Summary
behavioral Economics

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1 Standard Model + Methods

Individual i at time $t = 0$ maximizes expected life-time utility

$$\max_{x_i^t \in X_i} \sum_{t=0}^{\infty} \delta^t \sum_{s_t \in S_t} p(s_t) U(x_i^t | S_t) \tag{1}$$

- X_i is the set of "life-time strategies"
- x_i^t is the payoff of individual i at time t given strategy X_i
- S_t is the set of all relevant states (s_t) that can happen at time t
- $p(s_t)$ are rational beliefs
- δ is a time-consistent discount factor
- $U(x_i^t | s_t)$ is the utility of individual i, from payoff x, at time t, in state s

Rewrite equation 1 in four parts

$$(i) \max_{x_i^t \in X_i} (ii) \sum_{t=0}^{\infty} \delta^t \ (iii) \sum_{s_t \in S_t} p(s_t) \ (iv) U(x_i^t | S_t)$$

- Assumption 1
  - Economic agents act as expected utility maximizers (part i, iii an iv)
- Assumption 2
  - There are no interdependencies, that is, an agent's utility is governed by own payoffs and he or she does not take into consideration the payoff of others (part iv)
- Assumption 3
  - Agents are Bayesian probability operators, that is, they form subjective (unbiased) priors and update these priors according to Bayes rule (part iii)
- Assumption 4
  - Agents have consistent time preference according to the discounted utility model (part ii)

Components of a "good"Model

1. Parsimony
2. Tractability
3. Conceptual insightfulness

4. Generalizability
5. Falsifiability
6. Empirical accuracy
7. Predictive precision

Extensions of standard model

1. Non-standard preference
2. Non-standard beliefs
3. Non-standard decision making

Experimental methods

What to consider when doing a randomized experiment

1. Population of interest
2. Method of randomization
    - within (all subjects are both; control and treatment)
    - between (all subjects are either control or treatment)
3. Unit of randomization
4. Power
5. Ethical concerns

2 Intertemporal Choice

Definition:

Intertemporal choice = decisions where **negative payoffs** (costs > benefits) and positive payoffs (costs < benefits) occur in **different time periods**

- Two types of intertemporal goods
    - Investment goods
        - $b_1 < 0 \,\&\, b_2 > 0$
    - leisure goods
        - $b_1 > 0 \,\&\, b_2 < 0$
    - is its a leisure good or investment good can be different from individual to individual

Definition:

time preference = describes how the same instantaneous utility may generate different levels of life-time utility depending on when the instantaneous utility is experienced (everything else fixed)

2.1 $\beta\delta - model$

- Simplification: no uncertainty (different States are ruled out)
- First Period out of the sum

$$\max_{x_i^t \in X_i} u(X_i^0) + \sum_{t=1}^{\infty} \beta\delta^t U(x_i^t)$$

- discount function becomes:

$$1 + \beta\delta + \beta\delta^2 + \beta\delta^3$$

- the discount factor between two consecutive periods vary depending on which two periods we consider:
  - $\beta\delta$ between any current t and the period after $(t + 1)$
  - δ between any two consecutive periods in the future
- **if** $\beta = 1 \Rightarrow$ discount as in the standard models
- **if** $\beta < 1 \Rightarrow$ discount higher when comparing present and the period after as two periode further in the future
- Naive model:
  - wrong beliefs about β
  - $\hat{\beta} \neq \beta$
    - the belief about the discount in *Period t* is $1 + \hat{\beta}\delta + \hat{\beta}\delta^2 + \hat{\beta}\delta^3 + ...$
    - if there in Period t they discount with β
- different Types due to β
  - "rationalëxponential discounters: $\hat{\beta} = \beta = 1$
  - Naive: $\hat{\beta} = 1$ ***BUT*** $\beta < 1$
  - Sophisticated: $\hat{\beta} = \beta < 1$
  - Partially naive: $1 > \hat{\beta} < \beta$

