TEMPORARILY
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turn in midterm
question paper

QUEEN'S UNIVERSITY
FACULTY OF ARTS AND SCIENCE

DEPARTMENT OF ECONOMICS

Economics 222 A & B
Macroeconomic Theory I

Midterm Examination
February 11, 2009

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DURATION: 1.5 hours (90 minutes)

INSTRUCTIONS: Use the EXAMINATION BOOKLETS to answer. Show ALL RELEVANT STEPS**.**

Calculators: non-programmable, Casio 991, blue sticker, gold sticker.

Part A (Short Questions, True/False/Uncertain): Do **THREE** of the **SIX** questions. State whether you think the statement is true/false/uncertain, and explain why, using the appropriate diagrams if applicable. ***No marks*** will be given for answers lacking an explanation. Each question is worth **10 MARKS** for a total of **30 MARKS**.

Part B (Long Questions): Do **TWO** of the **FOUR** questions. Each question is worth **35 MARKS** for a total of **70 MARKS**.

TOTAL: 100 MARKS.

Part A – Short Questions (True/False/Uncertain)

*Do **three (3)** of the **six (6)** questions. Each question is worth **10 marks**, for a total of **30 marks**.* State whether you think the statement is true/false/uncertain, and explain why, using the appropriate diagrams if applicable. ***No marks*** will be given for answers lacking an explanation.

A1

The saving-investment identity in a closed economy, $S = I$, describes how an increase in government spending, G, must crowd out investment one-for-one.

A2

The government finances a transfer to households at time $t = 1$ by issuing debt. The debt must be reimbursed at time $t = 2$, and to this end the government levies a lump-sum tax on the households at time $t = 2$. As a result, the households' consumption choices are left unchanged.

A3

Two large economies (the US and China) interact in the world's economy. Assume that the US initially has a current account surplus. An increase in the US government's expenditures G will cause China to save more.

A4

The introduction of a tax on labour income will necessarily reduce the quantity of aggregate labour supplied in equilibrium.

A5

Classical theory provides a good framework for considering the aggregate fluctuations of unemployment in the short run.

A6

Knowing where the no-lending/no-borrowing point is on a consumer's inter-temporal budget constraint allows economists to derive the pure substitution effect of a change in the real interest rate.

Part B – Long Questions

*Do **two (2)** of the **four (4)** questions. Each question is worth **35 marks**, for a total of **70 marks**.*

B1 – Employment, Labour, and Production

An economy is characterized by the following equations, describing respectively the production technology and the supply of labour in this economy.

$$Y = 2K^{\frac{1}{2}}N^{\frac{1}{2}}$$

$$N^S = (1-\tau)w$$

where τ is the marginal tax rate on labour income. The capital stock is given by $K = 125$. Using this information, answer the following questions.

a) [5 MARKS] *Show algebraically* or *argue rigorously* that this production technology exhibits constant returns to scale (CRS).
b) [10 MARKS] Assume initially that $\tau = 0$. Find the labour market equilibrium wage rate, w^*, and level of employment, N^*.
c) [10 MARKS] Suppose now that $\tau = 0.25$. Find the new labour market equilibrium wage rate and level of employment. Illustrate this new equilibrium in a diagram, and contrast it with the equilibrium in b) by drawing the appropriate curves.
d) [10 MARKS] Assume again that $\tau = 0$. Suppose that the government imposes a minimum wage of $\underline{w} = 5.25$. Find the new labour market level of employment. What is the unemployment rate after the minimum wage has been imposed? Illustrate the situation graphically. Would you expect the effect to be the same if $\tau = 0.25$? Explain.

B2 – Saving, Investment, and the Goods Market Equilibrium

Suppose that the production side of the economy is characterized by the following equations:

$$MPK^f = 150 - 0.2K^f$$

$$\overline{Y} = 1600$$

$$K = 700$$

$$d = .20$$

$$p_K = 1$$

where MPK^f describes the relationship between the future marginal product of capital and the future capital stock K^f, $\overline{Y}$ represents full-employment output, K is the initial capital stock, d is the depreciation rate, and p_K is the price of capital.

a) [10 MARKS] We first seek to characterize the firms' investment decisions. To this extent, find the following: (i) an equation relating K^f to the interest rate, r; (ii) use this equation to find the firms' desired (gross) investment, I^d, as a function of r.

