# ECON 3010 Intermediate Macroeconomics
## Solutions to Exam #1

**Multiple Choice Questions. (25 points; 2.5 pts each)**

1. Exogenous variables are:

   A)   fixed at the moment they enter the model.
   B)   determined within the model.
   C)   the outputs of the model.
   D)   explained by the model.

2. Assume that a rancher sells McDonald's a quarter-pound of meat for $1 and that McDonald's sells you a hamburger made from that meat for $2. In this case, the value included in GDP should be:

   A)   $0.50.
   B)   $1.
   C)   $2.
   D)   $3.

3. If the number of employed increases while the number of unemployed does not change, the unemployment rate:

   A)   will increase.
   B)   will decrease.
   C)   will not change.
   D)   may either increase or decrease.

4. According to the definition used by the U.S. Bureau of Labor Statistics, people are considered to be unemployed if they:

   A)   are out of a job, but not looking for work.
   B)   retired from the labor force before age 65.
   C)   do not have a job, but have looked for work in the past 4 weeks.
   D)   are absent from work because of bad weather or illness.

5. Which of the following is a stock variable?

   A)   wealth
   B)   consumption
   C)   investment
   D)   income

6. If income is 4,800, consumption is 3,500, government spending is 1,000, and taxes minus transfers are 800, public saving is:

   A)   –200.
   B)   200.
   C)   500.
   D)   1,800.

7. *All* of the following actions increase government purchases of goods and services *except* the:
   A)   federal government's sending a Social Security check to Betty Jones.
   B)   federal governments sending a paycheck to the president of the United States.
   C)   federal government's buying a Patriot missile.
   D)   city of Boston's buying a library book.

8. If the consumption function is given by $C = 150 + 0.85Y$ and $Y$ increases by 1 unit, then $C$ increases by:

   A)   0.15 units.
   B)   0.5 units.
   C)   0.85 units.
   D)   1 unit.

9. If output is described by the production function $Y = AK^{0.2}L^{0.8}$, then the production function has:

   A)   constant returns to scale.
   B)   diminishing returns to scale.
   C)   increasing returns to scale.
   D)   a degree of returns to scale that cannot be determined from the information given.

10. In the long run, the level of national income in an economy is determined by its:

   A)   factors of production and production function.
   B)   real and nominal interest rate.
   C)   government budget surplus or deficit.
   D)   rate of economic and accounting profit.

**Problem Solving / Essay Questions. (75 points)**

#11.  (30 pts) Consider a macroeconomy that produces smartphones, automobiles and haircuts.  Use the information below to answer the following questions.

| | Quantity (in millions) | | Price (in $) | |
|---|---|---|---|---|
| Product | 2017 | 2018 | 2017 | 2018 |
| Smartphones | 50 | 60 | $400 | $350 |
| Autos | 4 | 5 | $25,000 | $30,000 |
| Haircuts | 200 | 160 | $20 | $25 |

(a) (10 pts) Calculate nominal and real GDP for 2017 and 2018 using 2017 as the base year.  What are the growth rates of nominal and real GDP over this period?  Which growth rate is a better indicator of economic growth and why?

$$\boldsymbol{Nominal\ GDP_{2017}} = (\mathbf{50 \times \$400}) + (\mathbf{4 \times \$25,000}) + (\mathbf{200 \times \$20})$$

$$= \mathbf{\$20,000 + \$100,000 + \$4,000 = \$124,000}$$

$$\boldsymbol{Nominal\ GDP_{2018}} = (\mathbf{60 \times \$350}) + (\mathbf{5 \times \$30,000}) + (\mathbf{160 \times \$25})$$

$$= \mathbf{\$21,000 + \$150,000 + \$4,000 = \$175,000}$$

$$\boldsymbol{Real\ GDP_{2017}} = \boldsymbol{Nominal\ GDP_{2017}} = \mathbf{\$124,000}$$

$$\boldsymbol{Real\ GDP_{2018}} = (\mathbf{60 \times \$400}) + (\mathbf{5 \times \$25,000}) + (\mathbf{160 \times \$20})$$

$$= \mathbf{\$24,000 + \$125,000 + \$3,200 = \$152,200}$$

$$\boldsymbol{Nominal\ GDP\ growth\ rate} = \mathbf{100} \times \left(\frac{\mathbf{\$175,000 - \$124,000}}{\mathbf{\$124,00}}\right) = \mathbf{41.13\%}$$

$$\boldsymbol{Real\ GDP\ growth\ rate} = \mathbf{100} \times \left(\frac{\mathbf{\$152,200 - \$124,000}}{\mathbf{\$124,00}}\right) = \mathbf{22.74\%}$$

