

**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 is marked on **100** points. This questionnaire has **2** pages. GOOD LUCK!

**1. (10 points)** What would be your best guesses for the average output growth rate, unemployment rate, and inflation rate in Canada over the last ten years? NB I am looking for a reasonable approximation, not the exact answer.

FULL-MARK ANSWERS: INFLATION RATE BETWEEN 1 AND 3%; OUTPUT GROWTH RATE BETWEEN 2 AND 4%; UNEMPLOYMENT RATE BETWEEN 6 AND 10%.

**2. (15 points)** The following is an excerpt from an article published by The Economist (4/12/2004): “The dollar wobbled badly this week, having fallen for five successive days after Mr Greenspan said that America’s current-account deficit was unsustainable because foreigners would eventually lose their appetite for more dollar-denominated assets.” NB Mr Greenspan is chairman of the US Central Bank.

Interpret Mr Greenspan’s comment concerning the relation between a current-account deficit and foreigners’ appetite for dollar-denominated assets. **(In words only in approximately 1/2 page.)**

A CURRENT-ACCOUNT DEFICIT MEANS THAT IMPORTS EXCEED EXPORTS. AS A RESULT, FOREIGN COUNTRIES ARE LEFT WITH A SURPLUS OF \$US THAT THEY DON’T USE TO BUY GOODS AND SERVICES FROM THE US. THOSE EXTRA \$US ARE USED BY FOREIGN INVESTORS TO INVEST IN DOLLAR-DENOMINATED ASSETS. THE US CURRENT-ACCOUNT DEFICIT IS THUS FINANCED BY FOREIGN INVESTORS WHO INVEST IN THE US. GREENSPAN’S COMMENT MEANS THAT ONCE THOSE INVESTORS WILL LOOSE INTEREST IN BUYING SO MUCH US ASSETS, THE EXCESS OF IMPORTS OVER EXPORTS WILL HAVE TO DECREASE.

**3. (45 points) The macroeconomic effects of antitrust legislation**

Assume a **closed** economy in which the labor, goods and financial markets are respectively described by the following equations:

(1) 
$$P = P^e(1 + \mu)F(u, z),$$

(2) 
$$Y = C(Y - T) + I(Y, i) + G,$$

(3) 
$$\frac{M}{P} = YL(i),$$

where each variable, parameter and function are as described in the course. People expect the next period's price level to be equal to the present period's price level.

**3.a)(8)** Interpret the labor market equation by explaining how it was derived. (**No graphic necessary here.**)

THE LABOR MARKET RELATION IS DERIVED FROM TWO EQUATIONS: THE WAGE-SETTING RELATION,  $W = P^e F(u, z)$ , AND THE PRICE-SETTING RELATION,  $P = (1 + \mu)W$ . THE WAGE-SETTING RELATION SAYS THAT NOMINAL WAGES DEPEND POSITIVELY ON EXPECTED FUTURE PRICES, NEGATIVELY ON THE UNEMPLOYMENT RATE, AND ON SOME OTHER STRUCTURAL FACTORS SUMMARIZED BY  $z$ , SUCH AS UNEMPLOYMENT BENEFITS, LABOR REGULATION, WORKERS' TRAINING, ETC. THE PRICE-SETTING RELATION SAYS THAT PRICES ARE EQUAL TO WAGES PLUS A MARKUP FACTOR  $\mu$  WHICH REPRESENTS THE FIRMS' PROFIT LEVEL.

**3.b)(8)** What is the natural unemployment level? Define it mathematically and show it on a graphic in the *real-wage* versus *unemployment* space.

THE NATURAL UNEMPLOYMENT LEVEL IS DEFINED BY THE POINT AT WHICH EXPECTED AND ACTUAL PRICES ARE EQUAL,  $P^e = P$ . HENCE,  $F(u_n, z) = \frac{1}{1+\mu}$ . (SEE GRAPHIC 3.B)

**Suppose now** that the government introduces stricter antitrust legislation that **successfully** increases the intensity of competition between firms.

**3.c)(8)** Using the graphic drawn in question (3.b), show what will be the effect of this legislation on the natural unemployment level. Explain.

IF THE INTENSITY OF COMPETITION BETWEEN FIRMS INCREASES, THEIR PROFIT LEVEL WILL GO DOWN, THUS LOWERING THE MARKUP LEVEL  $\mu$ . A LOWER  $\mu$  SHIFTS THE PRICE-SETTING CURVE UP IN GRAPHIC 3.B. ASSUMING A NEW LOWER MARKUP LEVEL AT  $\mu'$ , WE OBTAIN A LOWER NATURAL-UNEMPLOYMENT RATE AT  $u'_n$ . UNEMPLOYMENT DECREASES BECAUSE WITH A LOWER MARKUP LEVEL, REAL WAGES GO UP:  $\frac{W}{P} = \frac{1}{1+\mu}$ . IN THE WAGE-SETTING RELATION, A HIGHER REAL WAGE CORRESPONDS TO A LOWER UNEMPLOYMENT RATE, BECAUSE IT ALLOWS WORKERS TO NEGOTIATE HIGHER REAL WAGES.

