Macroeconomics Qualifier 2016

Questions provided by Dr. David Kiefer

Required Question

Consider a two-equation endogenous stabilization model:

$$\pi = E\pi + x + \varepsilon, \qquad \text{Phillips curve}$$

$$\pi = \frac{1}{2}\left(x^T + E\pi + \varepsilon\right), \qquad \text{president's policy rule}$$

where the endogenous variables are:

π = inflation rate,

x = output gap;

and the exogenous variables are:

ε = a random price shock,

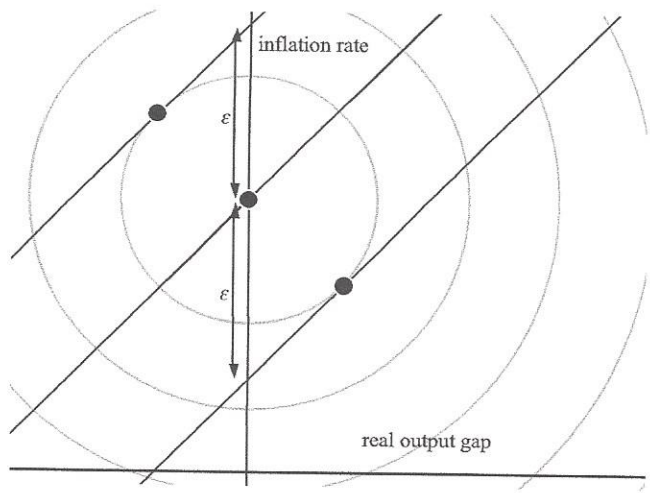
$E\pi$ = expected inflation,

x^T = the president's output target, where $x^T > 0$.

(a) Show that this policy rule above can be derived as a constrained optimization problem when the president's objective function is

$$W = -\left(x - x^T\right)^2 - \pi^2$$

Explain the logic of this model. Use the diagram below to illustrate your answer. You should label the unlabeled lines and points, add additional explanation and include it with your answer.



(b) Evaluate the signs of $\frac{\partial \pi}{\partial \varepsilon}$ and $\frac{\partial x}{\partial \varepsilon}$. If possible, interpret the signs of your results. Illustrate your answer on the above diagram.

(c) Explain how aggregate demand and supply theory is implicit in this model.

(d) Assuming the initial condition $(x,\pi) = (0,0)$ and that expectations are inertial, $E\pi = \pi_{t-1}$, illustrate this model's dynamics and its long-run equilibrium on the above diagram.

(e) Explain why it would be observationally impossible to distinguish between this model and one in which the president has an inflation target $\pi^T = x^T$ (and a zero output target).

(f) Explain the difference between the new-Keynesian and new-classical schools of thought. Discuss whether this model can be used to contrast the two schools of thought.

Answer *two* of the *three* questions below.

Question 1.
...Inflation in the United States has consistently undershot the Fed's goal of a 2 percent annual rate. This is going to sound like anathema to all those economists who lived through the inflation of the 1970s, but there's a good case for trying to double the inflation rate.

... "I don't see anything magical about targeting 2 percent inflation," Ben S. Bernanke, former Fed chairman ... for that matter, why not 3? Or, as Laurence M. Ball of Johns Hopkins University suggests, why not even 4? "There is no question that if you had a higher inflation target, you would be in a situation that hit the zero lower bound less often," said Frederic Mishkin, a former Fed board member now at Columbia University.

Why does that matter? Because if the economy falls into a recession when inflation is very low, it might be nearly impossible for the Fed to engineer the negative real interest rates — after accounting for inflation — needed to jolt the economy back to life.

... "Say you need a real interest rate of minus 3 percent," Professor Mishkin explained. "If your target inflation is 2 percent, you're toast because the lowest real interest rate you can achieve when you are at the zero lower bound is minus 2 percent, but if you have 4 percent inflation, you can achieve minus 3 percent with a 1 percent federal funds rate."

...A critical problem with aiming for higher inflation is how to get from here to there. The Fed has spent enormous effort anchoring people's expectations to 2 percent. Even economists sympathetic to a higher target are wary of what such a shift might do to its credibility.

"A perfect world, where you could commit to 4 percent and everybody believed it, would be great," Mr. Mishkin told me. "We are not in a perfect world. Moving much higher than 2 percent raises the risk that expectations become unanchored."

Eduardo Porter, "Preparing to Raise Rates, Fed Underestimates Benefits of More Inflation," December 16, 2015, **New York Times**

Discuss.

