Econ 002- INTRO MACRO Prof. Luca Bossi December 15, 2010
FINAL SUGGESTED SOLUTIONS

YOUR NAME: ______________________________________
YOUR PENN STUDENT NUMBER: ____________________________
YOUR R.I.’s NAME: _______________________________________

INSTRUCTIONS

The exam is closed book. It is composed of 40 multiple choice questions and three exercises. All multiple choice questions are worth 1.5 points (so the total is 60 points for the multiple choice part). The exercises are worth 10 or 15 points each (the total is 40 points for the exercise part).
ANSWER ALL QUESTIONS. TOTAL POINTS = 100. TOTAL TIME = 120 minutes

Provide your answers on the exam sheet directly.
Only the first five pages of the exam will be graded.
Read all questions very carefully. Write legibly.

EXAM TAKING POLICY

If you need to use the restroom, or you need a pencil or scratch paper, or some other supply that we might have, raise you hand and wait for the proctor to come to you. Only one person can be out of the examination room at a time, and the proctor will hold onto your exam papers while you are out at the restroom.
NO CELL PHONES. NO IPODS OR SIMILAR DEVICES WITH CALCULATOR “APPS”. YOU CANNOT CONNECT TO THE INTERNET. USE A UPENN APPROVED CALCULATOR. NO BOOKS. NO NOTES. NO HELP SHEETS. NO TALKING TO EACH OTHER. NO ASKING THE PROCTORS ANY QUESTIONS ABOUT THE EXAM. WRITE IN PENCIL OR IN PEN AS YOU LIKE, BUT IF YOU WRITE IN PENCIL THERE IS NO POSSIBILITY TO ASK FOR RE-GRADING.

PLEASE WRITE YOUR NAME ON EVERY SINGLE PAGE OF THE EXAM
PLEASE RETURN THE EXAM SPECIFICALLY TO YOUR R.I. WHEN YOU ARE DONE
PLEASE DO NOT START THIS EXAM UNTIL INSTRUCTED TO DO SO.

GOOD LUCK!
EXERCISE I

CHOOSE EITHER PART I-A OR I-B AND ANSWER ONE OF THESE QUESTIONS ONLY. BELOW YOU MUST DECLARE EXPLICITLY WHICH QUESTION YOU ARE SOLVING AND WANT TO CONSIDER FOR GRADING. IF YOU SOLVE BOTH I-A AND I-B YOU WILL NOT GET EXTRA CREDITS. IF YOU DO NOT DECLARE WHICH QUESTION YOU ARE SOLVING YOUR WORST QUESTION WILL BE GRADED.

I DECLARE THAT THE QUESTION I WANT TO BE GRADED IS ➔

I-A

(10 points) Fill in the table below with the direction of the change in the variables listed in the first row in response to the events in the first column. Your answer can only be one of the three following choices (just one for each cell): rises, falls or no change. No other answer can be accepted. Please write clearly.

<table>
<thead>
<tr>
<th>U.S. real interest rate</th>
<th>U.S. domestic investment</th>
<th>U.S. net capital outflow</th>
<th>U.S. real exchange rate of domestic currency</th>
<th>U.S. trade balance</th>
</tr>
</thead>
</table>

If the U.S. government budget deficit increases

If the U.S. imposes import quotas

If capital flight from the U.S.
Consider the following information about the JerseyShoreland economy.

\[ C = 300 + 0.5Y - 200r \]
\[ I = 200 - 300r \]
\[ G = 100 \]
\[ NX = 150 - 0.1Y - 0.5e \]

You know that the relationship between the real exchange rate and the real interest rate is given by:

\[ e = 20 + 600r \]

Y = 900

a) (5 points) What are equilibrium values of real interest rate, real exchange rate then?

