3-1-2012 4:21: Na eten met Ann Boeyen: Ilya Prigogin voor irreversability: <http://localhost.:55418/dissipative%20structures> : Economy as system with double irreversibility:

1. Micro-irreversibility: each transaction is irreversible because of the utility-generation which is a pre-condition for each transaction and makes reversing the transaction a direct loss of utility. This utility effect is fundamentally different from thermodynamics whre all physical laws at micro level have full
2. Macro-irreversibility: transactions are part of complex interlinked network of transactions which is statistically unlikely to be reversed (unravelled) .

Economics focusses too much on the actors: it should focus on the distinction:

1. Decisions: each decision of a person (even any animal, even every surviving system) is aimed at utility maximisation. Most of these decisions are not visible as economic transactions: waking up, heading west, read a book and all our personal actions.
2. Transactions: two (or more) actors take a decision together to exchange (economic) goods to optimise utility.

Decisions are far in the majority over transactions in number and influence. Hence we describe the influence in society in economy in transactions. Only recently (~100 years) transactions are registered in a way that accumulating-statistics can be made. Generally only the aggregate total transaction volume is used (GDP, turnover). It would be crucial to build economics on:

1. Number of transactions: N
2. Volume of transactions:
3. Power of transactions::

Of course the same would apply for al the personal decisions, where the influence of this distinction would be at least as important. This would however seem unmeasurable.

In physical systems we can reconstruct all 3 from external measurements like pressure (~number of impacts/sec \* impact impulse) and temperature.

13/01/2012 09:55: and any classical [dynamical system](http://localhost.:55418/dynamical%20system), relies heavily on [Hamiltonian mechanics](http://localhost.:55418/Hamiltonian%20mechanics) for which [time is reversible](http://localhost.:55418/Time%20reversibility), these approximations are not intrinsically able to describe dissipative systems. (Wiki dissipative sysem).

**15-1-2012: Pareto optimal: include ”third man” in every decision to make.**

18.01.2012 BOEK Perman: Natural Resource and Environmental Economics (Perman, Ma, McGilvray, & Common, 2003)

p.3 “Thinking about efficiency is in terms of missed opportunity. This often refers to some kind of technical or physical inefficiency which is usually assumed away by economists. Economists focus on ***allocative inefficiencies***”.

p.4 conditions hierarchy:

1. physical efficiency (irreversibility loss, energy output / input)
2. technical efficiency (usefull output / total input, eg exergy/energy)
3. allocation efficiency (usefull output / maximum possible output elsewhere)
4. (social) optimality (welfare maximization including external effects)
5. Intertemporal optimality (optimality constrained by sustainability)

p.6 John Stuart Mill (1857, book IV): “…It is only in in the backward countries of the world that increased production is still an important object; in the most advanced, what is needed is a better distribution…..”. ***efficiency***  
“I sincerely hope, for the sake of posterity that they will be content to be stationary long before necessity compels them to it.” ***growth***

Growth as a paradigm: (Georgescu-Roegen, 1986, p. 11)

p.7 “Classical economics used limits-to-growth arguments, based on a fixed land input, which did not have any place in early neoclassical growth modelling”. P6. “Neoclassical economists explained value as being determined in exchange, so reflecting preferences and costs of production. The concept of price and value ceased to be distinct.” MvB However only a small part of our economy are transaction decisions. As all decisions can be considered to optimise utility all self-centred and unilateral decisions optimise utility without any transaction. Getting up out bed to go to work can be considered part of an economical transaction with the employer, but the time to get up on a holiday is utility optimisation without a trace of a mutual price-value evaluation process of an economical transaction between two people.

So we should evaluate utility maximisation in a wider perspective beyond the possibly Pareto-optimal outcome of a large set of two-parties economical transactions.

1. Single party decision without transaction to other people.  
   Although no economical transaction directly, the utility maximisation over time includes of course the indirect impact of the decision to all other future decisions. This should naturally include influence on future two-parties economical transactions. For evaluating single actor decisions we have naturally no price-equilibrium and using the utility optimisation assumption is all that rests us. This would then gather all the biological and psychological needs-and-wants expressed in this single immeasurable quantity. Although all the innumerable personal decisions have a large influence on utility and directly visible economical welfare the science of economics focusses on transactions because that is the most visible, traceable object of study.
2. Transaction economy is dealing with the deals involving two (or more) actors that are together involved in the decision making.
   1. As with the single actor decisions in most of these decisions there is no explicit transaction, but still the driving force to do things together could be framed as utility maximisation. Examples could be friendships or marriages.
   2. In part of the two actor decisions there is a real transaction taking place: a deliberate mutual exchange of goods and services. Barter trade would be the common example.
   3. In a small part of these transactions money is used as intermediate part of the transaction. This is the area of economic studies modelling large number of two-actor transaction into a network which moves towards a state of (general) equilibrium in which price is an expression of the value of the goods and services and the cost to produce them.
3. Decisions in which a “Third party” is involved. These are transactions where two actors (or even only one) are taking a decision which also involves direct or indirect influence on the utility of other people.

Economic modelling focusses on class 2c of decision making. The attention to 2c is obviously generated by the fact that it is relative easy to observe monetary transactions and that modelling has brought great gains. General equilibrium modelling has clearly helped to formulate economic rules that have been instrumental in welfare improvements in many societies.

We will argue that, despite the common restriction of economic modelling to the class 2c, in reality class 1 and 3, and to a lesser extent 2a and b, are the ones that are at least as important as class 2c.

The reasoning is as follows: In the origin of mankind decisions were primarily class 1 individual decisions, just as is common in animal life. Only for mating and procrastination class 2a decisions were needed. Evolution has long worked to develop and select optimal decision mechanisms to optimise this. Of course these mechanisms are optimised by the conditions encountered during this long process of selection and survival.

When human groups became larger co-decisions (2a) between people became important, and with the increase of technology and possession (2b) barter trade became leading. The big change came with the trade using money (2c). This wonderful invention was instrumental in reducing transaction costs and was a key instrument to enable a 3 millennia long process of ever more goods and knowledge being exchanged.

As modern life is developed utility maximisation is a new sense: it is no longer surviving and procrastination in scarce and dangerous environments that is the core utility, but comfort and pleasure are the real new drivers behind utility maximisation. This shift is subject of studies like psychology and sociology.

Physics equivalent: This is unlike two molecules that collide in physics: they can mutually exchange their mass, impulse, energy, without any influence on their environment. It is more like two particles with an electric charge that collide: the field around the particles changes and so the collision has an influence on both particles charge and on the field around them.

Every transaction however is inducing an influence on its environment. In historic times the number of people was small and the number of transactions was even much smaller. As there was no infrastructure supporting economic efficiency transaction cost was high. As a result only transactions with a high utility-gain could be executed.

Nowadays however transaction cost has decreased by many economic inventions and a centuries long process of innovation to take advantage of market inefficiencies. Whereas equilibrium conditions of an efficient market still are not achieved in most markets, possibilities of trade, transport and information exchange have allowed an extreme amount of processes that bring the market closer to equilibrium. This increases the number of transactions, but decreases the potential utility gain of each transaction.

However each economical transaction inherently influences the two participants and interferes with the economic environment of the two participants. This combined with the ever increasing amount of transactions increases the total influence of *“externalities”* to levels that can no longer be ignored. This leads us to the point that in a near-equilibrium all transactions become a class 3 transaction.

This then has serious implications for the definition of a Pareto-optimal market. As the decision makers in a Pareto-optimal market are improving the utility only of themselves they don’t care about their externalities. This is Ok as long as the assumption of negligible externalities holds. As the externalities gain influence we have to define a new optimality criterion that includes *“Third party utility change”*. This creates a three dimensional diagram …MAKEN IN GOOGLE SKETCHUP.

06/02/2012 07:40:05 in trein.

Imagine a pure rational optimising intelligent chess player that likes betting.

He could make money if he is better in predicting and anticipating the outcome of games. The positions in a chess game are fully defined and the rules are clear and fixed. Ideal (economist defined) rational agent chess players should choose the best move in every move of the game. This makes the game forceful deterministic. So our third person can easily bet on the outcome of the game if there is another third-person willing to take a bet. In the deterministic initial position and the rational agent assumption he could bet an infinite sum on the outcome of the game.

So, if both players are rational agents, then any better is sure to lose his money if there is a single other person on the world that is smarter than he is.

Is this why is betting on horse races is more popular than betting on chess games?

What are the implications if the outcome of a pure deterministic game as chess is still fully determined by the two players? Why are they playing chess anyway? What is their economical ratio as rational agents to spend their time on this game. Initial position is deterministic, first move is with white, it is only rationality that moves the pieces and still the outcome is undetermined. Even the chances for the outcome are undetermined. One could estimate these chances on basis of the past performance of the chess players. This means that they are both different and do not fulfil the assumption of fully rational economical utility optimising agents. They might be intelligent, but even in a deterministic setting their behaviour is inherently not as rational as required by the initial assumptions.

