

**COURSE 180.101
MACROECONOMICS
EXAM #2 (Two Hours)**

NOVEMBER 7, 2017

NAME _____

TA* _____

***Two points if you write down the name of your TA**

Section I (20 points) (2 pts each)

1. Name both the outgoing Chair and the new Chair of the U.S. Federal Reserve Board.

Janet Yellen; Jerome Powell

2. In the AD/AS model, we identify an equilibrium price level, and an equilibrium level for output. In the real world we tend to think in dynamic equilibrium terms. Specify the variables, and plausible values for these variables, for dynamic equilibrium in the USA:

Inflation and growth rate; both are 2 %

3. As of 2016, Bolivia's GDP per capita is \$3,000, less than one-tenth the level of the USA. The Solow growth model identifies three ways in which labor productivity can grow. What would most likely be a central part of lifting Bolivia's productivity and GDP per capita?

Capital deepening

4. Name the four categories of U.S. government spending that comprise more than 3/4s of total Federal government spending:

Medicare or health care; social security or retirement benefits; defense or military; interest

5. Define ex-ante and ex-post real interest rates.

Ex-ante real interest rate=nominal interest rate-inflation expectation

Ex-post real interest rate=nominal interest rate-realized inflation

6. Briefly explain the Laffer curve.

Relationship between tax revenue and tax rate (1 point)

At very high tax rates, if you raise taxes revenue levels fall as people choose to work less (1 point)

7. For over 200 years, what phenomenon has prevented the outcome predicted by Malthus in 1798?

Technology OR PRODUCTIVITY

8. In our loanable funds model, why does the corporate demand curve slope downward?

Corporate sector finds fewer projects are PROFITABLE when they must pay higher interest for funds

9. In the AD/AS model, a jump in oil prices shifts which curve, and in what direction?

SRAS to the left

10. Fred makes \$125 thousand per year. Sally makes \$125 million per year. Given current social security tax law:

- a. Fred pays \$7,347 and Sally pays \$7,347,000 in social security taxes.
- b. Fred pays \$7,347 and Sally pays \$734,700 in social security taxes.
- c. Fred pays \$7,347 and Sally pays \$73,470 in social security taxes.
- d. Fred pays \$7,347 and Sally pays \$7,347 in social security taxes.

Section II Financial Markets (20 points)

The following data were obtained on Nov 1, 2017.

Bond	Yield to Maturity
1-yr US Treasury	1.5%
2-yr US Treasury	1.7%
10-yr US Treasury	2.35%
10-yr US TIPS	0.50%
10-yr Ford	3.75%

1. According to the expectations theory of the term structure, what do market participants expect the 1-yr US Treasury rate to be 1 year from now?

$1.7\% * 2 - 1.5\% = 1.9\%$ (4pts) OR $(1.017)^2 = 1.015$ (1+r)

2. According to the expectations theory of the term structure, is the average 1-yr Treasury rate for the next 10 years expected to be above or below 2.00% per year? Briefly explain.

Above. The average 1-yr Treasury rate for the next 10 years is expected to equal the yield of 10-yr US Treasury, WHICH IS 2.35%. (4 pts)

3. Why is the 10-yr Treasury rate lower than the 10-yr rate on Ford bonds?

Ford bonds are riskier. (2 pts) OR DEFALUT RISK OR BANKRUPTCY RISK

4. Ford currently must pay 140 basis points more per year than the U.S. treasury, if it chooses to borrow money for 10-years. Ford announces it has developed a new battery that will propel its cars 1,000 miles on one charge. Choose the most likely new value for the spread between the Ford bond and the 10-year treasury? (2 pts)

- (i) 180 basis points (ii) 100 basis points (iii) -20 basis points

5. If you expect inflation to average 3.00% per year over the next 10 years, would you prefer to hold 10-yr TIPS or Treasuries? Briefly explain.

Hold 10-yr TIPS. The nominal yield from 10-yr TIPS is $0.5\% + 3\% = 3.5\% > 2.35\%$, nominal yield from 10-yr Treasuries. (4 pts)

6. The bankruptcy of Lehman Brothers, one of the largest investment banks in the US, in September 2008 was one of the most dramatic events of the financial crisis. What do you expect happened to corporate bond yields in the months after the failure of Lehman? And to government bond yields?

