ECO 318, Practice Exam Key

Instructions: Answer all parts of all questions. For non-technical parts, think 1-2 paragraphs as a rough guideline. I will replace your worst scoring question with your presentation grade if that benefits you. You may thus decide to leave one question blank.

1. General, Relatively Non-Technical Questions.

a. Which model has better microfoundations: The Solow Model or the Infinite Horizon Model?

I would argue the Infinite Horizon Model has better microfoundations. In this model, the representative household's consumption-savings choice results from a utility maximization problem that includes a budget constraint. The savings rate is thus an endogenous variable that responds to factors including the real interest rate.

In the Solow Model, the savings rate is imposed, via assumption, as an exogenous and constant parameter. There is no optimization which limits the model's ability to discuss welfare.

b. What is the most significant difference between the assumptions of Evans, Honkapohja, and Romer (1998) and the other growth models seen in class?

There are a few crucial differences. First, the authors are working within the Endogenous Growth framework. Their model thus includes a positive production externaility where each firm's production increases overall TFP. As a result, equilibrium may not be efficient in contrast to the Infinite Horizon Model. Second, they assume a continuum of capital goods that are complimentary. This allows for the technology locus to be upward sloping. Third, they assume a capital adjustment cost, which allows for the technology locus to be downward sloping. The latter two assumptions allow for multiple, stable steady states. Fourth, the authors assume that expectations are formed through adaptive learning where agents use data to form their beliefs about the real interest rate. This last assumption allows the model to endogenously switch between the neighborhoods of the two stable steady states.

c. Evaluate the following statement "A sunspot is as likely to increase consumption as decrease it. Ensuring that sunspots do not affect the economy should not therefore be a concern for monetary policy."

This statement would be true if households were risk neutral where all they care about is the mean level of consumption. We typically assume, however, that households are risk averse which implies that volatility reduces utility. A sunspot that adds volatility is thus welfare reducing just like a technology shock that adds volatility.

d. Under what conditions can the monetary authority achieve the optimal allocation in the New Keynesian Model. Are these assumptions plausible?

In the basic New Keynesian model, the following policy rule potentially yields the optimal allocation:

$$i_t = (\textbf{??})t^n + \phi_\pi \pi_t + \phi \tilde{y}_t \tag{1}$$

To implement this rule, the monetary authority must be able to contemporaneously observe the natural rates of interest and output, as well as the current levels of output and inflation. I argue that this is not plausible, especially because the former two variables are hypothetical values that could exist if the economy exhibits flexible prices.

Assuming that the monetary authority has this information, optimality then requires that the Taylor Condition be satisfied, which approximately requires that $\phi_\pi > 1$. i find this to be realistic. In addition, fiscal policy must also impost the optimal labor subsidy, paid for by a lump sum tax. This is about as realistic as Mark Sanchez leading the New York Jets to an undefeated season in 2014.

2. Monetary Policy

Consider the model of Gali Chapter 2. Suppose that the monetary authority uses the following policy rule:

$$i_t = \rho + \phi_1 \pi_t + \phi_2 E_t[\pi_{t+1}] \tag{2}$$

a. Obtain a condition for determinacy of equilibrium.

Recall the Fisher Equation:

$$r_t = i_t - E_t[\pi_{t+1}] \tag{3}$$

Inserting (2) into (3) yields an ordinary difference equation:

$$r_t = \rho + \phi_1 \pi_t + \phi_2 E_t[\pi_{t+1}] - E_t[\pi_{t+1}] \tag{4}$$

which is equivalent to

$$i_t = \frac{1-\phi_2}{\phi_1} E_t[\pi_{t+1}] + v_t \tag{5}$$

where v_t is a collection of stuff that is irrelevant to the issue of determinacy.

As always, determinacy then requires that the absolute value of the coefficient for expected inflation be less than one:

$$|\frac{1-\phi_2}{\phi_1}| < 1 \tag{6}$$

b. How does the choice of ϕ_1 affect output and employment.

As shown in class, monetary policy does not affect output or employment when prices are flexible.

c. Now suppose that the monetary authority pursues this same rule, except that it does so in the context of the model from Chapter 3. Discuss (you likely lack time to derive anything formally) how the choice of policy parameters might impact the output gap.

If ϕ_1 is sufficiently small, then the model will likely exhibit indeterminacy. If so, then real variables such as output and employment will be destabilized.

If ϕ_1 is large enough then the model will be determinate. It is likely that increasingly large values will stabilize inflation, and possibly destabilize output, as interest rates increasingly rise in response to inflation.

3. Growth

Recall the Solow Model as developed in class. Now suppose that the aggregate production function takes the following functional form: $f(k) = k_t^2$.

a. Represent the model as a single difference equation.

$$\dot{k} = sk(t)^2 - (n+g+\delta)k(t) \tag{7}$$

b. Solve for the model's non-zero steady state.

As always, the steady state is defined as $\dot{k}$=0. Thus

$$k = \frac{n+g+\delta}{s} \tag{8}$$

c. How does the stability of this model compare to the baseline version presented in class?

Suppose that the economy lies just to the right of the steady state $k(t) = \frac{n+g+\delta}{s} + \epsilon$ where ϵ is an arbitrary (1 penny) small amount of capital. Evaluating (7), we see that:

$$\dot{k} = s(\frac{n+g+\delta+\epsilon s}{s})^2 - \frac{(n+g+\delta)(n+g+\delta+\epsilon s)}{s} \tag{9}$$

Re-arranging:

$$\frac{\dot{k}}{k(t)} = \epsilon s > 0 \tag{10}$$

So the steady state is not stable. The model either diverges toward infinity (if to the right of the steady state) or zero (if to the left).

It is really easy to show this with a simple graph too.