If there is a utility in betting itself (the fun of the stress) betting on a random/unpredictable process is a good choice if the costs of the betting are tower than the utility generated. If there is however a single person that has a competitive advantage (e.g. fraud in horse betting or being more intelligent in chess) this person will be able to extract net money from the game. Participating in the betting will then have the sum of the cost of the betting and the net money extraction. So the price for the average better goes up and less people will find it lower than the utility they get from the betting process. That there are less people betting on chess then on horse racing can mean:

* The utility of betting on horses is higher in the betting-utility (fun factor)
* The cost of competitive advantage is lower in horse betting (less fraud, less rationality risk).

Because it is unlikely that here is less fraud in horse racing then in chess-betting we have to conclude that the rationality risk could be an important explanation for the limited betting on chess.

This has an important role in (deterministic) chess-betting and less in horse betting.

It is rational behaviour to assume that there are other peoples who are more rational-intelligent then you are.

**Stelling: In general it is the individual who has to assess his own irrationality against the irrationality in the market. If a market is fully rational no rational person should participate in this market. This is a contradiction.**

**Stelling: Estimating the irrationality of the market (distance to the equilibrium point) is at least as important as finding out where the equilibrium point is.**

Stelling: Garbage in = Garbage out is true in virtually all businesses. For Waste-to-Energy it is:  
Garbage in = Electricity out.

Stelling: Size of Eggcell+semen of an elefant is ~10µm à 10-15m3 = 2-50ton = 10-12kg = = 10-9g = 1ng

A baby elephant 105 kg at birth = 0,1\*250=247 cell doublings

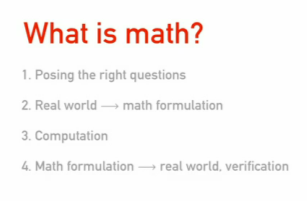
after 22 month= 670 dagen

Doubling takes place every 14 days average (faster in the beginning, slower at the end)

This growth is 5%/day.

Maximum full grown size is 10 ton = 100x baby in 20 years à 25%/year = 0,063%/day

It cannot grow further, not because of the growth-process, but of other growth-braking process that not only limit the growth, but completely stop the growth. Growth should be stopped before it collapses under his own weight. Growth modelling is only complete if the limitations are part of the process.

Tuesday, 21 February 2012: Economic modelling is focussing on solving the general equilibrium problem: where is GE and how to achieve this point of maximum utility. Yet in reality the economy is an “always far from equilibrium” system that is slowly reacting on fast changing “external” conditions. So it is hardly important to know the general equilibrium conditions, as long as we are sure that we are somehow moving towards maximum utility. The direction of the movement of the system state is crucial. As long as the invisible hand is steering towards higher utility we can be comfortable. But, if the invisible hand, or any other force (like corruption, political power play, military power or pursuit of ego) is driving us towards other directions we have to address ways to detect this early and surely. The finding of economic indicators for these kind of disturbances is what matters much more than the mathematical general equilibrium. In the end there are many “invisible hands”. As Adam Smith already noticed there is an “economic invisible hand” which is strong and effective in many cases, but in other cases other invisible hands are obvious causes for strong deviations from economic optimal behaviour.

The assumption of economic rational agents is good for easying the mathematics of general equilibrium thinking. What we need however is to extract irrational behaviour from the now available vast amounts of data.

<http://www.ted.com/talks/conrad_wolfram_teaching_kids_real_math_with_computers.html>

This is different thinking. The question is what we want to do and want to achieve with the possibility to map economic irrational behaviour? First it should be seen that it might perfectly be the case that the other invisible hands indeed should override economic rational behaviour. Ethical considerations are sometimes forcefully assumed to be part of the utility function, but it could be a better option to have a clear defined utility definition for economic optimisation. Then the economic invisible hand could do a bit of arm wrestling with the ethical invisible hand, or any of the other invisible hands that are ruling the world. So distinguishing several invisible hands is key to identify economic irrationality. And then accepting that economic irrationality can be rational by accepting higher order mechanisms. This would be a way out of the assumption that there is an unidentified utility function that covers all aspects, just in order to be able to assume economic rationality alone.

Friday, 09 March 2012: **General relativity of discounting: the fallacy of a single discount rate.**

Assume interest is the value of postponed utility. If all money inherited is transferred over an entire generation, the next generation should be able to have the utility of both generations. This gives an easy interest calculation where the age-expectancy determines the resulting interest rate. If an entire generation is taken as a full lifetime (inheritance at birth, passed through at death to somebody born at that time) we get the required base interest rate needed to generate the double utility for the second generation.



Alternatively correct the statistical age expectancy to the productive age by 30% of the years for growing up and education and by 10% for the last years in which health is limiting productivity and utility-consumption. These two values give an upper and under limit for utility-constant discounting.

An important consequence of this assessment of a base rate is that over the last two centuries, where life expectancy has more or less doubled in developed countries, the base rate should have a significant decrease.

Consequences: The high interest rates in the second half of the 20th-century would then be an anomaly that is opposite to the trend in the average-age-based rate. This means that the influence of monetary or government expense policies is even bigger then when the actual interest rates are compared to the average interest rate over the last two centuries.

14-10-12: (Georgescu-Roegen, 1986, p. 13): Discounting OK for individual with limited lifetime, not OK for society. Hotelling mathematics collaps when discountrate is zero.

13/03/2012: The same reasoning can be used for systems with a shorter lifetime. As example the question is what interest rate would be interesting for a one-day-fly to save or borrow money. We use the academic version of the Mayfly (Ephemeroptera), neglecting its larvae stadium and assuming an average life expectancy of 24 hrs.



The same way as above it is assumed that all money the one-day fly inherits is transferred over an entire generation, so the next generation should be able to have the utility of both generations together. The interest that is needed to generate this utility-conservation is “only” 2,93%/hr to generate the 100% (=doubling) per day. However if this value is translated to the human standard in %/year it shows an astronomical figure, way beyond all imagination of our human economics. If the one-day-fly lives in a leap year he will need the double annual interest to achieve his utility conservation. If the one-day-fly assumes he will live shorter or longer just one hour (in grey in the table) the interest he needs is five orders of magnitude bigger or smaller if expressed on an annual base.   
If a human bank would provide a loan to an entrepreneurial one-day-fly, at whatever conceivable rate, it would be extremely cheap for the fly. But on the other hand no one-day-fly would be happy to postpone his utility consumption for savings on a human bank if he would get only a 5%/year = 0,013% interest over his lifetime.

It is this asymmetry between interests depending on the life-time expectancy of a system that is crucial for discounting. A short lived part of a large system can borrow from the entire system to maximise its utility consumption, but it will not provide the savings to the long living system.

This has vast consequences for globalisation. Before 2 centuries borrowing money was mostly between people and lifetime-related interest rates were more or less equal between borrower and lender. Banks of rich families, spanning several generations, could lend money to people at attractive rates for both parties and were not dependent of savings brought to them. Borrowing was strictly limited by cultural and religious rules. Now size and implicit lifetime of banking gas grown to several human generations the related interest rates have decreased. And that it is this large banking system that is the primarily lender to individuals, asking and giving low interest rates for utility maximisation on the short run.

On the other hand for large investments with long lifetime, lending and borrowing at a larger scale in time should happen at significant lower interest rates. Especially when global problems play a role, like the greenhouse gas effect, it is important that interest rates related to the extremely long lifetime are available. Savings of governments, multinationals, rich dynasties and especially pension funds should be available for these types of investments. Of course the lifetime-interest gap makes it tempting to use this large scale funding for financing individuals. The consequence is then over-consumption at the micro level and under-funding at the macro level. Looking at credit crisis and global warming this is exactly what we see…..

A solution would be to reduce the size of consumer banks and have them fail often enough to have a lifetime of not much more than a human life. These banks could also attract money from individuals as their lifetime-interest rate is more-or-less similar.

So just as there is a clear split between one-day-fly utility maximisation and that of humans, there should be a clear split between discounting for humans maximising their utility and the discounting for global warming. A single discount rate is a fallacy, just as it is for humans and one-day-flies.

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Uit de nieuwsbrief Milieu & economie: **Journal of Environmental Economics and Policy** het levenslicht. Dit eerste nummer is gratis beschikbaar via <http://www.tandfonline.com/toc/teep20/1/1>. Roy Brouwer (IVM) is een van de redacteuren.

