



KRAKOW
UNIVERSITY
OF ECONOMICS



BIAS IN DECISION MAKING IN UNCERTAINTY

BIAS, BEHAVIOURAL ECONOMICS AND FINANCE

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Example of a survey

Question: How are you today?

- (A) Excellent
- (B) Very Good
- (C) Good
- (D) Not so Good

How do you see yourself?

Question: What describes you best?

- (A) Impulsive, biased, judging, and jumping to conclusions
- (B) both A and C
- (C) Logical, structured, open-minded, and conscious

Abstract

In this paper we present behavioural biases and introduce behavioural finance. We show how our brain is programmed to use mental short-cuts to observe the world, make sense of it and decide. When we have to decide fast, we will inevitably use these short-cuts and our decisions will not be “rational”. We have of course the ability to take a step back, consider the big picture and reflect on what the most logical or rational decision would be.

We present the reader with some biases and show how their effect on our thinking can be understood. We argue that it is not possible to become “unbiased”, but that it is possible to understand bias and use frameworks to bring decisions to the conscious reasoning process and improve decision making.

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1 Introduction

Behavioural economics in general and behavioural finance in particular studies the effects of psychological, social, cognitive, and emotional factors on the economic decisions of individuals and institutions and the consequences for market prices, returns, and resource allocation.

Behavioural economics is primarily concerned with the bounds of rationality of economic agents. Behavioural models typically integrate insights from psychology, neuroscience, and microeconomic theory.

The study of behavioural economics includes how market decisions are made and the mechanisms that drive public choice.

In 2017, economist Richard Thaler was awarded the Nobel Memorial Prize in Economic Sciences for his contributions to behavioural economics and his

pioneering work in establishing that people are predictably irrational in ways that defy economic theory.

Generally one considers three main themes in behavioural finances:

- **Heuristics:** humans make 95% of their decisions using mental shortcuts or rules of thumb.
- **Framing:** The collection of anecdotes and stereotypes that make up the mental emotional filters individuals rely on to understand and respond to events.
- **Market inefficiencies:** These include mis-pricings and non-rational decision making.

In this short presentation we will provide context and elaborate on those main themes.

2 Behavioural Finance (BF)

2.1 Market Efficiency and Limits to Arbitrage

Efficient Markets

- **Rational Approach:** people make decisions
 - according to Expected Utility (EUT) or at least Subjective Expected Utility Savage, [1954](#)
 - and apply correctly Bayes Law
- **Friedman, 1953:** rational traders (arbitrageurs) will fast eliminate non-inefficiencies created by irrational traders (noise traders)
- **Efficient Market Hypothesis (EMH)** Fama, [1965](#) and Fama, [1970](#)

Note

The EMH together with EUT is an elegant, appealing, compelling and rational framework

Market Efficiency

- **Behavioural Finance (BF)**, is the stance where some financial phenomena can be better understood, assuming that some agents are **not** (fully) rational
- **Examples** of behavioural models:
 - (A) Adam Smith's Theory of Moral Sentiments Smith, [1759](#)
 - (B) Keynes's beauty contest Keynes, [1936](#)
 - (C) Prospect Theory Kahneman and Tversky, [1979](#)
 - (D) Behavioural Portfolio Theory Shefrin and Statman, [2000](#)

Long Term Capital Management (LTCM)

Example 1: Exploiting Inefficiencies can be Risky

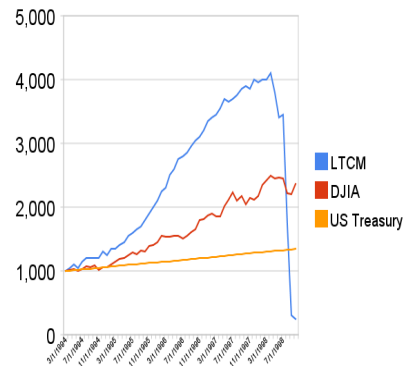
- LTCM was a well known Hedge Fund with 3 well known partners with excellent reputation:
 - John Meriwether (Salomon Brothers)
 - Myron Scholes (Nobel Laureate)
 - Robert Merton (Nobel Laureate)
- consistent and very good performance between 1994 and 1997
- more than USD 7 Bln. assets by 12/97
- banks eager to lend to LTCM



LTCM in 1998

- NAV: -82%
- 9/98: Federal Reserve Bank of NY organises rescue plan with 14 banks and brokers
- They raise \$3.6 bln. in exchange for 90% of LTCM's equity

... How was this possible?



LTCM made rational bets

The Pairs Trades

- Royal Dutch Petroleum (RDP) and Shell Transport & Trading (STT)
Both owned by Royal Dutch Shell
 - a DLC (Dual Listed Company)
 - 1998: a corporate charter linked the two companies by dividing the joint cash flows between them on a 60/40 basis
 - both shares quoted on the NYSE and the LSE
 - \implies Rational expectation: market cap of RDP = $1.5 \times$ market cap of STT
 - LTCM noticed that STT traded at a 8% discount
 - \implies pairs-trade: Long in STT and short in RDP
- but, the spread continued to widen ...
- and LTCM had to close its position at a spread of 22%
- of course there were also the swaps, equity volatility, emerging markets (Russia), etc. ...

Conclusion for Limits to Arbitrage

- Exploiting non-rational pricing can be
 - Risky
 - Costly
- \implies non-rationalities **may** persist longer than the rational trader can stay liquid.

- \implies markets can during certain periods deviate from what we would expect via the EMH framework
- \implies riding the trend can be the rational thing to do ...
- and ... who knows the real price anyhow?

Further Evidence of Non-Rationalities in Financial Markets

- The **Tulipomania** – Amsterdam, 1637 – Mackay, [1841](#)
- The **South-Sea Bubble** – LSE, 1720 – [ibid.](#)
- **Twin Shares** – e.g. Froot and Dabora, [1999](#): STT and RDS
- **Index Inclusions** – e.g. Harris and Gurel, [1986](#) and Shleifer, [1986](#)
- **Internet Carve-Outs** – e.g. 3Com and Palm (March 2000) – Lamont and Thaler, [2003](#)



Did we learn something?

