Economics 132.03

Principles of Macroeconomics

Spring 2008

Professor Peter Ireland

http://www2.bc.edu/~irelandp/ec132.html

First Midterm Exam

This exam has 9 questions on 3 pages; before you begin, please check to make sure your copy has all 9 questions and all 3 pages. Each of the 9 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. What happens to US gross domestic product (GDP) and its four main components when …

    a. Hallmark (a US firm) buys $1 million worth of paper from International Paper (another US firm) to make greeting cards?
    b. You (a US resident) buy a used car?
    c. The State of Massachusetts hires a new employee?
    d. General Motors (a US firm) buys new computer equipment made in Japan?
    e. You (a US resident) spend $25 on a haircut?

2. Consider a simple economy in which only two goods are produced and sold: pizza and beer. The prices and quantities produced of these two goods over a three-year period are shown in the table below.

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2005	$2	1	$2	1
2006	$2	3	$2	2
2007	$4	3	$8	2

    a. Calculate nominal GDP in 2005, 2006, and 2007.
    b. Next, using 2005 as your base year, calculate real GDP in 2005, 2006, and 2007.
    c. Does the GDP deflator rise between 2005 and 2006? Why or why not?
    d. Does the GDP deflator rise between 2006 and 2007? Why or why not?

3. In recent years, many new parents (fathers and mothers alike) have chosen to quit their jobs to stay home and care for their children.

    a. What happens to GDP when both parents work before having children, but one decides to stay at home afterwards to take care of the kids full time?
    b. How does this change in GDP compare to the change in the parents' well-being?

4. Go back to the same example from question 2, above. Consumers in the economy like two goods: pizza and beer. Prices and quantities consumed are the same as before:

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2005	$2	1	$2	1
2006	$2	3	$2	2
2007	$4	3	$8	2

    a. As a first step in computing the consumer price index (CPI), the Bureau of Labor Statistics surveys consumers to determine the "basket of goods" purchased by a typical consumer. Using 2005 as your base year, what is the basket of goods in this economy?
    b. What is the cost of the basket in each year: 2005, 2006, and 2007?
    c. Still using 2005 as the base year, what is the CPI in each year: 2005, 2006, 2007?
    d. Is percentage change in the CPI between 2005 and 2007 in this question larger than, smaller than, or the same as the percentage change in the GDP deflator between 2005 and 2007 in question 2? What explains the difference, if any?

5. Explain what happens to the GDP deflator and the CPI in the United States when …

    a. The price of fighter planes, newly-produced by Lockheed Martin (a US firm) and sold to the US Air Force, rises.
    b. The price of a BMW (a car, newly-produced in Germany) sold to a US consumer rises.
    c. The price of a Ford Taurus (a car, newly-produced in the US) sold to a US consumer rises.
    d. The price of a Boeing 747 (a commercial aircraft, newly-produced in the US) sold to US Airways (a US firm) rises.
    e. The price of a Boeing 747 (a commercial aircraft, newly-produced in the US) sold to British Airways (a foreign firm) rises.

6. In 1980, major US banks offered interest rates as high as 15% per year on savings accounts offered to consumers. By 2000, that rate had dropped to 5% per year. On the other hand, in 1980 the US inflation rate was about 14% per year, whereas in 2000, the US inflation rate was only 3% per year.

    a. What was the real interest rate in 1980? What was the real interest rate in 2000?
    b. What was the nominal interest rate in 1980? What was the nominal interest rate in 2000?
    c. For a consumer, which year – 1980 or 2000 – was a better time to put money in the bank? Why?

7. Explain *briefly* (in one, two, or three sentences):

   a. What do macroeconomist mean by the term "human capital?"
   b. How does the process of "investing" in human capital resemble the process of investing in physical capital?

8. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

$$Y = AF(L,K,H,N)$$

   Where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

   a. What does it mean to say that holding the stock of knowledge fixed, the aggregate production function has the property of constant returns to scale?
   b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.

9. Explain *briefly* (in no more than a sentence or two for each part) how the following public policies might help raise the US standard of living?

   a. The government decides to spend money to improve the quality of primary and secondary school education.
   b. The government increases the budget for the National Science Foundation.
   c. The government adopts policies that encourage US households to consume less and save more.
   d. The government allows foreigners to build, own, and operate new factories in the US.
   e. The government secures property rights so that all citizens can benefit in the future from their investments today.

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Solutions to First Midterm Exam

1. What happens to US gross domestic product (GDP) and its four main components when …

    a. Hallmark a (US firm) buys $1 million worth of paper from International Paper (another US firm) to make greeting cards?

In this case paper is an intermediate good, so GDP and all of its components remain unchanged.

    b. You (a US resident) buy a used car?

GDP only includes newly-produced items, so again, GDP and all of its components remain unchanged.

    c. The State of Massachusetts hires a new employee?

Salaries of all government employees at the federal, state, and local level are included in the government purchases component of GDP, so G goes up and so does GDP.

    d. General Motors (a US firm) buys new computer equipment made in Japan?

GDP only includes domestically-produced goods. I goes up, but NX goes down by the same amount. GDP remains unchanged.

    e. You (a US resident) spend $25 on a haircut?

Consumption includes durable goods, nondurable goods, and services, so C goes up and so goes GDP.

2. Consider a simple economy in which only two goods are produced and sold: pizza and beer. The prices and quantities produced of these two goods over a three-year period are shown in the table below.

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2005	$2	1	$2	1
2006	$2	3	$2	2
2007	$4	3	$8	2

a. Calculate nominal GDP in 2005, 2006, and 2007.

2005: $2 x 1 + $2 x 1 = $4
2006: $2 x 3 + $2 x 2 = $10
2007: $4 x 3 + $8 x 2 = $28

b. Next, using 2005 as your base year, calculate real GDP in 2005, 2006, and 2007.

2005: $2 x 1 + $2 x 1 = $4
2006: $2 x 3 + $2 x 2 = $10
2007: $2 x 3 + $2 x 2 = $10

c. Does the GDP deflator rise between 2005 and 2006? Why or why not?

No. Because quantities rise while prices remain unchanged, nominal and real GDP rise by the same amount, leaving the GDP deflator unchanged.

d. Does the GDP deflator rise between 2006 and 2007? Why or why not?

Yes. Because prices rise while quantities remain unchanged, nominal GDP rises but real GDP stays unchanged, and the GDP deflator rises too.

3. In recent years, many new parents (fathers and mothers alike) have chosen to quit their jobs to stay home and care for their children.

a. What happens to GDP when both parents work before having children, but one decides to stay at home afterwards to take care of the kids full time?

GDP measures the value of goods and services using market values; hence, activities like housework and childcare from a parent are not accounted for. Because of this convention, GDP falls when one parent who had been working decides to stay home and care for the children.

b. How does this change in GDP compare to the change in the parents' well-being?

Presumably, the parent gets a benefit from being with his or her children that is not accounted for in GDP. Hence, we can say that the decline in GDP is not necessarily matched by a decline in the parents' true well-being.

4. Go back to the same example from question 2, above. Consumers in the economy like two goods: pizza and beer. Prices and quantities consumed are the same as before:

Year	Price of Pizza	Quantity of Pizza	Price of Beer	Quantity of Beer
2005	$2	1	$2	1
2006	$2	3	$2	2
2007	$4	3	$8	2

a. As a first step in computing the consumer price index (CPI), the Bureau of Labor Statistics surveys consumers to determine the "basket of goods" purchased by a typical consumer. Using 2005 as your base year, what is the basket of goods in this economy?

The basket of goods consists of one pizza and one beer.

b. What is the cost of the basket in each year: 2005, 2006, and 2007?

