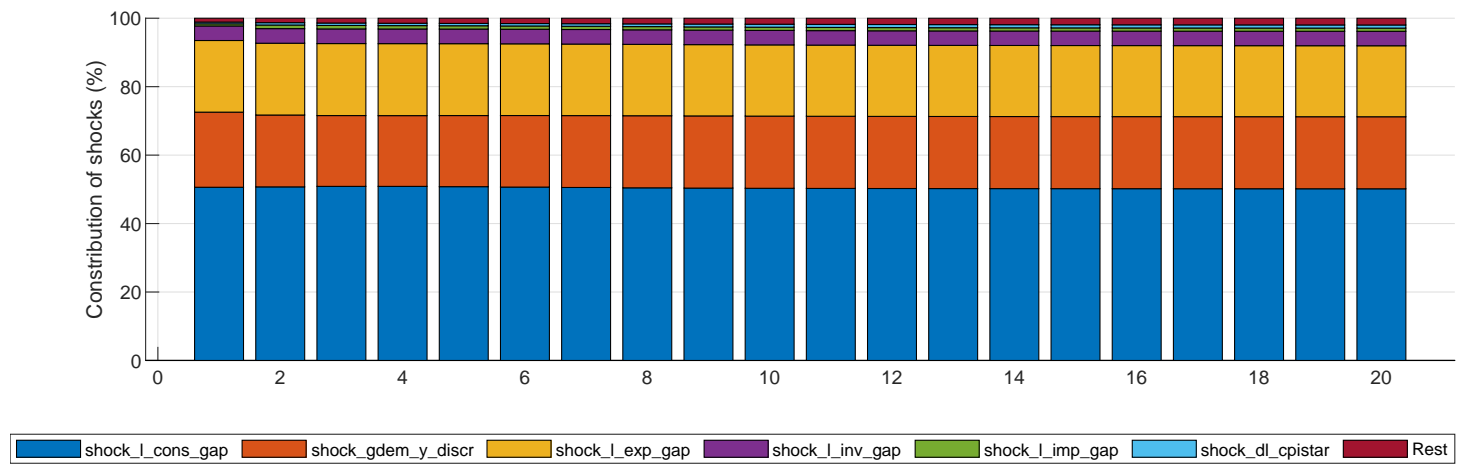
Import, ann. QQ % [dl_imp]



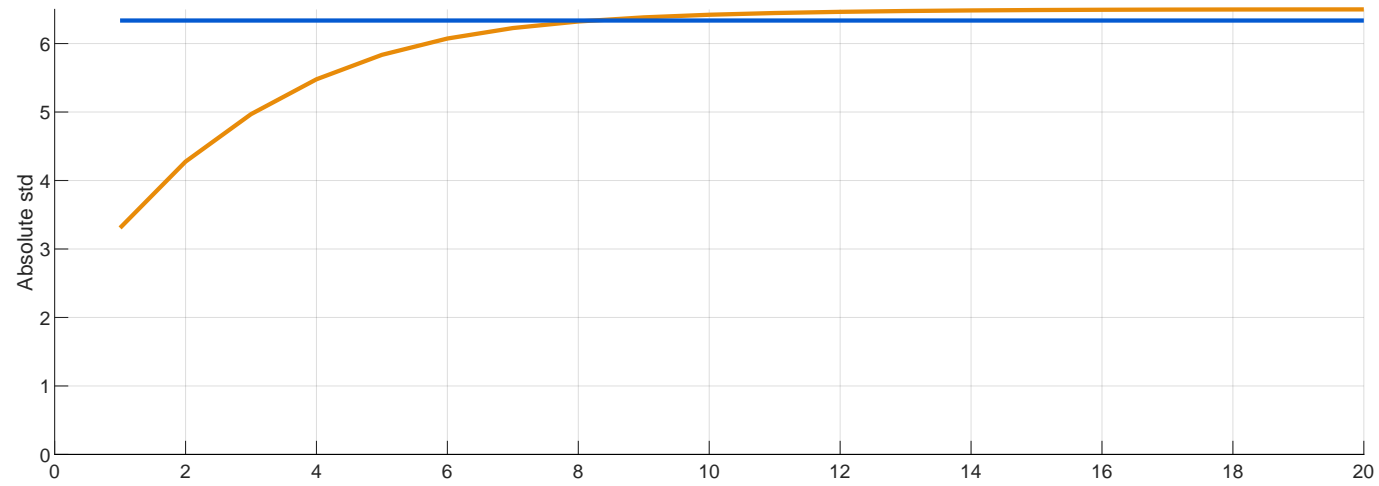
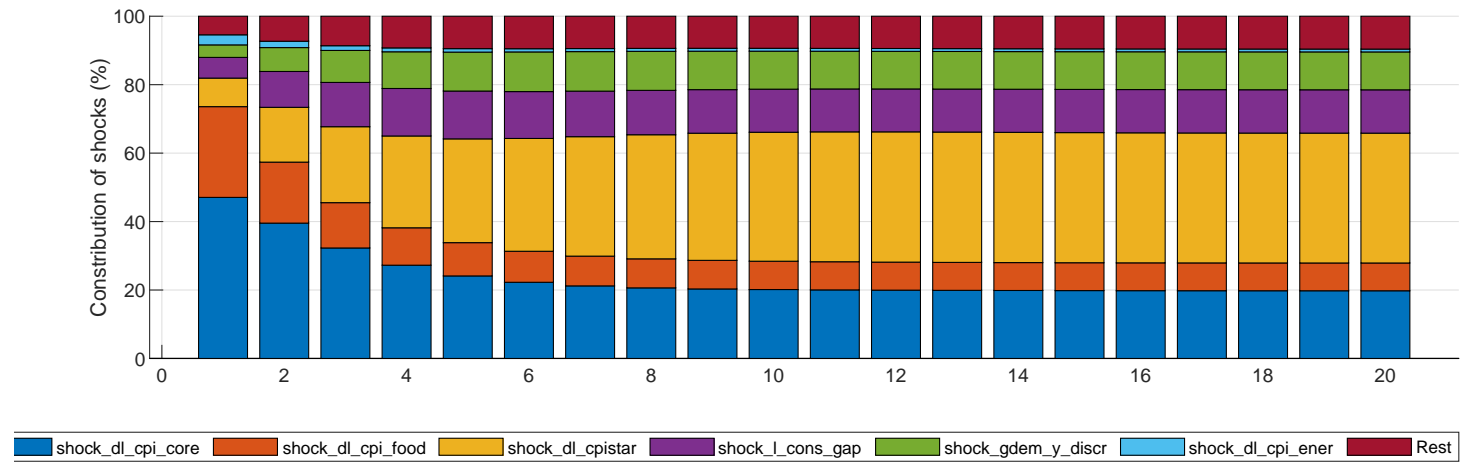
Output gap, % [l_y_gap]



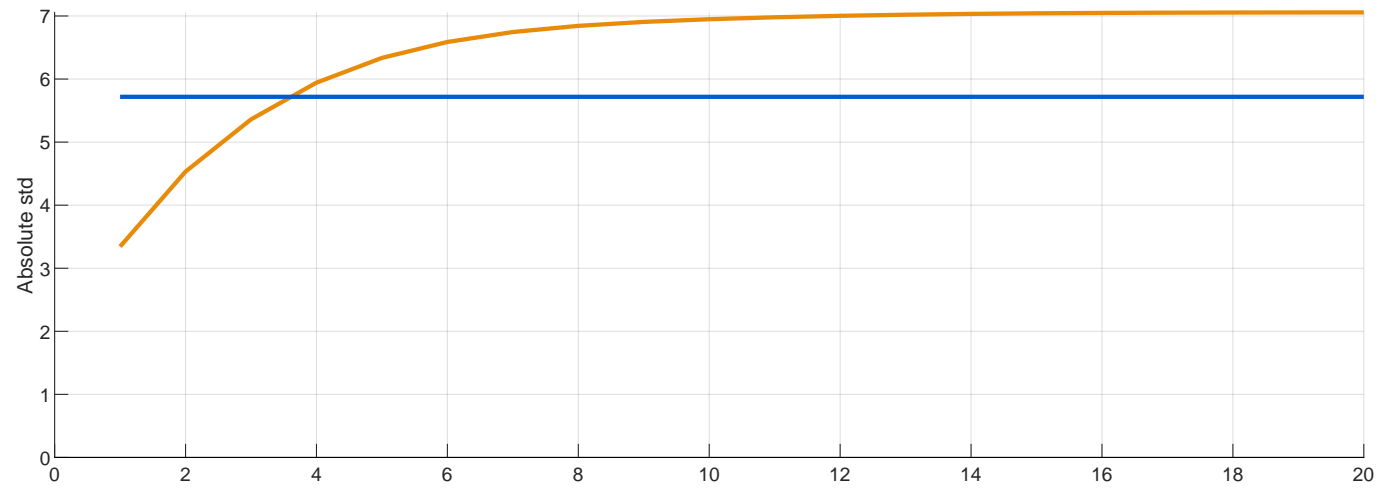
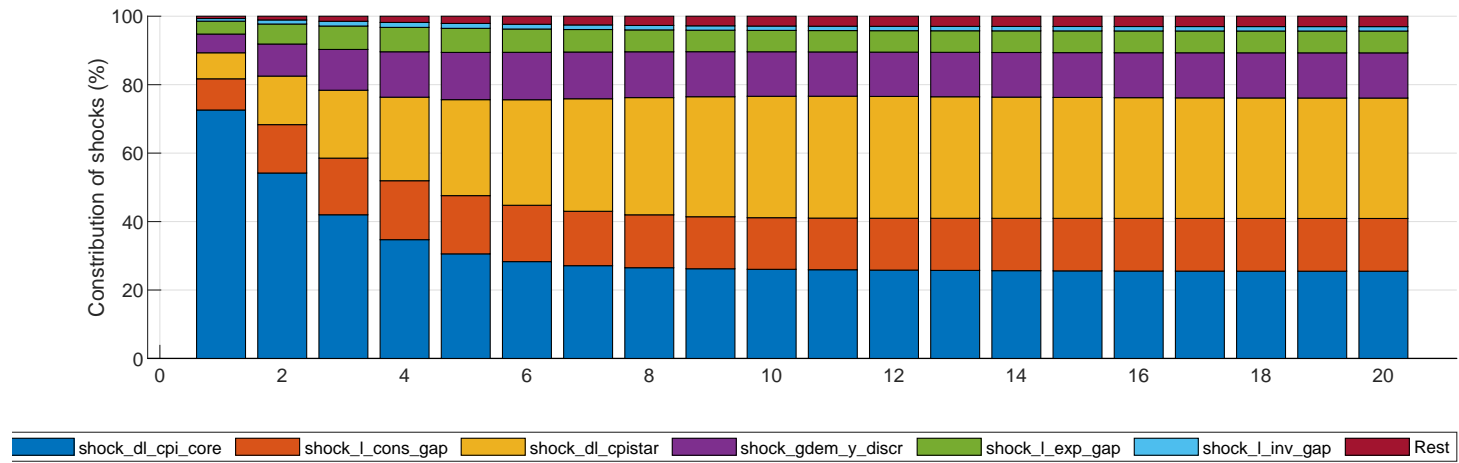
GDP, ann. QQ % [dl_y]



