Carvalho Vilella (2014) Matrices for Gensys

Gilberto Boaretto

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using Latexify

G0 = Array{Any}(nothing,24,24)
G1 = Array{Any}(nothing,24,24)
Psi = Array{Any}(nothing,24,8)
Pi = Array{Any}(nothing,24,6)

# Equation 1 (Euler)

G0[1,1] = -1
G0[1,2] = "-(1-h)/sigma()"
G0[1,3] = "(1-h)/sigma()"
G0[1,7] = "(1+h)"
G0[1,8] = "(1-h)/sigma()"

G1[1,3] = "(1+h)/sigma()"
G1[1,7] = "h"

Pi[1,1] = 1
Pi[1,2] = "(1-h)/sigma()"
Pi[1,3] = "(1-h)/sigma()"

# Equation 2 (goods market equilibrium)

G0[2,9] = 1
G0[2,7] = "-(1-alpha())"
G0[2,10] = "-alpha()*eta()*(2-alpha())"
G0[2,11] = "-alpha()*eta()"
G0[2,17] = "-alpha()"

# Equation 3 (tot)

G0[3,10] = 1
G0[3,13] = -1
G0[3,12] = 1

G1[3,10] = 1

# Equation 4 (relationship q and tot)

G0[4,8]  = "1-alpha()"
G0[4,14] = 1
G0[4,11] = -1
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G1[4,9] = 1

# Equation 5 (relationship q, s, pi)

G0[5,14] = 1
G0[5,15] = -1
G0[5,18] = -1

G1[5,2]  = -1
G1[5,14] = 1
G1[5,15] = -1

# Equation 6 (phillips curve - domestic)

G0[6,5]  = "-beta()"
G0[6,12] = "1-delta()_D"
G0[6,24] = "beta()*(1-theta()_D)*(1-theta()_D*beta())/theta()"

G1[6,12] = "delta()_D"

Pi[6,4] = "-beta()"

# Equation 7 (marginal cost)

G0[7,24] = 1
G0[7,10] = "-alpha()"
G0[7,9]  = "-phi()"
G0[7,7]  = "sigma()/(1-h)"
G0[7,20] = "1+phi()"

G1[7,7] = "-(sigma()*h)/(1-h)"

# Equation 8  (phillips curve - importing)

G0[8,6]  = "-beta()"
G0[8,13] = "1+beta()*delta()_I"
G0[8,11] = "-(1-theta()_I)*(1-theta()_I*beta())/theta()_I"
G0[8,22] = -1

G1[8,13] = "delta()_I"

Pi[8,5]  = "-beta()"

# Equation 9 (relationship pi and tot)

G0[9,12] = 1
G0[9,10] = "-alpha()"

G1[9,10] = "alpha()"
G1[9,2]  = -1

# Equation 10 (bugdet constraint)

G0[10,21] = 1
G0[10,10] = "-alpha()"
G0[10,11] = "alpha()"
G0[10,9]  = -1
G0[10,7]  = 1
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G1[10,21] = "1/beta()"

# Equation 11 (UIP)

G0[11,4]  = -1
G0[11,15] = 1
G0[11,8]  = 1
G0[11,19] = -1
G0[11,21] = "chi()"
G0[11,23] = -1

Pi[11,6] = -1

# Equation 12 (Taylor RMI)

G0[12,8]  = 1
G0[12,16] = "-rho()_1"
G0[12,9]  = "-(1-rho()_1-rho()_2)*lambda()_y"
G0[12,15] = "-(1-rho()_1-rho()_2)*lambda()_s"

G1[12,16] = "rho()_2"
G1[12,2]  = "(1-rho()_1-rho()_2)*lambda()_pi"
G1[12,15] = "-(1-rho()_1-rho()_2)*lambda()_s"

Psi[12,5] = 1

###################
## Foreign Block ##
###################

# System (Equations 13, 14 and 15)

G0[13,17] = 1
G0[14,17] = "a_0piy"
G0[14,18] = 1
G0[15,17] = "a_0iy"
G0[15,18] = "a_0ipi"
G0[15,19] = 1

G0[13,17] = "a_1yy"
G0[13,18] = "a_1ypi"
G0[13,19] = "a_1yi"
G0[14,17] = "a_1piy"
G0[14,18] = "a_1pipi"
G0[14,19] = "a_1pii"
G0[15,17] = "a_1iy"
G0[15,18] = "a_1ipi"
G0[15,19] = "a_1ii"