2.2 Empirical Evidence

Paying not to go to the Gym (self-control problems and investment goods)

- Different contracts available
  - Monthly
  - Yearly
  - Pay-per-visit
- Chooses in the standard Model
  - calculate unbiased estimation of expected number of visits per month
  - monthly contract if: $\frac{\text{monthly Fee}}{E(visit)} <$ price per visit
  - break even: $\frac{\text{monthly Fee}}{\text{price per visit}} <$ E(visit)

Findings

Paying Not to go to the Gym

1. average price per attendance **17.27 $** $>$ (pay-per-visit **10 $**)
   - Explanations
     - Standard model
       - risk preference
     - $\beta\delta$-model
       - Naive: Overestimate future usage
       - Sophisticated: better then not go (encouragement; dont have to pay every time; no decision between money and visit each time)
     - Other
       - Distaste to pay per usage
       - Persuasion
2. Are people naive or sophisticated
   - **predict**: 9.5 monthly visits
   - **actual**: 4.17 monthly visits
   - evidence of naive
   - but if there were asked people still would keep the monthly contract
3. Interval between last attendance and termination of contract = **2.3 month**
   - evidence for naive
   - other explanations
     - people forget

- pressure

4. Person with monthly contract 17 % more likely to be member after 14 months
    - despite less attendance on average
    - despite monthly contract is more expensive
5. decreasing average attendance in monthly contract
6. The higher price per visit the longer people wait to cancel their contract
    - the monthly members who attend relatively seldom take longer time to cancel membership
    - suggest that overestimation in one domain correlates with overestimation in another

Tying Odysseus to the Mast

Commitment = Takes action in advance that restricts future action

- The commitment device
    - A commitment **saving account** called SEED with **limited withdrawal** and the **same interest rate** as a full-flexible account
- Experiment
    - Sample = 4001 current or previous clients
    - These clients were randomly assigned to
        * Commitment Treatment(T) 50 %
        * Marketing Treatment (M) 25 %
        * Control group (c) 25 %
    - 1777 clients were found by the survey team (focus)
- Timeline
    - First step: Survey for time preference
    - second step: one month later T and M were informed and T got additionally the offer wit the commitment
- results
    - 202 clients signed up for the SEED account
        * 28 % has preferred for commitment if available
    - having answered the survey increased the probability to sign up for SEED account by 12.5 %
    - We can only measure the effect of being OFFERED the commitment account on future savings
    - highly significant

Temptation Bundling

- investment good and leisure good combined
- Results
  - Full treatment group with the highest visits
  - intermediate treatment group better then the control group
- WTP
  - 61 % would pay up to 1 $ for device
  - 32 % would pay up to 10 $ for device
  - 10 % would pay up to 20 $ for device

2.3 Market Implication

- Evidence suggest existence of naive and sophisticated agents
- rational firms want to offer a menu of contracts that maximize payoffs
- the menu they present will depend on the types of consumers they face
  - rational and sophisticated agents have rational beliefs
    - "rational": price = marginal cost
    - ßophisticated"
      - investment good: price < marginal cost
      - leisure good: price > marginal cost
      - **Intuition:** the firms offer a perfect commitment device
  - not the case for naive agents
    - Investment good: price < marginal cost
    - leisure good: price > marginal cost
    - same as for sophisticated but **different intuition**
    - **Intuition:** the firm takes advantage of consumer overestimation (underestimation) of the consumption of future **investment goods** (leisure goods)
  - **Same conclusion** in terms of pricing for both naive and sophisticated types

2.4 Policy

- with rationality or rational beliefs there is no need for political actions
- supply commitments devices when markets are not available
- Examples
  - Taxes on leisure goods
  - Subsidizes fees for investment goods
  - Reduce flexibility
  - Consumer protection

3 Reference-dependent Preference

Basic Framework: Expected Utility Theory (EUT)

