

# Consumption Smoothing, Saving, Credit and Insurance

## Lecture 9/1: Saving and Permanent Income Hypothesis

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# Consumption Smoothing, Risk Management and Poverty Dynamics

- ▶ There is temporal uncertainty with respect to the budget constraint. Both prices and incomes vary unpredictably over time.
- ▶ Especially, Agricultural sector has relatively price inelastic market demand that leads to high price variability, and agroclimatic shocks that lead to high variability in aggregate local output
- ▶ Basic question for policy makers: whether there is need for interventions to stabilize incomes or to provide public safety nets in order to ensure stable consumption and to keep people from falling into poverty traps.
- ▶ How people smooth consumption themselves: by saving in cash or in kind, by borrowing, by pooling risk through formal or informal insurance mechanisms, or by diversifying their incomes
- ▶ Most obstacles for access to financial services: information asymmetries, enforcement problems, and covariate risk

## Savings - theory

- ▶ One way to smooth consumption - an individual can use savings to transfer consumption into the future
- ▶ Suppose that an individual lives for 2 periods. She earns  $y_1$  in period 1, and  $y_2$  in period 2.
  - ▶ In period 1, she can save or borrow, at the interest rate  $r$
  - ▶ Her utility over consumption in each period is  $U(c_1)$  and  $U(c_2)$
  - ▶ She discounts future utility at rate  $\beta$

## Savings - theory

- ▶ The individual's maximization problem is:

$$\text{Max}_{c_1, c_2} U(c_1) + \beta U(c_2)$$

subject to

$$c_1 = y_1 - S$$

$$c_2 = y_2 + (1 + r)S$$

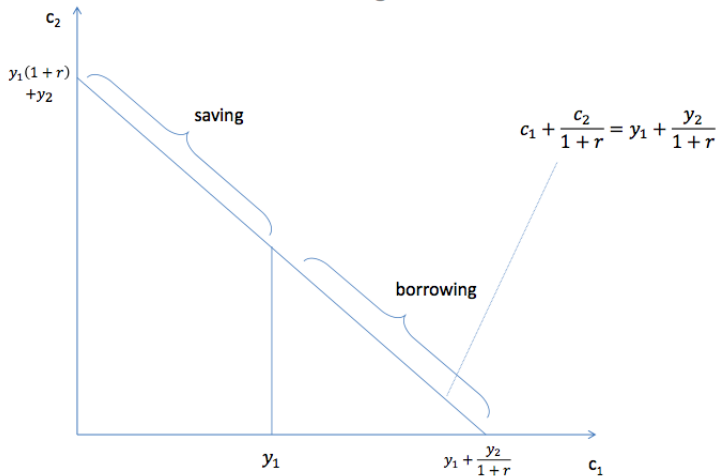
- ▶ We can combine these two equations to yield the intertemporal budget constraint:

$$c_1 + \frac{c_2}{1+r} = y_1 + \frac{y_2}{1+r}$$

- ▶ The first term is the present value of lifetime consumption
- ▶ The second term is the present value of lifetime income

# Savings - theory

## Household budget constraint

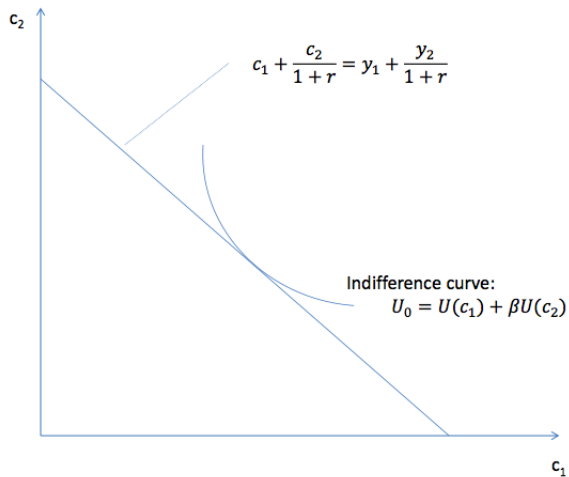


## Savings - theory

- ▶ The solution to this problem is that:  
$$\frac{U'(c_1)}{U'(c_2)} = \beta(1 + r)$$
- ▶ One implication: if  $\beta(1 + r) = 1$ , then  
$$U'(c_1) = U'(c_2) \Rightarrow c_1 = c_2$$
- ▶ This is called the permanent income hypothesis: consumption is constant over the life cycle, regardless of the distribution of income.
- ▶ Thus, 'permanent' income (income earned over the entire life cycle) matters, rather than income in an individual period.

