

Though this is a satisfactory normative theory, it is by no means descriptive. This does not mean that peoples decisions are unreasonable. They may be procedurally or **cognitively** rational.

Von Neumann & Morgenstern (1944) developed Expected Utility Theory. It states that we should make our decisions based on the option with the highest expected utility (EU).

EUT is based on several assumptions. These include **dominance** (never choose the dominated option) **cancellation** (ignore outcomes that have the same probs and utilities under each outcome (e.g. safe shares and speculations)) **invariance** (decisions should not be affected by the way options are presented).

The Allais Paradox (threatens the cancellation principle). The **cancellation assumption** states that if one factor (e.g. mileage) is the same for both options (e.g. cars), that factor should be ignored (or cancelled). In the Allais paradox, people that choose Gamble 1 in the first situation should choose Gamble 1 in the second situation. Both situations offer identical alternatives except from you get £1000 for the third option in the first situation and you get £0 for the third option in the second situation. In reality, the addition of a third option leading to nothing causes people to make different choices.

The Ellsberg Paradox (1961) (also threatens the **cancellation** principle). Most people choose red to avoid the uncertain mix in Situation A. However, in situation B they should then choose red in Option 3 according to the cancellation principle. However, they are much more likely to bet on black or yellow with Option 4 (again, to avoid uncertainty).

Preference Reversals (Lichtenstein & Fischhoff) (threatens the **invariance** principle). Preferences sometimes change according to the presentation of a choice. The expected value in both of these gambles is £1.40, but one has a high chance of winning, the other has a small chance of winning a lot. 73% of subjects sold a ticket for the high-pay-off gamble for more than the high-probability gamble.

Framing Effects: Asian Disease Problem (Kahneman & Tversky, 1981) (Threatens the invariance principle) When told that 400 people will die instead of 200 will be saved, they will be less likely to choose that option. Around 75% of participants choose either option depending on the framing of the question.

McNeil et al. (1982) found that radiologists preferred scenarios framed in terms of survival would elicit more preferences than those framed in terms of mortality.

Other examples of the **framing effect** come from financial choices. For example, **Tversky et al. (1981)** found that 88% of people will pay for another ticket if they have lost a £10 note but will not pay for another ticket if they lost the original, which cost £10. This is arguably evidence of framing but also of a **mental accounting** in which money is allocated mentally to events.

Thaler (1980) found that people were more likely to pay by card if they were told they had to give up a cash discount than if they had to pay a credit card surcharge.

Expected Utility Theory The question of whether Benoulli solved the St. Petersburg Paradox or not is still hotly debated. In this theory, utilities are substituted for values.

Three Types of Theory

Basic Concepts: Judgement & Decision

Expected Value Theory (Benoulli) An early **normative** theory of risky choice. States that we must take the option with the highest expected value (EV). Utilities are equivalent to monetary value and uncertainties are expressed by objective probabilities.

In life, we must make decisions in order to interact effectively with our environment. When choosing how to behave, we must choose between options that vary in their **utility, desirability and subjective value.**

People want to maximise money, happiness, respect etc. The concept of **utility** refers to how useful an option is to bring people towards their own personal goals.

Many situations can not use normative theories. E.g chess.

Normative Theories These specify how people **ought** to make decisions based on reaching their goals (e.g. maximising monetary income). These are developed primarily by economists.

Prescriptive Theories These tell people how people can **improve** their decision making. These are primarily developed by those researching operational research and artificial intelligence.

Descriptive Theories These explain **why** people do what they do. The reality of decisions is that they are often suboptimal (i.e. they disagree with normative theories).

Normative Theory Preference Assumptions: If $A > B$, $B > C$ then $A > C$. If $A = B$ and $B = C$ then $A = C$. If $A = B$ and $C > 0$, $A + C > B$. This is known as the **transitivity assumption**.

Are their assumptions psychologically reasonable? The JND between $A+B$ and $B+C$ may be small so that the preferences seem this way. However, the JND's may sum between $A+C$ so that they become noticeable enough to change the choice.

Example 1 Option 1: Do nothing, Option 2: Play Roulette. The expected value of Option 1 is 0.0 and the expected value of Option 2 is $-.028$ (with single number roulette). Therefore take Option 1.

But we know that gambling can pay off and can also be fun (especially with smaller risks and smaller stakes). There is therefore an element of utility.

The St Petersburg Paradox (Benoulli, 1713) States that a game in which an unbiased coin is tossed until it lands on tails and pays £2 for every tail. Though the EV is infinite, people are not willing to pay large amounts to enter this game.

Benoulli's Cousin, Daniel argued that the desirability of money declines with the amount won (it is not constant). This is why the expected utility is not infinite. E.G. If someone gave you £20, how much would it take to make you twice as happy?

However, clearly the utility of money also decreases depending on how rich you are. Decisions are made based on **utility** rather than monetary value.