Bullet Points

- Behavioral Finance shows, that in conflict to Modern Financial Theory, we do not always behave rationally.
- Most of our action is governed by the subconscious, by emotions.
- There is no rational behavior without emotions.
- Knowing about emotions can help to control and employ them for better investment decisions.
Failings of modern finance theory

Modern finance theory explains the reality of financial markets but insufficiently:

- e.g. many players are reluctant to use the benefits of diversification for risk reduction,
- e.g. trading volume is much higher than could be explained by new information,
- e.g. actively managed equity funds still dominate,
- e.g. volatility of stock prices is much higher than could be explained by theory

Behavioral Finance - a supplement to modern finance theory, analysis of human behavior for better forecasts, decisions

Cognition, valuation, decision
Three stages of human action

1. What is the situation, where are we?
   To see, perceive, recognize, explain, forecast

2. What do I want?
   To evaluate, weight, judge

3. What has to be done?
   To decide, take action

Behavioral Finance shows that there are deficiencies at each of the three stages, often systematic, sometimes avoidable.

The three stages describe the logical process. De facto there is strong interaction. E.g. the justification of decisions taken dominates not only the valuation but even the perception.
Behavioral finance - the idea

- Behavioral finance is based on the behavioral psychology of B. F. Skinner (1938).
- According to Skinner it is not possible to know the reasons for human (mis)behavior but luckily also not necessary.
- Each and every behavior has been learned and thus can be unlearned (conditioning).
- Behavioral finance: apparently irrational reactions of investors to certain stimuli - no questions as to causes
- Neuroscience tries to peep into the black box.

The Adaptive Market Hypothesis: Market Efficiency From an Evolutionary Perspective (Andrew W. Lo)

- The Efficient Markets Hypothesis postulates that market prices incorporate all information rationally and instantaneously. However, the emerging discipline of behavioral economics and finance has challenged this hypothesis, arguing that markets are not rational, but are driven by fear and greed instead.
- Recent research in the cognitive neurosciences suggests that these two perspectives are opposite sides of the same coin.
- A new framework reconciles market efficiency with behavioral alternatives by applying the principles of evolution—competition, adaptation, and natural selection—to financial interactions.
- Much of what behavioralists cite as counterexamples to economic rationality is consistent with an evolutionary model of individuals adapting to a changing environment via simple heuristics.
Freud’s „Id“, the third humiliation of the human race

- Man had the perception that everything revolves around her. **Copernicus** proved: Not the sun revolves around us but we revolve around the sun. Abruptly we were dislodged from the center of the universe to the periphery.

- As the deputy of God we set out to govern the world until **Charles Darwin** discovered that we are not that special. Just an update of the ape, product of desultory evolution, like all other creatures.

- But one distinction remained for humans: reason, rationality. Then **Freud** revealed that reason is just the flimsy and fragile surface. Below blazes the chaos of instincts, compulsions, and emotions. For Freud this presented the third humiliation of mankind. Man is not even in command of his own head.

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Freud's „Id“, the third humiliation of the human race - again accepted reluctantly if at all

- **Copernicus**: The Flat Earth Society still objects: “While the Society is not a "crackpot" group, it is opposed to the fashionable, politically correct Spherical Earth theory, which is expounded every day by so-called "scientists", the media and political leaders. The Society asserts that the Earth is flat and has five sides …” (www.flat-earth.org/society/about.html)

- 361-year abyss between Galileo's indictment for heresy 1632 and the church's acquittal of him in 1993

- **Darwin**: 137-year gap between Darwin's *Origin of Species* 1859 and acceptance of evolution by pope John Paul II 1996

- In November of 2003 the Texas State Board of Education approved a list of biology textbooks that scientists believe do justice to Darwin's theory.

