QPM Model

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% ====================================
% Basic Quarterly Projection Model (QPM)
% ====================================

!transition_variables
'Real GDP (100*log)'                                          L_GDP
'Trend in Real GDP (100*log)'                                 L_GDP_BAR
'Output Gap (in %)'                                           L_GDP_GAP
'Quarterly Growth in Real GDP(in % pa)'                       DLA_GDP
'Real GDP Growth YoY (in % pa)'                               D4L_GDP
'Real GDP Trend Growth QoQ annualized (in % pa)'              DLA_GDP_BAR
'Growth trend'    GROWTH_BAR

'Real Monetary Condition Index (in % pa)'                     MCI

'CPI (level, 100*log)'                                        L_CPI
'CPI Inflation QoQ annualized (in % pa)'                      DLA_CPI
'Expected CPI Inflation QoQ annualized (in % pa)'             E_DLA_CPI
'Expected CPI Inflation YoQ (in % pa)'                  E_D4L_CPI
'CPI Inflation YoY (in % pa)'                                 D4L_CPI
'Inflation Target (in % pa)'                                  D4L_CPI_TAR

'Real Marginal Cost  (in %)'                                  RMC

'Nominal Exchange Rate (LCY/FCY, 100*log)'                    L_S
'Nominal Exch. Rate Depreciation QoQ annualized (in % pa)'    DLA_S
'Nominal Exch. Rate Depreciation YoY (in % pa)'               D4L_S
'Country Risk Premium (in % pa)'                              PREM

'Nominal Policy Interest Rate (in % pa)'                      RS
'Real Interest Rate (in % pa)'                                RR
'Trend Real Interest Rate (in % pa)'                          RR_BAR
'Real Interest Rate Gap (in %)'                               RR_GAP
'Nominal Policy Neutral Interest Rate (in % pa)'              RSNEUTRAL

'Real Exchange Rate (level, 100*log)'                         L_Z
'Trend Real Exchange Rate (level, 100*log)'                   L_Z_BAR
'Real Exchange Rate Gap (in %)'                               L_Z_GAP
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'Real Exchange Rate Depreciation QoQ annualized (in % pa)'          DLA_Z
'Trend Real Exchange Rate Depreciation QoQ annualized(in % pa)'     DLA_Z_BAR

'Foreign Output Gap (in %)'                                         L_GDP_RW_GAP
'Foreign Nominal Interest Rate (in % pa)'                           RS_RW
'Foreign Real Interest Rate (in % pa)'                              RR_RW
'Foreign Real Interest Rate Trend (in % pa)'                        RR_RW_BAR
'Foreign Real Interest Rate Gap (in %)'                             RR_RW_GAP
'Foreign CPI (level, 100*log)'                                      L_CPI_RW
'Foreign Inflation QoQ annualized (in % pa)'                        DLA_CPI_RW

'Unemployment rate'                                                 UNEM
'equilibrium value of the unemployment (NAIRU)'                     UNEM_BAR
'Unemployment Gap'                                                  UNEM_GAP
'Temporaty Variation in the trend'                                  DLA_UNEM_BAR


% ------------------------------------------------------------------------------ %
!transition_shocks
'Shock: Output gap (demand)'                                        SHK_L_GDP_GAP⟨σ=4⟩
'Shock: CPI inflation (cost-push)'                                  SHK_DLA_CPI⟨σ=2⟩
'Shock: Exchange rate (UIP)'                                        SHK_L_S⟨σ=5⟩
'Shock: Interest rate (monetary policy)'                            SHK_RS⟨σ=2.35⟩
'Shock: Inflation target'                                           SHK_D4L_CPI_TAR⟨σ=2.85⟩

'Shock: Real interest rate'                                         SHK_RR_BAR⟨σ=0.6308⟩
'Shock: Real exchange rate depreciation'                            SHK_DLA_Z_BAR⟨σ=5⟩
'Shock: Potential GDP growth'                                       SHK_DLA_GDP_BAR⟨σ=0.5⟩

'Shock: Foreign output gap'                                         SHK_L_GDP_RW_GAP⟨σ=4.2⟩
'Shock: Foreign nominal interest rate'                              SHK_RS_RW⟨σ=0.3641⟩
'Shock: Foreign inflation'                                          SHK_DLA_CPI_RW⟨σ=3.1552⟩
'Shock: Foreign real interest rate'                                 SHK_RR_RW_BAR⟨σ=0.2⟩