Di 22 may 2012

**Exponential Growth, growth within limits and growth with waste**

(for graphs see excel model: "C:\Users\Marcel\Documents\My Dropbox\2012\Promotie 2012\Article growth waste discounting\Gordon Schaefer Logistic model 2.6.xlsx")

In the economic science the use of the exponential growth-assumption is ubiquitous. Even in well written articles where assumptions are well defined and explained it the exponential growth is used in the modelling without even mentioning this as an assumption. However exponential growth does not exist in our universe. Growth can only temporary follow an exponential growth path if the drivers for growth are purely proportional to the existing results of the growth:

creates an exponential growth:

Many processes follow similar differential equations and show consequentially an exponential growth. The big “however” is the behaviour of the resulting exponential function over longer times. If the growth parameter “c” is positive the exponential function ***inherently*** will invalidate the differential equation. Every exponential growth is “explosive”, which means that after a certain time (a multiplicity of the time constant “c”) the process will outgrow the system in which it is embedded. This is inherent to the nested structure of our universe in which processes are always part of higher level processes.   
The consequence is that exponential growth for any process is ***only*** temporary a viable description of what is happening. As soon as the process grows to a size where it will influence the higher level system of which makes part of there will be a limiting influence. For any exponential-explosive process there is a stronger process that will sooner or later kick in to limit the growth. In electronics time constants can be nano, micro or milliseconds. This means that limiting of these processes is always part of the considerations. In mechanics time constants can be seconds till days. In economics time constants can be years till many decades (equivalent to a few per cent per year). This makes the limiting process less trivial for our human observation. Although Thomas Malthus already in 17..discussed the population growth and its limiting process humanity still has been able to handle growth in a fairly exponential form. Being part of this explosive growth process for over 200 years nevertheless means that inevitably there will be a limiting process cutting down the very mechanism of economic growth. This paper deals with the consequences that this should have for economic theory.

First of all the common assumption of exponential growth should be stated specifically whenever it is assumed. A viability check and a validity period should be added to this assumption. The viability check can use historical data to assess the rate of growth and check whether the process indeed is exponential over at least a full time constant (=1/rate of growth). Then the likely first-limiting process should be identified and estimated in order to calculate a validity period for the exponential growth.

Secondly the modelling should never be used beyond the validity period. Especially for predictions like in climate-effect studies or resource-economics there is an implicit assumption that economy might reach a faze where a limiting processes can cut down the explosive growth. Even if the limiting process cannot readily be identified exponential extrapolation is inherently limited by a “next level feedback mechanism”. This unidentified limiting process can have impact on the model under study. Therefore we propose in this paper to incorporate always a limiting process in any model that is dealing with long term effects.

Processes under study

First limiting Proces

Second limiting Proces

Nested process structure:

The limiting process forms an additional feedback on the processes under study. This feedback can have many forms which should be identified cases by case because the specific type can have dramatic implications for system dynamics. Studying the interaction between a process and a limiting process can be complex and is often a study on its own.

We propose to replace all exponential results by logistic functions. This is an approach to have a simple representation of the explosion-limiting process without having to deal with the complexity of it. This approach enhances the current practice to use a model with only its internal dynamics without the added complexity of incorporating the limiting process really in the model.

The logistic function requires an estimation of the time where the exponential explosion will be limited. This can be reverse calculated by estimating the first-limitation.

The logistic function that replaces the exponential term should keep the results unchanged in times where the limitation is not effective.

Before the limiting process gets significant influence on system dynamics this change in system behaviour only happens if the limiting process is….. In this paper we propose a general approach which is suitable to identify the validity period for the process under study in relation to study impact of an unidentified limiting process.

7-6-2012 uit email van EARE 21-5 link naar site:

**[Markets or philosophers: who is right? The question of the long discount rate](javascript:animatedcollapse.toggle('news18')" \t "_parent)**[arrow2](javascript:animatedcollapse.show(['news18']))

*Christian Gollier, Toulouse School of Economics*   
In their recent book, Eric Posner and David Weisbach argue that issues related to distributional justice should not prevent us to push forward effective policies to fight climate change. Climate change agreements that are aimed to solve all the world’s ills and in particular to redistribute wealth across nations are doomed to fail. One particularly important issue is the problem of intergenerational justice to which is associated the issue of the level of the discount rate. In their chapter 7, Posner and Weisbach present the two classical schools of thought for the determination of the discount rate. The “ethicist position” attempts to reason from basic principles about what the discount rate should be. One of these principles is a preference for the reduction of inequalities. On the contrary, the “positivist position” uses the standard arbitrage argument to claim that the discount rate should equal the interest rate observed on markets. There is no doubt that Posner and Weisbach are inclined to support the positivist approach: “The positivists are correct that choosing any project that has a lower rate of return than the market rate of return throws away resources” (p. 159). I would like to challenge this position.

In principle, if markets are frictionless and complete, the competitive allocation of resources is efficient and competitive prices provide the right signals to agents to decentralize this allocation. Applied to credit markets, this means that the allocation of consumption and wealth across time is efficient and that the interest rate should be used to discount cash flows. In particular, at equilibrium, the intertemporal marginal rate of substitution (IMRS) of consumption today and tomorrow is equalized to the rate of return of capital, i.e., to the interest rate. In other words, transferring consumption to the future by investing in capital has no impact on intertemporal welfare at the margin. This equality is perfectly illustrated by the Ramsey rule, which equalizes the interest rate with the IMRS. In this context, Posner and Weisbach are perfectly right to claim that sacrificing current consumption to invest in projects that have a return smaller than the interest rate reduces intertemporal welfare, and throw away resources.  
  
But we know that credit markets do not work particularly well. The recent subprime crisis illustrates the various agency problems that make these markets deeply inefficient. Moreover, recent researches at the frontier between cognitive psychology and economics tend to demonstrate that human beings may have difficulty to behave rationally relative to their consumption planning over their lifetime. Last but not least, credit markets are obviously incomplete. In particular, future generations are unable to write contingent contracts with current generations. These arguments imply that the market allocation of resources over time is inefficient, and that the competitive price of time does not provide the right signal to economic agents about saving and investment. This fact corresponds to the so-called “risk free rate puzzle” (Weil (1989). It states that the observed interest rate over the last century, which has been approximately equal to 1% in real terms in the U.S., is much smaller than the IMRS, which is usually estimated around 4% in real terms. This puzzle just tells us that positivists value the future much more than the ethicists, contrary to what is suggested by Posner and Weisbach. During the XXth century, we accumulated much more capital than what the ethicists would have recommended from their basic principles. This accumulation of (physical, human and intellectual) capital has indeed generated an extraordinary large growth in developed countries at the cost of very large consumption sacrifices from our poor past generations.   
  
Over the past decade, several colleagues have contributed to reducing the gap between the positions of the positivists and of the ethicists. In my forthcoming book, I survey several of these attempts. Most of them are linked to the role of risk in the toolboxes of the two approaches. From the viewpoint of positivists, because fighting climate change has uncertain cash flows, the risk free interest rate is not the correct benchmark return to measure the opportunity cost of capital. Adding a risk premium to the interest rate to determine the rate at which benefits of fighting climate change should be discounted is crucial. However, I don’t know any paper that provides estimations of the socio-economic “beta” of investment projects that reduce CO2 emissions. From the viewpoint of ethicists, the recognition of the presence of huge long-term risks affecting economic growth tends to reduce their estimation of the IMRS. Prudent planners should ask for more sacrifices to current generations if future generations bear more risk.   
All in all, I believe that a consensus is not out of reach between ethicists and positivists, on the basis of a real discount rate for long term investment projects that are safe around 1.5%. A risk premium should be added to this rate for projects whose future socio-economic benefits are highly correlated to future GDP/cap.  
  
Christian Gollier  
Toulouse School of Economics  
France  
**References**  
Posner, E., and D. Weisbach, (2010), Climate Change Justice, Princeton University Press. Weil, P., (1989): “The Equity Premium Puzzle and the Risk-Free Rate Puzzle,” Journal of Monetary Economics, 24, 401–421.

**EARE Conference Prague 27-6-2012**

Send paper on growth and discounting to Partha Dasgupta and to Gollier.

EARE Discounting I (Friday 11:00): Yoko Nagase, Christian Traeger, Reyer Gerlach,

Gerlach: there is no market for intergenerational transfer from which the rate can be determined.

Koen Vermeyre UvA (discount dissident in Macro economics)

Julia Swart (Utrecht assis prof, ook in rome gesproken, waste-economy in haar lectures, vragen referenties)

Title of paper1: **Growth and utility modelling: consequences of material stock and waste generation.**

Traditionally economic growth is modelled as exponential growth of GDP. In this paper we link GDP growth to the flow of materials and the accumulation of materials into a stock in society. The utility is then a function of both the materials flow and the materials stock in society. The wastage rate has a big impact on the behaviour of the stock in society. For growth within limits of finite resources the impact is even more fundamental.

Title of paper 2:  **General relativity of discounting.**

Exponential discounting is the standard way for intertemporal evaluation of utility functions. The choice of the discountrate often has a drastic impact on actual outcome of the evaluation. Choosing t he discountrate is a non solved problem for which there are many alternatives proposed, like (non-)-hyperbolic discounting. In this paper we chose a different approach: Discounting is not a property of the system that can be applied to evaluate or optimise the behaviour of an individual investment decision. No, it is the other way round: the properties of an investment decisions (like scale and lifetime of those who make the investment) are determining the discount rate. The interest rates that develop at the market are an emergent result of all these individual decisions.

For each individual decision the discounting is made relative to the lifetime and growth of the subject for which the decision is made. So discounting is not a system property that is relevant for the individual decision, but it is a property of the decision to be made.