Question 2. Consider a simple macroeconomy:

$$\frac{w}{p} = F'[(1-u)N], \quad F'' < 0, \quad \text{labor demand}$$

$$Y = F[(1-u)N], \quad F' > 0, \quad \text{production function}$$

$$\frac{M}{p} = m(Y), \quad m_Y > 0, \quad \text{money market equilibrium}$$

where *Y, u and p* are endogenous and *w, N* and *M* are exogenous. All variables are labeled as in Sargent, with *u* denoting the unemployment rate. F' is the marginal product of employed labor, $(1-u)N$, and F'' is the second derivative of the production function with respect to employed labor.

(a) Obtain the total differential of these equations. Write this linearized system as a matrix equation, ***Jdy=dx***, where ***J*** is the Jacobian matrix, ***dy*** a vector of endogenous partials and ***dx*** a vector of exogenous effects. Find the Jacobian determinant. Evaluate your result.

(b) Use the implicit function theorem to evaluate the sign of $\frac{\partial Y}{\partial w}$. Interpret your results and illustrate a negative *w* shift with a diagram.

(c) Discuss whether this is a classical or Keynesian model. Does it exhibit neutrality? Dichotomy?

Question 3.

Consider a simple economy of N identical worker-investor-consumers. Each is endowed with 1 unit of labor power and nominal money m_o. Workers offer their labor to a single firm independently of the wage rate. The single firm produces a consumption good Y according to the production function

$$Y = \sqrt{N}$$

taking the wage rate and price as given, the firm maximizes profit. In their role as investors, all workers receive equal shares of the firm's profits

$$\Pi = pY - w(1-u)N$$

where p is the price of the consumption good and w is the nominal wage.

In their role as consumers, everybody allocates their budgets between consumption c_i and real money balances according to the utility function

$$U_i = \sqrt{c_i\left(\frac{m_i}{p}\right)},$$

where m_i is the nominal money balance held by the ith consumer. Consumers face the budget constraint

$$(1-\lambda)\left(w + \frac{\Pi}{N}\right) + m_o = pc_i + m_i,$$

where λ is the income tax rate. The consumption decision is made according to competitive assumptions; that is, consumers take as given w, p, λ and Π.

According the constitution of this society, there is no government spending, although income taxation is permitted. Equilibrium in the goods market is described by

$$Y = C = \sum_{i=1}^{N} c_i .$$

The government controls the supply of nominal money so that equilibrium in the money market is given by

$$M = \sum_{i=1}^{N} m_i .$$

Assume that p, w, Y, C and λ are endogenous, while M, m_o and N are exogenous.

(a) Derive the aggregate consumption function from this microeconomic description. What is the implied *marginal propensity to consume*? Compare the equations of this model to the Quantity Theory of Money. What is the implied the *velocity of money*?

(b) Show that this model implies a particular budget constraint for the government. It further implies that if the money supply M is exogenous, then the tax rate λ must be endogenous. Explain why.

(c) Given that M=100, m_o=1, and N=100, find equilibrium values for Y, p and λ. Illustrate your answer.

Qual Macro 2 2016. Rudi von Arnim

1. **Price flexibility**:
   a. Consider the following dynamic model:
      $\dot{u} = \alpha(g^I - g^S)$ (1)
      $\dot{\pi} = \beta(u - u^*)$, (2)
      where $u \equiv Y/K$ is the income–capital ratio as a proxy for demand, $g^I \equiv I/K$ is the rate of accumulation (with no depreciation), $g^S \equiv S/K$ and π is the profit share. u^* is exogenous and constant. $\alpha, \beta > 0$ are speed of adjustment parameters. The rate of accumulation is increasing in u and π. There are no savings out of wage income. Analyze the model: Discuss stability in u, π and sketch a phase diagram.
   b. Discuss these price dynamics, as well as the role of price flexibility in Skott's (1989) cyclical growth model. Discuss how either such price–distributive specification contrasts with the "profit–squeeze."

2. **Predator-prey model**:
   a. Present the Goodwin model of cyclical growth. Motivate and discuss the differential equations, present a Jacobian, and sketch a phase diagram.
   b. Assume that the rate of growth of labor productivity α is endogenous:
      $\alpha = f(\psi), f_\psi > 0,$ (3)
      so that labor productivity growth responds positively to a higher wage share ψ. Present a Jacobian, sketch a phase diagram, and discuss: how does the altered model compare to Goodwin's growth cycle?

3. **Trend & cycle**. Critically discuss the interaction between *growth* and the *business cycle*. Are they one and the same, or should they be analyzed separately? How could they be analyzed together? Sketch a model (and phase diagram) that generates *demand-driven growth and business cycle fluctuations.*