Economics 302: Macroeconomic Analysis
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Problem Set #2
Due: Wednesday, October 13, 2004

1. When we first started our examination of consumption behavior in class, we looked at data by income level from the *Consumer Expenditure Survey*, published by the Bureau of Labor Statistics.[1] Table 3 in that report shows statistics for income and expenditure by age group. Use that table to answer the questions below.

   (a) Plot the data for income and average annual expenditures by the following age categories: *Under 25, 25–34, 35–44, 45–54, 55–64, 65–74, 75 and over.*[2]

   (b) Is the behavior of expenditures relative to income consistent with the life-cycle hypothesis (LCH) for young households? Explain. What factors might lead to the behavior of these households to deviate from the LCH?

   (c) Is the behavior of expenditures relative to income consistent with the LCH for retired households? Explain. What factors might lead to the behavior of these households to deviate from the LCH?

   (d) Do your answers to parts (b) or (c) change if you instead plot home ownership by age category? Vehicle ownership by age category? Reconcile the implications for the LCH from these data with the above implications based on overall expenditure data.

2. For this question, collect quarterly data on real consumption and real disposable income. Take logs of both measures (denoted below by C and Y respectively) prior to any estimation. Regressions should be estimated over the sample 1947Q1 – 2004Q2. For your measure of real consumption, use the sum of real non-durables goods consumption and real services consumption from the U.S. national income accounts.

   (a) Do the data support a simple Keynesian model of consumption? Estimate such a model and report the estimated marginal propensity to consume (MPC). Are there any statistical problems with this model? (*Hint: plot the residuals along with the fitted and actual values of consumption from this regression.*)

   (b) A simple test of the PIH would be to regress consumption on the previous period's consumption; that is, to regress C_t on C_{t-1}. Briefly explain why this regression represents a test of the PIH. What is the null hypothesis for the slope estimate implied by the PIH for this regression specification?

   (c) Estimate the regression equation in part (b) and test the implied null hypothesis.[3]

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[1] See http://www.bls.gov/cex/csxann02.pdf.

[2] In order to have accurate scaling for subsequent answers, graphing in Excel is recommended. Use either a line graph or a bar graph — whichever you think displays the information most clearly.

[3] Suppose that `cons` is your measure of log real consumption in Eviews. Then `cons(-1)` would be lagged consumption; this expression is your regressor (plus a constant `c` for the intercept, of course!).

(d) One might be tempted to "nest" the two models of consumption by regressing C_t on Y_t (as in the Keynesian model) **and** C_{t-1} (as in the PIH). Explain why this regression is not valid. (*Hint: If the PIH is true, what statistical properties are violated by the inclusion of Y_t?*)

(e) An alternative regression (that is statistically valid) would be to regress C_t on C_{t-1} and Y_{t-1}. Explain why the PIH implies the coefficient on Y_{t-1} should be zero. Estimate this regression and statistically test this implication.

(f) What economic reasons might motivate a generalized Keynesian consumption function that included lagged income as an additional explanatory variable? Augment your regression equation in part (a) with lagged income and re-estimate. Interpret your results.

(g) Based on your empirical findings above, would you conclude that the aggregate U.S. consumption data are more consistent with a Keynesian specification than with the PIH? Justify your answer.

3. The consumption measure used in the previous problem excluded durable goods (i.e. housing, vehicles, furniture, appliances, etc.). Why might consumption of durable goods differ from consumption of non-durable goods or services? How do you think the inclusion of durable goods would change your answers to the previous problem?[4]

4. A small business is contemplating buying an additional machine for widget manufacturing. The machine costs \$100,000 today. The expected real profits from this additional machine are \$18,000 per year, beginning next year. Past experience has shown that similar machines depreciate at the constant rate of 8% per year.

(a) Suppose the business owner has an infinite horizon for evaluating this investment project. At what real interest rate would she be indifferent between purchasing this machine or not?

(b) Suppose the business owner will only keep the new machine for 10 years before scrapping it (at zero cost). At what real interest rate would she be indifferent between purchasing this machine or not? (*Hint: Finding a closed-form solution to this question is difficult. You might instead use Excel to simulate the consequences of different interest rate values in order to narrow down the appropriate interest rate.*)

5. Prior to the 2001 Bush tax policy changes, U.S. tax laws tended to strongly encourage investment in housing (through income tax deductions) and discourage investment in business capital. In the context of the Solow growth model, what would be the long-run implications of a pre-2001 tax policy on the level of capital, the growth rate of output per worker, and the real wage (ω)?

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[4]You need not re-estimate the above problem with the non-durables consumption data included, although it certainly wouldn't hurt — and you might be surprised by the results!