Macroeconomics Field Exam
August 2023
Department of Economics
UC Berkeley

(3 hours)

Answer Both Parts

Part I (Emi Nakamura): 90 points = 90 minutes

1. **10 points** Macroeconomists have long debated whether output is trend or difference stationary.
   a. **5 points** Briefly summarize the empirical evidence on this issue.
   b. **5 points** How/why does this matter for the cost of business cycles. Be specific.

2. **15 points**
   a. **5 points** Basu, Fernald and Kimball (2006) present "purified" technology shocks. What does it mean to "purify" technology shocks? What are the "impurities"?
   b. **5 points** In estimating the production function, Basu, Fernald and Kimball (2006) instrument for inputs. How would one expect estimates of productivity to be biased without this IV methodology? Why is defense spending a "good" instrument?
   c. **5 points** How does Basu, Fernald and Kimball's (2006) revised methodology affect their estimates of the effect of a productivity shock on employment? What is the intuition for why the "unpurified" shocks yield a different result than the "purified" shocks?

3. **15 points** Romer and Romer (2004) propose an approach to estimating monetary shocks by controlling for Greenbook forecasts of output and inflation. Describe whether each of the following scenarios could violate their identifying assumptions and why.
   a. **5 points** The Fed systematically lowers interest rates when it expects a recession.
   b. **5 points** The Fed systematically raises interest rates when inflation has been high in the recent past.
   c. **5 points** The FOMC relies on a combination of Greenbook and private sector economic forecasts in making decisions.

4. **15 points** True or false: For each statement, explain whether it is true or false and why (no explanation = no credit).
   a. **5 points** In a standard New Keynesian model, inflation can be predicted to decline to negative 300% if interest rates are promised to remain at zero for multiple years.
   b. **5 points** Heterogeneity in the frequency of price change can make inflation respond more sluggishly to monetary shocks.
   c. **5 points** Suppose you have obtained monetary shocks from another identification scheme (say, high frequency identification). You can estimate a standard VAR with four quarterly lags of output, inflation and interest rates, and use this VAR to generate forecasts of the effects of monetary shocks on output 5 years in the future. This does not require any additional assumptions beyond those used to identify the monetary shocks.

5. **15 points**
   a. **5 points** Write down the purely forward-looking New Keynesian Phillips Curve studied by Gali and Gertler (1999). What is the effect of a tight labor market on $\pi_{t+1} - \pi_t$ in this model. Explain, with reference to an equation. **Be sure to explain the intuition.**
   b. **5 points** Compare the results in part (a) to the effect of a tight labor market on $\pi_{t+1} - \pi_t$ in an "Old Keynesian" model with adaptive expectations.
   c. **5 points** Gali and Gertler show that one can rewrite the Phillips curve with π_{t+1} and an expectational error on the right-hand side. They then instrument for with π_{t+1} in estimating the coefficient on this variable. Suppose they used OLS instead (no

instrument). Would the estimated coefficient be larger or smaller than the true value? What is the intuition?

6. **10 points** A recent literature has estimated Phillips curves using regional data. Suppose you find that the slope of the regional Phillips curve for gasoline is flat. What can you conclude about the aggregate Phillips curve for gasoline?

7. **10 points** Gourinchas and Parker (2002) estimate the lifecycle profile of consumption, and use this to inform their theoretical analysis.
   - **a.** Draw a plot of consumption versus age in Gourinchas and Parker's baseline model (I am only looking for the qualitative features—a rough drawing is fine).
   - **b.** Now draw another line (and label it) for a case with a higher discount factor (households are more patient). What is the difference between the line in part (a) vs. part (b).

Macroeconomics Field Exam (Chen's Part: 90 minutes & 90 points)

July 19, 2023

1 Short Questions (45 points, choose 5 out of 6 questions)

1. Briefly describe how to use the primal approach to solve the optimal policy problem in economics.
2. Describe the Friedman rule.
3. Explain why the endogenous grid method is faster than policy function iteration when solving the income fluctuation problem.
4. Consider the textbook 3-equation new-Keynesian model with a cost-push shock. First, consider the case with an efficient steady state. Describe how the paths of inflation and the output gap (in response to a cost-push shock) differ under optimal monetary policy with commitment versus discretion. What happens with a distorted steady state?
5. What modeling elements can generate "inertia" (a hump-shaped response) of inflation to monetary policy shocks?
6. Describe why countercyclical income risk exacerbates the forward guidance puzzle in canonical HANK models.

