**SUMMER TERM 2018**

**ECON3029: ADVANCED MACROECONOMICS**

**TIME ALLOWANCE: 2 hours**

*All questions should be answered.*

*Each part (A, B and C) carries 1/3 of the total mark. Questions B.1 and B.2 have the same weight.*

# PART A : A Model of Fertility and Growth

Consider an overlapping generation environment in discrete time. Economic agents live for two periods, childhood and adulthood. Population of adults is $N_t$. They do not take any decisions in childhood. Adults decide how much to consume of the unique good produced in the economy, and how much of their time they allocate to work and to child-rearing. Each adult has one unit of time. A child needs $0 < \phi < 1$ units of time to be raised, and the number of children per adult is $n_t$. For simplicity, we assume that this number does not need to be an integer. The time allocated to work is $\ell_t$. Therefore, the time constraint of an adult is given by

$$\ell_t + \phi n_t = 1,$$

and the dynamics of the adult population is

$$N_{t+1} = n_t N_t.$$

Adults consume $c_t$. The consumption good is the numéraire, and the wage is denoted $w_t$.
Adults preferences are given by

$$u(c_t, n_t) = c_t + \gamma \log n_t.$$

with $\gamma > 0$. The budget constraint of an adult is

$$c_t = w_t \ell_t.$$

A.1 Write the utility maximisation problem of an adult. Substitute out $\ell_t$ and $c_t$ for $n_t$ using the constraints and derive the optimal fertility decision $n_t$. Comment on the obtained demand for children function.

On the production side, we assume that the production function is given by

$$C_t = \theta_t L_t,$$

where $\theta_t > 0$ is the level of productivity and $L_t$ is total employment.

A.2 Write the profit maximisation problem of a competitive representative firm, and explain why the wage $w_t$ must be equal to $\theta_t$ in equilibrium.

We now study the equilibrium and the dynamics of this economy.

A.3 What are the variables that are either exogenous or predetermined in period $t$?

A.4 What is the equilibrium value of $n_t$? Of income per adult $y_t = \frac{C_t}{N_t}$?

A.5 Find the difference equation $N_{t+1} = f(N_t)$ that determines adult population dynamics.

A.6 Assume $\theta_t = \theta \; \forall t$ (no technical progress). Draw $f$ and the dynamics of $N$ in the space $(N_t, N_{t+1})$, for the two cases $\frac{\gamma}{\theta\phi} > 1$ and $\frac{\gamma}{\theta\phi} < 1$. In each of those two cases, what is the limit of $N_t$ when $t \longrightarrow +\infty$? Give an interpretation.

A.7 Assume now that there is some technological progress, so that $\theta_t = \theta_0 \rho^t$ with $\rho > 1$. Use the equilibrium expression for $n_t$ to find the limit of $n_t$ and $N_t$ when $t \longrightarrow +\infty$.

A.8 What are the economic forces driving the result of the previous question?

## PART B : Questions

For each question, you should give a structured answer.

B.1 PIKETTY's two "laws of capitalism" are $\sigma_k = r \times \frac{k}{y}$ (first "law") and $\frac{k}{y} = \frac{s}{g}$ (second "law"), where $\sigma_k$ is the share of capital in total income, $k$ is capital, $y$ is income, $s$ is the saving rate, $r$ the interest rate and $g$ the growth rate of income. Discuss those two laws and their implication when $r > g$, when $g$ tends to zero?

B.2 What are the economic forces that link economic growth to natural resources and their dynamics?

## PART C : Discussion

Below is an article posted on the website *The Market Mogul* on August 18, 2016 and entitled "The UK's Liquidity Trap". Read carefully this article before answering the questions below.

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

C.2 What are the characteristics of a liquidity trap according to the author? Do you know other historical episodes of a liquidity trap?

C.3 Why would inflation be bad for investors? Is that necessarily bad for the economy as a whole in such a situation? Why?

C.4 The author writes *" It could be argued that now is the time to start taking decisive action by reducing taxes and increasing government spending to move the economy out of the stagnant position it finds itself in."* Does it make sense?

C.5 Find in this article an idea or a statement with which one could disagree, and explain why.

