

# AUSTRALIAN NATIONAL UNIVERSITY

*Annual Examination - November 2000*

## 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 1.** From the balance sheet of firms derive the identity for aggregate expenditure on GDP. Then, from the balance sheet of households derive the corresponding identity for the disposal of aggregate income. Use these to formulate the relationships between the surplus of domestic absorption over GDP, the surplus of domestic investment over domestic savings, the current account deficit and the capital account surplus. Ignore "net income" flows on the current account. Define your terms and explain your reasoning.

**Question 2.** In one decade, a steady state economy has one per cent of all employed workers separate from their jobs each month and 20 per cent of unemployed workers find new jobs each month. Calculate the natural rate of unemployment, taking care to explain your reasoning. In the next decade, the economy, still in the steady state (that is, not during a business cycle downturn), has a separation rate of two per cent and the number of unemployed workers finding work falls to 15 per cent per month. Calculate the new natural rate and briefly offer one possible explanation for the change.

**Question 3.** 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 4.** A closed Solow-Swan 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. Illustrate the result on a diagram.

**Question 5.** A closed Solow-Swan economy is in a steady state in terms of GDP per effective worker but it has population growth and labour augmenting technical change. Use a diagram to help explain the role of the saving rate in affecting the size of the economy and its growth rate.

**Question 6.** The Solow-Swan model incorporates only physical capital. Briefly explain how the model and its behaviour is changed when factors like "human capital" and "knowledge" are incorporated with physical capital. Suggest a possible single-sector formulation and indicate on what parameters the growth rate of the economy depends.

*The remaining questions in Part A address the short run effects of shocks on deviations from the steady state growth path. They refer 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.*

**Question 7.** The central bank of a closed economy in which all markets clear maintains a fixed monetary base. A sudden rise in the availability of debit cards changes the public's preferences over the division of their money holdings between cash and deposits in banks. They choose to hold less cash and more deposits. Formulate the relationship between the monetary base and the nominal money supply and use diagrams to explain the effects of the shock on the demand side of the economy.

**Question 8.** Wage bargainers agree to a sudden and unexpected 10% rise in the nominal wage. Thereafter, for the length of run of interest here, the nominal wage is fixed. State whether this is a demand or supply side shock and use diagrams representing the supply and demand sides of the economy to explain its short run effects on the real wage, output, total savings, the interest rate, investment, the price level, the current account deficit, the real exchange rate and the floating nominal exchange rate.

**Question 9.** For the length of run over which the nominal wage remains fixed, use the *AD-AS* diagram, in combination with the *IS-LM-BoP* diagram, to explain the effects of a monetary contraction on the price level, the interest rate, the level of unemployment, the current account deficit, the real exchange rate and the floating nominal exchange rate. In particular, note and explain any difference between the proportional changes in the nominal money supply and the price level.

**Question 10.** The macroeconomic policy regimes of the majority of industrial countries have changed substantially over the past three decades. At the outset their governments and central banks adopted fixed exchange rates and used fiscal policy extensively to stabilise output and employment. Then came a change to floating rates with monetary policy targeted on output or unemployment. Finally, floating rates with price level (or inflation) targeting were adopted. Explain why you think these two transitions occurred.

### **PART B**

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

**Question 1.** A closed economy with no government and a fixed average saving rate,  $s$ , and with capital depreciating at the rate,  $\delta$ , has technology  $Y = A K^\alpha (\theta L)^{1-\alpha}$ . Where  $\theta$  is the ratio of effective to actual workers, the growth in which represents labour-augmenting technical change at rate  $g = (\theta_{t+1} - \theta_t)/\theta_t$ . This economy also has a growing labour supply, at rate  $n = (L_{t+1} - L_t)/L_t$ . The equation of motion for capital per effective worker in this economy is  $k_{t+1} - k_t = [i_t - (\delta+n+g)k_t]/(1+n+g)$ , where  $i_t = sy_t$  and  $y_t = Y_t/(\theta_t L_t)$ .

(a) Formulate output per effective worker as a function of capital per effective worker then derive and explain the condition linking the savings rate, output per effective worker and capital per effective worker that must be met for the economy to be in a steady state.

(5 marks)

(b) Explain the nature of the “golden rule” steady state and note the condition on the marginal product of capital that must apply for its existence. Derive the marginal product of capital from the production function and use it to formulate the golden rule level of capital per worker in terms of the growth rates  $n$  and  $g$ .