'Shock: Unemployment'                                               SHK_UNEM_BAR⟨σ=0.8531⟩
'Shock: Variation in its trend unemployment'                        SHK_DLA_UNEM_BAR⟨σ=0.3119⟩
'Shock: Unemployment Gap'                                           SHK_UNEM_GAP⟨σ=0.1828⟩
'Shock: GDP trend'                                                  SHK_L_GDP_BAR⟨σ=2.3⟩
% ------------------------------------------------------------------------------ %
!parameters
b1⟨0.47⟩ b2⟨0.14⟩ b3⟨0.2⟩ b4⟨0.75⟩
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 80: a1⟨0.2912⟩ a2⟨0.2287⟩ a3⟨0.7847⟩
 81: e1⟨0.5⟩
 82: g1⟨0.7⟩ g2⟨1.5⟩ g3⟨0.375⟩
 83: u1⟨0.384⟩ u2⟨0.4503⟩ n1⟨0.9⟩
 84:
 85: rho_D4L_CPI_TAR⟨0.95⟩
 86: rho_DLA_Z_BAR⟨0.5361⟩
 87: rho_RR_BAR⟨0.95⟩
 88: rho_DLA_GDP_BAR⟨0.7242⟩
 89:
 90: rho_L_GDP_RW_GAP⟨0.7612⟩
 91: rho_RS_RW⟨0.95⟩
 92: rho_DLA_CPI_RW⟨0.3131⟩
 93: rho_RR_RW_BAR⟨0.95⟩
 94:
 95: rho_UNEM_BAR⟨0.2219⟩
 96: rho_DLA_UNEM_BAR⟨0.8742⟩
 97: rho_UNEM_GAP⟨0.2521⟩
 98:
 99: ss_D4L_CPI_TAR⟨3⟩
100: ss_DLA_Z_BAR⟨0⟩
101: ss_RR_BAR⟨3⟩
102: ss_DLA_GDP_BAR⟨3.3⟩
103:
104: ss_DLA_CPI_RW⟨2⟩
105: ss_RR_RW_BAR⟨0.5⟩
106:
107: ss_UNEM_BAR⟨11.1⟩
108:
109: %% ------------------------------------------------------------------------------ %
110: !transition_equations
111: %% === Aggregate demand (the IS curve) ===
112: L_GDP_GAP = b1⟨0.47⟩*L_GDP_GAP{-1} - b2⟨0.14⟩*MCI + b3⟨0.2⟩*L_GDP_RW_GAP + SHK_L_GDP_GAP⟨σ=4⟩;
113:
114: %-- Real monetary conditions index
115: MCI = b4⟨0.75⟩*RR_GAP + (1-b4⟨0.75⟩)*(- L_Z_GAP);
116:
117: %% === Inflation (the Phillips curve) ===
118: DLA_CPI =  a1⟨0.2912⟩*DLA_CPI{-1} + (1-a1⟨0.2912⟩)*DLA_CPI{+1} + a2⟨0.2287⟩*RMC + SHK_DLA_CPI⟨σ=2⟩;
119:
120: %-- Real marginal cost
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121: RMC = a3⟨0.7847⟩*L_GDP_GAP + (1-a3⟨0.7847⟩)*L_Z_GAP;
122:
123: %- expected inflation
124: E_DLA_CPI = DLA_CPI{+1};
125: E_D4L_CPI = D4L_CPI{+4};
126:
127: %% === Monetary policy reaction function (a forward-looking Taylor-type Rule) ===
128: RS = g1⟨0.7⟩*RS{-1} + (1-g1⟨0.7⟩)*(RSNEUTRAL + g2⟨1.5⟩*(D4L_CPI{+4} - D4L_CPI_TAR{+4}) + g3⟨0.375⟩*L_GDP_GAP) + SHK_RS⟨σ=2.35⟩;
129:
130: %- Neutral nominal policy interest rate
131: RSNEUTRAL = RR_BAR + D4L_CPI{+1};
132:
133: %% === Modified Uncovered Interest Rate Parity (UIP) condition ===
134: L_S = (1-e1⟨0.5⟩)*L_S{+1} + e1⟨0.5⟩*(L_S{-1} + 2/4*(D4L_CPI_TAR - ss_DLA_CPI_RW⟨2⟩ + DLA_Z_BAR)) + (- RS + RS_RW + PREM)/4 + SHK_L_S⟨σ
135:
136: %% === Definitions ===
137:
138: %- Fisher equation (RIR)
139: RR = RS - D4L_CPI{+1};
140:
141: %- Real exchange rate (RER)
142: L_Z = L_S + L_CPI_RW - L_CPI;
