

Summary
**-Behavioral and Experimental
Economics-**



What BE aims to do

- Behavioral economics increases the **explanatory** power of economics by providing it with more realistic psychological foundation.
- It is important to emphasize that the behavioral economics approach extends rational choice and equilibrium models; it does not advocate abandoning these models entirely.

Key concerns in BE

1. Discovering empirical law that describe behavior as correctly and accurately as possible
2. Departures of actual behavior from the neoclassical assumptions
3. To supply **empirical evidence about the shape and content of the utility function** so as to **strengthen the predictions** that can be made about human economic behavior

Utility maximization under constraints

-Three components

1. Preferences & utility function (U)
2. Constraints (budget) (C)
3. (Relative) prices (P)

-Behavior = MaxUCP

But grounded under strong assumptions:

BE adds reality (and complexity)

Positive: How things are

Normative: how things should be

In BE: normative = prescriptive

- How people should behave in order to maximize their utility

Rationality in economics

-Basic approach: **without uncertainty**

-Starting point: preferences

1. **Completeness:** individuals have preference ordering over all alternative courses of action
2. **Transitivity:** If $A > B$ & $B > C$ -> $A > C$
3. **Monotonicity:** More of a good is preferred over less of the same good ($2A > A$)

Rationality with uncertainty

1. Exogenous uncertainty

1. Expected utility maximization (as opposed to "plain" utility maximization)
2. Bayesian probability estimation: people are able to estimate probabilities correctly

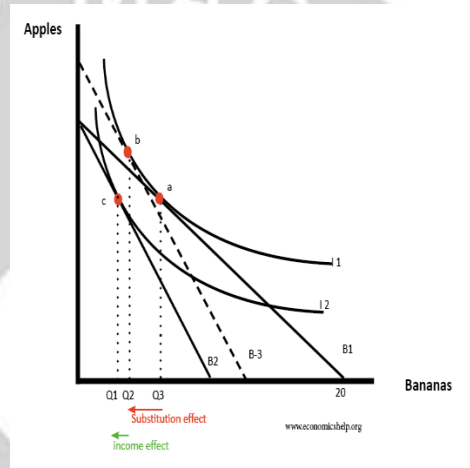
2. Endogenous (or behavioral) uncertainty

-Derives from strategic interaction between individuals (game theory)

-**Common knowledge assumption:** Person A knows that person B knows that person A knows...

Models have a **domain of application** & a **domain of validity**

1. **Domain of application:** the set of phenomena that the model seeks to explain
 2. **Domain of validity:** the set of phenomena for which the model offers a valid account or explanation
- Domain of validity: SEM may work for **markets as a whole**, but not for **a single individual**



Fehr & Tyran (2005)

Does individual irrationality have aggregate-level consequences or do individuals' biases cancel out?

- Strategic complementarity:** An increase in *i*'s actions generates an incentive for *j* to increase his/her action.
 - *j* can benefit (even) more from an action by *i* by engaging in this action him/herself.
 - Example: Do you think that Bitcoin is overpriced? That doesn't really matter, it is more about if you expect that if you buy it now you can sell it at a higher price.
- Strategic substitutability:** An increase in *i*'s action generates an incentive for *j* to decrease his/her action.
 - *j* can benefit (even) more from an action by *i* by not engaging in this action him/herself.

Effects on aggregate-level outcomes

- Strategic complementarity: Small amount of individual irrationality may lead to large deviations from aggregate predictions of SEM.
 - Complementarity works as an amplifier.
- Strategic substitutability: Minority of rational agents may suffice to generate aggregate outcomes consistent with SEM.
 - Enough individuals engage in actions that go counter to the actions of irrational individuals

		Aggregate level	
		Do not exist	Exist
Individual level	Anomalies	Do not exist	Exist
	Do not exist	Behaviour at both levels corresponds to the criteria of rational behaviour (e.g. in simple decision contexts) A	Anomalies arise at the aggregate level (e.g. private property can be valued particularly high, public goods very low) C
	Exist	Anomalies eliminated at the aggregate level (e.g. in pure market situations) B	Anomalies maintained at the aggregate level (e.g. anomalies due to judgmental heuristics) D

Methodology of BE

Doing scientific research involves:

1. Formulating models and theories (e.g. the SEM)
2. Gathering evidence (using experiments)

Instrumentalism vs realism

Realism: how realistic is the model

Instrumentalism: how valid is the model, how good are they at predicting

- Standard economics (SE): "as-if" models

- Aim is to **predict** choices
- BE: process models
 - Aim is to predict choices **AND** model processes that produce these choices

Are SE or SEM assumptions often unrealistic? – Yes

Is unrealisticness of assumptions sufficient grounds to dismiss SEM? – No

Unrealisticness of assumptions as challenge to usefulness

Four common evaluation criteria for theories/models

- 1. Congruence** with reality: Good theories fit and/or explain existing data and make testable predictions that are later proven correct
- 2. Generality:** Good theories apply to a wide range of phenomena
- 3. Trackability:** Complex theories may perform better but cannot easily be translated into models
- 4. Parsimony:** Many predictions from relatively few assumptions