2005: $2 x 1 + $2 x 1 = $4
2006: $2 x 1 + $2 x 1 = $4
2007: $4 x 1 + $8 x 1 =$12

c. Still using 2005 as the base year, what is the CPI in each year: 2005, 2006, 2007?

2005: $4/$4 x 100 = 100
2006: $4/$4 x 100 = 100
2007: $12/$4 x 100 = 300

d. Is percentage change in the CPI between 2005 and 2007 in this question larger than, smaller than, or the same as the percentage change in the GDP deflator between 2005 and 2007 in question 2? What explains the difference, if any?

In this example, the inflation rate as measured by the CPI is larger than the inflation rate as measured by the GDP deflator. This is because of what macroeconomists call "substitution bias." The CPI holds the basket of goods fixed, even though consumers will tend to substitute away from goods, such as beer in this case, with prices that rise at relatively faster rates.

5. Explain what happens to the GDP deflator and the CPI in the United States when …

a. The price of fighter planes, newly-produced by Lockheed Martin (a US firm) and sold to the US Air Force, rises.

The sale contributes to government purchases and hence to GDP, but fighter planes are not included in the basket of goods used to compute the CPI. Hence, the GDP deflator rises but the CPI remains unchanged.

b. The price of a BMW (a car, newly-produced in Germany) sold to a US consumer rises.

The imported car is not included in GDP, but will be in the basket of goods used to compute the CPI. Hence, the GDP deflator remains unchanged but the CPI rises.

    c.   The price of a Ford Taurus (a car, newly-produced in the US) sold to a US consumer rises.

The GDP deflator rises and so does the CPI.

    d.   The price of a Boeing 747 (a commercial aircraft, newly-produced in the US) sold to US Airways (a US firm) rises.

The sale of commercial aircraft to a US firm contributes to investment but not to consumption. Hence the GDP deflator rises but the CPI remains unchanged.

    e.   The price of a Boeing 747 (a commercial aircraft, newly-produced in the US) sold to British Airways (a foreign firm) rises.

The export contributes to the net export component of GDP but commercial aircraft are not included in the basket of goods used to compute the CPI. Hence the GDP deflator rises but the CPI remains unchanged.

6.   In 1980, major US banks offered interest rates as high as 15% per year on savings accounts offered to consumers. By 2000, that rate had dropped to 5% per year. On the other hand, in 1980 the US inflation rate was about 14% per year, whereas in 2000, the US inflation rate was only 3% per year.

    a.   What was the real interest rate in 1980? What was the real interest rate in 2000?

The real interest rate equals the nominal interest rate minus the rate of inflation.

1980: 15% - 14% = 1%
2000: 5% - 3% = 2%

    b.   What was the nominal interest rate in 1980? What was the nominal interest rate in 2000?

The nominal interest rate is the rate that is actually quoted by the bank: 15% in 1980 and 5% in 2000.

    c.   For a consumer, which year – 1980 or 2000 – was a better time to put money in the bank?

Nominal interest rates can be misleading measures of the return on saving when the inflation rate changes a lot; real interest rates are more relevant, since consumers care not so much about the number of dollars received but about the amount of goods and services those dollars can buy. In this case, higher real interest rates make 2000 the better time to put money in the bank, even though the nominal interest rate was lower than in 1980.

7. Explain *briefly* (in one, two, or three sentences):

   a. What do macroeconomist mean by the term "human capital?"

Human capital refers to the knowledge and skills that workers require through education, training, and experience.

   b. How does the process of "investing" in human capital resemble the process of investing in physical capital?

Both activities involve a trade-off over time: a cost is incurred today and a benefit is enjoyed in the future. In the case of physical capital, the cost is the cost of the capital investment today and the benefit is the earnings that capital provides in the future. In the case of human capital, the cost is the cost of tuition and of foregone earnings while receiving training, but the benefit is the higher wage earned by the more highly-skilled labor.

8. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

$$Y = AF(L,K,H,N)$$

Where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

   a. What does it mean to say that holding the stock of knowledge fixed, the aggregate production function has the property of constant returns to scale?

Constant returns to scale means that holding A fixed, doubling L, K, H, and N leads to a doubling of output. Mathematically:

$$2Y = AF(2L,2K,2H,2N)$$

or, more generally, for any multiple or fraction x,

$$xY = AF(xL,xK,xH,xN),$$

   b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.

Choosing $x = 1/L$ in the last expression from above:

$$Y/L = AF(1,K/L,H/L,N/L).$$

9. Explain *briefly* (in no more than a sentence or two for each part) how the following public policies might help raise the US standard of living?

   a. The government decides to spend money to improve the quality of primary and secondary school education.

This policy will increase the standard of living by raising productivity and, more specifically, by contributing to the accumulation of human capital per worker.

   b. The government increases the budget for the National Science Foundation.

This policy will increase the standard of living by raising productivity and, more specifically, by adding to the stock of technological knowledge.

   c. The government adopts policies that encourage US households to consume less and save more.

This policy will increase the standard of living by raising productivity and, more specifically, by contributing to the accumulation of physical capital per worker.

   d. The government allows foreigners to build, own, and operate new factories in the US.

This policy will increase the standard of living by raising productivity and, more specifically, by contributing to the accumulation of physical capital per worker.

   e. The government secures property rights so that all citizens can benefit in the future from their investments today.

This policy will increase the standard of living by raising productivity and, more specifically, by contributing to the accumulation of physical capital per worker, and possibly human capital per worker as well.

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Second Midterm Exam

This exam has 12 questions on 5 pages; before you begin, please check to make sure your copy has all 12 questions and all 5 pages. Each of the 12 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. Suppose that you are an investment advisor and, after checking the latest interest rates in the bond market, you collect the following information:

Issuer	Maturity Date	Interest Rate (per year)
US Government	December 2008	1.75%
US Government	December 2028	4.50%
General Motors	February 2038	11.00%
General Electric	February 2038	6.25%
State of Massachusetts	December 2028	3.25%

Explain briefly (no more than a sentence or two for each case) which of these bonds you would recommend, and why, to a client who tells you:

a. "I'm saving for retirement, so I won't need the money for many years, but above all I don't want to risk losing my money."
b. "I'm saving to buy a new house. I may need the money next year, and I don't want to take any risk either."
c.   "I'm in a high federal income tax bracket and would really benefit from a tax break on the income from my savings."
d. "I want to aim for a high return and don't care if that means taking on a lot of risk."
e. "I want a decent return and am willing to tolerate some risk, but not too much risk."

2. Consider a closed economy in which GDP equals $15 billion, consumption equals $9 billion, government purchases equal $2 billion, and tax revenue equals $1 billion. Use this information to answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic):

    a. What is investment equal to in this economy?
    b. What is national saving equal to in this economy?
    c. What is public saving equal to in this economy?
    d. What is private saving equal to in this economy?
    e. What are net exports equal to in this economy?

3. Suppose that after the 2008 elections, the new President and Congress act to cut government spending and, by doing so, eliminate the current federal government budget deficit.

    a. Does this change in policy shift the demand curve or the supply curve in the market for loanable funds?
    b. Use a supply-and-demand diagram for loanable funds to show in which direction the relevant curve shifts.
    c. Does the interest rate rise or fall as a result of this change in policy?
    d. What happens to private investment as a result of this change in policy?
    e. What effect would this policy have on the productivity of US workers?

