PhD Macro 2 Topic 4 Questions

1) In the model of the lecture, show that if we observe capital and capacity utilisation then we may calibrate δ_0 and δ_2 via regression. Go on to do this with real data! Is this a legitimate exercise given the way national statistical agencies construct capital series?

2) Re-do example 5.11 from "Methods for applied macroeconomic research" (Canova) on up to date data.

3) Complete the following exercises from "Methods for applied macroeconomic research" (Canova):

a)

Exercise 5.41 *Consider the situation where agents in one country (say the US) have the option to purchase one period bonds denominated in another currency (say, yen) and let* ner_t *the (dollar-yen) exchange rate. Show that in equilibrium*

$$0 = E_t[\beta \frac{U_{c,t+1}/p_{t+1}}{U_{c,t}/p_t}((1+i_{1t}) - \frac{ner_{t+1}}{ner_t}(1+i_{2t}))] \tag{5.32}$$

where i_{it} *is the nominal interest rate on bonds of country* i, p_t *is the price level and* $U_{c,t+1}/p_{t+1}$ *the marginal utility of money. Log linearize the condition, assuming* $u(c_t) = \ln c_t$. *Using nominal balances, nominal interest rates and nominal exchange rate data verify whether (5.32) holds. Test whether agents discount the future or not (i.e. whether* $\beta = 1$*).*

b)

Exercise 7.1 *Consider a sticky price model without capital and instantaneous utility* $U(c, N, M) = \ln c_t + \frac{1}{1-\varphi_m}(\frac{M_{t+1}}{p_t})^{1-\varphi_m}$. *Assume Calvo pricing; let* $1-\zeta_p$ *be the fraction of agents allowed to change prices and* β *the discount factor. Derive an Euler equation, a money demand function and a Phillips curve. Log-linearize the conditions and describe how to select preferences and production parameters, relevant steady states and auxiliary parameters.*

Exercise 7.8 *Using the sticky price model of exercise 7.1 and the selected parameters, examine whether the model reproduces the persistence of US inflation by computing* $S(\omega = 0) = \sum_{\tau-\infty}^{\infty} ACF_\pi(\tau)$ *where* $ACF_\pi(\tau)$ *is the autocovariance of inflation at lag* τ.

c)

Exercise 7.4 *(Risk free rate puzzle) Take the economy discussed in exercise 2.6 of chapter 2. Assume that* $u(c_t) = \frac{c_t^{1-\varphi}}{1-\varphi}$ *and that output evolves according to* $gdp_{t+1} = gy_{t+1}gdp_t$. *Assume that* gy_{t+1} *can take* n *possible values* $(gy_1, \ldots, gy_n)$ *and let* $p_{ij} \equiv P(gy_{t+1} = gy_{i'}|gy_t = gy_i) = \mu_{i'} + \rho_y(\mathcal{I}_{ii'} - \mu_{i'})$ *where* $\mu_{i'}$ *are unconditional probabilities,* $\mathcal{I}_{ii'} = 1$ *if* $i = i'$ *and zero otherwise, and* $\rho_y \in (-(n-1)^{-1}, 1)$. *If the current state is* (gdp_t, gy_i), *the price of an asset paying one unit of output next period satisfies* $p_t^s U_c(gdp_t, gy_i) = \sum_{i'} p_{ii'}\beta[U_c(gdp_{t+1}, gy_{i'})]$. *It is easy to verify that unconditionally* $var(p_t^s) = \beta^2\rho_y^2 \sum_{i=1}^n p_i(\sum_{i'=1}^n p_{i'}(gy_i^{-\varphi} - gy_{i'}^{-\varphi}))^2$.

i) Set $n = 2, gy_1 = 0.9873, gy_2 = 1.0177, \mu_1 = 0.2, \mu_2 = 0.8, \beta = 0.99, \rho_y = 0.8, \varphi = 2$. *Simulate asset price data from the model and treat these as the actual data.*

ii) Set (n, gy_i, p_i, β) *as in i) but now set* $\rho_y = 0.6$. *Choose* φ *so that the simulated variance of asset prices matches the variance of asset prices produced in i) (you can select the loss function you want, e.g.,* $min|var^A(p_t^s) - var^S(p_t^s)|$ *where* $var^S(p_t^s)$ $(var^A(p_t^s))$ *is the variance of simulated (actual) data). Repeat the exercise for* $\rho_y = 0.9$.

iii) Repeat i) 100 times drawing φ *from* $\mathsf{U}(1, 10)$ *(treat this as 100 realizations of the actual data). Repeat ii) 100 times for* $\rho_y = 0.6, 0.9$ *and show the distributions of* $\hat{\varphi}$ *that best matches* $var^A(p_t^s)$.

iv) Consider now the mean of asset prices. Repeat iii) fixing $\varphi = 2$ *and choosing* ρ_y *to minimize* $|E_t((p_t^s)^A - (p_t^s)^S)|$. *Is there any pattern worth mentioning?*