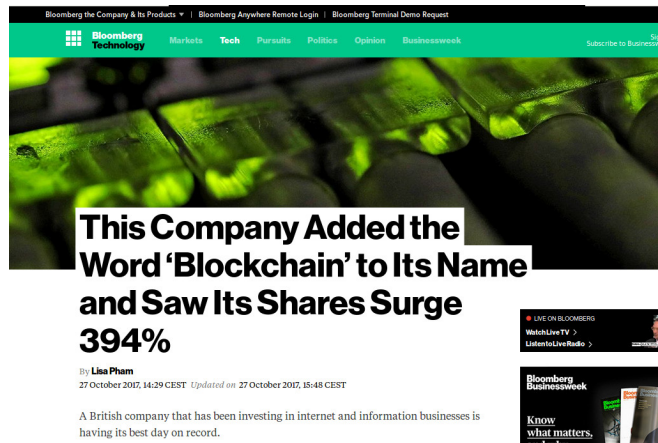


Figure 1: The reaction of the market to the name change of the company On-Line Plc. Source: <https://www.bloomberg.com/news/articles/2017-10-27/what-s-in-a-name-u-k-stock-surges-394-on-blockchain-rebrand>.

Did we learn something?

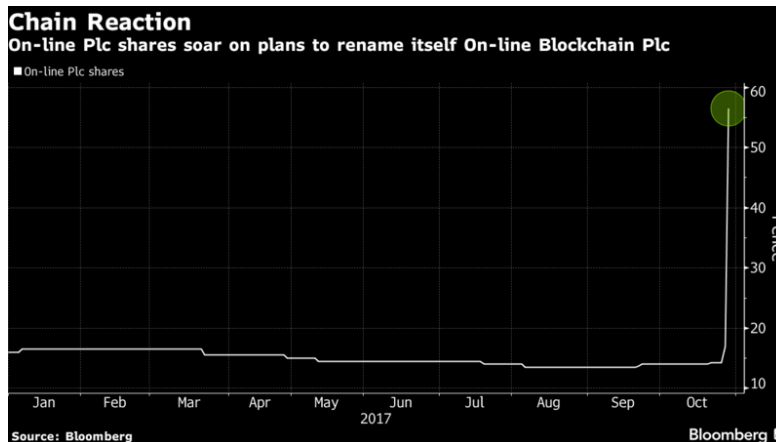


Figure 2: chart supplied by Bloomberg. Source: <https://www.bloomberg.com/news/articles/2017-10-27/what-s-in-a-name-u-k-stock-surges-394-on-blockchain-rebrand>.

ONL today

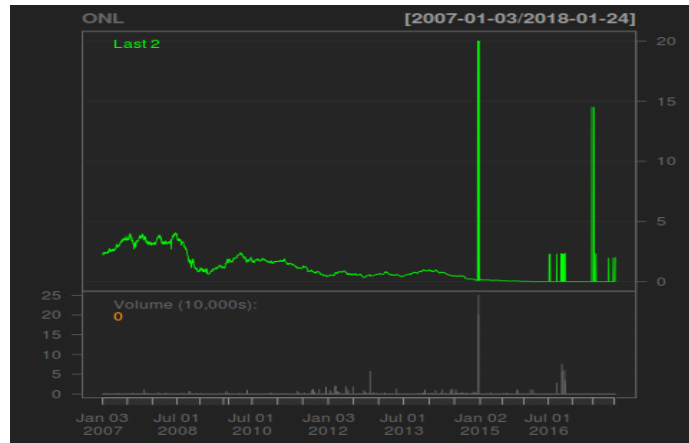


Figure 3: in R: `library(quantmod);loadSymbols('ONL',src='yahoo');lineChart(ONL)`

2.2 Conclusion

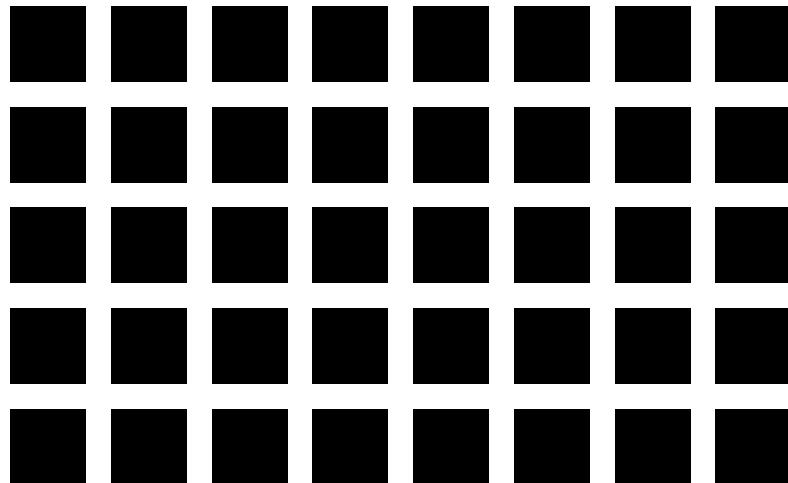


Figure 4: Gray dots appear at the intersection of the black squares (and if you focus on it, then it disappears, but others become visible).

