$$\begin{aligned} &\sum_{t=0}^{\infty} \beta^t U(c_t) \\ s.t \quad &c_t + I_t = A_t k_t^{\alpha} \end{aligned} \tag{1}$$

We assume a CRRA utility function :

$$U(c_t) = \frac{c^{1-\gamma}}{1-\gamma} \tag{2}$$

The investment function takes the following form :

$$\begin{cases} I_t = k_{t+1} - (1-\delta)k_t + FC \\ I = \delta k \end{cases} \tag{3}$$

The Lagrangian associated with the following program is :

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \left\{ \frac{c^{1-\gamma}}{1-\gamma} + \lambda_t (A_{t+1} k_t^{\alpha} - c_t - k_{t+1} + (1-\delta)k_t - FC \right\}$$

FOC :

$$\frac{\partial \mathcal{L}}{\partial c_t} = 0 \iff c_t^{-\gamma} = \lambda_t \tag{4}$$

$$\frac{\partial \mathcal{L}}{\partial k_{t+1}} = 0 \iff \lambda_t = \beta \lambda_{t+1} (\alpha A k_{t+1}^{\alpha-1} + 1 - \delta) \tag{5}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_t} = 0 \iff A_t k_t^{\alpha} = c_t + k_{t+1} - (1-\delta)k_t + FC \tag{6}$$

In the steady state :

$$\begin{cases} c^{-\gamma} = \lambda \\ 1 = \beta(\alpha A k^{\alpha-1} + 1 - \delta) \\ A k^{\alpha} = c + \delta k \\ I = \delta k \end{cases} \iff \begin{cases} \lambda = \Big(A k^{\alpha} - \delta k \Big)^{-\gamma} \\ k = \left(\dfrac{1 - \beta - \beta\delta}{A\alpha\beta} \right)^{\frac{1}{\alpha-1}} \\ c = A k^{\alpha} - \delta k \\ I = \delta k \end{cases}$$