Question 1

Consider the model described in Handout 5 and its implementation in Dynare. Modify the model to incorporate Rotemberg-type contracts for intermediate firms.

Accordingly, the profit maximization problem for intermediate firms (using the notation in the handout) becomes:

$$\max_{P_t(f)} E_t \sum_{j=0}^{\infty} \psi_{t+j+1,t+j}(P_{t+j}(f)(1 + \tau_p) - \Sigma_{t+j})Y_{t+j}(f)(1 - \phi_{t+j}(f))$$

subject to the demand schedule $Y_t(f) = \left(\frac{P_t(f)}{P_t}\right)^{-\frac{1+\theta_p}{\theta_p}} Y_t$. The adjustment cost function ϕ_t is given by:

$$\phi_t = \frac{\phi_1}{2}\left(\frac{P_t(f)}{\pi P_{t-1}(f)}\right)^2$$

Question 2 After log-linearizing the first order condition from the profit maximization problem in question 1, show that it takes the same form as the first-order condition in Handout 5 using Calvo-type contracts.

How should we set ϕ_1 to ensure the first-order condition from profit maximization is first-order equivalent to the one for Calvo-type contracts?

Question 3

Set $\xi_w = 0.0001$, so that the wage rigidity is negligible. Set ϕ_1 to ensure first-order equivalence with Calvo contracts for intermediate prices with $\xi_p = 0.75$. Leave all the other model parameters unchanged from the examples we saw in class. Confirm that the model responses to a technology shock line up whether you use Calvo or Rotemberg contracts.

Question 4

Using Dynare++ solve the Ramsey optimal monetary policy problem assuming the planner aims to maximize welfare.

Question 5

Introduce Rotemberg-type contracts in the labor market, instead of Calvo-type contracts, using adjustment costs for wages analogous to the ones for prices in question 1.

Show first-order equivalence between Rotemberg and Calvo contracts for wages, and set the adjustment cost parameter to be first-order consistent with a choice of the Calvo parameter $\xi_w = 0.75$ (contracts last 4 quarters, on average).

Using Dynare++ solve the Ramsey optimal monetary policy problem assuming the planner aims to maximize welfare. Compare the model's response to technology shock under the optimal rule to the response of a model with flexible wages and prices.