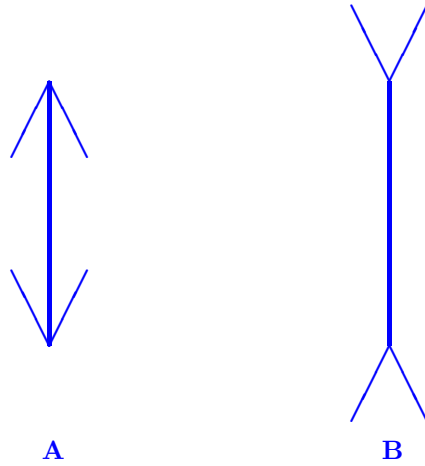


Figure 5: Which vertical line is longer? (only taking into account the vertical lines, not the arrows)

Summary Behavioural Finance/Economics

	Traditional	Behavioural Finance
Investors	rational	cognitive biases
Markets	efficient	not always efficient
Return	driven by risk	driven by risk, greed and fear

Table 1: Behavioural Finance in a nutshell

2.2.1 Examples from Investment Practice

Some Examples

- **buy more after market decline** (“to reduce average purchase price”) ← loss aversion, overconfidence
- a **portfolio of loser stocks** ← loss aversion, overconfidence, affect heuristic
- **home bias** ← label effect, prefer the known ⇒ suboptimal diversification
- ... or home bias for the location of the private banker
- **exclusive products** for exclusive clients ← labelling ⇒ products that are generally less diversified with higher (fixed) costs and the same MtM
- **bespoke products** ← labelling, overconfidence ⇒ products that are less diversified with higher (fixed) costs and the same MtM

- **complicated products** ← labelling, overconfidence, (sometimes) loss aversion ⇒ investments with high costs, and proven mathematical inefficiency (e.g. Bernard, Maj, and Vanduffel, 2010 show that path dependency is not efficient)
- arguments such as “**most people choose option A**” ← works because of herding effect
- **bubbles** ← herd behaviour, greed, overconfidence, etc.
- **crashes** ← herd behaviour, fear, etc.

The Emotional Investment Life Cycle



Figure 6: The effect of all those biases from rational behaviour on our investment life cycle.

The Life Cycle of a Bubble

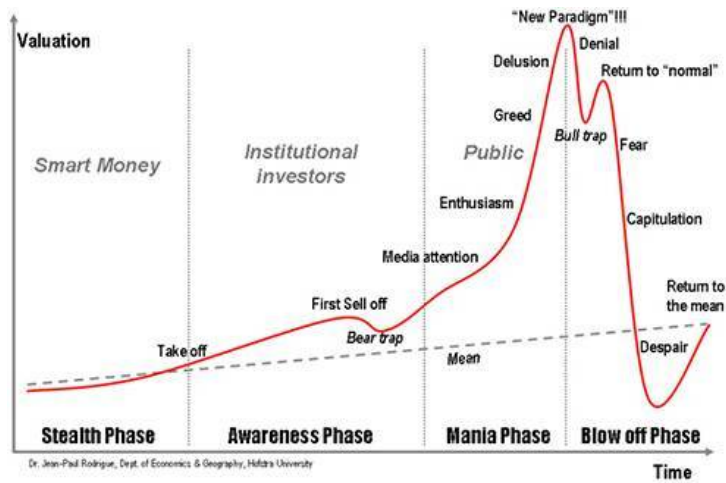


Figure 7: The life cycle of a bubble in financial markets.

Bitcoin: where are we today?



Figure 8: In what phase is Bitcoin? Source: <https://www.coindesk.com/price/>

The Truth

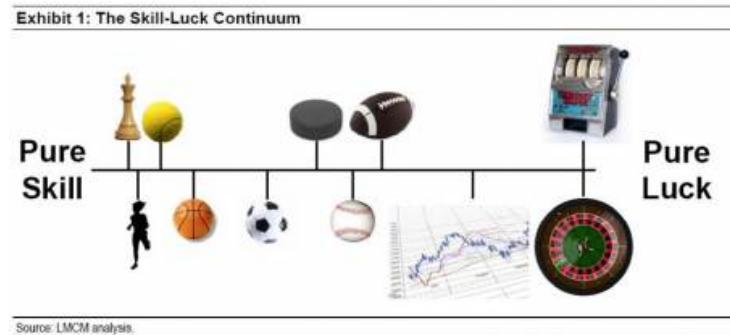


Figure 9: The truth about forecasting power in financial markets.

3 Selected Behavioural Biases

3.1 What is Bias and How Can we Use it?

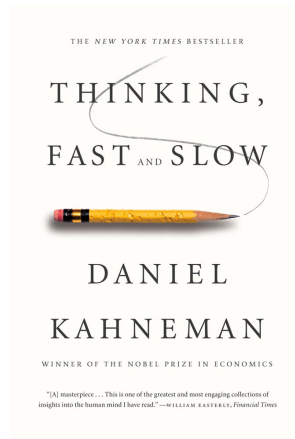
Warm-up: Math first

Question: what is the next number in the following series:
1, 3, 5, 7, ...

The most complete answer is ...

- (A) 9
- (B) 11
- (C) 217,341
- (D) A and B
- (E) A, B, and C

Bias is Rooted in Heuristics for Fast Decisions



Two systems of thinking

(A) System 1:

- automatic
- quick
- no sense of voluntary control
- huge processing capacity (11 000 000 bits per second)

(B) System 2:

- requires effort and concentration
- slow
- conscious
- limited capacity (40 bits per second)

When we think about “us”, we think of System 2, but from others we see more of System 1 (e.g. System 1 is only 7%)

What is Bias Anyhow?



Question:

How much cost the ball?

- (A) 0.0\$
- (B) 25.5\$
- (C) 50.0\$
- (D) 75.5\$

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3.2 Overconfidence

Are you a bad driver?

Overconfidence

Question: Suppose that we (with the group in which we are now) would do a driving test and rank all drivers from the best to the worst. Then we split the group in half: group 1: 50% relatively best drivers and group 2: 50% relatively worst drivers. In which group would you end up?

- (A) group 1: 50% relatively best drivers
- (B) group 2: 50% relatively worst drivers

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Question: The Amazon river is a river in South America. Provide a confidence interval so that you're 90% sure that the real length is in it. (use *km* or *mi*)

Overconfidence

- When people give a 98% confidence interval, it contains only in 60% of the cases the true value – Alpert and Raiffa, [1982](#)
- When they say to be “certain”, then they are about 80% certain – Fischhoff, Slovic, and Lichtenstein, [1977](#)
- Related to:
 - hindsight bias
 - self attribution bias
 - optimism and wishful thinking: 90% of people believe to be over average in many common skills – Weinstein, [1980](#); and they generally are too optimistic in meeting deadlines – Buehler, Griffin, and Moss, [1994](#)

Overconfidence Examples

Discussion – Overconfidence

Here are some examples of the overconfidence bias:

- Someone tells you “I’m sure.”
- An investor tells you “it’s different this time.”
- 90% of startups fail ... but you will start a new company.