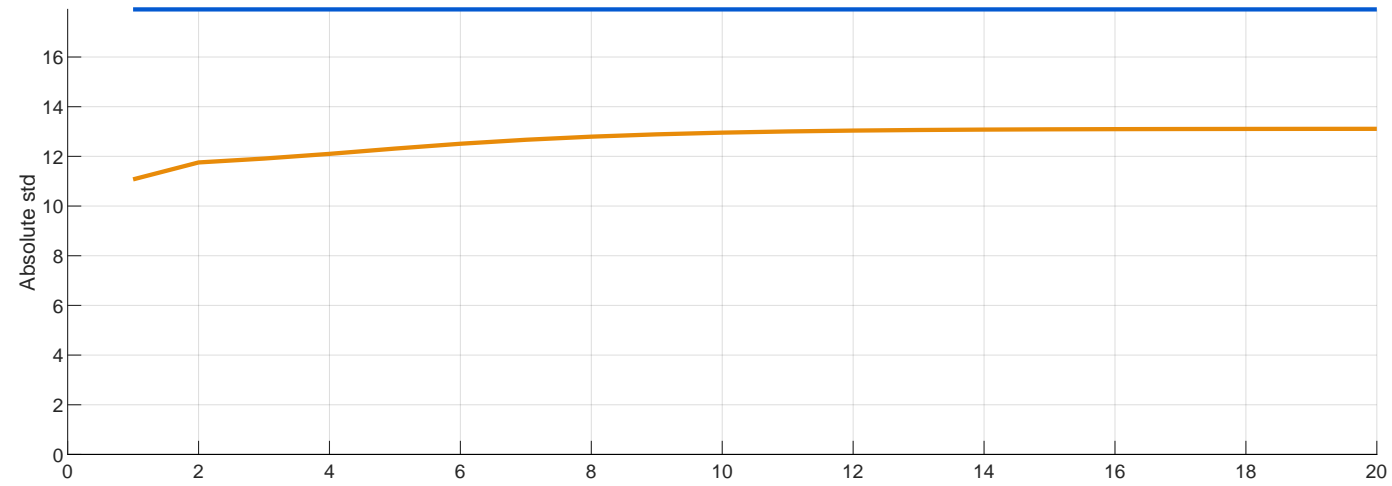
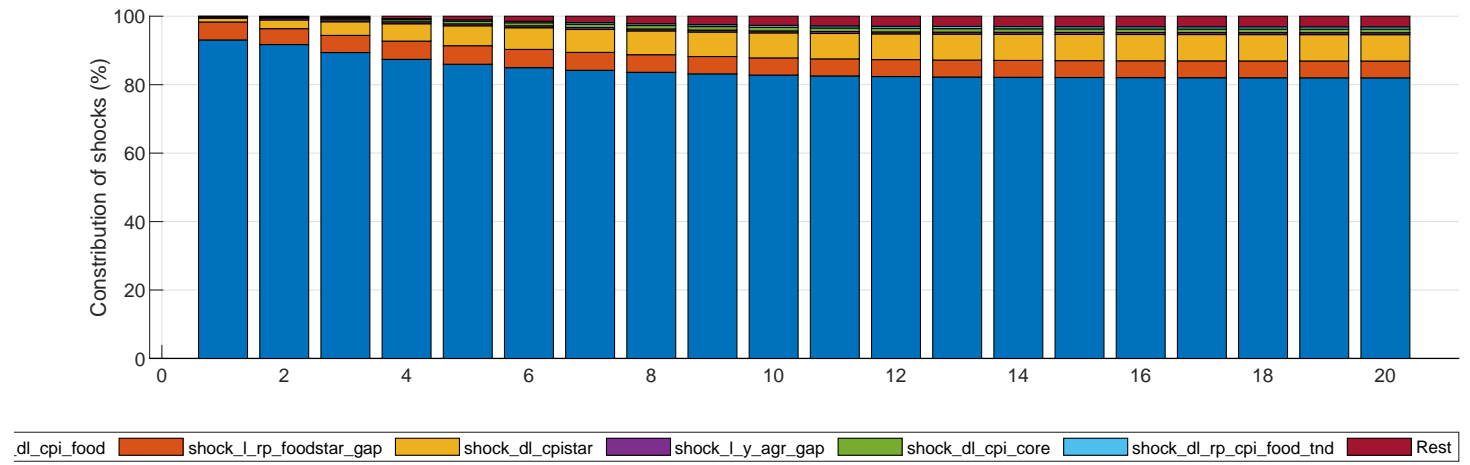
Headline CPI, ann. QQ % [dl_cpi]



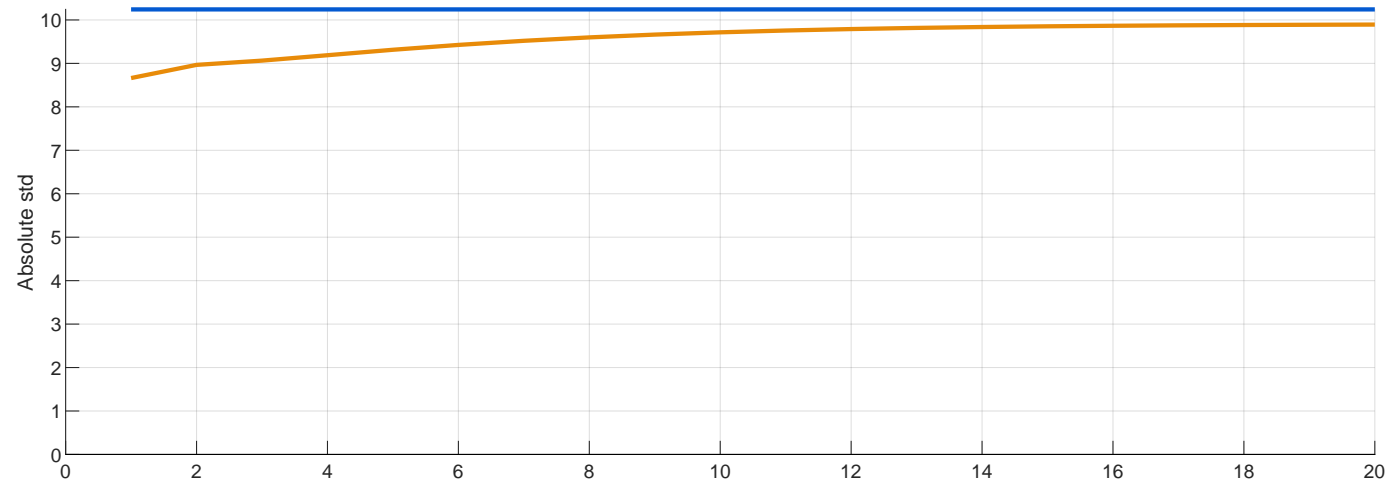
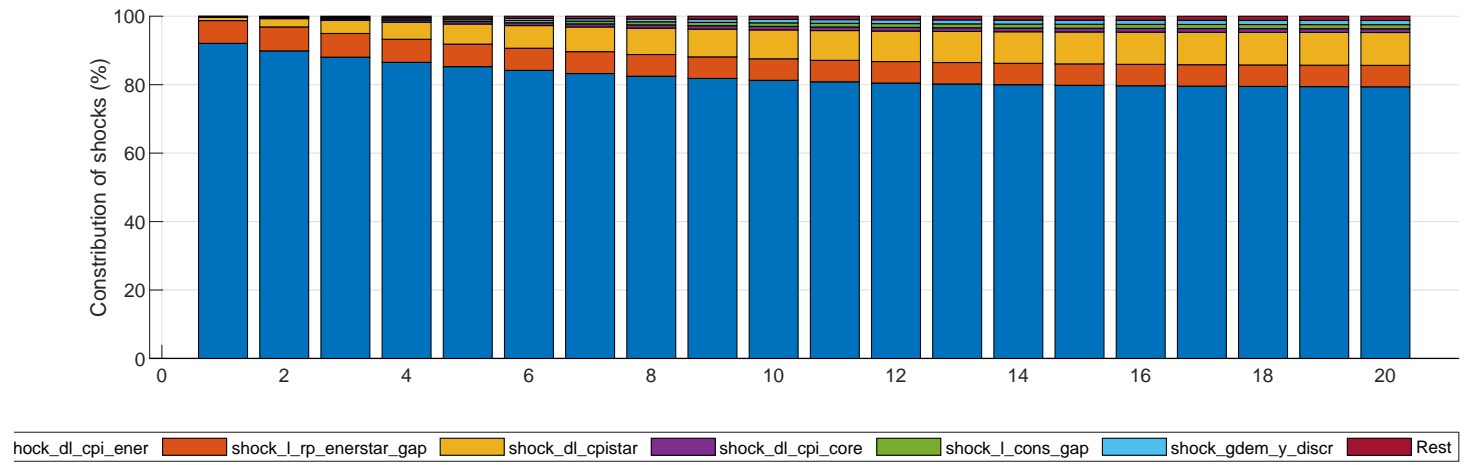
Core CPI, ann. QQ % [dl_cpi_core]



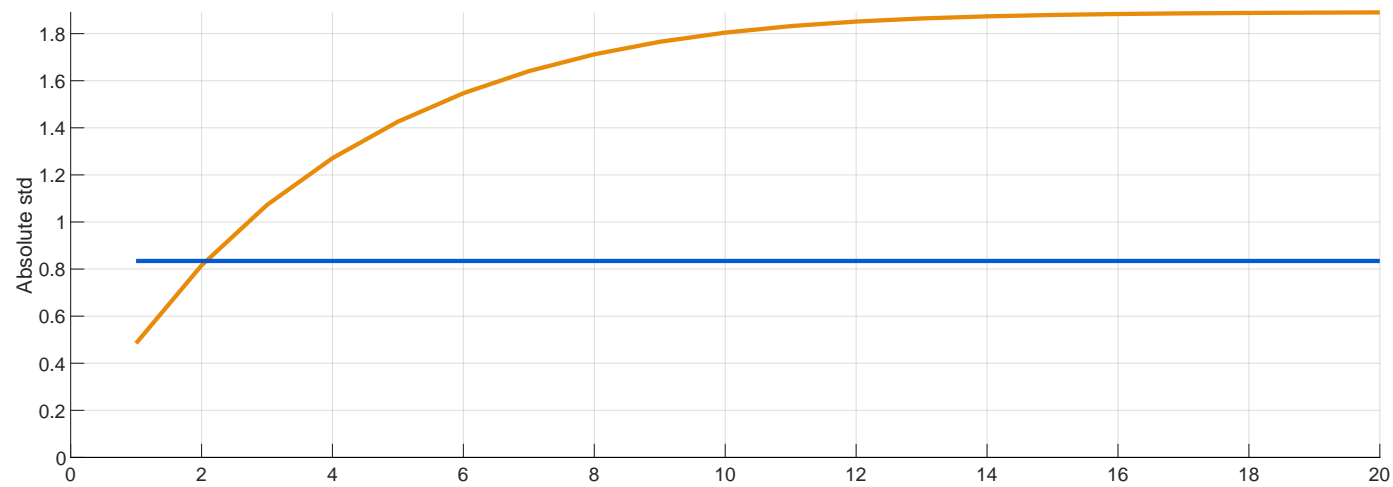
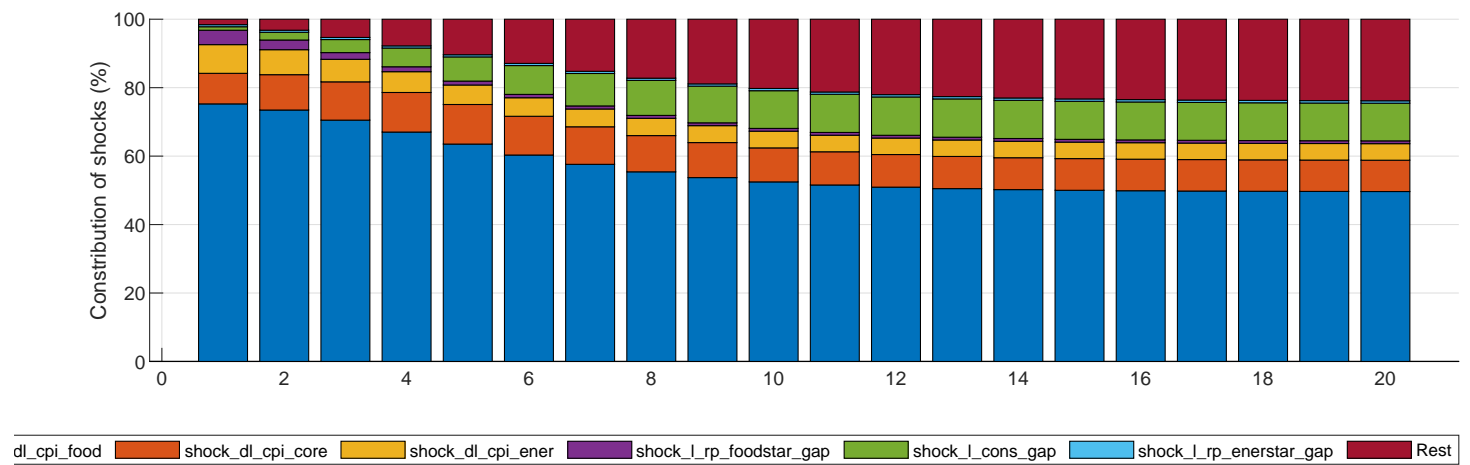
Food CPI, ann. QQ % [dl_cpi_food]



