University of Victoria **Department of Economics**

ECON 546: Themes in Econometrics

Lab Exercises # 9
(19 March, 2013)

In this lab. class you are going to get some experience with the GMM estimator in the context that originally motivated its development – estimating an Euler equation associated with an inter-temporal maximization problem. Essentially, the point is that the solution to this maximization problem yields first order conditions which are effectively in the form of moment equations, so GMM estimation is a natural way to proceed.

Background:

An important problem in finance is the pricing of assets. The "Consumption-Based Asset-Pricing Model" is one of the most famous solutions to this problem. In simplified terms, the set-up of the model is as follows.

A representative agent chooses a consumption time-path to maximize expected discounted utility, $E[\sum_{i=0}^{\infty}\beta^i U(c_{t+i}) \mid \Omega_t]$, where Ω_t is the information set at time 't', subject to the inter-temporal budget constraint, $c_t + p_t q_t = r_t q_{t-1} + w_t$, for all '$t$'.

The optimal consumption path satisfies:

$$p_t U'(c_t) = \beta E[r_{t+1}U'(c_{t+1}) \mid \Omega_t] \text{ , for all '}t\text{'.}$$

This can be re-written as the following 'Euler equation':

$$E[\beta(r_{t+1}/p_t)[U'(c_{t+1})/U'(c_t)] \mid \Omega_t] - 1 = 0 .$$

If the utility function is taken to be of the form: $U(c_t) = c_t^{1-\gamma}/(1-\gamma)$, where $\gamma > 0$ ensures a concave utility function, the Euler equation becomes:

$$E[\beta(r_{t+1}/p_t)(c_{t+1}/c_t)^{-\gamma} \mid \Omega_t] - 1 = 0 .$$

This yields the moment equations:

$$E[\{\beta(r_{t+1}/p_t)(c_{t+1}/c_t)^{-\gamma} - 1\}z_t] = E[E[\beta(r_{t+1}/p_t)(c_{t+1}/c_t)^{-\gamma} - 1 \mid \Omega_t]\, z_t] = 0 ,$$

where z_t is a ***vector*** of instruments belonging to Ω_t.

Data:
The (Canadian) data are in the file S:\Social Sciences\Economics\Econ546\Lab9.xls
(Note that each series has its own dates, and that there is a mixture of monthly and quarterly data. We are going to estimate the model using ***quarterly data***.)

TBILL = 91-day Treasury Bill rate
CONS = real, seasonally adjusted, consumption expenditure on non-durables
POP = Population
CPIND = CPI for non-durables expenditure

Tasks:

1. Create 2 new EViews workfiles – one for monthly data for the sample period 1946M1 – 2005M12, and one for the period 1946Q1 – 2005Q4. Convert the monthly TBILL & CPIND data into quarterly (end-of-quarter) data, and load the other quarterly data series.

2. Verify that the TBILL and CPIND series ***do not*** need to be adjusted for seasonality. Construct a real rate of return series, "R", as one plus the "real" TBILL rate.

3. Estimate the Euler equation, choosing a suitable set of instruments. (Set the initial values for the 2 parameters to unity, rather than the default value of zero, and make sure that the estimation algorithm has converged!) Are your results sensitive to the choice of these instruments? Are they sensitive to the choice of bandwidth estimator for the HAC covariance matrix? Apply the "J-test" to test the validity of the over-identifying restrictions.

4. Interpret your estimation results in economic terms.

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