Increase; decrease (2 pts)

7. The expectations theory of the term structure is incomplete – after accounting for the expected path of interest rates, the 10-yr Treasury rate is usually higher than the 1-yr Treasury rate. What is the main explanation for that? (2 points)

The residual is due to risk premium,
OR TERM PREMIUM

Section III Phillips Curve (20 points)

1. Write down the Phillips Curve equation. (2 pts)

EQUATION: $\pi_t = \pi_e + \alpha(U^* - U)$

(2 points for correct, zero points for wrong)

2. What is the mandate of the Federal Reserve? What is the mandate of the European Central Bank? (2 pts)

Fed: target low inflation and low unemployment (1 point)

ECB: target low inflation (1 point)

3. Suppose the economy is characterized by having $\alpha = 0.2$, $U^* = 5\%$, and $\pi^e = 2\%$, and the economy is currently in a recession with the unemployment rate at $U_t = 8\%$. What is the implied inflation rate π_t ? (2 pts)

$\pi_t = \pi_e + \alpha(U^* - U)$ $\pi_t = 2\% + .2(5\% - 8\%) = 1.4\%$

(2 points for correct, zero points for wrong)

4. Based on current π_t and U_t rank the likely response of the ECB and Fed: (2 pts)

ECB response: (1 point)

Strongly Tighten, Moderately Tighten, Moderately Loosen, Strongly Loosen (circle one)

Fed response: (1 point)

Strongly Tighten, Moderately Tighten, Moderately Loosen, Strongly Loosen (circle one)

The nation of Balonia, in the early 1980s, experiences a long recession. At the start of the recession, 1979, inflation is very high. The Table below provides details for the performance of unemployment in Balonia over the four years of recession.

Assume the Phillips curve perfectly predicts inflation each year. Assume further that expected inflation in year t equals actual inflation in year $t-1$

Calculate the path for inflation, 1980 through 1983, and fill in the blanks in the table below: (4 pts)

Table	π_e	Natural rate	Phillips curve forecast
	12.5%	6%	10.5%
	10.5%	6%	7.5%
	7.5%	6%	4.5%
	4.5%	6%	2.5%

(Column 1: 0.25 each; Column 2: 0.25 each; Column 3: 0.5 each)

Balonia has two more recessions. Again, assume that the Phillips curve perfectly predicts inflation each year. The tables below depict the performances for unemployment and inflation.

BALONIA				
		(assume $U^* = 6\%$)	(assume $\alpha = ???$)	1988: $\pi = 5.5\%$
	expected inflation	unemployment rate	natural rate of unemployment	Phillips curve inflation forecast
1989	5.5%	8.0%	6.0%	5.1%
1990	5.1%	9.0%	6.0%	4.5%
1991	4.5%	9.0%	6.0%	3.9%
1992	3.9%	8.0%	6.0%	3.5%

BALONIA				
		(assume $U^* = 6\%$)	(assume $\alpha = ???$)	2007: $\pi = 3.5\%$
	expected inflation	unemployment rate	natural rate of unemployment	Phillips curve inflation forecast
2008	3.5%	8.0%	6.0%	3.3%
2009	3.3%	9.0%	6.0%	3.0%
2010	3.0%	9.0%	6.0%	2.7%
2011	2.7%	8.0%	6.0%	2.5%

5. By how much did the inflation rate change, in each of the three recessions from the first year of the recession (1980, 1989 or 2008) to the last year provided in the tables (1983, 1992 or 2011)? (2 pts)

1980: $2.5\% - 10.5\% = -8$ percentage points OR $(2.5 - 10.5)/10.5\% = -76\%$
1989 $3.5\% - 5.1\% = -1.6$ percentage points OR $(3.5 - 5.1)/5.1 = -31\%$
2008 $2.5\% - 3.3\% = -0.8$ percentage points OR $(2.5 - 3.3)/3.3 = -24\%$

(0.5 for each; full points no matter positive or negative)

6. Did the different pace for inflation's decline reflect a different output gap? (2 pts)
(Explain briefly)

NO (1 point)

the gap between U and U^* was the same in all three cases (1 point)

7. What are the two values for α that would result in the declines for inflation presented in the two tables provided above? (2 pts)

$$5.1 = 5.5 + \alpha(6-8) \Rightarrow \alpha = 0.2 \quad (1 \text{ point})$$

$$3.3 = 3.5 + \alpha(6-8) \Rightarrow \alpha = 0.1 \quad (1 \text{ point})$$

8. What might explain the different pace of inflation's decline that led to the different values you computed for α ? (Hint, think of the second way we use the phrase ZERO BOUND). (2pts)

Wage gains can slow much more easily than wage levels can fall

In practice this means we rarely get deflation

Thus a large output gap, if it starts from a low inflation rate produces little additional decline

(I will give full points if students mention de facto "zero lower bound on inflation," "it is hard for wages to go down," "it is hard to have deflation;" however, if they mention "sticky wages," which is relevant but not fully correct, I will give 1 point.)

