

Supplementart Examination

Macroeconomic Analysis

ECON7040

July 19, 2021

Instructions

You must submit to Turnitin the questions and answers to this assessment, including graphs and tables, when necessary. You can use this *tex* file to fill in your answers <https://www.overleaf.com/read/pypqgcgrrbfw>. The answers must contain a list of references used in the analysis/discussion of your arguments. There is no page limit. However, brevity and clarity will be valued and excessively long and unclear answers will be penalized. *Collaboration, not plagiarism, is encouraged. You must write the names of the students you collaborated with.* **Deadline for submission: July 22, 2021, 5:00 PM, Brisbane time.**

Part A: Short Questions and Answers (50 marks total)

1. (10 marks) Assume the following capital accumulation equation $K_{t+1} = I_t^{1/3} + (1 - \delta)K_t$, where $I_t = sY_t = sAK_t^\alpha N_t^{1-\alpha}$. A given amount of investment I_t generates less new capital (adjustment costs). Obtain the new TD equation and find the steady state value of capital per-capita (k^*) assuming $N_t = N_{t+1} = \bar{N}$ for every t . Explain the difference, in terms of economic intuition, between this formula and the one studied in lectures.
2. (10 marks) Figure 1 shows the evolution of GDP per-capita and the growth rate population of Japan. Use the Endogenous growth model and the historical events affecting Japan to describe the evolution of these variables, in isolation and together. Can any of the model's implied equilibrium make sense of the facts? If not, what should the model incorporate?
3. (10 marks) Assuming Cobb-Douglas production technology, we have that total factor productivity (A) can be measured as $A_t = Y_t/(K_t^\alpha N_t^{1-\alpha})$. Provide three arguments that invalidate this formula as a good proxy for

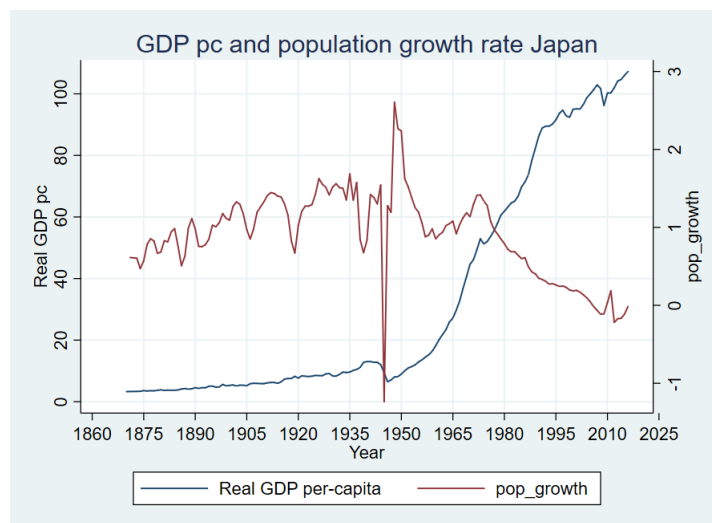


Figure 1: Japan: GDP per-capita and n

total factor productivity. Be explicit about the potential bias and discuss its implications.

4. (10 marks) Write down the Euler equation for consumption and saving decision derived in lecture 6. Assume the utility function is logarithmic ($U(C, N) = \log C + \theta \log(1 - N)$). Combine the resulting Euler equation with the household's budget constraint in period t and $t+1$. Express C_t as a function of Y_t , Y_{t+1} , the real interest rate (r) and β the discount factor. Explain why and how consumption at time t depends on future income (Y_{t+1}). How does the previous answer depend on β ? Explain.
5. (10 marks) Ramey and Zubairy (2018) "Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data"¹ (discussed in lecture 10) show that the government spending multiplier can be substantially larger than 1 (1.5) when the economy is at the ZLB. Explain how our model can or cannot make sense of this result.

¹Link to the published paper <https://www.journals.uchicago.edu/doi/10.1086/696277?mobileUi=0>.

Part B: Long Question (50 marks)

1. Suppose that the economy is well described by the augmented Solow model. Assume $F(K_t, Z_t N_t) = A_t K_t^\alpha (Z_t N_t)^{1-\alpha}$. Also, assume that Z_t and N_t grow at a rate equal to z and n , respectively. The transitional dynamics equation, in terms of efficiency units ($\hat{k}_t = \frac{K_t}{Z_t N_t}$), is .

$$\hat{k}_{t+1} = \frac{1}{(1+z)(1+n)} [sA_t \hat{k}_t^\alpha + (1-\delta)\hat{k}_t].$$

- (a) (5 marks) Derive a formula for the steady state value of capital *per-efficiency units* and an expression for the long-run capital per capita.
 - (b) (10 marks) Suppose that the economy reached its steady state. Unfortunately, an earthquake destructs a large fraction of the physical capital (K) in the economy. There is also a small reduction in population (N) due to the earthquake, but the reduction in K generates a significant decline in capital per capita (k). Describe and explain the evolution of k, y, c, i, r , and w .
 - (c) (5 marks) Suppose that the economy reached its steady state again. Describe and explain the evolution of k, y, c, i, r and w after an unexpected and permanent increase in the growth rate of labour augmenting productivity z .
 - (d) (5 marks) Derive the Golden rule saving rate of this model. Provide an expression for the Golden rule level of steady state consumption per-efficiency units.
2. Suppose that the economy is well described by the IS-LM-AD-AS model with partially sticky prices studied in class. In your answers below, keep in mind the consumers' and firms' optimal decisions that give rise to the model and explain how and why agents' decisions change.

- (a) (5 marks) Suppose that the degree of price flexibility in the economy increases, such that the parameter γ in our price determination equation

$$P_t = \bar{P} + \gamma(Y_t - Y_t^f)$$

changes. Explain how this change affects the effectiveness of fiscal policy. In particular, how do the responses of Y , P , N , r , and w , to a given shock in G , change when γ changes?

- (b) (5 marks) Suppose that the economy is sitting at its frictionless long-run equilibrium ($Y_t = Y_t^f$). Suddenly, there is an international shock that decreases the average production cost in the economy (\bar{P} decreases). Describe the new short-run equilibrium of the economy. In particular, explain the effect on the output gap, employment level, price level, interest rate, and real wage rate. How different would have been the macroeconomic effects of the shock absent the change in price flexibility γ ?

- (c) (5 marks) Given the reduction in \bar{P} , the government decides to pursue an unexpected program of fiscal *austerity* in which G_t reduces significantly and G_{t+1} is expected to gradually increase. Explain the rationale of this policy as a way to stabilise output around potential. Discuss the effects of this austerity policy on consumption, investment, output, employment, prices, real interest rate and employment.
- (d) (10 marks) Suppose now that the ZLB binds. Bad news hit the world. A fraction of the labor force is infected with a deadly virus. Besides the decline in labor force, there is an increase in macroeconomic uncertainty, and governments start implementing restrictions on social gathering. These restrictions imply that, given existing inputs K, N , firms will be able to produce less output Y . Describe the macroeconomic effects of the virus using our five graphs' model.