Some additional questions to practice for 411-3 final

Here are some optional additional practice questions to prepare for the 411-3 final, in addition to the problem sets, lecture notes, last year's final, and so on. Please keep in mind that the final is completely *cumulative*, but that these questions focus on more recent material (since you already had additional practice questions for the midterm material). Also, some of these questions are a bit more time-intensive than what is likely to appear on the final.

Problem 1. Suppose that the central bank has a rule for the real interest rate, and it shocks the date-0 real interest rate relative to steady state, $dr_0 < 0$, while leaving all other real interest rates the same. Suppose that the steady-state level of government debt is zero.

What are the output effect, and the decomposition into "direct" and "indirect" effects, in the RA and TA models?[1] How do they compare? How would the answer be different if the steady-state level of government debt was not zero?

Problem 2. Consider a shock to real interest rates in the HA model—say, an AR(1) cut to real interest rates, like we covered in class. Assume that the steady-state level of government debt is positive, and that the government follows a rule where it cuts taxes at date t in response to a cut in rates at date t so that $(1 + r_t)B_t$ is unchanged.

First, write the generalized IKC for the output effect,

$$d\mathbf{Y} = \mathbf{M}^r d\mathbf{r} - \mathbf{M}d\mathbf{T} + \mathbf{M}d\mathbf{Y}$$

Which of these terms will be generally positive at date 0? Which of these terms will have positive, zero, or negative present value?

Now suppose we split up the direct effect into a "substitution" and "income" term as in class:

$$d\mathbf{Y} = \mathbf{M}^{r,sub}d\mathbf{r} + \mathbf{M}^{r,inc}d\mathbf{r} - \mathbf{M}d\mathbf{T} + \mathbf{M}d\mathbf{Y}$$

What is the sign at date 0, and what is the sign of the present value, of each of these two new terms? What about grouping the two middle terms together, $\mathbf{M}^{r,inc}d\mathbf{r} - \mathbf{M}d\mathbf{T}$?

Finally, what if we split up the $\mathbf{M}d\mathbf{Y}$ term as in class, and split the GE effects as

$$d\mathbf{Y} = \mathcal{M}\mathbf{M}^{r,sub}d\mathbf{r} + \mathcal{M}(\mathbf{M}^{r,inc}d\mathbf{r} - \mathbf{M}d\mathbf{T})$$

Do we generally expect both of these terms to be positive (both in date 0 and present value), or not? How would things change if taxes at the margin are assessed not on income but instead lump-sum in proportion to assets?[2] Alternatively, how might things change if the tax cut following a drop in rates is delayed by many periods (and debt lower in the meantime)?

Problem 3. What does the $\mathbf{E}$ matrix look like for a expectation friction where (1) a fraction $1 - \theta$ of households update their expectations, and then have rational foresight, upon an MIT shock at date 0, and (2)

[1] Assume that we always select the general equilibrium where output returns to its steady-state level in the long run.

[2] By "lump sum", I'm supposing that the household does not internalize the disincentive to saving that would be caused by a tax on assets, so that its Euler equation is unchanged.

the remaining fraction θ of households never update their expectations, and are completely myopic, only learning about changes to variables when they happen?

Now, suppose that we have an economy where the **M** matrix under rational expectations mapping income to consumption is

$$\mathbf{M} = \begin{pmatrix} 3/4 & 1/4 & 0 & \ddots \\ 1/4 & 1/2 & 1/4 & \ddots \\ 0 & 1/4 & 1/2 & \ddots \\ 0 & 0 & 1/4 & \ddots \\ 0 & 0 & 0 & \ddots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix}$$

i.e. where spending out of income is always $1/4$ in the periods before and after the income, and $1/2$ in the period of the income, except when the income is unexpected (first column), in which case it is $3/4$ in that period and $1/4$ in the next period.

How does this **M** matrix change when we replace rational expectations with the friction described above where $\theta = 1/2$?

Problem 4. In an input-output network, suppose that I modify the economy by making it more "round-about", imposing that some additional share μ of each sector j's production function is from sector j, and that the remaining $1-\mu$ is split between sector j's original inputs.

In math, this amounts to saying that I replace Ω by $\mu I + (1-\mu)\Omega$, where I is the identity matrix.

How does this change affect the Leontief inverse and Domar weights in the economy? How, according to Hulten's theorem, is the response of real final output C (holding total labor constant) to productivity shocks affected by this?

Conceptual questions.

Problem 5. What is more likely to generate hump-shaped impulse responses, cognitive discounting or sticky expectations? Why?

Problem 6. Consider the menu cost model from class, where there is some iid probability λ of a "free reset". Suppose that we increase λ, recalibrating the menu cost $\xi > 0$ so that the steady-state frequency of price changes is the same. Does ξ increase or decrease? Do the steady-state adjustment bands $[-\bar{x}, \bar{x}]$ expand or contract? How do the weights on the intensive and extensive margins in the equivalent mixture of TD models change, and why?

Problem 7. Does inflation display inertia or anti-inertia in response to real marginal cost shocks in an economy where there is a mixture of relatively flexible and relatively sticky price-setters? Do you have some intuition why?