143:
144: %- Long-term version of UIP (consistency of trends)
145: DLA_Z_BAR{+1} = RR_BAR - RR_RW_BAR - PREM;
146:
147: %% === Identities ===
148: GROWTH_BAR = 4*(L_GDP_BAR - L_GDP_BAR{-1});
149: L_GDP_BAR = L_GDP_BAR{-1} + DLA_GDP_BAR/4 - n1⟨0.9⟩*(UNEM_BAR-UNEM_BAR{-1}) - (1-n1⟨0.9⟩)*(UNEM_BAR{-1}-UNEM_BAR{-16}) + SHK_L_GDP_BAR
150: DLA_Z_BAR   = 4*(L_Z_BAR - L_Z_BAR{-1});
151: DLA_Z       = 4*(L_Z - L_Z{-1});
152: DLA_GDP     = 4*(L_GDP - L_GDP{-1});
153: DLA_CPI     = 4*(L_CPI - L_CPI{-1});
154: DLA_S       = 4*(L_S - L_S{-1});
155:
156: D4L_GDP     = L_GDP - L_GDP{-4};
157: D4L_CPI     = L_CPI - L_CPI{-4};
158: D4L_S       = L_S - L_S{-4};
159:
160: %% === Gaps ===
161: RR_GAP    = RR - RR_BAR;
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162: L_Z_GAP   = L_Z - L_Z_BAR;
163: L_GDP_GAP = L_GDP - L_GDP_BAR;
164:
165: %% === Trends ===
166: D4L_CPI_TAR = rho_D4L_CPI_TAR⟨0.95⟩*D4L_CPI_TAR{-1} + (1-rho_D4L_CPI_TAR⟨0.95⟩)*ss_D4L_CPI_TAR⟨3⟩ + SHK_D4L_CPI_TAR⟨σ=2.85⟩;
167: DLA_Z_BAR   = rho_DLA_Z_BAR⟨0.5361⟩*DLA_Z_BAR{-1} + (1-rho_DLA_Z_BAR⟨0.5361⟩)*ss_DLA_Z_BAR⟨0⟩ + SHK_DLA_Z_BAR⟨σ=5⟩;
168: RR_BAR      = rho_RR_BAR⟨0.95⟩*RR_BAR{-1} + (1-rho_RR_BAR⟨0.95⟩)*ss_RR_BAR⟨3⟩ + SHK_RR_BAR⟨σ=0.6308⟩;
169: DLA_GDP_BAR = rho_DLA_GDP_BAR⟨0.7242⟩*DLA_GDP_BAR{-1} + (1-rho_DLA_GDP_BAR⟨0.7242⟩)*ss_DLA_GDP_BAR⟨3.3⟩ + SHK_DLA_GDP_BAR⟨σ=0.5⟩;
170:
171: %% === Foreign Sector Equations ===
172: L_GDP_RW_GAP = rho_L_GDP_RW_GAP⟨0.7612⟩*L_GDP_RW_GAP{-1} + SHK_L_GDP_RW_GAP⟨σ=4.2⟩;
173: DLA_CPI_RW   = rho_DLA_CPI_RW⟨0.3131⟩*DLA_CPI_RW{-1} + (1-rho_DLA_CPI_RW⟨0.3131⟩)*ss_DLA_CPI_RW⟨2⟩ + SHK_DLA_CPI_RW⟨σ=3.1552⟩;
174: RS_RW        = rho_RS_RW⟨0.95⟩*RS_RW{-1} + (1-rho_RS_RW⟨0.95⟩)*(RR_RW_BAR + DLA_CPI_RW) + SHK_RS_RW⟨σ=0.3641⟩;
175: RR_RW_BAR    = rho_RR_RW_BAR⟨0.95⟩*RR_RW_BAR{-1} + (1-rho_RR_RW_BAR⟨0.95⟩)*ss_RR_RW_BAR⟨0.5⟩ + SHK_RR_RW_BAR⟨σ=0.2⟩;
176: RR_RW        = RS_RW - DLA_CPI_RW;
177: RR_RW_GAP    = RR_RW - RR_RW_BAR;
178:
179: DLA_CPI_RW   = 4*(L_CPI_RW - L_CPI_RW{-1});
180:
181: %% === Labour Market Equations ===
182: UNEM_GAP = UNEM_BAR - UNEM;
183: UNEM_BAR = rho_UNEM_BAR⟨0.2219⟩*UNEM_BAR{-1} + (1-rho_UNEM_BAR⟨0.2219⟩)*ss_UNEM_BAR⟨11.1⟩ + DLA_UNEM_BAR - u1⟨0.384⟩*(L_GDP_GAP{-8}+L_GD
184: %UNEM_BAR = rho_UNEM_BAR*UNEM_BAR{-1} + (1-rho_UNEM_BAR)*ss_UNEM_BAR + DLA_UNEM_BAR - u1*(L_GDP_GAP{-8}+L_GDP_GAP{+8})/2 + SHK_UNEM_
185: DLA_UNEM_BAR = rho_DLA_UNEM_BAR⟨0.8742⟩*DLA_UNEM_BAR{-1} + SHK_DLA_UNEM_BAR⟨σ=0.3119⟩;
186: UNEM_GAP = rho_UNEM_GAP⟨0.2521⟩*UNEM_GAP{-1} + u2⟨0.4503⟩*L_GDP_GAP + SHK_UNEM_GAP⟨σ=0.1828⟩;
187: %% ------------------------------------------------------------------------------ %
