INTRODUCTION TO ECONOMICS FOR PSYCHOLOGISTS: HISTORY, CONCEPTS, AND PSYCHOLOGICAL FOUNDATIONS

PART 1

# From the Invisible Hand to the Marginalist Revolution: Utility and the Law of Supply and Demand

Niels Boissonnet

Université Paris Cité · Second-year Psychology · 2022/23

> *[He] is in this, as in many other cases, led by an* ***invisible hand*** *to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.*

— Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776), Book IV, ch. 2




**The cartoon says**

"Yeah, guys!!! We've managed to capture the invisible hand of the market!"




Émile Zola, *Au Bonheur des Dames* (*The Ladies' Paradise*, 1883): a novel set in one of the first Parisian department stores.

# Price adjustment: a first approach

What makes the **balance between supply (S) and demand (D)** possible?

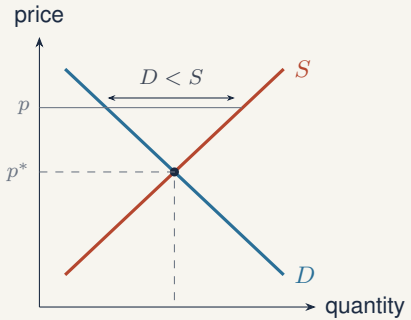
- If $D < S$: producers (e.g. firms) struggle to sell their goods $\Rightarrow$ they **lower the price** $\Rightarrow$ $D$ rises until it reaches $S$.
- If $D > S$: firms can afford to sell at a **higher price**, and $D$ falls.

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- If $D > S$: firms can afford to sell at a **higher price**, and $D$ falls.

But what is **demand** based on?



# Outline

1. The labour theory of value and its critics
2. The return of utility
3. The marginalists and the concept of utility
4. A little mathematics: the utility function
5. Diminishing marginal utility
6. Diminishing marginal utility, value and prices: a first intuition
7. Indifference curves, marginal rate of substitution and the Edgeworth box
8. Some important general remarks
9. Experimental economics and markets

**Goals of this part**

- Present the historical steps through which the **measurement of utility** and the **theory of supply and demand** were built together.
- Show, period by period, the **links with the history of psychology**.
- Master the **basic concepts of consumer theory**.

# 1

# The labour theory of value and its critics

Where do prices come from? Smith, Ricardo and Marx answer: from labour.

# How should we measure value?

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What is this concept? **Utility?**

## Labour as the measure of value

A. Smith, D. Ricardo and K. Marx distinguish:

**Use value vs. exchange value**

- **Use value**: what I can do with a good, i.e. its *utility*.
- **Exchange value**: the price at which the good is exchanged.

For these thinkers, exchange value is **not** determined by utility, but by the **quantity of labour** needed to produce the good (or at least, for Marx, it *should* be).

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**The water–diamond paradox**

- **Water** is very useful, yet it has no (exchange) value.
- A **diamond** is useless, yet it has great value.

# The drawbacks of the labour theory of value

**Anomalies**

Many goods do not seem reducible to the labour spent obtaining them:

- works of art;
- celebrities.

**Picasso**

“What? 5,000 dollars?! How can you ask that much, when it took you only one second to make this drawing?!”
“No, madam. It took me my whole life.”

**Practical problems**

It is very hard to know *what* should be measured.

- What measures the quantity of labour embodied in a good? Working time?
- Should we count the time it took to **train** the worker? (cf. Marx)

# 2

# The return of utility

Two forerunners: a moral philosophy that counts pleasures, and a new psychology that measures sensations.

# Two forerunners

**1. In moral philosophy**

**Utilitarianism**

**2. In psychology**

**Psychophysics**

# Utilitarianism and the measurement of pleasures

**Utilitarianism (J. Bentham)**

A theory of the **moral value of actions**, not a theory of the value of goods: **an act is moral if it maximises the sum of the pleasures of all individuals in society**.