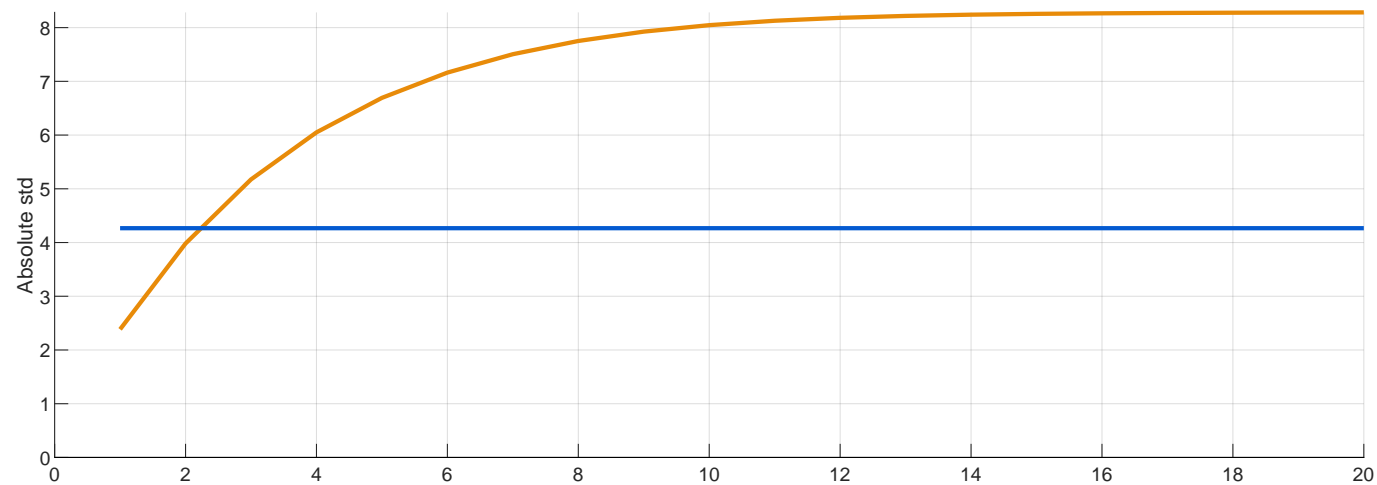
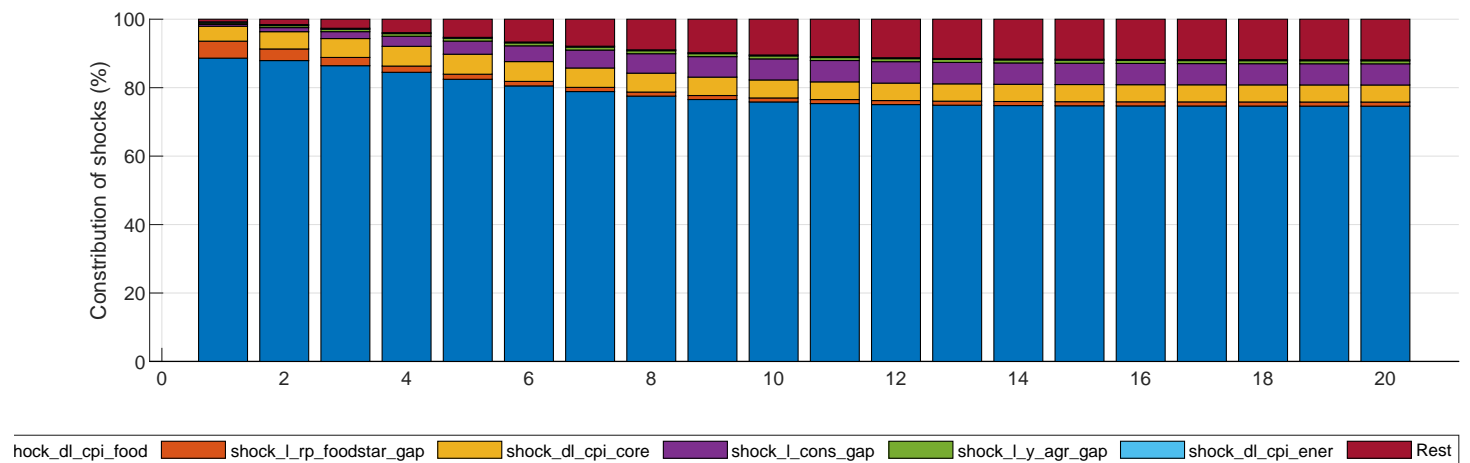
Energy CPI, ann. QQ % [dl_cpi_ener]



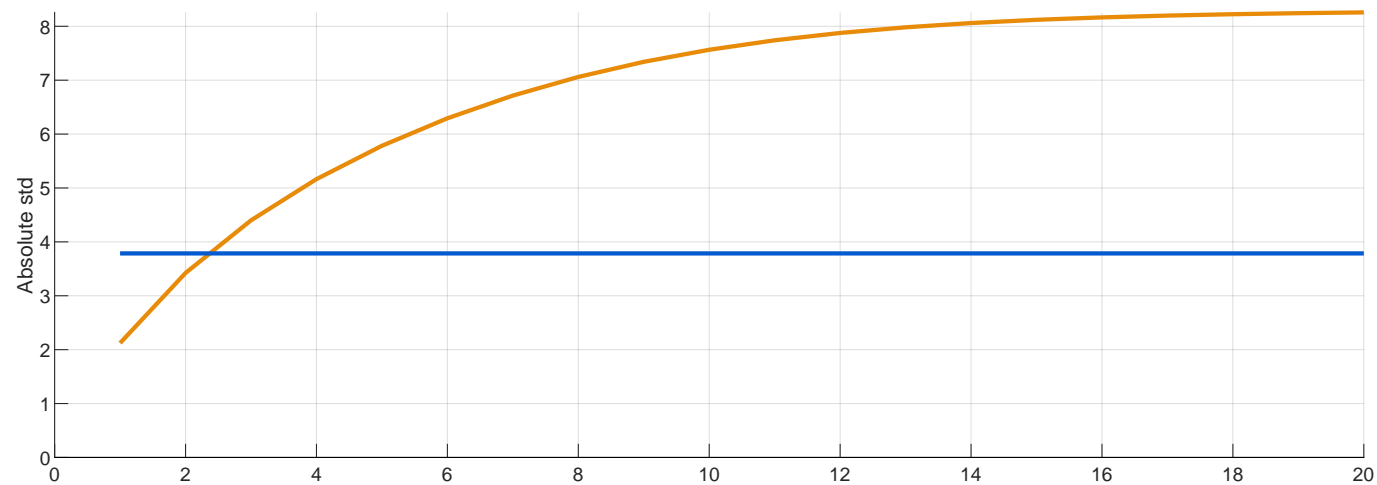
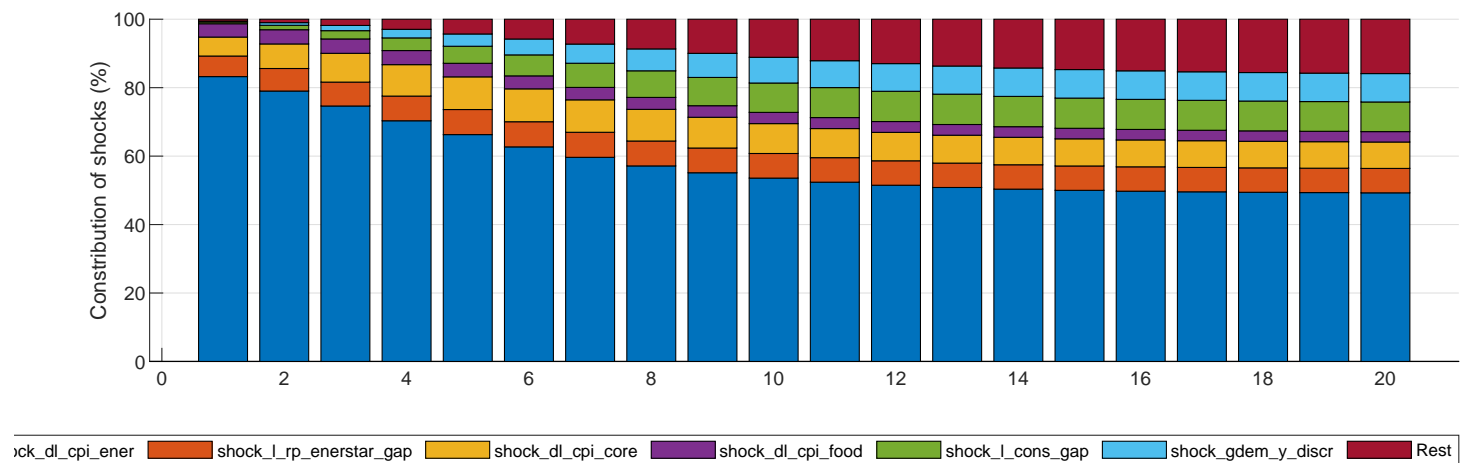
Core rel. price gap, % [l_rp_cpi_core_gap]