This has profound consequences for the properties of the discounting. Aggregation of discount rates of many decisions into a discountrate for the larger system is no longer straightforward.

Discount rates become depending on scale to asses and the period of tame relevant for the problem.

Nav presentatie Gould: hij slechts twee discountrates.

For our more earthly creatures a market-rate would be the discount rate. For a social planner the discountrate is lower (see Gould 2012) because of the scope of his system (in time and options to settle between different individuals). A worldwide social planner, as could be envisioned for the climate effect, would use an even lower discountrate than a national social planner would do. To pull this to the extreme: an intergalactic social planner (“God”) would have such a long horizon that discount rates would be zero. This is just like Ramsey in his original formulation argued that for ethical reasons the discountrate would have to be zero.

Growth is a major subject in economics and modelling it as exponential growth is a central paradigm in economics. There are good reasons for using exponential growth:

1st exponential growth is direct result of many differential equations that are describing linear processes. 2nd expogro is easily understood and expressed in percentages per year. 3rd expogro is matchin surprisingly well with many real world economical processes that we can evaluate.

However, expogro does not match with some other fundamental fenomena like ”limits to growth” which make the underlying system inherently non-linear.

Back to Malthus this assessment has been the very basis of economic theory. Resulting in ….verburgh? (183?).. defining the basic differential equation leading to logistic growth.

However simple, this approach is not used in modelling consequences of growth. Probably because of mathematical ease and good practical predictions in the past we also use exponential growth for modelling the future.

Adding limits-to-growth to the classical Ramsey 1928) equation would lead to…..

The question is whether the utility itself should be discounted (time preference) or that the generation of utility from the economical goods is relative to the size of the economy. In a growing economy the utility from an additional economic good will be relatively decrease.

or

The difference between the two is only the nonlinearity of the utility function as long the growth of total consumption indeed is (more-or-less\_ described as exponential.

When however the growth happens within limits the relative value of than good will no longer decrease exponentially to zero.

For all the time before the transition this approach is the same as the exponential discounting. In the long run however this mathematical formulation is consistent with growth-within-limits. The exponentially limited growth to the asymptote is then again simple to be used for analytical analysis.

Only in the transition period in-between pure exponential growth and fully exponentially limited economy the logistic function adds complexity to the analysis. For really long tern studies this can however be omitted, and for short term analyses it can be approached as linear growth transition period.

Logistic growth is not time consistent in the transition period. This is however a property that is an inherent consequence of a transition period where the properties of the economic system are changing fundamentally.

Having discounting relative to the actual size of the physical economy

…… This way of origin and result could not be reversed. Never use market rate to determine the discounting for a decision.

Schumperial growth is driven (only) by R&D.==> energy efficiency improvement is one of the drivers for growth -> R&Dà reboundeffect.

8-7-2012: The word akrasia means the state of acting against one's better judgment. It is often used in philosophical discussion to describe the lack of self-control.   
In this paper we propose the use of the word in a generalised meaning to **all economical sub-optimal behaviour and define: Akrasia is the difference between the optimum choice and the most likely choices**. For a system in which there are many states possible we define “A” as the difference between the maximum utility possible in the system for any choice and the utility of the observed choice

Where and with x as the vector that represents the state of the system over time.

The distance between the utility of the optimum and the chosen state is caused by all the mechanisms that influence decision making, to sum up a few: weakness of will, time preference, ignorance, stupidity, short-sight, greed, over self-esteem, information lack, information asymmetry, power abuse, monopoly, …..

It is the mental-decision making equivalent of the entropy in molecular movement. The more options there are to be considered the ***less likely*** it is that the optimum will be chosen. In a real world it is the counterforce driving the system state away from the single/few state(s) with maximum utility. In a general equilibrium the akrasia is zero by definition. In a real world situation the complexity of the setting leads to an akrasia 0<A<Umax.

Real world akrasia can be estimated by evaluating (ex-post) the distance between the optimum decision in a well-defined choice-set and the real world.

Example: consider a stock-market trader having a sum of “x” to be traded optimally in a set of “n” stocks in-between the time t0 and t1. The maximum profit that can be made can be evaluated by ex-post analysis of investment moments and sum to invest, at any time choosing the stock with the highest positive gradient. Possibly additional rules can apply like transaction costs or limitations to the amount of transactions. When the stock value data is known for the period between t0 and t1­­ a path of x(t) can be calculated for which all rules are satisfied and the return is maximised. For the real trade path of xchosen(t) the return is calculated. The difference then is the missed opportunity because of the non-optimal behaviour. For stock markets data is available to determine Umax and Uchoice for each trader or fund.

The relative akrasia is then:

This is a measure of the difference between the real trader and the economically perfect trader as is used in economic theory. The ex-post analysis provides the data which a rational economical agent would have anticipated with perfect foresight.

If a is small then the trader is well represented by the economic theory and markets will indeed be efficient. If a is big then the economic theory should include a non-equilibrium term in its models. It is to be expected that a stock market is rationally optimised and akrasia for the stock market is smaller than for most other markets.

11-7-2012: **Reboundeffect: CO2-tax and Cap-and-Trade**

The rebound effect has different implications for the CO2 reduction with CO2-tax and the Cap-and-Trade.

A CO2-tax works in three ways:

1. First it assumes a functioning market with mechanisms that optimise energy use depending on price. Every optimisation has a decision based on the price, so the CO2-tax will encourage these optimisations.
2. Secondary the CO2-tax is a fixed component in the energy-price, reducing its volatility and is especially limiting the minimum prices. This enables long-term projects and research which are especially sensitive to the risk-component in the financial evaluation.
3. Tertiary every optimisation has a reducing effect on the market-price of energy. Over the price-elasticity this results in a rebound effect. A rebound-effect of 100% will exactly compensate the savings of the optimisation only if linearity is assumed. The visibility of tax can create a stronger effect then a similar price reduction. This non-linearity can curb down CO2-emission even with a rebound-effect of 100% or more.

For a CO2-emission-ceiling the rebound effect is different:

1. Also it assumes a functioning market with mechanisms that optimise energy use depending on price. Every optimisation has a decision based on the price, so rising prices due to the ceiling will encourage the optimisations.
2. The influence of the CO2-ceiling on the price is variable, adding another component to the volatility of the cost of energy consumption. When the economy is down the energy-price and the CO2-price will be low. This downward risk is evaluated stronger then chances on peak-prices, effectively blocking long term projects.
3. Every optimisation has a reducing effect on the market-price of energy and on the CO2 market price. At the emission-ceiling the CO2-price-elasticity is zero. This means that optimisation measures will have a perfect rebound. Any (spontaneous) invention that optimises energy efficiency will crowd out other innovation or research-projects till the point that only the implemented ceiling determines the path of CO2-reduction. The total-factor-productivity or Solow-residual will be effectively be reduced by this mechanism.

Both measures fully rely on functioning market mechanisms, but effectively Cap-and-Trade is a state-planning that enforces a minimum innovation to achieve the CO2-ceiling. At the same time creates an upper limit on the progress of implementation of innovations. This makes that Cap-and-Trade only works out positively if, and only if, it is extremely ambitious in the trajectory of lowering the ceiling. If the trajectory of lowering the ceiling is not ambitious the autonomous innovation could be fast enough to keep prices low, but then the Cap-and-Trade mechanism does not have any added value. In the case of lower economic growth the relative low emissions will lead to low CO2 and energy prices, creating a double signal to stop innovation for lowering CO2-emissions.

The trajectory of lowering the ceiling should be based on reduced economic growth, the fastest possible innovation and implementation of these innovations in order to prevent rebound-effects. This leads to high and volatile prices hurting both vested interests and innovations. It is questionable whether such a trajectory is feasible with respect to political-economy mechanisms.

2-12-2012: CO2 Cap&Trade in California combined with additional measures to increase efficiency.

<http://www.robertstavinsblog.org/2012/12/01/while-international-climate-negotiations-continue-the-worlds-ninth-largest-economy-takes-an-important-step-forward/>

13-7-2012 Hoera, gisteren eindelijk referentie gevonden voor **logarithmic discounting**: Takahasi 2005 is al 63 x geciteerd, simple, kort en krachtige onderbouwing voor hyperbolic discounting.

Logarithmic time awareness makes ultimate sense. As above use lifetime of animal as the base: bee = 6 weeks, beehive= 6 years. The discounting is a consequence of optimisation of behaviour to enable a lifetime and generations to follow. Not the other way around.

Now work on time inconsistency between linear and logarithmic time perception. Limit the use of akrasia for this effect. Combine it with different discountrates for different lifetimes (see one-day-fly above) and show that this is a base for general irreversibility of transactions.

Then show that this causes a sub-optimality (lower utility then max-welfare) which is the ultimate driver for change and progress in society. Sub-optimality within the given conditions helps to change the conditions, creates new degrees of freedom that then allows for further growth of welfare.