**Key elements**

- "All human actions are guided by the pursuit of pleasure and the avoidance of pain."
- "Individuals generally always seek to have more rather than less" (J.S. Mill's **law of psychology**).
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- **No a priori hierarchy of pleasures**: what matters is that the action maximises the sum of pleasures.
  - J.S. Mill concedes that, for the same amount of pleasure, reading Shakespeare may be worth more than eating a sweet!

## Psychophysics

Founded by **G. Fechner** (1860). Its goal: to **measure sensations** (see also **W. Wundt**, founder of experimental psychology, and **H. von Helmholtz**).

**Fechner's unit of measurement**

The **just noticeable difference** between two sensations.

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The **just noticeable difference** between two sensations.

**Fechner's law**: sensation grows ever more slowly as the stimulus grows (logarithmically: $S = k \log I$).



# 3

# The marginalists and the concept of utility

1871–1874: Jevons, Menger and Walras put utility, and subjectivity, at the heart of value.

## The marginalist revolution

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**Labour theory of value**

Value is **objective**: it is set by the labour embodied in the good.

**Marginalists**

Value is **not objective**: it results from the confrontation, on a market, of many **subjectivities**, which yields a price that equalises supply and demand.

# The concept of utility

All three authors appeal to the notion of **utility**, but they understand it differently.

**Jevons (English)**

Strongly influenced by Bentham: **utility = pleasure**. No moral feelings, no aesthetic values.

**Menger (Austrian)**

Sees utility from a more **physiological** point of view (hence independent of the will).

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Common idea: **diminishing marginal utility**!

# 4

# A little mathematics: the utility function

What a utility function is, and three first examples.

# The concept

Today, depending on the context, the utility function is meant to capture:

- some kind of **desirability**;
- **pleasure**;
- the **value of an object** in the narrow sense;
- value in the **broad sense** (aesthetic, moral, . . . ).

**Mathematically**

Take a set of objects $X$. A **utility function** is a function

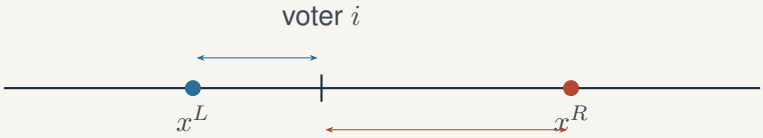
$$u : X \to \mathbb{R}$$

that assigns a value to each object.

In terms of behaviour, the agent is assumed to **maximise $u$ subject to a budget constraint**.

## Example 1: voters with a quadratic utility function

Suppose there are two candidates in an election, $x^L$ (left) and $x^R$ (right).




The voter votes for the candidate whose views are **closest to her own**, $i$, i.e. her utility is

$$u(x) = -(x - i)^2.$$

**Decision rule**

she votes for $x^L \iff -(x^R - i)^2 < -(x^L - i)^2$

# Example 2: a consumer with a Cobb–Douglas utility function

There are two goods ($i = 1, 2$) with prices $p_1$ and $p_2$. The consumer earns a wage $w$ and chooses the quantities $(x_1, x_2)$ of goods 1 and 2 so as to

**maximise**

$$u(x_1, x_2) = x_1^{1/3} x_2^{2/3}$$

**subject to the budget constraint**

$$(x_1, x_2) \in \{(x_1, x_2) : p_1 x_1 + p_2 x_2 \leq w\}$$

We will solve this problem later.

# Concave utility

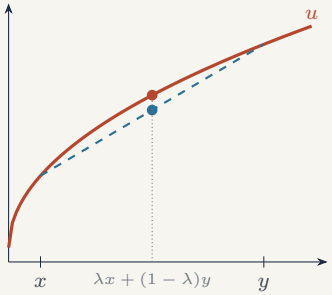
**Definition**

$u$ is **concave** if

- for all $\lambda \in [0,1]$:
  $u(\lambda x + (1-\lambda)y) \geq \lambda u(x) + (1-\lambda)u(y)$;
- equivalently (if $u$ is twice differentiable):
  $u''(x) \leq 0$ for all $x$.

A concave utility function can capture:

- **diminishing marginal utility**: the more you have of a good, the less you want more of it;
- **risk aversion**: we will see this later.




The curve lies above the chord.