4. Suppose that you are the CEO of a large corporation, and one of your vice presidents finds an investment project that costs $100 million today, but promises to pay off $200 million 7 years from now.

    a. Write down a formula for the present value of the $200 million that your firm stands to receive from the project 7 years from now, assuming that the interest rate is 10 percent per year (*note:* all you need to do for this part is to write down the formula, since actually computing the numerical value of this present value isn't possible without the help of a calculator).
    b. Suppose the present value from part (a) turns out to be greater than $100 million. Should you use your corporation's funds to undertake the project?
    c. Suppose that the interest rate falls to 5 percent per year between the time that the vice president alerts you to the project and the time at which you actually have to make the decision of whether to undertake the project. Would that change the answer that you gave in part (b) above: yes, no, or maybe?

5. Legend has it that Peter Minuit, a Dutch official working in the colony of New Netherland, which stretched along the Northeast US coastline from what is now Rhode Island down to what is now New Jersey, purchased the island of Manhattan from a group of Native Americans 382 years ago, in 1626, for the equivalent of $24. Assuming that those $24 were invested at an interest rate of 7 percent per year, write down a formula that shows how much money the Native American sellers would have today, if they took advantage of compounding by leaving all of the money in the bank, earning interest over time on the previous years' interest payments as well as the original amount deposited (*note:* again, all you need to do here is to write down the formula, since actually computing the numerical value isn't possible without the help of a calculator).

6. Please answer these short-answer questions:

    a. Some insurance company executives worry that once a driver buys automobile insurance, he or she will become a less careful driver, more likely to have an accident. Are they describing the problem of *adverse selection* or the problem of *moral hazard*?
    b. Some insurance company executives worry that drivers who tend to drive less carefully are more likely to buy automobile insurance than drivers who tend to drive more safely. Are they describing the problem of *adverse selection* or the problem of *moral hazard*?
    c. Some investment advisors argue that stock prices tend to move randomly and are impossible to predict. Do these advisors believe in the *efficient markets hypothesis* or in *market irrationality*?
    d. Some investment advisors argue that waves of optimism or pessimism can push stock prices above or below their true intrinsic values, and that savers can profit by buying undervalued stocks. Do these advisors believe in the *efficient markets hypothesis* or in *market irrationality*?
    e. Some investment advisors point out that when a firm's future prospects improve, the price of that firm's stock usually rises right away, when the news is released, and not later on, when the firm's profits actually do improve. Does this fact support the *efficient markets hypothesis* or the theory of *market irrationality?*

7. Consider a very simple economy in which there are only 20 people of age 16 or over. Eight are working at jobs, two do not have jobs but are actively looking, six are full-time students who are not looking for jobs and have not done so at any time in the past month, and four are retired people who are not looking for jobs and have not done so at any time in the past month. Using the same definitions employed by the Bureau of Labor Statistics, please answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic).

    a. How large is the labor force in this economy?
    b. What is the unemployment rate?
    c. What is the labor force participation rate?

8. Consider each of the following labor-market developments. In each case, indicate whether the event raises or lowers the natural rate of unemployment, and whether that effect arises because of a change in the amount of frictional unemployment or because of a change in the amount of structural unemployment.

   a. More firms start paying "efficiency wages."
   b. The internet makes it easier for firms to advertise their job openings and for unemployed workers to find job openings.
   c. Labor unions successfully organize workers in new industries.
   d. More and more consumers switch from Dell and Hewlett-Packard's laptop computers, and buy Apple's instead.
   e. Government training programs help unemployed people who lost their jobs in declining industries to acquire new skills.

9. Draw a supply-and-demand diagram for the labor market to show what happens when the government sets the minimum wage above the equilibrium wage; then use that diagram to answer the following questions:

   a. What happens to the wages paid to workers who remain employed?
   b. What happens to the number of workers who are actually employed?
   c. What happens to the number of workers who would like to work at the prevailing wage?
   d. What happens to the number of workers who would be classified by the Bureau of Labor Statistics as unemployed?

10. Consider an economy in which the following assets are available:

Asset	Dollar Value Outstanding
Currency	$7
Demand Deposits	$3
Savings Deposits	$20
Money Market Mutual Funds	$8
Time Deposits (Certificates of Deposit)	$11
Short Term Government Bonds	$21
Stock Market Mutual Funds	$50

   a. What is the value of M1 for this economy? (*Notes:* If you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic. Also, please assume that if a particular asset from the actual US economy is not shown above, then there is none of that asset available in this economy.)
   b. What is the value of M2 for this economy?

11. Consider an economy in which, initially, there are no banks. Suppose that one consumer initially holds the economy's entire money supply, in the form of $100 in currency. Then a new bank – call it the First National Bank – opens, and the consumer deposits the entire $100.

    a. Assuming that the First National Bank has a 100 percent reserve ratio, use a T-account to show what effect this deposit has on the Bank's balance sheet.
    b. Still assuming a 100 percent reserve ratio, explain what effect this deposit will have on the economy's total money supply.
    c. Show how the First National Bank's T-account will look if, instead, it chooses a 10 percent reserve ratio.
    d. Assuming that many other banks open up, all choosing the same 10 percent reserve ratio, and assuming that every consumer now chooses to hold all of his or her money as deposits instead of currency, explain what effect the initial deposit will eventually have on the total money supply.
    e. Are consumers as a group wealthier when the banking system chooses a 10 percent reserve ratio instead of a 100 percent reserve ratio?

12. Suppose that the Federal Reserve conducts an open market operation in which it purchases $10 million in US Government bonds.

    a. Will this open market operation increase or decrease the money supply?
    b. If there were no banks in the US economy, by how much will the money supply change?
    c. Given that there are banks in the US economy, is the actual change in the money supply likely to be larger or small than the answer you gave in part (a) above?

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Solutions to Second Midterm Exam

1. Suppose that you are an investment advisor and, after checking the latest interest rates in the bond market, you collect the following information:

Issuer	Maturity Date	Interest Rate (per year)
US Government	December 2008	1.75%
US Government	December 2028	4.50%
General Motors	February 2038	11.00%
General Electric	February 2038	6.25%
State of Massachusetts	December 2028	3.25%

Explain briefly (no more than a sentence or two for each case) which of these bonds you would recommend, and why, to a client who tells you:

a. "I'm saving for retirement, so I won't need the money for many years, but above all I don't want to risk losing my money."

An investor who wants to minimize risk ought to buy a US Government bond; but if the money won't be needed for awhile, he or she can earn a higher return by buying the long-term government bond. He or she should buy the US Government bond that matures in December 2028.

b. "I'm saving to buy a new house. I may need the money next year, and I don't want to take any risk either."

Again, the investor who wants to minimize risk ought to buy a US Government bond; but if the money is needed next year, he or she should probably buy the short-term bond. He or she should buy the US Government bond that matures in December 2008.

c. "I'm in a high federal income tax bracket and would really benefit from a tax break on the income from my savings."

Although municipal bonds, issued by state and local governments, offer lower interest rates, their interest payments are exempt from the federal income tax. This investor should buy the bond issued by the State of Massachusetts.

    d.   "I want to aim for a high return and don't care if that means taking on a lot of risk."

This investor should buy the bond issued by General Motors, since it pays the highest interest rate, even though it has the highest default risk.

    e.   "I want a decent return and am willing to tolerate some risk, but not too much risk."

This investor should buy the bond issued by General Electric, which is a bit riskier than the US Government bond, but less risky than the General Motors bond, and still pays a decent interest rate.

2.   Consider a closed economy in which GDP equals $15 billion, consumption equals $9 billion, government purchases equal $2 billion, and tax revenue equals $1 billion. Use this information to answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic):

    a.   What is investment equal to in this economy?