- 29 Jan. 2004, “evolution” removed from Georgia schoolbooks

- **Freud**: Discussion in FAZ 2003/2004
Renaissance of the science of emotion

- Only now Freud’s views are attested by Neuroscience.
- As keynote speaker drawing the „Decade of the Brain 1990-2000“ to a close, Antonio R. Damasio identified three possible reasons for the long black hole of almost a century between Freud and the new blossoming of the Science of Emotion:
  - Sexual fantasies were more attractive to the researchers than analysis of electrochemical processes in the brain.
  - There is “a long philosophical tradition of not trusting emotions, regarding them as unruly phenomena that can wreck havoc on decision-making.”
  - Neuroscience did not have the necessary instruments.

Neuroscience used to neglect emotions

- With the traditional tools of neuroscience insights on emotion were hard to obtain.
  - Destruction of brain areas in animal experiment: detect changes in the animal’s ability to perceive, learn, control movements. The emotions of animals are difficult to define and to detect.
  - Non-invasive experiments with brain damaged humans: ethical objections and only very few cases (the emotion nuclei are well protected in the center of the brain), difficulties in defining and measuring emotions.
  - Rediscovery of the Science of Emotion owed to new chemistry (psychotropic drugs) and new physics (new technical equipment).
New tools for neuroscience

- After electroenzephalogram (EEG) and computer-tomographe (CT) new imaging techniques: positron-emission-tomographe (PET), magnetic resonance imaging (MRI), and especially functional magnetic resonance imaging (fMRI).

- The scans can not only show which areas of the brain receive fresh, oxygenated blood at any given time, but also the electrical activity when individual neurons fire, chemically discharging e.g. dopamine.

- Current research centers on
  - the strength of neural activities associated with specific perceptions, thoughts, emotions, and activities,
  - the exact areas of the brain where these activities take place.

The Doctor Can See You Now

GE
imagination
at work
Forecasting is fun: the nucleus accumbens

- In the hemline of the bridge connecting the two brain sides
- Part of the limbic system, that is in charge of emotions: fury, fear, lust, sexual arousal and aggression (sex and crime)
- The brain nucleus for hope, euphoria but also addiction
- Activated in situations that involve reward and punishment
- Active with calculation of probabilities
- Central in search for analogies, especially left nucleus accumbens lodges patterns even when we positively know that there aren’t any.
- Representation of samples and gambler’s fallacy, the feeling: “now it is the turn for red“

Addicted to forecasting

- Neuroscience tracks neural activity. Where are forecasts generated, where are they processed?
- Every action is based on forecasts, sometimes explicitly, mostly just implicitly.
- All forecasts are an extrapolation of analogies (trends, patterns, similarities, causations).
- That is why our brain compulsively looks for analogies, causation in random events, order in chaos, it forecasts.
- We always find analogies to base forecasts on, even if we positively know there aren’t any.
- ... and proofs (heuristics of availability, selective perception, cognitive dissonance, technical analysis, data mining).
Happiness is pleasant anticipation and dopamine is the neurotransmitter of happiness

- Neurotransmitter dopamine, most important amplifier in learning activities
- Good vibrations when forecasting
- „To the alliance of curiosity and desire sponsored by dopamine belongs creativity as well.“ Stefan Klein
- „The Brain Runs on Fun.“ American saying
- Dopamine causes happiness by pleasant anticipation. When we enjoy, relish, savor though, parts of the brain are activated that are in charge of conscious perception. And here the neurotransmitter is not dopamine but opioides, drugs produced by the brain that resemble opium.

Dopamine discharge at the time of the forecast
No risk - no fun / Forecasting is fun

- Dopamin discharge higher when more difficult to forecast.
- People enjoy surprises.

Juice or water - model of dopamine discharge
High on dopamine, electrified investors

- Our overconfidence is immune to learning. We get our reward now, even if forecasts later turn out to be wrong.
- Heuristics of availability, experiences that are not representative but dominate memory, especially when positive emotions had been experienced.
- High stakes trigger dopamine discharge (lottery, penny stocks, IPOs) however small the chances of winning.
- When expected rewards don’t materialize, dopamine level and mood go south, a possible reason for the sometimes extreme overreaction when earnings forecasts are just barely missed.
- Does this mean that the investor should suppress his emotions? No: but recognize and manage!