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# Diminishing marginal utility

The marginalists' basic psychological hypothesis: each extra unit brings less satisfaction.

# Marginal utility

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It describes how my utility changes if, for example, I have a bundle $(x_1, x_2)$ and add a tiny crumb of good 1:

$$\frac{\partial u}{\partial x_1}(x_1, x_2) = \lim_{h \to 0} \frac{u(x_1 + h, x_2) - u(x_1, x_2)}{h}$$

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or how it changes if I add a tiny crumb of good 2:

$$\frac{\partial u}{\partial x_2}(x_1, x_2) = \lim_{h \to 0} \frac{u(x_1, x_2 + h) - u(x_1, x_2)}{h}$$

# Diminishing marginal utility

**The marginalists' fundamental psychological hypothesis**

The marginal utility of consumption **decreases**: the more I consume of a good, the less extra satisfaction consuming more of it brings me.

- The first donut gives me $+4$ of pleasure, the second $+2$, the third $+1$, etc.
- $\frac{\partial^2 u}{\partial x_1^2}(x_1, x_2) < 0$
- $u$ is **concave** in $x_1$.

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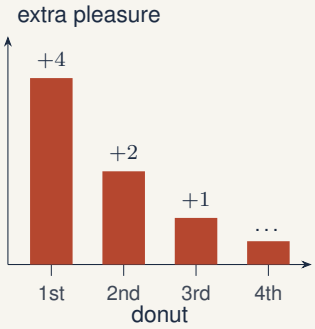
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**A link with Fechner's curve?**

- **Yes** for Edgeworth, heir of the marginalists.
- A **debate**: Max Weber argues it has nothing to do with it; Brentano holds that it does.



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# Diminishing marginal utility, value and prices: a first intuition

How diminishing marginal utility explains value, trade and equilibrium.

# Value and diminishing marginal utility

**Solving the water–diamond paradox**

- **Diamonds** are expensive because, as we have few (or none), one more brings a lot of utility.
- **Water** is cheap because, as we have a lot, one more brings little utility.

# Value and diminishing marginal utility

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**Remark: the sociological side is left out**

- Owning diamonds is a **social marker** that sets one apart.
- Veblen's notion of **conspicuous goods**.

# Value and price determination

**First intuition:** why are value and marginal utility linked?

**Imagine that**

1. Homer has 200 beers and Marge has 150 donuts;
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So Homer and Marge both gain from **trading a little beer for a piece of donut**.

## Will they keep on trading?

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- The same holds, the other way round, for Marge.

## Value and marginal utility: equilibrium

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**And value?** It is given by the amount of beer one must give up for a little more donut, **at the equilibrium**. In other words: $x$ **beers are worth 1 donut**.

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# Indifference curves, marginal rate of substitution and the Edgeworth box

Drawing preferences: the geometry of consumer choice and exchange.

## The indifference curve

Suppose we have

- two goods $i = 1, 2$ (e.g. beer and donuts);
- $x_1$ = quantity of good 1, $x_2$ = quantity of good 2: $(x_1, x_2)$ is a **bundle of goods**;
- a utility $u(x_1, x_2)$ over these two goods.

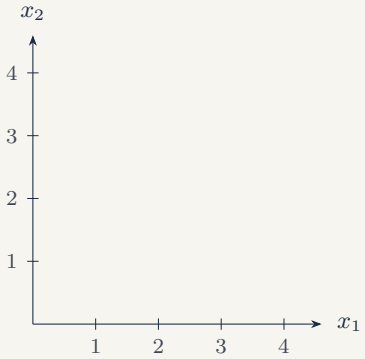
**Definition**

For a given utility level $\hat{U}$, the **indifference curve** of $u$ at $\hat{U}$ is

$$IC(u, \hat{U}) = \{(x_1, x_2) : u(x_1, x_2) = \hat{U}\}.$$

**Example**

Homer has $u(1, 2) = 2 = u(2, 1)$ and $u(2, 2) = 3$. So $(1, 2)$ and $(2, 1)$ both belong to $IC(u, 2)$, while $(2, 2)$ belongs to $IC(u, 3)$.