16-7-2012: Waste and the fundamentals of **negative price.**

The economy of trading with waste is not really recognised as having special problems in economic modelling. Negative prices however return the match between product quality and transaction asymmetry.

Normal: a product is 99% OK, 1 % not OK: The client returns of course the product and gets the refund. So his being unsatisfied is rewarded with 100% money.

For waste however the waste treatment facility has to pay back the 100% money if he misses only 1% in quality. This is of course an enormous disincentive to reverse the deal. Being marginally unsatisfied with the deal will COST the full price of the transaction. This is an enormous hurdle to create an quality optimisation process in the trading. Consequentially only the price mechanism is the consequence of the market of trading with negative prices.

18-7-2012: **Chapters of thesis**:

1. Introduction: Explanation of 2003 CBA Dijkgraaf, environmental impact, economics, discounting, efficiency, rebound effect.
2. Utility of Growth in a system with waste and limits: Logistic growth, Utility and waste (Utility on flow and stock in society U(c(t))= c(t)\*(1-w-s) + Integr(s\*c(t))dt, (waste-rate, stocking-rate, sustainable supply on top of limited stock supply), growth with waste modelling.
3. Discounting: growth dependence, system limits dependence, endogenizing discounting. Logistic time awareness.
4. CBA Waste-to-Energy: consequences of exponential or hyperbolic discounting and influence of economic modelling.
5. Add-on: rebound effect for energy and for waste. Total rebound.
6. Conclusions: no exponential discounting, matching waste recycling with sustainable production.

19-7-2012: **Difference in discounting as irreversibility of transactions.**

The logistic time awareness of an individual results in hyperbolic discounting for him (Takahashi, 2005). A bank however, has a fully rational approach in real time and employs exponential discounting.

File Gordon-Schaefer 28The private person and the bank have different discounting curves because the type of discounting differs. The difference in the two discount functions creates a ***dynamical inconsistency in intertemporal choices***. If also the rate used for the discounting differs between the two parties doing a trade-transaction the deal is even more irreversible. This taking advantage of difference in discounting the value of time is one of the drivers in generating value by trading. Using exponential discounting in general equilibrium modelling kills this driver of the trade that is needed to establish the trajectory towards the GE. ***The surface within the loop of the graph*** shows the utility generated by the use of different discounting functions between a consumer (hyperbolic discounting) and a bank (exponential discounting) for extending a loan with 10 years from now. In the graph interest rates are taken as 1/80year = 1,25%/year for both curves. If the discount-rate used by the bank is higher than the difference between the future value of an individual and the bank is even bigger. This higher future value for the individual makes it worth to pay the rent.

Transactions between two parties with different discounting will inherently be irreversible. In a general equilibrium this is not possible. The general equilibrium of idealised actors has an unavoidable difference with a “dissipating” equilibrium of agents with different discounting curves. Call this difference Akrasia (see above at 8-7)

??definieren consumptietijdstip voor versimpeling.

22-7-2012: **the need for irreversibility**.

[Steven N. S. Cheung](http://en.wikipedia.org/wiki/Steven_N._S._Cheung) thinks that private property rights are institutions that arise to reduce transaction costs. The existence of private property rights implies that transaction costs are non-zero. If transaction costs are really zero, any property rights system will result in identical and efficient resource allocation, and the assumption of private property rights is not necessary. Therefore, zero transaction costs and private property rights cannot logically coexist. (from <http://en.wikipedia.org/wiki/Coase_theorem> )

Stelling: The presumption of no transaction cost in many economic theories puts them on par with Newton’s first law that applies when no friction is available: A fundamental theory that is perfect for outer space. For more earthly applications it is the exactly the study of friction and transaction cost that results in finding useful applications. Transaction cost and consequentially irreversibility of transactions are a direct consequence of property law. It is the irreversibility that shapes the system. Finding a measure for the irreversibility is key for all optimization of economic systems.

Stelling: For this thesis the emergence of waste out of economic transactions is a crucial deviation from the zero transaction cost assumption.

Wo 22-8-2012, 03:00 La Londe balkon. Write out the article on the intuition:

Distinguish: Free Utility B=U-TS in equivalent reasoning as thermodynamic enthalpy and free energy (energy and exergy).

For a given economic system or model U is the maximum utility possible. This requires a system in (general) equilibrium that full fills the standard assumptions of economic modeling (e.g. frictionless trade, full information, no transaction cost, fully rational utility optimization). Normally it is implicitly assumed that other activities which go on outside or beyond the modeled system (like the supply of food) do not interfere with the system or model under consideration and do not interfere with the state of equilibrium. The available number of states in the system that have this maximum utility to one or a relatively small number of equally Pareto-efficient states. Any driver that creates economic activity would bring the system out of its Pareto-efficiency. This means that the system has to be “perfectly ordered” and economic activity has come to a halt (because it is already in a state of Pareto-efficiency).

Now assume a system with losses, degradations and wastes which are reducing utility in a non-homogenous way. This brings the system out of the Pareto-efficient state and creates new degrees of freedom in which the system can be. Economic activity pushes the system back to equilibrium. There is a difference between the utility of the full equilibrium without economic activity and the utility of the equilibrium with losses, degradation and wastes. Assume the generation of losses, degradation and wastes is a continuous one. Then the system will have constant economic activity and will not reach the Pareto-efficient state. The next approach is an intuition to find a way to express the difference between the maximum utility and the utility in a system with constant degradation of utility.

Assume B is the ***FREE UTILITY*** which is the utility for a system or model which can be out of the Pareto-efficient state. 0 ≤ B ≤ U

To estimate the difference between the maximum utility and the free utility we need an indicator for the complexity of the system which determines how far the system is away from the state with the Pareto-efficiency. Further we assume the system is stable which means that the utility generation by economic activity is a force that pushes back to the equilibrium equal to the utility degradation.

We chose B = U - T∙S

S is the entropy = k log W where W is the number of system states that the system can occupy. For the equilibrium there is a number of states that poses the maximum utility. This is the minimum W. For each incremental deviation from the equilibrium there a (large) number of possible system states that is additionally available.

k is a constant/variable that expresses how stark the utility impact is of economic activity varies with an additional number of degrees of freedom: [ Util/Euro/log degreesof freedom.

T is the relation between economic activity and utility. 05:26

10-9-2012: Probably GDP per person is a good indicator for this economic activity as it comprises GDP = ∑ Transaction-Value = Number-of-transactions \* Average‑transaction-value. It might be a consideration that the Root-Mean-Square would be a better indication for the entropic impact of the transactions:

………..

<http://youtu.be/86x-u-tz0MA>: Elizabeth Gilbert: A new way to think about creativity

Di 11 sept 2012: <http://youtu.be/BltRufe5kkI> : Peter Diamandis: Abundance is our future.

……..

20-9-2012,05:30

In (Braun, Orthega, Theodorou, & Schaal, 2009) a kind of “free utility” is proposed. This has a nice observation in the analogy between an (ideal) gas where molecules interact and the economic transactions where people interact. In his proposal for the entropy part in the “free utility” he uses the information value of the entropy of the choices to be made. We support the idea that there is definitely an impact of “choice-space” on the utility that can be reached in practice. Although a certain maximum utility might me possible for an ideal economic agent if he has perfect information the availability of millions, billions or more of suboptimal choices creates the *chance* that a somewhat less than perfect agent has a chance to chose a less than perfect choice. This means that the mere availability of many options must have an impact on the average utility for a group of less than perfect agents.

The use of the informational-entropy is based on the physical system behaviour as found between molecules or bits of information. We however argue that in a science-of-humanities the principle must be the impact of the choice-space on the *human decision maker*. So although the choice-space still influences the chance of making the optimal choice this influence should have some economic framework instead of the mere informational influence. Indirectly this is also done by Braun 2011 who directly uses the Shannon-entropy.

In this the proposal for the free utility is:

The represents the economic efficiency of the society in which the choice is made. It relates the monetary economy to the human perception of happiness. The represents the size of the choice that is considered and the is a constant that expresses the relative impact of the choice-space-size.

With this proposal we introduce a *force* that drives the real economy from its ideal fully rational and fully informed optimum. This force can be used to model non-equilibrium stationary situations like in (Lems, 2009, pp. 121-136).

This economic definition of realistically achievable utility is the combination of Braun’s informational influence of choice on utility and Lem’s calculation of about a force resulting from having a large state-space in which the choices are made.

The that expresses the relative impact of the size of the choice-space is then an expression of the social and psychological mechanisms that deviate from rational, informed, non-monopolistic, non-corruption ideal economic behaviour. It seems logical that economic theory needs an expression which relates utility to monetary and behavioural aspects of a society. Of course must be *measured* by experimenting with people in choice situations. 06:45

27-9:

The economic entropy is related to the informational complexity of the choice (the Shannon entropy of the degrees of freedom in which the choice is made) and the monetary impact of the choice:

This is corresponding with the Shannon-entropy of the possible choices, an equivalent of the way thermodynamic entropy is related to the degrees of freedom in a physical system.