In a closed economy, net exports are zero, so that the national income accounting identity implies

$$Y = C + I + G \text{ or } I = Y - C - G.$$

Plugging in the numbers that are given yields

$$I = \$15 \text{ billion} - \$9 \text{ billion} - \$2 \text{ billion} = \$4 \text{ billion}.$$

    b.   What is national saving equal to in this economy?

In a closed economy, national savings equals $Y - C - G$, which, as shown above, also equals investment. The answer that national saving equals $4 billion therefore follows immediately.

    c.   What is public saving equal to in this economy?

Using

$$\text{National Saving} = S = I = Y - C - G = (Y - C - T) + (T - G) = \text{Private Saving} + \text{Public Saving}$$

one can use the numbers that are given to calculate

$$\text{Public Saving} = T - G = \$1 \text{ billion} - \$2 \text{ billion} = -\$1 \text{ billion}.$$

Public saving is negative because the government is running a budget deficit.

    d.   What is private saving equal to in this economy?

Again, plugging in the numbers that are given,

Private Saving = $Y - C - T$ = $15 billion - $9 billion - $1 billion = $5 billion.

    e.   What are net exports equal to in this economy?

In a closed economy, imports, exports, and net exports are always zero.

3.   Suppose that after the 2008 elections, the new President and Congress act to cut government spending and, by doing so, eliminate the current federal government budget deficit.

    a.   Does this change in policy shift the demand curve or the supply curve in the market for loanable funds?

This change in policy increases public saving, by making public saving zero instead of negative. Since saving relates to the supply of loanable funds, the supply curve for loanable funds shifts.

    b.   Use a supply-and-demand diagram for loanable funds to show in which direction the relevant curve shifts.

The graph should show the supply curve for loanable funds shifting to the right: there are more funds supplied at any given interest rate.

    c.   Does the interest rate rise or fall as a result of this change in policy?

The interest rate falls.

    d.   What happens to private investment as a result of this change in policy?

The equilibrium quantity of loanable funds increases, and so does investment. Another way to describe this is to say that as the interest rate falls, households buy more new houses and firms buy more new capital equipment so that, again, private investment rises.

    e.   What effect would this policy have on the productivity of US workers?

Private investment adds to the stock of physical capital and thereby raises the productivity of US workers.

4.   Suppose that you are the CEO of a large corporation, and one of your vice presidents finds an investment project that costs $100 million today, but promises to pay off $200 million 7 years from now.

    a.   Write down a formula for the present value of the $200 million that your firm stands to receive from the project 7 years from now, assuming that the interest rate is 10 percent per year (*note:* all you need to do for this part is to write down the formula, since actually

computing the numerical value of this present value isn't possible without the help of a calculator).

Present value of $200 million received 7 years from now = ($200 million)/(1+0.10)^7

b. Suppose the present value from part (a) turns out to be greater than $100 million. Should you use your corporation's funds to undertake the project?

Yes.

c. Suppose that the interest rate falls to 5 percent per year between the time that the vice president alerts you to the project and the time at which you actually have to make the decision of whether to undertake the project. Would that change the answer that you gave in part (b) above: yes, no, or maybe?

No, the answer will not change. If the interest rate falls, the present value will go up even more. If the project deserves to be funded at the 10 percent interest rate, it will also deserve to be funded at the lower interest rate.

5. Legend has it that Peter Minuit, a Dutch official working in the colony of New Netherland, which stretched along the Northeast US coastline from what is now Rhode Island down to what is now New Jersey, purchased the island of Manhattan from a group of Native Americans 382 years ago, in 1626, for the equivalent of $24. Assuming that those $24 were invested at an interest rate of 7 percent per year, write down a formula that shows how much money the Native American sellers would have today, if they took advantage of compounding by leaving all of the money in the bank, earning interest over time on the previous years' interest payments as well as the original amount deposited (*note:* again, all you need to do here is to write down the formula, since actually computing the numerical value isn't possible without the help of a calculator).

Future Value in 382 Years of $24 received Today (i.e., in 1626) = $24 x (1+0.07)^{382}

6. Please answer these short-answer questions:

a. Some insurance company executives worry that once a driver buys automobile insurance, he or she will become a less careful driver, more likely to have an accident. Are they describing the problem of *adverse selection* or the problem of *moral hazard*?

Moral hazard.

b. Some insurance company executives worry that drivers who tend to drive less carefully are more likely to buy automobile insurance than drivers who tend to drive more safely. Are they describing the problem of *adverse selection* or the problem of *moral hazard*?

Adverse selection.

    c.   Some investment advisors argue that stock prices tend to move randomly and are impossible to predict. Do these advisors believe in the *efficient markets hypothesis* or in *market irrationality*?

The efficient markets hypothesis.

    d.   Some investment advisors argue that waves of optimism or pessimism can push stock prices above or below their true intrinsic values, and that savers can profit by buying undervalued stocks. Do these advisors believe in the *efficient markets hypothesis* or in *market irrationality*?

Market irrationality.

    e.   Some investment advisors point out that when a firm's future prospects improve, the price of that firm's stock usually rises right away, when the news is released, and not later on, when the firm's profits actually do improve. Does this fact support the *efficient markets hypothesis* or the theory of *market irrationality?*

The efficient markets hypothesis.

7.   Consider a very simple economy in which there are only 20 people of age 16 or over. Eight are working at jobs, two do not have jobs but are actively looking, six are full-time students who are not looking for jobs and have not done so at any time in the past month, and four are retired people who are not looking for jobs and have not done so at any time in the past month. Using the same definitions employed by the Bureau of Labor Statistics, please answer the following questions (*note:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic).

    a.   How large is the labor force in this economy?

The labor force consists of ten people: the eight people who are employed and the two people that are unemployed, that is, who don't have jobs but are actively looking.

    b.   What is the unemployment rate?

    Unemployment Rate = (Unemployed Workers)/(Labor Force) x 100 = (2/10)x100 = 20%

    c.   What is the labor force participation rate?

  Labor Force Participation Rate = (Labor Force)/(Total Adult Population) x 100 = (10/20)x100 = 50%

8.   Consider each of the following labor-market developments. In each case, indicate whether the event raises or lowers the natural rate of unemployment, and whether that effect arises because of a change in the amount of frictional unemployment or because of a change in the amount of structural unemployment.

     a. More firms start paying "efficiency wages."

This increases the natural rate of unemployment by increasing the amount of structural unemployment.

     b. The internet makes it easier for firms to advertise their job openings and for unemployed workers to find job openings.

This decreases the natural rate of unemployment by decreasing the amount of frictional unemployment.

     c. Labor unions successfully organize workers in new industries.

This increases the natural rate of unemployment by increasing the amount of structural unemployment.

     d. More and more consumers switch from Dell and Hewlett-Packard's laptop computers, and buy Apple's instead.

This increases the natural rate of unemployment by increasing the amount of frictional unemployment.

     e. Government training programs help unemployed people who lost their jobs in declining industries to acquire new skills.

This decreases the natural rate of unemployment by decreasing the amount of frictional unemployment.

9. Draw a supply-and-demand diagram for the labor market to show what happens when the government sets the minimum wage above the equilibrium wage; then use that diagram to answer the following questions:

Please see the diagram on the next page.

