

# Consumption and Saving

Joydeep Bhattacharya

ISU

January 20, 2009

## Definition

Economics: The scientific study of the choices made by individuals and societies in regard to the alternative uses of scarce resources which are employed to satisfy wants.

- *Scientific* study. Testable. Disinterested in outcome.
- Testability: questions of belief? := do tax cuts create more jobs? will outsourcing hurt America?
- Economists try to maintain objectivity even though they study politically charged issues.
- a tension: human beings may/can not be all that objective; subjectivity, biases (first impressions matter, looks matter), people forget (prices), anger,...a theory for every Tom, Miguel, or Mao?

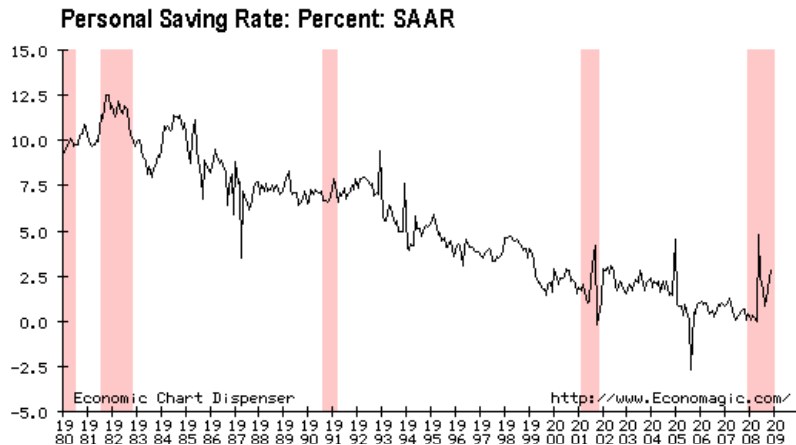
- Not a problem for the natural sciences: what is true for one block of ice is true of them all
- Economists create a strawperson, a fictitious character who behaves within certain reasonable bounds: rational (*Homo economicus*); a person who is *consistent* in her actions and takes those actions that make her happier than other competing actions.
- Economists **believe** that *Homo sapiens*  $\equiv$  *Homo economicus*.

- the value of all goods and services bought by households in a year.
- durable goods last a long time ex: cars, home appliances
- non-durable goods last a short time ex: food, clothing
- services work done for consumers ex: dry cleaning, air travel.

## Importance of consumption in national income accounts

	\$ billions	% of GDP
Consumption	\$7,064.5	69.2%
Durables	858.3	8.4
Nondurables	2,055.1	20.1
Services	4,151.1	40.7

# Low personal savings rate in the US



## Personal Savings Rate 1959–2007

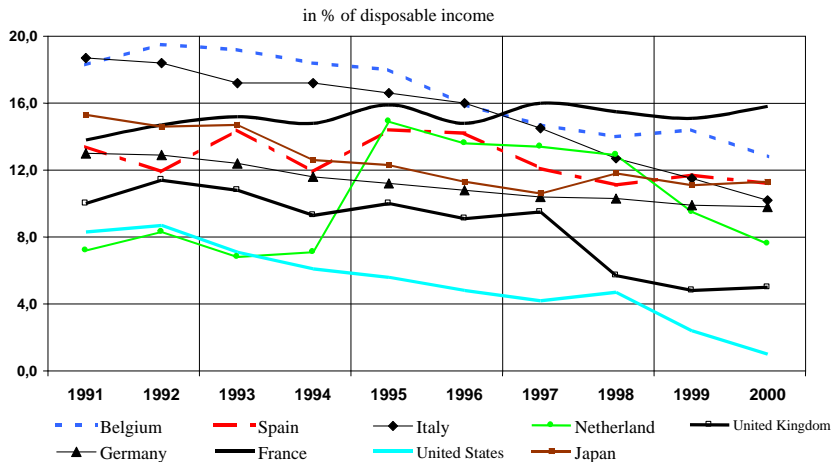
PERSONAL SAVINGS AS A PERCENTAGE OF DISPOSABLE INCOME



Source: U.S. Department of Commerce, Bureau of Economic Analysis,  
"Personal Saving Rate January 1, 1959 to 2007," March 1, 2008.

