An RBC model with asset price and convex adjustment cost

A represntative firm solves the following problem:

$$\begin{aligned} J(k;S) &= \max_{k'} Ak^{\alpha} - k' + (1-\delta)k - \frac{\mu}{2}\left(\frac{k'-(1-\delta)}{k}\right)^2 k + \beta\mathbb{E}M(S,S')J(k';S') \\ &\text{s.t.} \quad S' = \Gamma_S(S) \quad \text{(Aggregate law of motion)} \end{aligned}$$

where $S = \{K, A, \mu\}$ is the aggregate state. A and μ follow an exogenous Markov process.

The household-side problem is as follows:

$$\begin{aligned} V(a;S) &= \max_{c,a'} \; log(c) + \beta\mathbb{E}V(a';S') \\ \text{s.t.} \quad & c + \int a'(S')d\Gamma_{S'} = a \end{aligned}$$

The stochastic discount factor $M(S,S')$ is determined at the competitive market:

$$[M]: \quad a(S) = J(k(S);S)$$