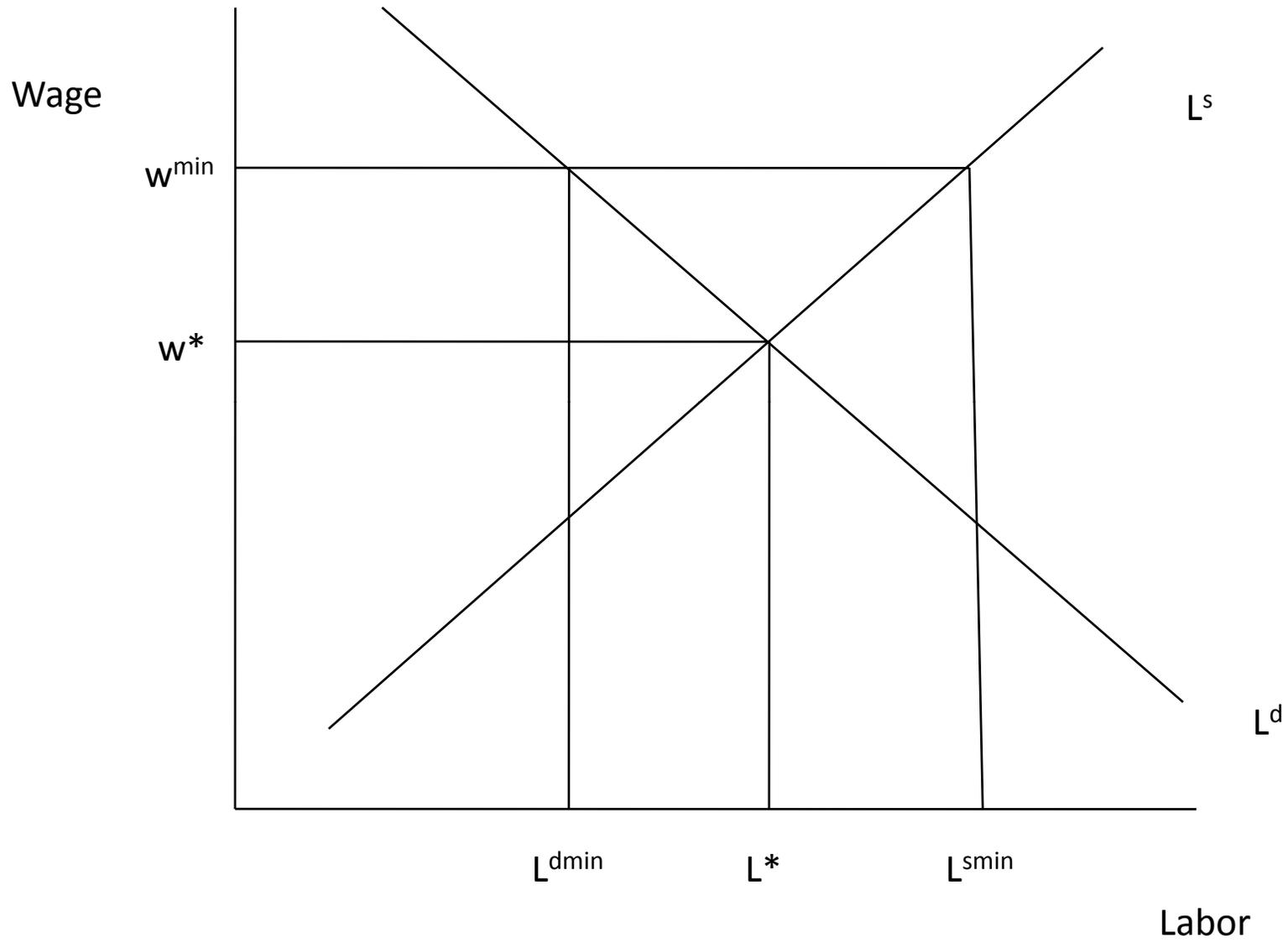   a. What happens to the wages paid to workers who remain employed?

The wage rises from w* to w^{min}.

     b. What happens to the number of workers who are actually employed?

Employment falls from L* to L^{dmin}.

     c. What happens to the number of workers who would like to work at the prevailing wage?

The number of workers who would like to work rises from L* to L^{smin}.

d. What happens to the number of workers who would be classified by the Bureau of Labor Statistics as unemployed?

The number of workers who would be classified as unemployed rises from zero to $L^{smin} - L^{dmin}$.

10. Consider an economy in which the following assets are available:

Asset	Dollar Value Outstanding
Currency	$7
Demand Deposits	$3
Savings Deposits	$20
Money Market Mutual Funds	$8
Time Deposits (Certificates of Deposit)	$11
Short Term Government Bonds	$21
Stock Market Mutual Funds	$50

a. What is the value of M1 for this economy? (*Notes:* if you show your calculations and use the correct formulas, we can give you partial credit even if you make a mistake with the arithmetic. Also, please assume that if a particular asset from the actual US economy is not shown above, then there is none of that asset available in this economy.)

M1 = Currency + Demand Deposits = $7 + $3 = $10.

b. What is the value of M2 for this economy?

M2 = M1 + Savings Deposits + Money Market Mutual Funds + Time Deposits = $10 + $20 + $8 + $11 = $49.

11. Consider an economy in which, initially, there are no banks. Suppose that one consumer initially holds the economy's entire money supply, in the form of $100 in currency. Then a new bank – call it the First National Bank – opens, and the consumer deposits the entire $100.

a. Assuming that the First National Bank has a 100 percent reserve ratio, use a T-account to show what effect this deposit has on the Bank's balance sheet.

First National Bank

Assets	Liabilities
Reserves $100	Deposits $100

b. Still assuming a 100 percent reserve ratio, explain what effect this deposit will have on the economy's total money supply.

With a 100 percent reserve ratio, the deposit has no effect on the total money supply, it simply means that the money supply is held in the form of deposits instead of currency.

    c.   Show how the First National Bank's T-account will look if, instead, it chooses a 10 percent reserve ratio.

First National Bank

Assets	Liabilities
Reserves $10 Loans $90	Deposits $100

    d.   Assuming that many other banks open up, all choosing the same 10 percent reserve ratio, and assuming that every consumer now chooses to hold all of his or her money as deposits instead of currency, explain what effect the initial deposit will eventually have on the total money supply.

Under these assumptions, banks will end up with $100 in reserves and the money multiplier will equal 10. The total money supply will equal $1000.

    e.   Are consumers as a group wealthier when the banking system chooses a 10 percent reserve ratio?

No. Before the fractional banking system opens, one consumer held $100 in currency. After the fractional banking system opens, consumers as a group hold $1000 in deposits, but also owe $900 to the banks; their wealth remains equal to $100. In other words, consumers as a group are more liquid but not more wealthy.

12. Suppose that the Federal Reserve conducts an open market operation in which it purchases $10 million in US Government bonds.

    a.   Will this open market operation increase or decrease the money supply?

Since the Fed is purchasing the US Government bonds with "newly printed money," the open market operation will increase the money supply.

    b.   If there were no banks in the US economy, by how much will the money supply change?

If there were no banks in the US economy, the change in the money supply would consist entirely of a change in currency and the money supply would increase by $10 million.

    c.   Given that there are banks in the US economy, is the actual change in the money supply likely to be larger or small than the answer you gave in part (a) above?

With banks, at least some of the additional $10 million will be deposited and, because of the money multiplier, the money supply will increase by even more than $10 million.

Economics 132.03

Principles of Macroeconomics

Spring 2008

Professor Peter Ireland

Final Exam

This exam has 12 questions on 5 pages; before you begin, please check to make sure that your copy has all 12 questions and all 5 pages. Each of the 12 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. Suppose that the Federal Reserve conducts monetary policy by setting a target for the federal funds rate.

    a. If the Federal Reserve wants to lower its federal funds rate target, should it conduct an open market operation in which it purchases government bonds or an open market operation in which it sells government bonds?
    b. Assuming that households and firms hold at least some of their money in the form of deposits instead of currency, will this open market operation work to increase or decrease the quantity of reserves held by banks?
    c. Will the money supply increase or decrease?
    d. According to liquidity preference theory, which assumes that the economy-wide price level is held fixed, will this change in the money supply cause other interest rates in the economy to rise or fall?
    e. Continuing to assume that the economy-wide price level is held fixed, will this change in interest rates work to increase or decrease the aggregate demand for goods and services?