BE and added criteria for evaluating theories

- **Precision:** ability to give exact numerical predictions about behavior
- **Psychological plausibility:** process and realisticness of assumptions
- *BE: congruence, generality, precision psychological plausibility*
 - Precision & plausibility at the expense of tractability & parsimony

Reductionism

- Explanation at different hierarchical levels
- Proximate vs ultimate causes
- To explain something, means uncovering underlying mechanism
 - Prediction and explanation are different scientific endeavors
- Ad absurdum → everything is physics

BE prone to two types of studies:

1. Field studies (FS): involve real decisions that people make in their lives
2. Experimental studies (ES): asking individuals to evaluate real or theoretical prospects that are manipulated by the researcher

Other types of studies: neuroeconomics, survey data

Judging quality of evidence

1. **Ecological or external validity:** Generalizability (FS > ES)
2. **Conceptual or internal validity:** Free from confounding influences (ES > FS)

Also: experiments vs quasi-experiments

-Genuine experiments require random assignment to manipulation/treatment (helps control for confounding influences)

Types of inference

- **Necessary: deduction**
 - What is inferred is necessarily true because the underlying premises are true.
 - If All Xs are Ys & Z is an X, then Z is a Y
- **Non-necessary: induction and abduction**
 - Inferences based on statistical evidence
 - Induction vs abduction: abduction involves explanatory considerations, whereas induction only appeals to observed frequencies or statistics
 - BE more focused on abduction compared to SE

The SEM on consumer preferences

- Same axioms as before: completeness, transitivity and monotonicity
 - + **revealed preference**: the choice of consumption bundle (x_1, x_2) over bundle (y_1, y_2) implies that (x_1, x_2) is preferred over (y_1, y_2)
 - To prefer a **preference ranking** -> **higher ordinal utility**
 - Assumption that preferences don't change

An axiom is definitely true, not up to debate. An assumption you can discuss about.

Four further assumptions

- **Cancellation**: a generic preference for winning x over winning y implies a preference for winning x over winning y in specific states of the world
 - $x > y$, unconditional -> $x > y$, conditional on rain tomorrow
- **Dominance**: a preference for winning x over winning y in a specific state of the world implies a preference for winning x over winning y in all states of the world
 - $x > y$, conditional on rain tomorrow -> $x > y$, unconditional
- **Extensionality**: objectively similar product information should lead to similar preferences
 - 5% fat = 95% fat free
- **Invariance**: different representations of the same choice problem should yield the same preference
 - if x , 1% fat $> y$, 5% fat -> x , 99% fat free $> y$, 95% fat free

If people violate invariance, that is the strongest evidence against rationality of choices (then extensionality, dominance and at last cancellation)

Revealed preferences and utility

- Why revealed preferences? Conviction that utility cannot be measured (no standard measurement), only inferred
 - If people choose x over y , it must be because x gives them more "utility"
- Utility concept in SEM: ordinal preference ordering: we can rank them, but we don't know exactly how much utility we get and how much utility they difference
 - No link to (hedonic) pleasure/intuitive understanding of utility

Attitudes, values, value & preferences

- Attitudes = mental states regarding an object, person or idea with some degree of positivity or negativity
- Values = cross-situational concepts about desirable end states that guide behavior
 - Values are like attitudes but broader
 - Example: I value freedom therefore I have a positive attitude towards democracy/a negative attitude towards autocracy
- Value = the quantitative evaluation of something (values \neq value)
- Preferences = the choosing of one course of action over another
 - In SEM: preferences = choice
 - Revealed preferences cannot be used to **explain** choice -> tautological
- Meanwhile: unlike preferences, attitudes do not necessarily involve choice
 - I have a more positive attitude towards Picasso's later work than towards his earlier work (You will never get this choice)

Cognitive biases are tendencies to think in certain ways that can lead to systematic deviations from a standard of rationality or good judgement

- Deviations from SEM: non-transitivity
- Implications: room for improving the SEM and individuals' welfare
-SEM as prescriptive model for human decision making

Psychological effects (biases)

