ECON 311 - Intermediate Macroeconomics (Professor Gordon)
Final Examination: Fall 2013
Answer sheet

YOUR NAME: _____

Student ID: _____

INSTRUCTIONS:

1. The exam lasts **2 hours**.
2. The exam is worth 120 points in total: 30 points for the multiple choice questions , 60 points for the analytical problems, and 30 points for the essays.
3. **Write your answers for the multiple choice section in the blanks below.** You won't get credit for circled answers in the multiple choice section.
4. **Place all of your answers for the analytical problems in the space provided**.
5. You must show your work for the analytical problems. There is no need to explain your answers for the multiple choice questions.
6. Write your **essays with a pen**. Write clearly!
7. **You must turn in both the answers and the multiple-choice questions. DO NOT PULL THEM APART.**

Good luck and Happy Holidays!

PART A: Multiple Choice Problems
Answer multiple choice questions in the space provided below.
USE CAPITAL LETTERS.

1	**C**	6	**B**	11	**E**	16	**B**	21	**D**	26	**A**
2	**A**	7	**D**	12	**A**	17	**B**	22	**D**	27	**C**
3	**C**	8	**C**	13	**C**	18	**D**	23	**A**	28	**A**
4	**D**	9	**B**	14	**B**	19	**C**	24	**B**	29	**D**
5	**D**	10	**B**	15	**C**	20	**E**	25	**B**	30	**A**

PART B: Analytic Problems

QUESTION 1: Growth theory (20 points)

Consider two countries: **F**rugalia and **P**rodigalia (we will call them F and P). In both countries the production function is Cobb-Douglas: $Y = AK^{1/3}N^{2/3}$. The population growth rate is 0.1, physical capital depreciates at the rate of 0.1, and A=1.
In F the savings rate is $s_F = 0.2$ and in P it is $s_P = 0.4$.

(A) Write the production function in terms of output per capita (Y/N). (2 points)

> **$Y = AK^{1/3}N^{2/3}$ --> $Y/N = A(K/N)^{1/3}$**

(B) Find the steady-state values of the capital-labor ratio (K/N) in both countries. (6 points)

> **In steady state the following relation must hold:**
> **$s(Y/N) = (n+d)(K/N)$**
> **The intuition is that saving per capita must make up for depreciation and the increased need of total capital given population growth.**
>
> **Using (A), we find**
> **$sA(K/N)^{1/3} = (n+d)(K/N)$**
> **and sloving for K/N gives**
> **$K/N = (sA/(n+d))^{3/2} = (s/0.2)^{3/2}$**
>
> **Hence in F we find K/N = 1**
> **and in P we find $K/N = 2^{3/2} = 2.83$**

(C) Find the steady-state values of the output per capita (*Y/N*) in both countries. (4 points)

> **Fram (A) we know $Y/N = A(K/N)^{1/3}$ and we've found K/N for both countries in (B).**
>
> **Hence in F we find Y/N = 1**
> **and in P we find $Y/N = 2^{(3/2)*(1/3)} = 2^{(1/2)} = 1.41$**

(D) In which of the countries is consumption-per-capita higher in the steady-state? (4 points)

Consumption-per-capita is 1 minus saving times output-per-capita, i.e.
(C/N) = (1-s)*(Y/N)

We have found Y/N in (C) and we know (1-s). Thus we find
C/N in F: 0.8*1 = 0.8
C/N in P: 0.6*1.41 = 0.85

I.e. consumption-per-capita is higher in P. But only marginally as the lower (1-s) almost completely offsets the gains of the higher capital-per-capita ratio.

(E) In which of the countries is the marginal product of labor higher in the steady-state? *Hint: The MPL is the derivative of the production function with respect to labor. You can relate this to your findings in (B).* (4 points)

MPL is the derivative of the production function with respect to N, i.e.
MPL = A*(2/3)*K$^{1/3}$N$^{(2/3-1)}$= A*(2/3)*(K/N)$^{1/3}$

Thus the MPL is higher in the country with the higher capital-per-capita ratio K/N, which is P.