# Low savings rate in the US relative to OECD countries

Figure 1 : Household saving rates published by the OECD



# Two period model preliminaries

- why save? transfer income across a) time (lifecycle motive) b) states of nature (precautionary motive)
- People trade-off present consumption with future consumption
- Assumptions of the Fisher model
  - 1 only 2 periods
  - 2 current  $w_1$  and future income  $w_2$  given
  - 3 perfect capital markets: person (*Homo economicus*) can borrow/save  $S$  “any” amount at market interest rate  $R = 1 + r$ ; net vs gross
- difference between feasibility & choice

# The budget constraint

- $c_1$  is real consumption in period 1 and  $c_2$  is real consumption in period 2.
- per-period budget constraints

$$c_1 = w_1 - S$$

$$c_2 = w_2 + rS$$

$$c_1 \geq 0, \quad c_2 \geq 0, \quad S \begin{matrix} \geq \\ \leq \end{matrix} 0$$

- $S$  put in a bank account in period 1 earns an interest “ $r$ ” for the length of the period. Next period, agent has  $(S + rS)$ . She also has her period 2 income of  $w_2$ .
- non-negativity constraint on consumption; not on saving

# The intertemporal budget constraint

- writing it as a single lifetime *intertemporal* budget constraint (IBC)
- fungibility of funds across time
- notion of discounting; **Present Discounted Value** – PDV (if you have to make a payment of \$100 one year from now, how much should you put aside today?)

$$c_1 + \frac{c_2}{1+r} = w_1 + \frac{w_2}{1+r}$$

- interpretation of IBC as PDV of lifetime cons = PDV of lifetime income.

# The intertemporal budget constraint

- plotting the budget constraint; maximum amount he can save or borrow?
- the **feasible set** of consumption possibilities (budget set)
- no borrowing, no saving point; saving segment
- negative slope implies trade-off between current and future consumption
- why are interior points left out?

# Preferences and utility

- preferences: (a) consumer knows if he prefers  $A$  to  $B$  or  $B$  to  $A$  or he is indifferent; (b) only one is true, (c) if  $A \succeq B \succeq C$ , then  $A \succeq C$ .
- Utility fn: if  $x \succeq y$ , then  $u(x) > u(y)$
- People may have different preferences about whether to consume more when young or to consume more when old.
- The level of utility any combination of current and future consumption brings to a consumer is summarized by the utility function:

$$U(c_1, c_2)$$

- assume  $U$  is strictly increasing in  $c_1$  and  $c_2$ .

# Preferences and utility

- consumption smoothing; people don't like extremes.
- Example

$$U(c_1, c_2) = c_1^{0.4} c_2^{0.6}$$

Check  $U(20, 1) < U(10, 10)$ .

- 3-D picture of utility; to move to 2-D, use indifference curves (IC)
- IC's show all combinations of current and future consumption that yields the same level of utility  $\bar{U}$

$$U(c_1, c_2) = \bar{U}$$

- Figure

- properties of indifference curves:
  - downward-sloping; notion of MRS (rate at which person would like to substitute current cons. for future cons.);
  - declining MRS
- consumption-smoothing idea and its relation to declining MRS
- Optimal bundle diagrammatically;  $MRS = \text{slope of IC at a point}$  (negative).
- Optimal (“utility maximizing”) level of consumption: where  $MRS = \text{the slope of the budget line}$ . Interpretation.

# The agent's problem in formal notation

- the agent's problem:

$$\max_{(c_1, c_2)} U(c_1, c_2)$$

subject to

$$c_1 + \frac{c_2}{1+r} = w_1 + \frac{w_2}{1+r}$$

and non-negativity constraints on consumption.

# Example



$$U(c_1, c_2) = \ln c_1 + \beta \ln c_2$$

- $Y \equiv \left[ w_1 + \frac{w_2}{1+r} \right] \Leftrightarrow$  PVLI; Solution: optimal consumption

$$c_1^* = \frac{1}{(1+\beta)} Y; \quad c_2^* = (1+r) \frac{\beta Y}{(1+\beta)}$$

optimal saving:

$$S^* = \frac{\beta w_1}{(1+\beta)} - \frac{1}{(1+\beta)} \frac{w_2}{1+r}$$

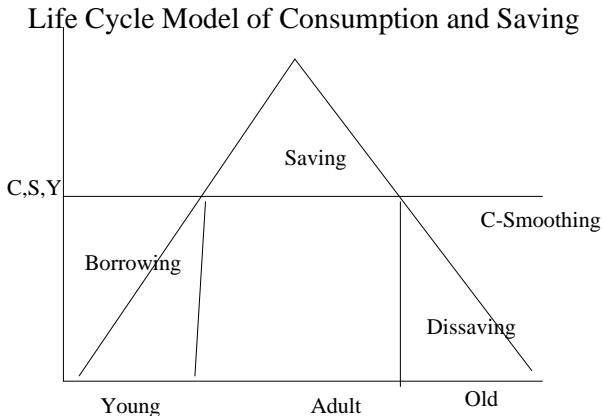
$$c_1^* = \frac{1}{(1 + \beta)} \left[ w_1 + \frac{w_2}{1 + r} \right]; \quad c_2^* = (1 + r) \frac{\beta}{(1 + \beta)} \left[ w_1 + \frac{w_2}{1 + r} \right]$$

$$S^* = \frac{\beta w_1}{(1 + \beta)} - \frac{1}{(1 + \beta)} \frac{w_2}{1 + r}$$