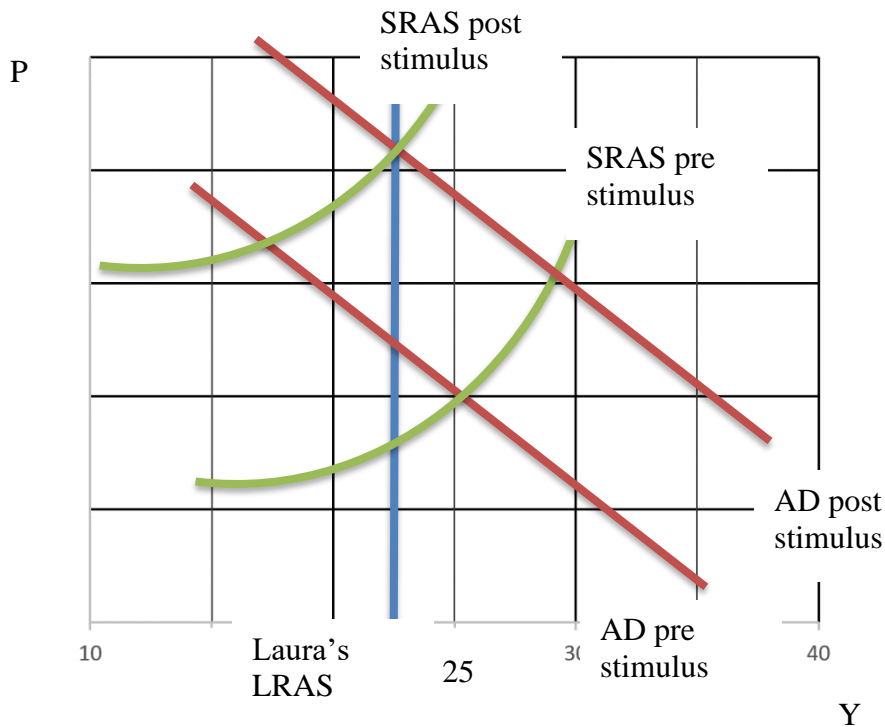
Section IV Loanable Funds and AD/AS (39 points)

In 2024, the U.S. has been growing for 2 years, following a mild recession. The unemployment rate is 5%, the level of real GDP is \$25 trillion and inflation is running at 1.5%. The 10-year U.S. t-note yield is 2.5%. The 10-year yield for corporate debt is 6%. The government will borrow \$100 billion in 2024.

In the 2024 Presidential Election, Tom Hardy runs on the promise of enacting a large infrastructure program, intended to build 200 electric car-charging spaces at every Service Station on U.S. Interstate Highways. He recognizes the program will be costly, adding \$50 billion per year to government spending. He promises that the program will create many new jobs. Moreover, he argues, the effort will propel the U.S. economy into the future.

Laura Tyson, an economist at U.C. Berkley, evaluates Tom Hardy’s infrastructure plan. Laura is a very strong believer in green energy, so she supports Tom Hardy’s plan. However, she is not enthusiastic about the employment effects of the infrastructure program. She thinks that the program will lead to only moderate job gains in the short term, and no job gains in the long-run. A key assumption in her analysis is her view that the natural unemployment rate for the economy is 5.5%.

- 1) Use both the data provided on the economy, as well as Laura’s judgment on 2024 macroeconomic conditions, to represent the U.S. economy in the AD/AS space before the infrastructure investment.



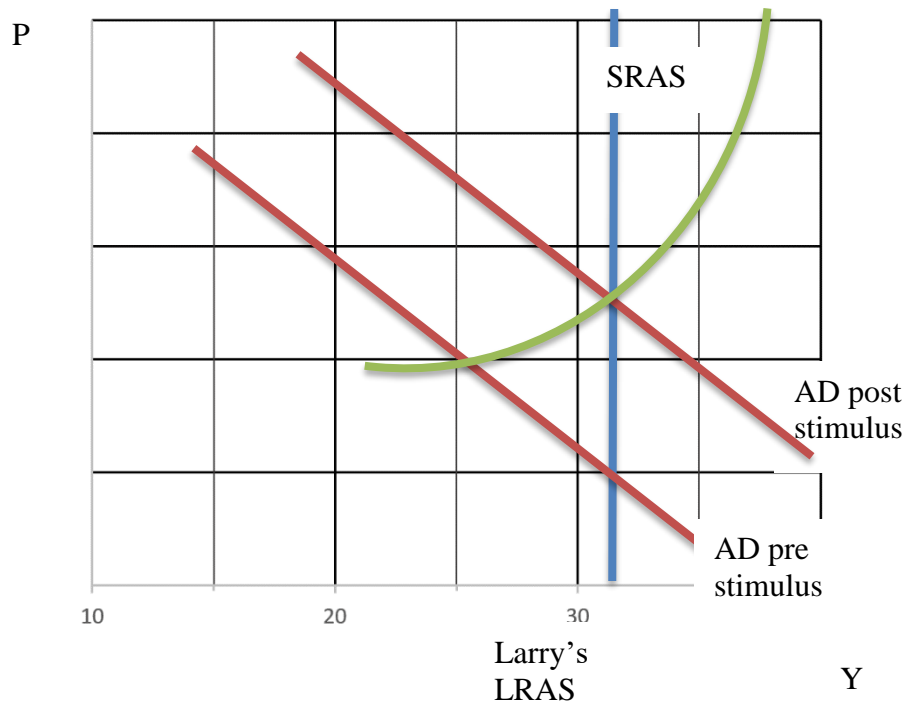
To receive full credit, answers should be properly labeled; show that output is equal to 25 trillion prior to the stimulus and Laura's view is that potential output is below 25 trillion.