188: !measurement_variables
189: OBS_L_GDP
190: OBS_L_GDP_GAP
191: OBS_L_CPI
192: OBS_RS
193: OBS_L_S
194: OBS_D4L_CPI_TAR
195:
196: OBS_L_GDP_RW_GAP
197: OBS_DLA_CPI_RW
198: OBS_RS_RW
199: OBS_UNEM
200:
201: !measurement_equations
202: OBS_L_GDP = L_GDP;
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203: OBS_L_GDP_GAP = L_GDP_GAP;
204: OBS_L_CPI = L_CPI;
205: OBS_RS    = RS;
206: OBS_L_S   = L_S;
207: OBS_D4L_CPI_TAR = D4L_CPI_TAR;
208:
209: OBS_L_GDP_RW_GAP = L_GDP_RW_GAP;
210: OBS_DLA_CPI_RW   = DLA_CPI_RW;
211: OBS_RS_RW        = RS_RW;
212: OBS_UNEM         = UNEM;
213:
214: %% ------------------------------------------------------------------------------- %
215: Legend
216: _GAP        cyclical deviation from a trend
217: _BAR        trend (equilibrium)
218: ss_         steady-state value
219: DLA_        q-o-q change
220: D4L_        y-o-y change
221: _RW         foreign variable
222: SHK_        equation residual
```

Steady state

Variable	Description	Value
L_GDP_GAP	Output Gap (in %)	0
DLA_GDP	Quarterly Growth in Real GDP(in % pa)	3.3
D4L_GDP	Real GDP Growth YoY (in % pa)	3.3
DLA_GDP_BAR	Real GDP Trend Growth QoQ annualized (in % pa)	3.3
GROWTH_BAR	Growth trend	3.3
MCI	Real Monetary Condition Index (in % pa)	0
DLA_CPI	CPI Inflation QoQ annualized (in % pa)	3
E_DLA_CPI	Expected CPI Inflation QoQ annualized (in % pa)	3
E_D4L_CPI	Expected CPI Inflation YoQ (in % pa)	3
D4L_CPI	CPI Inflation YoY (in % pa)	3
D4L_CPI_TAR	Inflation Target (in % pa)	3
RMC	Real Marginal Cost (in %)	0
DLA_S	Nominal Exch. Rate Depreciation QoQ annualized (in % pa)	1
D4L_S	Nominal Exch. Rate Depreciation YoY (in % pa)	1
PREM	Country Risk Premium (in % pa)	2.5
RS	Nominal Policy Interest Rate (in % pa)	6
RR	Real Interest Rate (in % pa)	3
RR_BAR	Trend Real Interest Rate (in % pa)	3
RR_GAP	Real Interest Rate Gap (in %)	0
RSNEUTRAL	Nominal Policy Neutral Interest Rate (in % pa)	6
L_Z_GAP	Real Exchange Rate Gap (in %)	0
DLA_Z	Real Exchange Rate Depreciation QoQ annualized (in % pa)	0
DLA_Z_BAR	Trend Real Exchange Rate Depreciation QoQ annualized(in % pa)	0
L_GDP_RW_GAP	Foreign Output Gap (in %)	0
RS_RW	Foreign Nominal Interest Rate (in % pa)	2.5
RR_RW	Foreign Real Interest Rate (in % pa)	0.5
RR_RW_BAR	Foreign Real Interest Rate Trend (in % pa)	0.5
RR_RW_GAP	Foreign Real Interest Rate Gap (in %)	0
DLA_CPI_RW	Foreign Inflation QoQ annualized (in % pa)	2
UNEM	Unemployment rate	11.1
UNEM_BAR	equilibrium value of the unemployment (NAIRU)	11.1
UNEM_GAP	Unemployment Gap	0

Variable	Description	Value
DLA_UNEM_BAR	Temporaty Variation in the trend	0