

Economic Growth ECON8050

EXAM

Semester 2, 2001

Permitted Materials: non-programmable calculator
English or foreign language dictionary

Answer FOUR (4) questions.

QUESTION 1.

Assume that the output, Y_t , of a single good economy at time t can be represented by a Cobb-Douglas production function exhibiting constant returns to scale in relation to two inputs: capital, K_t , and effective labour, $(A_t L_t)$ – where labour augmenting technology, A_t , is growing at a constant rate, g . The labour input, L_t , is growing at a constant rate, n . Gross investment is sY_t , where s is the constant exogenous rate of investment. The capital stock depreciates at a constant rate, d .

Define capital stock per effective worker, $k_t = K_t / (A_t L_t)$. Define the growth rate as $\hat{k}_t = (dk_t / dt) / k_t$. Define the steady state value as k^* .

- i) Derive the expression for the growth rate, \hat{k}_t , as a non-linear function of k_t .
- ii) Use a first-order Taylor approximation to linearise the growth rate around the steady state, expressing \hat{k}_t as a linear function of the absolute distance from steady state, $(k_t - k^*)$.

[NOTE: this is not the same as Mankiw, Romer and Weil who linearise as a function of $(\ln k_t - \ln k^*)$.]

- iii) Derive and use the steady state condition to eliminate the investment rate, s , from the expression in ii) to show that the growth rate is a linear function of the *proportional* distance from steady state, $(k_t - k^*) / k^*$.

- iv) Explain the determinants of the rate of convergence to steady state in this linearised model.

QUESTION 2

A typical empirical growth study on a cross-section of countries, indexed by i , regresses the growth rate of output *per capita*, y_i , on the log of its initial value, y_{i0} , and a vector of other variables, \mathbf{X}_i , which might include the investment rate, the rate of population growth, the degree of openness to trade, etc. We can write the regression, using only one X variable, as:

$$\ln \left(\frac{y_{it}}{y_{i0}} \right) = \alpha + \beta \ln y_{i0} + \gamma X_i + \varepsilon_i$$

Suppose that the random shocks to growth, ε_i , are uncorrelated with the explanatory variables. Suppose also that the regression reveals conditional convergence, i.e. that the coefficient $\beta < 0$.

- i) Does this imply σ -convergence, i.e. that $\text{Var}[\ln y_{it}] < \text{Var}[\ln y_{i0}]$? Explain your answer analytically and with examples.
- ii) Does this also imply that each country is converging towards its own steady state value?
- iii) Recent studies have produced a wide range of different estimates of the rate of conditional convergence, despite the fact that they have been studying the growth rates of the same group of countries over the past forty years. What are the methodological differences and why do they produce such different results?

QUESTION 3

The role of human capital varies across growth models. In Romer (1990), long-run growth depends on the stock of human capital in a country. According to the model of Lucas (1998), long-run growth is a function of the rate at which human capital is accumulated. In the neo-classical model, however, long-run growth is unaffected by either the stock or the growth rate of human capital.

Explain why these models have such different predictions and evaluate the empirical evidence.

QUESTION 4: answer either part A or part B

4A) Barro (1990) constructs a model where productive public expenditure, financed by a flat-rate income tax, and private investment can together drive long-run growth. He finds that decentralised investment decisions lead to sub-optimal growth.

Explain this finding. Also discuss how lump-sum taxation would affect growth and welfare, according to this model.

OR

4B) Evaluate theory and evidence concerning the impact of government expenditure on growth.

QUESTION 5 answer either part A or part B

Recent modelling of endogenous technological progress has tended to divide into two classes: models that emphasise the development of new products, or models that emphasise improvements in the quality of existing products.

5A) Compare and contrast the principal features of these two classes of models. What are the implications for public policy towards R&D ?

OR

5B) Critics, such as Charles Jones, have argued that both classes of models suffer from 'scale effects' – the counterfactual prediction that larger economies should grow faster. Evaluate the arguments and evidence. Discuss how these models may be modified to eliminate the scale effect.