- Expectation Principal:
  - $U(x_1, p_1; \ldots; x_n, p_n) = p_1 u(x_1) + \ldots + p_n u(x_n)$
- Asset Integration:
  - $(x_1, p_1; \ldots; x_n, p_n)$ is acceptable at asset position w if $U(w+x_1, p_1; \ldots; w+x_n.p_n) > U(w)$
- Risk aversion:
  - u is concave (u" < 0)

3.1 Prospect Theory

- evaluate prospect as follows

$$V(x_1, p_1; x_2, p_2) = \pi(p_1)v(x_1) + \pi(p_2)v(x_2)$$

- two basic difference
  - $\pi(p) \neq p$ non-standard beliefs
  - $v(x) \neq u(x)$ the value people assign are differ from the standard model
- mostly the simplified version without π are used
  - $V(x_1, p_1; x_2, p_2) = p_1 v(x_1) + p_2 v(x_2)$
- two value functions; one over prospect and one over payoffs
- value function over payoffs

$$v(x) \begin{cases} (x-r)^\alpha & \text{if } x \geq r \\ \lambda(x-r)^\beta & \text{if } x \leq r \end{cases}$$

  - r = reference point
  - λ = coefficient of loss aversion ($\lambda \geq 1, \lambda = 1$ no loss aversion)
  - α = diminishing marginal sensitivity for **gains** ($\alpha \leq 1$)
  - β = diminishing marginal sensitivity for **losses** ($\beta \leq 1$)
- graphically the loss aversions is shown with a **kink**
- $\lambda = 2.25$ in Kahneman and Tversky (1992)
- the location of the **reference point** is crucial for the computation
  - Kahneman & Tversky say in there paper that it is given
  - rational expectation as reference point (Köszegi and Rabin (2006))

Applications

- Finance - Odean (1998)
  - disposition effect = tendency to sell "winnersänd hold on to "losers"
  - Prospect Theory as an explanation
    - the concavity over gains induces less risk taking for winner stocks (more sales of winner)
    - the convexity over losses induces more risk taking for loser stocks (more purchases of losers)
- Labor supply - Cramer et al. (1997)
  - upward sloping in the standard model
  - Results
    - Increases in the daily wage (per hour), leads to a decrease in the number of hours worked
    - downward sloping
    - rejects the standard model
    - support of a reference-dependent model (daily income targets)

Endowment effect

- your selling price is higher when you have the object as your offer to purchase the object
  - clearly linked to loss aversion and Prospect Theory

Does Experience eliminate Market Anomalies

- sports card fair
  - two types of people (low and high experience players)
  - cards have the same value
  - expectation is that 5 % trade their cards
  - Result
    - 6.8 % trade for low experience types
    - 46.7 % trade for high experience types
  - Problems
    - selection effect
    - low n

Selling your Apartment

- A home owner choose sales price P to maximize

$$U = p(P)u(P) + (1 - p(P))\bar{U}$$

  - $u(P)$ utility from selling the apartment at Price P
  - $p(P)$ is the probability to sell at price P
  - $\bar{U}$ is the reservation utility received if not selling
  - Properties
    - u(P) is increasing in P (u'(P) > 0)
    - p(P) is decreasing in P (p'(P) < 0)

- optimal Price*

$$\frac{\partial U}{\partial P} = p'(P)u(P) + p(P)u'(P) - p'(P)\bar{U} = 0$$

$$\Rightarrow p(P)u'(P) = p'(P)(\bar{U} - u(P))$$

- Marginal gain of higher price equals marginal cost
  - marginal gain: $p(P)u'(P)$
  - marginal cost: $p'(P)(\bar{U} - u(P))$

- Prospect Theory

$$u(P) = v(P) = \begin{cases} (P - P_0) & \text{if } P \geq P_0 \\ \lambda(P - P_0) & \text{if } P \leq P_0 \end{cases}$$

  - When $P > P_0$, $p(P) = p'(P)(\bar{U} - (P - P_0)$
  - When $P < P_0$, $p(P)\lambda = p'(P)\left[\bar{U} - \lambda(P - P_0)\right]$

Playing Golf

Family Violence