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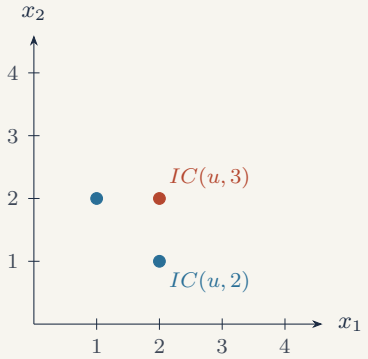
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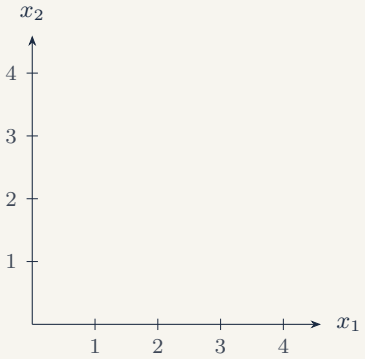
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# Exercise: drawing indifference curves (1)

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Draw $IC(u, 2)$ and $IC(u, 3)$.

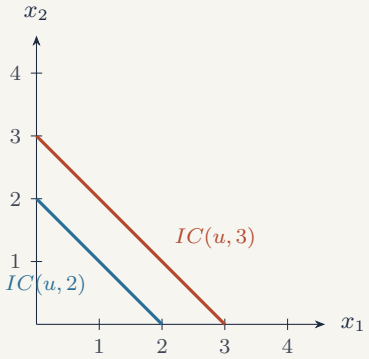


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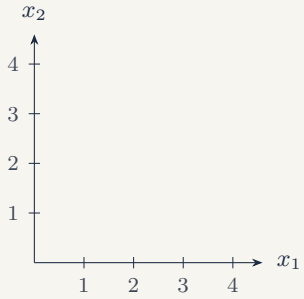
$IC(u, 2)$: $x_2 = 2 - x_1$; $IC(u, 3)$: $x_2 = 3 - x_1$.



# Exercise: drawing indifference curves (2)

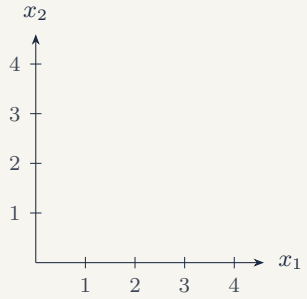
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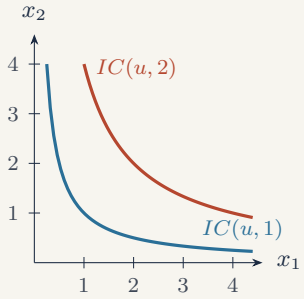
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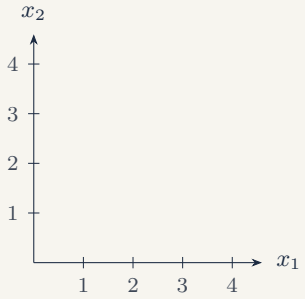
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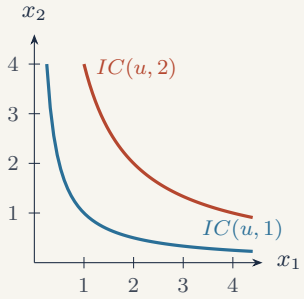
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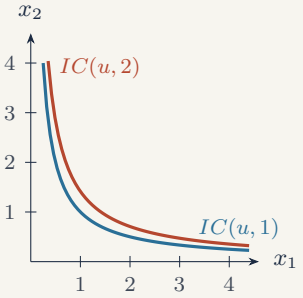
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# Properties of indifference curves, depending on $u$

**Continuity**

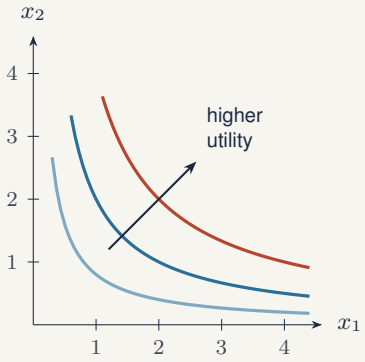
If $u$ is continuous, then all its indifference curves are continuous.

