Problem Set V: GMM Estimation

1. A standard version of the consumption-based CAPM says that

$$\mathrm{E}\left[\beta\left(\frac{C_t}{C_{t+1}}\right)^{\gamma}(1+r_{t+1})-1\,\middle|\,\mathcal{I}_t\right]=0,$$

where r_t is the real rate of return, C_t is consumption, $\mathcal{I}_t$ is the information set available in period t, $0<\beta<1$ is a time discount factor, and γ measures the curvature of the utility function (and $1/\gamma$ is the elasticity of intertemporal substitution). Your data file provides quarterly US time series data from 1960Q1 to 2016Q4. It includes real personal consumption expenditures of nondurable goods, C (chain index, seasonally adjusted, per capita), the associated price index, P (seasonally adjusted), and the nominal 3-month Treasury Bill rate, r.

(a) Load the data into Stata. Prepare them to obtain C_t/C_{t+1} and r_t.

(b) Estimate β and γ by means of GMM with identity weighting matrix, using the above orthogonality condition. Start with a baseline instrument set that includes a vector of ones, the first four lags of consumption growth $\Delta\log(C_t)$, inflation $\Delta\log(P_t)$, and the real rate r_t. Discuss your findings.

(c) Check how sensitive your results are to changes in the instrument set.

(d) Show that a log-linearization under certainty equivalence yields the approximate condition

$$\mathrm{E}\left[\log(\beta)-\gamma\Delta\log(C_{t+1})+r_{t+1}|\mathcal{I}_t\right]=0.$$

Estimate this equation by GMM using an identity weighting matrix and the baseline instrument set. Compare your results.