Psi[13,6] = 1
Psi[14,7] = 1
Psi[15,8] = 1

#################
## Shocks block #
#################

# Equation 16 (a)
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G0[16,20] = 1

G1[16,20] = "rho()_a"

Psi[16,1] = "sigma()_a"

# Equation 17 (gamma)

G0[17,3] = 1

G1[17,3] = "rho()_gamma"

Psi[17,2] = "sigma()_gamma"

# Equation 18 (epsilon_cp)

G0[18,22] = 1

G1[18,22] = "rho()_cp"

Psi[18,3] = "sigma()_cp"

# Equation 19 (phi)

G0[19,23] = 1

G1[19,23] = "rho()_phi"

Psi[19,4] = "sigma()_phi"

####################
## Identity block ##
####################

# Equation 20

G0[20,1] = 1
G1[20,7] = 1

# Equation 21

G0[21,4] = 1
G1[21,15] = 1

# Equation 22

G0[22,5] = 1
G1[22,12] = 1

# Equation 23

G0[23,6] = 1
G1[23,13] = 1

# Equation 24

G0[24,8] = 1
G1[24,16] = 1
```

```
G0[findall(G0 .== nothing)] .= 0
G1[findall(G1 .== nothing)] .= 0
Psi[findall(Psi .== nothing)] .= 0
Pi[findall(Pi .== nothing)] .= 0
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print(string("\$\$\\Gamma_0 = \$\$",latexify(G0)))
```

$$\Gamma_0 =$$

$$
\left[\begin{array}{cccccccccc}
-1 & \frac{-(1-h)}{\sigma()} & \frac{1-h}{\sigma()} & 0 & 0 & 0 & 1+h & \frac{1-h}{\sigma()} & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & -\left(1-\alpha\left(\right)\right) & 0 & 1 & \left(-\alpha\left(\right)\right)\cdot \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-\alpha\left(\right) & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & -\beta\left(\right) & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & \frac{\sigma()}{1-h} & 0 & -\phi\left(\right) & \\
0 & 0 & 0 & 0 & 0 & -\beta\left(\right) & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & -1 & \\
0 & 0 & 0 & -1 & 0 & 0 & 0 & 1 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & \left(-\left(1-\rho\left(\right)\cdot_{1}-\rho\left(\right)\cdot_{2}\right)\right)\cdot\lambda\left(\right)\cdot_{y} & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 &
\end{array}\right. \tag{1}
$$

```
print(string("\$\$\\Gamma_1 = \$\$",latexify(G1,cdot = false)))
```

$$\Gamma_1 =$$

$$
\left[\begin{array}{ccccccccccccccc}
0 & 0 & \frac{1+h}{\sigma()} & 0 & 0 & 0 & h & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \delta\left(\right)_D & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & \frac{-\sigma()h}{1-h} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \delta\left(\right)_I & 0 & 0 \\
0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \alpha\left(\right) & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & \left(1-\rho\left(\right)_1-\rho\left(\right)_2\right)\lambda\left(\right)_{pi} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & (-(1-\rho\left(\right)_1-\rho \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \rho\left(\right)_{gamma} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{array}\right. \tag{2}
$$

The order of the variables is:

$$Y_t = \begin{bmatrix} c_{t+1} \\ \pi_{t+1} \\ \gamma_{t+1} \\ s_{t+1} \\ \pi_{D,t+1} \\ \pi_{I,t+1} \\ c_t \\ i_t \\ y_t \\ \text{tot}_t \\ \Psi_{I,t} \\ \pi_{D,t} \\ \pi_{I,t} \\ q_t \\ s_t \\ i_{t-1} \\ y_t^* \\ \pi_t^* \\ i_t^* \\ a_t \\ z_t \\ \varepsilon_{cp,t} \\ \phi_t \\ mc_t \end{bmatrix}$$

The order of the shocks is:

$$z_t = \begin{bmatrix} \epsilon_{a,t} \\ \epsilon_{\gamma,t} \\ \epsilon_{cp,t} \\ \epsilon_{\phi,t} \\ \epsilon_{i,t} \\ \epsilon_{y^*,t} \\ \epsilon_{\pi^*,t} \\ \epsilon_{i^*,t} \end{bmatrix}$$

The order of the expectation erros is:

$$\eta_t = \begin{bmatrix} \eta_t^c \\ \eta_t^\pi \\ \eta_t^\gamma \\ \eta_t^{\pi_D} \\ \eta_t^{\pi_I} \\ \eta_t^s \end{bmatrix}$$