QUESTION 2: Open IS-LM (16 points)

Let the following represent the structure of a **SMALL OPEN ECONOMY** with **PERFECT CAPITAL MOBILITY** and **FLEXIBLE EXCHANGE RATES**:

$C = C_a + 0.6(Y-T)$,
$C_a = 80$, $T = 60$, $G=84$,
$I_P = 70 - 10r$,
$NX = 100 - 0.1Y - 24e$,
$(M/P)^D = 0.2Y-4r$,
$M^S/P = 60$.

A) Assume that initially foreign and domestic interest rates be equal so that $r = r^f$ and let the foreign exchange rate e equal 2. Find the IS and LM equations. (4 points)

k=1/(0.4+0.1)=2
Ap=80 - 0.6*60 + 84 + 70 - 10r + 100 - 24e = 298 - 10r - 24e = 250 - 10r
IS: Y = 596 - 20r - 48e = 500 - 20r
LM: 60 = 0.2Y - 4r -> Y = 300 + 20r

(B) Find the equilibrium income, interest rate and net exports. (2 points)

300 + 20r = 500 - 20r -> r = 5 -> Y = 400
NX = 100 - 40 - 48 = 12

(C) The central bank thinks that Y is too high and reduces real money supply from 60 to 56 in order to reduce GDP. Find the new **equilibrium** values of Y, e and NX. *Hint: you can find Y just using the new LM curve. Don't forget that this is a small open economy with flexible exchange rates and perfect capital mobility.* (5 points)

New LM: 56 = 0.2Y - 4r -> Y = 280 + 20r
In equilibrium r goes back to previous level, so r = 5 and Y = 380

e and NX:

Y = 596 - 20r - 48e
-> 380 = 596 - 100 - 48e
-> e = 116/48 = 2.416
NX = 100 - 0.1*380 - 24*2.416 = 4

or start with: Ap has to go down by 10 so that Y down by 20.
> NXa has to go down by 10
-> 24*delta_e=10 -> delta_e = 10/24
-> e = 2+(10/24) = 2.416

(D) After the central bank's intervention of (C), the government thinks that (as a result of this intervention) NX is too low. In order to increase NX, the government reduces spending by 10 to 74. Find the **equilibrium** values of Y, e and NX after this reduction in G (assuming that M^S/P is still at 56). *Hint: You know one of the variables right away. Again, keep in mind that this is a small open economy with flexible exchange rates and perfect capital mobility.* (5 points)

Y = 576 - 20r - 48e
-> 380 = 576 - 100 - 48e
-> e = 96/48 = 2
NX = 100 - 0.1*380 - 24*2 = 14

Or start with : Change in Ap induced by G has to be offset by NX

If G reduced by 10, then NX$_a$ must increased by 10 and hence NX must increase by 10 to 14 (it was 4 in part C).

Necessary change in e so that NXa increased by 10: e needs to go down by 10/24=0.416 and we're back at the original e=2 (e was 2.416 in part C).

QUESTION 3: Government deficits (9 points)

Consider an economy described as follows:
$C = C_a + c(Y - T) = 200 + 0.5(Y-T)$
$T = T_a + t*Y = 100 + 0.2Y$
$NX = NX_a - nx*Y = 150 - 0.2Y$
$I_p = 300$,
$G = 400$.