- **Expectations effects:** anticipatory utility
Example: placebo effect
- **Addiction and abstinence:** self-signaling; deriving (diagnostic) utility from proving to oneself that one can/does not do something
Example: running a marathon
- **Endowment effect:** utility not independent of possession
= People are more likely to retain an object they own than acquire that same object when they do not own it → related to loss aversion
Example: ownership increases valuation
- **Framing effects:** "framing" of identical choices or other irrelevant cues affect preferences
Example: plate size affects eating
Preference reversals. Violation of transitivity
- **Anchoring effects:** generic phenomenon involving framing effects, people rely too much on pre-existing information or the first information they find when making decisions
Example: if two shirts are 100 and 90 euros, the second t-shirt is seen as cheap because you saw the t-shirt of 100 euros first
- **(In)attention:** lack of focus when it is required
Example: neglect of shipping costs
- **Menu effects:** occurs when choosing from a list of options, the way you portray options matters (includes framing and anchoring effects)
 - Attraction (decoy) effect: unattractive option affects preferences
 - Salience: first item on the list
 - Paradox of choice: too much choice leads to stress, which reduces buying
 - Momentum effect: in the mood for buying
 - Vicarious consumption: seeing something healthy "allows" indulging in something unhealthy
 - Confusion
→ Related to framing effect. Menu effect = generic phenomenon. How choices are presented matters.**Famous example: Asian disease**
- **Effects of visceral factors such as emotions:** narrow attention, automatic decisions, impulsive.
- Narrow attention (object/time), automatic decisions, impulsive.
 - Short-sighted decisions
 - Uptake of earthquake insurance.
- Irrationality involving emotions:
 - Overestimation of duration of current emotional state.
 - Underestimation of adaptation / habituation.
 - Difficult to predict hedonic effect of choice.
 - What people think will make them happy, does not always do so.

- **Example:** going to the supermarket when your hungry increases spending

Different types of "utility"

- **Decision utility = "weight of an outcome in a decision"**
-traditional utility concept in economics
- **Experienced utility = "the hedonic quality of an outcome"**
-Closer to intuitive, layperson understanding of utility as presence of pleasure and absence of displeasure
 1. Remembered utility: hedonic experience as people remember it
-Peak-end rule: in retrospective evaluations people remember an experience by its most intense point and its end
 2. Real time utility: hedonic experience as it occurs
-Edgeworth's (1881) hedonimeter
-Nowadays: Diary studies -> people responding to happiness questions several times a day
- Difference between choice and preference: what people choose may not maximize their happiness

Endowment effects and contrast effects as drivers of happiness

- Endowment effect = events can affect our happiness or satisfaction indirectly
Example: sunshine
- Contrast effect = prior hedonic experience of something affects future hedonic experience of the same thing
-(hedonic) adaptation: *"gradual reduction of the affective intensity of favorable and unfavorable circumstances"*

Adaptation

- Treadmill effects: evermore positive stimuli needed to maintain a given level of happiness or satisfaction
- Aspiration effects: people's aspiration increase, which increases their felt needs
Example: people with an apartment want a house, people with a house want a villa
-Also related to relative poverty

Anticipatory utility

- Expected or predicted utility guides choice, not equal to experienced utility
- Application: experiencing the chance of winning the lottery renders pleasure over and above the expected value of the ticket

Residual and diagnostic utility

- **Residual utility:** People can re-enjoy or re-suffer past (consumption experiences)
Example: holidays
- **Diagnostic utility:** People infer utility from their own actions
Example: I feel good for taking the train instead of flying

The SEM on beliefs

1. Perfect rationality
2. Bayesian probability estimation
= *"people are able to estimate probabilities correctly, given the relevant information and are able to update their estimates correctly given a sequence of prior outcomes"*

Perfect rationality

More realistic is bounded rationality → *rationality is limited by the tractability of the decision problem, the cognitive limitations of people's minds, and the time available to make the decision*

- **Heuristics → biases**
- **Heuristic** = "any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals"
Example: rule of thumb
- **Bias = systematic error**
 - Beliefs: bias → **factual error**
 - Preferences: bias → **non-utility maximizing choice**

Bayesian probability estimation

- **Bayes' theorem (or law or rule)**: describing the probability of an event, using prior knowledge of conditions that might be related to the event
 - P(A) = probability of observing A regardless of B
 - P(B) = probability of observing B regardless of A
 - P(A/B) = conditional probability = probability of observing A given that B is true
 - P(B/A) = probability of observing B given that A is true

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

- **Bayesian updating of probabilities**

$$P(H|E) = \frac{P(E|H)P(H)}{P(E)} = \frac{P(H)}{P(E)} P(E|H)$$

- H = Hypothesis
- E = observed science
- P(H) = prior probability of H
- P(E/H) = conditional probability = chance of seeing evidence E when H is true
- P(E) = marginal probability = a priori chance of seeing evidence E, regardless of H
- P(H/E) = posterior probability of H being true, taking evidence into account
- Bayes formula: $P(A/B) = (P(B/A) \times P(A))/P(B)$

Heuristics in probability estimation

- **Availability heuristic** = *mental shortcut that relies on immediate example that come to a given person's mind when evaluating a specific topic, concept, method or decision*
 - People overestimate probability of rare events because these events are salient
 - Example: Earthquake insurance
- **Representativeness heuristic** = *Tendency to evaluate the likelihood of a subject to belong to a certain category based on the extent to which the subject resembles a stereotypical subject from that category*
 - **Conjunction fallacy**: P(A&B) appears more likely than P(A), because P(A&B) is more representative of known category
 - Example: Linda is a bank teller, or Linda is a bank teller AND a woman. The first one is more likely, but we assume Linda is a woman's name.
- **Base rate bias (base rate fallacy or base rate neglect)**: "when presented with related base rate information and specific information, the mind tends to ignore the former and focus on the latter"
Example: Doing a coronatest getting a positive result and the chance that you actually have corona. / Blue and green cab example

