SUMMER TERM 2019

ECON0039: ADVANCED MACROECONOMICS

TIME ALLOWANCE: 2 hours

All questions should be answered.

Part A carries 50% of the total mark, Part B 20% and Part C 30%. Questions B.1 and B.2 have the same weight.

PART A : Dynamics and Stagnation in the Malthusian Epoch

(Ashraf and Galor, The American Economic Review, Vol. 101, No. 5, 2011)

This problem follows Ashraf and Galor [2011] and proposes a model of the Malthusian regime.

Consider an overlapping-generations economy in which activity extends over infinite discrete time. In every period, the economy produces a single homogeneous good using land and labour as inputs. The supply of land is exogenous and fixed over time, whereas the evolution of labour supply is governed by households' decisions in the preceding period regarding the number of their children.

Production occurs according to a constant-returns-to-scale technology. The output produced at time t, Y_t is

$$Y_t = (AX)^{\alpha} L_t^{1-\alpha}, \qquad 0 < \alpha < 1,$$

where L, and X are, respectively, labour and land employed in production in period t, and A measures the technological level. The technological level may capture the percentage of arable land, soil quality, climate, cultivation and irrigation methods, as well as the knowledge required for engagement in agriculture (i.e., domestication of plants and animals). Thus, AX captures the effective resources used. Output per worker produced at time t is denoted y_t.

In each period t, a generation consisting of L_t identical individuals joins the workforce. Each individual has a single parent. Members of generation t live for two periods. In the first period of life (childhood), $t-1$, they are supported by their parents. In the second period of life (parenthood), t, they inelastically supply their labour (one unit), generating an income that is equal to the output per worker, y_t, which they allocate between their own consumption and that of their children. Individuals derive utility from consumption and the number of their children:

$$u^t = c_t^{1-\gamma} n_t^{\gamma} \qquad 0 < \gamma < 1,$$

where c_t is consumption and n_t, is the number of children of an individual of generation t.

Members of generation t allocate their income between their consumption, c_t and expenditure on children, ρn_t, where ρ is the cost of raising a child. Hence, the budget constraint for a member of generation t (in the second period of life) is

$$\rho n_t + c_t \leq y_t.$$

A.1 Write the utility maximisation problem of an adult and derive optimal consumption c_t and fertility n_t as a function of income per capita. What is the impact of income on fertility? Comment.

A.2 Assume that the initial size of the working population is $L_0 > 0$. Explain why the law of motion of adult population is $L_{t+1} = n_t L_t$. Use the result of the previous question to derive the equilibrium law of motion of adult population $L_{t+1} = \phi(L_t)$.

A.3 Show graphically in the plane (L_t, L_{t+1}) that L will converge to a steady state. Compute that steady state $\overline{L}$. Draw the time path of L starting from $L_0 < \overline{L}$.

A.4 Population density is defined as $P_{dt} = \frac{L_t}{X}$. Compute steady state population density $\overline{P}_d$.

A.5 Compute the law of motion of output per worker $y_{t+1} = \psi(y_t)$. Compute the steady state level of y, denoted $\overline{y}$. Interpret the result.

A.6 Assume that L_0 is at its steady state level $\overline{L}$ and that in period 0 technology A permanently increases to the level δA, $\delta > 1$. Compute y_0, n_0 and L_1.

Draw the time path of adult population L_t and output per worker y_t following that increase in A.

A.7 Ashraf and Galor [2011] write in their article:

> *"The Malthusian theory generates the following testable predictions:*
>
> *(i) Within a country, an increase in productivity would lead in the long run to a larger population, without altering the long-run level of income per capita.*
>
> *(ii) Across countries, those characterized by superior land productivity or a superior level of technology would have, all else equal, higher population densities in the long run, but their standards of living would not reflect the degree of their technological advancement"*

Prove that in the model we have solved, those testable predictions are correct.

PART B : Questions

For each question, you should give a structured answer in no more than one page.

B.1 What are the consequences of the fact that agents do not internalize the dynamics of natural resources in the Easter Island model seen in class. Relate this to current debates on Global Warming.

B.2 What are Piketty's [2014] main contributions to the analysis of inequality?

PART C : Discussion

Below is an article published in The Guardian in August 2018 and entitled "Venezuela devalues currency and raises minimum wage by 3,000%". Read carefully this article before answering the questions below.

C.1 Write a 10-line summary of that article.

C.2 According to that article, what are the consequences of hyperinflation in Venezuela?

C.3 What are the main actions of Nicolás Maduro's plan to stop hyper inflation? Discuss.

C.4 According to historical records and theory, what needs to be done to end hyperinflation episode?

"Venezuela devalues currency and raises minimum wage by 3,000%, Caracas shears five zeros from bolívar, which will be pegged to new cryptocurrency"
by Tom Phillips, Latin America correspondent, *The Guardian*, Mon 20 Aug 2018

Venezuela moved to shore up its crumbling economy on Monday, devaluing its currency and preparing to raise the minimum wage by more than 3,000% in what the country's president, Nicolás Maduro, declared a visionary bid to tame rampant hyperinflation.