**The growth rate in real GDP is the better measure for the economy because it controls for inflation by keeping prices constant.**

| | Quantity (in millions) | | Price (in $) | |
|---|---|---|---|---|
| Product | 2017 | 2018 | 2017 | 2018 |
| Smartphones | 50 | 60 | $400 | $350 |
| Autos | 4 | 5 | $25,000 | $30,000 |
| Haircuts | 200 | 160 | $20 | $25 |

(b) (10 pts) Assuming that the 2017 quantities in the table also represent the typical consumer's basket of goods, calculate the GDP deflator and CPI for 2017 and 2018 using 2017 as the base year.

$$GDP\ Deflator_{2017} = 100$$

$$GDP\ Deflator_{2018} = \frac{Nominal\ GDP_{2018}}{Real\ GDP_{2018}} \times 100 = \frac{\$175,000}{\$152,200} \times 100 \cong 115$$

$$CPI_{2017} = 100$$

$$CPI_{2018} = \frac{(50 \times \$350) + (4 \times \$30,000) + (200 \times \$25)}{\$124,000} \times 100 = \frac{\$142,500}{\$124,000} \times 100 \cong 115$$

(c) (10 pts) What is CPI inflation rate between 2017 and 2018? Explain how the substitution bias may cause the CPI to overstate inflation and give an example using one of the three goods or services.

**The CPI inflation rate between 2017 and 2018 is approximately 15%. The CPI inflation rate is biased because consumers substitute away from more expensive items, but the CPI uses a fixed basket of goods that does not recognize this substitution. For example, haircuts increased in price and consumers substituted away from haircuts. This substitution is not reflected in the CPI because the quantity of haircuts in the representative "basket" is fixed.**

#12. (30 pts)  Consider the following (closed) Neoclassical model of the economy, where $r$ is in percentage terms.  Show all your work.

| Supply | Demand |
|---|---|
| $Y = F(K,L) = \sqrt{KL}$ | $C = 20 + 0.8(Y - T)$ |
| $MPL = 0.5\sqrt{K/L};\; MPK = ?$ | $I = 50 - 5r$ |
| $K = 900;\; L = 100$ | $G = 40, T = 50$ |

(a) (10 pts) What is the level of GDP in the economy?  How much of national income goes to workers and how much goes to the owners of capital?  Show your work.  How much are households saving? How much is the government saving?

**The level of real GDP is** $Y = \sqrt{KL} = \sqrt{900 \times 100} = 300.$

**The real wage is** $\dfrac{W}{P} = MPL = 0.5\sqrt{K/L} = 0.5\sqrt{900/100} = 1.5.$

**The amount of GDP going to workers is** $\dfrac{W}{P} \times L = 1.5 \times 100 = 150.$

**The real rental rate is** $\dfrac{R}{P} = MPK = 0.5\sqrt{L/K} = 0.5\sqrt{100/900} = 1/6.$

**The amount of GDP going to the owners of capital is** $\dfrac{R}{P} \times K = \dfrac{1}{6} \times 900 = 150.$

**Households are saving:** $Y - T - C = 300 - 50 - 220 = 30.$

**The government is saving:** $T - G = 10.$

| Supply | Demand |
|---|---|
| $Y = F(K, L) = \sqrt{KL}$ | $C = 20 + 0.8(Y - T)$ |
| $MPL = 0.5\sqrt{K/L}; \; MPK = ?$ | $I = 50 - 5r$ |
| $K = 900; L = 100$ | $G = 40, T = 50$ |

