Decission Making in Uncertainty

Using Behavioural Finance to Improve Decission Making

Dr. Philippe J.S. De Brouwer

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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.

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2 What Is 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-efficiencies created by irrational traders (noise traders)
- **Efficient Market Hypothesis** (EMH)Fama (1965) and Fama (1970)

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:
    1. Adam Smith's Theory of Moral Sentiments Smith (1759)
    2. Keynes's beauty contest Keynes (1936)
    3. Prospect Theory Kahneman and Tversky (1979)
    4. Behavioural Portfolio Theory 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)

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- consistent and very good performance between 1994 and 1997

- more than USD 7 Bln. assets by 12/97

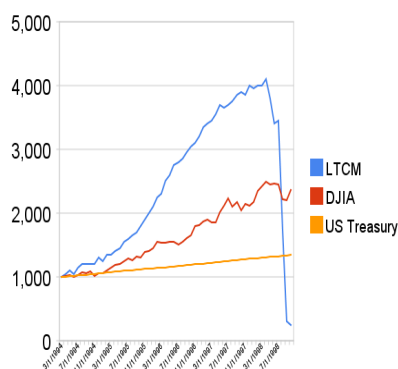- banks eager to lend to LTCM

LTCM in 1998

- The assets decreased with 82%

- 9/98: the Federal Reserve Bank of NY organises privately funded rescue plan with 14 banks and brokers

- They raise $3.6 bln. in exchange for 90% of LTCM's equity

Question

How was this possible?

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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 × 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 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 – Mackay (1841)

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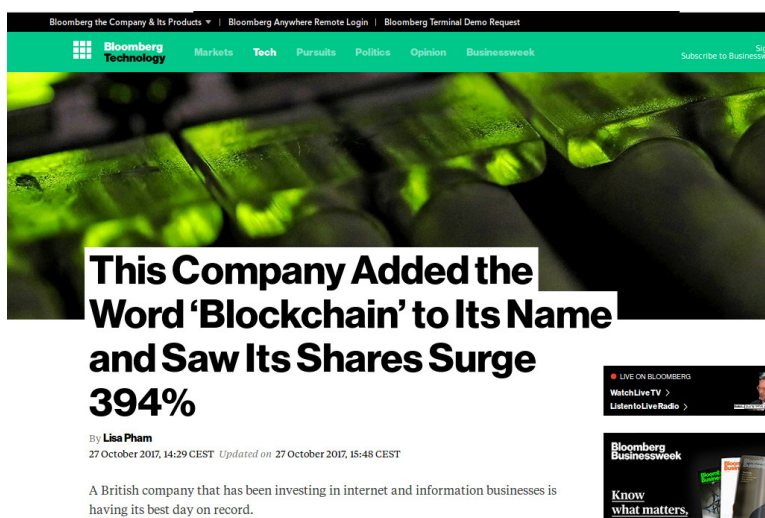
Figure 1: The reaction of the market to the name change of the company On-Line Plc. Source: `https://www.bloomberg.com/news/articles/2017-10-27/ what-s-in-a-name-u-k-stock-surges-394-on-blockchain-rebrand`*.*

Did we learn something?

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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)

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2.2 Non Rational Choices

Beliefs

> **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?
>
> 1. group 1: 50% relatively best drivers
>
> 2. group 2: 50% relatively worst drivers

. . . .

. . . .