(A) Assume that the economy as described above is at natural GDP. What is the value of the structural government deficit/surplus? *Hint: you have to find Y.* (4 points)

$A_p = 200 - 0.5(100) + 300 + 400 + 150 = 1000$
$k = 1/(0.5(1 - 0.2) + 0.2 + 0.2) = 1.25$
$Y = K*Ap = 1250$
$T = 100 + 0.2*1250 = 350$
$T-G = 350 - 400 = -50$

(B) Suppose that I_p temporarily falls to 200 and we are no longer at natural GDP. What is the value of the actual deficit? (3 points)

$A_p = 900$
$Y = K*Ap = 1125$
$T = 100 + 0.2*1125 = 325$
$T-G = 325 - 400 = -75$

(C) Suppose that monetary policy could somehow be used to bring A_p back to the initial value (for instance because C_a and I_p depend on the interest rate). What is the new value of actual deficit? *Hint: this exercise does not require any calculations.* (2 points)

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QUESTION 4: SPDG model (11 points)

Suppose the following equations describe an economy currently at long-run equilibrium:

$$p_t = p_t^e + \widehat{Y}_t + z_t$$
$$p_t^e = 0.4p_{t-1}^e + 0.6p_{t-1}$$
$$p_0 = p_0^e = \widehat{x_0} = 3 \quad \widehat{Y}_0 = z_0 = 0$$

Recall that z represents supply shocks, $\hat{x} = x - y^N$ and $\widehat{Y} = 100 \ln \left({}^Y/_{Y^N} \right)$

(A) Write down the numerical SP and DG equations using the information above. (2 point)

SP	p_{t} = 0.4 * p_{t-1}^{e} +0.6 * p_{t-1} + \hat{Y}_{t} + z_{t} for some reason I cannot get "equations" to work within a table, but this will be deleted before printing
DG	\hat{Y}_{t} = \hat{Y}_{t-1} + \hat{x}_t - p_{t} for some reason I cannot get "equations" to work within a table, but this will be deleted before printing

(B) Substitute the DG equation into the numerical SP equation and solve for p_t as a function of $p_{t-1}, p_{t-1}^e, \widehat{Y}_{t-1}, \hat{x}_t$ and z_t. (1 point)

$$p_t = 0.4p_{t-1}^e + 0.6p_{t-1} + (\widehat{Y}_{t-1} + \hat{x}_t - p_t) + z_t$$
$$p_t = 0.2p_{t-1}^e + 0.3p_{t-1} + 0.5(\widehat{Y}_{t-1} + \hat{x}_t + z_t)$$

(C) Starting from the long-run equilibrium described above in period 0, assume that in period t=1, we observe a positive change in $\hat{x}_1 = \hat{x}_2 = 4$. Fill in the following table. *Hint: In this question we assume that the element of supply shocks is absent (z=0), so that we can concentrate on demand inflation.* (3 points)

t	p_t^e	$\widehat{Y}_t$	$\hat{x}_t$	p_t	z_t
0	3	0	3	3	0
1	3	0.5	4	**3.5**	0
2	**3.3**	0.6	4	**3.9**	0

(D) Starting from the long-run equilibrium described above in period 0, assume that in period t=1, we observe a supply shock ($z_1 = 2$) that occurs for only a single period and then in period 2 z goes back to its initial value of zero. Fill in the following table assuming that the central bank is following an extinguishing policy. (4 points)

t	p_t^e	$\widehat{Y}_t$	$\widehat{x}_t$	p_t	z_t
0	3	0	3	3	0
1	3	-2	1	3	2
2	3	0	5	3	0

QUESTION 5: Growth rates (5 points)

In Utopia, GDP grows at the exact same rate every year. In 1990, GDP was at 100, and in 2000 it was at 200.

(A) Will Utopia first reach four times the GDP of 2000, or twice the GDP of 2010? Show all your work! (3 points)

200 = 100*exp(g*10) -> g = 6.93%
But even without finding g, we know that exp(g*10)=2. Hence GDP in 2010 is 400.
Therefore twice the GDP of 2010 is the same as four times GDP of 2000 and, accordingly, it will be reached at the same time.

or: the result can be found even faster by knowing that a constant growth rate implies a constant time to double.

(B) In what year will GDP for the first time be at least three times as high as it was in 2000? (2 points)

g = 6.93%
Time to triple at g: ln 3 / 0.0693 = 15.85 years
Therefore 2016 will be the first year with at least three times the GDP of 2000.