Add some examples yourself.



Figure 10: In 2011, Aaron Barr, CEO of HBGary Federal, bragged that he could exploit social media to gather information about anonymous. Photo: pixabay.com

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3.3 Framing

Question on next slide

Two Gambles

Suppose that you are participating in a game that consists out to two gambles. Choose an option in gamble 1 and 2

Gamble 1

- (A) a sure gain of € 2,400
- (B) 25% chance to win € 10,000 and 75% chance to win nothing

Gamble 2

- (A) a sure loss of € 7,500
- (B) 75% chance to loose € 10,000 and 25% chance to loose nothing

Voting

Question:

Gamble 1 and 2

- (A) **1A** and **2A** (sure gain of € 2'400 and sure loss of € 7'500)
- (B) **1A** and **2B** (sure gain of € 2'400 and 75% chance to lose € 10'000 and 25% chance to lose nothing)
- (C) **1B** and **2A** (25% chance to win € 10'000 and 75% chance to win nothing and sure loss of € 7'500)
- (D) **1B** and **2B** (25% chance to win € 10'000 and 75% chance to win nothing and 75% chance to lose € 10'000 and 25% chance to lose nothing)

Framing

Below are the observed probabilities for the question “Suppose that you are participating in a game that consists out to two gambles: A and B, so choose an option in question A and B”.

1 Choose an option.

- (A) a sure gain of € 2'400 [84%]
- (B) 25% chance to win € 10'000 and 75% chance to win nothing [16%]

2 Choose an option.

- (A) a sure loss of € 7'500 [13%]
- (B) 75% chance to lose € 10'000 and 25% chance to lose nothing [87%]

→ risk aversion when profits are involved and loss aversion when losses are involved

the results:

- A. $(1A + 2A) = 100\%$ sure € 5'100 loss
- B. $(1A + 2B) = 75\%$ chance to lose € 7'600 and 25% to win € 2'400
- C. $(1B + 2A) = 25\%$ chance to win € 2'500 and 75% chance to lose € 7'500
- D. $(1B + 2B) = 37.50\%$ chance on zero, 6.25% chance to win € 10'000, 56.25% chance to lose 10'000

→ In order to solve a problem, people break it down to small units and solve each of them overlooking correlations and interconnections – Tversky and Kahneman, 1981

Framing is a strong heuristic and leads to different other biases

- mental accounting
- consider gains and losses in stead of total wealth (consider each gamble separate)
- (and as a consequence) **loss aversion** (in stead of volatility aversion)
- labelling
- sunk cost fallacy
- loss aversion
- anchoring

Framing



Discussion – Framing

Here are some examples of framing:

- Sunk costs.
- Replace a fixed premium/bonus of \$1000 with a variable one (even if the expected average is equal or higher).
- Loss aversion (not seeing the bigger frame: total wealth).

Give an example about framing from your experience

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Figure 11: The pyramids are in the middle of the desert, isn't it? Pictures pixabay.com and twitter.com.

3.4 Beliefs

3.4.1 Forming Beliefs

Question: Linda is thirty-one years, single, outspoken and very bright. She majored in Philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti nuclear demonstrations.”

What is most probable:

- (A) Linda is a bank teller
- (B) Linda is a bank teller and is active in the feminist movement

Representativeness

- People tend to confuse “sounds like” with “is proof for”. Generally people act here in contradiction with Bayes’ law.
- Related to:
 - sample size neglect
 - hot-hand fallacy – Gilovich, Vallone, and Tversky, [1985](#)
 - the Law of Small Numbers – Rabin, [2002](#)
 - gamblers’ fallacy

3.4.2 Changing Beliefs

Belief Perseverance

- Once people have formed their opinion, they stick to it too tightly and too long – Lord, Ross, and Lepper, [1979](#)
- Two effects:
 - (A) people do not search for disconfirming evidence
 - (B) if they find it anyhow, they treat it with excessive scepticism (i.e. they underreact to it)
- Related to:
 - Confirmation bias: people misinterpret disconfirming evidence as if it would support their beliefs
 - overconfidence
 - self-serving bias

Your and Your Parent's Worldview

Question: Compare your religious beliefs or the lack thereof with your parents.

- (A) I am less religious (same religion) or have no religion
- (B) I have the same religion, similar level
- (C) I am more religious (same religion)
- (D) I have a different religion

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Confirmation Bias / Conservatism Bias / Information Bias

Discussion – Confirmation Bias

People tend to listen only to news that corroborates their beliefs or preconceptions. Examples:

- Political and religious views.
- Flat Earthers.
- Information Bias: If you are convinced of something, then you will search for confirming information.
- Conservatism Bias: slow to accept new evidence that does not corroborate one's preconceptions.
- Ostrich Effect: Ignoring disconfirming evidence.
- Outcome Bias: judging a decision based on its outcome.
- Attribution bias: my investments performed well so I'm a good investor; last month it was not good because the Fed raised the interest rates.
- Placebo Effect: e.g. in medicine

Can you find other examples of the belief and preconception related biases?

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3.5 Choice Supportive Bias

Choice Supportive Bias

Discussion – Choice Supportive Bias

People tend to support a choice once made or an opinion once formed and overlook its weaknesses.

Examples:

- My child, beautiful child.
- My dog is the best, even if it bites from time to time
- I have chosen for SAS/IBM/xxx, it is *my* project, I support it

Can you find other examples of the Choice Supportive Bias?

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3.6 Selective Perception

Discussion - Selective Perception

Discussion – Selective Perception

Our expectations and point of view influence what we see.

