Macroeconomic Theory I
ECO2142
October 8th, 2004
Mid-Term Exam
University of Ottawa
Professor: Louis Hotte

Calculators allowed
Time allowed: 1h 20min

Attention: *Graphics and equations should be accompanied with* ***short and precise*** *comments; it is often the only way to make a difference between a calculation mistake and deficient comprehension. However, comments that have nothing to do with the question will be interpreted as a lack of understanding.*

The exam supervisors are there to supervise, not answer questions. They have been instructed ***not*** *to answer questions unless they feel that it is absolutely necessary.*

The exam is marked on ***25*** *points. This questionnaire has* ***2*** *pages.* GOOD LUCK!

A. **Multiple choice questions: (5 points)**

(1) The velocity of money
   (a) is the speed at which the Central Bank prints new bills and coins.
   (b) is equivalent to the inflation rate.
   (c) is the time it takes for money to go from one bank to another on average.
   (d) is the opportunity cost of holding money.
   (e) represents how fast a dollar bill moves from one person to another on average.♠

(2) In the short run, economists consider that interest rates are primarily determined by
   (a) the demand and supply of goods and services.
   (b) the equilibrium between saving and investment.
   (c) government spending.
   (d) the demand for liquidities and the supply of money.♠
   (e) the tax rate.

(3) Which of the following is false?
   (a) In the last 10 years or so, the inflation rate in Canada is considered to be well under control.
   (b) Today, the per-capita income in the USA is about 25% higher than in Canada.
   (c) Since the 2nd World War, West European countries have chronically suffered from a higher unemployment than the USA.♠
   (d) Japan has suffered from a long recession recently.
   (e) Today, the unemployment rate in Canada is considered too high by most observers.

(4) Compared to the 1950-1970 period, the USA measured GDP has experienced a slowdown in its growth rates from 1974 to today. Which of the following is most probably **not** responsible for that measured slowdown?
   (a) Decreasing returns to research.
   (b) High military spending in the USA.♠
   (c) Reductions in capital investments.
   (d) Measurement problems concerning quality improvements in goods and services.

(5) A recent report announces that the number of individuals that have abandoned job searches due to discouragement has increased. According to the definitions of unemployment and labor force that we have seen, and assuming that nothing else has changed, this report would imply that
   (a) the unemployment rate has gone down.♠
   (b) the number of working people has increased.
   (c) the share of the labor force that is unemployed has increased.
   (d) the number of unemployment people has increased.
   (e) None of the above.

B. (10 points) Assume that we have a closed economy and that investment is exogenously set at $I = \bar{I}$. The economy's short run behavior is described by the following system of equations:

$$Z = C + \bar{I} + G \tag{1}$$

$$Y = Z \tag{2}$$

$$C = c_0 + c_1(Y - T) \tag{3}$$

where each variable is defined as seen in class.

(1) (4 points) Explain, in your own words, what each equation represents. (What does it mean intuitively, no mathematics.)

EQUATION 1 DENOTES THE AGGREGATE DEMAND FOR GOODS AND SERVICES, WHICH IS THE SUM OF AGGREGATE CONSUMPTION, INVESTMENTS, AND PUBLIC EXPENDITURES. IT IS AN IDENTITY BECAUSE IT IS TRUE BY DEFINITION.

EQUATION 2 REQUIRES THAT OUTPUT BE EQUAL TO DEMAND BECAUSE FIRMS WILL MATCH ANY INCREASE IN DEMAND BY AN EQUAL INCREASE IN OUTPUT. THERE IS THUS AN INFINITE (PERFECT OR COMPLETE) ELASTICITY OF SUPPLY. IT IS AN EQUILIBRIUM-CONDITION.

EQUATION 3 SAYS THAT AGGREGATE CONSUMPTION DEMAND IS LINEARLY AND POSITIVELY RELATED TO DISPOSABLE INCOME, THAT IS, THE DIFFERENCE BETWEEN AGGREGATE INCOME AND TAXES. IT IS CALLED A BEHAVIORAL EQUATION BECAUSE IT DEFINES THE CONSUMERS' BEHAVIOR. PARAMETER c_1 REPRESENTS THE PROPENSITY TO CONSUME WHILE c_0 IS THE ZERO-INCOME CONSUMPTION LEVEL.

(2) (3 points) Define private aggregate saving and show that investment is equal to the sum of private and public saving.

Private aggregate saving is defined as

$$S = Y - T - C$$

that is, disposable income minus consumption. From equations 1 and 2, we have

$$Y = C + \bar{I} + G.$$

This implies that

$$Y - T = C + \bar{I} + G - T$$

and thus

$$Y - T - C = \bar{I} + G - T.$$

With the above definition of private aggregate saving, we get

$$S = \bar{I} + G - T,$$

which implies that

$$\bar{I} = S + (T - G).$$

This completes the proof.

(3) (3 points) How can it be that a decision to save more out of income can induce a recession? Does it mean that a higher willingness to save is bad for the economy?

The reason why an increased willingness to save causes a recession is because we assumed that investment was fixed at $\bar{I}$. Hence, with $S = \bar{I} + G - T$, saving remains constant even though people are trying to save more out of their income. This paradoxical result comes from the fact that output decreases as people try to save more. Indeed, since $S = Y - T - C$, we have $S = Y - T - c_0 - c_1(Y - T) = -c_0 + (1 - c_1)(Y - T)$. The model thus predicts that $\Delta S = -\Delta c_0 + (1 - c_1)\Delta Y = 0$.

An increased willingness to save out of income is of course not necessarily bad for the economy. Although it may cause a recession in the short run because of the slow response of investment decisions, one would expect investment to increase in the longer run. This would lead to higher output in the future.

C. (10 points) A bond promises to pay \$100 in one year.

(1) (2 points) What is the interest rate on the bond if its price today is \$75? \$95?

If the price of a bond today is \$ 75, its annual return is

$$i = \frac{100 - 75}{75} = 33.3\%.$$

Similarly, if today's price is \$ 95, the interest rate will be

$$i = \frac{100 - 95}{95} = 5.26\%.$$

(2) (3 points) What is the relation between the price of a bond and its interest rate?

Since $i = \frac{100-P}{P}$, we have $Pi + P = 100$, and thus $P(1+i) = 100$, so that

$$P = \frac{100}{1+i}.$$

Bond prices and interest rates are negatively related.

(3) (2 points) If the interest rate is 8%, what is the price of the bond today?

$i = 8\%$ implies that $P = \frac{100}{1+0.08} = \$92.6$.

(4) (3 points) Explain why the Central Bank's monetary policy is usually described in terms of interest rates while in fact it is really controlling the money supply. (No math.)

Controlling interest rates and controlling the money supply are essentially equivalent goals for a Central Bank. For instance, when the CB wants to increase the money supply, it can simply buy back government bonds with newly printed money. This is equivalent to reducing interest rates because the increased demand for bonds leads to higher bond prices (see above).

Most observers prefer to talk of reduced interest rates instead of a larger supply of money because interest rates are easier to interpret by most people.