Macroeconomics, Part IIA
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Supervision 1
Intertemporal Macroeconomics: Consumption and Labor Supply

Problems

1. Consider the two-period Fisher model of consumption and saving. Assume that initially, output and consumption are equal in period one. (For simplicity, you may assume that preferences are homothetic.)

   (a) Explain graphically and intuitively the effect on consumption and saving of

      i. an increase in output in period 1 (temporary change).
      ii. an increase in output in both period 1 and 2 by the same proportion (anticipated permanent change).
      iii. an increase in output in period 2 (anticipated change).

   (b) Explain whether the results in (a) change if the consumer is liquidity constrained and cannot borrow against future income.

   (c) Explain graphically the effect on consumption of an increase in the real interest rate, using the decomposition into intertemporal income and substitution effect, assuming

      i. the consumer is a borrower.
      ii. the consumer is a lender.

   Under what conditions does saving depend positively on the real interest rate?

2. Consider the following consumption/saving decision under uncertainty. The representative consumer lives for two periods and maximizes the expected value of life-time utility

$$U = u(C_1) + \beta u(C_2)$$

where C_t denotes consumption in period $t = 1, 2$. Assume that $u'(.) > 0$ and $u''(.) < 0$. The subjective intertemporal discount factor equals $\beta = 1/(1+\rho)$, where $\rho > 0$ is the rate of time preference. The intertemporal budget constraint of the consumer is

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

where Y_t denotes labor income in period $t = 1, 2$ and r the real interest rate. In period 1, the consumer is uncertain about labor income in period 2. Let $\mathrm{E}[Y_2]$ denote the expected value of Y_2. [cf Tripos 2004]

   (a) Derive the intertemporal Euler equation for consumption using the substitution method. Give a brief intuitive interpretation of the result.

(b) Suppose now that $r = \rho$ and that $u(C) = C - \frac{1}{2}\alpha C^2$, where $C < 1/\alpha$ and $\alpha > 0$. Solve for the optimal levels of consumption C_1 and C_2. Give a brief intuitive interpretation.

(c) Using the result in part (b) derive the effect on consumption C_1 and C_2 of

i. a temporary increase in labor income in period 1.

ii. a permanent increase in labor income in periods 1 and 2 by ΔY.

iii. an anticipated increase in labor income in period 2.

3. Consider the following static labour/leisure choice problem of a representative agent [cf Tripos 2013]:

$$\max_{c,l,L} \{\ln c + \ln l\}$$
$$\text{s.t.} \quad c = L(1-\tau)w + R$$
$$1 = l + L$$

where c denotes consumption, l leisure, L labour, w the real wage, τ an income tax, and R a lump-sum transfer.

(a) Assume initially that $\tau = R = 0$. Derive the optimal choice of c, l and L. Explain intuitively how they depend on the wage w.

(b) Suppose now that the government levies an income tax ($0 < \tau < 1$) and assume that it rebates all revenue from the income tax as a lump-sum transfer. Derive the optimal choice of c, l and L. Explain how they are affected by the income tax τ.

(c) Compute the value of τ that maximises welfare in this setting. Explain the intuition underlying this result.

Main readings

- Barro (1997), *Macroeconomics*, chapters 2, 3, 13.
- Doppelhofer (2009), "Intertemporal Macroeconomics", forthcoming in McCombie and Allington (eds), *Cambridge Essays in Applied Economics*, https://www.vle.cam.ac.uk/pluginfile.php/13437652/mod_resource/content/1/Intertemporal_Macroeconomics.pdf
- Williamson (2013), *Macroeconomics*, chapters 4, 5 and 9 (pp. 310-339).

Supplementary references

-Abel, Bernanke and McNabb (1998), *Macroeconomics*, European Edition, chapter 4.
-Blanchard and Johnson (2012), *Macroeconomics*, chapter 16.
-Friedman (1957), *A Theory of the Consumption Function.* [classic on Permanent Income Hypothesis]
-Hall (1978), "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence", *Journal of Political Economy* 86(6), December, pp. 971-987. [classic on random walk consumption]
-Mankiw and Taylor (2014), *Macroeconomics - Second European Edition*, chapter 18.
-Modigliani (1986), "Life Cycle, Individual Thrift, and the Wealth of Nations", *American Economic Review* 76(3), June, pp. 297-313 [seminal review of Life Cycle Hypothesis]