

# AUSTRALIAN NATIONAL UNIVERSITY

*Annual Examination - November 2002*

## MACROECONOMICS 2

**(ECON 2102 and ECON 2111)**

*Pass and First Honours*

*Study Period: 30 Minutes*

*Time Allowed: Three Hours*

*Permitted Materials: Calculators, Foreign Language/English Dictionaries*

Parts A and B are of equal value. Each part is worth 50 marks.  
Within each part each question is of equal value.

Answer ALL of the questions in PART A and TWO of the questions in PART B

Answers to Part A must be written in the book stamped "A" and answers to Part B must be written in the book stamped "B".

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### **PART A**

**Answer ALL of the questions in this Part in the booklet stamped "A"**

**Question A1.** Use the data for the economy represented in the table below to calculate GDP via the expenditure method. Write down clearly the identity you are using and the simplifications required in this special case then explain each step.

	\$'000s
Agriculture	
Total sales	140
Capital goods purchases	40
Manufacturing inputs	30
Wages	70
Operating surplus	40
Manufacturing	
Sales of capital goods	100
Sales of other manufactures	260
Capital goods purchases	60
Agricultural inputs purchased	80
Wages	170
Operating surplus	110

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**Part A continued:**

**Question A2.** A country's GDP is 600 (\$ billion) and its dependence on factor inputs can be described using the function  $Y = A K^\alpha L^{1-\alpha}$ . The initial capital stock is 1600 (\$ billion), the supply of labour is 12 (million person-years) and the capital share of GDP at factor cost is 30 per cent. Assuming all markets clear in this economy, calculate the real wage, indicating the units of measurement, and the per cent rate of return on capital at the margin. Then use diagrams to help explain how each would differ if the initial capital stock were larger.

**Question A3.** A closed Swan-Solow economy has output  $Y = A K^\alpha L^{1-\alpha}$ , no government, a fixed average saving rate,  $s$ , and its capital depreciates at the rate,  $\delta$ . There is no population growth or technical change. Establish that its technology exhibits constant returns to scale and use this to formulate the relationship between output per worker and capital per worker. Then write the equation of motion for capital per worker and solve for the steady state capital per worker in terms of the production function parameters, the saving rate and the depreciation rate. Explain your result and illustrate it using a diagram.

**Question A4.** A closed Swan-Solow economy has output  $Y = A K^\alpha (\theta L)^{1-\alpha}$ , where  $\theta$  is the ratio of effective to actual workers. There is no government, a fixed average saving rate,  $s$ , and its capital depreciates at the rate,  $\delta$ . The labour force grows at the rate  $n$ /year and the rate of labour-augmenting technical change (the growth rate of  $\theta$ ) is  $g$ /year. The economy is in a steady state in output per effective worker. Derive the growth rates of the economy's GDP, its real wage and its rate of return on capital. Briefly explain your results.

**Question A5.** Cyril Wang's computer store rents laptop PCs and has an existing stock of  $K$  machines. Cyril is choosing how many new machines to buy during the coming year. He faces a market nominal interest rate,  $i$ , a depreciation rate on his stock of PCs,  $\delta$ , and the price of new PCs is  $P_K$ . The price of PC rental services in the economy is  $P_Y$  and he can charge a nominal rent per PC equal to the value of its marginal product:  $P_Y MP_K(K)$ . Construct Cyril's annual profit per PC. Explain how his investment demand would change with an increase in either the price of PCs relative to rental services, the net rate of return on PCs, the interest rate (bond yield) or the inflation rate.

**Question A6.** A waterside worker is commencing his last decade prior to retirement. His disposable income during this decade will be 500 (thousands of dollars). He expects to live one further decade beyond retirement but to have no disposable income in that period. The bond market offers a nominal interest rate of  $i = 0.5$  (50%) per decade and no inflation is expected between the two decades. His preferences as between consumption in the current decade and in his retirement accord with the utility function:

$$U = C_1^{1/4} C_2^{3/4} .$$

Formulate the worker's intertemporal budget constraint and use the optimality condition linking marginal utilities with the real interest rate:

$$\frac{MU_{C_1}}{MU_{C_2}} = 1 + r$$

to solve for his consumption and saving during his last decade of work. Briefly explain how this allocation would change were the nominal interest rate to rise.