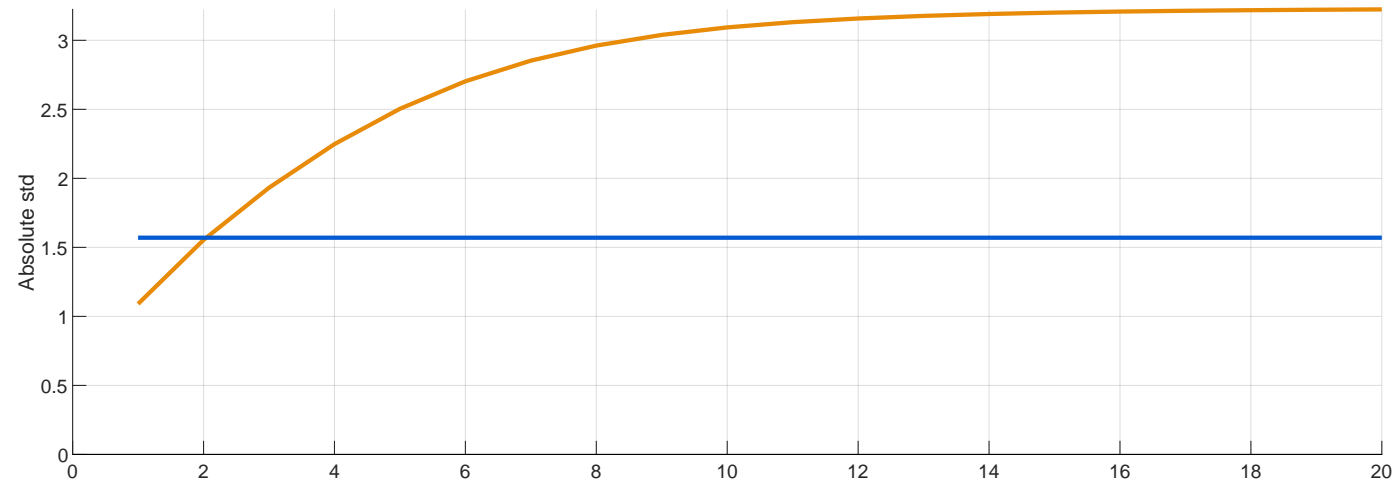
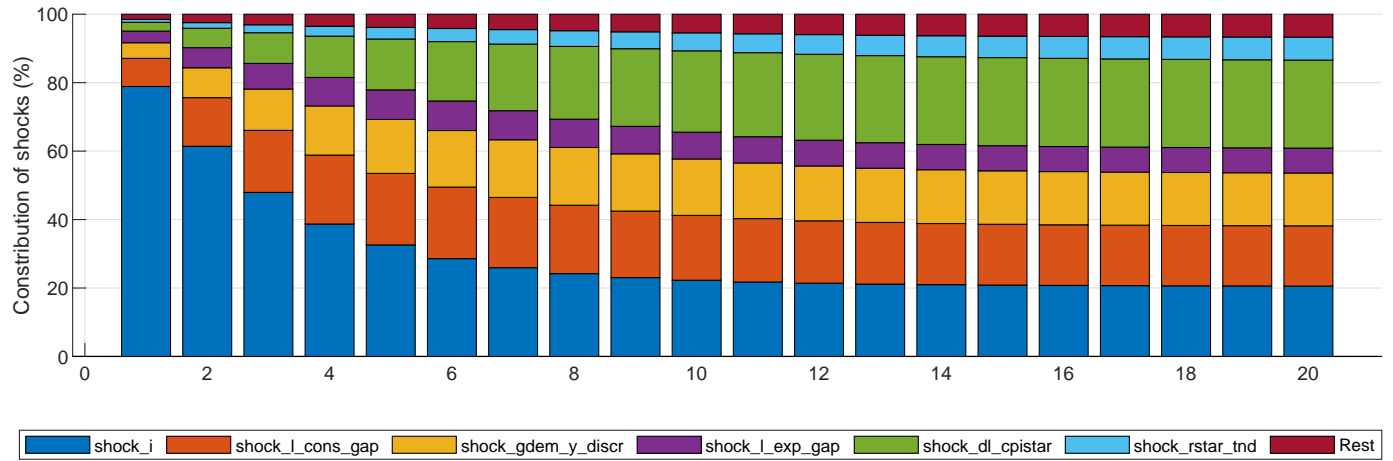
Food rel. price gap, % [l_rp_cpi_food_gap]



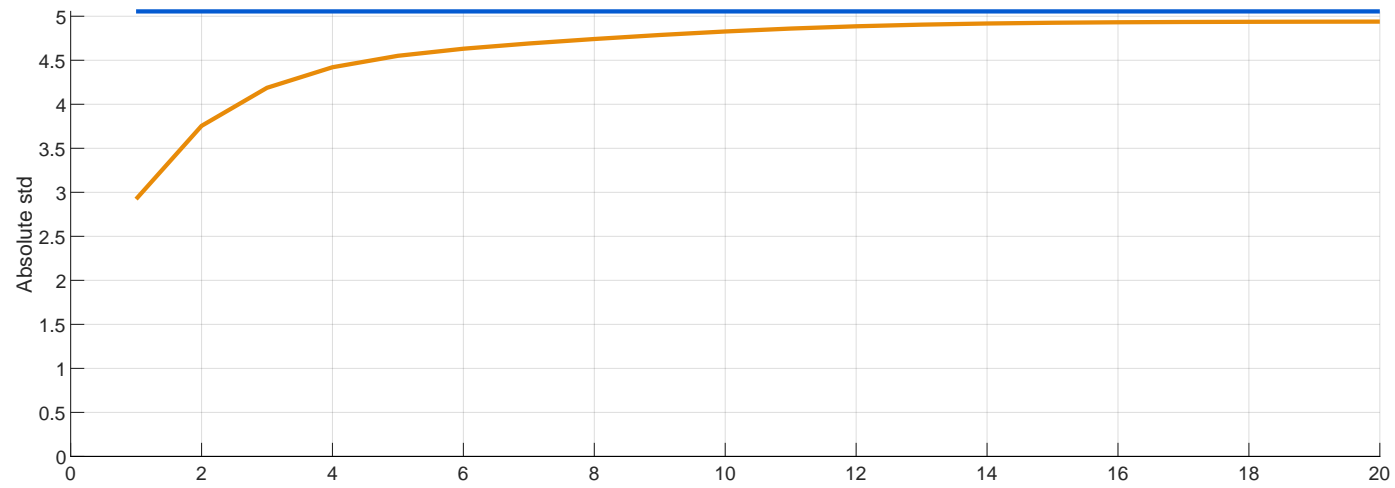
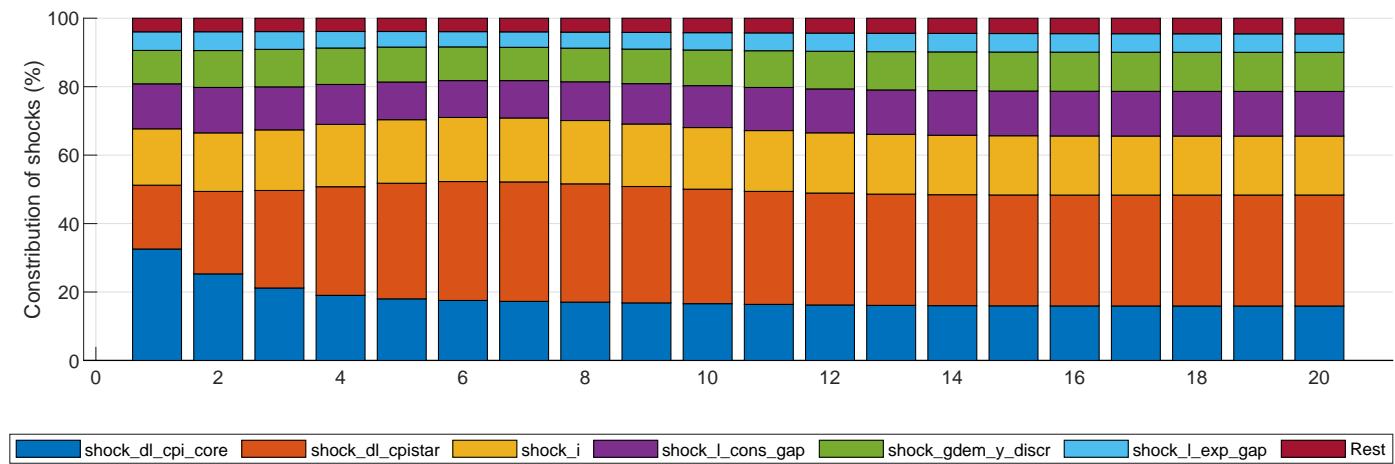
Energy rel. price gap, % [l_rp_cpi_ener_gap]

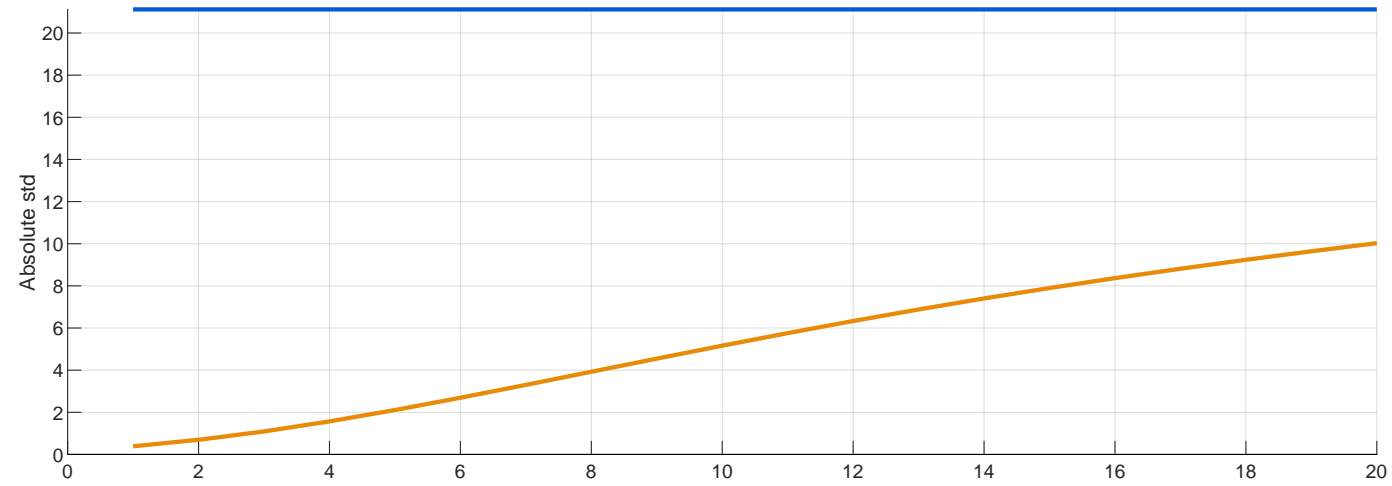
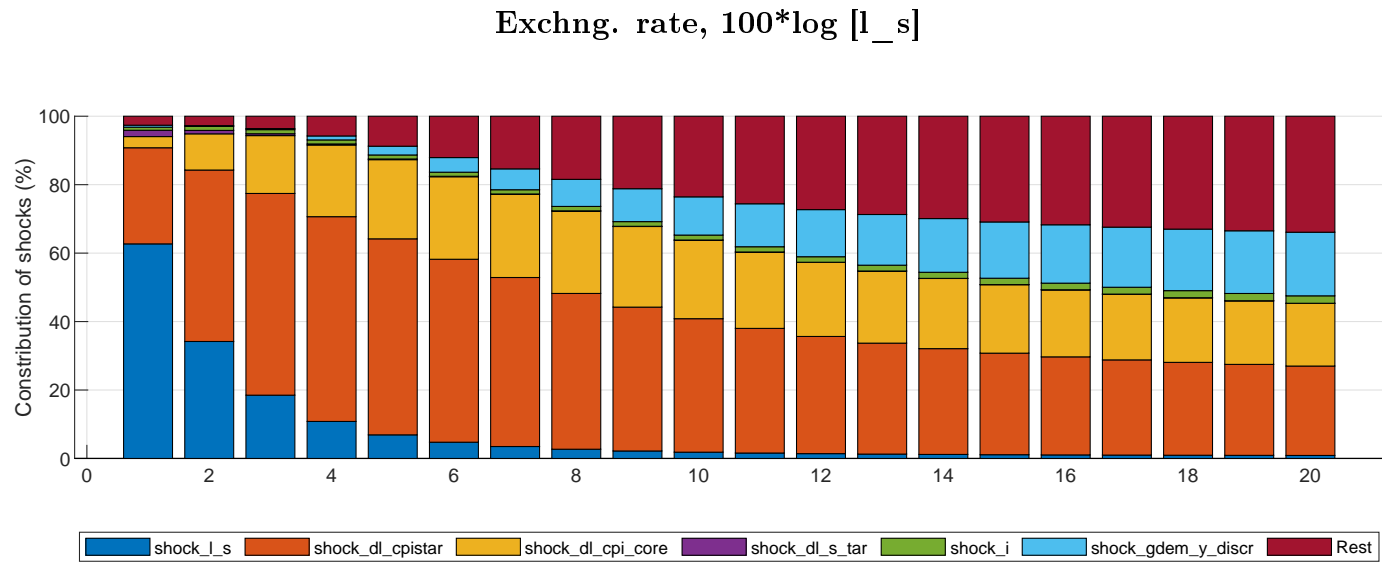