- Football players see more mistakes of the other team when the movie is played.
- We judge ourselves on our intentions and others on the outcome of their intent.

Can you find other examples of the selective perception bias?

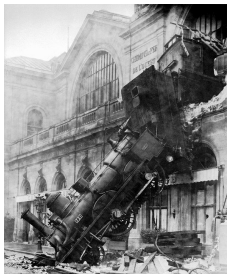


Figure 12: Train accident in Gare de l'Ouest (22/10/1895) – source: pixabay.com.

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3.7 Heuristics

Question: Assume that you're hungry and find two restaurants that only differ in name and in the number of guests: one is empty and the other is half full.

Which restaurant would you choose?

- (A) the empty restaurant
- (B) the half full restaurant

Herding Behaviour

- How hard is it to be the first to stand up and applaud after an opera that you particularly liked, or to remain seated when all are standing?

Herding

Humans feel safe in bigger crowds. We tend to see it as the natural choice to follow the herd.

Availability Bias

Question:

Who kills most people per year?

(A) dogs

(B) crocodiles, sharks, tsetse fly (carries malaria virus), and hippopotamus combined

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see: Tversky and Kahneman, [1973](#)

Availability Bias – II

Question:

Were there more man or more women in the picture? (not counting Harambe, the gorilla)

(A) more women

(B) more men

3.7.1 Anchoring

Anchoring

Question: Paul is told by the car dealer that the car is \$20'000 and next week the price is \$25'000
Peter is told that the car costs 30'000 and a week later it is \$25'000.

Who is most happy?

- (A) Paul
- (B) Peter

Anchoring

- When forming an estimate, people start from an initial (possibly) arbitrary value and then adjust ... but not enough – Kahneman and Tversky, 1974
- Related to:
 - Availability Bias: people overestimate the value of the available information – [ibid.](#) Tversky and Kahneman, 1973

Anchoring

Discussion – Anchoring

Give an example of your personal experience that illustrates the anchoring bias.



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Figure 13: People are over-reliant on
the first piece of information they get.
For example in salary negotiations, the
first person to speak sets a range of pos-
sibilities in the other person's mind.
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3.7.2 Availability Heuristic

Availability Heuristic

Discussion – Availability

People overestimate the probability of something based on anecdotal evidence (e.g. waiving climate change after one cold winter).

- The pictures with Harambe, men and women.
- Recency Bias: annual performance review in your company: does it really cover one year or just one month?
- Salience Bias: focus on the most easily recognizable features (e.g. crocodiles/dogs)
- Survivorship Bias: belief that starting a new company is easy because only the people that succeeded talk about it.

Can you find other examples of the availability heuristic?

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Example of Availability Heuristic



Figure 14: D. Trump on climate change – Source: [twitter.com](https://twitter.com/realDonaldTrump) .

Availability Heuristic: Consequences



70 Years Later, Florida Posthumously Pardons the “Groveland Four”

On January 11, 2019, the Florida Clemency Board unanimously granted posthumous pardons to the “Groveland Four,” four young African-American men falsely accused of raping a young white woman in Lake County, Florida in 1949. During the racist hysteria following the accusation, white mobs burned down black residences, a massive white posse lynched a black suspect, all-white juries condemned two innocent men to death and an innocent teen to a life sentence, and a racist sheriff murdered one of the men and attempted to kill another.

Figure 15: From www.deathpenaltyinfo.org.

3.7.3 Herd effect and Groupthink

Herd effect in thinking

The Bandwagon Effect or Group-think

Discussion – Group-think

People feel safe in the group. In a meeting, the first speaker sets the frame in which others will form their beliefs ... often corroborating.

Examples:

- People hold generally similar belief frameworks as their parents.
- The influence of polls on elections
- Did you foresee the global meltdown in 2008?
- Did you expect D. Trump to win the election in 2016?
- Did you expect Russia to attach Ukraine in February 2022?
- Pro-innovation bias (e.g. Bitcoin)

Can you find other examples of Group-think?

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3.7.4 Hot Hand Fallacy

Hot Hand Fallacy

Clustering Illusion



Figure 16: People tend to “see” patterns, even where there are none. Image from pixabay.com

Discussion – Hot Hand Fallacy

Examples:

- The Makapangsat pebble, washing machine, and Mary’s cheese.
- The “Hyperactive Causal Agent” and belief.
- Madoff, Enron, etc.

Can you find other examples of the Hot Hand Fallacy?

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Choice Supportive Bias

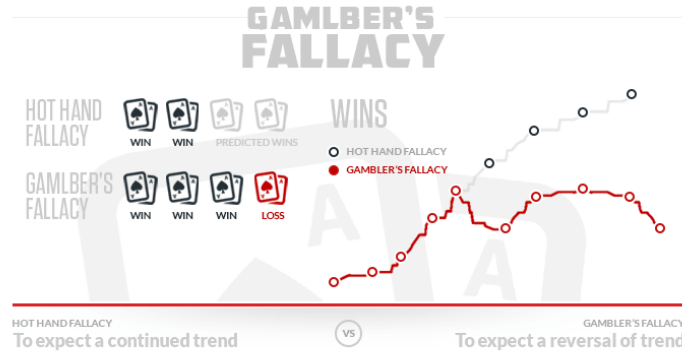


Figure 17: Image from <https://cdn.sportsbettingdime.com>

3.8 Stereotyping

Stereotyping

Discussion – Stereotyping

Our capability to recognise fast friend or foe (other tribes), creates the tendency to be able to attribute characteristics to an individual based on the group to which he or she belongs.

Examples:

- Racism (crime, good at math)
- The differences in gender and the MBTI profiles.

Can you find other examples of stereotyping?



Figure 18: Stereotypes. Source: Isaac Cruikshank, Wikimedia, A Man-Mid-Wife, or a newly discovered animal not Known in Buffon's time" – Coloured etching by I. Cruikshank, 1793. A literalistic visual interpretation of the phrase "man mid-wife" used to criticize male participation in childbirth.