- **Law of small numbers**

- Gambler's fallacy: mistaken belief that, if something happens more frequently than normal during some period, it will happen less frequently in the future

- Hot hand effect: belief that experienced success with a seemingly random event increases chance of further success in additional attempts

Biases

1. Self-evaluation bias = *Distortion of any cognitive or perceptual process brought on by the need to maintain and enhance self-esteem or the tendency to perceive oneself in an overly favorable manner*

- **Overconfidence:** individuals' subjective confidence on their own judgements or performance is greater than the objective level of those performances or the objective accuracy of those judgements
 - Overestimation of one's actual or absolute performance.
 - Overplacement of one's performance relative to others.
 - as when an individual expresses unwarranted certainty in the absolute accuracy of his/her beliefs.
- **Underconfidence:** Tendency to underestimate one's abilities, control and performance, both in absolute terms and relative to others
 - Hard-easy effect: *Based on a specific level of difficulty of a given task, subjective judgements do not accurately reflect the true difficulty of that task*
 - Example: overconfidence makes the test seem hard whereas underconfidence makes the test look easier*
- **Self-serving bias:** Any cognitive or perceptual process that is distorted by the need to maintain and enhance self-esteem, or the tendency to perceive oneself in an overly favorable manner
 - Self-attribution bias: ascribing success to one's own abilities and efforts, but ascribing failure to external factors
 - Cognitive dissonance: changing beliefs to reconcile them with past behavior

2. Projection bias = "Tendency to overestimate how much one's future self shares one's current preferences, thoughts and values, thus leading to suboptimal choices"

Example: hungry people snack unhealthy food more often than not hungry people

- **Generic perspective: decision utility ≠ experienced utility**

Linking projection bias to self-evaluation bias

- Visceral fit & emotional attachment to one's beliefs
- "Empathy gap": Cognitive bias in which people underestimate the influences of visceral drives on their own attitudes, preferences and behavior"
 - Hot-to-cold: people in a visceral hot state do not fully grasp how much their behavior and preferences are being driven by their current state
 - Cold-to-hot: people in a visceral cold state have difficulty picturing themselves in hot states

Causes of irrationality

- Emotional distress, memory, cognitive dissonance, threat to self-esteem, failure of self-regulation, decision fatigue, interpersonal rejection
- In general: **decision utility ≠ experienced utility**
 - People do things they do not want to do, e.g., smoke.
 - People do not do things they would like to do, e.g., stop smoking.

Emotions and irrationality

- Two opposing perspectives on emotions and judgement
 - They are bad: cloud good judgement
 - Or good: evidence for economics and neuroscience (no decisions without emotions)
- Overall: Emotions lead to better or worse decisions, depending on circumstances

The SEM of decision making under risk

Prospects and their notation

- Prospect = a number of possible outcomes with their associated probabilities

1. Expected utility theory = SEM of decision making under risk

-Same axioms as before:

- Completeness: $q \geq r$ or $r \geq q$
- Transitivity: $q \geq r$ AND $r \geq s \rightarrow q \geq s$

-But also **continuity**: when there are three lotteries (q , r and s) and the individual prefers q to r and r to s , then there should be a possible combination of q and s in which the individual is then indifferent between this mix and the lottery r

$\rightarrow r = (q, p; s, 1-p)$

\rightarrow Compound prospect = prospect that has other prospects as its components

-And **independence**: two gambles mixed with an irrelevant third one will maintain the same order of preference as when the two are presented independently of the third one

\rightarrow If $q > r \rightarrow (q, p; s, 1-p) > (r, p; s, 1-p)$

-And **monotonicity**: objective improvements to a prospect should increase its attractiveness

\rightarrow More is better than less

Two additional assumptions in EUT

1. Asset integration: Individuals value a prospect because of its pay offs and its pay offs only

- Final states matter, not gains or losses

2. Risk aversion: Individuals value a prospect with certain pay off x over any prospect with expected pay off x

EUT and real-world decision making

- Anomalies: violations of one or more of the axioms or assumptions
 - Completeness, transitivity, independence, continuity, monotonicity, asset integration, risk aversion
- Is EUT violated in the real world? Yes, because of behavioral economics

Approaches to improving on EUT

Decision weighting theories + weighted utility theory

- Role of weights in theories of decision making under risk of uncertainty
 - Outcomes are weighted subjectively (probabilities are objective)
 - Subjective probabilities (objectively weighted outcomes)
- Part of decision utility: the weight of an outcome in a decision

Others: regret theory, betweenness and non-betweenness models, rank-dependent EUT

Prospect theory (PT)