(5 marks)

Part B, Question 1, continued.

- (c) Combine your result in (b) with the expression for steady state capital per worker derived in (a) to obtain the golden rule saving rate. Explain the implication of your result for the optimality of saving behaviour when there are shocks to the population growth rate or the rate of technical change.  
(5 marks)
- (d) Imagine that the economy begins in a steady state with a national saving rate below its golden rule level. The government then changes policy so as to induce a sudden increase to the golden rule saving rate. Sketch the path through time of consumption per effective worker and comment on any policy implications.  
(5 marks)
- (e) Calculate the values of the steady state growth rates of GDP, GDP per actual worker and the real wage and offer a brief explanation.  
(5 marks)

**Question 2:** A small open economy experiences a sudden deterioration in its terms of trade (a fall in  $P^*$  by 10%). 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 labour market, the market for loanable funds, the money market and the balance of payments to characterise the initial equilibrium in this country's economy. Explain how solving for the equilibrium requires a progression between markets and how you arrive at a value for the initial nominal exchange rate.  
(5 marks)
- (b) The government and central bank decide to float the exchange rate. Assuming the nominal wage adjusts to clear the labour market, explain the effect of the terms of trade change (fall in  $P^*$ ) on output, investment, the real money supply, the interest rate, the real exchange rate, the price level, the nominal wage and the nominal exchange rate.  
(3 marks)
- (c) Alternatively, the government and central bank could use monetary policy to target the nominal exchange rate so that it remains fixed. Assuming the nominal wage adjusts to clear the labour market, use diagrams to explain how the effects of the fall in  $P^*$  would differ. Note the magnitude of the change in the nominal money supply and, referring to its balance sheet, indicate the steps the central bank would need to take to bring this about.  
(5 marks)

Part B, Question 2, continued.

- (d) Now consider the case in which monetary policy is used to target the nominal exchange rate but the nominal wage cannot be renegotiated. Use your diagrams representing both the supply and demand sides of the economy to help explain the effects of the shock and the monetary policy response on output, unemployment, investment, the real money supply, the interest rate, the real exchange rate, the price level, the nominal wage and the nominal exchange rate. In particular, indicate whether the change in the domestic price level is larger or smaller than in (c), above, and if you can say whether the monetary change is more or less contractionary.

(7 marks)

- (e) If the terms of trade shock were seen as temporary, the central bank could maintain both a fixed nominal exchange rate and a fixed price level by changing its rate of accumulation of official foreign reserves ( $\Delta R$ ). Referring again to your demand side diagrams and the central bank's balance sheet, explain the changes that would be needed to maintain both a fixed nominal exchange rate and a fixed price level following the decline in  $P^*$ .

(5 marks)

**Question 3:** 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 or a fiscal expansion. 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 labour market, the market for loanable funds, the money market and the capital account of the balance of payments to characterise the initial equilibrium in this country's economy. Show and explain how these diagrams would differ were "capital mobility" to be increased.

(5 marks)

- (b) While ever the nominal wage cannot be renegotiated, the magnitude of the employment increase obtained depends on the size of the price level increase generated by the policy change (the size of the vertical shift in the aggregate demand, or  $AD$ , curve). To isolate this, consider the demand side of the economy for the case where output is fixed at its initial level. Use diagrams like those in (a), above, to implement a 10% monetary expansion and explain the resulting price level change.

(3 marks)

Part B, Question 3(b), continued.

- (c) Show on your diagrams the effects of the fiscal expansion that would cause the same price level rise as the monetary expansion in (b), above. Use your diagrams to illustrate whether the corresponding fiscal expansion would 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 changes to shift the *AD* curve upward as capital mobility increases.

(7 marks)

- (d) Illustrate the initial equilibrium of the economy using both the *AD-AS* and the *IS-LM-BoP* diagrams. Explain to which market each curve refers and how the diagrams would differ were capital to be more mobile.

(5 marks)

- (e) Use the *AD-AS* and the *IS-LM-BoP* diagrams to show the effect of a fiscal expansion. Deduce the associated changes in the price level, the interest rate, the real exchange rate and the nominal exchange rate. Then explain how these results would change with increased capital mobility.

(5 marks)



