# Questions and Problems

## A. Review questions

1. Derive the two-year household budget constraint shown in equation (7.9). According to this constraint, if a household reduces this year's consumption, $C_1$, by one unit, how much would next year's consumption, $C_2$, rise (if nothing else changes in the equation)?
2. Show how taking a present value gives different weights to income and consumption in different years. Why is a unit of real income in the present more valuable than a unit of real income next year? Why is a unit of consumption next year cheaper than a unit this year?
3. What factors determine whether the propensity to consume out of an additional unit of income is less than or equal to one? Can the propensity be greater than one?
4. Discuss the effects on this year's consumption, $C_1$, from the following changes:
   a. An increase in the interest rate, $i_1$
   b. A permanent increase in real wage income, $(w/P) \bullet L$
   c. An increase in current real wage income, $(w/P)_1 \bullet L_1$, but no change in future real wage incomes
   d. An increase in future real wage income, $(w/P)_t \bullet L$ for $t = 2, 3$, and so on
   e. A one-time windfall, which raises initial real assets, $(B_0/P + K_0)$

## B. Problems for discussion

5. Permanent income

   The idea of permanent income is that consumption depends on a long-run average of income, rather than current income. Operationally, we can define permanent income as the hypothetical, constant income that has the same present value as a household's sources of funds on the right-hand side of the multiyear budget constraint:

**(7.12)** $$C_1 + C_2/(1 + i_1) + C_3/[(1 + i_1) \bullet (1 + i_2)] + \cdots = (1 + i_0) \bullet (B_0/P + K_0) + (w/P)_1 \bullet L + (w/P)_2 \bullet L/(1 + i_1) + (w/P)_3 \bullet L/[(1 + i_1) \bullet (1 + i_1)] + \cdots$$

   a. Use equation (7.12) to get a formula for permanent income, when evaluated in year 1.
   b. What is the propensity to consume out of permanent income?
   c. If consumption, $C_t$, for $t = 1, 2$, and so on is constant over time, what is the value of permanent income?

6. Income effects

   Consider again the household's multiyear budget constraint in equation (7.12). What are the income effects from the following:
   a. An increase in the price level, $P$, for a household that has a positive value of initial nominal bonds, $B_0$. What if $B_0$ is zero or negative?
   b. An increase by 1% per year in every year's interest rate, $i_t$. Assume here that $B_0 = 0$.