**Monotonicity**

Take a bundle $(x_1, x_2)$ and $\varepsilon > 0$. If $u$ is increasing, the curve $IC(u, u(x_1, x_2))$ lies **below** the curves $IC(u, u(x_1 + \varepsilon, x_2))$ and $IC(u, u(x_1, x_2 + \varepsilon))$.

**Concavity**

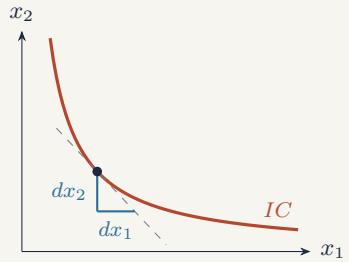
If $u$ is concave, then all its indifference curves are **convex**.



# The marginal rate of substitution

**Definition**

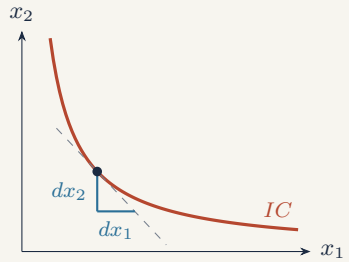
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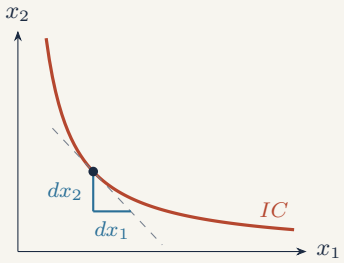

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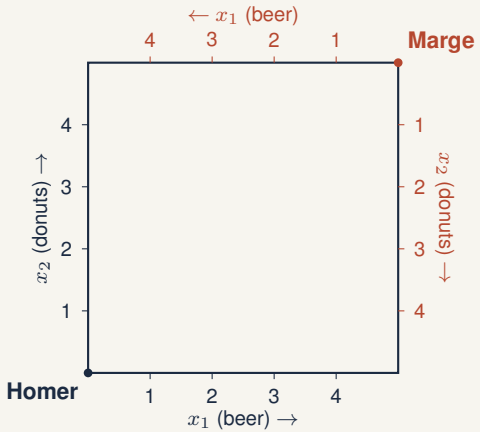



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$$MRS = -\frac{dx_2}{dx_1} = \frac{\partial u/\partial x_1}{\partial u/\partial x_2}.$$

Yet the MRS is the **same for every utility function** that represents the same (ordinal) preferences.

# The Edgeworth box




**How to read it**

Each point of the box is a way of **sharing out** the total quantities of the two goods: Homer's quantities are read from the bottom-left corner, Marge's from the top-right corner.

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# Some important general remarks

The implicit assumptions behind the theory, and what kind of explanation it offers.

# Implicit assumptions: perfect competition

**Atomicity of the market**

A great multitude of agents: no single agent can influence supply or demand (agents are **price takers**).

**Free movement of the factors of production**

Labour and capital can move to wherever they are best paid. Workers are drawn to where the demand for labour exceeds its supply.

**Fluidity of the market**

Free entry and exit: any agent can enter or leave the market without conditions or barriers.

**Transparency of information**

Every agent knows everything that happens on her market; information (notably on prices anywhere in the market) is free and immediate. **No information asymmetry**.

# General equilibrium and partial equilibrium

**General equilibrium**

The equilibrium of supply and demand on **all markets** at once.

- Takes the **interaction between markets** seriously, but is abstract: we speak of *pure economics*.
- First studied by **Walras** (hence "Walrasian equilibrium").

**Partial equilibrium**

A balance between supply and demand on **one restricted market**, e.g. the energy market.

- **Pro:** easier to study with data; it is pragmatic.
- **Con:** markets may interact, e.g. energy prices also depend on the state of the car market.
- The perspective adopted by **Menger and Jevons**.

# Methodological individualism

Some say that economics mainly adopts **methodological individualism** (true?). The concept comes from the economist **Schumpeter**, but also from von Mises, Hayek and (Max) Weber.