Suppose now that aggregate desired consumption in this economy is given by:

$$C^d = 160 + 0.6Y - 150r$$

Meanwhile, government expenditures are given by $G = 300$. No taxes are levied, hence $T = 0$.

b) [5 MARKS] Find an equation for desired national saving, S^d, as a function of the interest rate r.
c) [10 MARKS] Find the goods market equilibrium, that is, the market clearing interest rate r^*, and equilibrium levels of investment and saving.
d) [10 MARKS] Now assume that this is a small open economy, and that $NFP = 0$. The world's interest rate is given by $r^w = 0.02$. Holding national income at its full-employment level, compute the desired saving S^d and desired investment I^d, as well as the current account balance, CA. Is this economy a net lender or borrower on the world market? Represent the situation graphically.

B3 – National Accounts

The table below summarizes an economy, which consists of three sectors, potato farmers, McCain's (a producer of potato chips) and a government sector. Farmers have a current crop (valued at 200) as well as some left over potatoes from the previous year's crop held as inventories (valued at 20). Farmers sell most of their crop to McCain's (170) and the rest, including the previous year's inventories, to the public. Farmers pay wages (100) and they receive a subsidy from the government (20).

McCain's potato chips are popular and are sold in both Canada (350) and the United States (150). To produce them, McCain's buys potatoes from farmers and pays wages (200) to its employees. As well the firm pays taxes to the government equal to 20% of its profits.

The government sector produces a service, which is valued at cost (200, the amount paid to civil servants to deliver the service). In addition, the government also pays subsidies to farmers. The only source of revenue that the government has is corporate taxes, which it levies

on McCain's profits at a 20% rate.

Potato Farmers	
Crop in current year	200
Inventories from previous year	20
Amount sold to public (from crop and inventories)	50
Amount sold to McCain's	170
Wages paid to employees	100
Subsidies to farmers	20

McCain's	
Amount of potatoes purchased from farmers	170
Value of potato chips sold in Canada	350
Value of potato chips sold in US	150
Wages paid to employees	200
Tax rate on corporate profits	20%

Government	
Wages paid to civil servants to perform services	200
Subsidies paid to farmers	20
Revenues from corporate profits	20% of profits

In answering the following questions, be sure to give the reasons behind each calculation. ***No marks*** will be given for answers lacking an explanation.

a) [15 MARKS] Use the example to show that the three approaches to national accounting are equivalent. In the income approach, what is the value of net domestic product at factor costs? How does one go from that concept to GDP?
b) [10 MARKS] Show the relation for and calculate the fiscal balance of the government. Show the relation for and calculate private saving. Using your results, calculate national saving. Is saving equal to investment, and if not, why not?
c) [10 MARKS] Show the relation for and calculate domestic absorption. Is Canada experiencing a capital inflow or an outflow? In all cases, state why when giving your answer.

B4 – Consumption and Saving

A consumer divides his/her life into two periods, working and retirement. The consumer has a current income (y) of 250 and an expected future income (y^f) of 200. The agent knows the rate of interest ($r = 5\%$). The agent is a consumption smoother and he/she needs to determine how much to consume in the current period (c) and how much to consume in the future (c^f).

a) [5 MARKS] Use the information given to calculate the present value of the agent's lifetime

resources. As well, calculate the maximum amount that the agent could consume in the future. Use that information to plot the agent's budget constraint line.

b) [10 MARKS] The agent faces a set of downward sloping indifference curves with each having a slope given by $-(10/9)(c^f/c)$. Use this information, and the agent's inter-temporal budget constraint, to calculate the optimal levels of current and future consumption. Show your results graphically.

c) [10 MARKS] Suppose now that the agent is made aware of a gift of 50 to be received in the second period. Calculate the effect that this has on both current and future consumption as well as current saving.

d) [10 MARKS] Starting from the original income position (no gift of 50), assuming that interest rates rise to 10%. What is the effect on both current and future consumption as well as on current saving? What can we say about the strength of the income and substitution effects?