- consumption depends not only on current income but on PVLI (present value of lifetime income)

- using saving to bring income forward/backward to help smoothen consumption

$$S^* = \frac{\beta w_1}{(1 + \beta)} - \frac{1}{(1 + \beta)} \frac{w_2}{1 + r}$$



# Temporary vs. Permanent

- Distinguishing between temporary and permanent changes:

- 1 **temporary** increase in  $w_1$  to  $w_1 + \Omega$  with no increase in  $w_2$

$$c_1 + \frac{c_2}{1+r} = (w_1 + \Omega) + \frac{w_2}{1+r}$$

- 2 **permanent** increase in  $w_1$  to  $w_1 + \Omega$  and increase in  $w_2$  to  $w_2 + \Omega$ .

$$c_1 + \frac{c_2}{1+r} = (w_1 + \Omega) + \frac{(w_2 + \Omega)}{1+r}$$

# Temporary vs Permanent tax cut

- Permanent increases in income have much stronger effects on consumption than temporary changes.

$$S_{\text{temp}} = \frac{\beta (w_1 + \Omega)}{(1 + \beta)} - \frac{1}{(1 + \beta)} \frac{w_2}{1 + r}$$

$$S_{\text{permanent}} = \frac{\beta (w_1 + \Omega)}{(1 + \beta)} - \frac{1}{(1 + \beta)} \frac{(w_2 + \Omega)}{1 + r} \Rightarrow S_{\text{permanent}} < S_{\text{temp}}$$

- Tax cuts are more likely to have strong effects on consumption if the cut is a permanent one.

- Do tax cuts work? increase consumption? get economies out of recessions?

# Bush Tax Relief Reconciliation Act of 2003

*When people have more money, they can spend it on goods and services. And in our society, when they demand an additional good or a service, somebody will produce the good or a service. And when somebody produces that good or a service, it means somebody is more likely to be able to find a job.*



*We know that tax relief is going to help this economy ... The tax relief we passed in 2001 helped make the recession one of the shallowest in American history.*

# Ricardian Equivalence

- Suppose the government cuts taxes today and has no plans to cut spending. Are you better off as a result? Will you consume more?
- The situation before any tax-cuts are announced: In period 1, govt. collects taxes  $T_1$  and spends  $G_1$ ; similarly in period 2.
- Deficit:

$$D_{\text{pre}} = G_1 - T_{1\text{pre}}$$

- Govt. finances deficit  $D$  by selling bonds (borrowing from the public).

# Ricardian Equivalence

- In period 2,

$$T_{2\text{pre}} = (1 + r)D_{\text{pre}} + G_2$$

or,

$$T_{2\text{pre}} = (1 + r)\{G_1 - T_{1\text{pre}}\} + G_2 \quad (1)$$

- After tax-cuts are announced  $\rightarrow$  Suppose govt. announces a tax-cut of  $\Delta T$  in the first period. Then, govt. deficit after the policy (denoted  $D_{\text{post}}$ ) is

$$D_{\text{post}} = G_1 - \{T_{1\text{pre}} - \Delta T\} = G_1 - T_{1\text{pre}} + \Delta T$$

- Then

$$T_{2\text{post}} = (1 + r)D_{\text{post}} + G_2$$

or,

$$T_{2\text{post}} = (1 + r)\{G_1 - T_{1\text{pre}}\} + (1 + r)\Delta T + G_2 \quad (2)$$

- Therefore, taxes will have to be increased by the amount [using (1) & (2)]

$$T_{2\text{post}} - T_{2\text{pre}} = (1 + r)\Delta T$$

- Thus a current period tax cut of  $\Delta T$  implies a tax hike of  $(1 + r)\Delta T$  in the future!
- For the consumer: first period effective income goes up (as a result of the tax cut in the first period) from  $w_1$  to  $\{w_1 + \Delta T\}$ . But second period income (as a result of the tax hike in the second period) goes down from  $w_2$  to  $\{w_2 - (1 + r)\Delta T\}$ .
- What happens to their permanent income?

# Precautionary Motive

- life is full of economic risks and uncertainties.
- good and bad outcomes; people don't like extremes (risk-averse);
- like to smooth consumption over good and bad states; can save to limit the economic setbacks (buffer); precautionary saving

# Precautionary Motive

- suppose second period income is uncertain; can be  $w_2 - \Omega$  with probability 0.5 and  $w_2 + \Omega$  with probability 0.5
- very risk-averse people focus only (put a lot of weight) on the really bad state.
- Save assuming that their second period income will be  $w_2 - \Omega$ .
- difference between this and what they would have saved if they knew that their second period income was  $w_2$  for sure is called precautionary saving.
- may explain low US saving.