Substituting everything in and reducing:

\[ 0.6*Y = 750 - 500r - 0.5e \]

Using Y=900

\[ 0.6*900 = 750 - 500r - 0.5e \]
\[ -210 = -500r - 0.5e \]

and using the relationship between e and r, we solve

\[ -210 = -500r - 0.5*(20 + 600r) \]
\[ -200 = -800r \]

and get \( r = 0.25 \), \( e = 170 \).

b) (5 points) Suppose that \( r \) can be affected by the government by adjusting government spending. What must government spending be for
the real exchange rate to be 140? Does consumption and investment increase or decrease with respect to part a) as a result?
With e = 140, r must be 0.2. You know this from the relationship between the real exchange rate and the real interest rate is given by e = 20 + 600r
Using Y = C+I+G+NX and setting Y = 900, e = 140 and r = 0.2 solving for G gives:
G = 60
So the government spends less to achieve r to 0.2. As a result, consumption and investment are increased.
Consumption Before (r = 0.25)
C = 300 + 0.5Y – 200r = 300 + 450 -50 = 700
After (r = 0.2)
C = 300 + 0.5Y – 200r = 300 + 450 -40 = 710
Investment before (r = 0.25)
I = 200 – 300r = 125
Investment After (r = 0.2)
I = 200 – 300r = 140

EXERCISE II
You have the following data from the country of Farmland:

<table>
<thead>
<tr>
<th></th>
<th>Price of Apples</th>
<th>Quantity of Apples</th>
<th>Price of Oranges</th>
<th>Quantity of Oranges</th>
<th>Price of Cars</th>
<th>Quantity of Cars</th>
<th>Price of Olives</th>
<th>Quantity of Olives</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2009</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>12</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

This country produces Apples, Oranges and Cars. They consume all the fruits that they produce but they do not consume any car, in fact, they export every year all the cars that they produce. Moreover, the habitants of this country love to eat olives but, as they cannot produce them, they need to import them from overseas.

a) (5 points) Show all the general formulae that you need to use and complete the following table:

<table>
<thead>
<tr>
<th></th>
<th>Real GDP</th>
<th>Nominal GDP</th>
<th>Deflator</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) (5 points) Show all the general formulae that you need to use and complete the following table:

<table>
<thead>
<tr>
<th></th>
<th>Cost of the basket</th>
<th>CPI</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
c) (5 points) The money demand of the country is given by: \( M^d = 300 \times P^2 \). Show all the general formulae that you need to use and complete the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Money Demand using CPI</th>
<th>Money Demand using Deflator</th>
<th>% Increase/Decrease in a given year from CPI to Deflator</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Only produced goods: Apples, Oranges and Cars

<table>
<thead>
<tr>
<th>Year</th>
<th>Real GDP</th>
<th>Nominal GDP</th>
<th>Deflator</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>28</td>
<td>28</td>
<td>100</td>
<td>NA</td>
</tr>
<tr>
<td>2009</td>
<td>50</td>
<td>60</td>
<td>120</td>
<td>20%</td>
</tr>
<tr>
<td>2010</td>
<td>47</td>
<td>86</td>
<td>182.9787234</td>
<td>52%</td>
</tr>
</tbody>
</table>

Only Consumed goods: Olives, Oranges and Apples

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of the basket</th>
<th>CPI</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>5</td>
<td>100</td>
<td>NA</td>
</tr>
<tr>
<td>2009</td>
<td>8</td>
<td>160</td>
<td>60%</td>
</tr>
<tr>
<td>2010</td>
<td>14</td>
<td>280</td>
<td>75%</td>
</tr>
</tbody>
</table>

EXERCISE III

Consider the Solow model we have seen and studied in class.

Assume that the production function is given by the Cobb-Douglas expression

\[ Y_t = AK_t^\alpha L_t^{1-\alpha} \]

a) (5 points) Write down the 5 basic equations that characterize the Solow model. Show your work.

a) The five equations are

1) \( Y_t = AK_t^\alpha L_t^{1-\alpha} \)
2) \( S_t = sY_t \)
3) \( I_t = S_t \)
Now recall that the fundamental equation of the Solow model can be written as:

\[ k_{t+1}(1 + n) = s_t + (1 - d)k_t \]

