Additional Practice Exercises for Final Exam

1. Consider the following model of a closed economy in which household income taxes are proportional to income:

- $Y^d = C + I + G$
- $C = 200 + 0.80(Y - T)$
- $Y = Y^d$
- $I = 600$
- $G = 1000$
- $T = 0.20Y$

a. What is "autonomous expenditure" for this economy? *Hint: by definition, it should not depend on the value of aggregate income (Y).*
b. What is the short run equilibrium value of aggregate income (Y) for this economy?
c. What will the equilibrium value of aggregate income be if investment (I) falls from 600 to 400?
d. What is the spending multiplier for this economy? *Hint: it is NOT equal to 1/(1-0.80)*.
e. Suppose that the government is required by law to keep its budget balanced, so that government purchases must always equal income tax revenue (G = T = 0.20Y). What is the spending multiplier in that case?
f. Would a balanced budget requirement make the economy more or less vulnerable to negative spending shocks? Explain.

2. According to Keynes' "Liquidity Preference Theory," what determines the overall level of interest rates in the short run? Based on that theory, what should a central bank do when it wants to lower interest rates? Explain.

3. Use the IS/LM model to predict how each of the following shocks would likely affect real aggregate income (Y) and the overall level of real interest rates (r) in the short run, all else equal. In each case, be sure to make a prediction for both variables, explain your predictions intuitively, and illustrate them with the relevant diagrams.

a. Autonomous consumption falls.
b. The expected inflation rate rises.
c. The nominal money supply decreases.
d. Aggregate income tax collections fall.

4. Describe the difference between "stock variables" and "flow variables" in macroeconomic models. Of the following variables: aggregate income, aggregate wealth, aggregate investment, the aggregate money supply, government budget deficit, and government debt, which are stock variables, and which are flow variables?

5. Consider the following IS/LM model of a closed economy:

- $Y^d = C + I + G$
- $C = 300 + 0.75(Y - T)$
- $I = 600 - 3000r$
- $Y = Y^d$
- $M^d/P = 0.05\big(Y/(r + \pi^e)\big)$
- $M^S/P = M^d/P$
- $G = 195; \quad T = 400$
- $M^s = 4800; \quad P = 2$
- $\pi^e = 0.035$

a. Find the equation that describes the IS curve for this economy.
b. Find the equation that describes the LM curve for this economy.
c. What are the short run equilibrium values of real aggregate income (Y) and the real interest rate (r) for this economy?
d. What happens to the equilibrium value of aggregate income when autonomous consumption rises from 300 to 400?
e. Why does your answer in part d differ from the impact predicted by the simple spending multiplier?

6. Consider the following linear IS/LM model in which E_0 and M^s are exogenously determined:

- $Y^d = E_0 + 0.60Y$
- $Y = Y^d$
- $M^d = 0.10Y - 500r$
- $M^s = M^d$

a. Find the equation that describes the IS curve for this economy.
b. Find the equation that describes the LM curve for this economy.
c. Solve the model to find the equation that relates the equilibrium value of the interest rate (r*) to its exogenous determinants (E_0 and M^s).
d. How would a 10 unit increase in autonomous expenditure ($\Delta E_0 = 10$) affect the equilibrium value of the interest rate (up or down, and by how much), all else equal?
e. How would a 10 unit increase in the money supply ($\Delta M^s = 10$) affect the equilibrium value of the interest rate (up or down, and by how much), all else equal?

7. Consider the following AS/AD model of a closed economy:

- $Y^d = C + I + G$
- $Y^s = AK^{1/2}L^{1/2}$
- $C = 250 + 0.70(Y - T)$
- $I = 1400 - 10{,}000r$
- $M^d/P = 0.40Y - 5000r$
- $G = 400; \quad T = 500$
- $K = 100; \quad L = 225$

- $M^s = 2000$
- $A = 20$

a. What are the 3 necessary conditions for this economy to be in a long run equilibrium?
b. Calculate the long run equilibrium values of Y, r, and P for this economy.
c. Use the IS/LM diagram to illustrate how an increase in government purchases would affect Y and r in the short run, all else equal.
d. What would the new short run equilibrium values of Y and r be for this economy if government purchases increased by 200? *Hint: Assume that the price level is at its initial long run equilibrium value (from part b) at the time of the shock*.
e. Use the IS/LM diagram and the AS/AD diagram to illustrate how an increase in government purchases would affect P and r in the long run, all else equal.
f. What would the new long run equilibrium values of P and r be for this economy if government purchases increased by 200?