Attention to underlying psychological mechanisms, how people make decisions

Two-phase process:

1. Editing

-**Coding**: individuals perceive outcomes of prospects as gains or losses relative to a reference point

- Combination**: individuals simplify prospects by combining probabilities
Example: (\$50, 0.2; %50, 0.2) -> (\$50, 0.4)
- Segregation**: individuals segregate between the riskless and the risky component of a prospect
- Cancellation**: individuals cancel components that are identical across prospects
Example: two-stage prospect with same first stage for the two prospects involved (50% chance of winning 0, 50% chance of entering a lottery)
- Simplification**: individuals simplify by rounding outcomes and/or probabilities
- Dominance detection**: individuals are able to detect which prospect dominates (if any)

2. Evaluation

Evaluation comes after editing

Overall value of an edited prospect V:

- **Value function $v(x)$** assigns subjective value to outcome x
- **Decision weighting function $\pi(p)$** assigns (subjective) decision weight to each probability p

Reference points and loss aversion

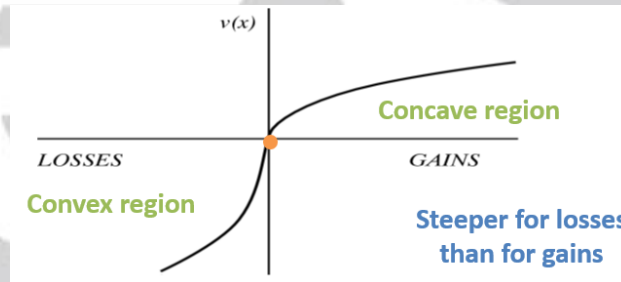
- $v(x) = (x - r)a$ if $x \geq r$
 $= -(r - x)b$ if $x < r$

r = reference point

a = diminishing marginal sensitivity of valuation to gains

b = diminishing marginal sensitivity of valuation to losses

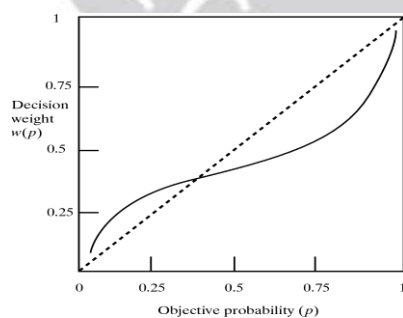
l = coefficient of **loss aversion**



Steeper for losses than for gains

- Reflection effect: risk aversion exhibited by individuals when all outcomes are gains will be transformed into a preference for risk when all outcomes are losses

Decision weighting



-Cumulative prospect theory (CPT)

Overall value function in PT vs. EUT

- EUT: $V(x, p; y, q) = px + qy$
- PT: $V(x, p; y, q) = \pi(p)*v(x) + \pi(q)*v(y)$
 - p & q are probabilities

- x & y are outcomes
- PT adds subjective valuation and subjective decision weights to create a descriptive accurate theory

Mental accounting theory (MAT)

Mental accounting = the process or set of cognitive operations used by people to code, categorize and evaluate economic outcomes

Three components of mental accounting processes:

1. Framing and editing

- Perception of outcomes and the making and evaluation of decision (as in prospect theory)
 - Segregate gains → **two time lotter winners happier**
 - Integrate losses → **losing once hurts less than losing twice**
 - Integrate smaller losses with larger gains → **net gain or smaller loss**
 - Segregate small gains from larger losses → **silver lining, use reference price to emphasize discount**
- Two types of utility from transactions
 1. **Acquisition utility**: value of good obtained relative to its price (equivalent to consumer surplus)
 2. **Transaction utility**: perceived value of the "deal" (difference between reference price and price paid)

Example: hedonic editing: mention reference price for discounted products
- MAT for bundles is more complex (compared to single products)
 - Consolidated price = bundle priced as a whole
 - Partitioned price = products priced separately

2. Budgeting and fungibility

- Consumption budgeting: allocation of spending for different categories
- Fungibility: overspending in one budget category can be compensated by underspending in another budget category
- SEM: $MU > MC$ → completely fungible budget → perfect substitutability between different budget categories

Examples of different mental accounts and imperfect fungibility: spending unexpected money rather than saving it, petty cash

3. Choice bracketing and dynamics

- Choice bracketing: how individuals segregate or aggregate choices over time periods

Example: buying and selling stock: people hold on to assets that has lost value as to avoid making the loss real

Hedonic editing and transaction utility

Examples of creating value by using hedonic editing:

- Save €5 on €15 product or €5 on €125 product.
 - Cf. framing effects (= external coding)
- Again: Mention reference price for discounted products.