The error of René Decartes

- Descartes established the credo of rational, cartesian thinking: „Cogito ergo sum.“ or „Je pense donc je suis.“
- His view was: only by thinking man becomes human, rational action must disregard emotion.
- Modern neuroscience begs to differ, and radically so.
- Antonio R. Damasio: without emotion there is no incentive for rational decision, it just does not happen! (Descartes’ Error, New York 1994)
- „Long before the dawn of humanity, beings were beings.“
- Emotions are the engine of thinking.
The amygdala (corpus amygdalum)

- Part of the limbic system, processing scent information, center of instinctive reactions, fear and anger
- Instantaneous reactions of the whole body, connected to the adrenaline system, much faster than cortex
- With hippocampus welds emotions to memories

a) Increasing gains activate left amygdala
b) Increasing losses activate right amygdala

The prefrontal cortex

- Magazine of memories with attached emotions (know-feel-combinations, Damasio: „somatic marker“)
- In charge of planning of actions and of rational evaluation of possible outcomes
- Moderates the emotional input from the amygdala
- Input from amygdala to prefrontal lobe (via hippocampus) very much stronger than the other way round. That may explain the difficulties of psychoanalysis and why it is so hard to act against our emotions.
The Iowa Gambling Task

- Four stacks of cards to choose from
- A und B bad, possible gain of $130 - maximal loss $1,500
- C und D better, maximal gain lower, much lower maximal loss

The Iowa Gambling Task: measured emotion after

- µS/sec after reward (gain) or punishment (loss)
- SCR (skin conductivity response)
The somatic-marker-hypothesis

- Antonio Damasio: We make judgements not only by assessing probabilities and consequences, but also, "and primarily", by evaluating their emotional attributes, the somatic marker.
- The "right" decision is taken only when also felt to be "good".
- There is no rational behavior without emotion. Without emotion the conscious mind is only a paper tiger, unable to stick to its chosen course.
- 4Ws: Why do We Want What? All our objectives are based on emotion.

Intelligence depends on brain size - but not cortex

- The latest research by Paul Zak: Size matters.
- IQ and brain size are correlated after all.
- But not all the brain, especially not the highly developed neocortex that distinguishes man from all other species.
- It is the volume of amygdala and hippocampus that determines intelligence.
- The volume of the cortex, although obviously a selective advantage, is not a sufficient or even necessary condition for high intelligence.
- Feeling emotions, being able to match them to memories, and to employ both for purposeful decisions - that makes the successful animal.
Conclusion: seven suggestions (not only) for investors

- Man is not just a thinking machine but at least as much a feeling machine. With no emotion as to the consequences of actions there is no right or wrong.
- The act of prediction is addictive. We are hard wired to make forecasts based on repetition and alteration.
- A brain that predicts gains looks like a brain that is high on drugs or sex. Illusion of control, pharmacologically addiction prone.
- Work your dopamine, you can’t possibly fight it.
- Seven suggestions

1: Define the right (accessible) objectives

- Happiness, well-being is not identical to performance. Thrill, fun, status gain are as legitimate. Saving is not always just deferred consumption. Investing in equities, riding the roller coaster of equity markets, can be fun (and thus consumption).
- „Hedonic Investment“, motivation and emotion of an investor developing complex investment strategies may be comparable to a sky diver preparing to jump.
- Self-commitment, burning the bridges makes use of cognitive dissonance (endowment effect).
- Think positively. Happiness by pleasant anticipation of gains, however improbable they may be, nobody can take away again.
- But beware of euphoria, the hangover won’t take long to come.
1a: Don’t worry, be happy - the brain runs on fun

- Good moods, while they last, enhance the ability to think flexibly and with more complexity, thus making it easier to find solutions to problems, whether intellectual or interpersonal. One way to help someone think through a problem, is to tell her a joke.