Where:
- \( k_{t+1} \) = future physical capital per person
- \( n \) = population growth rate
- \( s_t \) = saving per capita (saving rate times the appropriate income)
- \( d \) = depreciation rate of capital
- \( k_t \) = current physical capital per person

A criticism that the Solow model is subject to is that there is no government in the model, whereas in reality there is always a government that imposes some tax. Suppose now we want to introduce a government in the Solow model. In particular, we assume all the production/income in the economy is taxed at a certain constant tax rate \( \Omega < 1 \). Households can save only after having paid taxes.

b) (2 points) Find the expression of the after tax output (income) in per person terms. Show your work.

b) After tax output per person is:

\[
\frac{(1 - \Omega)Y_t}{L_t} = \frac{(1 - \Omega)AK_t^{\alpha}L_t^{1-\alpha}}{L_t} = (1 - \Omega)A\left(\frac{K_t}{L_t}\right)^{1-\alpha}
\]

With the small caps convention the expression above becomes:

\[
(1 - \Omega)y_t = (1 - \Omega)A(K_t)^{1-\alpha}
\]

c) (3 points) Find the expression for the steady state level of physical capital per person when the government is introduced in the Solow model in this way. (Hint: you need to use the expression of output per person from part b) first, and then use the equation given above appropriately). Does the presence of taxation increase or decrease the steady state level of physical capital per person when compared to an economy without taxation? Show your work.

Using after tax output per person into the fundamental equation that was given to you:
\[ k_{t+1}(1 + n) = s(1 - \Omega)A(k_t)^\alpha + (1 - d)k_t \]

In steady state we know that:

\[ k_{t+1} = k_t = \bar{k} \]

Plug this into the fundamental equation to obtain:

\[ 0 = s(1 - \Omega)A(\bar{k})^\alpha - (n + d)\bar{k} \]

Solving for \( \bar{k} \):

\[ \bar{k} = \left( \frac{n + d}{s(1 - \Omega)A} \right)^{\frac{1}{\alpha - 1}} = \left( \frac{s(1 - \Omega)A}{n + d} \right)^{\frac{1}{1 - \alpha}} \]

d) (5 points) Now suppose that the government not only taxes as in the previous part of the exercise, but also offers productive government spending that enhances total production in the economy. Think of this as the services coming from the roads, general infrastructures, public schools, police, firemen etc.. This being the case, the new production function for our economy becomes:

\[ Y_t = A K_t^\alpha L_t^\beta G_t^{1 - \alpha - \beta} \]

with
\[
\begin{align*}
\alpha + \beta &< 1 \\
\alpha &> 0 \text{ and } \beta > 0.
\end{align*}
\]

And where \( G_t \) is government spending.

If the government is running a balanced budget every period, is it possible for taxes to be output enhancing? (Hint: Use the information given to express output as a function of taxes and draw your conclusions). Show your work.

If the government is running a balanced budget then
In order for the inequality to be satisfied, but this is never possible.

If you do not believe this simple argument and you want a mathematical proof, take logs of the inequality \((\Omega)^{\frac{1-\alpha-\beta}{\alpha+\beta}} > 1\)

But since you are told that \(\Omega < 1\) and \(1 > \alpha + \beta\), this is never possible.

WRITE THE LETTER OF YOUR CHOICE FOR THE MULTIPLE CHOICE QUESTIONS HERE; ONLY THIS THIS PAGE WILL BE GRADED FOR THE MC PART.

1) __________ 21) __________

2) __________ 22) __________

3) __________ 23) __________

4) __________ 24) __________

5) __________ 25) __________
MULTIPLE CHOICE QUESTIONS

1) The dictator of Turan has recently begun to arbitrarily seize farms belonging to his political opponents, and he has given the farms to his friends. His friends don't know much about farming. The courts in Turan have ruled that the seizures are illegal, but the dictator has ignored the rulings. Other things equal, we would expect that the growth rate in Turan will
   a. fall temporarily, but will return to where it was when the new owners learn how to farm.
   b. increase because the total amount of human capital in the country will increase as the new owners learn how to farm.
   c. fall and remain lower for a long time.
   d. not be affected unless widespread civil disorder or civil war results.
2) Suppose the government deficit increases, but the interest rate remains the same. Which of the following things might have happened simultaneously to keep interest rates the same?
   a. The government reduces the amount that people may put into savings accounts on which the interest is tax exempt.
   b. Because they are optimistic about the future of the economy, firms desire to borrow more to purchase physical capital.
   c. Consumers decide to decrease consumption and work more.
   d. All of the above could explain why the interest rate would be unchanged.