**Ontological version**

Only individuals exist, not collective entities such as social classes (which aggregate individuals).

**Epistemological version**

Only individuals can be observed: every explanation rests exclusively on individual behaviour.

It is opposed to **holism**, which accepts explanations based on collective entities.

# Two remarks on general equilibrium

1. **How do prices adjust?** Walras uses the metaphor of an **auctioneer** who proceeds by **tâtonnement** (“groping”), calling out prices until equilibrium is reached.
   - A weakness of the theory, and an element of **holism**.

# Two remarks on general equilibrium

1. **How do prices adjust?** Walras uses the metaphor of an **auctioneer** who proceeds by **tâtonnement** (“groping”), calling out prices until equilibrium is reached.
   - A weakness of the theory, and an element of **holism**.
2. General equilibrium is **not necessarily laissez-faire** (Walras and the administered economy).

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# Experimental economics and markets

Can we test these theories? Markets and bubbles in the laboratory.

## Experimental economics

So far we have mostly discussed theories and speculation. But how can we **test** these theories?

For a long time, this was judged **impossible**:

> *"Economics... cannot perform the controlled experiments of chemists or biologists because [it] cannot easily control other important factors. Like astronomers or meteorologists, [it] generally must be content largely to observe."*
>
> — Samuelson and Nordhaus, *Economics*

## The great shift

From the **1970s** on, the discipline changes deeply:

- a new **macroeconomics** that wants to be *microfounded*, i.e. built from individual behaviour;
- **general equilibrium is called into question** (information asymmetries);
- the development of **statistics and computing**;
- the development of **experimental methods**.

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All this brings economics **closer to psychology again**, all the more as psychology is changing too (cognitive science, computing).

# Experimental economics: markets in the lab

What happens when lab subjects are asked to reproduce **market mechanisms**? **Vernon Smith**, founder of the experimental approach, tries to answer this question, and to study the formation of **financial bubbles**.

**The market**

Subjects are randomly assigned to be buyers or sellers of one and the same good.

- Each seller has a single unit of the good; each buyer wants to buy a single unit.
- Each seller (buyer) is randomly given a **reservation value** $s$ (resp. $b$): at price $p$, the seller earns $p - s$ and the buyer $b - p$.

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**Result:** a clear, real and fast **convergence to the theoretical equilibrium price**.

**How do we define a bubble?**

- An asset has a **fundamental value**, around which its return on investment varies randomly.

**Example**

The fundamental value of a L'Oréal share is €100: its return may be €105 on Monday, then €110 on Tuesday, etc. On average over a month it will be very close to €100.

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- **Bubble**: agents buy the share at a price **above its fundamental value**, i.e. above what they can expect to get from it.

# Market experiments, general equilibrium and bubbles

## The experiment

- 15 or 30 periods (depending on the treatment).
- An asset pays a **randomly determined dividend** at the end of each period.
- Subjects receive money, with which they may buy the asset, at a price that rises with the demand for it.
- All participants know this, as well as the asset's average dividend (hence its **fundamental value**).

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## Results

- **Bubbles and crashes** form: subjects buy above the fundamental value, then everybody sells and the price collapses.
- Subjects **do not anticipate the crash**.

# Take-aways

- **Labour theory of value** (Smith, Ricardo, Marx): prices reflect the labour embodied in goods. It stumbles on the water–diamond paradox, art and celebrities.
- **Utility returns** through utilitarianism (Bentham, Mill) and psychophysics (Fechner).
- **Marginalist revolution** (Jevons, Menger, Walras, 1871–74): value is subjective; common idea: **diminishing marginal utility**.
- Diminishing marginal utility explains the paradox, gains from trade and the **equilibrium** price.
- **Tools**: utility function, marginal utility, indifference curves, MRS $=$ ratio of marginal utilities, Edgeworth box.
- **Behind the theory**: perfect competition, general vs. partial equilibrium, methodological individualism.
- **In the lab** (Vernon Smith): markets converge fast to equilibrium, yet asset markets produce **bubbles and crashes**, the bridge back to psychology.