Scaling issue: <http://en.wikipedia.org/wiki/KT_(energy)> + <http://en.wikipedia.org/wiki/Canonical_ensemble>

24-9-2012 blauwe teehuis. Opmerkingen voor dagboek toe te voegen:

EAERE 6-2012: C.Traeger, UC Berkely, Discounting: Weitzman-Gollier Puzzle.  
Photo P1090988-P1100017: "D:\Public\Pictures\2012 foto's\2012 06 29 EAERE conferentie Praag presentaties\P1090986.JPG"   
My quick interpretation: General relativity of discounting:   
1. Weitzman: Discounting is dependent on the reference system; uncertainty of growth.  
2. Gollier: Discounting is dependent on the project; uncertainty of payoff.  
3. MvB: Discounting is dependent on point in time: Time perception is relative, (Logarithmic time perception instead of linear): from one year to two years is the same relative uncertainty as from one year to two years. In climate effect: rational discounting on logarithmic time.

General: Exponential discounting implicitly assumes a linear world model: no uncertainty and no location and time dependency. This is OK if the world is quasi-linear around a specific case or project. Exponential discounting should not be used if uncertainty has an influence, location is important or time to consider goes beyond the period for which the discounting is validated as approximately linear. For longer periods discounting is generally a tricky area. Looking at nature we see that living creatures have a behaviour that indicates that discounting is depending on their lifetime. And also that social communities (like bee’s, ants and termites) have a much longer lifetime and behave with much lower discount rates than their individuals do.   
Market interest rates (corrected for risks) are an expression of average discounting value of money within the future that the individuals can oversee. Differences between short-term rates and 10 to 30 year interest rates (corrected for uncertainty) are an indication of non-linearity. There is no averaging of expression of revealed interest-rates or revealed discount rates for individuals. Even the markets for this are gedomineerd door institutional investors (banks, pension funds, family-capital) that have a longer lifetime than the average individual.  
For all periods longer than the revealed expression of discounting for the individuals we will have to rely on lifetime-based discounting relating to the *lifetime of the ensemble of individuals*. There is abundand evidence that behaviour is not following exponential discounting as is based on linear time perception.

Revealed evidence shows that people in societies very often behave with very low discount rates. Examples are the construction of Egyption piramids, Maya temples, Indonesian Borubudur, European cathedrals and many infrastructural works which had construction times equal to or exceeding average lifetime in society. This means that the apparent discountrate of these societies is much lower than the discount rates that would follow on the average lifetime of these individuals. In these societies beliefs play a role to influence individual’s behaviour to match with the lower discount rates of the society of a whole. This might be a crucial link between the individuals behaviour and the lifetime of these societies.

A further non-linearity is the (possible/apparent) asymmetry between the discounting of positive and negative future value.  
First there is the observation that people in western developed countries tend to have on average a significant positive possession (search average inheritance in NL/EEU/US). This indicates non-rational behaviour of the individual, but could indicate rationality when considering multiple generation family perspective. The fact that many countries facilitate wealth transfer via inheritance-legislation indicates that society supports this long-term perspective dat het individu overstijgt. These inheritance regulations have a very long tradition (as far back as Egyptians, Babylon, Israel) and could be seen as one of the mechanisms that encourage individuals to use a low discount rate for future value.

**Negative value market**

So there is some evidence that a society discounts the value of positive goods (considerably) lower than the individuals do. This however does not apply for goods with negative value, like waste or nuances. Only recently markets have been established for goods with a negative value. That has to do with the fact that these markets can only exist if regulation is in force to avoid the “free-disposal” behaviour for products with a negative value. Nowadays in some western countries waste is traded as a commodity with negative value. This is however a recent development and only a limited number of countries and a limited number of goods. This seems to be inherent to the way these markets develop: for negative-value markets the initiative must come from a regulator that creates the market. In a positive markets goods the initiative for trade can come from either consumer or producer and a regulator is in principle not needed to establish the market. But negative prices cannot occur as long as the producer of the good has an option to avoid the deal. Consequently some (legal) force must be in place to create the market.

In most discounting discussions the implicit assumption is a symmetry for future (positive) value and future negative value. The different market structure however makes discounting in markets for goods with a negative value is not (NOT!) automatically equal to the discounting in normal markets for goods with positive value.

|  | **Positive value good** | **Negative Value good** |  |
| --- | --- | --- | --- |
| Parties | Two party deal between producer and consumer | Three party deal: producer, consumer and regulator |  |
| Deal | Both have a positive value-surplus or no-deal. |  |  |
| Externalities | Externalities not priced in | Externalities are basis of regulation and so indirectly for price formation |  |
| Timing | Both parties have emotional bias to close the deal “now”, rational evaluation of timing. | Producer of negative value good (eg. Waste) has bias to postpone treatment.  Treater of waste wants to close the deal now.  Regulator should be rational with maybe a precautionary bias. |  |
| Uncertainty | 1. Consumer developments of the needs. 2. Producer development of production capacity. 3. Market development (balance of other consumers/producers) | 1. Producer estimate of externalities. 2. Treater development of production capacity. 3. Market development (balance of other consumers/producers) 4. Regulator future (political) support for regulation and handhaving. |  |
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25-9 :05:10

Utility = Bliss – entropy of the choices.

Assume a new-born has a potential of 100 years \* 8760 h/y \* 100% bliss = 876 000 blisshours.

Each and every choice he makes consumes a bit of this potential utility.

It cannot be expected that all his choices are optimal for his total utility over his life.

E.g. if one of his cells “chooses” a mutation that leads to dying on cancer at his 60ths birthday this choice costs him (100-60)y \*8760h/y \* 100% bliss = 350 400 blisshours (for simplicity we assume a sudden death). So each cigarette that induces the risc of such a mutation provides utility during the smoking of the cigarette.

So for 6 minutes of smoking: *……………..review formula…………..*

If the impact of the cigarette is known……

If a television set is bought with a lifetime of 10 000 hrs and the supply of electricity and TV-signal for 50 channels is included this provides a utility that is lower than the best choice:

1-10-2012: **Why is the entropy of the choices reducing utility?**

As utility is not defined in absolute figures it should only be discussed in a comparison of one situation against another (reference) situation. If the reference situation is a perfectly rational, fully informed general equilibrium this leaves the economic actors with choices between equal options that resulting in the same utility. Any other choice would be the result of misinformation or it would be irrational.

However if the amount of choices and their options increases, the combination of even a few choices provides astronomic numbers of combinations of choices and options. The share of optimal choice-option combinations of the to the total number of choice-option combinations becomes an astronomical small figure even for relative small experiments or models. This makes the chance that the optimum choice is made astronomically-unlikely. It is this power of the large numbers that invalidates the assumption of perfect rationality and fully informed economic decision maker. So the outcome of a (set of) choice(s) is in all (practical) cases lower than the maximum utility that we can derive mathematically. Only in a perfectly defined choice set of limited size (number of choices) and complexity (number of combinations of options) can be evaluated completely. This requires boundaries in choices, place and time that exclude all external influences.

*Example:* Each move in a chess game is an (economical) decision (if it is played for money). It is the complexity of this set of choices and options that makes it unlikely that somebody makes a move that that is optimal. In fact even for this limited and well defined set of choices the best first move has not been established after centuries of intelligent people thinking about it. In artificial intelligence the “horizon effect” is the problem that due to the immense number of possible states only a few ply can be evaluated completely. Evaluation functions that prune the search tree search for quiescence in order to avoid the risk of situations with too many risky options to evaluate in available time. So there is always the possibility that a few ply further away there is a winning move that is not evaluated because it is behind the horizon.

9-9-2012 (in schrift, ingevoerd 11-10)

**1e zinnen voor proefschrift**

In 165. Newton wrote an absurd assumption that proved so succesfull that it ruled science for the next 250 years and it still is the basic education for all students in physics. Nevertheless it is a strange assumption that motion continues without decreasing speed if no action is performed on it. It contradicts all human experience and it is not verifyable in an earthly environment where there is always a form of friction.

But the perfect simplicity of the assumption combined with the perfect prediction of movements of the planets made the theory the rock-solid basis of mechanics. Only 200 years later an additional theory developed which was useful for describing deviations from Newtonian descripton of movement. It was thermodynamics that added the concept of irreversibility. Via Carnot, Clausius, Gibs and Boltzman ever more tools became available to describe specifically the difference between reversible processes and processes in which irreversibility plays a role. In engineering real world processes like steam engines it became increasingly important to understand the nature of deviations from frictionless models. It proved a long route from the mechanic-deterministic models to the models for irreversible processes based on the statistical properties of *complex systems.* Even today science and engineering try to use as much as possible the deterministic relations, and then use linear approaches. Students learn almost all theory about ideal gasses, even if these gas-models can not deal with condensation of vapour into water. This complication is avoided in order to keep linearity and deterministic properties in the model. The main advantage of this Linear-Mechanic-Deterministic (LMD) modelling is de “coherence over scale”. The LMD-behaviour of large number of particles (or people) is directly coupled to their individual behaviour. Although in principle this behaviour remains the same if the system is extended, the added complexity makes the system-behaviour increasingly sensitive to the initial state.

