**MMM - Problem Set 3**

IES FSV UK

Notes:

Homework is due to **9th December 13:00.** Upload files via Moodle. If you face any problem with uploading files, send the files via email to [josef.strasky@gmail.com](mailto:josef.strasky@gmail.com) and [michal.kubista@nielsen.com](mailto:michal.kubista@nielsen.com)

1. **Consider the simplified IS-LM model specified in the IS-LM\_lecture**

* Consider the IS-LM model in Python (see Moodle).

1. **Comment extensively all features of the plot (all lines, arrows, curves ,...).** From the comments it must be obvious that you understand the IS-LM model and how the model is illustrated using the phase diagram.
2. Prepare an interactive phase diagram using the predefined function **update()** and **widgets.interact()** (consult the first seminar if needed). You should parametrise and briefly describe every argument of the function **update()**. You will use this plot to answer the following points.
3. Comment briefly (but precisely) how the plot develops with change in ‘a’ parameter. Describe very briefly the economic meaning of ‘a’ parameter, meaning of its change and economic implications.

* Consider (or search Wikipedia) ‘liquidity trap’ and ‘crowding out’ situations of the IS-LM model. c) Describe (briefly but precisely) values of the parameters of the model to get

1. ‘liquidity trap’
2. ‘crowding out’

Situations in the IS-LM notebook in Python.

d) Illustrate these situations using the phase diagram in Python (send phase diagrams and proper values of parameters to illustrate each of these situations).

e) Describe in words efficiency of fiscal and monetary policy according to the model in the respective cases.

**2) Bellman equation and Ramsey model**

Consider discrete-time Ramsey model from lecture and provided Python code. You are expected to comment on your code, especially the operations in scripts copied from the seminar to demonstrate your understanding of this problem.

Select arbitrarily your own parameters within following intervals:

1. Prepare the interval for optimisation, the following range should work, but if your (final) solution is too close to one of the borders, you can alter it:

kspace = np.arange(2, 10, 0.05)

1. Use function bellmanRam from seminar (use your parameters and interval from previous parts)

to solve Ramsey model using Bellman equation (iteration method).

1. Use the plotting specification from the seminar, (minor changes might be needed for a nice plot) and discuss how this plot can be used for determination of equilibrium from numerical solution.
2. Determine equilibrium of Ramsey model from numerical calculation in Python. (Equilibrium can be calculated more precisely by selecting denser mesh by changing the definition of interval in part a)

BONUS: Reformulate utility function with the use of CRRA utility function (parameter theta must be appropriately added). (See short presentation on CRRA in Moodle.)