**3.d)(8)** Explain, with the help of **only one** graphic in the *price* versus *output* space, what will be the short-run and medium-run effects of this legislation on output, unemployment, and prices. Assume that prior to the new legislation, the economy was at its natural output equilibrium.

BY DEFINITION,  $u = \frac{L-Y}{L} = 1 - \frac{Y}{L}$ . HENCE,  $u_n = 1 - \frac{Y_n}{L}$ . IN GRAPHIC 3.D, THE AS CURVE DENOTES THE LABOR MARKET RELATION (1), WHILE THE AD CURVE DENOTES THE GOODS AND FINANCIAL MARKETS (2) AND (3). AS CAN BE SEEN FROM RELATION (1), A LOWER  $\mu$  WILL SHIFT THE AS CURVE DOWN. NOTE THAT THE NEW CURVE AS' IS ASSOCIATED WITH A HIGHER NATURAL-OUTPUT LEVEL  $Y'_n$  SINCE THE NATURAL-UNEMPLOYMENT RATE IS NOW LOWER. THIS CURVE MUST INCLUDE POINT  $P = P^e$  AT  $Y'_n$ . IN THE SHORT RUN, AT POINT B, OUTPUT INCREASES AND PRICES DECREASE. AS PRICES DECREASE, PEOPLE'S EXPECTATIONS OVER PRICES ( $P^e$ ) WILL DECREASE, THUS SHIFTING THE AS CURVE DOWN FURTHER (SEE RELATION (1)). THIS PROCESS WILL CONTINUE UNTIL EXPECTED PRICES ARE EQUAL TO ACTUAL PRICES. THE MEDIUM-RUN

EQUILIBRIUM IS REACHED AT POINT A', WHICH RESULTS IN A HIGHER OUTPUT AND LOWER PRICE.

**3.e)(8)** Explain, with the help of **only one** graphic in the *interest rate* versus *output* space, what will be the short-run and medium-run consequences of this legislation on the goods and financial markets.

IN GRAPHIC 3.E, THE IS AND LM CURVES DENOTE RELATIONS (2) AND (3) RESPECTIVELY. WE HAVE SEEN THAT AS  $\mu$  GOES DOWN, SO DO PRICES. THIS SHIFTS THE LM CURVE DOWN BECAUSE THE REAL MONEY SUPPLY ( $\frac{M}{P}$ ) HAS INCREASED, THUS LEADING TO LOWER INTEREST RATES. IN THE SHORT RUN, WE HAVE A LOWER INTEREST RATE AND HIGHER OUTPUT. AS PRICES KEEP DECREASING TOWARD THE MEDIUM-RUN LEVEL, THE LM CURVE KEEPS SHIFTING DOWN. IN THE NEW MEDIUM-RUN EQUILIBRIUM AT A', THE INTEREST RATE IS LOWER. NOTE THAT THE NEW MEDIUM-RUN OUTPUT LEVEL  $Y'_n$  IS CHARACTERIZED BY A HIGHER CONSUMPTION LEVEL,  $C(Y'_n - T)$ , AND HIGHER INVESTMENT LEVEL,  $I(Y'_n, i)$ .

**3.f)(5)** According to this model of the economy, what could we say about the effects of stricter antitrust legislation on workers' welfare?

IN THE NEW, MEDIUM-RUN EQUILIBRIUM, WORKERS' REAL WAGES AND EMPLOYMENT RATE BOTH INCREASE. THIS SUGGESTS THAT WITHIN THE FRAMEWORK OF THE PROPOSED MODEL, WORKERS DO BETTER WHEN COMPETITION BETWEEN FIRMS BECOME MORE INTENSE.

#### 4. (30 points) Open economy under a fixed exchange rate regime

We describe an economy that is open to trade and subject to perfect capital mobility by the following system of equations:

$$(4) \quad Y = C(Y - T) + I(Y, i) + G - \epsilon Q(Y, \epsilon) + X(Y^*, \epsilon),$$

$$(5) \quad \frac{M}{P} = YL(i),$$

$$(6) \quad i_t = i_t^* + \frac{E_{t+1}^e - E_t}{E_t},$$

where each variable, parameter, and function is defined as seen in the course. We shall assume that  $E_{t+1}^e = \bar{E}^e$ , that is, the expected exchange rate is fixed.

**4.a)(10)** Interpret relation (6) by explaining how it was derived.

EQUATION (6) IS CALLED THE INTEREST-PARITY CONDITION. IT INSURES THAT THE BOND MARKET IS IN EQUILIBRIUM BY MAKING INVESTORS INDIFFERENT BETWEEN HOLDING DOMESTIC AND FOREIGN BONDS.