- Laughing, like elation, seems to help people think more broadly and associate more freely, noticing relationships that might have eluded them otherwise - a mental skill important for creativity, recognizing complex relationships, foreseeing the consequences of a decision.

- The intellectual benefits of a good laugh are most striking when it comes to solving a problem that demands a creative solution. One study found that people who had just watched a video of television bloopers were better at solving a puzzle long used by psychologists to test creativity.

1b: Good mood enhances performance, not (only) the other way round

- Andrew Lo et al, 2004

- Online-Traders with more self-control underperform.

- Improving mood the night before explains 24% of the variance of performance of the best third of outperformers.

- Deteriorating mood the night before explains 35% of the variance of performance of the worst third of underperformers.

- Only trade when in the mood!
2: Recognize (= perceive and accept) your emotions

- The conscious mind works on 40-60 bits/sec and keeps track of a maximum of 7 objects, that is only a fraction of the processing capacity of the subconscious.
- The „Id“ often perceives faster and always more.
- Be conductive to ideas that are not (yet) based on information to the conscious mind (brainstorming).
- To the „(number-)crunch“ factor add the „hunch“ factor.
- Be conductive to but not just a conduct of ideas from the subconscious. “Id” is trigger happy and tends to decide on scant information (heuristics of availability, anchors, similarities, attention, Antonio’s pizza).

2b: An emotional registry for investors?

- Establish an emotional registry (Antoine Bechara)
- To the rational analysis of the cortex the limbic system adds the valuations and prejudice from emotions felt in similar situations in the past. The emotional registry helps to realize and thus neutralize these prejudices.
  
a) How did I feel last time and b) what was the outcome?
- (a) explains why if wish to act.
- (b) could be the basis to decide against this emotional urge.
- Alongside your trading records, keep feeling records - especially important for young investors.
2c: Soros’ “Emotional Registry”

“My father will sit down and give you theories to explain why he does this or that, But I remember seeing it as a kid and thinking, Jesus Christ, at least half of this is bullshit. I mean, you know the reason he changes his position on the market or whatever is because his back starts killing him. It has nothing to do with reason. He literally goes into a spasm, and it’s this early warning sign.”


3: Accept the limits to your knowledge

- My main topic is evaluation and decision making, but first a glance at perception and memory.

- The amount of information around us is unlimited. A very minor part of it we can apprehend with our senses.

- Of this we perceive only what fits in our (sometimes extremely distorted) model of reality.

- Some of that we remember somehow for some time but in a form that can be severely altered with the next recall.

- (Only) when the memorized item is marked with an emotion it is taken into account for evaluation and decision making.

- Winner Take All Nature of Neural Processing
4: Recognize your prejudices

- Behavioral finance: investors often act irrationally.
- Neuroscience has some evidence as to why that is so.
- Basis for critical reflection of this behavior applied to perception, valuation, decision, the whole panoply of behavioral finance.

4a: ... and thus neutralize unfounded urges

- When I realize, that my preference for BAYER over BASF is due to the fact that I live in Bayer town Wuppertal (home bias), I can put that into perspective and relativize.
- When I realize that only the disposition effect lets me stick to my looser shares, I can sell them.
- Gefahr erkannt - Gefahr gebannt or: Un homme averti en vaut deux or: once burned twice shy?
  - Martin Weber’s student’s portfolios
  - Antonio’s pizza
  - Hans Eberspächer’s spittle
  - Highway amygdala - prefrontal cortex: scant oncoming traffic
- We have to keep trying. Heisenberg’s Unschärferelation applied to emotion: any emotion reflected is not the same any more.
6: Muster courage for contrarian investments

- Better performance than dead fish.
- You have to deal with maverick risk, the risk of being wrong and alone. And this risk is real. Fund managers who correctly saw the equity bubble, were not in the business any more, when proven right in mid 2000. Although right in the long term, they had been wrong longer than their clients were willing to tolerate.
- But it is even worse. As Bob Shiller states in his "Irrational Exuberance", every era, every location has its Zeitgeist. Strong pressure to group conformity is mainly on the subconscious level. Deviating behavior is felt by the other group members as a threat to their reliance on doing the right thing themselves. They don’t like that at all. Contrarian investors not only have to consider maverick risk, but also, and mainly, have to fight a very strong subconscious inclination to follow the crowd.