Many many authors have explored relations between thermodynamics and economics. To name some: (Georgescu-Roegen, 1986, pp. 8-9) (originally 1971), … (Smith & Foley, 2002).. (Kümmel, 2011).

See extensive website on the subject: [http://www.eoht.info/page/Economic+thermodynamics](http://www.eoht.info/page/Economic/thermodynamics)

These approaches generally try to construct a direct relation between thermodynamic properties (e.g. energy, entropy and exergy) with economic properties (e.g. utility, value). This has up to now not been successful in generating a contribution to mainstream economic applications.

In economics the use of the frictionless free-trade-perfect-market is the basis for modelling reality. It has proven to be extremely useful to generate many insights in operating and optimising the economy. Nevertheless it is a strange assumption and far from reality in most cases.

It is the aim of this thesis to propose a for economic irreversibility a theory similar to the thermodynamic irreversibility. It is a construct from scratch based on analogies with thermodynamics, but respecting the key differences in the properties of utility versus energy, choice and entropy etc.

|  |  |  |
| --- | --- | --- |
|  | **Thermodynamics** | **Economy** |
| **Micro objects** | Individual particles | Individual people |
| **Micro interaction** | Collisions between particles exchanging energy | Transactions between people exchanging value |
| **Micro-reversibility** | Laws of nature are symmetric in time àmicro reversibility of all collisions | Individual transactions are irreversible |
|  |  |  |
| **Macro** | State properties: pressure, temperature, volume, enthalpy, entropy. | State property: capital  Flow properties: GDP |
| **Macro-reversibility** | In equilibrium state (slow) reversible processes are possible as a limit case. All other processes are irreversible. | In a general equilibrium (Pareto optimum) there is no trade.  Trade to equilibrium is irreversible. |
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General equilibrium

11-10-2012

An economic general equilibrium is the state where all transactions are Pareto-efficient. This means that these transactions are not negative for anybody, and that net utility is generated. The fact that net utility is generated means that the transaction can not be reversed, because this would then be not-Pareto efficient for at least one of the participants in the transaction. This matches common legislation in economic transactions: “a deal is a deal” which makes transactions irreversible (except in certain cases where guarantee is granted in order to compensate for mis-information or failure). So there is no micro-reversibility in economics

Define state variables:

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Because the absolute value of the utility has little importance the actual interest is the the differential equivalent which expresses the change of utility for a certain choice:

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| --- | --- | --- |
|  | is the free-utility: it is the utility in non-equilibrium state where economic actors still have utility improvement as incentives to do trade. |  |

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| --- | --- | --- |
|  | is the utility in a general equilibrium: a Pareto optimal exchange economy without production and consumption of the goods. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | is the utility of the choice space. | |  | |
|  | | is the utility of the choice space. | |  | |

|  |  |  |
| --- | --- | --- |
|  | is the factor to normalise the utility effect to the currency in use. It is a macro property of the system. Util is the total utility in the system. € is the GDP….??unit €/time?? |  |

|  |  |  |
| --- | --- | --- |
|  | is the economic entropy of the choice-space in that part of the economy. It is the value of the possibility to choose suboptimal and it expresses the effect that in a large number of choices it is unlikely that the optimum will be chosen. S is the weighted average of the utility for all possible choices. |  |

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| --- | --- | --- |
|  | is the size of the choice-space relative to the Pareto optimal choice-space. 1/W is the chance that a certain |  |

|  |  |  |
| --- | --- | --- |
|  | is the size of the Pareto optimal choice-space relative to the total choice-space. It expresses the chance that a random choice-set will lead to a Pareto-optimal outcome. |  |

|  |  |  |
| --- | --- | --- |
|  | is the chance that a random choice-set will lead to destruction of all utility. |  |

|  |  |  |
| --- | --- | --- |
|  | is the effect of export or import of utility outside the boundaries of the model (e.g. externalities). |  |

|  |  |  |
| --- | --- | --- |
|  | is the utility produced by making choices and executing them. |  |

|  |  |  |
| --- | --- | --- |
|  | is the utility decay by enjoying the consumption. |  |

The economic entropy S is path dependent and each choice generates a dS. For Pareto-optimal choices dS=0 and for a destroy-all-utility dS=Uideal.

If for a transaction

* dS=0 then there is no net utility change and so the transaction could be reversed without problem.
* dS<0 then there is a net increase of free utility. The transaction is Pareto efficient and could not be reversed.
* dS>0 then there is a net decrease of free utility. The transaction destroys value/utility and could in principle be reversed with a Pareto-efficient return-transaction.

**Experimental use**

The economic entropy S is a measure for the rationality of the decisions.

For reversiblility you need Quasi static state and frictionless change.

Spontaneous processes are irreversible.

General Equilibrium Pareto Optimal: Uncertainty and time (Levin, 2006) via: “Arrow’s insight was to introduce “states of the world” along the lines of Savage’s decision theory. A state of the world is a complete description of a date-event.”

Random choice general equilibrium: (Birchenall, 2010)

17-10-2012: **Maxwell’s paradox without a daemon.**

Maxwell’s daemon is a famous thought experiment by James Maxwell that was later labelled as such by lord Kelvin. The name relates to the possible use of a daemon to decide whether particles with high energy could be allowed to pass ([[1]](#footnote-1)). It is often debated in complex terms to explain that the configuration Maxwell describes would not violate the second law of thermodynamics. Much of this confusion is created by the introduction of a “daemon” which would be needed to sort the particles passing through the wall. Maxwell spoke about a “being”, which was named daemon by Kelvin, thereby implicitly introducing a macro influence in his paradox. Of course this daemon has also to obey the second law of thermodynamics which is then explained via complication evaluation of the energy of the information processed by this daemon.

The crux is the notion of the scope where the second law of thermodynamics applies: It is a macro-law which precludes reversal of statistically complex processes. The irreversibility is an expression of the more-than-astronomical small chance that a process from itself will return to its initial state ***if the number of particles is sufficiently large***.

Maxwell’s paradox is essentially the dis-match between the inherent irreversibility at macro-scale and the notion that this does not apply for micro-systems that deal with individual particles. There reversibility is possible, just as described by the laws of motion, energy conservation, etc., which are all time symmetric. Examples are extensively discussed in (Van den Broeck, 2005).

Non-linearity

Rectifier

Net flow out

Net flow in of high energy particles

Channel 1: Energy threshold and an particle one-way-valve

Channel 2: Energy threshold and an particle one-way-valve

So if Maxwell’s original concept however has no requirement for a macroscopic decision maker then a micro version of his concept would be possible without violating the second law which only applies for systems where reversibility is precluded by the statistics of the complexity.

Imagine a system with a single large reservoir with homogenic temperature T. In this system there is a small isolated chamber with two channels through which individual particles can move. The first channel consists of a non-linear energy threshold which forms a barrier for slow atoms. The level of the threshold is chosen so that only a small percentage of the particles has an energy to overcome the threshold. In the same channel there is a non-return-mechanism that can allow particles into the small isolated chamber. The combination of these ***two non-linearity’s allows only fast particles*** into the small chamber.

The second channel is a normal but extremely small channel so that it lets pass only single particles at a time.

To explain in a didactical way how the concept works we sketch a macro analogy: Imagine a large reservoir of water with a homogenic level (e.g. Sea-level). Without a level-difference we cannot produce energy from this water. We need for example level-difference at a dam-reservoir and the outflow. But imagine a small dimple at the beach in which the top of the waves can just tip some of their water. The return flow via a small channel has some energy. It is not from the level of the sea (the equivalent macro-system), but of the statistical variations (micro) around this sea-level that this energy is extracted. Analogy Maxwell Paradox  with waterlevel in a dimple at the beach. R0012042, M.v.Berlo, 2008

Maxwell Paradox Creating a level difference from statistical variations.

As a result of the non-linear channel faster particles can move into the chamber and in average the temperature and the pressure will be higher in this chamber. It is even possible to imagine a micro-mechanism that could convert some work (exergy) out of the flow in the second channel. The amount would however be extremely small, but related to the micro-scale still relevant. It would not violate the (macroscopic) second law if that one is applied on a scale sufficiently large around the chamber.

This short interpretation of Maxwell’s paradox explains how at a micro level exergy can be extracted from a reservoir with a single temperature, and that this is not a violation of the second law of thermodynamics. The exergy generated will dissipate back to heat and so will keep the entire system in its equilibrium temperature and no net-work will be performed. Should it be possible to extract some of the exergy out of the system then the Boltzman-distribution will initially be disturbed. When the particles have interacted enough the Boltzman-distribution will re-establish itself but at a slightly lower temperature. The amount of energy that can be extracted from a single particle passing through the two channels is small (only energy difference between selected and average particle) and the number of particles is also limited (configuration should be of the size to sort individual particles). The configuration influences the micro-cannonical distribution, but will not influence the macro state for which the second law applies.