3.9 Blind Spot Bias

Blind Spot Bias

Failing to Recognise our Own Biases

People tend to see themselves as unbiased, leaving massive room for judgement error and inferior decisions.

Bible

'You hypocrite! First, remove the beam out of your own eye, and then you can see clearly to remove the speck out of your brother's eye.'
Matthew 7:5

3.10 Preferences

Question:

Assume that you have bought a bond for your portfolio. Which one would be the most acceptable for your boss?

- (A) a junk-bond
- (B) a high-yield bond

Preferences – Labelling

Which do you prefer?

- (A) a junk bond
- (B) a high-yield bond

Other biases:

- hyperbolic discounting
- money illusion

4 Forms of Bias Hindering Inclusion

It is a well understood and commonly accepted fact that the human mind is biased. For example **russo1989decision** argue that the main barrier good decision making are biased heuristics in the mind. Some of the most disturbing and clear forms of bias are related to:

Forms of Bias Indirectly Hindering Inclusion

- **Overconfidence on own ability and own judgement:** we systematically over-estimate our own abilities (e.g. After the failure of LTCM the owners tried many more hedge funds that equally failed) – typically people use the wording “to be sure” when they are actually 85% sure — See: Camerer and Lovallo, [1999](#); Daniel, Hirshleifer, and Subrahmanyam, [2001](#).
- **Framing** we systematically fail to consider problem from multiple points of view (frames), more in particular we tend to focus on a small frame (e.g. profit and loss of an investment) and fail to see the bigger frame (total wealth) — See e.g. Tversky and Kahneman, [1981](#)
- **Confirmation Bias:** we tend to neglect information that dis-confirms our beliefs and overweight information that confirms our beliefs —

- **Information Bias:** the more information we have, the more confident we get; however, in reality too much information is basis for a weaker decision process. This overconfidence translates in believing that we can “win it” and we fail to follow a process —

Bias Directly Influencing Inclusion

- **Groupthink:** we have the innate need to conform (e.g. notice how hard it is to remain seated when everyone else is going for a standing ovation), this results in the belief that the majority is right —
- **Shortsighted Shortcuts:** this leads to underestimating the risk of a viral outbreak or interest rates. It also results in trusting that our brain has an unbiased view on the world. Instead our brain will typically use the most readily available information as an anchor and extrapolate from there (but not enough – aka Anchoring) —
- **Attribution Bias and Failure to Seek Feedback:** when a decision is successful then we tend to attribute the success to our own abilities (e.g. “I’m a good investor since the stock that I bought is up”) and failures to external circumstances (e.g. “the stock that I bought is down, because of an unfortunate decision of the FED”) —
- **Tribal Thinking:** we tend to use ourselves as the norm to judge others and tend to see what our tribe does as normal. An interesting example are the Latin words “dexter”, and “barbarus”¹ Obvious examples are wars between tribes, nations, or within nations: almost without exception the rivalling party is portrayed as barbarian.
- **Failure to Learn:** even when we get the feedback, it seems hard to adjust our decision process or understand the biases and heuristics that govern our decision process —
- **Herd behaviour:** our innate drive to conform to the group to which we belong, to fit and to be part of a group (in a way, group-think is a special case of this bias) – Banerjee, 1992; Nosfinger and Sias, 1999
- **In-group favouritism:** related to the previous, and also known as in-group-out-group bias, in-group bias, intergroup bias, or in-group preference, is the bias to favour members of one’s in-group over out-group members. This results in an automatic bias for own gender (Rudman and Goodwin, 2004) and race (Fershtman and Gneezy, 2001). We have the tendency to self-identify with groups and favourise members of them in

¹The word “dexter” means left, wrong, unfavorable, on the left hand, perverse, harmful: it was indeed the norm to write with the right hand. Also in English “right“ reverts to the direction on the right but is also the word to indicate what is fair according to the judicial system. “Barbarus” referred originally to foreigners but soon became a word that indicates uncultivated, savage, uncivilized, wild, cruel, etc.

many ways – Oklahoma. Institute of Group Relations and Sherif, 1961; Sumner, 2007

There is indeed ample evidence that we all are biased. Even the manager who honestly tries to forge strong and diverse teams, and fosters an inclusive atmosphere has many psychological biases that hinder rational decision making. Nobody is free from bias and we are influenced by who we are as well as by our environment. Our brain is evolved to do pattern recognition, and just as machine learning that will pick up patterns that might be true (or true in our distorted perception of the world) on average, but forego the right of everyone to be treated as an individual. Even with the best intentions, each one of us will have certain biases: both active and passive. Active bias is where one holds an explicit or implicit bias and hence will automatically value people more based on that bias.

Places to Start Understanding Own Bias

- tolerance.org
- Harvard University

Besides being conscious or unconscious, bias can also be active or passive. Active bias would be that you believe that a certain group is better in a certain job and hence you pay them more. Passive bias occurs where a person makes biased decision while the intend was to be unbiased. This is because other people will push your decision making in a certain direction.

For example of you have two employees and a small budget for salary increase. Whom would you give the money to? To the person that complains or to the person that expresses concern about your difficult task as a manager. Who on average would be these people? Well women score on average higher in agreeableness and are more “feeling” – in MBTI terminology – so you can expect on average men to be more vocal about their salary expectations and women to be more inclined to express compassion. This mechanism will push you to give salary increases –on average– more to men than women.

5 Deep Dive: Gender Bias

EU Definition

‘Any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited.’
article 21 of the Charter of Fundamental Rights

Gender stereotypes and bias

	doctor	nurse	police officer
female	45%	90%	17%
male	55%	10%	83%

Car Accidents

Question: Who causes the highest number of car accidents?

Who causes the highest number of car accidents? (EU or USA data)

- (A) Men
- (B) Women
- (C) roughly equal number caused by men and women?

Car Accidents - again

Question: Men drive much more kilometres

Men drive much more kilometres than women (e.g. men are the majority of truck drivers, taxi drivers, delivery drivers, etc.). So, if we correct per kilometer driven: who causes more car accidents per kilometer?