2. This question asks you to use supply and demand analysis applied to the market for money to consider the long-run effects of an increase in the money supply.

   a. To begin, draw a diagram with the quantity of money measured in dollars on the x-axis and the "goods price of money" measured as 1/P, where P is the economy-wide price level, on the y-axis. Then draw in a demand curve for money.
   b. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.
   c. Show what happens in the graph when the Federal Reserve acts to increase the money supply to a new, higher level M**.
   d. What happens to the price level P as a result of this increase in the money supply?

3. Assume throughout this next question that the velocity of money is constant and that the Federal Reserve can control the money supply directly.

   a. If real GDP is constant and the Federal Reserve wants the price level to stay constant, what should it do with the money supply?
   b. If real GDP is constant and the Federal Reserve wants the inflation rate to be 5 percent per year, what should it do with the money supply?
   c. If real GDP is growing at 5 percent per year and the Federal Reserve is holding the money supply constant, what is the inflation rate?
   d. If real GDP is growing at 5 percent per year and the Federal Reserve wants the price level to stay constant, what should it do with the money supply?
   e. If real GDP is growing at 5 percent per year and the Federal Reserve wants the inflation rate to be 5 percent per year, what should it do with the money supply?

4. For each part of this question, please indicate whether the fact explains why, in the aggregate demand/aggregate supply diagram: (i) the aggregate demand curve slopes down, (ii) the long-run aggregate supply curve is vertical, or (iii) the short-run aggregate supply curve slopes up.

   a. In the long run, "money is neutral."
   b. Firms and workers often reach agreements under which nominal wages are "sticky" for periods as long as one or two years.
   c. When the price level rises, the real value of savers' monetary wealth declines.
   d. Some firms face "menu costs" that cause them to change their output prices infrequently.
   e. When the price level falls, the real value of savers' monetary wealth rises.

5. For each part of this question, please indicate whether the economic event works **initially (that is, in the short run)** to shift the (i) aggregate demand curve, (ii) the short-run aggregate supply curve, (iii) the long-run aggregate supply curve, or (iv) both the short-run and long-run aggregate supply curves.

    a. The Federal Reserve increases the money supply.
    b. The US experiences a wave of immigration.
    c. Workers become more concerned about inflation (that is, the expected price level goes up) and are able to bargain for higher wages from their employers.
    d. Firms become more confident about future economic prospects.
    e. Congress and the President pass a fiscal stimulus bill that increases government spending.

6. Suppose that the economy starts in a long-run equilibrium.

    a. Draw the aggregate demand/aggregate supply diagram to illustrate this initial state of the economy, showing the aggregate demand curve together with both the short-run and the long-run aggregate supply curves.
    b. Now suppose that stock (equity) prices begin to rise much more rapidly than expected. Use the diagram to show what happens to output and the price level in the short run.
    c. What should the Federal Reserve do in response to the stock market boom if it wants to stabilize output and prices?
    d. Suppose, instead, that there are no changes in monetary or fiscal policy. If the stock market boom turns out to be temporary, so that equity prices soon return to their previous levels, what will happen in the diagram to bring output back to its natural rate? What happens to the price level as a result?
    e. If there are no changes in monetary or fiscal policy, but the rise in stock prices turns out to be permanent, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in this case?

7. This question asks you to use liquidity preference theory to show what might happen to the economy during the Christmas shopping season, when consumers demand more money.

    a. To begin draw a diagram with the quantity of money, measured in dollars, on the x-axis and the interest rate on the y-axis. Then draw in a demand curve for money.
    b. What is being assumed about the price level in this diagram? Which interest rate – the real or the nominal – is being measured along the y-axis?
    c. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.
    d. Now suppose that heading into the holiday shopping season, consumers demand more money at any given interest rate. What happens to the demand curve for money in the diagram? What happens to the interest rate?
    e. If the Federal Reserve does not want the interest rate to change because of consumers' increased demand for money, what should it do to the money supply?

8. Suppose the economy starts in a long-run equilibrium in which the actual unemployment rate equals the natural unemployment rate U* and the actual and expected inflation rate both equal Π*.

   a. Use a diagram showing both the short-run and long-run Phillips curves to illustrate this initial equilibrium. Label the point that corresponds to this initial equilibrium as point A in this diagram.
   b. Now suppose that the Federal Reserve acts deliberately to lower the rate of inflation, as it did under new Chairman Paul Volcker in 1979. What happen to inflation and unemployment in the short run? Label the point that depicts these short-run effects as point B in the diagram.
   c. Suppose that the Federal Reserve keeps inflation at a permanently lower level, even in the long run, after the unemployment rate returns to its natural rate U*, so that the actual and expected inflation rate equals Π** < Π*. Label the point that depicts these long-run effects as point C in the diagram.
   d. What happens to the short-run Phillips curve as a result of this change in monetary policy?
   e. What happens to the long-run Phillips curve as a result of this change in monetary policy?

9. Assume throughout this next question that the economy's natural rate of unemployment stays constant at U*. On a single graph, draw a diagram with one long-run Phillips curve and two short-run Phillips curves that describe the four situations listed below. In each case, label the point in the graph that corresponds to each situation.

   a. Point A: actual inflation is 5 percent and expected inflation is 3 percent.
   b. Point B: actual inflation is 3 percent and expected inflation is 5 percent.
   c. Point C: actual inflation is 5 percent and expected inflation is 5 percent.
   d. Point D: actual inflation is 3 percent and expected inflation is 3 percent.

10. During the first week of May 2008, the nominal interest rate on 30-year fixed-rate mortgage loans as reported by the *Wall Street Journal* was 6 percent per year.

   a. Suppose that the inflation rate in the United States turns out to be 3 percent per year, on average, over the next 30 years. What will the real interest rate on these mortgage loans be in this case?
   b. Suppose that, instead, US inflation turns out to be 5 percent per year, on average, over the next 30 years. What will the real interest rate on mortgage loans be in this case?
   c. Who "wins," in the sense of being better off financially, if inflation turns out to be 5 percent instead of 3 percent: the households who take out new mortgage loans today at 6 percent, or the banks that make new mortgage loans today at 6 percent?

11. A salesperson offers you two possible deals on a new big-screen TV: (i) pay $1500 in cash today or (ii) buy on credit and pay $1700 two years from now. Having taken "Principles of Macroeconomics" this term, you know that in order to decide which deal to take, you need to check on interest rates first. So suppose that having done this, you already know that by keeping your money in the bank, you can earn interest at the rate of 6 percent per year for the next two years.

    a. Write down a formula for the present value of the $1700 that you would pay two years from now, assuming that you buy the TV on credit today (*note:* all you need to do is to write down the formula, since actually computing the numerical value of this present value isn't possible without the help of a calculator).
    b. Suppose that your present value from part (a) turns out to be *more* than the $1500 that you'd pay if you decide to buy the TV with cash today. What should you do: pay $1500 today or $1700 two years from now?

12. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

    $$Y = AF(L,K,H,N),$$

    where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

    a. What does it mean to say that holding the stock of knowledge fixed, the aggregate production function has the property of constant returns to scale?
    b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity (output per worker) depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.
    c. The British economist Thomas Robert Malthus (1766-1834) famously predicted that because natural resources are limited, population growth would inevitably lead to declining standards of living, perhaps to the point that societies are doomed to suffer from chronic poverty. Explain *briefly* (no more than a sentence or two), how Malthus' reasoning is reflected in your equation from part (b) above.
    d. Thankfully, Malthus' prediction has proven to be far too pessimistic; instead of declining towards poverty, living standards in many countries around the world have grown enormously over the past 200 years. According to your equation from part (b) above, what economic factors allow for rising productivity and living standards, even as supplies of natural resources dwindle over time?

Economics 132.03

Principles of Macroeconomics

Spring 2008

Professor Peter Ireland

http://www2.bc.edu/~irelandp/ec132.html

Solutions to Final Exam

This exam has 12 questions on 5 pages; before you begin, please check to make sure that your copy has all 12 questions and all 5 pages. Each of the 12 questions will receive equal weight in determining your overall exam score. You can work on the questions in any order, but please be sure to keep your answers to all of the parts of a specific question together in your exam book.

1. Suppose that the Federal Reserve conducts monetary policy by setting a target for the federal funds rate.

    a. If the Federal Reserve wants to lower its federal funds rate target, should it conduct an open market operation in which it purchases government bonds or an open market operation in which it sells government bonds?

The Fed should conduct an open market operation in which it purchases government bonds.

    b. Assuming that households and firms hold at least some of their money in the form of deposits instead of currency, will this open market operation work to increase or decrease the quantity of reserves held by banks?

It will increase the quantity of reserves held by banks.

    c. Will the money supply increase or decrease?

The money supply will increase.

    d. According to liquidity preference theory, which assumes that the economy-wide price level is held fixed, will this change in the money supply cause other interest rates in the economy to rise or fall?

It will cause other interest rates to fall.

e. Continuing to assume that the economy-wide price level is held fixed, will this change in interest rates work to increase or decrease the aggregate demand for goods and services?

It will work to increase the aggregate demand for goods and services.

2. This question asks you to use supply and demand analysis applied to the market for money to consider the long-run effects of an increase in the money supply.

a. To begin, draw a diagram with the quantity of money measured in dollars on the x-axis and the "goods price of money" measured as 1/P, where P is the economy-wide price level, on the y-axis. Then draw in a demand curve for money.

In this graph, the money demand curve slopes downward.

b. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.

The money supply curve should be vertical at the point M* along the x-axis.

c. Show what happens in the graph when the Federal Reserve acts to increase the money supply to a new, higher level M**.

The vertical money supply curve shifts to the right.

d. What happens to the price level P as a result of this increase in the money supply?

The goods price of money 1/P falls, so the price level P rises.

3. Assume throughout this next question that the velocity of money is constant and that the Federal Reserve can control the money supply directly.

a. If real GDP is constant and the Federal Reserve wants the price level to stay constant, what should it do with the money supply?

M x V = P x Y. V and Y are both constant. So to keep the price level constant, the Fed should hold the money supply constant.

b. If real GDP is constant and the Federal Reserve wants the inflation rate to be 5 percent per year, what should it do with the money supply?

With V and Y still constant, if the Fed wants P to increase at a rate of 5 percent per year, it should increase the money supply at the same rate of 5 percent per year.

c. If real GDP is growing at 5 percent per year and the Federal Reserve is holding the money supply constant, what is the inflation rate?

Now V and M are constant, but Y is rising at 5 percent per year. So the inflation rate is -5 percent per year.

    d. If real GDP is growing at 5 percent per year and the Federal Reserve wants the price level to stay constant, what should it do with the money supply?

If V is constant and Y is growing at 5 percent per year, the Fed should increase the money supply at the rate of 5 percent per year to keep the price level constant.

    e. If real GDP is growing at 5 percent per year and the Federal Reserve wants the inflation rate to be 5 percent per year, what should it do with the money supply?

If V is constant and Y is growing at 5 percent per year, the Fed should increase the money supply by 10 percent per year to make inflation equal to 5 percent per year.

4. For each part of this question, please indicate whether the fact explains why, in the aggregate demand/aggregate supply diagram: (i) the aggregate demand curve slopes down, (ii) the long-run aggregate supply curve is vertical, or (iii) the short-run aggregate supply curve slopes up.

    a. In the long run, "money is neutral."

This fact explains why the long-run aggregate supply curve is vertical.

    b. Firms and workers often reach agreements under which nominal wages are "sticky" for periods as long as one or two years.

This fact explains why the short-run aggregate supply curve slopes up.

    c. When the price level rises, the real value of savers' monetary wealth declines.

This fact explains why the aggregate demand curve slopes down.

    d. Some firms face "menu costs" that cause them to change their output prices infrequently.

This fact explains why the short-run aggregate supply curve slopes up.

    e. When the price level falls, the real value of savers' monetary wealth rises.

This fact explains why the aggregate demand curve slopes down.

5. For each part of this question, please indicate whether the economic event works **initially (that is, in the short run)** to shift the (i) aggregate demand curve, (ii) the short-run aggregate supply curve, (iii) the long-run aggregate supply curve, or (iv) both the short-run and long-run aggregate supply curves.

    a. The Federal Reserve increases the money supply.

An increase in the money supply shifts the aggregate demand curve.

   b.   The US experiences a wave of immigration.

A wave of immigration changes the natural rate of output, and shifts both the short-run and the long-run aggregate supply curves.

   c.   Workers become more concerned about inflation (that is, the expected price level goes up) and are able to bargain for higher wages from their employers.

An increase in the expected price level shifts the short-run aggregate supply curve.

   d.   Firms become more confident about future economic prospects.

When firm's become more confident about future economic prospects, they invest more at any given price level, shifting the aggregate demand curve.

   e.   Congress and the President pass a fiscal stimulus bill that increases government spending.

When government spending increases, the aggregate demand curve shifts.

6.   Suppose that the economy starts in a long-run equilibrium.

   a.   Draw the aggregate demand/aggregate supply diagram to illustrate this initial state of the economy, showing the aggregate demand curve together with both the short-run and the long-run aggregate supply curves.

(i) The aggregate demand curve should slope down, (ii) the short-run aggregate supply curve should slope up, (iii) the long-run aggregate supply curve should be vertical, and (iv) all three curves should intersect at the point at which output Y equals its natural rate Y*.

   b.   Now suppose that stock (equity) prices begin to rise much more rapidly than expected. Use the diagram to show what happens to output and the price level in the short run.

(i) The aggregate demand curve shifts to the right, (ii) output rises above the natural rate, and (iii) the price level rises above its initial level.

   c.   What should the Federal Reserve do in response to the stock market boom if it wants to stabilize output and prices?

It should decrease the money supply (or increase its federal funds rate target) in order to shift the aggregate demand curve back to the left.

   d.   Suppose, instead, that there are no changes in monetary or fiscal policy. If the stock market boom turns out to be temporary, so that equity prices soon return to their previous levels, what will happen in the diagram to bring output back to its natural rate? What happens to the price level as a result?

(i) The aggregate demand curve will shift back to its original position and (ii) the price level will fall back to its initial level.

    e. If there are no changes in monetary or fiscal policy, but the rise in stock prices turns out to be permanent, what will happen in the diagram to bring output back to its natural rate? What happens to the price level in this case?

(i) The expected price level will rise, shifting the short-run aggregate supply curve to the left, and (ii) the price level will increase still further and remain above its initial level.

7. This question asks you to use liquidity preference theory to show what might happen to the economy during the Christmas shopping season, when consumers demand more money.

    a. To begin draw a diagram with the quantity of money, measured in dollars, on the x-axis and the interest rate on the y-axis. Then draw in a demand curve for money.