2 Long Question (45 points)

This question studies the consumption behavior of perpetual-youth households. There is a unit continuum of such households, and each household $i \in [0,1]$ orders consumption streams according to a per period felicity function $u(\bullet)$, discounts at rate β, and survives from period to period with probability $\theta \in (0,1]$. Consumption streams are thus evaluated according to

$$\mathbb{E}_t \left[\sum_{s=0}^{\infty} (\beta\theta)^s u(c_{it+s}) \right]$$

Note that this specification of preferences means that households are not altruistic—they do not value the consumption of future generations. Households invest in actuarially fair annuities with fixed return $\frac{1+\bar{r}}{\theta}$

(where $1 + \bar{r} = \frac{1}{\beta}$) and receive a perfectly deterministic per-period income sequence $\{y_t\}_{t=0}^{\infty}$ (conditional on survival to date t). The wealth of dying households is passed on to the newborns that replace them.

It can be shown—though you do *not* need to do so here—that, for a per-period felicity function $u(\bullet)$ with the usual properties, the implied total consumption $c_t \equiv \int_0^1 c_{it} di$ and (beginning-of-period) wealth holdings $a_t \equiv \int_0^1 a_{it} di$ are fully characterized by the following pair of equations: the aggregate consumption function

$$c_t = (1 - \beta\theta) \times \left(a_t + \sum_{s=0}^{\infty} (\beta\theta)^s y_{t+s} \right) \tag{1}$$

and the aggregated budget constraint

$$a_{t+1} = (1 + \bar{r}) (a_t + y_t - c_t) \tag{2}$$

The remainder of this problem only uses equations (1) - (2). The sole purpose of the sketch of the OLG model at the beginning was to give you some context for these two equations.

- Consider first the special case where households are infinitely lived, so $\theta = 1$. Show that, by combining (1) and (2), we recover the standard aggregate Euler equation, and so in particular that consumption is constant:

$$c_t = c_{t+1} \quad \forall t.$$

For the remainder of this question we return to the case with general $\theta \in (0, 1]$.

- Suppose that $a_0 = 0$, and consider a one-off, unit-size, date-0 income shock; that is, the aggregate income sequence $\boldsymbol{y}$ satisfies $\boldsymbol{y} = (1, 0, 0, \dots)'$. Combine (1) and (2) to derive the implied aggregate consumption sequence $\boldsymbol{c} = (c_0, c_1, c_2, \dots)$. How does θ affect this sequence? What's the economic intuition? In your discussion pay particular attention to the comparison of $\theta < 1$ vs. $\theta = 1$.

- Suppose again that $a_0 = 0$, and now consider a one-off, unit-size, *date*-1 income shock; that is, a one-period-ahead news shock with aggregate income satisfying $\boldsymbol{y} = (0, 1, 0, \dots)'$. Again derive the associated consumption sequence $\boldsymbol{c}$. How strongly does consumption demand at date 0 respond to the date-1 income shock? Again pay particular attention to the comparison of $\theta < 1$ vs. $\theta = 1$.

- Derive the date-0 response of aggregate consumption to a one-off, unit-size, income shock at some arbitrary date h. What can you say about the strength of anticipation effects as the horizon h increases?

- From item b) you know the entire consumption sequence in response to a date-0 income shock, and from item d) you know the response of date-0 consumption to all possible income news shocks. Leveraging the logic of the fake-news algorithm in Auclert, Rognile, and Straub (2021), discuss how you can map these two sequences into the entire matrix $\mathcal{C}_y$ of intertemporal marginal propensities to consume.

- Provide a sketch of the implied matrix of intertemporal marginal propensities to consume. The x-axis should be time, the y-axis the MPC, and then you draw different lines for income gains at different dates (say, $t = 0$, $t = 5$, $t = 10$). For example, the first line (corresponding to $t = 0$) should be the consumption path you computed in item b). The figure should correctly capture the *qualitative* features of household consumption behavior; precise magnitudes are not important.