8. Consider the following linear, dynamic AS/AD model:

- $Y_t^d = E + 0.5Y_t - 100r_t$
- $Y_t = Y_t^d$
- $(M^s/P)_t = M^s - P_t$
- $(M^d/P)_t = 0.5Y_t - 200r_t$
- $(M^s/P)_t = (M^d/P)_t$
- $P_{t+1} = P_t - 0.75(Y^s - Y_t)$
- $Y^s = AL$
- $E = 60$
- $M^s = 100$
- $L = 25$
- $A = 4$

a. Solve the model to find the long run equilibrium values of Y, r, and P. *Hint: Long run equilibrium in this model is the model's steady-state equilibrium, where $P_{t+1} = P_t$*.
b. Suppose that at time 0, the money supply increases from 100 to 120. What will r_0, and Y_0 be? *Assume the economy was initially in long run equilibrium*.
c. Explain intuitively why r and Y respond as they do in the short run to the money shock.
d. Calculate the values of Y_t, r_t, and P_t for t = 1, 2, and 3.
e. What are the new long run equilibrium values of Y, r, and P?
f. Explain intuitively why Y, r, and P respond as they do in the long run to the money shock.
g. What would the long run equilibrium values of Y, r and P be if, instead of the money supply increasing from 100 to 120, the labor supply (L) increased from 25 to 27.5?

9. Consider the following version of Solow's model of economic growth with no population growth and no technological progress:

- $y_t = k_t^{1/2}$
- $c_t = (1 - s)y_t$

- $i_t = sy_t$
- $k_{t+1} = k_t + sy_t - \delta k_t$
- $s = 0.10$
- $\delta = 0.04$

a. If capital per worker (k) is 4.0 at time 0 ($k_0 = 4.0$), what will capital per worker be at times 1, 2, and 3? What will income per person (y) be at times 0, 1, 2, and 3?
b. What is the steady-state value of capital per worker (k*) for this economy?
c. When capital per worker reaches its steady-state value, what will income per person (y), consumption per person (c), and investment per person (i) be?
d. If the savings rate doubles from 0.10 to 0.20, what will the new steady-state value of capital per worker be?
e. What are the steady state values of income per person, consumption per person, and investment per person when the savings rate is 0.20?

10. Consider the following version of Solow's model of economic growth with no technological progress:

- $y_t = k_t^{2/3}$
- $c_t = (1 - s)y_t$
- $i_t = sy_t$
- $k_{t+1} = k_t + sy_t - (n + \delta)k_t$
- $s = 0.12$
- $\delta = 0.02$
- $n = 0.02$

a. If capital per worker (k) is 8 at time 0 ($k_0 = 8.0$), what will capital per worker be at times 1, 2, and 3? What will income per person (y) be at times 0, 1, 2 and 3? What will the *growth rate* of income per person (%Δy) be between times 0 and 1, 1 and 2, and 2 and 3?
b. Suppose the population size is 1.0 at time zero ($L_0 = 1$). What will aggregate income (Y = y×L) be at times 0, 1, 2, and 3? *Hint: By definition, $L_{t+1} = (1+n)L_t$.* What will the growth rate of aggregate income (%ΔY) be between times 0 and 1, 1 and 2, and 2 and 3?
c. What is the steady state value of capital per worker (k*) for this model? What will income per person (y) be when k reaches its steady state value?
d. What will the growth rate of income per person (%Δy) be when k reaches its steady state value? What will the growth rate of aggregate income (%ΔY) be when capital per worker reaches its steady state value? Explain.
e. Suppose that at time zero, capital per worker is at its steady state value (k_0 = k* from part c), and then the population growth rate is cut in half (n falls from 0.02 to 0.01). Use EXCEL to calculate and plot capital per worker (k), income per person (y), and the growth rate of income per person (%Δy) for t = 0 … 350.
f. What will the new steady-state value of capital per worker (k) be with a population growth rate of n = 0.01? What will income per person (y) be when k reaches its new steady-state value? What will the growth rate of income per person (%Δy) be when k reaches its new equilibrium value? What will the growth rate of aggregate income (%ΔY) be when k reaches its new steady state value?

11. According to Solow's model of economic growth, what determines the rate at which a nation's income per person grows? Based on that model, what sort of public policies would be able to increase the growth rate of income per person? Give at least 2 specific examples.