QUEEN'UNIVERSITY
DEPARTMENT OF ECONOMICS

ECON320: MACROECONOMIC THEORY II
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Final examination

Section A (30percent)**:** Read the following statements and indicate whether they are **True**, **False** or **Uncertain**. Briefly explain your answer. All questions have equal value. NO MARKS WILL BE GIVEN FOR UNSUPPORTED ANSWERS.

A1. Reel business cycle models do not account well for the relative volatility of employment.

True –In the data for the US, Canada employment is almost as volatile as output over time. The basic RBC model adopts the classical assumption that fluctuations in unemployment reflect individual labour supply curves. In order to get the same degree of volatility as in the data, in response to productivity shocks, a very high elasticity of labour supply is needed. However, micro estimates of the labour supply elasticities are typically very small, so that RBC models have a hard time replicating the relative volatility of unemployment.

A2. The neutrality of money only holds if markets are competitive.

False- If all prices are flexible and price information is perfect, then money will be neutral, will not affect real variables even if markets are imperfectly competitive (monopoly)

Section B (20 percent): Multiple choice- CIRCLES the one correct answer

1. An increase in expected future output while holding today's output constant would

a. increase today's desired consumption and increase desired national saving.
b. **increase today's desired consumption and decrease desired national saving**.
c. decrease today's desired consumption and increase desired national saving.
d. decrease today's desired consumption and decrease desired national saving.

2. According to the permanent income theory, temporary increases in income will mostly be ____, and permanent increases in income will mostly be____.
    a. Spent; saved
    b. Saved; spent
    c. Spent; spent
    d. Saved; saved

3. which of the following machines has the lowest user cost? Machine A costs $15,000 and depreciates at 25% rate, machine B costs $10,000 and depreciates at a 20% rate, machine C costs $20,000 and depreciates at 10% rate, and machine D costs $17,000 and depreciates at an 11% rate. The expected real interest rate is 15%.
    a. machine A
    b. machine B
    c. machine C
    d. machine D
4. Suppose your company is in equilibrium, with its capital stock at its desired level. A permanent decline in the expected real interest rate now has what effect on your desired capital stock?
    a. raises it, because the future marginal productivity of capital is higher
    b. lowers it, because the future marginal productivity of capital is lower
    c. raises it, because the user cost of capital is now lower
    d. lowers it, because the user cost of capital is now higher

5. Total factor productivity growth is that part of economic growth due to
    a. capital growth plus labour growth
    b. capital growth less labour growth
    c. capital growth times labour growth
    d. **neither capital growth nor labour growth**.

6. Over the past year, output grew 6%, capital grew 2%, and labour grew 4%. If the elasticities of output with respect to capital and labour are 0.3 and 0.7, respectively, how much did productivity grow?
    a. 2.0%
    b. 2.6%
    c. 3.0%
    d. 3.3%

7. In the long run, an increase in the saving rate in a steady-state economy will cause

    a. an increase in the capital-labour ratio and an increase in consumption per worker
    b. an increase in the capital-labour ratio and a decrease in consumption per worker
    c. a decrease in the capital-labour ratio and a decrease in consumption per worker

d. a decrease in the capital-labour ratio and an increase in consumption per worker

8. Unconditional convergence means that in the long run,
    a. living standards converge only within groups of countries having similar characteristics
    b. living standards converge only for countries that have the same initial capital-labour ratio
    c. living standards around the world become the same
    d. differences persist in living standards around the world.

9. The fact that business cycles are periodic but not recurrent means that
    a. business cycles occur at predictable intervals, but do not last a predetermined length of time
    b. the business cycle's standard contraction-trough-expansion-peak pattern has been observed to recur over and over again, but not at predictable intervals
    c. business cycles occur at predictable intervals, but do not all follow a standard contraction-trough-expansion-peak pattern
    d. business cycles last a predetermined length of time, but do not all follow a standard contraction-trough-expansion-peak pattern.

10. Which of the following macroeconomic variables is countercyclical?
    a. real interest rate
    b. unemployment
    c. the money supply
    d. consumption

11. What do RBC economists mean by the term calibration?
    a. modifying the structure of an economic theory to strengthen its logic
    b. changing a theory as the economy changes
    c. working out a detailed numerical example of a more general theory
    d. writing out the implications of a theory for all the main economic variables.

12. When RBC economists compare the correlations in their models to the data, what are they looking at?
    a. The degree to which variables lead output over the business cycle
    b. The strength of procyclicality of different variables
    c. The amount of random variation in economic variables
    d. **The degree to which different economic variables move together**.