Discounted utility model

Rae (1834): People have generic desire to accumulate through saving and investment

-Factors promoting accumulation

- Bequest motive & capacity for self-restraint
- factors inhibiting accumulation

- Uncertainty (you might die) & desire for immediate gratification

The DUM consists of intertemporal discounting, consumption in the future gets discounted compared to consumption now. DUM in mathematics:

$$U_t(c_t, \dots, c_T) = \sum_{k=0}^{T-t} D(k) u(c_{t+k}) \quad \text{where } D(k) = \frac{1}{(1+\rho)^k}$$

D(k) = intertemporal discounting

Numerical example $U_0(20,20,20) = \frac{20}{1+0.1} + \frac{20}{(1+0.1)^2} + \frac{20}{(1+0.1)^3} = 49.74$

Discount rate ρ (>0)

Bequest motive + capacity for self-restraint + uncertainty + desire for immediate gratification create the **discount rate ρ**

Psychology of $\rho < 0$? \rightarrow in some cases, you get utility from delaying your consumption

Some underlying assumptions of the SEM/DUM

- **Utility independence:** the distribution or order of utilities does not matter
-No preference for increasing profiles
- **Consumption independence:** consumption in one period does not affect utility in other periods
-Utility of eating Italian today does not depend on having eaten Italian yesterday or on plans to eat Italian tomorrow
- **Stable instantaneous utility function:** people's preferences do not change over time
- **Stable discounting rate:** people use the same discount rate over their lifetime
- **Constant discount rate:** the same discount rate is used in all future periods
- **Consumption independent discounting:** discount rate is not domain specific, applying equally to all forms of consumption, costs and/or benefits

Anomalies and deviations from the DUM

- Assumptions satisfied in real world?
-No, various anomalies
- **Sign effect:** gains are discounted more than losses (temporal loss aversion)
-You need to compensate more when you give people money later than when you take money from people later
- **Magnitude effect:** smaller future gains are discounted more than larger gains
-The higher the amount, the less you're willing to delay getting it
- **Delay-speed up asymmetry:** willingness to pay (WTP) for speeding up delivery $<$ willingness to accept (WTA) delayed delivery
-people would rather delay having money than having to pay to get it faster
- **Preference for improving sequences:** people like rising income and consumption profiles
-They prefer having a rising income than a decreasing income, even if that decreasing income is higher in total
- **Violation of independence:** diverging choices in logically equivalent situations
-Asian disease example, framing effects

Behavioral models of intertemporal decision making

- Generic background: major psychological influences on people's intertemporal decisions/time preferences
- What we know: people suffer from **procrastination** and **temptation**
 - ➔ Even if people want to act according to DUM, implementing this decision is difficult

Alternatives to DUM

Time-inconsistent instead of time-consistent preferences

1. **Stable discounting rate:** people use the same discount rate over their lifetime

2. **Constant discount rate:** the same discount rate is used in all future periods

If they are violated, time preferences are inconsistent

Alternative: Hyperbolic discounting: declining discount rates (incorporates **present bias** and able to generate **time-inconsistent preferences**)

- **Present bias:** more impatient in the short run
- **Per period discount factor δ** ($= f(p) = 1 / (1+p)$): proportion by which each discount factor is multiplied when discounting next period

(Quasi) hyperbolic discount function

- $D(t) = 1$ if $t = 0$
- $D(t) = \beta\delta^t$ if $t > 0$
 - $\beta < 1$ ➔ **Present bias** (future discounted more heavily than in DUM)

Individuals belief b regarding their actual B

$B < 1$ = **present bias** (future discounted more heavily than in DUM)

1. **Naïve consumers'** beliefs: $B < b = 1$

2. **sophisticated consumers'** beliefs: $B = b < 1$

-Sophisticated consumers recognize potential for inconsistency and may take action

-Typical consumer: underestimation of actual B ($B < b < 1$)

Another alternative: modifying the instantaneous utility function

- Habit formation models: shifting reference points
 - High past consumption increases utility of present-day consumption, decreasing delaying of consumption
- Anticipatory utility models: $\delta > 1$ -> savoring a positive expected future experience
- Visceral influence models: present emotions such as sadness affect discount rate
 - Spatial and temporal proximity effects
 - Immediacy bias: present emotional state more intense than previous states

Other alternatives to the DUM

1. Mental accounting models: different discount rates for different goods (lack of fungibility)
2. Multiple-self models
 - Current vs future self
 - Near-sighted (myopic) self and far-sighted self
3. Dual-self models (multiple self-models too ad hoc)
 - Far-sighted planner = principal
 - Near-sighted doers = agents
 - Game theoretic approach to optimal form of incentivizing (future) doer-selves by (current) planner self

The SEM of social preferences & anomalies

Neoclassical economics' "holy trinity":

1. Rationality
2. Equilibrium
3. Greed

SEM of social (or other-regarding) preferences: there are no social preferences

-Pure self-interest

Anomalies: giving to charity, unpaid volunteer work, voting, completing tax returns honestly, tipping waiters

Dictator game: divide a certain amount of euros between yourself and someone else

Maximize own payoff → give 0 away

Actual behavior → €2 (20%), 17% zero offers

Ultimatum game: divide a certain amount of euros between yourself and someone else, and that someone else can decide to accept or reject (and then no one gets anything)