**Question A7.** Briefly define purchasing power parity (PPP), the real exchange rate and the PPP exchange rate. In some initial year the home (H) country has a nominal exchange rate of 0.80 F\$/H\$ and the ratio of the home price level in H\$ to the foreign price level in F\$ is 1.33. Five years later the nominal exchange rate is 0.50 F\$/H\$ and the ratio of the home price level in H\$ to the foreign price level in F\$ is now 1.5. Work out both the real exchange rate and the PPP exchange rate in the initial year and after the five-year interval and comment on whether the nominal rate is under or over valued in each period.

*The remaining questions in Part A address the short run effects of shocks on deviations from the steady state growth path. They pertain to a length of run over which the productive capital stock is fixed, determined by previous investment. New investment creates expenditure on current GDP but does not affect current production capacity. There is no expected inflation at home or abroad.*

**Question A8.** The government of a small open economy in which all markets clear, and in which there is a current account deficit, faces a rise in the risk-adjusted return on foreign bonds,  $r^*$ . The central bank is independent and it targets the price level. Assuming the price level chosen is that of home-produced goods and services (the GDP deflator or GDP price),  $P_Y$ , use diagrams representing the labour, capital, foreign exchange and money markets to help explain the effects this shock has on output, the price level, the interest rate and the real and nominal exchange rates.

**Question A9.** The government of a small open economy in which all markets clear, and in which there is a current account deficit, implements a fiscal contraction (it reduces  $G$ , reducing its fiscal deficit and so issues fewer government bonds). The central bank is independent and it targets the price level (in this case the GDP deflator or GDP price,  $P_Y$ ). Use diagrams to help explain the effect of this policy change on the interest rate, the size of the current account deficit, the real exchange rate and the nominal exchange rate. Briefly explain whether the central bank raises or contracts the nominal money supply.

**Question A10.** Use the  $AD-AS$  diagram, in combination with the  $IS-LM-BoP$  diagram, to analyse the effects of a single shock (a 10% increase in the most recently negotiated nominal wage) on the interest rate, the level of unemployment, the current account deficit, the real exchange rate and the nominal exchange rate. The central bank adopts a monetary policy that targets the GDP price,  $P_Y$ . Explain how the effect might be different if the central bank targeted the unemployment rate. Indicate the direction of change in the monetary base and the nominal exchange rate in each case.

## PART B

**Answer TWO questions only in this Part in the booklet stamped "B"**

### **Question B1:**

A Solow-Swan economy has production function  $Y = A K^\alpha (\theta L)^{1-\alpha}$ , where  $\theta$  is the ratio of “effective” workers to actual workers, a rise in which reflects labour augmenting technical change. GDP per effective worker is in a steady state, the population is growing at  $n$ /yr and technical change progresses such that the growth rate of  $\theta$  is  $g$ /yr.

- (a) Formulate the growth rates of the real wage and the real return on capital in terms of  $g$ ,  $n$  and the production parameters. Explain your reasoning and the implications of your result.

(6 marks)

- (b) Use a diagram to explain the role of the saving rate in affecting the size of the economy and its growth rate. (5 marks)
- (c) List two types of policies that would bolster growth in per capita income in the context of this model. Briefly describe the means by which each would be expected to change the steady state growth rate. (8 marks)
- (d) The model specified above incorporates only physical capital. Briefly explain how the model and its behaviour is changed when factors like “human capital” and “knowledge” are incorporated into the single aggregate “capital”. Suggest a possible formulation and indicate on what parameters the growth rate of the economy then depends. (6 marks)

**Question B2:**

Consider a small open economy and a length of run over which the productive capital stock is fixed, determined by previous investment. New investment creates expenditure on current GDP but does not affect current production capacity. There is no *expected* inflation. The perceived (risk-adjusted) real return on investments abroad ( $r^*$ ) falls, raising net foreign savings unambiguously. In each of the four cases (a) to (d) below, offer a brief analysis of the effects of the shock, focussing on the directions of change in the interest rate, the current account deficit, the real exchange rate, the price level, the nominal exchange rate, the nominal wage, the level of GDP and the levels of employment and unemployment. Use diagrams representing the markets for labour (if needed), financial capital (“loanable funds”), foreign exchange and home money, combined with steps in point form, then comment briefly on the policy regime in each case.