SHORT ANSWER: IF A CANADIAN BUYS A CANADIAN BOND, HE GETS A RETURN OF  $i$  IN ONE YEAR. IF HE BUYS A US BOND INSTEAD, HE GETS A RETURN EQUAL TO THE FOREIGN INTEREST RATE  $i^*$  PLUS THE DEVALUATION OF THE CANADIAN DOLLAR IN THAT YEAR  $\frac{E_{t+1}^e - E_t}{E_t}$ . SINCE THE FUTURE VALUE OF THE EXCHANGE RATE IS NOT KNOWN WITH CERTAINTY AT THE TIME OF THE INVESTMENT DECISION, INVESTORS USE THEIR EXPECTED VALUE  $E_{t+1}^e$ .

LONGER ANSWER: IF A CANADIAN INVESTS 1\$C IN A CANADIAN BOND, HE WILL GET BACK  $(1 + i)$ \$C NEXT YEAR. IF, INSTEAD, HE INVESTS 1\$C IN A US BOND, HE MUST FIRST EXCHANGE IT INTO \$US. THIS GIVES  $\frac{1}{E_t}$ \$US INVESTED IN US BONDS. THIS WILL YIELD  $(1 + i^*)\frac{1}{E_t}$ \$US THE FOLLOWING YEAR. ONCE CONVERTED INTO \$CDN, IT YIELDS  $(1 + i^*)\frac{1}{E_t}E_{t+1}$ \$CDN. IN EQUILIBRIUM, INVESTORS MUST BE INDIFFERENT BETWEEN INVESTING IN CANADIAN OR US BONDS, THAT IS, THEIR EXPECTED RETURNS MUST BE EQUAL, OTHERWISE INVESTORS WOULD ALL SELL THE LOWER PERFORMING ONE. SINCE THE FUTURE EXCHANGE RATE IS NOT KNOWN AT PERIOD  $t$ , INVESTORS USE THEIR EXPECTED VALUE  $E_{t+1}^e$ . IN EQUILIBRIUM, THEREFORE:

$$(7) \quad 1 + i = (1 + i^*)\frac{E_{t+1}}{E_t} \equiv (1 + i^*)\left(1 + \frac{E_{t+1}^e - E_t}{E_t}\right)$$

THIS EQUATION IS APPROXIMATELY EQUAL TO EQUATION (6) FOR LOW VALUES OF  $i$ ,  $i^*$ , AND EXPECTED DEVALUATION  $\frac{E_{t+1}^e - E_t}{E_t}$ .

**4.b)(10)** Analyze graphically and describe the effects of a fiscal contraction on the economy when exchange rates are fixed.

THE ECONOMY IS INITIALLY AT POINT A IN THE ACCOMPANYING IS-LM GRAPHIC 4.B. AT THAT POINT, THE DOMESTIC INTEREST RATE IS EQUAL TO THE FOREIGN ONE. THIS MEANS THAT PEOPLE DO NOT EXPECT ANY CHANGE IN THE EXCHANGE RATE, AS PER EQUATION (6). HENCE, THE EXCHANGE RATE IS EFFECTIVELY FIXED.

BY REDUCING THE DEMAND FOR GOODS, A FISCAL CONTRACTION WILL SHIFT THE IS CURVE TO THE LEFT. IF NOTHING ELSE IS DONE, THE ECONOMY'S NEW EQUILIBRIUM WOULD MOVE TO POINT B, CHARACTERIZED BY A LOWER INTEREST RATE THAN THE FOREIGN ONE. ACCORDING TO RELATION (6), THIS WOULD DEPRECIATE THE CURRENCY. IN ORDER TO MAINTAIN THE EXCHANGE RATE FIXED, THE CENTRAL BANK MUST REDUCE THE MONEY SUPPLY. THE LM CURVE SHIFTS UP, THEREBY INCREASING INTEREST RATES, UP TO A NEW EQUILIBRIUM AT POINT A', WHERE DOMESTIC AND FOREIGN INTEREST RATES ARE EQUAL. THE EXCHANGE RATE IS THUS UNCHANGED.

WITH A FIXED EXCHANGE RATE, A FISCAL CONTRACTION WILL REDUCE OUTPUT THROUGH TWO CHANNELS: DIRECTLY BY REDUCING THE DEMAND FOR GOODS; INDIRECTLY BY FORCING THE CENTRAL BANK TO INCREASE INTEREST RATES IN ORDER TO KEEP THE EXCHANGE RATE AT THE SAME LEVEL.

**4.c)(10)** Comment on the following assertion: "Under fixed exchange rates, the money stock must be constant".

THIS ASSERTION IS FALSE. WITH A FIXED EXCHANGE RATE, THE CENTRAL BANK MUST CONSTANTLY VARY THE MONEY SUPPLY IN ORDER TO KEEP THE DOMESTIC INTEREST RATE EQUAL TO THE FOREIGN ONE, AS SEEN IN THE ANALYSIS IN 4.B). WHAT IS TRUE, HOWEVER, IS THAT THE CENTRAL BANK HAS NO CONTROL OVER ITS MONETARY POLICY SINCE IT CANNOT CHOOSE INTEREST RATES INDEPENDENTLY.