

Problem set 3. 14.461 Fall 2012.

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References: Aiyagari, McGrattan (1997), "The optimum quantity of debt".

1 Optimal level of dept.

Consider the following modification of Aiyagari (1994) with technological progress, government debt and lump-sum taxes. Technological progress is labor-augmenting and given by $z_t = (1 + g)^t$. Government finances exogeneous process of government expenditures G_t through government debt and lump-sum taxes.

1. Normalize variables so that balanced-growth path of the original economy corresponds to a steady-state of the transformed economy. From now on we refer to transformed economy.
2. Compute supply and demand on assets. Draw a graph.¹ Compare the steady-state interest rates and aggregate amount of assets. What is the interest rate if we assume complete markets? Does the increase of debt have different effect under complete and incomplete markets?
3. Denoting by $V(a, e)$ expected utility of agent with asset holdings a and productivity shock e and by $H(a, e)$ distribution of agents across asset holdings and shocks consider the following welfare criterion

$$\Sigma = \int \int V(a, e) dH(a, e). \quad (1.1)$$

¹You may use the AR process for productivity $\log(e_t) = \rho \log(e_{t-1}) + \sigma \epsilon_t$ and the following parameters $\rho = 0.6, \sigma = 0.3$, growth rate - 0.0185, risk aversion 3, discount factor - 0.971, capital share - 0.3, initial borrowing limit 0, depreciation - 0.075, government debt - 10.

Plot welfare as a function of government debt. Is the relation monotonic? Comment.

2 Review of the topic "Agent Heterogeneity in Macroeconomic Models".

The purpose of the problem is to give you the idea of what you could write in a week period.

Using techniques covered in the first topic come up with research question and give an answer to it. Follow the guidelines below.

1. The question should be related to the first topic, which could be roughly stated as "Agent Heterogeneity in Macroeconomic Models". Examples for directions are
 - Theoretical exploration of the models we've covered in lectures and recitations. *E.g. assume that agents in Krusell, Smith model make "naive" conjectures about evolution of capital. Come up with two different "naive" conjectures such that one has similar properties to KS and in another agents could considerably improve their expected utility by being more sophisticated.*
 - Comment on a controversial statement using the heterogeneous agent models. *E.g. take some popular claim and do theoretical adjustment or a version of the calibration of known model to support or object the claim.*
 - Take some macroeconomic model learned in the core macro sequence and introduce agent heterogeneity.
2. You are not supposed to know the literature and it's fine if your question is accidentally already answered as long as you come up with it independently. So don't read extensively and get to modeling as quickly as you can.
3. Report should not exceed 7 pages, single interval, 10pt font. You don't need to provide details of every calculation you make. For proofs a physicist proof would suffice. Make sure you describe carefully the model and equilibrium concept. Be precise in the statements of the results and new assumptions you make.
4. Try to use the tools that you already developed in problem sets and covered in lectures. It could be quite easy or hard problem depending on how far you depart from the tools we've covered.

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