Policy rate (IB rate used), % [i]

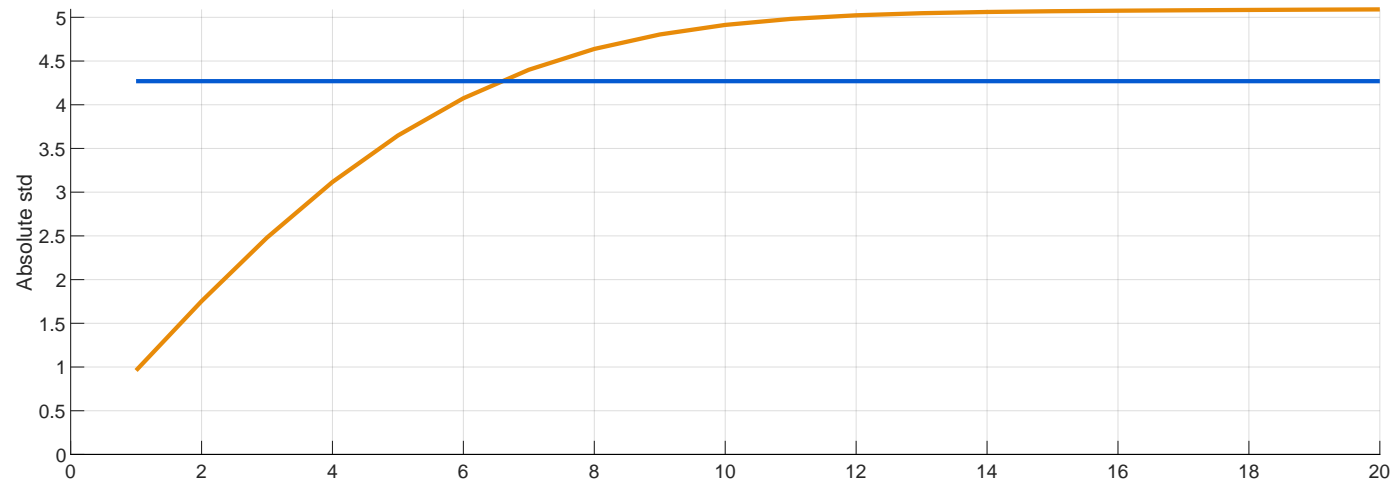
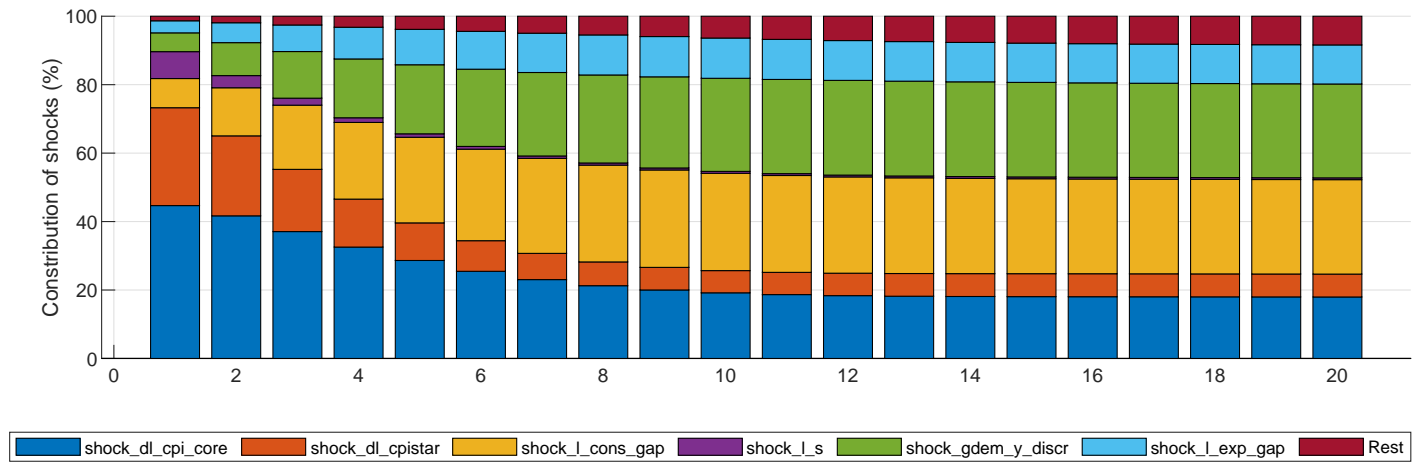


RIR (policy) gap, % [r_gap]

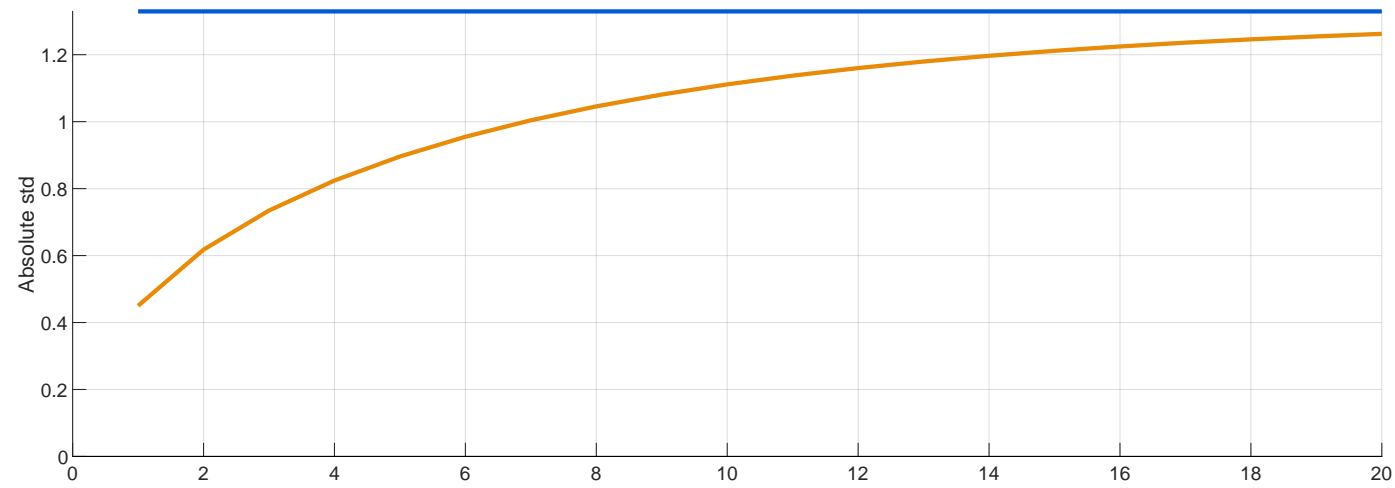
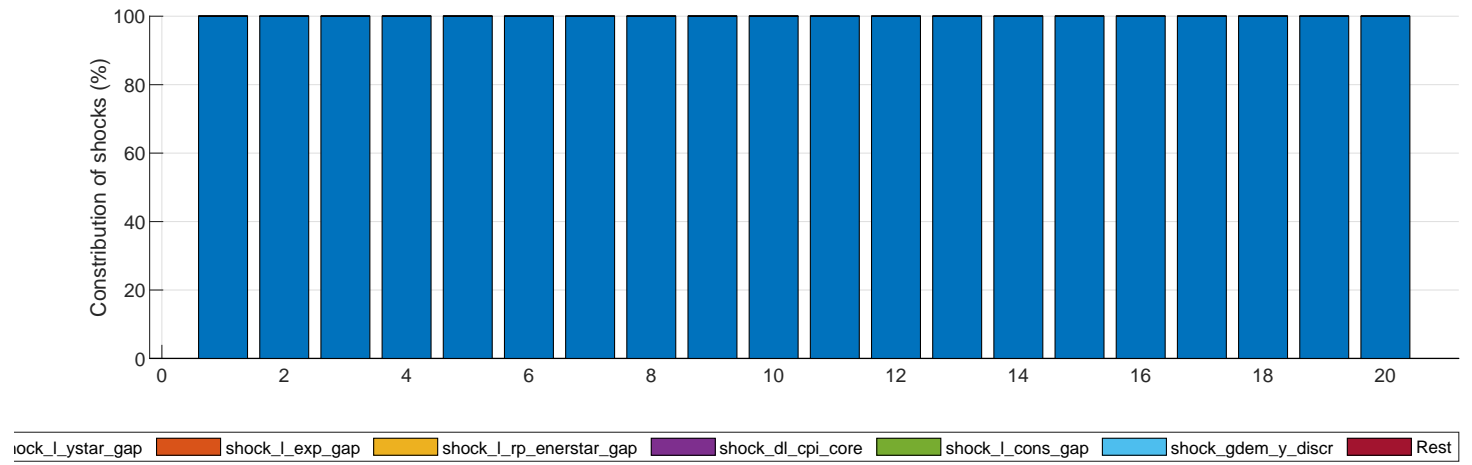