(b) (10 pts) Find the interest rate that produces equilibrium in either the goods market or the loanable funds market. Draw two demand-supply diagrams (side-by-side) to show the equilibrium in the economy, making sure to carefully label and title both diagrams.
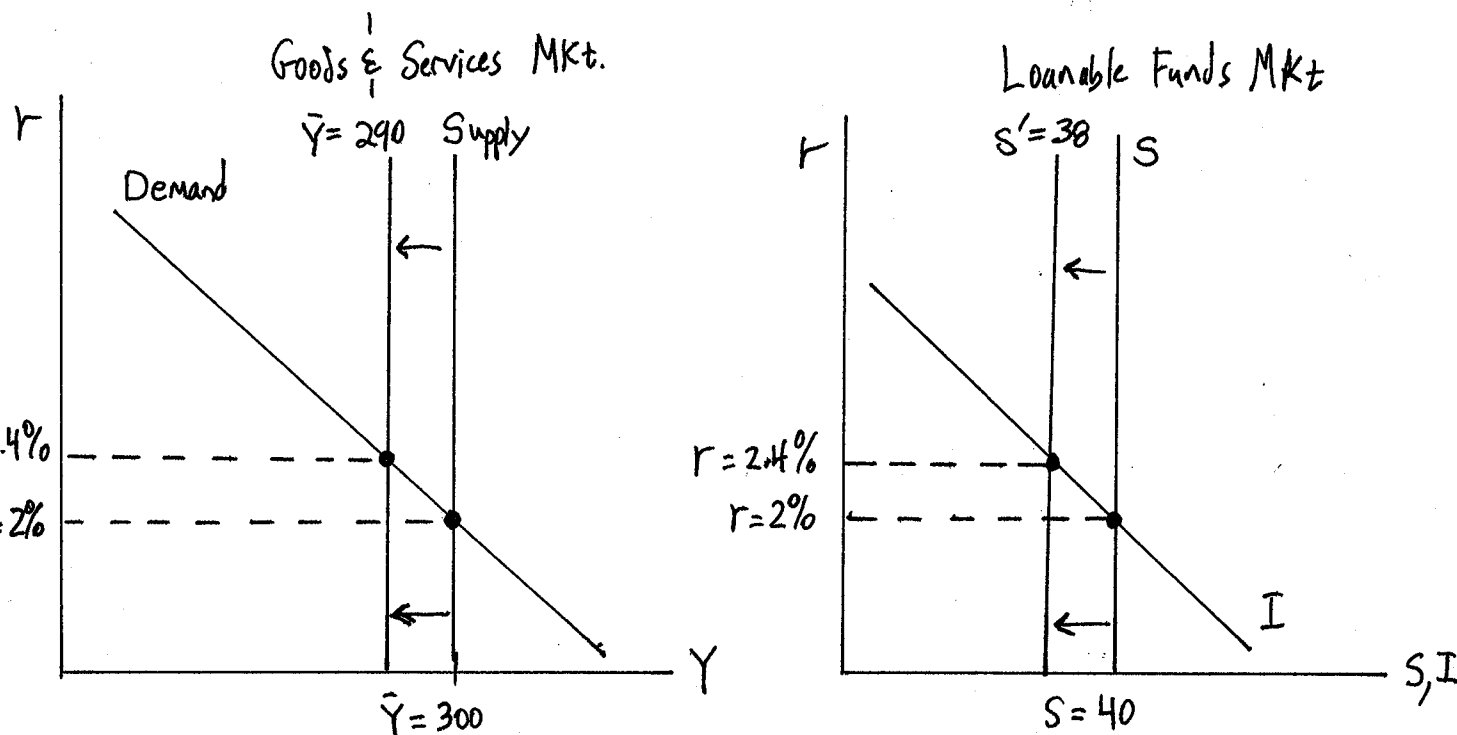
**To find the equilibrium interest rate, we set $Y = C + I + G$.**

**$300 = 20 + 0.8(300 - 50) + 50 - 5r + 40$**

**$300 = 310 - 5r$**

**$5r = 10$**

**$r = 2\%$**



(c) (10 pts) Assume a massive natural disaster destroys part of the nation's productive capital such that $K = 841$. Find the new equilibrium real interest rate and show the change on the diagrams in part (b).

**To find the new equilibrium interest rate, we again set $Y = C + I + G$.**

**$290 = 20 + 0.8(290 - 50) + 50 - 5r + 40$**

**$290 = 302 - 5r$**

**$5r = 12$**

**$r = 2.4\%$**

#13. (15 pts) Complete the following statements to make them true.

(a) (2.5 pts) The current U.S. _____unemployment rate_____ is 3.9%.

(b) (2.5 pts) In his campaign statements, President Trump has promised 4% annual growth in

_____real GDP_____.

(c) (2.5 pts) The main reason the labor force participation rate has been declining since 2000 is

_____baby boomers retiring_____.

(d) (2.5 pts) The main reason the labor force participation rate was increasing between 1970 and 2000 is

_____women entering the labor force_____.

(e) (2.5 pts) Under the national income accounts, the purchase of a new house is categorized as

_____investment_____.

(f) (2.5 pts) The Federal Reserve ("Fed") is targeting a 2% annual rate for the

_____inflation rate_____.