THE UK'S LIQUIDITY TRAP, by Sam Lerche , *The Market Mogul*, August 18, 2016

Britain is in the midst of an economic slowdown, which started after the 2007-2008 financial crisis and has resurfaced following the UK's vote to leave the EU. The UK has just reduced its interest rates to a new record low of 0.25% in the wake of Brexit, having previously been 0.5% since March 2009. These low-interest rates coupled with tiny bond yields and an economy operating below capacity suggest that all the characteristics of a liquidity trap are being fulfilled. The US, Japan and much of Europe are also experiencing similar conditions, but there is no clear policy to "escape" from the trap, although significant monetary stimulus is the way most policy makers are going.

**The Bond Market**

One major area of concern for the UK is the increasing price of government bonds and consequently the diminishing yields on them. The government announced plans for a new £60bn round of quantitative easing together with the cut in interest rates. The idea behind this is to encourage the sellers of government bonds to invest the money back into the private sector, which supports growth. The buyback of government bonds will only push up prices, which decreases yields.

Last week, yields on gilts maturing in 2019 and 2020 were at -0.1%, meaning that buying these bonds will get a negative return. In real terms, this problem for investors is multiplied with the expected rise in inflation following the sharp devaluation of the pound and rising commodity prices. One of the main consequences of these tiny to negative yields in the bond market is the effect this has on individual pensions. Ultimately, lower yields result in lower returns for their savings as pension funds buy government bonds as liability for their annuities.

**The Monetary Policies**

Another major implication of the liquidity trap is that it makes the main macroeconomic tool, monetary policy, largely ineffective. Clearly, the huge monetary stimulus, which started with the drop in interest rates to 0.5% in 2009, hasn't had the desired outcome on economic performance. Perhaps a reason for this is the contractionary fiscal policy measures introduced by George Osborne in 2010, which may have offset gains achieved from the drop in interest rates.

The new government under Theresa May now finds itself in a state of limbo by declaring its aim to reduce austerity measures, yet not committing to an active fiscal policy. It could be argued that now is the time to start taking decisive action by reducing taxes and increasing government spending to move the economy out of the stagnant position it finds itself in.

Furthermore, a show of boldness and courage by the Bank of England (BoE) could help exert confidence back to the consumer. However, this shift in stance by the BOE could also put even more inflationary pressure on the economy, which they are evidently trying to avoid.

**Is Japan Where The UK Is Heading?**

Unfortunately, the UK is not alone in this situation. The world's third- biggest economy, Japan, first experienced conditions associated with a liquidity trap in the 1990s and recent data would suggest that they still haven't escaped the bottleneck. One economic argument is that when rates go negative like they have in Japan, they reduce the velocity of money through the economy as people take their money out the banks and hoard it at home or in other units of value such as commodities. This has a deflationary impact on the economy as each yen generates less economic activity. Therefore policymakers must put in more and more money to try and generate growth. One has seen another example of this with Abe's most recent $258bn stimulus package. Furthermore, Japan is experiencing flatline inflation, which makes real interest rates more attractive, thus keeping the value of the yen strong and this, in turn, has an adverse impact on the country's trade balance. Although the UK is in a much stronger position than Japan, it shows the damaging long-term consequences of a fledgeling economy and keeping interest rates too low for too long.

**UK Equities ? The Resurgence**

The UK equities market has surged to almost record highs in the wake of these challenging economic conditions. The severely weakened pound along with comparatively poor yields in the bond market have been the main drivers of this resurgence, and J.P. Morgan remains bullish that stock prices will remain high despite negative economic data. In this sense, the damaging impact of the liquidity trap has been partly recuperated by gains in UK equities but how much this affects the ordinary working man is questionable, to say the least. Nonetheless, it does at least give investors an opportunity for short-term gains.

**Conclusion**

It is a worrying time for the UK. It is clear that monetary policy cannot be loosened much further with Mark Carney, Governor of the BoE, already saying that the UK will not follow some of its European counterparts in introducing negative interest rates. Clearly, the UK's difficult position will have an effect on individuals whether they are pensioners or for ordinary savers. The expected rise in inflation caused by the weakening pound and rising commodity prices will only accelerate the decline in people's real savings. One must hope that Carney's latest monetary stimulus will keep the economy moving, otherwise the BoE may be forced into taking some potentially inflationary fiscal measures.