13. According to the misperceptions theory, when the aggregate price level is higher than expected,
    a. the aggregate quantity of output supplied rises above the full employment level

b. the aggregate quantity of output supplied falls below the full employment level
c. the aggregate quantity of output demanded falls below the full employment level
d. the aggregate quantity of output demanded rises above the full employment level.

14. Which of the following statements is true about the misperceptions theory?
    a. Both anticipated and unanticipated changes in the nominal money supply have real effects on the economy
    b. Neither anticipated nor unanticipated changes in the nominal money supply has real effects on the economy
    c. Unanticipated changes in the nominal money supply have real effects, but anticipated changes are neutral.
    d. Anticipated changes in the nominal money supply have real effects, but unanticipated changes are neutral.

15. The theory of rational expectations suggests that
    a. people never make forecast errors
    b. people make intelligent use of available information
    c. people make systematic forecast errors
    d. people are slow to incorporate new information into their forecasts.

16. Hysteresis in unemployment means
    a. many people counted as employed are really underemployed
    b. the natural rate of unemployment changes in response to the actual rate of unemployment
    c. there is no natural rate of unemployment; there is a natural rate of inflation instead.
    d. The actual unemployment rises when the natural rate of unemployment rises.

17. The main determinant of how quickly expected inflation adjusts to changes in monetary policy is
    a. the slope of the Phillips curve
    b. the slope of the short-run aggregate supply curve
    c. the credibility of the Central Bank
    d. the degree of indexation in the economy.

18. The argument that when policy changes, people's behaviour changes so that historical relationships between macroeconomic variables will no longer hold is known as
    a. the Phillips curve
    b. the policy irrelevance hypothesis
    c. hysteresis
    d. the Lucas critique

19. Historically, Brazil has suffered higher and more variable rates of inflation than Venezuela. You would expect the short-run aggregate supply curve of Brazil to be _____ than that of Venezuela, and the Phillips curve of Brazil to be _____ than that of Venezuela
    a. flatter; flatter
    b. flatter; steeper
    c. steeper; steeper
    d. steeper; flatter

20. Both classicals and Keynesians agree that policymakers
    a. Can exploit the Phillips curve in the short run.
    b. Cannot exploit the Phillips curve in the short run
    c. Can keep the unemployment rate permanently below the natural rate by permanently running a high rate of inflation
    d. Cannot keep the unemployment rate permanently below the natural rate by permanently running a high rate of inflation

Section C (50 percent): Answer the two following **Long question:**

C1. Consider the following economy

IS curve	$r = 2.47 - 0.0004Y$
Real money demand	$L = 0.5Y - 500(r + \pi^e)$
Short run aggrgate supply	$Y = \bar{Y} + 100(P - P^e)$

Here, r is the real interest rate, Y is output, and P is the price level. Assume that the expected inflation is zero, nominal money supply M = 88,950, and full-employment output $\bar{Y}$ = 6000.

a) **What is the equation of the aggregate demand curve**?

$$IS: r = 2.47 - 0.0004Y$$

$$LM: \frac{M}{P} = 0.5Y - 500r$$

$$AD: \frac{M}{P} = 0.5Y - 500(2.47 - 0.0004Y)$$

$$\Rightarrow \frac{M}{P} = 0.7Y - 1235$$

$$\Rightarrow Y = \frac{127071.42}{P} + 1764.28$$

b) Suppose the expected price level P^e = 29.15. What are the short-run and the long-run equilibrium values of the price level P and output Y?

$$AS: Y = 3085 + 100P$$

$$AD: Y = \frac{127071.42}{P} + 1764.28$$

$$\Rightarrow 3085 + 100P = \frac{127071.42}{P} + 1764.28$$

$$\Rightarrow 13.20 + P^2 - 1270.71 = 0$$

$$P = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow P = 29.65$$

$$Y = 6050$$

c) An unanticipated increase raises the money supply to M = 100000. What are the equilibrium values of the price level P and output Y?

$$P^e = 29.15$$

$$AS: Y = 3085 + 100P$$

$$AD: Y = \frac{142857.14}{P} + 1764.28$$

$$\Rightarrow 3085 + 100P = \frac{142857.14}{P} + 1764.28$$

$$\Rightarrow 13.20 + P^2 - 1428.57 = 0$$

$$P = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow P = 31.76$$

$$Y = 6261.83$$

d) The Bank of Canada announces that the money supply will be increased to M = 100000, which the public believes. Now what are the equilibrium values of the price level P, the expected price level P^e, and the output Y?

$$P^e = P$$
$$AS: Y = 6000$$
$$AD: Y = \frac{100000}{0.7P} + \frac{1235}{0.7}$$
$$\Rightarrow 6000 = \frac{100000}{0.7P} + \frac{1235}{0.7}$$
$$P = 33.72$$
$$Y = 6000$$

C2. Suppose that the economy has the Phillips curve

$$\pi = \pi_{-1} - 0.5(u - u^n)$$

The natural rate of unemployment is: $u^n = 0.06$

a. **What is the natural rate of unemployment**?

