

First Order Conditions:

Households

$$\begin{aligned}
u_t &= c_t^{\nu_{EZ}} (1 - L)^{(1 - \nu_{EZ})} \\
ev_t &= v_{t+1}^{1 - \gamma_{EZ}} \\
v_t &= (1 - \beta) u_t^{\frac{1 - \gamma_{EZ}}{\theta_{EZ}}} + \beta \left(ev_t^{\frac{1}{\theta_{EZ}}} \right)^{\frac{\theta_{EZ}}{1 - \gamma_{EZ}}} \\
\frac{1 - \nu_{EZ}}{\nu_{EZ}} \frac{c_t}{1 - L_t} &= P_m (1 - \alpha) \frac{Y_t}{L_t} \\
\Lambda_t &= \left(\frac{u_{t+1}}{u_t} \right)^{\frac{1 - \gamma_{EZ}}{\theta_{EZ}}} \frac{c_t}{c_{t+1}} \left(v_{t+1}^{\frac{1 - \gamma_{EZ}}{ev_t}} \right)^{1 - \frac{1}{\theta_{EZ}}} \\
\beta \Lambda_t R_{t+1} &= 1
\end{aligned}$$

Financial Intermediaries

$$\begin{aligned}
\nu_t &= (1 - \theta) \beta \Lambda_{t+1} (R_{k,t+1} - R_t) + \beta \Lambda_{t+1} \theta x_{t+1} \nu_{t+1} \\
\eta_t &= (1 - \theta) + \beta \Lambda_{t+1} \theta z_{t+1} \eta_{t+1} \\
\phi_t &= \frac{\eta_t}{\lambda - \nu_t} \\
z_t &= (R_{k,t+1} - R_t) \phi_{t-1} + R_{t-1} \\
x_t &= \frac{\phi_t}{\phi_{t-1}} z_t \\
Q_t K_t &= \phi_t N_t \\
N_t &= N_{et} + N_{nt} \\
N_{et} &= \theta z_t N_{t-1} (-e_{Ne,t}) \\
N_{nt} &= \omega Q_t \xi_t K_{t-1}
\end{aligned}$$

Final good producer

$$\begin{aligned}
R_{k,t} &= P_{mt} \alpha \frac{Y_{mt}}{K_{t-1}} + \xi_t \frac{Q_t - \delta_t}{Q_{t-1}} \\
Y_{mt} &= a_t \xi_t U_t K_{t-1}^\alpha L_t^{1 - \alpha}
\end{aligned}$$

Capital Good Producer

$$\begin{aligned}
Q_t &= 1 + \frac{\eta_i}{2} \left(\frac{I_n + I_{ss}}{I_{n,\tau-1} + I_{ss}} - 1 \right)^2 + \eta_i \left(\frac{I_n + I_{ss}}{I_{n,\tau-1} + I_{ss}} - 1 \right) \frac{I_n + I_{ss}}{I_{n,\tau-1} + I_{ss}} \\
&\quad - \beta \Lambda_{t+1} \eta_i \left(\frac{I_n + I_{ss}}{I_n + I_{ss}} - 1 \right) \left(\frac{I_n + I_{ss}}{I_n + I_{ss}} \right)^2 \\
\delta_t &= \delta_c + \frac{b}{1 + \zeta} U_t^{1 + \zeta} \\
P_{mt} \alpha \frac{Y_{m,t}}{U_t} &= b U_t^\zeta \xi_t K_{t-1} \\
I_n &= I_t - \delta - t \xi_t K_{t-1} \\
K_t &= \xi_t K_{t-1} + I_n \\
G_t &= G_{ss} g_t
\end{aligned}$$

Equilibrium

$$\begin{aligned}
Y_t &= c_t + G_t I_t + \frac{\eta_i}{2} \left(\frac{I_n + I_{ss}}{I_{n,t-1} + I_{ss}} - 1 \right)^2 (I_n + I_{ss}) \\
Y_{mt} &= Y_t D_t \\
D_t &= \gamma D_{t-1} \pi_{t-1}^{-\gamma_P \epsilon} \pi^\epsilon + (1 - \gamma) \left(\frac{1 - \gamma \pi_{t-1}^{\gamma_P(1-\gamma)} \pi^{\gamma-1}}{1 - \gamma} \right)^{\frac{-\epsilon}{1-\gamma}} \\
x_t &= \frac{1}{P_{mt}} \\
F_t &= Y_t P_{mt} + \beta \gamma \Lambda_{t+1} \pi_{t+1}^\epsilon \pi^{-\epsilon \gamma_P} F_{t+1} \\
Z_t &= Y_t + \beta \gamma \Lambda_{t+1} \pi_{t+1}^{\epsilon-1} \pi_t^{\gamma_P(1-\epsilon)} Z_{t+1} \\
\pi_t^* &= \frac{\epsilon}{\epsilon - 1} \frac{F_t}{Z_t} \pi_t \\
\pi^{1-\epsilon} &= \gamma \pi_{t-1}^{\gamma_P(1-\epsilon)} + (1 - \gamma) (\pi_t^*)^{1-\epsilon} \\
i_t &= R_t \pi_{t+1} \\
i_t &= i_{t-1}^{\rho_i} \left(\frac{1}{\beta} \pi_t^{\kappa_\pi} \left(\frac{X_t}{\frac{\epsilon}{\epsilon-1}} \right)^{\kappa_y} \right)^{1-\rho_i} e_{it}
\end{aligned}$$