3) Suppose a country imposes new restrictions on how many hours people can work. If these restrictions reduce the total number of hours worked in the economy, but all other factors that determine output are held fixed, then
   a. productivity and output both rise.
   b. productivity rises and output falls.
   c. productivity falls and output rises.
   d. productivity and output fall.

4) An increase in the price level causes the aggregate quantity of goods and services demanded to decrease because
   a. Wealth rises, interest rates rise, and the dollar appreciates.
   b. Wealth rises, interest rates fall, and the dollar depreciates.
   c. Wealth falls, interest rates rise, and the dollar appreciates.
   d. Wealth falls, interest rates fall, and the dollar depreciates.

5) Suppose a fall in stock prices makes people poorer. The decrease in wealth would induce people to
   a. decrease consumption, shown as a movement to the left along a given aggregate demand curve.
   b. decrease consumption, shifting the aggregate demand curve to the left.
   c. increase consumption, shown as a movement to the right along a given aggregate demand curve.
   d. increase consumption, shifting the aggregate demand curve to the right.

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Table 1
2009 Labor Data for Wrexington

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of adults</td>
<td>20,000</td>
</tr>
<tr>
<td>Number of adults who are paid employees</td>
<td>8,000</td>
</tr>
<tr>
<td>Number of adults who work in their own businesses</td>
<td>1,600</td>
</tr>
<tr>
<td>Number of adults who are unpaid workers in a family member’s business</td>
<td>1,000</td>
</tr>
<tr>
<td>Number of adults who were temporarily absent from their jobs because of an earthquake</td>
<td>400</td>
</tr>
<tr>
<td>Number of adults who were waiting to be recalled to a job from which they had been laid off</td>
<td>200</td>
</tr>
<tr>
<td>Number of adults who do not have a job, are available for work, and have tried to find a job within the past four weeks</td>
<td>1,400</td>
</tr>
<tr>
<td>Number of adults who do not have a job, are available for work, but have not tried to</td>
<td>780</td>
</tr>
</tbody>
</table>
find a job within the past four weeks
Number of adults who are full-time students 3,000
Number of adults who are homemakers or retirees 3,620

6) Refer to Table 1. How many people were employed in Wrexington in 2009?
   a. 9,600
   b. 10,600
   c. 11,000
   d. 11,200

7) Refer to Table 1. How many people were in Wrexington’s labor force in 2009?
   a. 11,000
   b. 12,600
   c. 13,380
   d. 20,000

8) Refer to Table 1. What was Wrexington’s labor-force participation rate in 2009?
   a. 55 percent
   b. 63 percent
   c. 66.9 percent
   d. 87.3 percent

9) The sticky wage theory of the short-run aggregate supply curve says that when the price level rises more than expected, the real wage
   a. rises, so employment rises.
   b. rises, so employment falls.
   c. falls, so employment rises.
   d. falls, so employment falls.

10) In 1931, President Herbert Hoover was paid a salary of $75,000. Government statistics show a consumer price index of 15.2 for 1931 and 207 for 2007. President Hoover’s 1931 salary was equivalent to a 2007 salary of about
   a. $5507.
   b. $1,021,382.
   c. $1,140,000.
   d. $15,525,000.

11) Which of the following shifts short-run aggregate supply right?
    a. an increase in the price level
    b. an increase in the minimum wage
    c. a decrease in immigration from abroad.
    d. a decrease in the price of oil

12) Suppose the economy is initially in long-run equilibrium and aggregate demand rises. In the long run prices
    a. and output are higher.
    b. and output are lower.
    c. are higher and output is the same.
    d. are the same and output is lower.
13) Which of the following properly describes the interest rate effect?
a. As the money supply increases, the interest rate falls, so spending rises.
b. As the money supply increases, the interest rate rises, so spending falls.
c. As the price level increases, the interest rate falls, so spending rises.
d. As the price level increases, the interest rate rises, so spending falls.

