

**Intermediate Macroeconomic Theory /
Macroeconomic Analysis
(ECON 3560/5040)
Spring, 2008
Midterm Exam (Answers)**

Part A (12 points)

State whether you think each of the following questions is true (**T**), false (**F**), or uncertain (**U**) and briefly explain your answer. No credit will be given for an answer without any explanation

- (1) [4 points] An increase in the price of *imported* goods will show up in the GDP deflator but not in the CPI

***False.** Since CPI uses a typical consumer's basket of goods and services, an increase in the price of imported goods will show up in the CPI but not in the GDP deflator*

- (2) [4 points] The concept of *monetary neutrality* in the classical model means that an increase in the money supply will increase both saving and investment by the same amount

***False.** Monetary neutrality implies changes in the money supply do not influence real variables. Since saving and investment are real variables, an increase in the money supply do not change saving and investment*

- (3) [4 points] Someday we will live in a “cashless society” in which all businesses and banks will be link to a centralized accounting system. In the cashless society, there would be no *expected* inflation costs

***False.** In the cashless society, there would be no shoe-leather costs, as there would be no cash balances on which to economize. But menu costs would remain for anticipated inflation. The costs of unanticipated inflation would remain as well: both the risk of wealth transfers plus confusion in price signals*

Part B (12 points) Fill-in Questions

- (1) [3 points] Macroeconomics is the study of the economy as a whole. It focuses on issues such as Economic Growth, Inflation, and Unemployment
- (2) [3 points] If a firm hires an additional unit of labor while keeping other inputs constant, its production increases by the Marginal Product of Labor (MPL)
- (3) [3 points] Efficiency Wage theories, another cause of wage rigidity, suggest that higher wages make workers more productive unemployment
- (4) [3 points] The interest rate banks pay to depositor is called nominal interest rate. According to the Fisher equation, it is equal to the real interest rate plus expected inflation rate

Part C (76 points)

- (1) [15 points] **Classical Model**

Assume that real GDP (Y) is 1,200. Consumption (C) is given by the equation $C = 125 + 0.75(Y - T)$. Investment (I) is given by the equation $I = 200 - 10r$, where r is the real interest rate in percent. Taxes (T) are 100 and government spending (G) is 150

- (a) [3 points] What is the equilibrium value of r ?

$$r = 10$$

- (b) [3 points] What are the equilibrium values of C and I ?

$$C = 950, I = 100$$

- (c) [3 points] Now assume government purchases increase by 50 to 200. What are the new equilibrium values of C , I , and r ?

$$C=950, I=50, r=15$$

- (d) [3 points] Now assume that we start again at $G = 150$. Suppose a government education program succeeds in getting households to save more. It lowers marginal propensity consume (MPC) to 0.60. What is the new equilibrium value of r ?

$$r = -6.5$$

Table 1: The Reagan Deficits

variable	1970s	1980s	actual change
S	19.6	17.4	↓
I	19.9	19.4	no change
r	1.1	6.3	↑

Data: decade averages; all except r are expressed as a percent of GDP

- (e) [3 points] Suppose that both government purchases (G) and taxes (T) increase by 100. Is r increasing or decreasing? Briefly explain

The increase in G reduces S by 100 and the increase in T raises S by less than 100. The overall effect of balanced-budget fiscal policy is to reduce national saving (S). Therefore, r rises

(2) [15 points] **Classical Model in the Long Run**

Use the Classical Model to answer the following questions. Be sure to label: i) the axes; ii) the curves; iii) the initial equilibrium values; iv) the direction curves shift; and v) the terminal equilibrium values

- (a) [4 points] During early 1980s, President Reagan proposed to increase defense spending and decrease taxes. Table 1 shows how the policies affected the U.S. economy. Use the classical model and illustrate graphically how the model predicts national saving (S), investment (I), and real interest rate (r) in the long run

The increase in the deficit reduces saving which causes the real interest rate to rise. The level of investment falls as much as savings

- (b) [4 points] Are the data in the table consistent with model predictions that you found in part (a)? Briefly discuss

The closed economy model correctly predicted that national saving would fall and the interest rate would rise. But, the closed economy model predicted that investment would fall as much as saving; actually, investment fell by much less than saving. In our closed economy model, the only source of loanable funds is national saving. But the U.S. is actually an open economy. In the face of a fall in national saving—the domestic supply of loanable funds, firms can finance their investment spending by importing loanable funds

- (c) [4 points] Suppose a government education program succeeds in getting households to save more (you may interpret this as a downward shift in the consumption function). Use the classical model and illustrate graphically how the model predicts national saving (S), investment (I), and real interest rate (r) in the long run

Real interest rate (r) decreases and both national saving (S) and investment (I) increase

- (d) [3 points] According to your answer in part (c) above, state in words what happens to output (Y)

Output is unchanged because it is determined by the factors of production

(3) [24 points] **Solow-Swan Growth Theory**

Use the Solow-Swan growth model to answer the following questions. Be sure to label: i) the axes; ii) the curves; iii) the initial equilibrium values; iv) the direction curves shift; and v) the terminal equilibrium values

Case I: No Population Growth and No Technological Progress

- (a) [3 points] Suppose Congress passes significant tax cuts on household income but does not reduce spending, so that the government budget deficit is larger. Graphically illustrate the impact of the tax cut on the steady-state capital-labor ratio (k^*) and the steady-state level of output per worker (y^*)

Both the steady-state capital-labor ratio (k^) and the steady-state level of output per worker (y^*) will decrease*

- (b) [3 points] Does the country have the faster *rate of growth of output per worker* in the new steady state? Why?

