Solve only one equation numerically

When $\gamma \neq 0$, there is no close form solution for the steady state

$$L^{\gamma} = \frac{\widehat{w}}{\widehat{C}} \quad \text{(from static optimal condition)}$$

$$\widehat{KL} = (1+g)\left(\frac{r}{\alpha A}\right)^{\frac{1}{\alpha-1}} \quad \text{(from firm F.O.C.)}$$

$$\widehat{w} = (1-\alpha)A\left(\frac{\widehat{K}}{1+g}\right)^{\alpha} L^{-\alpha}$$

from good market equilibrium:

$$KL \cdot L + \frac{\widehat{w}}{L^{\gamma}} = A\left(\frac{\widehat{KL} \cdot L}{1+g}\right)^{\alpha} L^{1-\alpha} + (1-\delta)\frac{\widehat{KL} \cdot L}{1+g}$$

Solving for labor services

Solving

$$KL \cdot L + \frac{\widehat{w}}{L^{\gamma}} - A\left(\frac{\widehat{KL} \cdot L}{1+g}\right)^{\alpha} L^{1-\alpha} I(1-\delta)\frac{\widehat{KL} \cdot L}{1+g} = 0$$

```
function L = solve_for_L(L0, w, A, KL, alpha, ...
                         delta, gamma, g)

% anonymous function
myfun = @(L) KL*L + w/L^gamma ...
             - ((1-delta)*(KL*L/(1+g)) ...
             + A*(KL*L/(1+g))^alpha*L^(1-alpha));

L = fzero(myfun, L0);
```

Steady state model block:

```
steady_state_model;
  A = 1;
  r = (1+g)/beta+delta-1;
  KL = (1+g)*(r/(alpha*A))^(1/(alpha-1));
  w = (1-alpha)*A*(KL/(1+g))^alpha;
  L = solve_for_L(1.0, w, A, KL, alpha,
                  delta, gamma, g);
  K = KL*L;
  C = w/L^gamma;
end;
```

Dating variables in Dynare

Dynare will automatically recognize predetermined and non–predetermined variables, but you must observe a few rules:

- period t variables are set during period t on the basis of the state of the system at period $t-1$ and shocks observed at the beginning of period t.
- therefore, stock variables must be on an end–of–period basis: investment of period t determines the capital stock at the end of period t.

Log–linearization

- Taking a log–linear approximation of a model is equivalent to take a linear approximation of a model with respect to the logarithm of the variables.
- In practice, it is sufficient to replace all occurences of variable X with $exp(LX)$ where $LX = \ln X$.
- It is possible to make the substitution for some variables and not anothers. You wouldn't want to take a log approximation of a variable whose steady state value is negative ...
- There is no evidence that log–linearization is more accurate than simple linearization. In a growth model, it is often more natural to do a log–linearization.

The role of the Dynare preprocessor

- the Dynare toolbox solves generic problems
- the preprocessor reads your *.mod file and translates it in specific Matlab/Octave files
- these files are located in a subdirectory called `+<filename>`
- driver.m: main Matlab script for your model
- static.m: static model
- dynamic.m: dynamic model
- steadystate.m: steady state function
- set_auxiliary_variables.m: static auxiliary variables function
- set_dynamic_auxiliary_variables.m: dynamic auxiliary variables function