14) Exchange rates are 150 yen per dollar, 0.8 euro per dollar, and 20 pesos per dollar. A bottle of beer in New York costs 6 dollars, 1,200 yen in Tokyo, 7 euro in Munich, and 100 pesos in Cancun. Where is the most expensive and the cheapest beer in that order?
a. Cancun, New York
b. New York, Tokyo
c. Tokyo, Munich
d. Munich, Cancun

15) Consider an open economy, like US, with the following situation:
Savings = 1200
Domestic Investments = 700
Exports = 600
Capital Inflows = 200
Then:
a. Imports = 100
b. Capital Outflows = 300
c. Net Exports = 310
d. Both a and b are correct

To do the exercise above you need to remember the following formulas
S = I + NCO
NCO = NX
NX = EXPORTS – IMPORTS
NCO = CAP. OUTFLOWS – CAP. INFLOWS

From S = I + NCO we know that 1200 = 700 + NCO so NCO = 500
Capital inflows = 200
From NCO = CAP. OUTFLOWS – CAP. INFLOWS we then know that
500 = Cap. Outflows - 200 => CAP. OUTFLOWS = 700 Thus b is not correct.
From NCO = NX we know that NX =500 so you can rule out answer c.
Let’s check that a is correct.
From NX = EXPORTS – IMPORTS we know that
500 = 600 – Imports so Imports = 100 This is correct.
So a is correct.

16) Suppose that in a closed economy GDP is equal to 10,000, taxes are equal to 2,500 Consumption equals 6,500 and Government expenditures equal 2,000. What are private saving, public saving, and national saving?
a. 1500, 1000, 500
b. 1000, 500, 1500
c. 500, 1000, 1500
d. None of the above are correct.
17) Which of the following is consistent with the catch-up effect?
   a. The United States had a higher growth rate before 1900 than after.
   b. After World War II the United States had lower growth rates than war-ravaged European countries.
   c. Although the United States has a relatively high level of output per person, its growth rate is rather modest compared to some countries.
   d. All of the above are correct.

18) A typical worker in Italy can produce 24 units of product in an 8 hour day, where a typical worker in Poland produces 25 units of product in a 10 hour day. We can conclude that
   a. worker productivity in Poland is higher than in Italy because productivity for the Polish worker is 250 units of product and 192 units of product for the Italian worker.
   b. productivity for the Polish worker is 3 units per hour and 2 1/2 units per hour for the Italian worker.
   c. the standard of living will be higher in Italy than in Poland.
   d. there will be no difference between the standard of living in Italy and Poland.

19) An Italian company opens a pasta company in the U.S. The profits from this pasta company are included in
   a. both U.S. and Italian GNP.
   b. both U.S. and Italian GDP.
   c. U.S. GDP and Italian GNP.
   d. U.S. GNP and Italian GDP.

20) A few years ago, based on concepts similar to those used to estimate U.S. employment figures, the Canadian adult population was 24 million, the labor force was 16 million, and the number of people employed was 14 million. According to these numbers, the Canadian labor-force participation rate and unemployment rate were about
   a. 67 percent and 8.3 percent.
   b. 67 percent and 12.5 percent.
   c. 58 percent and 8.3 percent.
   d. 58 percent and 12.5 percent.

21) During a presidential campaign, the incumbent argues that he should be reelected because nominal GDP grew by 12 percent during his 4-year term in office. You know that population grew by 4 percent over the period and that the GDP deflator increased by 6 percent during the past 4 years. You should conclude that real GDP per person
   a. grew by more than 12 percent.
   b. grew, but by less than 12 percent.
   c. was unchanged.
   d. decreased.