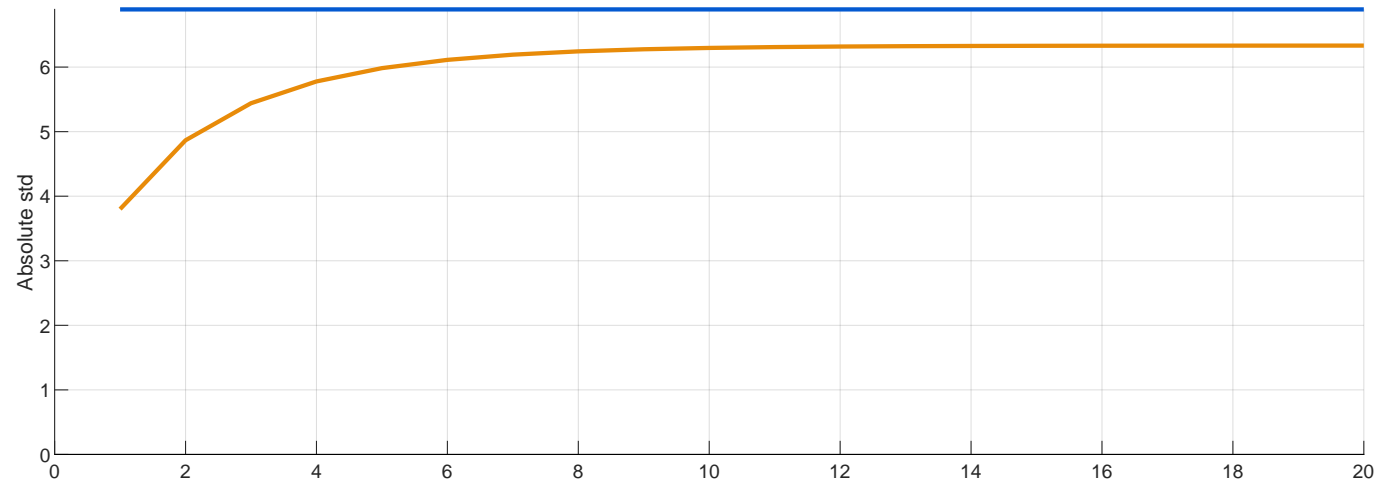
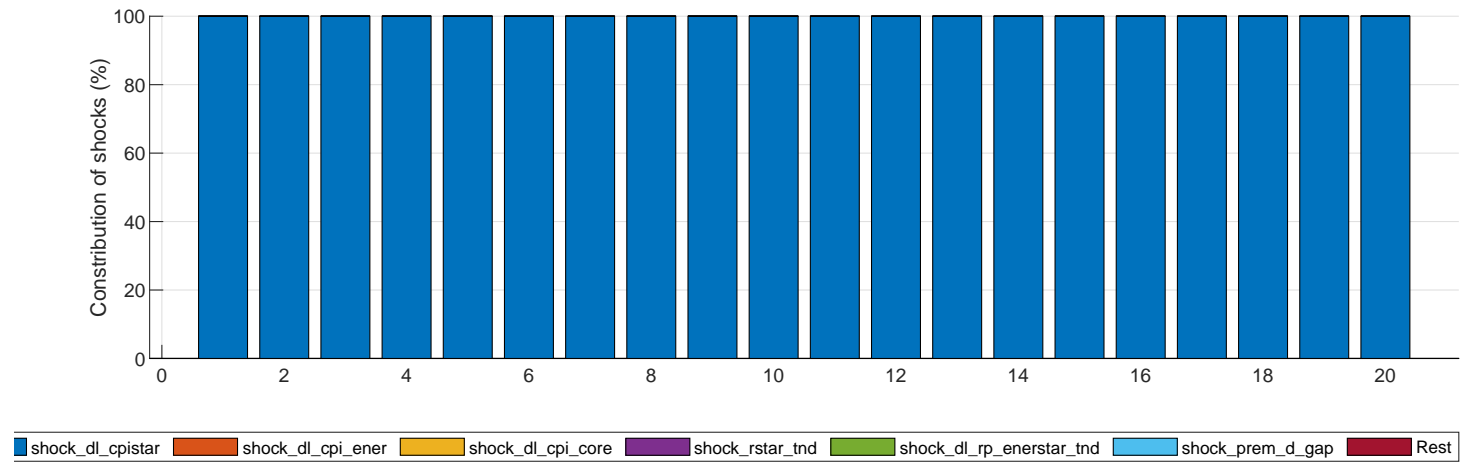
Real exchng. rate gap, % [l_z_gap]

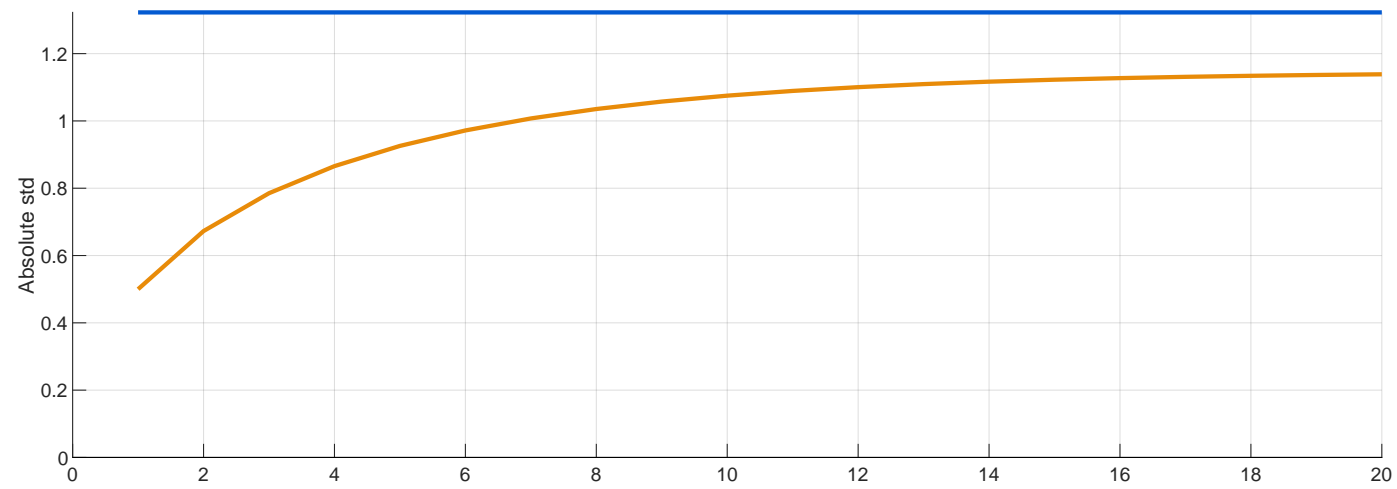
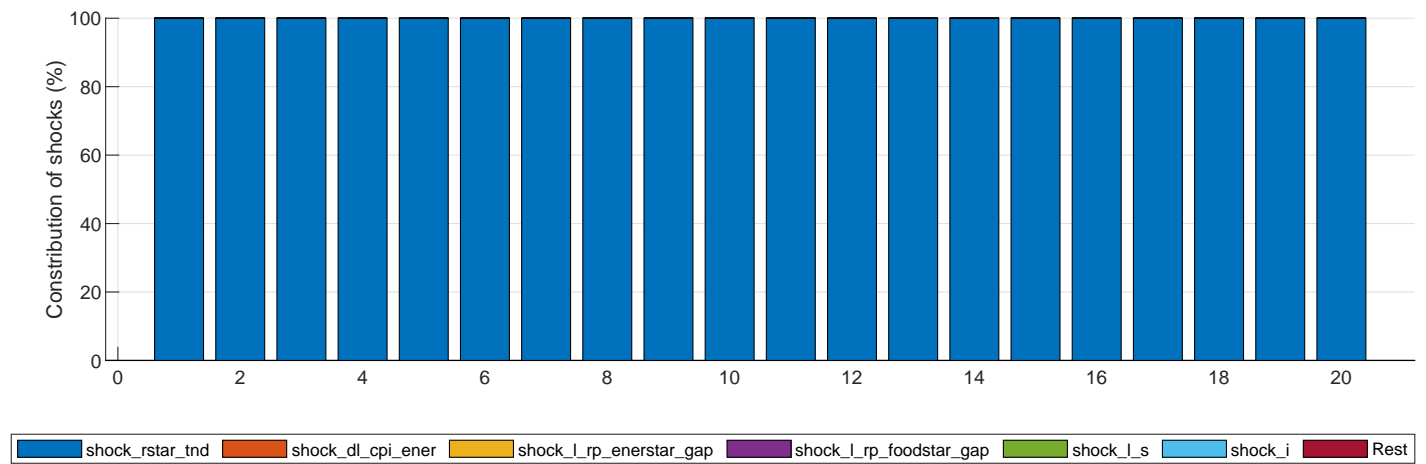


Foreign output gap, % [l_ystar_gap]

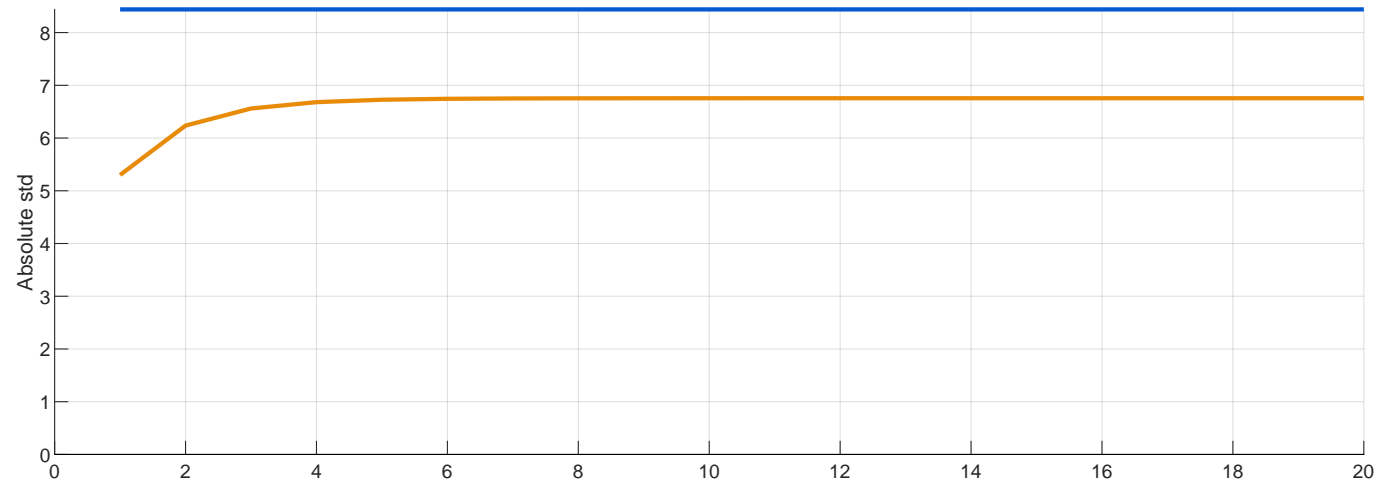
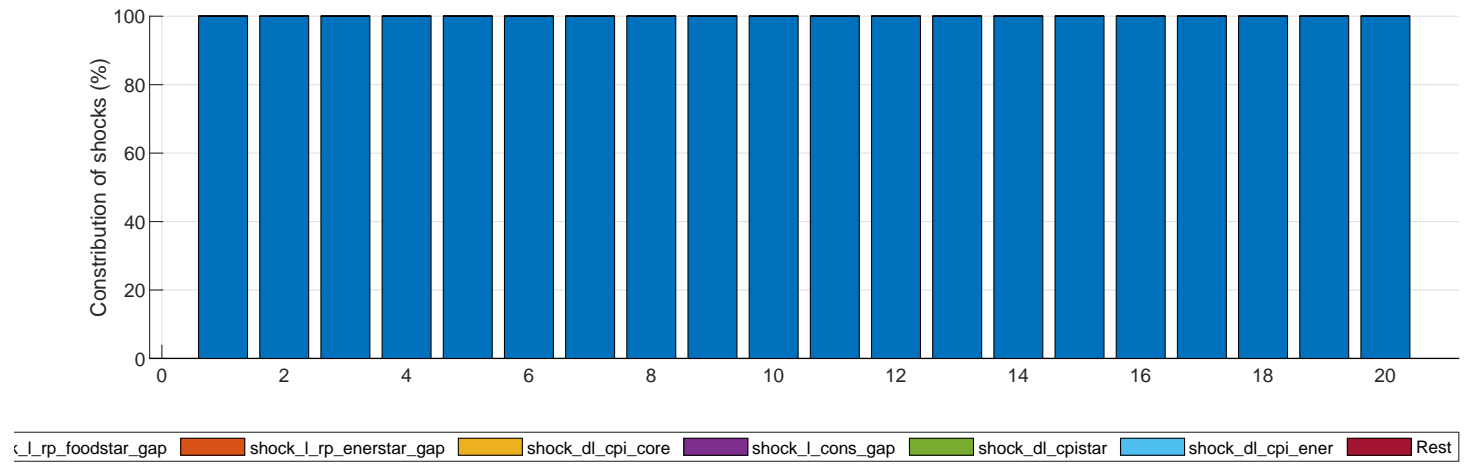