Maximize own payoff → offer 0.01, and the second player should accept anything

Actual behavior → people offer more, second player rejects when the amount is too "low"

- €4.50
- 60% to 80% of offers between 40% and 50% (€4-5), rarely below 20% (€2)

Natural of social preferences

Social preferences are **other-regarding preferences** in the sense that individuals that exhibit these preferences behave as if they **value the payoff of relevant reference agents positively or negatively**

- Positive value: **fairness or altruism**
- Negative value: **spite, envy or jealousy**
 - Envy ≠ jealousy

Dual entitlement

In an economic interaction, both parties are entitled to certain consideration

Outcomes for trans actors: one party's gains are unfair when they come at the expense of the counterparty's surplus

Examples:

- Increasing price of shovels after heavy snowfall is unfair.
- Increasing gasoline prices because price of oil is rising is fair.

Further considerations

Reference transactions: history builds up a reference point for considerations

Circumstances of changing transactions terms:

-Profiting from "uncontrollable" windfall changes is unfair

-Profiting from "controllable" superior technology is fair

Example: higher prices for new iPhones is fair but higher prices for raincoats during bad weather is unfair

Two types of altruism

1. Pure altruism: Experiencing psychic benefits from others' prospering **even when not responsible for causing this prospering**

2. Impure or “warm glow” altruism: Experiencing psychic benefits from others’ prospering **but only when causing this prospering oneself**

Reciprocity

Reciprocity = tit-for-tat in repeated interaction

-Standard reciprocity: defect when others have defected, cooperate when others have cooperated

Why reciprocity matters?

Pure altruism versus fear of reciprocity (retaliation)?

Strong reciprocity

Strong reciprocity = reciprocity + willingness to punish behavior of others at expense of own payoff

- **Strategic reciprocity:** punishment has positive expected payoff
- **Altruism:** punishment does not have material payoff for punisher
 - But... non-punishers may also be punished for not punishing

Intentions

When responding to other people’s behavior, individuals are led by their beliefs about these other people’s intentions

-**Perception of unfairness** invokes stronger (reciprocal) response than actual inequality of outcomes

Evidence: minimum acceptable offer (MAO) in UG higher when playing against other people than when playing against computer

Two main models

1. Inequality aversion models

-“preference for fairness and resistance to incidental inequalities”

- Fehr & Schmidt (1999)

2. Reciprocity models

- Rabin (1993)

-People willing to sacrifice own material well-being to help others who are being kind

-People willing to sacrifice own material well-being to punish others who are being unkind

Fehr-Schmidt’s inequality-aversion model

- Neutral reference point by which the allocation of payoffs to different individuals is valued
 - Relative payoffs matter
- $U_i(x) = \text{own material payoff} - \text{how much more other persons get} - \text{how much less they get}$
 $U_i(x) = x_i - \alpha_i / (n-1) \sum \max(x_j - x_i, 0) - \beta_i / (n-1) \sum \max(x_i - x_j, 0)$
- α_i = individuals’ “envy” coefficient
 - Aversion to disadvantageous inequality
- β_i = individuals’ “guilt” coefficient
 - Aversion to advantageous inequality

For most people, alpha would be bigger

Rabin’s reciprocity model

- Game-theoretical approach: tit-for-tat in two player (PD) game
 - Kindness of player 1 (P1)**
 - Perceived kindness of player 2 (P2)**

- If someone is being nice to you, fairness dictates that you be nice to him. If somebody is being mean to you, fairness allows – and vindictiveness dictates – that you be mean to him

$$f_1(a_1, b_2) = \frac{\pi_2(b_2, a_1) - \pi_2^{fair}(b_2)}{\pi_2^{max}(b_2) - \pi_2^{min}(b_2)}$$

1. **P1's kindness towards P2:**

$$\tilde{f}_2(b_2, c_1) = \frac{\pi_1(c_1, b_2) - \pi_1^{fair}(c_2)}{\pi_1^{max}(c_1) - \pi_1^{min}(c_1)}$$

2. **P1's perception of P2's kindness:**

a1 = strategy of P1

b2 = P1's belief about P2's strategy

c1 = P1's belief about P2's belief about P1's strategy

Π = payoff (to player 1 or 2)

Player 1 has 3-component utility function:

$$U_1(a_1, b_2, c_1) = \pi_1(a_1, b_2) + \alpha \tilde{f}_2(b_2, c_1) + \alpha f_1(a_1, b_2)$$

1. $\pi_1(a_1, b_2)$ = **direct monetary payoff**
2. $f_2(b_2, c_1)$ = **utility of P1's perception of P2's kindness**
 - Converted into money utility (cf. component 1)
3. $f_2(b_2, c_1) f_1(a_1, b_2)$ = **utility of reciprocity**
 - Also converted into money utility
 - Both positive and negative reciprocity → not just altruism

Reference agent & social distance

"A wealthy man is one who earns 100 a year more than his wife's sister's husband"

You compare yourself towards the people close to you and the people around you, thus social distance matters

Conclusion on BE

Much accomplished, but two issues remain:

1. Profusion of (overly specific) models → over 1000 different biases exist
2. Policy implications do not follow automatically, but if the SEM has been used to argue specific policies, maybe the rationale of these policies needs to be checked

BE, freedom and policy nudging

- **Libertarian paternalism:** "the idea that it is both possible and legitimate for private and public institutions to affect behavior while also respecting freedom of choice, as well as the implementation of that idea"
- **Nudging:** using psychological biases to steer – not force – individuals into making decisions deemed in these individuals' best interests

Summary of L1 – What is behavioral economics?