6a: Social exclusion really hurts

Feeling the Pain of Social Loss (Jaak Panksepp)

Poets have long waxed lyrical about the pain of a broken heart. Now, as explains in his Perspective, this metaphor may reflect real events in the mammalian brain. A new brain neuroimaging study reveals that the brain areas that are activated during the distress caused by social exclusion are also those activated during physical pain. Thus, we now have an explanation for the feeling of physical pain that accompanies emotional loss-whether that be the loss of a loved one, rejection by one’s social group, or the distress of separation experienced by young animals.
7: Discipline

- Winning investment bets is fun, but normally takes hard training.

- Persistent outperformance on financial markets requires:
  - solid proficiency of financial instrument and analytical tools,
  - control of illusions as to the reliability of our return forecast (low) and risk evaluations (even worse),
  - Discipline, to stay on course when all others sway.

- Discipline is rarely fun

- Entertainment value of disciplined strategies no match for exploding tech stocks, penny stocks, gambling

- Discipline by definition means to follow preset rules instead of following the current emotional urges.

Hey, big spender - the neuroscience of saving

- Margo Wilson and Martin Daly, McMaster University, Hamilton
- Study with 200 young men and women
- Time preference individually different but consistent – at first
- Four (alternative) sorting tasks
  - 12 attractive members of the opposite sex
  - 12 non-lookers
  - 12 beautiful cars
  - 12 unimpressive cars
- Result: men (case 1) and women (case 3) discounted the future more steeply.
- Activity in the nucleus accumbens (forecasting, rewards, euphoria, hope, addiction)
- Men: mating opportunity mindset: “I want that now.”
- Women: status symbols, more susceptible to display of wealth
The Chemistry of Trust, Paying through the nose

- Michael Kosfeld and Markus Heinrichs of the University of Zurich explored the biological underpinnings of trust. They found that trust is surprisingly mechanistic: sniffing oxytocin increases a person's level of trust in others. Oxytocin, a hormone produced by part of the brain called the hypothalamus, is a peptides that can cross into the brain if administered as a nasal spray.

- To probe oxytocin’s role in promoting trust between people, the researchers invented a game involving an “investor” and an anonymous “trustee” in whom money, in the form of “monetary units” worth 40 Swiss centimes (32 cents) was invested. Each investor received 12 units. He could choose to keep all of them, or to give four, eight or all 12 of them to the trustee which would result in their value being tripled. All the investors and all the trustees had something sprayed up their noses before the experiment started. In some cases, though, there was no oxytocin in this spray. Of the investors who were sprayed with oxytocin, 45% invested the maximum of 12 units, while only 21% of those who received the control spray did so. On average, the oxytocin-sprayed group transferred 17% more money to their trustees than the controls. Oxytocin, therefore, seems to promote trust.

- While these results could be misused, the authors hope their findings will instead be used to treat mental disorders such as extreme social phobia. Nevertheless, beware of strange odours or mysterious vapours in the boardroom.

Neuroscience: Nothing to worry about?

- In a free society everybody is free to worry as she pleases, however absurd this may seem to a third party:
  - A chain smoker may sue his barbecuing neighbor.
  - A disco freak may suffer agonies hearing the dog next door.
  - A free climber may only invest in bonds.

- In the spring of 2002 the Economist devoted its cover story to neuroscience and expressed amazement that so far nobody seems to worry.

- Quite in contrary to gene technology, neuroscience has so far escaped the radar screen of our concerned contemporaries. Although here the possibility for manipulation “poses far more of a threat to human dignity and autonomy than does cloning.”