Macroeconomic Policy
Solution to question 2 in exercise 2.

Since menu costs are effectively infinite for firms that change prices at the wrong time, no firm would do so. So in each period there are 0.5 firms that have set prices in the previous semester according based on their expectations about the future. For these firms the price is $P_i = P^e$. The remaining 0.5 firms set prices optimally according to the pricing rule $P_i = P + \alpha(Y_i - Y^*)$ in the lecture notes.

The aggregate price level is the average of these two sets of prices; i.e.

$$P = 0.5P^e + 0.5\left[P + \alpha(Y_i - Y^*)\right]. \tag{1}$$

Rearranging results in the short run aggregate supply function

$$P = P^e + \alpha(Y - Y^*), \tag{2}$$

where we have replaced Y_i by Y as all firms of the same tipe are identical.

In the long run the aggregate supply curve is vertical as all firms can change their prices after one year from their last change. The shape of the aggregate supply depends on the time horizon not on the size of shocks as the (menu) cost of changing prices at unusual times is infinite.

The effect of an unanticipated nominal shock will last only one semester. The 0.5 firms with flexible prices will react to the shock within the period. The remaining 0.5 firms will react when they readjust prices after one semester.