Consider a standard neoclassical model of investment

$$
\begin{aligned}
V_t &= \max_{I_t, K_{t+1}} \; D_t + \mathbb{E}_t[e^{m_{t+1}} V_{t+1}] \\
D_t &= Y_t - I_t - \frac{\theta}{2}\left(\frac{I_t}{K_t}\right)^2 K_t \\
Y_t &= e^{x_t + z_t} K_t^{\alpha} \\
K_{t+1} &= (1-\delta)K_t + I_t
\end{aligned}
$$

Exogenous variables are specified as follows

$$
\begin{aligned}
x_{t+1} &= (1-\rho_x)\bar{x} + \rho_x x_t + \sigma_x \varepsilon_{x,t+1} \\
z_{t+1} &= \rho_z z_t + \sigma_z \varepsilon_{z,t+1} \\
m_{t+1} &= -r_f - \frac{1}{2}(\lambda_x^m \sigma_x)^2 - \lambda_x^m \sigma_x \varepsilon_{x,t+1}
\end{aligned}
$$

The first-order condition, combined with the envelop theorem, is given by

$$
1 + \theta \frac{I_t}{K_t} = \mathbb{E}_t\left[e^{m_{t+1}} \left[\alpha \frac{Y_t}{K_t} + \frac{\theta}{2}\left(\frac{I_{t+1}}{K_{t+1}}\right)^2 + (1-\delta)\left(1 + \theta \frac{I_{t+1}}{K_{t+1}}\right)\right]\right]
$$

Marginal Q equals

$$
MQ_t = 1 + \theta \frac{I_t}{K_t}
$$

Stock returns are given by

$$
R_{t+1} = \frac{V_{t+1}}{V_t - D_t}
$$

The standard timing convention is that, upon observing the shocks at the beginning of period t, firms make optimal investment decisions. See, for example, Zhang (2005 JF)

How to deal with the timing of variables in Dynare?

Steady-state: In the steady state, all variables are constant. That is, $K^* = (1-\delta)K^* + I^*$. Therefore, $I_t = \delta K_t$ or $I_t/K_t = \delta$. In the steady state, the stochastic discount factor is just the risk-free rate, $e^{m_{t+1}} = e^{-r_f} = 1/R_f$. The steady-state value of capital stock is given by

$$
\begin{aligned}
1 + \theta\delta &= \frac{1}{R_f}[\alpha K^{\alpha-1} e^{\bar{x}+\bar{z}} + \frac{\theta}{2}\delta^2 + (1-\delta)(1+\theta\delta)] \\
\alpha K^{\alpha-1} e^{\bar{x}+\bar{z}} &= (1+\theta\delta)(R_f - 1 + \delta) - \frac{\theta}{2}\delta^2 \\
\log\alpha + (\alpha-1)k + \bar{x} + \bar{z} &= \log\left[(1+\theta\delta)(R_f - 1 + \delta) - \frac{\theta}{2}\delta^2\right] \\
k^* &= \left[\log\left[(1+\theta\delta)(R_f - 1 + \delta) - \frac{\theta}{2}\delta^2\right] - \log\alpha - (\bar{x}+\bar{z})\right]/(\alpha - 1)
\end{aligned}
$$