Sample Questions for Part 3 of Advanced Macro Final Exam
February 27, 2020

1. The IS-MP-PC Model

This question refers to the IS-MP-PC model, described by the IS curve

$$y_t = y_t^* - \alpha\left(i_t - \pi_t - r^*\right) + \epsilon_t^y$$

the monetary policy rule

$$i_t = r^* + \pi^* + \beta_\pi\left(\pi_t - \pi^*\right)$$

and the Phillips curve:

$$\pi_t = \pi_t^e + \gamma\left(y_t - y_t^*\right) + \epsilon_t^\pi$$

where y_t is output, π_t is inflation, i_t is the interest rate, π^* is the central bank's inflation target and α and γ are assumed to be positive.

(a) Show how to derive the IS-MP curve and explain what determines its position and whether it slopes upwards or downwards.

(b) Show how to derive a solution for inflation as function of expected inflation and the central bank's inflation target. Discuss the factors determining the coefficient on expected inflation.

(c) How do the dynamics of the model change when β_π moves from being greater than one to slightly less than one? What is the explanation for the change in the behaviour of the model?

(d) How do you adapt the model to account for the zero lower bound on interest rates? How would your answer change if the central bank adopted a Taylor-style rule with the interest rate dependening on an output gap as well as inflation?

2. **Asset Prices**

This question relates to the dividend-discount model.

(a) Starting from the definition of the rate of return on stocks, show that stock prices obey the following first-order difference equation

$$P_t = \frac{D_t}{(1 + r_{t+1})} + \frac{P_{t+1}}{(1 + r_{t+1})}$$

where D_t represents dividends and r_t is the rate of return on stocks.

(b) Now assume that agents have rational expectations and that expected future stock returns are constant and equal to r. Show that this difference equation implies the following representation for stock prices

$$P_t = \sum_{k=0}^{\infty} \left(\frac{1}{1 + r} \right)^{k+1} E_t D_{t+k}$$

Discuss any assumptions that you make in deriving this equation.

(c) Suppose dividend payments are expected to grow at rate g forever. What does the dividend-discount model (i.e. the model derived in part (b) above) imply for the current level of stock prices?

(d) Now suppose that instead of growing at rate g each period, dividends can be expressed as the sum of two components—a trend component that grows at rate g each period and a cyclical component u_t that follows an AR(1) process $u_t = \rho u_{t-1} + \epsilon_t$ where $0 < \rho < 1$ and ϵ_t is a zero-mean noise process. What does the dividend-discount model imply for stock prices in this case?

3. **Rational Expectations and Consumption**

(a) Starting from the household budget constraint

$$A_{t+1} = (1 + r)(A_t + Y_t - C_t)$$

where A_t is the value of household assets, Y_t is after-tax labour income, and C_t is consumption expenditures, derive the intertemporal budget constraint

$$\sum_{k=0}^{\infty} \frac{E_t C_{t+k}}{(1+r)^k} = A_t + \sum_{k=0}^{\infty} \frac{E_t Y_{t+k}}{(1+r)^k}$$

(b) State the assumptions required to derive the random walk hypothesis that expected changes in consumption should be unpredictable, i.e. that $C_t = E_t C_{t+1}$ and sketch out how this result is derived.

(c) Show that the random walk hypothesis implies that current consumption depends in a specific fashion on current assets and on current and expected future labour income.

(d) Now suppose that consumers expect after-tax labour income to grow at rate g forever (where $g < r$). Maintaining the random walk assumption, what does this imply for the relationship between consumption, labour income and assets?

(e) Could econometric estimates of the relationship derived in (d) be used to assess the effects of a temporary tax cut? Explain your answer.