Example: A very simple neoclassical growth model

$$\max_{\{c_t\}_{t=1}^{\infty}} \sum_{t=1}^{\infty} \beta^{t-1} \frac{c_t^{1-\sigma}}{1-\sigma}$$

s.t.

$$c_t + k_t = A_t k_{t-1}^{\alpha} + (1-\delta) k_{t-1}$$

Endogenous variables

c_t	consumption
k_t	capital at the end of period

Exogenous variables

A_t	total factor productivity

Parameters calibration

$\bar{A}$	TFP steady state	1.0
α	capital share	0.3
β	discount factor	0.98
δ	depreciation rate	0.025
σ	inverse of elasticity of intertemporal substitution	2

First order conditions and steady state

Before being able to write a model in Dynare, we need to derive

- the first order conditions for optimality:

$$
\begin{aligned}
c_t^{-\sigma} &= \beta c_{t+1}^{-\sigma}\left(\alpha A_{t+1} k_t^{\alpha-1} + 1 - \delta\right)\\
c_t + k_t &= A_t k_{t-1}^{\alpha} + (1-\delta) k_{t-1}
\end{aligned}
$$

- the steady state:

$$
\begin{aligned}
\bar{k} &= \left(\frac{1-\beta(1-\delta)}{\beta\alpha\bar{A}}\right)^{\frac{1}{\alpha-1}}\\
\bar{c} &= \bar{A}\bar{k}^{\alpha} - \delta\bar{k}
\end{aligned}
$$