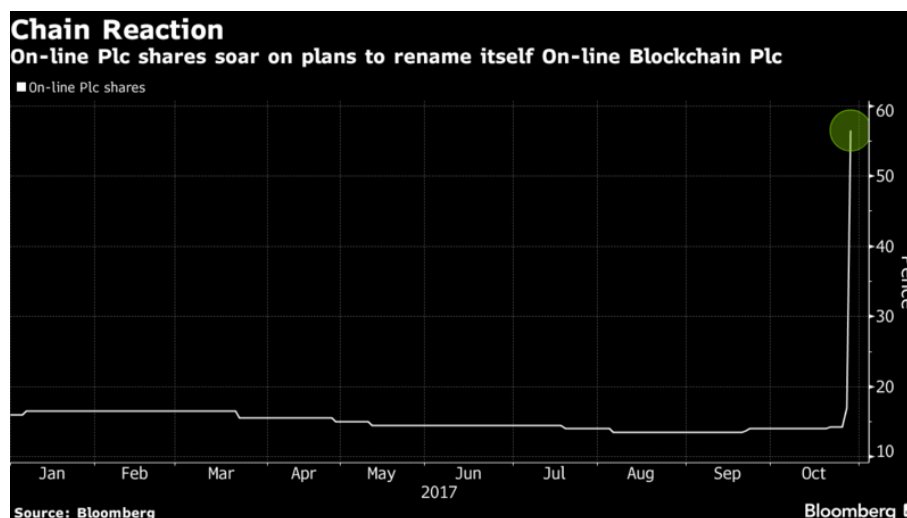. . . . .

. . . .

> **Question**
>
> The Amazon river is a river in South America. Provide an upper boundary for the length of the river so that you're 90% sure that the real length is shorter. (in *km* or *mi*)
> So, we would expect that 10% of the people will find that the correct answer is higher than their limit, while 90% will find the real value lower than their estimate.
>
> 1. Yes, the real length is indeed lower than my upper bound.
>
> 2. No, the real length is longer.

. . . .

. . . .

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Overconfidence

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- 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 the they are about 80% certain – Fischhoff et al. (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 et al. (1994)

Question

Linda is thirty-one years, single, outspoken and very bright. She majored in Phylosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti nuclear demonstrations." – what is most probably:

1. Linda is a bank teller

2. Linda is a bank teller and is active in the feminist movement

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. . . .

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. . . .

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 et al. (1985)

  - the Law of Small Numbers – Rabin (2002)

  - gamblers' fallacy

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Belief Perseverance

- Once people have formed their opinion, they stick to it too tightly and too long – Lord et al. (1979)

- Two effects:

  1. people do not search for disconfirming evidence
  2. 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

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 – Kahneman and Tversky (1974) Tversky and Kahneman (1973)

Heuristics

> **Question**
>
> Suppose that you are participating in a game that consists out to two gambles: A and B. Choose an option in gamble A and B
> Choose an option in Gamble A
>
> 1. a sure gain of € 2'400
>
> 2. 25% chance to win € 10'000 and 75% chance to win nothing
>
> Choose an option in Gamble B
>
> 1. a sure loss of € 7'500
>
> 2. 75% chance to loose € 10'000 and 25% chance to loose nothing

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Framing

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.

A Choose an option.

    i a sure gain of € 2'400 [84%]

    ii 25% chance to win € 10'000 and 75% chance to win nothing [16%]

B Choose an option.

    i a sure loss of € 7'500 [13%]

    ii 75% chance to loose € 10'000 and 25% chance to loose nothing [87%]

$\longrightarrow$ risk aversion when profits are involved and loss aversion when losses are involved

    the results:

1. (Ai + Bi) = 100% sure € 5'100 loss

2. (Ai + Bii) = 75% chance to loose € 7'600 and 25% to win € 2'400

3. (Aii + Bi) = 25% chance to win € 2'500 and 75% chance to loose € 7'500

4. (Aii + Bii) = 37.50% chance on zero, 6.25% chance to win € 10'000, 56.25% chance to loose 10'000

$\longrightarrow$ 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

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> **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?
>
> 1. the empty restaurant
>
> 2. the half full restaurant

. . . .

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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**
>
> Is the world a safer place now than 100 years ago?

. . . .

. . . .

. . . .

. . . .

Availability Bias

> **Question**
>
> Who kills more people per year: dogs or crocodiles?

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....

....

....

....

see: Tversky and Kahneman (1973)

Anchoring

> **Question**
>
> Who is happy?
> 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.