PART C: Essays

This final exam covers Chapters 5 through 12 of the textbook that explains the major macroeconomic theories and relates them to the real world. The real world is introduced through a large number of textbook charts spanning those chapters. There are at least 20 charts in these chapters that display the behavior of particular variables or combinations of variables over the past 40 to 50 years. In addition there are charts that cover shorter periods, including comparisons of the past five years of the "Great Recession" with earlier periods.

The lectures went beyond the textbook by developing a coherent story about two five-year time periods when the evolution of the major macroeconomic variables was very different than any other five-year period in the last five decades. These five-year periods are 1980-1985 and 1995-2000. The lectures repeatedly came back to these two intervals and explained *what happened* and *why* for each interval, across many dimensions of macroeconomics.

Your essay question is to write about *what happened* that was unusual about each of those periods, covering at least five or six different major macro variables, and to explain *why* these two five year intervals were so different.

Take a few minutes to outline what was unusual about the two periods. To remember the major macro concepts that you should include in your essay, just think back to what topics were covered in Chapters 5-12. When you write about *why*, remember that each of those two periods is unique because events were propelled by unique driving forces that were not present in other periods over the past five decades. You want to explain the process by which the unique driving forces altered the behavior of other variables.

Your essay should be entirely confined to the U.S. economy. You do not need to consider what was happening in the rest of the world. But remember that the U.S. is an open economy, and that the variables you should consider include exchange rates and the current account, not just the standard list of major macro variables introduced in the first and second lecture back in September.

1. (15 min) Explain what was unique and why for the five year period 1980-85
2. (15 min) Explain what was unique and why for the five-year period 1995-2000.

PART A: Multiple Choice Problems

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) In the recent Global Economic Crisis, the negative wealth effect caused the
      A) LM curve to shift to the right.
      B) LM curve to shift to the right.
      C) IS curve to shift to the left.
      D) LM curve to shift to the left.

2) The main differences between the bank and the nonbank institutions include all of the following EXCEPT
      A) banks' balance sheets include assets and liabilities while nonbank institutions' balance sheets include only liabilities.
      B) banks obtain the funds to buy investment by attracting deposits while nonbank institutions borrow funds.
      C) banks are regulated by the Fed while nonbank institutions are not.
      D) banks hold more equity then nonbank institutions.

3) Which of the following statements is closest to the truth, according to the lectures
      A) Deflation in the US in 2010-2013 caused consumers to postpone purchases through the "expectations effect"
      B) Inflation in the US in 2010-2013 caused consumers to cut spending due to the real wealth effect
      C) Deflation in the US did not happen in 2010-13 because of adverse supply shocks
      D) Inflation in the US was lower than otherwise because of beneficial supply shocks

4) A deliberate change in the government's deficit
      A) leads to automatic stabilization.
      B) acts as a drag on the economy.
      C) is implemented by the Fed.
      D) constitutes discretionary fiscal policy.

5) By far the largest real government budget deficits measured as a percentage of natural real GDP occurred during
      A) World War I.
      B) the late 1960s.
      C) the Great Depression.
      D) World War II.
      E) the late 1980s and early 1990s.

6) Of the following acronyms, which is most closely related to sub-prime mortgages during 2002-2006?
      A) MBS
      B) NINJA
      C) SEC
      D) CFTC

7) When the dollar strengthens,
      A) exports will increase and U.S. exporters gain.
      B) exports will increase and U.S. consumers benefit.
      C) exports will decrease and U.S. exporters benefit.
      D) imports will increase and U.S. consumers benefit.

8) Over the past eight years, China's currency has
      A) been pegged to the dollar
      B) been pegged to the yen
      C) appreciated substantially
      D) depreciated substantially

9) The purchasing power parity theory predicts that
> A) a nation's exchange rate is determined by the extent of speculation in the foreign-exchange market.
> B) a nation's exchange rate will decline at a rate equal to the difference between the domestic and the foreign rates of inflation.
> C) a nation's exchange rate will decline when there is a balance-of-payments deficit.
> D) a nation's exchange rate will differ from another nation's exchange rate by an amount depending upon the difference between the domestic and foreign rates of inflation.