22) There will be structural unemployment if
   a. some wages are kept above the equilibrium level.
   b. some people choose not to work at the equilibrium wage.
   c. some wages are below the equilibrium level.
   d. All of the above could be correct.
23) Which list contains only actions that increase the money supply?
   a. lower the discount rate, raise the reserve requirement ratio
   b. lower the discount rate, lower the reserve requirement ratio
   c. raise the discount rate, raise the reserve requirement ratio
   d. raise the discount rate, lower the reserve requirement ratio

24) If real GDP doubles and the GDP deflator doubles, then nominal GDP will
   a. stay the same.
   b. double.
   c. triple.
   d. quadruple.

25) Risk-averse people will choose different asset portfolios than people who are not risk averse. Over a long period of time, we would expect that
   a. every risk-averse person will earn a higher rate of return than every non-risk averse person.
   b. every risk-averse person will earn a lower rate of return than every non-risk averse person.
   c. the average risk-averse person will earn a higher rate of return than the average non-risk averse person.
   d. the average risk-averse person will earn a lower rate of return than the average non-risk averse person.

26) When the government attempts to cut the economic pie into more equal slices,
   a. it is easier to cut the pie, and therefore the economy can produce a larger pie.
   b. the government can more easily allocate the pie to those most in need.
   c. the pie gets smaller, and there will be less pie for everyone.
   d. the economy will spend too much time cutting and loses the ability to produce enough pie for everyone.

27) Velocity in the country of Nemedia is always stable. In 2001, the money supply was $100 billion and real GDP was $300 billion. In 2002, the money supply increased by 10 percent, real GDP increased by 5 percent and nominal GDP equaled $660 billion. By how much did the price level increase between 2001 and 2002?
   a. 10 percent
   b. 9.5 percent
   c. 4.75 percent
   d. There is not enough information to answer the question.

   For 2001 we know: $M=100$, $Y=300$
   For 2002 we know: $M=110$, $Y=315$, $P\cdot Y=660$ so it follows that $P\cdot 315=660$ so $P=2.095$ in 2002. Also from the quantity theory we know that $M\cdot V=P\cdot Y$ then we can find that $V=6$ in 2002. We are told that $V$ is stable so $V=6$ also in 2001. Applying the quantity theory to 2001 we know that $100\cdot 6=P\cdot 300$ so $P=2$ in 2001. So $P=2$ in 2001 and $P=2.095$ in 2002. The increase in the price level was 4.75%.

28) GDP is defined as the market value of all final goods and services produced
   a. by the citizens of a country, regardless of where they live, in a given period of time; this definition focuses on GDP as a measure of total income.
29) An important difference between the GDP deflator and the consumer price index is that
a. the GDP deflator reflects the prices of goods and services bought by producers, whereas the consumer price index reflects the prices of goods and services bought by consumers.
b. the GDP deflator reflects the prices of all goods and services bought by producers and consumers, whereas the consumer price index reflects the prices of final goods and services bought by consumers.
c. the GDP deflator reflects the prices of all final goods and services produced by a nation's citizens, whereas the consumer price index reflects the prices of final goods and services bought by consumers.
d. the GDP deflator reflects the prices of all final goods and services produced domestically, whereas the consumer price index reflects the prices of some goods and services bought by consumers.

30) Henry buys a bond issued by Ralston Purina, which uses the funds to buy new machinery for one of its factories.
a. Henry and Ralston Purina are both investing
b. Henry and Ralston Purina are both saving.
c. Henry is investing; Ralston Purina is saving.
d. Henry is saving; Ralston Purina is investing.

31) Over the past 100 years, U.S. real GDP per person has doubled about every 35 years. If in the next 100 years it doubles every 25 years, then a century from now U.S. real GDP per person will be:
a. 4 times higher than it is now.
b. 8 times higher than it is now.
c. 12 times higher than it is now.
d. 16 times higher than it is now.

32) A bond is a
a. financial intermediary.
b. certificate of indebtedness.
c. certificate of partial ownership in an enterprise.
d. None of the above is correct.