....

....

....

....

Anchoring Example from

> **Question**
>
> Ask group A to multiply $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ and group B $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ in such short time they have to estimate the result (5 sec.)

....

....

....

....

see: Tversky and Kahneman (1973)

Note: *Would you be happier if you were richer?*

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Preferences

> **Question**
>
> Assume that you have bought a bond for your portfolio. Which one would be the most acceptable for your boss?
>
> 1. a junk-bond
>
> 2. a high-yield bond

Preferences – Labelling

Which do you prefer?
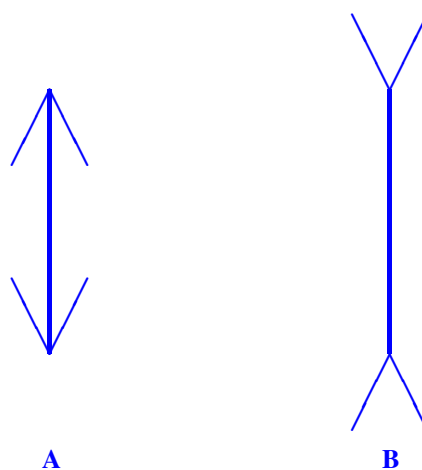
A a junk bond

B a high-yield bond

Other Biasses:

- hyperbolic discounting

- money illusion

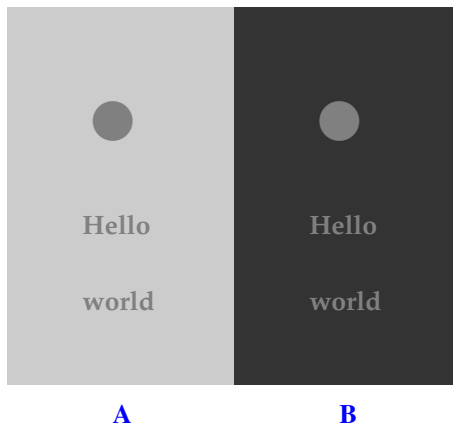*Philippe De Brouwer*

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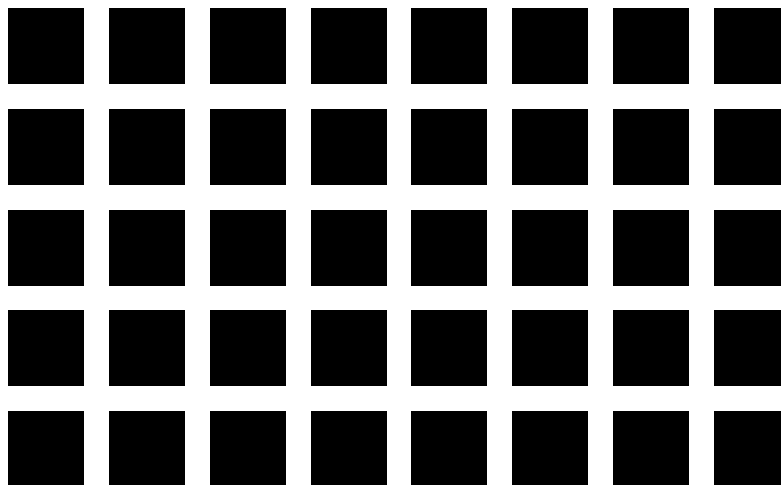
Figure 4: Gray dots appear at the intersection of the black squares (and if you focus on it, then it disappears, but others become visible).

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

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Figure 6: Which text is darker?
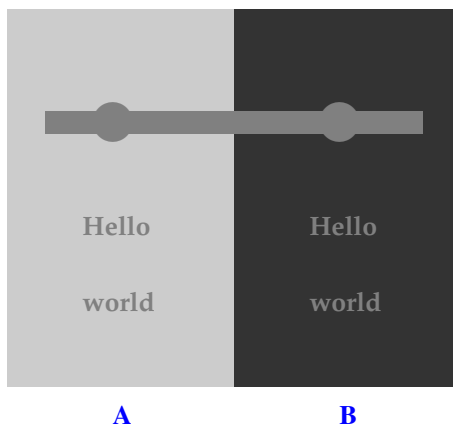
Figure 7: Which text is darker?