In the steady state, the country's growth rate of output per worker is 0

- (c) [3 points] Suppose that the country's steady-state capital-labor ratio (k^*) was equal to the Golden rule level of capital per worker (k^g). State in words the impact of the tax cut on the consumption per person

The steady state with the highest consumption is called the Golden Rule level of capital. Since the country initially has the Golden Rule level of capital, the consumption per person falls

Case II: Growing Population and No Technological Progress

Suppose that two countries are exactly alike in every respect except that population grows at a faster rate in country A than in country B. That is, the population growth rate in country A is 3 % per year ($n_A = 3\%$) and the population growth rate in country B is 1 % per year ($n_B = 1\%$)

- (d) [3 points] Which country will have the higher level of output per worker in the steady state? Illustrate graphically

Country B has a higher level of income per worker, $y_A^ < y_B^*$*

- (e) [3 points] What is the rate of growth of output per worker ($y = Y/L$) in country B?

In the steady state, the country's growth rate of output per worker is zero

- (f) [3 points] What is the rate of growth of output (Y) in country A?

The country's growth rate of output equals $n_A = 1\%$

Case III: Growing Population and Technological Progress

Consider a hypothetical economy. Suppose that marginal product of capital (MPK) is 5 percent per year, depreciation rate is 2 percent per year ($\delta = 0.02$), population growth rate is 1 percent per year ($\delta = 0.01$), and the economy's real GDP growth rate is 3 percent per year

- (g) [3 points] Let's assume that the economy is in a steady state. Let A be the efficiency of labor or a society's knowledge about production method. What is the rate of growth of efficiency of labor (g)?

The economy's real GDP growth rate implied by this model is $n + g$. Therefore, $g = 0.02$

- (h) [3 points] Is the steady-state capital per worker at, below, or above the Golden Rule level of capital per worker, k^g ?

Since $MPK = \delta + n + g$, the steady state is at the Golden Rule level of capital per worker. That is, $k^ = k^g$*

(4) [8 points] **Money and Inflation**

Answer the following questions

- (a) [3 points] According to the Fisher equation, if the Fed announces that it will raise the money supply in the future but does not change the money supply today, then what happens to nominal interest rate?

The Fisher equation says $i = r + \pi^e$, where i is nominal interest rate, r is real interest rate, and π^e is expected inflation rate. If the Fed announces that it will raise the money supply in the future, π^e will increase, so does the nominal interest rate

- (b) [3 points] Assume that expected inflation rate is 4 percent and nominal interest rate in the same period is 3 percent. What is the real interest rates in the period?

According to the Fisher equation, $i = r + \pi^e$, real interest rate is -1%

- (c) [3 points] Suppose velocity is constant and, in addition, the factors of production and the production function determine real GDP. If the money supply increases 8 percent and the price level increases 5 percent, then what is the change in **nominal GDP** and **real GDP**?

The quantity equation implies $\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$ or $\% \Delta M + \% \Delta V = \% \Delta PY$. Since velocity is constant ($\% \Delta V = 0$), the change in nominal GDP ($\% \Delta PY$) equals the money growth rate and the change in real GDP is $\% \Delta Y = \% \Delta M - \% \Delta P = 8\% - 5\% = 3\%$

(5) [8 points] **Unemployment**

Let's assume that supply of labor is fixed in the long run, and thus the labor supply curve is vertical. Suppose that a country experiences a reduction in productivity that lowers the marginal productivity of labor for any given level of labor

- (a) [2 points] State in words what happens to **labor supply curve** and **labor demand curve**

Labor demand curve shifts downward and to the left. Labor supply curve remain unchanged

- (b) [3 points] Suppose the labor market were always in equilibrium. Illustrate graphically the effects of the reduction in productivity on real wage and unemployment

The reduction in productivity causes a lower real wage and no change in unemployment

- (c) [3 points] Will your answer in part (b) change if the real wage were rigid? Briefly discuss

The reduction in productivity causes no change in the real wage and a rise in in unemployment

(6) [6 points] **Economic Fluctuations**

Answer the following questions

- (a) [3 points] If you knew that the economy was falling into a recession, what would you expect to happen to *investment* during the next quarters? To the *unemployment*?

If the economy is entering a recession, you would expect investment to decline because it is procyclical, and the unemployment rate to rise because it is countercyclical

- (b) [3 points] Consumer expenditures on *durable goods* such as cars and furniture fall much more than expenditures on *nondurable goods* and *services* during most recessions. Why do you think that is?

Expenditure on durable goods is more sensitive to the business cycle than expenditure on nondurable goods and services, because people can more easily change the timing of their expenditure on durables. When economic activity is weak, and people face the danger of losing their jobs, they avoid making durable goods purchases. Instead, they may drive their cars a little longer before buying new ones, get the old washing machine repaired instead of buying a new one, and put off buying new furniture until a new expansion indicates greater income security. So in a recession, durable purchases decline a lot, but when an expansion begins, durable purchases pick up substantially. The exception was in the business cycle that began in March 2001, when very low interest rates supported expenditures on durable goods

Part D (10 points)

If you are a *Graduate* student, you must answer the following question. This is a bonus question for *Undergraduate* Students

- (7) [10 points] Assume that a war reduces a country's labor force but does not directly affect its capital stock. The economy was in a steady state before the war and the saving rate does not change after the war. Answer the following questions using the Solow-Swan model

- (a) [5 points] What will be *immediate* impact on real GDP (Y) and real GDP per person (y)

Real GDP will fall, but real GDP per person will rise

- (b) [5 points] What will happen to capital per worker ($k = K/L$) *over time*?

Capital per worker will decline over time