33) Real GDP per person in the country of Smallville in 1912 was 1000$ (in 2000 dollars). In 2006, real GDP per person in Smallville was 30,000$. Then, the average growth rate per year in Smallville over this period was approximately (hint: use the compound interest rate formula to determine this):
a. 3.6%.
b. 4.3%.
c. 5.1%.
d. 5.5%

3.6% To solve this exercise and the following one it may be useful to remember the compound interest formula: $FV = PV (1 + r)^T$
$PV = $ the present value
$FV = $ the final value
r = the interest rate (expressed as a fraction)
T = the number of years
We need to use the equation that is suggested in the text and adapt it to our exercise. So in this case we have
PV=30,000
FV=1,000
r is the variable that we need to find
T =2006-1912=94
So we need to solve the following equation for r
30,000=1,000*(1+r)^94
30=(1+r)^94
At this point there are two options:
1) Your calculator allows you to take \( \frac{\sqrt[94]{30}}{\sqrt[94]{30}} \) in which case you obtain \( r = 3.6\% \)
2) If your calculator does not allow you to do that, instead. Then taking \( \ln \) on both sides of the equation and using the properties of the \( \ln \):
\( \ln(30)=94\ln(1+r) \)
\( \ln(1+r) = \frac{3.401}{94} = 0.0361 \)
Now to get rid of the \( \ln \) operator we need to use the Natural Logarithm Base (e) so the equation becomes:
\( (1+r) = \exp(0.0361) = 1.036 \)
So \( r = 0.036 \)
Or \( r = 3.6\% \)
The average growth rate of Smallville between 1912 and 2006 has been 3.6%.

34) According to the rule of 70, if the interest rate is 7 percent, how long will it take for the value of a savings account to grow by a factor of 64?
   a. about 28 years
   b. about 70 years
   c. about 660 months
   d. about 720 months
   about 720 months. In order to double it would take = \( \frac{70}{7} = 10 \) years. To grow by a factor of 64 the savings account has to double for 6 consecutive times. Therefore 10x6=60 years. These are equivalent to 720 months

Table 2

<table>
<thead>
<tr>
<th>Bank of Tampa</th>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>$100</td>
<td>Deposits</td>
</tr>
<tr>
<td>Loans</td>
<td>$900</td>
<td></td>
</tr>
</tbody>
</table>

35) Refer to Table 2. If the Bank of Tampa has loaned out all the money it wants given its deposits, then its reserve ratio is
   a. 1%
   b. 5%
   c. 10%
   d. 20%

36) Refer to Table 2. If the Fed requires banks to hold 5 percent of deposits as reserves, how much in excess reserves does the Bank of Tampa now hold?
   a. $25
   b. $50
37) Which of the following is included in the supply of dollars in the market for foreign-currency exchange in the open-economy macroeconomic model?
   a. A retail outlet in Russia wants to buy semi-conductors from a U.S. manufacturer.
   b. A U.S. bank loans dollars to Blair, a U.S. resident, who wants to purchase a new house in the United States.
   c. A U.S. based mutual fund wants to purchase bonds issued by an Italian corporation.
   d. All of the above are correct.

38) If the U.S. put an import quota on vacuum cleaners, it would
   a. raise U.S. net exports of vacuum cleaners and raise net exports of other U.S. goods.
   b. lower U.S. net exports of vacuum cleaners and raise net exports of other U.S. goods.
   c. raise U.S. net exports of vacuum cleaners and lower net exports of other U.S. goods.
   d. lower U.S. net exports of vacuum cleaners and lower net exports of other U.S. goods.

39) You put money in an account and earn a real interest rate of 6 percent, inflation is 2 percent, and your marginal tax rate is 20 percent. What is your after-tax real rate of interest?
   a. 4.8 percent
   b. 3.2 percent
   c. 2.8 percent
   d. None of the above is correct.

40) When the money market is drawn with the value of money on the vertical axis, if the price level is above the equilibrium level, there is an
   a. excess demand for money, so the price level will rise.
   b. excess supply of money, so the price level will fall.
   c. excess supply of money, so the price level will rise.
   d. excess demand for money, so the price level will fall.