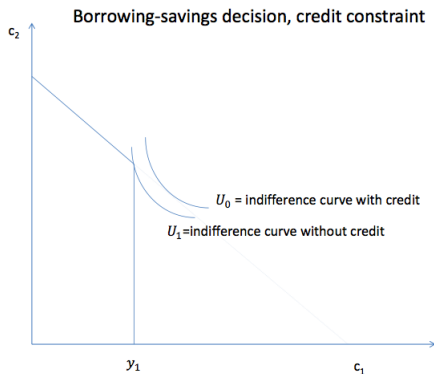
# Borrowing-savings decision, no credit constraint

## Borrowing-savings decision, no credit constraint



## Saving - Credit constraints

- ▶ Suppose that an individual cannot borrow. This implied that he faces the additional constraint:  
 $c_1 \leq y_1$
- ▶ This can hurt overall utility if income is very low in  $y_1$  relative to  $y_2$



## Permanent vs. Transitory incomes

- ▶ Suppose that  $y_1$  and  $y_2$  can be broken up into a permanent and a transitory component:

$$y_1 = y_1^T + y^P$$

$$y_2 = y_2^T + y^P$$

- ▶ In period 1, we observe shocks to transitory income ( $y_1^T$ ) and permanent income ( $y^P$ )
- ▶ With complete insurance markets, consumption will be determined solely by expected permanent income, not by stochastic current income.
  - ▶ Any excess (shortfall) in current income, relative to permanent income, will be (dis)saved so as to smooth consumption over the full time horizon.

## Permanent vs. Transitory incomes

- ▶ What is the marginal propensity to consume (MPC) in each period from each type of shock?
  - ▶ MPC = the fraction of the income that is consumed
- ▶ If  $\beta(1 + r) = 1$ , then  $c_1 = c_2$ 
  - ▶ Consumption is expected to be stable over time
  - ▶ An increase in permanent income by  $\Delta y^P$  will increase consumption in each period by  $\Delta y^P$
  - ▶ Implication: consumption should be constant over time and equal to mean income, or permanent income
  - ▶ A permanent change in income will yield a MPC of 1
  - ▶ This implies that the marginal propensity to save (MPS) will be 0

# Permanent income hypothesis

- ▶ Basic strategy in empirical investigation of the permanent income hypothesis (PIH):
- ▶ Consumption is a function of permanent and transitory incomes, along with other independent variables:  
$$c_t = \alpha + \beta y_t^P + \gamma y_t^T + \theta Z_t + \varepsilon_t$$
- ▶ Strict test for the PIH:  $H_0 : \beta = 1$  and  $\gamma = 0$  vs.  $H_a : \beta < 1$  or  $\gamma > 0$
- ▶ General results: positive correlation (less than one) of consumption with transitory income and a sub-unit correlation of consumption with permanent income

# Permanent income hypothesis

- ▶ As long as a greater share of transitory income than permanent income is saved, then households are indeed smoothing consumption relative to income
- ▶ Weak form test for the PIH:  $H_0 : \beta = \gamma$  vs.  $H_A: \beta > \gamma$  (test for incomplete consumption smoothing)
- ▶ Typical findings: in favor of the alternative hypothesis
- ▶ There is evidence of consumption smoothing relative to stochastic incomes (transitory incomes) in most data sets.

# Permanent income hypothesis

- ▶ The estimation specification is potential biased due to endogeneity and/or correlated measurement errors that arise from trying to come up with reasonable measure for  $y^P$  and  $y^T$ 
  - ▶  $y^T$  will be determined simultaneously with consumption, thereby producing spurious correlation
- ▶ Choosing an instrument for  $y^P$  and  $y^T$  that is not a determinant of consumption
  - ▶ Instrument for  $y^P$ : education, value of initial asset holdings, long-run rainfall averages
  - ▶ Instrument for  $y^T$ : deviation of rainfall from long-run local average, deviations from expected harvest period profits

# Testing the permanent income hypothesis

Paxson (1992)

- ▶ Paxson(1992) tests the implications of this model using data from rural Thai households
- ▶ Cross-sectional surveys taken in 1975/76, 1981, and 1986
- ▶ Measure of permanent income:
  - ▶ Landholdings
  - ▶ Demographic composition of the household (age/sex/education of household members)
- ▶ Measure of temporary income:
  - ▶ Deviations from mean rainfall in the household's region, in each quarter of the past year
  - ▶ Rainfall in any given quarter is plausibly random, and is not serially correlated, so that deviations from means in one quarter do not translate into deviations in subsequent quarters

# Testing the permanent income hypothesis

- ▶ Hypothesis: Marginal propensity to save out of transitory income should be higher than MPS out of permanent income (weak form)
- ▶ Two-step estimation strategy:
- ▶ Regress income on predictors of permanent and transitory income

$$Y_{irt} = \beta_t + \beta_r + X_{irt}^P \beta_1 + X_{irt}^T \beta_2 + \epsilon_{irt}$$

- ▶  $Y_{irt}$  = income of household  $i$  in region  $r$  in year  $t$
- ▶  $\beta_t$  and  $\beta_r$  are controls for time and region
- ▶  $X_{irt}^P$  = components of permanent income
- ▶  $X_{irt}^T$  = components of transitory income

## Testing the permanent income hypothesis

- ▶ Predict  $\hat{Y}_{irt}^P$  using estimated coefficients  $\hat{\beta}_1$
- ▶ Predict  $\hat{Y}_{irt}^T$  using estimated coefficients  $\hat{\beta}_2$
- ▶ Then use these predicted components of income in the equation:  
$$S_{irt} = \alpha_0 + \alpha_1 \hat{Y}_{irt}^P + \alpha_2 \hat{Y}_{irt}^T + u_{irt}$$
  - ▶ where  $S_{irt}$  is savings in household  $i$  in region  $r$  in year  $t$
- ▶ See Table 4
- ▶ MPS are not exactly 0 and 1, but the relative magnitudes are consistent with the theory