- (A) Men
- (B) Women
- (C) roughly equal number caused by men and women?

Car Accidents - deaths

Question: More fatalities in men or women

Knowing that men are roughly 75% more often involved in car accidents. How much percent more road fatalities are men?

- (A) 50% more fatalities are male
- (B) 75% more fatalities are male
- (C) 100% more fatalities are male
- (D) 200% more fatalities are male

The data behind car accidents

multiple sources: Hailemariam et al., *n.d.*, Eustace and Wei, 2010, Kouabenan et al., 2001, Obeng, 2011, Szumska, Frej, Grabski, et al., 2020, EU, IIHS, NHSA, Insurance information institute, etc.

All agree:

- men cause around 70% of car accidents in the EU
- 20,000 male fatalities p.a. vs. 6,000 female in the EU (3 times more men die on the road – 76% of road fatalities are men)²
- men are more in fatal accidents (speed and misjudgement), women in minor accidents (distraction, information failure)

²EU data from: https://ec.europa.eu/transport/road_safety/sites/default/files/pdf/statistics/dacota/bfs2018_gender.pdf

- In USA: Men drive ca. 30% more miles than females, and cause 6.1 mln accidents vs females 4.4. (IIHS)

Introvertism/Extrovertism

Question: Do women talk more than men

Is the percentage of extroverts higher in women then in men?

- (A) Yes
- (B) No
- (C) It is similar in both sexes

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The Gender of Personality: MBTI

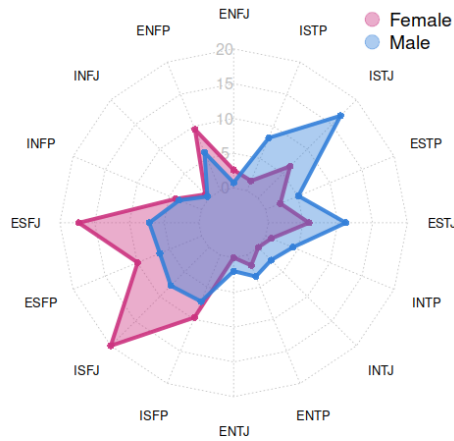


Figure 19: Gender differences in the MBTI profiles.

The Gender Differences in the MBTI Dimensions

Table 2: Gender differences in personality. Data from www.statisticbrain.com/myers-briggs-statistics and <https://personalitymax.com/personality-types/population-gender/>.

Dimension	Male	Female	Δ
Introversion/Extrav.	5% more Introvert	3% more Extravert	8%
iNtuition/Sensing	22% more Sensing	25% more Sensing	3%
Thinking/Feeling	7% more Thinking	26% more Feeling	33%
Judging/Perceiving	2% more Judging	7% more Judging	4%

Sensing/iNtuition and Judging/Perceiving

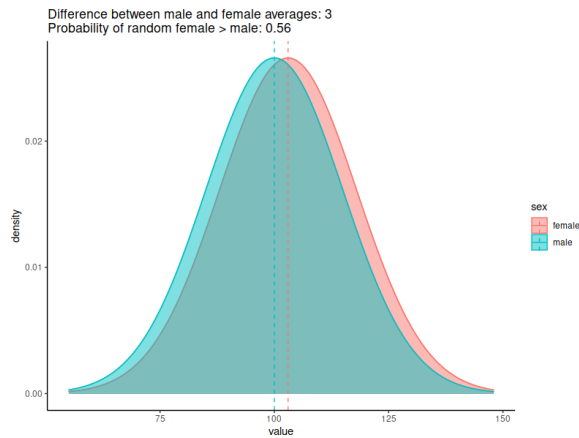


Figure 20: When the differences are small (e.g. 3% or 4%, then the probability that in a random pair men score lower is roughly 50%.

For the dimensions Sensing/iNtuition and Judging/Perceiving there are on average small differences between men and women, however these differences are so small that we don't seem to notice them and no stereotypes occur in our tales nor customs.

Introversion vs. Extroversion

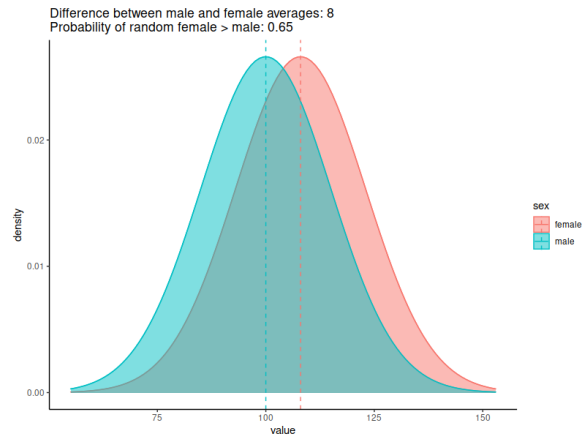


Figure 21: With 8% difference, the probability that in a random pair the woman scores higher/lower is 65%.

For the dimension Introversion/Extroversion there is a difference of about 8% between the average score for men and that of women. This difference implies that if we select a random pair of a man and a woman in the population that we can expect in 65% of the cases that the woman is more extrovert and the men more introvert in those pairs.

That means that, for example, in marriage (assuming that partner selection is agnostic for introversion/extroversion) in most cases (65%) of the marriages the woman will be more extrovert. This difference seems big enough to be noticed by our pattern-recognising brain, and indeed we see that in many folk tales, the woman is the more talkative person.

Thinking vs. Feeling

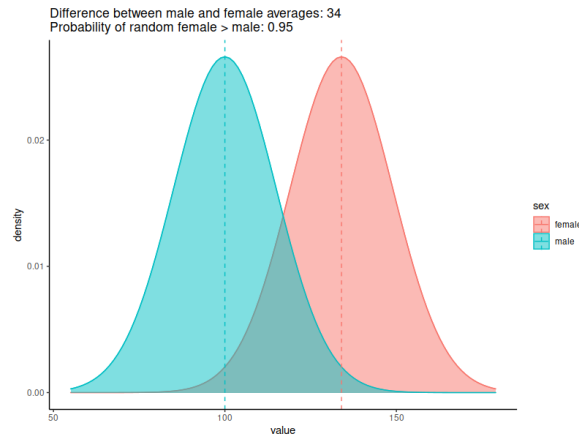


Figure 22: With 34% difference, the probability that in a random pair the woman scores higher is 95% – almost always.