10) Initially the real and nominal exchange rates of the pound are $2 per pound. The English price level doubles but the US price level remains the same and the nominal exchange rate does not change. The new real exchange rate is
> A) 2 pounds/$1.
> B) 1 pound/$4.
> C) 1 pound/$2.
> D) 1 pound/$1.

11) Suppose that the nominal wage falls by x percent, and a certain change in the price level maintains the same real wage as before. In the SAS diagram these events cause
> A) no change at all, as they offset each other.
> B) a downward movement along the SAS curve.
> C) an upward shift of the SAS curve.
> D) an upward movement along the SAS curve.
> E) a downward shift of the SAS curve

12) A consensus about the 2009-10 Obama stimulus in the lecture and course-packet readings is:
> A) The size of the stimulus program was too small
> B) The size of the stimulus program was too large
> C) The stimulus program spent too much on unemployment compensation and not enough on infrastructure
> D) The stimulus program spent too much on infrastructure and not enough on unemployment compensation

13) A fiscal expansion will
> A) reduce both the price level and the real income in the short run.
> B) raise both the price level and real income in the long run.
> C) raise both the price level and real income in the short run.
> D) raise real income but leave the price level unaffected in the long run.

14) A course packet reading on the trilemma contrasted flexible exchange rates in _____ to loss of control over domestic monetary policy in _____ and capital controls in _____.
> A) Euro, US, Euro
> B) US, Euro, China
> C) China, US, Euro
> D) China, China, US

15) If the inflation rate is 10% and nominal GDP growth is 8% then real GDP must have
> A) increased by 2%.
> B) increased by 18%.
> C) decreased by 2%.
> D) decreased by 18%.

16) If there is a permanent adverse supply shock
    A) the rate of inflation can be held constant if real wages are kept from falling.
    B) a policy of accommodation at the original natural level of real GDP is not possible without an acceleration of inflation.
    C) the level of employment at the natural level of real GDP will remain constant only if the labor supply curve is upward sloping to the right.
    D) an extinguishing policy will produce an acceleration of inflation.

17) A lecture recommending regulated loan-to-value ratios for residential mortgages drew an analogy to
    A) Fed regulation of reserve requirements
    B) Fed regulation of stock market margin requirements
    C) Fed regulation of the discount rate
    D) Fed regulation of the 10-year bond rate

18) A lecture comment about the application of the Obama Stimulus to Sheridan Road at Northwestern U was:
    A) The road-rebuilding project was long delayed after the recession
    B) The road-rebuilding project disrupted campus life by blocking intersections
    C) The road-rebuilding project was wasteful because it used a lot of people instead of machines
    D) The road-rebuilding project was wasteful because it used a lot of machines instead of people

19) Unemployment due to the location or skill requirements of job vacancies not matching the location or skills of the unemployed is called _____ unemployment.
    A) cyclical
    B) frictional
    C) structural
    D) natural

20) A feature of labor markets in the economic recovery of 2010-2013 is
    A) Employers cutting hours
    B) Employers cutting pay
    C) Employers raising hours
    D) Employers raising pay
    E) A) and B)
    F) A) and D)

21) During the expansion period of 2010-2013, the labor market indicator _____ exhibited _____.
    A) unemployment rate; no change
    B) labor-force participation rate; no change
    C) long-term unemployed as a percentage of the labor force; no change
    D) employment-population ratio; no change

22) In recent years new automobile factories have opened in California and Ohio and closed in Detroit where the unemployment of automobile workers has increased. This unemployment could be decreased if
    A) information about the new jobs was made available to the unemployed workers at reduced cost.
    B) "moving costs" from Detroit to California and Ohio were reduced.
    C) workers with the appropriate skills were relatively scarce in Ohio and California.
   D) all of the above.