- The Standard Economic Model (SEM)
- Generic issues when doing (social) science
 - Positive/descriptive vs. normative/prescriptive
 - Applicability and validity of theories & models
 - Different approaches to gathering evidence
 - In BE, experiments are particularly prominent

What is BE? How it developed in response to the SEM. People are careful and don't want to abandon the SEM, but make it better. Prediction is nice and fine, but it would be awesome to add explanation. First build up the Standard Economic Model that people have been building to make sense. Introduce deviations from the SEM where we have solid proof that it's violated and then BE.

Summary of L2 – Values, preferences and choice

- The Standard Economic Model (SEM) as starting point.
 - Systematic deviations & complementary concepts..
- Systematic deviations: Psychological effects / biases.
 - Not random
- Complementary concepts: Additional types of utility.
- Integration (speculative): Distinguishing types of utility helps make sense of biases.

Summary of L3 – Beliefs, heuristics and biases

- People are not Bayesian as in SEM → Bounded rationality
→ Heuristics → Biases
 - E.g., using rules of thumb → systematic errors
- Example: Representativeness heuristic → conjunction fallacy
- Two main categories of biases:
 1. Self-evaluation bias
 2. Projection bias

Summary of L4 – Mental accounting & Decision making under risk/uncertainty

- Systematic deviations from SEM / expected utility theory (EUT) → Prospect theory (PT)
 - Process model: Editing & Evaluation
 - Evaluation: Subjective valuation and subjective decision weighting.
- Mental accounting theory (MAT)
 - Framing and editing (as in prospect theory)
 - Budgeting and fungibility
 - Choice bracketing and dynamics

Summary of L5 – Discounting & Intertemporal choice

- SEM for intertemporal decision making = the discounted utility model (DUM)
- Systematic deviations
 - E.g., preference for improving sequences
- Alternatives to DUM
 - **Hyperbolic discounting**
 - Modifying the instantaneous utility function
 - E.g., habit formation

Summary of L6 – Social preferences & conclusion

- Beyond the “holy trinity” → Social or other-regarding preferences
 - Evidence from, e.g., dictator games
- Alternatives to the SEM
 - Modify utility function to include term(s) concerning material wellbeing of others
 - **Positive value: e.g., fairness or altruism**
 - **Negative value: e.g., spite, envy or jealousy**
- Future of BE
 - Key challenge: Profusion of models
 - “Grand unified theory”
- BE and policy: **Libertarian paternalism & nudging**

What you should be able to do

- Explain rationality in economics without uncertainty
- Explain rationality in economics with uncertainty
- Explain and apply domain of application and domain of validity on standard economics and behavioral economics
- Explain and apply instrumentalism and realism on standard economics and behavioral economics
- Explain the four common evaluation criteria for theories/models for standard economics and behavioral economics
- Explain the methods, quality of evidence, and types of inference on behavioral economics
- Explain the standard economic model assumptions on consumer preferences
- Explain the difference between attitudes, values, value and preferences
- Name and explain psychological effects
- Name and explain different types of utility
- Explain the differences between perfect rationality and bounded rationality
- Explain and calculate a Bayesian probability estimation
- Explain heuristics in a probability estimation
- Name and explain different biases
- Explain the expected utility theory, its assumptions, whether it works in real-world decision making and how to improve it
- Explain what the prospect theory is and how it works
- Explain the mental accounting theory and its components
- Explain the discounted utility model, its assumptions, alternatives, and be able to calculate it
- Name and explain anomalies
- Name and explain the social preferences and anomalies of the standard economic models
- Name and explain the inequality aversion models and reciprocity models, and be able to calculate them

Disclaimer

ESV Nijmegen makes an effort to keep the content of this summary up to date and where needed complements it. Despite these efforts it is still possible that the content is incomplete or incorrect. The offered material is a supplement for studying next to the appointed literature. The material is offered without any guarantee or claim for correctness.

All rights of intellectual property concerning these summaries are owned by the ESV. Copying, spreading or any other use of this material is not allowed without written permission by the ESV Nijmegen, except and only to the extent provided in regulations of mandatory law, unless indicated otherwise.

Tips and remarks about the summary can be send to secretaris@esvnijmegen.nl.