Foreign CPI, ann. QQ % [dl_cpistar]

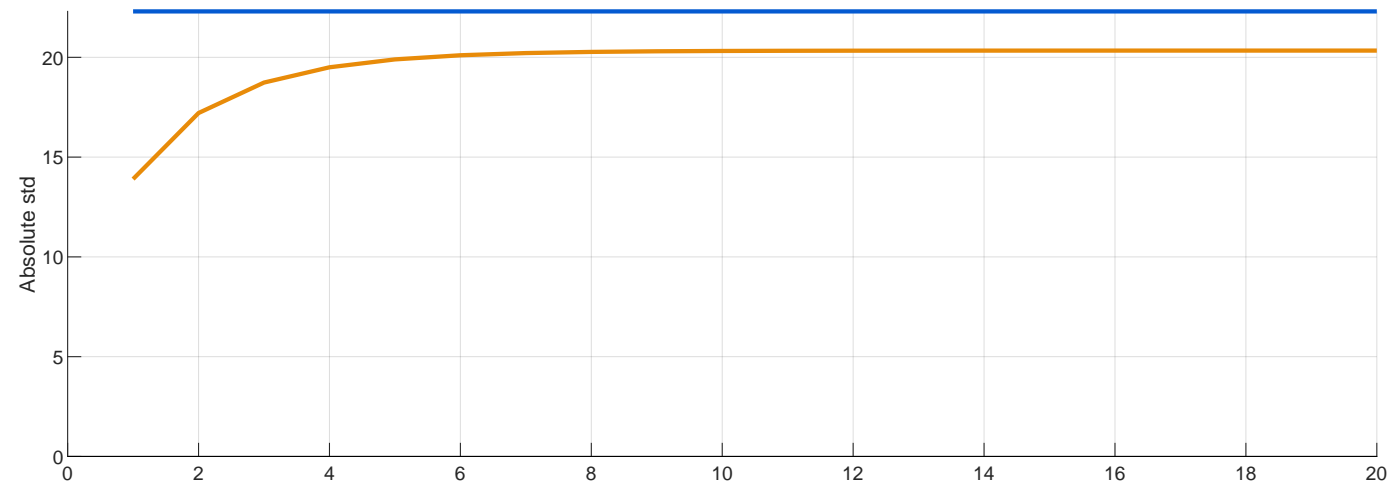
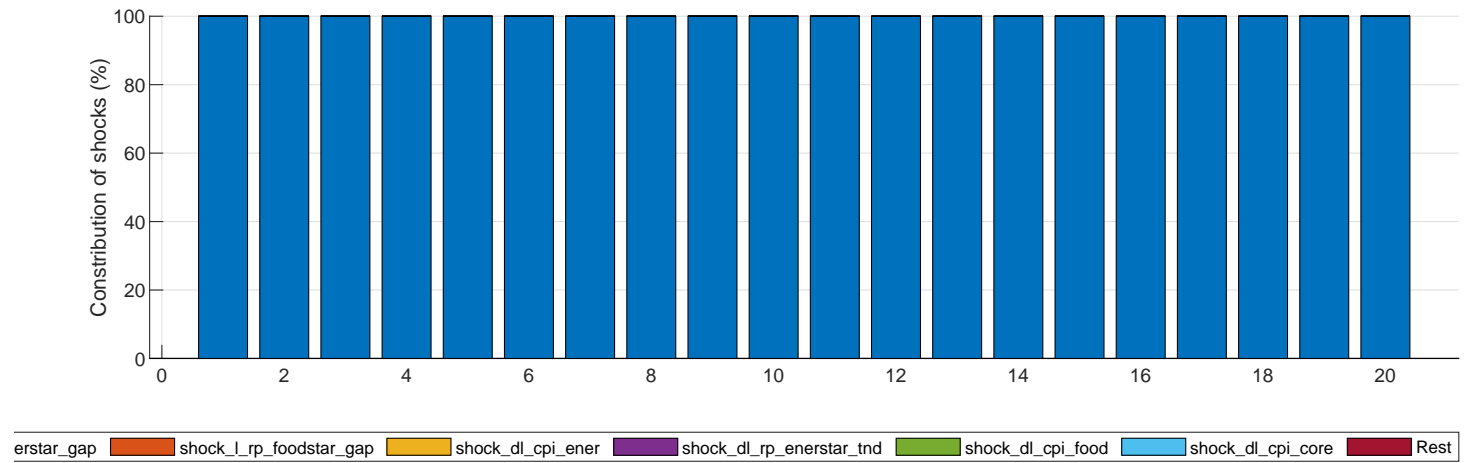


Foreign real interest rate trend, % [rstar_tnd]

Foreign rel. food price gap, % [l_rp_foodstar_gap]



Foreign rel. ener. price gap, % [l_rp_enerstar_gap]



4 Standard deviations: asymptotic model vs. data

	, data	, model
Gov. demand, ann. QQ % [dl_gdem]	35.88	35.88
Gov. demand, YY % [d4l_gdem]	14.80	14.89
Budget deficit, % of GDP [def_y]	2.61	3.46
Govt. rev., % of GDP [grev_y]	3.11	1.87
Govt. demand (G&S), % GDP [gdem_y]	4.34	2.39
Other govt. exp., % to GDP [oexp_y]	2.03	1.82

5 Standard deviations: filtered shocks vs. model calibration

	, filtered	, calibrated
Cons. gap shock, % [shock_l_cons_gap]	3.70	2.50
Inv. gap shock, % [shock_l_inv_gap]	20.47	6.00
Export gap shock, % [shock_l_exp_gap]	11.03	6.00
Output gap shock, % [shock_l_y_gap]	1.99	0.00
Core infl. shock, ann. QQ % [shock_dl_cpi_core]	3.24	2.00
Food infl. shock, ann. QQ % [shock_dl_cpi_food]	13.92	9.00
Energy infl. shock, ann. QQ % [shock_dl_cpi_ener]	7.01	7.10
Policy rate shock, % [shock_i]	0.94	1.00
Lending premium shock, % [shock_prem_d_gap]	0.74	0.80
Exchng. rate shock, 100*log [shock_l_s]	0.66	0.35
Gov rev. discr. shock, % of GDP [shock_grev_y_discr]	1.88	1.73
Gdem. discr. shock, % of GDP [shock_gdem_y_discr]	2.48	1.73
Gov exp. discr. shock, % of GDP [shock_oexp_y_discr]	2.01	1.73
Fiscal grants, % of GDP [shock_grants_y]	2.77	2.50

Equations (parameter values taken from setparam.m)

```

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 exchn. rate, ann. QQ %"      dl_z
242: "Real exchn. rate, YY %"          d4l_z
243: "Exptd. RER, ann. QQ %"          e_dl_z
244: "Real exchn. rate trend, 100*log"  l_z_tnd
245: "Real exchn. rate trend, ann. QQ %" dl_z_tnd
246: "Real exchn. rate trend, YY %"     d4l_z_tnd
247: "Exp. RER trend., ann. QQ %"      e_dl_z_tnd
248: "Real exchn. 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( $\sigma=2.5$ )
316:
317: "Gdem. cyc. shock, % of GDP"    shock_gdem_y_str( $\sigma=0.075$ )
318: "Gdem. str. shock, % of GDP"    shock_gdem_y_cyc( $\sigma=0$ )
319: "Gdem. discr. shock, % of GDP"  shock_gdem_y_discr( $\sigma=1.7321$ )
320:

```

```

321: "Gov exp. cyc. shock, % of GDP"      shock_oexp_y_str< $\sigma=0.1732$ >
322: "Gov exp. str. shock, % of GDP"      shock_oexp_y_cyc< $\sigma=0$ >
323: "Gov exp. discr. shock, % of GDP"    shock_oexp_y_discr< $\sigma=1.7321$ >
324:
325: "Gov rev. str. shock, % of GDP"      shock_grev_y_str< $\sigma=0.1$ >
326: "Gov rev. cyc. shock, % of GDP"      shock_grev_y_cyc< $\sigma=0$ >
327: "Gov rev. discr. shock, % of GDP"    shock_grev_y_discr< $\sigma=1.7321$ >
328:
329: "Cons. gap shock, %"                 shock_l_cons_gap< $\sigma=2.5$ >
330: "Inv. gap shock, %"                 shock_l_inv_gap< $\sigma=6$ >
331: "Export gap shock, %"               shock_l_exp_gap< $\sigma=6$ >
332: "Import gap shock, %"               shock_l_imp_gap< $\sigma=0.5$ >
333: "Output gap shock, %"               shock_l_y_gap< $\sigma=0.0001$ >
334: "Agric. output gap shock, %"        shock_l_y_agr_gap< $\sigma=0.3$ >
335:
336: "Core infl. shock, ann. QQ %"       shock_dl_cpi_core< $\sigma=2$ >
337: "Food infl. shock, ann. QQ %"       shock_dl_cpi_food< $\sigma=9$ >
338: "Energy infl. shock, ann. QQ %"     shock_dl_cpi_ener< $\sigma=7.1$ >
339: "CPI discr. shock, 100*log"         shock_l_cpi< $\sigma=0.0001$ >
340:
341: "Policy rate shock, %"              shock_i< $\sigma=1$ >
342: "Lending premium shock, %"          shock_prem_d_gap< $\sigma=0.8$ >
343:
344: "Exchng. rate shock, 100*log"        shock_l_s< $\sigma=0.35$ >
345: "Exchng. rate target shock, ann. QQ %" shock_dl_s_tar< $\sigma=0.3$ >
346:
347: "Real money dem. shock, ann. QQ %"  shock_dl_rmd< $\sigma=1$ >
348: "Chng. of vel. shock, ann. QQ %"    shock_dl_v< $\sigma=0.1$ >
349:
350: "Cons. tnd. shock, ann. QQ %"       shock_dl_cons_tnd< $\sigma=0.25$ >
351: "Inv. tnd. shock, ann. QQ %"       shock_dl_inv_tnd< $\sigma=0.5$ >
352: "Export shock, ann. QQ %"           shock_dl_exp_tnd< $\sigma=0.75$ >
353: "Import tnd. shock, ann. QQ %"      shock_dl_imp_tnd< $\sigma=0.25$ >
354:
355: "CPI target shock, YY %"            shock_d4l_cpi_tar< $\sigma=0.1$ >
356: "Food rel. price. tnd. shock, ann. QQ %" shock_dl_rp_cpi_food_tnd< $\sigma=0.5$ >
357: "Energy rel. price. tnd. shock, ann. QQ %" shock_dl_rp_cpi_ener_tnd< $\sigma=0.15$ >
358: "RER tnd. shock, ann. QQ %"         shock_dl_z_tnd< $\sigma=0.1$ >
359: "Premium shock, %"                  shock_prem< $\sigma=0.1$ >
360: "Agric. output tnd. shock, %"       shock_dl_y_agr_tnd< $\sigma=0.06$ >