23) According to the Solow model of economic growth, if per capita savings, s (Y/N), exceeds required steady state investment, (n + d) K/N, then
        A) capital per capita increases.
        B) per capita output declines.
        C) steady state growth characterizes the economy.
        D) capital per capita decreases.

24) In a reading item about India vs. China, which of the following is the most accurate statement
        A) China's biggest barrier to growth is the low education and health of the population
        B) India's biggest barrier to growth is the low education and health of the population
        C) China's biggest barrier to growth is its massively inefficient investment in highways and railroads
        D) India's biggest barrier to growth is its massively inefficient investment in highways and railroads

Figure 10-4
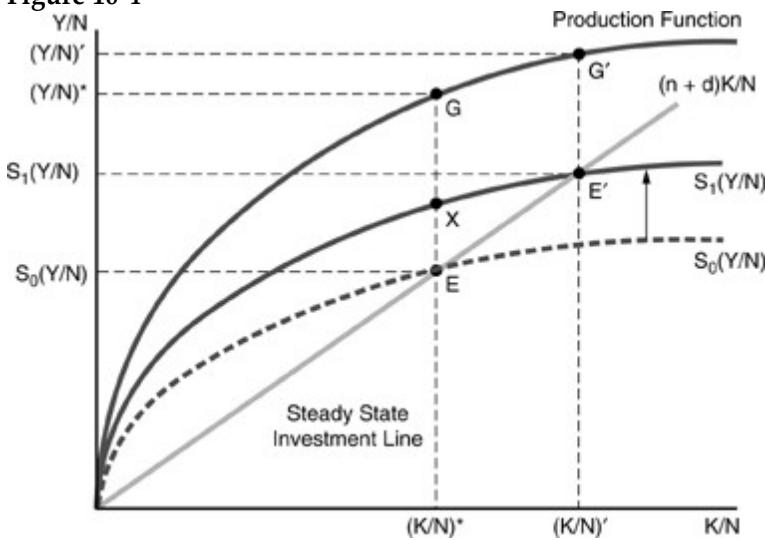
25) Initially, the economy is at point E in Figure 10-4 above. An increase in per capita savings from s(0) to s(1) will in the short run result in _____ and in the long run result in _____.
        A) excess per capita saving; less rapid growth in per capita output
        B) more rapid growth in per capita output; no change in the long run rate of growth in per capita output
        C) more rapid growth in per capita output; more rapid growth in per capita output
        D) excess per capita saving; more rapid growth in per capita output

26) One of the shortcomings of the Solow growth model is that in it the rate of technological change is
        A) left unexplained.
        B) assumed to be equal to the population growth rate.
        C) assumed to be zero.
        D) zero unless the saving rate exceeds the depreciation rate.

27) A course packet reading item recommended a tax on carbon emissions because
        A) It would reduce global warming
        B) It would force people to take public transit
        C) It would lead to an investment boom as old capital became obsolete
        D) It would help poor and middle-class people and hurt the rich

28) The formula for the growth rate of multifactor productivity is

     A) $a = y - bk - (1 - b)n$.
     B) $y = a + bk + bn$.
     C) $y = a - b/k(1 - b)n$.
     D) $a = y + bk + (1 - b)n$.

29) The Solow model predicts that the standard of living in poorer nations will converge on that of richer nations through rapid capital formation that raises output per person. The introduction of technological change to the model _____ change this prediction because technology _____ assumed to be freely available to all countries.

     A) does not, is not
     B) does, is
     C) does, is not
     D) does not, is

30) As defined in lecture, "hysteresis" refers to

     A) structural unemployment is caused by cyclical unemployment
     B) frictional unemployment is caused by cyclical unemployment
     C) cyclical unemployment is caused by structural unemployment
     D) cyclical unemployment is caused by frictional unemployment