Can we learn to de-bias?

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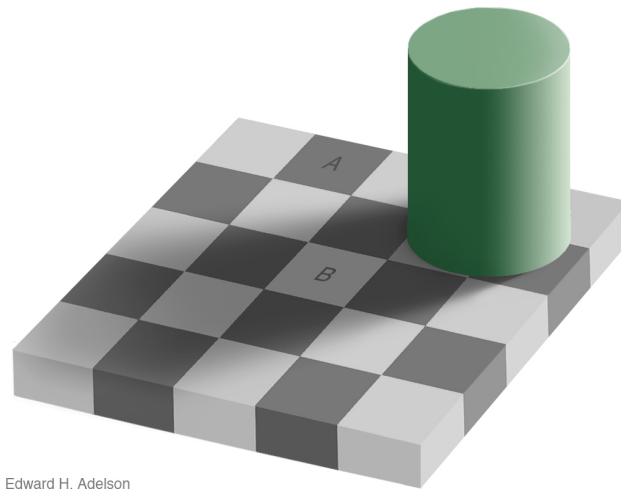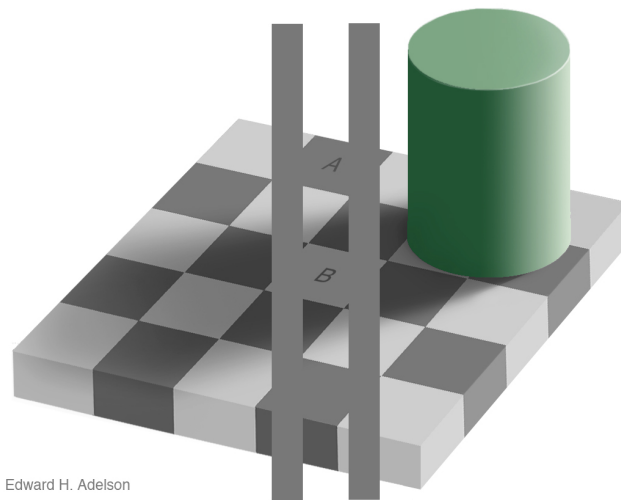
Edward H. Adelson

Edward H. Adelson

Figure 8: Are A and B of the same shade of grey? – Source: Edward H. Adelson `http://web.mit.edu/persci/people/adelson/checkershadow_` `illusion.html`

Summary Behavioural Finance/Economics

2.4 What is Behavioural Finance NOT?

- a normative theory(!)

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	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*

- a portfolio selection method: so it is no replacement for Mean Variance (MV), CAPM and Safety First (SF)

- a sure way to beat markets (despite BAPT)

- (necessarily) in contradiction with EMH ...

- a model for financial markets (a more complex model might be needed, for example the Adaptive Market Hypothesis (AMH) Lo (2004))

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3 Examples from Practice

3.1 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 et al. (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

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Figure 9: The effect of all those biasses from rational behaviour on our investment life cycle.

