

Monetary Economics

Exam

Two hours.

Course presentation slides allowed, in paper format, possibly with hand-written annotations (on the slides or on separate paper sheets). Bilingual dictionaries allowed too.

No other document allowed, nor any electronic device (calculator, mobile phone...).

1 Exercise (10 points)

The goal of this exercise is to study the positive and normative implications of government purchases in the basic New Keynesian model. The only change brought to the model considered in the course is that the government is now assumed to purchase an exogenous fraction δ_t (common across goods but varying over time) of the output of each good at each date t , and to finance these purchases by lump-sum taxes on households.

As a reminder, in the basic New Keynesian model, the following log-linearized equilibrium conditions hold, up to first order :

$$\begin{aligned}y_t &= (1 - \alpha)n_t + a_t && \text{(aggregate production function),} \\w_t - p_t &= \sigma c_t + \varphi n_t && \text{(labor-consumption trade-off condition),} \\c_t &= \mathbb{E}_t \{c_{t+1}\} - \frac{1}{\sigma} (i_t - \mathbb{E}_t \{\pi_{t+1}\} - \rho) && \text{(Euler equation),} \\ \pi_t &= \beta \mathbb{E}_t \{\pi_{t+1}\} + \kappa \tilde{y}_t && \text{(Phillips curve),}\end{aligned}$$

where the notations are the same as in the course (in particular, the output gap $\tilde{y}_t \equiv y_t - y_t^n$ is the difference between the equilibrium output level y_t and the natural level of output y_t^n , both expressed in log).

Question 1 Briefly explain why none of the equilibrium conditions stated above is changed by the introduction of government purchases into the model. Show that the goods-market-clearing condition can now be written as $y_t = c_t + g_t$, where $g_t \equiv -\log(1 - \delta_t)$.

Question 2 Derive an expression for the (log) average real marginal cost mc_t as a function of y_t , a_t , g_t , and the parameters α , σ , φ , and (the employment subsidy) τ .

Question 3 Briefly explain why, under flexible prices and at the first order, $mc_t = -\mu_t \equiv -\log\left(\frac{\varepsilon_t}{\varepsilon_t - 1}\right)$, where ε_t is the elasticity of substitution between goods. Deduce, from this

equation and the previous question, an expression for the natural level of output y_t^n as a function of a_t , μ_t , g_t , and the parameters α , σ , φ , and τ . Does an expansionary fiscal policy (i.e. a rise in g_t) increase or decrease the natural level of output? How does the effect of g_t on y_t^n depend on the parameter φ ? Explain the mechanism.

Question 4 Rewrite the Euler equation as

$$\tilde{y}_t = \mathbb{E}_t \{ \tilde{y}_{t+1} \} - \frac{1}{\sigma} (i_t - \mathbb{E}_t \{ \pi_{t+1} \} - r_t^n) \quad (\text{IS equation})$$

and derive an expression for the natural rate of interest r_t^n as a function of $\mathbb{E}_t \{ \Delta a_{t+1} \}$, $\mathbb{E}_t \{ \Delta \mu_{t+1} \}$, $\mathbb{E}_t \{ \Delta g_{t+1} \}$, and the parameters α , σ , φ , and ρ . When g_t follows an AR(1) process with autoregressive coefficient $\rho_g \in [0, 1]$, does an expansionary fiscal policy increase or decrease the natural rate of interest? Briefly interpret.

Question 5 Show that the social-planner allocation (taking fiscal policy as given) satisfies $\sigma c_t + \varphi n_t = mpn_t - g_t$, where $mpn_t \equiv \log(1 - \alpha) + a_t - \alpha n_t$ is the (log) average marginal product of labor. When there are no cost-push shocks ($\varepsilon_t = \varepsilon$), under what condition on the stochastic process of g_t does there exist a value of the constant employment subsidy τ such that optimal monetary policy achieves the social-planner allocation? Briefly interpret.

2 Commentary (10 points)

Comment, in the light of the course, upon the following excerpt from the speech entitled “Federal Reserve Review of Monetary Policy Strategy, Tools, and Communications : Some Preliminary Views” made on November 26, 2019, by Lael Brainard, member of the Federal Open Market Committee (FOMC) of the Federal Reserve. In particular, build on the course to : (i) briefly explain the feedback loop from inflation expectations to inflation ; (ii) briefly discuss the possible origins and consequences of the flattening of the Phillips curve ; (iii) explain the challenges raised by a durably low “neutral rate” (interpreted as “natural rate of interest”) ; and (iv) assess the advantages and drawbacks of the proposal to target the average of inflation over ten years.

“The Federal Reserve is conducting a review of our monetary policy strategy, tools, and communications to make sure we are well positioned to advance our statutory goals of maximum employment and price stability. Three key features of today’s new normal call for a reassessment of our monetary policy strategy : the neutral rate is very low here and abroad, trend inflation is running below target, and the sensitivity of price inflation to resource utilization is very low.

First, trend inflation is below target. Underlying trend inflation appears to be running a few tenths below the Committee’s symmetric 2 percent objective, according to various statistical filters. This raises the risk that households and businesses could come to expect inflation to run persistently below our target and change their behavior in a way that reinforces that expectation. Indeed, with inflation having fallen short of 2 percent for most of the past seven years, inflation expectations may have declined, as suggested by some survey-based measures of long-run inflation expectations and by market-based measures of inflation compensation.

Second, the sensitivity of price inflation to resource utilization is very low. This is what economists mean when they say that the Phillips curve is flat. A flat Phillips curve has

the important advantage of allowing employment to continue expanding for longer without generating inflationary pressures, thereby providing greater opportunities to more people. But it also makes it harder to achieve our 2 percent inflation objective on a sustained basis when inflation expectations have drifted below 2 percent.

Third, the long-run neutral rate of interest is very low, which means that we are likely to see more frequent and prolonged episodes when the federal funds rate is stuck at its effective lower bound (ELB). (...) When looking at the Federal Reserve's Summary of Economic Projections, it is striking that the Committee's median projection of the longer-run federal funds rate has moved down from 4-1/4 percent to 2-1/2 percent over the past seven years. A similar decline can be seen among private forecasts. This decline means the conventional policy buffer is likely to be only about half of the 4-1/2 to 5 percentage points by which the FOMC has typically cut the federal funds rate to counter recessionary pressures over the past five decades.

This large loss of policy space will tend to increase the frequency or length of periods when the policy rate is pinned at the ELB, unemployment is elevated, and inflation is below target. In turn, the experience of frequent or extended periods of low inflation at the ELB risks eroding inflation expectations and further compressing the conventional policy space. The risk is a downward spiral where conventional policy space gets compressed even further, the ELB binds even more frequently, and it becomes increasingly difficult to move inflation expectations and inflation back up to target. (...)

In this context and as part of our review, my colleagues and I have been discussing how to better anchor inflation expectations firmly at our objective. In particular, it may be helpful to specify that policy aims to achieve inflation outcomes that average 2 percent over time or over the cycle. Given the persistent shortfall of inflation from its target over recent years, this would imply supporting inflation a bit above 2 percent for some time to compensate for the period of underperformance. (...) For instance, following five years when the public has observed inflation outcomes in the range of 1-1/2 to 2 percent, to avoid a decline in expectations, the Committee would target inflation outcomes in a range of, say, 2 to 2-1/2 percent for the subsequent five years to achieve inflation outcomes of 2 percent on average overall."