shocks

$$\begin{aligned}
a &= \rho_a a_{t-1} - e_a \\
\xi_t &= \rho_\xi \xi_{t-1} - e_\xi \\
g_t &= \rho_g * g_{t-1} \\
K_{eff,t} &= \xi_t K_{t-1} \\
w_t &= P_{mt} (1 - \alpha) \frac{Y_t}{L_t} \\
VMPK_t &= P_{mt} \alpha \frac{Y}{\xi_t K_{t-1}} \\
W_{elf,t} &= \log(C_t - hh C_{t-1}) - \frac{\chi L_t^{1+\varphi}}{1 + \varphi} + \beta * W_{elf,t+1} \\
prem &= \frac{R_{k,t+1}}{R_t}
\end{aligned}$$

Parameter	Restriction	Description	Value
Households			
γ_{EZ}		risk aversion	
ψ_{EZ}		Elasticity of intertemporal substitution	
θ_{EZ}		deviation with respect to the benchmark CRRA	
ν_{EZ}		labor supply	
β	$0 < \beta < 1$	discount factor	0.99
f		fraction of bankers in the household	
$(1 - f)$		fraction of workers	
θ	$0 < \theta < 1$	prob. bankes stay bankers in the next period	
$\frac{1}{1-\theta}$		average survival time	
Financial Intermediate			
λ		fraction of Banker's possible diverable assets	
τ		central bank efficiency cost per unit supplied	
$\delta, \delta(U)$		depreciation rate	0.025
ψ		fraction of assets the government is willing to fund	
Intermediate good firms			
α		Effective Capital share	0.33
U		Steady state capital utilization rate	1.0
$\delta(U)$		Steady state depreciation rate	
ζ		Elasticity of marginal depreciation with respect to utilization rate	7.2
Captial			
η_i		Inverse elasticity of net investment of the price of capital	1.728
Retail firms			
ϵ		Elasticity of substitution	4.167
γ		Probability of keeping prices fixed	0.779
γ_P		Measure of price indexation	0.241
Government			
κ_π		Inflation coefficient of the Taylor rule	1.5
κ_y		Output gap coefficient of the Taylor rule	0.5/4
ρ_i		Smoothing parameter of the Taylor rule	0.8
$\frac{G}{Y}$		Steady state proportion of government expenditures	0.200

Literature	γ_{EZ}	ψ_{EZ}
Caldara, Fernandez		
Rubio-Ramirez, Yao 2011	2, 5, 10, 40	0.5, 1.5
Sunbae An	10	1.25
Bansal, Yaron 2004	7.5, 10	0.5, 1.5
van Binsbergen, Fernandez-Villaverde		
Koijen, Rubio-Ramirez 2010	79.34	1.731

Variable	Description
Households	
C_t	consumption
L_t	Family labor supply
R_t	Gross real return from $t - 1$ to t
B_t	total quantity short term debt the household acquires
W_t	Real Wage
Π_t	net payouts to the households from ownership of (non)-financial firms
T_t	lump sum tax
ϱ_t	marginal utility of consumption
$\Lambda = \frac{\varrho_{t+1}}{\varrho_t}$	
Capital Producing Firms	
I_t	gross capital created
$\delta(U_t)\xi_t K_t$	quantity of capital refurbished
$I_{nt} \equiv I_t - \delta(U_t)\xi_t K_t$	net capital created
I_{ss}	steady state investment
Financial intermediaries	
N_{jt}	amount of net worth that Banker j has at the end of periot t
S_{jt}	the quantity of financial claims on non-financial firms on the intermdinary's balance sheet
Q_t	the relative price of each claim
B_{jt}	the intermediary's debt
R_{kt+1}	intermediary's return on assets
$\beta\Lambda_{t,t+1}$	stochastic discount the banker at t
V_{jt}	banker's losts from diverting
$x_{t,t+i}$	gross rate in assets between t and $t + i$
$z_{t,t+i}$	gross rate of net worth
ν_t	expected discounted marginal gain of the banker of expanding assets $Q_t S_{jt}$ by a unit
η_t	expected discounted value of having another unity of $N_{j,t}$
$Q_t S_{jt}$	value of assets Banker j holds
ϕ_t	ratio of privatly intermediated assets to equity
N_{et}	sum of net worth of entering banker
N_{nt}	net worth of entering bankers
$\frac{\omega}{1-\theta}$	value of asset intermediated via government
Credit policy	
$Q_t S_{gt}$	value of assets intermediated via government
ψ_t	fraction central bank is willing to fund of intermediated assets
ϕ_{ct}	leverage ratio for total intermediated funds
Firm	
K_{t+1}	Kapital acquired by the firm
Y_t	output produced by the firm
U_t	Utilization rate of capital
A_t	total factor productivity
P_{mt}	relative intermediate price
ξ_t	Quality of Capital
$\xi_t K_t$	effective quantity of capital