

14.02 Principles of Macroeconomics

Problem Set 9 - GROWTH

Posted: Wednesday, November 28, 2001

Due: Monday, December 10, 2001

PART I (TRUE or FALSE)

1. Under a fixed exchange rate regime, aggregate demand is vertical because any change in P will be offset by an endogenous movement of M .
2. Under a flexible exchange rate regime, an increase in E^e will shift aggregate demand to the left.
3. Under a fixed exchange rate regime, an increase in E^e will shift aggregate demand to the right.
4. As long as productivity does not affect the bargaining process between workers and firms, technological progress will not affect the natural rate of unemployment.
5. The Solow model with no technological progress concludes that output per capita will converge to a level that does not depend on s (savings rate).
6. Conditional convergence states that, everything else equal, the absolute increase of output per capita in small countries will be larger than in rich countries.
7. The more you save the more your country will keep growing in the long run.
8. The 1970's was a decade of huge growth among developed countries.
9. If s is greater/smaller than s_{GR} (Golden Rule) then a decrease/increase in s would increase consumers well being.
10. If $F(K,L)$ shows constant returns to scale then $f(k) = \lambda k$ for every $\lambda > 0$.

PART II (SOLOW MODEL)

1. Deduce the growth equation in per capita terms of a country with production function $F(K, L)$, depreciation rate δ , savings rate s and population growth rate n . Where $F(K, L)$ shows constant returns to scale.
2. Answer the question above assuming the government taxes a fraction t of total production and uses its revenues to dig holes in the ground.

3. Answer the previous question assuming a government that saves all its revenues.
4. Assume $n = t = 0$. In this new economy capitalists save all their rents while workers consume all their wages. In a competitive scenario the rent from one unit of capital will be equal to its net marginal productivity (i.e. $r = f'(k) - \delta$) What will the growth equation be in this case?
5. In the previous question, if $F(K, L) = K^\alpha L^{1-\alpha}$ the growth equation will be equivalent to a standard Solow growth equation. What is the savings rate associated to the latter?
6. Go back to question 4. and assume $F(K, L)$ is such that $f'(k) > 0$ decreases as k increases (diminishing returns to capital). But it is such that for low values of k , $f'(k)$ decreases at a very low rate so that $f'(k)k$ actually increases with k . After a certain level k_0 , diminishing returns start having a big effect so that $f'(k)k$ decreases with k .

As k increases to a level $k_1 > k_0$, the country finds itself in a new industrialized environment. In this new scenario returns to capital decrease at a lower pace so that $f'(k)k$ starts increasing again. Eventually diminishing returns in this environment will become big enough to make $f'(k)k$ decrease.

- (a) Graph $f'(k)k$ and show that there can be multiple equilibria (3).
- (b) Assume the country is in the 'industrialized equilibrium' (associated with the highest k in equilibrium). If an earthquake destroys a given amount of capital, how will this economy evolve? What will your answer depend on?