When we look at the dichotomy Thinking/Feeling, we notice that there is a whopping difference of 34% between the average score of both sexes. This implies that (assuming Gaussian distributions and a volatility of 15%) that in a randomly chosen pair of a man and a woman, that in 95% of those pairs the man is more Thinking and the woman more Feeling.

This difference is so big that nearly always men will be more Thinking and woman more Feeling. That means that men will engage first logic and then feelings and that the first response is rational, whereas in women we rather expect first the emotional response and then the logical. Both sexes might come to the same conclusion as they both engage both emotional and rational processes, but feelings like satisfaction will rather come from the first reflex.

This seems to be a potential candidate to explain the different career choices mentioned above. Both a nurse and a police officer are linked to hard work that can be dangerous and uncomfortable, but is a first line response to help others. A person who has more a Thinking tendency will get more satisfaction from the police officer role, a person who is more on the iNtuitive side, will get more satisfaction from the nurse role.

This seems to happen only in professions like nurse and police officer: professions that people choose at adult age. If one wishes to become a medical doctor, then conscious hard work need to start at around 13 years old. At that age girls have an intellectual advantage and they are on average more agreeable and hence fit better in the schooling system.

So, we see that when choices are made in adult life gendered roles are preferred, and when parents have more influence we see more equality of representation. Also note that it is likely that the profession of medical doctor does not give a clear satisfaction advantage to one group in the Feeling/Thinking dichotomy.

This is a strong argument against the narrative that people choose for police officer or nurse because of pressure by parents based on stereotypes. Remember, the stereotype about a doctor was male, but the social pressure from parents not.

The Big 5

- **Neuroticism** – experience negative emotion in response to perceived threat and punishment (e.g. anxiety, depression, anger, self-consciousness, and emotional lability) — women score higher (except anger)
- **Agreeableness** – cooperation, social harmony, and consideration of others — women score significantly higher
- **Conscientiousness** – self-discipline, organization, and control of impulses (linked to the ability to exert self-control in order to follow rules or maintain goal pursuit) — women score a little higher
- **Extraversion** – sociability, assertiveness, and positive emotionality (linked to sensitivity to rewards) — women score a little higher
- **Openness/Intellect** – imagination, creativity, intellectual curiosity, and appreciation of esthetic experiences — no diff.

First Impressions Matter (System 1)



Figure 23: System 1: First impressions matter

How to Tame System 1?

Discussion – Recruitment

How can we get System 1 under control for recruitment?

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Is this enough to get to equal chances

Question: Assuming that we have an unbiased hiring process (like in previous slide). Is that enough to get completely equal chances for everyone?

- (A) Yes
- (B) No

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Beyond Recruitment

Discussion ?

Is de-biasing recruitment enough to get equal pay for equal work?

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See the paper “Reporting about Diversity and Inclusion that Inspires to Action” – <http://www.de-brouwer.com/assets/div/div-white-paper.pdf>

Salary and Gender

Question: What mechanisms *can* lead to lower pay for women?

What mechanisms can lead to lower pay for women?

- (A) biases like over-confidence, availability heuristic etc
- (B) biases like framing, groupthink, in-group favouritism, etc.
- (C) prejudice / conscious bias
- (D) unconscious bias
- (E) all of the above

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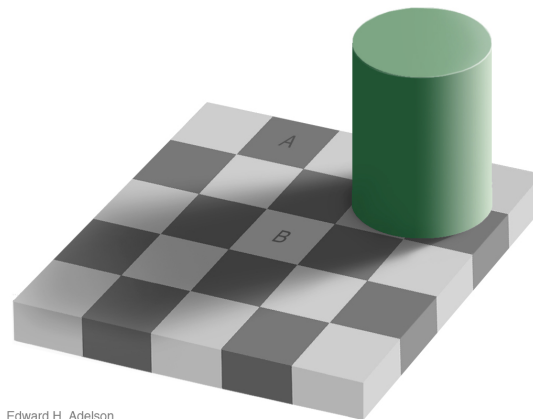
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6 Conclusion

Conclusions

- Behavioural biases are deeply rooted in the unconscious part of the brain
← it is not possible to get “unbiased”, being aware of your bias is key on counteracting.
- Understanding Behavioural Biases is understanding yourself and others.
- ... we can make better decisions by consciously engage our rational (aka. slow or System 2) thinking process.
- We all have multiple biases.

Can we learn to de-bias?



Edward H. Adelson

Figure 24: Are A and B of the same shade of grey? – Source: Edward H. Adelson http://web.mit.edu/persci/people/adelson/checkershadow_illusion.html

How do you see yourself?

Question: What describes you best?

- (A) Impulsive, biased, judging, and jumping to conclusions
- (B) Both A and C
- (C) Logical, structured, open-minded, and conscious

Course assesment

Question: Please rate this presentation

- (A) Not good – needs replacement
- (B) mediocre – needs improvement
- (C) good – is ok, but could be improved
- (D) very good – difficult to find improvements
- (E) top

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Nomenclature

- \wedge the logical “and” operator
- $P(A)$ the probability that event A occurs in a given time frame
- BF Behavioural Finance
- DLC Dual Listed Company
- EMH Efficient Market Hypothesis
- EUT Expected Utility Theory
- LSE London Stock Exchange
- LTCM Long Term Capital Management (hedge fund)
- MtM Marked to Market
- NYSE New York Stock Exchange
- RDP Royal Dutch Petroleum
- SEUT Subjective Expected Utility Theory
- STT Shell Transport and Trading