```

```

361:
362: "Foreign output gap shock, %"          shock_l_ystar_gap< $\sigma=0.45$ >
363: "Foreign CPI shock, ann. QQ %"        shock_dl_cpistar< $\sigma=3.8$ >
364: "Foreign intr. rate shock, %"         shock_istar< $\sigma=0.45$ >
365: "Foreign rel. food price gap shock, %" shock_l_rp_foodstar_gap< $\sigma=5.3$ >
366: "Foreign rel. ener. price gap shock, %" shock_l_rp_enerstar_gap< $\sigma=13.9$ >
367: "Foreign rel intr. rate rtnd. shock, %" shock_rstar_tnd< $\sigma=0.5$ >
368: "Foreign rel. food price tnd. shock, ann. QQ %" shock_dl_rp_foodstar_tnd< $\sigma=0.5$ >
369: "Foreign rel. ener. price tnd. shock, ann. QQ %" shock_dl_rp_enerstar_tnd< $\sigma=2.5$ >
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<0.1>
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 coefficient"        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: "Exchnng rate, UIP"                  e1<0.2>

```

```

481: "Exchnge rate expect., forward"      e2<0.2>
482: "Premium, persist."                  e3<0.9>
483: "Exchnge rate target, persist."       e4<0>
484: "Exchnge rate target, infl. dev."     e5<0.3>
485: "Exchnge 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< $\sigma=2.5$ >;
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< $\sigma=0$ >;
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< $\sigma=0.1$ >;
558: grev_y_discr = shock_grev_y_discr< $\sigma=1.7321$ >;
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< $\sigma=0$ >;
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< $\sigma=0.1732$ >;
566: oexp_y_discr = shock_oexp_y_discr< $\sigma=1.7321$ >;
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< $\sigma=0$ >;
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< $\sigma=0.075$ >;
574: gdem_y_discr = t4<0.7> * gdem_y_discr{-1} + shock_gdem_y_discr< $\sigma=1.7321$ >;
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<0.1> * fisc_imp ...
600:   + shock_l_cons_gap< $\sigma=2.5$ >;

```

```

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( $\sigma=6$ );
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( $\sigma=6$ );
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< $\sigma=0.5$ >;
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< $\sigma=0.0001$ >;
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< $\sigma=0.3$ >;
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< $\sigma=2$ >;
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( $\sigma=9$ );
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( $\sigma=7.1$ );
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< $\sigma=0.0001$ >;
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< $\sigma=1$ >;
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< $\sigma=0.8$ >;
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< $\sigma=0.1$ >;
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< $\sigma=0.35$ >;
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< $\sigma=0.1$ >;
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< $\sigma=0.3$ >;
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< $\sigma=1$ >;
806:
807: dl_v = m3<0.9> * dl_v{-1} + (1 - m3<0.9>) * ss_dl_v<-2.02027> + shock_dl_v< $\sigma=0.1$ >;
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< $\sigma=0.25$ >;
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< $\sigma=0.5$ >;
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< $\sigma=0.75$ >;
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< $\sigma=0.25$ >;
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< $\sigma=0.06$ >; % 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< $\sigma=0.1$ >;
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< $\sigma=0.5$ >;
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< $\sigma=0.5$ >;
831:
832: % -----
833: % ----- External sector -----
834:
835: l_ystar_gap = r_ystar<0.94> * l_ystar_gap{-1} + shock_l_ystar_gap< $\sigma=0.45$ >;
836:
837: dl_cpistar = r_cpistar<0.8> * dl_cpistar{-1} + (1 - r_cpistar<0.8>) * ss_dl_cpistar<1.98026> + shock_dl_cpistar< $\sigma=3.8$ >;
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< $\sigma=0.45$ >;

```

```

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_? = ?;
903: !end
904:
905: % -----
906: % ----- Expert/judgemental tunes -----
907:
908: !for
909:   gdem_y, oexp_y
910:   gdem_y_str, oexp_y_str, grev_y_str
911:   gdem_y_cyc, oexp_y_cyc, grev_y_cyc
912:   l_y_tnd, l_cons_tnd, l_inv_tnd, l_gdem_tnd, l_exp_tnd, l_imp_tnd
913:   d4l_cpi_tar, l_rp_cpi_food_tnd, l_rp_cpi_ener_tnd
914:   r_tnd, l_z_tnd, prem, dl_s_tar
915:   def_y_str, def_y_discr, grants_y
916:   l_y_gap, l_cons_gap, l_inv_gap, l_gdem_gap, l_exp_gap, l_imp_gap
917:   l_y_agr_gap
918:   l_z_gap
919:   l_y, d4l_y
920: !do

```

```

921:  !measurement_variables
922:    tune_?
923:  !measurement_equations
924:    tune_? = ?;
925: !end
926:
927: % -----
928: % ----- Auxiliary variables/equations for shock tuning in the filter -----
929:
930: !for
931:   shock_dl_cons_tnd( $\sigma=0.25$ )
932: !do
933:   !transition_variables
934:     aux_?
935:   !transition_equations
936:     aux_? = ?;
937:   !measurement_variables
938:     tune_?
939:   !measurement_equations
940:     tune_? = aux_?;
941: !end
942:
943: % -----
944: % ----- Reporting equations -----
945: % -----
946:
947: !parameters
948:
949: "Share of import prices in CPI"          mu_pimp( $0.35$ )
950: "Share of export prices in GDP deflator"  mu_pexp( $0.2$ )
951:
952: "share of fcy debt in total debt"        r_debt_fcy_rat( $0.9$ )
953: "interest rate fcy debt persistence"     r_debt_fcy_intrate_pers( $0.9$ )
954: "interest rate lcy debt persistence"     r_debt_lcy_intrate_pers( $0.9$ )
955:
956: gamma_r( $0.5$ )
957: gamma_k( $0.8$ )
958: gamma_BP_tnd( $0.9$ )
959: % AK 7/14/23 replace k_bar by l_BP_tnd; % log(BP)=k, BP cum inflows mln$,
960: % BP does not go to fixed ss level k_bar=log(6500), but to trend

```

```

961: % with initial value trend set equal to actual in readData
962:
963: "Import share in consumption"    lam_imp_cons(0.2)
964: "Import share in investment"     lam_imp_inv(0.42)
965: "Import share in govdemand"      lam_imp_gdem(0.42)
966: "Import share in exports"        lam_imp_exp(0.20381)
967:
968: !reporting_equations
969:
970: % True percentages (added Oct 28, '22)
971: !for
972:   y, cons, inv, gdem, exp, imp
973:   cpi, cpi_core, cpi_food, cpi_ener
974:   s, z
975: !do
976:   pct_?   = exp(dl_?/100)*100 - 100;
977:   pct4_?  = exp(d4l_?/100)*100 - 100;
978: !end
979:
980: !for
981:   i, r
982: !do
983:   pct_?   = exp(?/100)*100 - 100;
984: !end
985:
986: % Levels exchange rate and nominal money demand
987: s   = exp(l_s/100);
988: md  = exp(l_md/100);
989: dl_md = 4*(l_md - l_md{-1}); % ak 7/15/23 must[dbFcats be annualized
990:
991: % Deflators (recall: all annualized, *4)
992:
993: dl_pexp = dl_pexpstar + dl_s;
994: dl_pimp = dl_pimpstar + dl_s;
995:
996: dl_pdom = (dl_cpi - mu_pimp(0.35) * dl_pimp) / (1 - mu_pimp(0.35));
997:
998: dl_py   = mu_pexp(0.2) * dl_pexp + (1 - mu_pexp(0.2)) * dl_pdom;
999: % deflator for govt demand assumed equal to dl_cpi_core to simplify
1000:

```

```

1001: % Nominal growth rates (recall:all annualized, *4)
1002:
1003: dl_nexp = dl_exp + dl_pexp;
1004: dl_nimp = dl_imp + dl_pimp;
1005: dl_ny   = dl_y   + dl_py;
1006: dl_ngdem = dl_gdem + dl_cpi_core;
1007: dl_ncons = dl_cons + dl_cpi_core; % 4/19 AK for ratios (% to nom GDP)
1008: dl_ninv  = dl_inv + dl_cpi_core;
1009:
1010: % Nominal levels exports, imports, GDP
1011:
1012: nexp = exp(log(nexp{-1}) + dl_nexp/100/4);
1013: nimp = exp(log(nimp{-1}) + dl_nimp/100/4);
1014: ny   = exp(log(ny{-1}) + dl_ny/100/4); % get ny{-1} etc from dbAUX to have start value forecast
1015: ngdem = exp(log(ngdem{-1}) + (dl_ngdem/100)/4); % idem
1016: ncons = exp(log(ncons{-1}) + dl_ncons/100/4); % 4/19/23 AK for ratios
1017: ninv  = exp(log(ninv{-1}) + dl_ninv/100/4);
1018:
1019: tb_rat = (nexp - nimp) / ny *100;
1020:
1021: % Capital account (Ostry/Ghosh/Chamon,2012:log(BP)=k; define rstar here,not done in model)
1022: % 7/14/23 trend eq for ss cumul capital inflows in line with real GDP, instead of k_bar
1023: rstar = istar - e_dl_cpistar;
1024: % first evaluate trend
1025: dl_BP_tnd = gamma_BP_tnd(0.9) * dl_BP_tnd{-1} + (1-gamma_BP_tnd(0.9)) * ss_dl_y_tnd(7.23207);
1026: l_BP_tnd = dl_BP_tnd/4 + l_BP_tnd{-1};
1027: % then evaluate level
1028: l_BP = l_BP{-1} + gamma_r(0.5) * ( (r - rstar - prem)/4 - e_dl_z ) ...
1029:      - gamma_k(0.8) * (l_BP{-1} - l_BP_tnd);
1030: dBP_usd = exp(l_BP/100) - exp(l_BP{-1}/100);
1031:
1032: % evaluate debt and deficit first before rest of BOP and MON
1033: % ak debt changes with deficit-/grants, nb def_y and grants are over Q-GDP, as is debt
1034: debt_y = ...
1035:      + debt_lcy_y{-1} * (1) / exp(dl_ny/400) ...
1036:      + debt_fcy_y{-1} * exp(dl_s/400) / exp(dl_ny/400) ...
1037:      + def_y - grants_y;
1038:
1039: 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);
1040:

```



```

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

```