Problem Set 3
Due on April 11, either in discussion or in my mailbox by 9:30 AM.

1. Suppose that there is a temporary change in consumer sentiment, so that households cut back on consumption spending, but this has no other direct effects on the economy. Consider the Keynesian model with sticky prices, and discuss the short and long run effects on output and interest rates of the following policy options.

   (a) The money supply is adjusted to return the economy to full employment.
   (b) Government spending is adjusted to return the economy to full employment.

2. Suppose that a household does not face a cash in advance constraint, but instead money is the only asset for transferring income over time. That is, suppose that household preferences are given by:

   \[ \log C + \beta \log C'. \]

   The household has real unearned income \( Y \) in period 1, and uses money \( M \) to transfer assets to the future, thus facing the budget constraints:

   \[
   PC + M = PY \\
   P'C' = M
   \]

   (a) Find the household’s money demand function and show that it is decreasing in the inflation rate.
   (b) Relate your results to the quantity theory of money \( MV = PY \). What is the velocity of money in this problem?

3. Suppose that instead of being on a fiat money system, where it is essentially costless to change the money supply, an economy runs on a commodity money system. In particular, to print more money the government must mine more gold and this costs real resources, which the government finances via lump sum taxes. As usual, assume that increases in money supply are distributed in a lump sum fashion to the households, so that the government retains no seignorage revenue. Assuming that all prices and wages are flexible, answer the following.

   (a) What are the effects of a one-time increase in the money supply in this commodity money system? Consider the effects on output, real interest rates, employment, real wages, and the price level.
(b) Now suppose that there is a new government mine discovered, and the government increases the growth rate of the money supply requiring ongoing taxes to pay for the extraction of the gold. What are the effects of this on output, real interest rates, employment, real wages, and the price level?

4. During the recession, the federal government implemented a temporary expansion of government purchases in an effort to help stimulate the economy. Suppose that current taxes remained unchanged. Compare and contrast the effects of this change in our basic real intertemporal model (with Ricardian equivalence) and the Keynesian model (with efficiency wages). In particular, what will be the effects on current output, employment, the real interest rate, and the real wage? How could you distinguish between the models?

5. In class we worked with the Lucas model in a labor market version, but this problem derives a product market version closer to Lucas’s original model. Suppose consumer $i$ owns his own firm and produces output using his own labor: $Y_i = N_i$, and his budget constraint in nominal terms is $PC_i = P_iY_i$, where $P_i$ is the price of the consumer’s own good and $P$ is the aggregate price (and the price of consumption goods). The consumer has preferences:

$$U(C_i, N_i) = C_i - \frac{N_i^{1+\phi}}{1+\phi}$$

(a) Suppose the consumer takes prices $P_i$ and $P$ as given and find his optimal choice of production $Y_i$.

(b) Let $y_i = \log Y_i$ and $y = \log Y$ where $Y$ is aggregate output, and suppose that the demand for good $i$ is given by:

$$y_i = y + z_i - \eta(p_i - P)$$

where $z_i$ is a demand shock for firm $i$. Find the equilibrium level of production $y_i$ and price $p_i$ in terms of the aggregates $p$ and $y$.

(c) Now suppose that the consumer cannot distinguish between movements in the aggregates $(y, p)$ and a shock to his own demand $z_i$. He must forecast aggregate prices, and uses the same decision rule for production as in part (a), but substitutes the expected price $E(p)$ for the observed price $p$. Write the consumer’s production choice for $y_i$ in terms of $p_i$ and $E(p)$. Now define the aggregate (log) price $p$ as the average of individual prices $p_i$ and aggregate (log) output $y$ as the average of $y_i$. Find an expression for $y$ in terms of $p$ and $E(p)$.

(d) Suppose that velocity is constant at 1 so we can write $Y = MP$ or $y = m - p$ where $m = \log M$. Using the results of the previous part, find the equilibrium $p$ and $y$ in terms of $m$ and $E(p)$.

(e) Suppose there is an unanticipated increase in the money supply $m$. How will output respond?