More than 500,000 Venezuelans have fled overseas this year amid chronic shortages of food and medicine, soaring crime and warnings from the International Monetary Fund (IMF) that inflation could hit 1m% this year.



A street market in Caracas. The IMF has predicted that hyperinflation may reach 1m% this year. Photograph: Marco Bello/Reuters

But on Friday Maduro unveiled a dramatic raft of measures designed to end a depression he blames on an economic war being waged by imperialist foes of the Bolivarian revolution he inherited after Hugo Chávez's 2013 death.

"I want the country to recover and I have the formula. Trust me," Maduro said in a televised address from the presidential palace, adding, ominously, that "no experts were involved" in the elaboration of that plan.

Maduro began to implement his blueprint – known as the "programme for recovery, growth and economic prosperity" – on Monday, claiming it would represent an inflection point for his once wealthy nation.

"We are going to begin a process of recovery in the coming days, weeks and months," Venezuela's 55-year-old leader vowed on Sunday in a live Facebook broadcast. "It is a revolutionary formula ... unique in the world!"

The recovery package includes measures such as raising taxes, increasing petrol prices for some drivers, and introducing a rebranded currency – the sovereign bolívar – which will have five fewer zeros than its inflation-stricken predecessor, the bolívar.



Maduro holds up a rebranded bolivar in a television broadcast from the presidential palace. Photograph: AFP/Getty Images

"Venezuela is going to experience an economic miracle," Maduro boasted.

Economists and opposition figures, who are calling a nationwide strike for Tuesday in protest, are sceptical the plan will fix an economy so broken that a Venezuelan version of Who Wants to be a Millionaire had to be scrapped because the prize had become so worthless.

A recent survey found that about 90% of Venezuelans now live in poverty while more than 60% admitted to waking up hungry because they lacked the means to buy food. Henrique Capriles, a prominent opposition leader, denounced Maduro's move as a Venezuelan "Black Friday" that would go down as one of the darkest days for the country's already reeling economy.

"The government has decided to thrust us into one final disaster," Capriles wrote in an online essay in which he accused Maduro of plunging the oil-rich nation into "the greatest tragedy in its history".

Another opposition leader, Andrés Velásquez, said: "The measures announced on Friday are not any economic recovery plan for the country. On the contrary, they represent more hunger, more ruin, more poverty, more suffering, more pain, more inflation, more deterioration of the economy."



Bill samples of the new 'sovereign bolívar' currency in a store in Caracas. Photograph: Miguel Gutierrez/EPA

Henkel García, director of the Caracas-based consultancy Econometrica, told Bloomberg Maduro's plan was "a head-scratcher". "This series of measures is a mix of incoherent and contradictory ideas ... It is a worrying contraption that generates a lot of uncertainty about how it will be executed," he said.

During Sunday's Facebook broadcast, Maduro claimed he was ushering in a period of "definite and necessary economic change". He alleged the recent botched attempt to assassinate him with explosive-laden drones was intended to thwart this bright new economic dawn. "I'm alive ... and I am ready to give my whole life for the recovery and economic prosperity and growth of this country," he said.

"Everything will work out. I have such great faith. I love Venezuela profoundly and I know when you turn love into politics miracles can happen."

The estimated 2.3m Venezuelan citizens who have abandoned their country since 2015 – mostly for Brazil, Chile, Colombia, Ecuador and Peru – have no such optimism. The situation is critical and it will get worse, predicted Marisela Guédez, a 38- year-old civil servant who fled through Colombia into the Ecuadorian border town of Tulcán last week, having sold her hair for 100,000 pesos (about £26) in order to pay for the journey. "I never, ever thought about leaving Venezuela – not once," added the homeless mother-of-five, who had left her children behind in Caracas. "Venezuela was such a rich country."

Reinaldo Rivera, a 33-year-old from Maracaibo who had moved to the same border town, said skipping the country with his wife and 18-month-old son had been the only way of keeping them all alive. "In Venezuela you work for a month and it only allows you to eat for two days," he said. "It was almost a question of life or death ... I said: 'Either we get out of Venezuela or we die of hunger'."

On a recent afternoon Maria Consuelo Garcia López, a Dominican nun who helps run a soup-kitchen for economic exiles near Ecuador's border with Colombia, served lunch to hundreds of famished and penniless Venezuelans who had taken the same decision. "How could we just cross our arms and do nothing"? she said. "These people arrive with nothing but their suffering."

Oliver Stuenkel, an international relations specialist from Brazil's Fundação Getulio Vargas, predicted the exodus was likely to accelerate further a result of this week's economic changes. "Maduro's economic reforms – particularly the dramatic increase of the minimum wage – are likely to have a terrible effect on employment, increasing the number of those leaving Venezuela," he tweeted.

Those migrants are likely to face growing obstacles. In recent months Chile, Colombia, Ecuador and Peru have all made life more difficult for Venezuelans wishing to enter their territory.

On Monday the northern Brazilian state of Roraima called on the country's supreme court to halt the entry of Venezuelan immigrants following anti-immigrant riots on the weekend that saw about 1,200 Venezuelans forced back over the border.