The demand curve for money should slope downward.

    b. What is being assumed about the price level in this diagram? Which interest rate – the real or the nominal – is being measured along the y-axis?

(i) The price level is being held fixed, so (ii) the interest rate being measured along the y-axis is both the real interest rate and the nominal interest rate.

    c. Assuming for simplicity that the Federal Reserve is able to fix the money supply at some initial level M*, draw in the supply curve for money.

The supply curve for money should be vertical at the point M* along the x-axis.

    d. Now suppose that heading into the holiday shopping season, consumers demand more money at any given interest rate. What happens to the demand curve for money in the diagram? What happens to the interest rate?

(i) The money demand curve shifts to the right and (ii) the interest rate rises.

    e. If the Federal Reserve does not want the interest rate to change because of consumers' increased demand for money, what should it do to the money supply?

It should increase the money supply in order to shift the money supply curve to the right.

8. Suppose the economy starts in a long-run equilibrium in which the actual unemployment rate equals the natural unemployment rate U* and the actual and expected inflation rate both equal Π*.

a. Use a diagram showing both the short-run and long-run Phillips curves to illustrate this initial equilibrium. Label the point that corresponds to this initial equilibrium as point A in this diagram.

(i) The short-run Phillips curve slopes down, (ii) the long-run Phillips curve is vertical at the point U* along the x-axis, and (iii) the short-run and long-run Phillips curves intersect at the point A, where unemployment equals U* and inflation equals Π*.

b. Now suppose that the Federal Reserve acts deliberately to lower the rate of inflation, as it did under new Chairman Paul Volcker in 1979. What happen to inflation and unemployment in the short run? Label the point that depicts these short-run effects as point B in the diagram.

(i) Inflation falls below Π* and (ii) unemployment rises above U* as (ii) the economy moves to point B, down along the short-run Phillips curve and away from the long-run Phillips curve.

c. Suppose that the Federal Reserve keeps inflation at a permanently lower level, even in the long run, after the unemployment rate returns to its natural rate U*, so that the actual and expected inflation rate equals Π** < Π*. Label the point that depicts these long-run effects as point C in the diagram.

Point C should lie on the long-run Phillips curve at a point that is below the initial equilibrium point A, since unemployment is back at the natural rate but inflation is lower.

d. What happens to the short-run Phillips curve as a result of this change in monetary policy?

The short-run Phillips curve will shift downward because expected inflation has declined.

e. What happens to the long-run Phillips curve as a result of this change in monetary policy?

The long-run Phillips curve stays fixed because the natural rate of unemployment remains unchanged.

9. Assume throughout this next question that the economy's natural rate of unemployment stays constant at U*. On a single graph, draw a diagram with one long-run Phillips curve and two short-run Phillips curves that describe the four situations listed below. In each case, label the point in the graph that corresponds to each situation.

The graph should show one vertical long-run Phillips curves and two short-run Phillips curves, both of which intersect the long-run Phillips curve at the natural rate of unemployment U*. See figure 1 from the solutions to Problem Set 10 – this question is exactly the same as question 1 from that assignment.

a. Point A: actual inflation is 5 percent and expected inflation is 3 percent.

Point A should lie along the lower short-run Phillips curve at a point to the left of the long-run Phillips curve.

    b. Point B: actual inflation is 3 percent and expected inflation is 5 percent.

Point B should lie along the higher short-run Phillips curve at a point that is to the right of the long-run Phillips curve.

    c. Point C: actual inflation is 5 percent and expected inflation is 5 percent.

Point C should lie along the higher short-run Phillips curve at the point that it intersects with the long-run Phillips curve.

    d. Point D: actual inflation is 3 percent and expected inflation is 3 percent.

Point D should lie along the lower short-run Phillips curve at the point that it intersects with the long-run Phillips curve.

10. During the first week of May 2008, the nominal interest rate on 30-year fixed-rate mortgage loans as reported by the *Wall Street Journal* was 6 percent per year.

    a. Suppose that the inflation rate in the United States turns out to be 3 percent per year, on average, over the next 30 years. What will the real interest rate on these mortgage loans be in this case?

With a 6 percent nominal interest rate and 3 percent inflation, the real interest rate equals 3 percent per year.

    b. Suppose that, instead, US inflation turns out to be 5 percent per year, on average, over the next 30 years. What will the real interest rate on mortgage loans be in this case?

With a 6 percent nominal interest rate and 5 percent inflation, the real interest rate equals 1 percent per year.

    c. Who "wins," in the sense of being better off financially, if inflation turns out to be 5 percent instead of 3 percent: the households who take out new mortgage loans today at 6 percent, or the banks that make new mortgage loans today at 6 percent?

The real interest rate is the most relevant measure of the true cost of borrowing and the true benefit of lending. Since the higher inflation rate implies a lower real interest rate, households win and banks lose in that case.

11. A salesperson offers you two possible deals on a new big-screen TV: (i) pay $1500 in cash today or (ii) buy on credit and pay $1700 two years from now. Having taken "Principles of Macroeconomics" this term, you know that in order to decide which deal to take, you need to check on interest rates first. So suppose that having done this, you already know that by keeping your money in the bank, you can earn interest at the rate of 6 percent per year for the next two years.

a. Write down a formula for the present value of the $1700 that you would pay two years from now, assuming that you buy the TV on credit today (*note:* all you need to do is to write down the formula, since actually computing the numerical value of this present value isn't possible without the help of a calculator).

Present value of $1700 paid two years from now = $1700/(1+0.06)^2.

b. Suppose that your present value from part (a) turns out to be *less* than the $1500 that you'd pay if you decide to buy the TV with cash today. What should you do: pay $1500 today or $1700 two years from now?

Pay $1500 today.

12. Macroeconomists sometimes think about the determinants of a nation's standard of living with the help of an "aggregate production function" such as

$$Y = AF(L,K,H,N),$$

where Y denotes real GDP, L the number of workers, K the stock of physical capital, H the stock of human capital, N the stock of natural resources, and A the stock of technological knowledge.

a. What does it mean to say that holding the stock of knowledge fixed, the aggregate production function has the property of constant returns to scale?

Constant returns to scale means that holding A fixed, doubling L, K, H, and N leads to a doubling of output. Mathematically,

$$2Y = AF(2L,2K,2H,2N)$$

or, more generally, for any multiple or fraction x,

$$xY = AF(xL,xK,xH,xN).$$

b. Assuming that this aggregate production function has this property of constant returns to scale, rewrite the equation from above as one that shows how productivity (output per worker) depends on four determinants: physical capital per worker, human capital per worker, natural resources per worker, and the stock of technological knowledge.

Choosing x = 1/L in the last expression from above:

$$Y/L = AF(1,K/L,H/L,N/L).$$

c. The British economist Thomas Robert Malthus (1766-1834) famously predicted that because natural resources are limited, population growth would inevitably lead to declining standards of living, perhaps to the point that societies are doomed to suffer from chronic poverty. Explain *briefly* (no more than a sentence or two), how Malthus' reasoning is reflected in your equation from part (b) above.

Malthus' idea was that with limited natural resources N, an increase in L would lead to a reduction in the stock of natural resources per worker, and hence to a lower level of productivity (output per worker).

  d. Thankfully, Malthus' prediction has proven to be far too pessimistic; instead of declining towards poverty, living standards in many countries around the world have grown enormously over the past 200 years. According to your equation from part (b) above, what economic factors allow for rising productivity and living standards, even as supplies of natural resources dwindle over time?

Malthus underestimated the possibility that increases in the stock of technological knowledge or in the stocks of physical and human capital per worker would more than offset dwindling supplies of natural resources.