- 2) Now use the chart you made above to show how the infrastructure program would affect the economy. Draw the graph to support Laura's view on job creation both in the short and long-run.

The stimulus program shifts AD to the right, generating temporarily higher output and employment. Laura thinks the economy was operating over capacity even before the infrastructure program. With the program, the economy is seriously over-heating. Wages rise which shift the LRAS curve to the left, to bring back output to its long-run level (where the unemployment rate is 5.5%, Laura's view on the natural rate of unemployment). To receive full credit, answers should be properly labeled, and show that in the long-run, $SRAS=LRAS=AD$.

- 3) Larry Ball, an economist at the Johns Hopkins University, also evaluates Tom Hardy's infrastructure plan. Larry is also a very strong believer in green energy, so he also supports Tom Hardy's plan. Different from Laura, he thinks that the infrastructure program can lead to large and permanent job gains. He believes that the economy is currently operating below capacity – specifically, he thinks the natural rate of unemployment is 2.5%.

In the quadrant below, use Larry's view on 2024 macroeconomic conditions to represent the U.S. economy in the AD/AS space before the infrastructure investment.

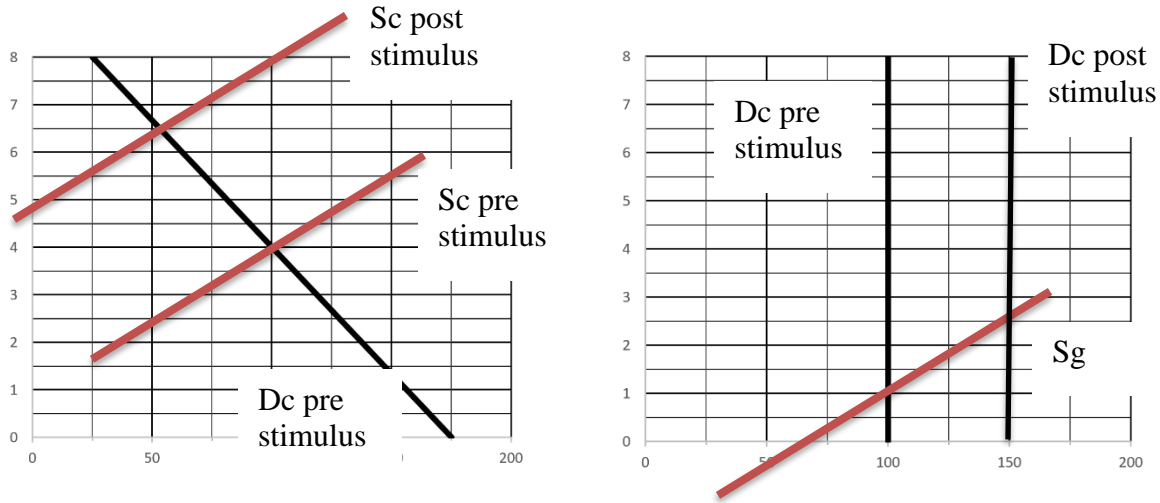


To receive full credit, answers should be properly labeled; show that output is equal to 25 trillion prior to the stimulus, and Larry's view is that potential output is above 25 trillion.

- 4) Now use the chart you made to show how the infrastructure program would affect the economy, according to Larry.

According to Larry, the economy is currently operating under-capacity. The stimulus program works to heal the economy and bring back output to its long-run equilibrium (where the unemployment rate equals the natural rate of unemployment). The job gains are permanent. To receive full credit, answers should be properly labeled, and show that in the long-run, $SRAS=LRAS=AD$.