The natural rate of unemployment is the rate at which the inflation rate does not deviate from expected inflation rate. Here, the expected inflation rate is just last period's actual inflation rate.

b. How much cyclical unemployment is necessary to reduce inflation by 1-percentage points? Using Okun's law, compute the sacrifice ratio.

To reduce inflation, the Phillips curve tells us that unemployment must be above the natural rate of 6 percent for some period of time. We can write the PC in the form

$$\pi - \pi_{-1} = -0.5(u - 0.06)$$
$$-0.01 = -0.5u + 0.03$$
$$u = 0.08$$

Hence, we need 2 percentage point years of cyclical unemployment above the natural rate of 6 percent.
Okun's law says that a change of 1 percentage point in unemployment translates into 2 percentage points in GDP. Hence, an increase in unemployment of 2 percentage points corresponds to a fall in output of 4 percentage points. The sacrifice ratio is the percentage of a year's GDP that must be forgone to reduce inflation by 1 percentage point. The sacrifice ratio is 4

c. Inflation is running at 3 percent. The bank of Canada wants to reduce it to 1 percent. Give two scenarios that will achieve that goal.

One scenario is to have very high unemployment for a short period of time. For example, we could have 12 percent unemployment for a single year. Alternatively,

we could have a small amount of cyclical unemployment spread out over a long period of time. For example, we could have 4 percent unemployment for three years. Both of these plans would bring the inflation rate down from 3 percent to one percent, although at different speeds.

Suppose now that the natural rate of unemployment is given by an average of the past two years' unemployment:

$$u^n = 0.5(u_{-1} + u_{-2})$$

d. Why might the natural rate of unemployment depend on recent unemployment (as is assumed in the preceding equation)?

The natural rate of unemployment might depend on recent unemployment for at least two reasons, suggested by theories of hysteresis. First, recent unemployment rates might affect the level of frictional unemployment. Unemployed workers lose job skills and find it harder to get jobs; also, unemployed workers might lose some of their desire to work, and hence search less hard for a job. Second, recent unemployment rates might affect the level of wait unemployment. If labour negotiations give a greater voice to "insiders" than "outsiders," then the insiders might push for high wages at the expense of jobs. This will be especially true in industries in which negotiations take place between firms and unions.

e. Suppose that the bank of Canada follows a policy to reduce permanently the inflation rate by 1 percentage point. What effects will that policy have on the unemployment rate over time? [Hint: demonstrate that the unemployment until period 4, remains at least 1 percent above its original natural rate].

If the central bank seeks to reduce inflation permanently by 1 percentage point, then the PC tells us that the first period we require

$$\pi_1 - \pi_0 = -1 = -0.5(u_1 - u_1^n)$$
$$u_1 - u_1^n = 2$$

That is, we require an unemployment rate 2 percentage points above the original natural rate u_1^n**.** Next period, however, the natural rate will rise as a result of the cyclical unemployment. The new natural rate u_2^n will be

$$u_2^n = 0.5(u_1 + u_0) = 0.5[(u_1^n + 2) + u_1^n] = u_1^n + 1$$

Hence the natural rate of unemployment rises by 1 percentage point. If the bank of Canada wants to keep inflation at its new level, then unemployment in period 2 must equal the new natural rate u_2^n**.** Hence, $u_2 = u_1^n + 1$

In every subsequent period, it remains true that the unemployment rate must equal the natural rate. This natural rate never returns to its original level: we can show this by deriving the sequence of unemployment rates:

$$u_3 = 0.5u_2 + 0.5u_1 = u_1^n + 1 - \tfrac{1}{2}$$

$$u_4 = 0.5u_3 + 0.5u_2 = u_1^n + 1 - \tfrac{1}{4}$$

$$u_5 = 0.5u_4 + 0.5u_3 = u_1^n + 1 - \tfrac{3}{8}$$

Unemployment always remains above its original natural rate. Thus to reduce inflation by 1 percentage point, unemployment rises above its original level by 2 percentage points in the first year, and by 1 or more percentage points in every year after that.

f. What do these equations imply about the short-run and long run tradeoffs between inflation and unemployment.

Without hysteresis, we found that there was a short run trade-off but no long-run trade-off between inflation and unemployment. With hysteresis, we find that there is a long-run tradeoff between inflation and unemployment: to reduce inflation, unemployment must rise permanently.