The Life Cycle of a Bubble

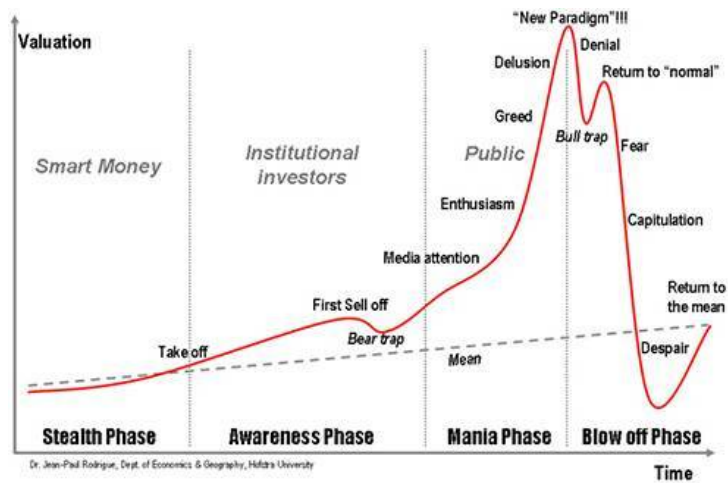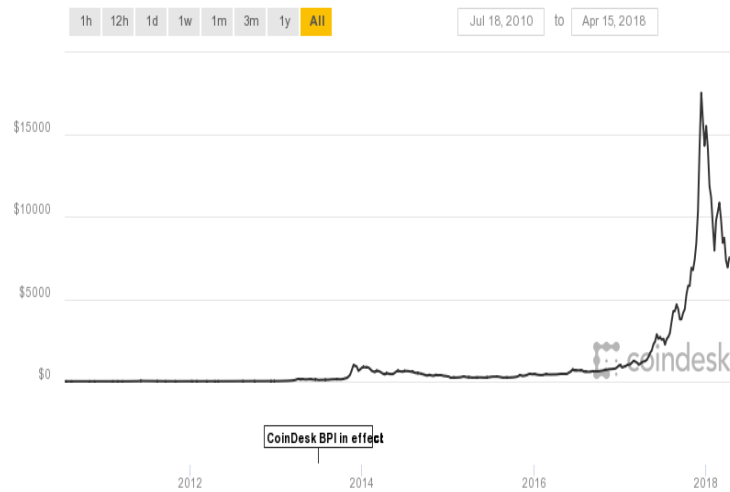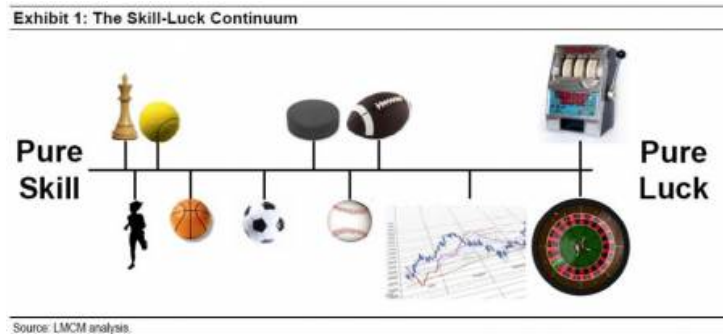*Figure 10: The life cycle of a bubble in financial markets.*

Bitcoin: where are we today?

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Figure 11: *In what phase is Bitcoin? Source:* `https://www.coindesk.com/price/`

The Truth

Figure 12: *The truth about forecasting power in financial markets.*

3.2 Other Business Examples

- your colleague tells you "I'm sure ..."

- an investor tells you "it's different this time"

- "All banks use SAS" / "No one ever gets fired for hiring IBM"

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- decission making in boards

- publicity / marketing (availability bias, herd behaviour, loss aversion, greed, . . .)

- replace a fixed premium/bonus of $1000 with a variable one (even if the expected average is equal or higher)

- . . .

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4 How can BF help to improve our decisions?

- **Before the Decission**

    – First ask "is this the main problem?" (try to see the big picture / the main cause)

    – List possible alternatives and possible criteria

    – Use a MCDA to help deciding (do not only rely on the WSM (weighted Sum method) [ie. quantify the problem and solutions, try to use rational arguments/process]

    – ignore marketing and do some market research

    – in summary have a decission process and stick to it

- **During the Decission**

    – overconfidence,

    – hot hand fallacy,

    – sample size neglect,

    – conservatism / belief perseverance

    – labelling / availability bias / herd behaviour (Madoff)

- **After the Decision**

    – avoid to solutions/agents/decissions at short term (narrow frame)

    – look at the big picture (not only the small choice). Is the big picture still optimal?