- (a) The labour market clears, so that the nominal wage adjusts to retain full employment. Analyse the effects of the above shock for the case in which there is no change in fiscal policy and the central bank targets the monetary base, holding official foreign reserves constant. (5 marks)

- (b) The labour market clears, so that the nominal wage adjusts to retain full employment. Analyse the effects of the above shock for the case in which there is no change in fiscal policy but monetary policy is adjusted to retain a fixed nominal exchange rate – monetary policy “targets” the (nominal) exchange rate,  $E$ , and the rate of accumulation of official foreign reserves ( $\Delta R$ ) are held constant. (5 marks)
- (c) No short-run adjustment in the nominal wage is possible. Analyse the effects of the above shock for the case in which monetary policy is adjusted to retain a fixed price level of home-produced goods and services (that is, monetary policy “targets” the GDP price level,  $P_Y$ ) and the rate of accumulation of official foreign reserves is held constant. (7 marks)
- (d) No short-run adjustment in the nominal wage is possible. Analyse the effects of the above shock for the case in which monetary policy is adjusted to retain a fixed GDP deflator level,  $P_Y$  (monetary policy “targets” the GDP price level). This time, however, the rate at which official foreign reserves are increasing is changed to avoid any change in the (nominal) exchange rate. Briefly explain how “sterilisation” would be necessary in this case. (8 marks)

**Question B3:** Recent shocks have left the government of a small open economy with substantial unemployment. It maintains a floating exchange rate regime and seeks to boost employment via either a monetary expansion or a fiscal expansion (while the central bank targets the nominal money supply). Consider a length of run over which the productive capital stock is fixed (determined by previous investment) and in which new investment creates expenditure on GDP but does not affect current production capacity. There is no *expected* inflation at home or abroad.

- (a) Use diagrams representing the markets for labour, financial capital (“loanable funds”), foreign exchange and domestic money to characterise the initial equilibrium in this country’s economy. Show and explain how these diagrams would differ were the international mobility of financial capital (“capital mobility”) to be increased. (5 marks)

- (b) Use diagrams representing the  $AD$ ,  $SAS(W)$ ,  $IS$ ,  $LM$  and  $BoP$  curves to characterise the initial equilibrium in this country's economy. With reference to the diagrams in (a), above, briefly explain the meaning of each curve. Then show and explain how these diagrams would differ were "capital mobility" to be increased.
- (5 marks)
- (c) Assume, temporarily, that the labour market clears and that capital mobility is imperfect. Use which ever set of diagrams seems appropriate. Analyse separately the effects of a pure fiscal expansion (monetary base constant) and a pure monetary expansion ( $G$  constant), both of which are sufficient to cause a 10% rise in the GDP price ( $P_Y$ ). Then determine whether the fiscal expansion would need to be larger or smaller if there were an increase in "capital mobility". Deduce from this the change in the comparative power of the two policy instruments as capital mobility increases.
- (5 marks)
- (d) For the case where the international mobility of "capital" is imperfect, use your diagrams to help explain how the effectiveness of such a fiscal expansion also depend on the central bank's target of monetary policy. Compare the results from (c), above, with two alternative cases: 1) the central bank targets the nominal exchange rate,  $E$ , and 2) the central bank targets the price level of home-produced goods and services (the GDP deflator or GDP price),  $P_Y$ .
- (5 marks)
- (e) Again for the case in which international "capital" mobility is imperfect, explain whether such a fiscal expansion would be effective in raising output if the central bank were to target the price level of home consumption (the CPI),  $P_C$ . In particular, explain whether the fiscal expansion would be more effective in this case than were the central bank to target the price level of home-produced goods and services,  $P_Y$ .
- (5 marks)