Problem Set – Keynes

Problems

2.1. (**The Classical model**) Consider a closed (Classical) economy with no government, where the representative production function takes the following form $Q = zN$. Further assume that the labour supply is constant at $N^S = 100$, and that prices and wages are fully flexible. Workers are the only consumers in this economy.

a) Assuming that firms maximize profits, find out the labour demand in this economy. Display the equilibrium in the labour market in a graph, assuming that $z = 10$. What will be the equilibrium output in this case?

b) Now assume that the demand for real money was given by $m^d = Q$, and the supply of nominal money was $M^S = 1000$. (b1) Describe the equilibrium in the money market; (b2) Which theory underlies this specification?

c) Represent in a graph the aggregate demand and the aggregate supply in this economy and find out the equilibrium prices and nominal wages. Explain what will happen to prices and wages if the supply of money increased to $M^S = 2000$. Which proposition is being illustrated here?

d) Finally, assume that productivity increased to $z = 20$. What would be the impact on production, income and consumption? Which proposition is being illustrated here?

2.2.(**Keynes effect**) Consider a closed economy with no government, where the production function of the representative firm takes the following form: $Q = 10N$. Further assume that the labour force is constant at $N^S = 10$. The output price is flexible, but the wage rate is sticky at $\bar{W} = 10$. Further assume that the money demand is given by $m^d = Q/10i$, the consumption function is $C = (20/10r) + 0.75Q$, and planned investment responds to the interest rate according to $I = (5/10r)$. In this economy, there is no inflation.

a) (Keynesian supply curve) Assuming that firms maximize profits, find out the aggregate supply function in this economy.

b) (AD curve) Using the equilibrium in the money market and in the market for goods and services, find out the expression of aggregate demand in this economy. Explain its slope in the (P,Q) locus.

c) (Keynesian unemployment) Suppose that the money supply was equal to M=81. Would the economy be at full employment in that case? How much would be investment and consumption? Describe the labour market in a graph.

d) (Policy shift) Could monetary policy be used to drive the economy to full employment? Describe the effect of the policy in the savings-investment diagram.

2.3. Consider a closed economy where the labour supply is inelastic at $N^S = 100$. In this economy, the production function and aggregate demand are given, respectively, by $Q = zN$ with z=1, and $Q^d = (M/P)^2$.

a) (**Well-functioning**) Assume perfect competition. (a1) Find out the equilibrium real wage, W/P, and full employment output. (a2) Describe this economy in the AS-AD diagram, assuming that prices and wages are both flexible. Analyse the effects of a monetary contraction from M=10 to M=8, on prices, output and wages.

b) (**Keynesian model**) Describe this economy in the AS-AD diagram assuming that nominal wages are sticky at $\bar{W} = 1$. In particular, analyse the effects of a monetary contraction from M=10 to M=8, on output and employment. Show in a graph the adjustment in the labour market. What is the name of the curve describing the demand for labour in this case?

c) (**Keynes effect**) In this economy, the market for goods and services is described by: private savings $S^P = 0.25(Q - T) - 1/10r$, government savings, $S^G = T - G$, and investment, $I = 3/20r$. The money market equilibrium condition is $M/P = (Q/r)^{0.25}$. In the baseline case, consider G=T=0. (c1) Show that aggregate demand is indeed $Q^d = (M/P)^2$. In light of this model, find out the solutions for the interest rate and investment when: (c2) M=10 and P=1; (c3) M=8 with P=1. (c4) Describe graphically the adjustment process. (c5) Explain the intuition for the change in investment. (d6) Could the government use a balanced budget T=G>0 to reach full employment? Discuss.

d) (**Flexible prices**) Referring to (c), compare now the cases with M=10, P=1 with that with M=8, P=0.8. How do savings and investment adjust in this case? Does the Say Law hold in reverse?

2.4. Consider a closed economy where the labour supply is inelastic at $N^S = 100$. In this economy, the production function and aggregate demand are given, respectively, by $Q = zN^{0.5}$ with z=10, and $Q^d = (M/P)$.

a) **(Perfect competition)** Assume perfect competition. Find out the demand for labour as a function of real wage, W/P.

b) (**Well-functioning case**) Assume that prices and wages are flexible. (b1) Find out the equilibrium in the labour market and represent it in a graph. (b2) Describe this economy in the AS-AD diagram. In particular, examine the effects of a monetary contraction from M=200 to M=128, on prices, output and nominal wages. Which proposition is illustrated here? Explain the intuition.

c) **(Keynesian model)** Describe this economy in the AS-AD diagram assuming that nominal wages are sticky at $\bar{W} = 1$. In particular: (c1) Find out the expression of the aggregate supply; (c2) analyse in the AD-AS diagram the effects of a monetary contraction from M=200 to M=128, and quantify the impacts on output, prices, and employment;(c3) describe with the help of a graph the adjustment in the labour market. How would you classify the unemployment thereby generated? Explain.

d) (**Transmission mechanism**) In this economy, the market for goods and services is described by: private savings $S^P = 0.25(Q - T) - 1/10r$, government savings,

$S^G = T - G$, and investment, $I = 3/20r$. The money market equilibrium condition is $M/P = \left(Q/r\right)^{0.5}$. In the baseline case, consider G=T=0. (d1) Show that aggregate demand is indeed $Q^d = \left(M/P\right)$. Examine again the implications of a monetary contraction from M=200 to M=128, assuming that nominal wages are sticky at $\overline{W} = 1$. In particular: (d2) Find out the interest rate before and after the policy change. (d3) Describe the changing equilibrium in the money market. Depict graphically and explain what happened to the demand for money. (d4) Describe the adjustment graphically and explain the intuition for the change in savings and in investment.

e) (**Fiscal policy**) Departing from the equilibrium under M=128 in d), suppose that the government uses a balanced budget T=G to reach full employment. (e1) Find out the new AD curve, as a function of G; (e2) compute the required G and represent the new equilibrium in the AD-AS graph; (e3) describe graphically the adjustment in the money market and quantify the new interest rate. Explain. (e4) Describe graphically the adjustment process and find out the new investment level. Explain what happened to investment. (e5) Describe with the help of a graph the adjustment in the labour market.

f) (**Increase in the savings rate**) Departing from full employment (say, with M=200), use the 4 diagrams to examine the effects of an increase in the marginal propensity to save assuming that: (f1) wages are flexible. (f2) wages are sticky at $\overline{W} = 1$. Use only graphical analysis. Explain carefully why the different variables adjust differently in the two models.