    – sunk cost "we already invested so much in it, let's continue"

    – but do follow up: avoid self attribution bias

    – try to see your mistakes and learn!

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5 Conclusion

Conclusions

- the Efficient Market Hypothesis is not (necessarily) dead

- but Behavioural Finance is real

- Behavioural biasses are deeply rooted in the unconscious part of the brain ← it is not possible to get "unbiased", but reconsider with an open mind decisions.

- Behavioural Finance is not a new *normative* framework.

- Understanding Behavioural Finance is understanding yourself and others . . .

- . . . and therefore helps in various ways in all decissions when the outcome is uncertain

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6 Background Information

About Philippe J.S. De Brouwer

- He studied **theoretical physics** and **Business Engineer**. Finishing this second Master he solved the "fallacy of large numbers puzzle" (formulated by P.A. Samuelson 38 years earlier). In his **PhD** he successfully challenged the assumptions of the Noble price winning "Mean Variance Theory" of H. Markovitz that dominated thinking about suitability of investments for more than 60 years.

- He moved from insurance to banking focussing on **ICT**, and then he found passion in **asset management**. For Fortis he created "product development and programme management", stood at the cradle of one of the first capital guaranteed funds and got promoted to director in 2000. In 2002 he choose for KBC where he merged 4 companies. In 2005 he became CEO of the merged entity and soon the company climbed from number 11 to number 5 on the market. In the aftermath of the crisis he helped creating a new investment management company in Ireland that soon managed ca. 1000 investment funds and had about 32 Bln Euro under management. In 2012 he widened his scope by joining **Risk Management** and specializing in statistics, numerical methods and data management.

- Philippe is also passionate about coaching on **team leadership and teamwork** as well as **teaching** (mainly for Vlerick Business School, the University of Warsaw and Jagiellonian University).

Questions?

contact

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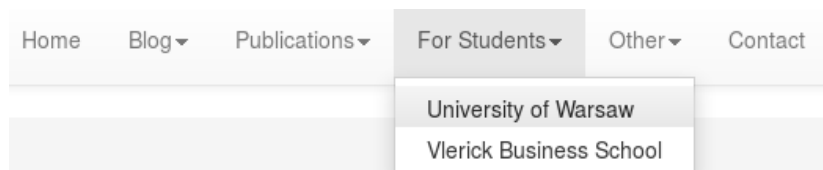url: http://www.de-brouwer.com
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email: philippe@de-brouwer.com
mobile: +48 790 715 002

Availability of Slides

...and eventually other materials

1. url: http://www.de-brouwer.com

2. select "For Students" and then "University of Warsaw"

3. locate your program

4. locate the relevant course and download your materials

Organization of the Slides

1. introduce myself
2. sides — this is the main part!
3. appendix with certain background information (not in all courses)
4. appendix with references
5. appendix with nomenclature (always last pages!)

Note that

- all slides are numbered
- on the top you can see where we are in the materials

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6 Nomenclature

$\wedge$ the logical "and" operator, page 10

$P(A)$ the probability that event A occurs in a given time frame, page 10

AMH   Adaptive Market Hypothesis – Lo (2004), page 19

BAPT   Behavioural Asset Pricing Theory, page 19

BF   Behavioural Finance, page 4

DLC   Dual Listed Company, page 6

EMH   Efficient Market Hypothesis, page 4

EUT   Expected Utility Theory, page 4

LSE   London Stock Exchange, page 6

LTCM Long Term Capital Management (hedge fund), page 5

MCDA Multi Criteria Decission Analysis, page 24

MtM   Marked to Market, page 20

NYSE   New York Stock Exchange, page 6

RDP   Royal Dutch Petroleum, page 6

SEUT   Subjective Expected Utility Theory, page 4

STT   Shell Transport and Trading, page 6

WSM   Weigthed Sum Method, page 24

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