- 5) Both economists supplement their AD/AS analysis with loanable funds graphs. Label the axes and curves in the loanable funds quadrants below. (2 points)



- 6) Draw the additional curves needed to establish equilibrium conditions in the loanable funds market. Draw equilibrium in both markets so they are consistent with the relevant information provided in the beginning of this section.

Inflation is 1.5%, so the real corporate bond rate = $6.0\% - 1.5\% = 4.5\%$, while the real government bond rate = $2.5\% - 1.5\% = 1.0\%$.

- 7) Laura was skeptical about the expansionary job effects of the infrastructure program. Correspondingly, she does not think that the program will increase total lending in the economy. In the two quadrants above, represent the effects of the infrastructure program, in a way consistent with Laura's view.

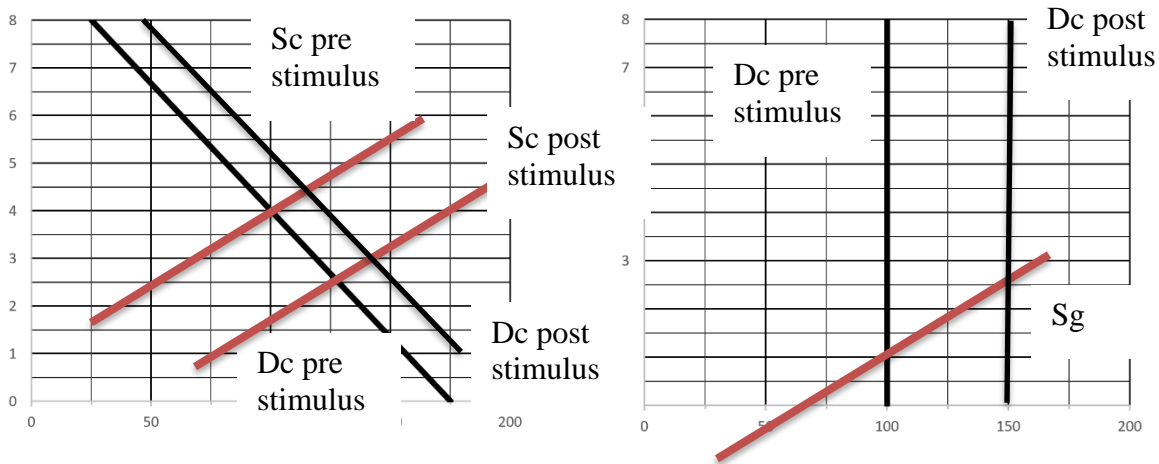
The increase in demand for government bonds results in a \$50 billion increase in government lending, and a higher real borrowing rate for the government. Because households are now receiving a higher rate when lending to the government, they supply less to the corporate sector – the supply curve in the left quadrant shifts back. As a result, corporate borrowing decreases (it is 'crowded-out') to the extent that total lending in the economy is unchanged; corporate borrowing decreases by 50 billion.

- 8) Larry Ball, on the other hand, thinks that the infrastructure program will be expansionary. He is aware of Laura's concerns. However, he thinks that the infrastructure spending will also cause other 'shifts' in the economy. What effect does he think the spending program will have on both households' and borrowers' risk attitudes?

Larry thinks the economy is under-capacity, so the stimulus program will create permanent job gains. The fix will increase confidence in the economy. Households will

be willing to lend more to risky companies, (the supply curve in the left quadrant will shift to the right) and demand for funds from corporations will also increase (the demand curve in the left quadrant will shift to the right). Overall, loans to the private sector increase.

- 9) In the graphs below, draw the effect of the infrastructure program on the government and corporate debt markets, in a way consistent with Larry’s view.



- 10) Tom Hardy is not sure if Laura or Larry is right. He recognizes that their analysis has different predictions for the supply of credit in the corporate loan market. He thinks to himself "If I announce a large spending program, and _____ falls, then I will know Larry is right." Fill in the blank.

The equilibrium spread (government bond yield – corporate bond yield) should now be lower, reflecting higher risk tolerance in the financial sector.

Answers that only discussed lower corporate bond yields, but provided enough explanation, received full credit. To receive full credit, the answers needed to be clear that the spread would be lower, or that corporate bond rates would be lower. Answers like “the interest rate would be lower” received only partial credit because they did not specify whether “the interest rate” referred to the firms or the government.

More explaining: If corporate bond rates fall upon announcement, that will mean that financial markets interpret that the boost in confidence will lower borrowing rates – a sign that Larry is right, and that Laura’s concerns of crowding-out concerns are exaggerated (otherwise corporate bond rates would have risen).