With the simplicity of this concept it can be predicted that evolution has found ways to exploit this. We should research micro-biology specifically for possible implementations of Maxwell’s original concept. Possibly (biological) membrane structures can behave like non-return-valves that can rectify flow of selected particles. It is the configuration that sorts particles into different energy that creates the difference in average energy level. A sorting-mechanism can in principle be organised by any non-linear micro-structure (acting on individual particles) that is embedded in a proper configuration.

Crux of this Maxwell paradox is the possibility of a non-return-valve-mechanism (rectified Brownian motion) at micro scale in equilibrium conditions (Mather, 2007).

There appear no fundamental physical objections against the existence of non-return-valve mechanisms at micro scale. Even if no temperature or concentration differences provide a (macro) driving force this mechanism could create a motion additional to the Brownian motion.

**DISCUSSION:** (Reimann, 2002)gives a good overview of the possible discussion. First Feynman analyses the ratchet-type Brownian motor suggests that the thermal Brownian movement of the ratchet is of such an unavoidable impact that the ratchet motor can work only when the ratchet is cooler. Second the Curie dissymmetry principle makes it a key question whether a flow can be created by an asymmetry. However: the combination of a non-linearity and a rectifier is not discussed. Excluding this would need a separate analysis.

31-10-12 17:41

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1-11 Van Harry: Education Paradigm +++ <http://www.youtube.com/watch?v=zDZFcDGpL4U&sns=em>

Zelf: WHERE GOOD IDEAS COME FROM by Steven Johnson <http://www.youtube.com/watch?v=NugRZGDbPFU&feature=related>

This is a good relaxing state of mind for my PhD.

1-11: omkeren: T = dU/dS oftewel

economische temp = d (average utility) / d(choice options)

= d (average utility) / GDPpP \* GDPpP / kost of choice \* Kost of choice / choice options

Economy: ratchet effect = irreversibility

9-11-2012: **Positive, Zero and Negative prices**

DRIVERS FOR TRANSACTION.

For wastes the value is generally negative or so low that the transaction cost exceeds the value. This challenges the general assumption is that products have a positive value in the conventional modelling of economical transactions. In this article we deduce the fundamental difference between the modelling of transactions for goods with positive and negative value.

First the note of that the value relates to the direction of the flow of money in relation the flow of goods or services. In a normal transaction the money flows the opposite direction to the flow of goods or services. If the money is seen as just a good these transactions are equivalent to barter trade where two goods are exchanged.

These transactions have a direct utility increase for both participants and it is easy to achieve Pareto efficiency for each transaction. Non Pareto-efficient transactions will effectively be avoided while for each of the participants there is a direct advantage and no secondary compensation is needed.

If the price however is negative the owner of the waste-good is inclined to do no transaction, postpone it as much as possible or is searching for ways to dispose of the negative value good (waste-dumping). This negative incentive is a crucial difference while it fundamentally requires a third party to organise a negative-value transaction. These are Non-Pareto efficient transactions that provide a Kaldor-Hicks[[2]](#footnote-2) improvement and provide a compensation. The background for negative value MUST be a THIRD PARTY that precludes the dumping of the waste. This third-party involvement in utility-generation principally distinguishes negative value transactions from positive value transaction. The Non-Pareto Kaldor-Hicks transactions require some form of power to enforce transaction participation of at least one of the participants. This is organisational requirement is the fundamental distinction between products with positive and negative prices.

In modelling economy the transition from positive to negative prices therefore is inherently a nonlinear transition point involving complex changes in the mechanism to organise the transactions and consequentially in the price formation. As far as the author is aware there is only few research to negative price formation (Nicolosi, 2010) and especially the nonlinearities round the zero price are not studied in relation to the third party-involvement and enforcement-power for externalities.

In the transition range there might be a relative large range where prices are essentially zero or are only involving transaction costs between the two parties. Neglect of externalities can extend the range of near zero transaction prices if the externalities are diffuse, the third party is unaware or has no power to enforce a non-Pareto Kaldor-Hicks compensation.

For transactions with real zero value there is a single side advantage and the other party is either unaware of the transaction or non-existent. Examples are gifts (positive externalities for the receiver) or wastes (negative externalities for the receiver). The gifts are subject to Pareto-efficiency considerations, but the cases of wastes will tend to be explicit-non-Pareto efficient. The rationality assumption in this case makes that there would be no driver to make these transactions.

OPTIMISATION TENDENCY

Normally economic modelling

Negative value transactions express only externalities und the “ontdoener” will try to optimise the transaction to the lowest.

16-11 Let op: **Different discounting needed for negative value** (externalities): To avoid accumulation of externalities with negative value the discount rate should be lower than the decay rate of the possible externalities.

The negative externalities generated in the last few thousand years periods were generally short lived, with as a possible exception the introduction of new diseases like the plague. The positive externalities were long lasting knowledge contributions that lead to higher productivity in key areas as agriculture, metal processing and energy harvesting.

The assumption that future generations will be better off is based on the historic developments since the industrial revolution. Over the last 200 years the development of science and technology was faster than the growth of the needs of the (growing) population. This enabled increasing prosperity. Over these 200 years the value of the knowledge handed over to future generations has apparently been higher than the negative externalities. This period is however historically rare. Other periods could for example be the roman times and the medieval period 1000-1300. Over time however in most periods there was more or less an equilibrium state in which welfare was limited by available resources and the size of the population.

A new exceptional development is that currently society generates several significant long-lived externalities. Most significant are resource depletion and hazardous effects of waste generation, including greenhouse gas effect. Resource depletion is an inherently a long-living externality. This can be valued positively if the materials are stored in society and provide positive value on the long run. If however resource depletion is combined with waste production (i.e. not storing the materials in society) it is an intergenerational negative externality.

Hazardous effects of waste generation have always been short lived (possible spread of diseases, some nuisances). With the invention of materials that have a long lifetime in nature and are possibly hazardous this has fundamentally changed. Examples are possibly Persistent Organic Pollutants or radioactive materials. This makes discounting of the negative externalities an item probably without historical or evolutional precedents.

The possible delay in the feedback effect of the negative externalities is a thread for the stability of society. It could lead to an accumulation of negative effects before adaptation starts. Examples are Easter Island and bison’s extinction (Taylor, 2009).

27-11 The transition region from positive to negative prices has in many cases a sticky effect: the difficulty to make the organisational transition from a two-party deal to a three party deal. This hysteresis creates a near-zero price region. The transition will only happen if negative utilities (nuisances) are large enough to trigger organisational powers. In most cases these powers are (semi)public structures that can impose regulation that enables negative prices. The alternative is that action is organised that is paid out of taxes.

The hysteresis and the organisational difference also have consequences for the intertemporal behaviour of the market. In a market with positive prices the actors all have a tendency to make transactions as fast as possible in order to reap the utility. When prices are negative at least one party will have the tendency to postpone the deal as much as possible. At near zero prices there are no incentives for any of the parties to push for closing deals.

It is important to distinguish these three regions in discounting the future. Commonly discounting is done with a single exponential discount factor, yielding much debate about the value of this factor. But distinguishing discount factors between positive, negative and near-zero value regions is in many cases a deciding factor for the conclusions of the modelling.

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23-11: mail van Harry over boek Daniel Kahneman: Thinking fast-slow.

Nobelprijs voor irrationele “prospect theory”.

Planning fallacy is only one of the manifestations of pervasive optimistic bias.

Keynes “animal spirits”

Nature of rationality = goal is happiness =/= remembered happiness= “duration neglect” and the “peak-end rule”.

# 26-11: Maximum Power Principle (Vos/Uitert 2005, Broeck 2009, Esposito 2009).

The likely state for an economy is not an equilibrium, where transaction volume is close to zero due to a near pareto-efficient allocation of all resources. For a real economy that strives to maximise GDP the actual transaction volume will be maximised instead of the utility. This comes down to the same principle as the Maximum Power Principle (MPP) as in thermodynamics. The maximisation of GDP (transactions\_volume\* Averag\_price\_per\_transaction) is not compatible WITH BEING CLOSE TO AN EQUILIBRIUM. Possibly we should consider to maximise as a possibly better optimisation criterion:

Either:

Or:

In any case the equilibrium condition is equivalent to the absolute crises: there is no longer a need to do any transactions. Equilibrium mans a dead economy, whereas a boom-period means many transactions far from equilibrium. This is equivalent to a limited rationality in the decision making which initiate many consequential opportunities for rational optimisation, and hence a large transaction volume which is shown as a high GDP. GDP growth is in this perspective a sign of lowering rationality.

Productivity growth by innovation increases the direct production possibilities, but also allows dissipation of this productivity-power in chains of irrational transactions that are multiplying the actual GDP-growth. Hence innovation creates options for higher utility, but also creates economic entropy by dissipating the additional productivity in allowing increased irrational behaviour.

4-12-2012: The Utility over time paradox:

Mass distribution is a STOCK in society is a result of PAST mass-FLOWS.

The current SITUATION of the economy is a STOCK as result of PAST utility optimisations.

The current BEHAVIOUR in the economy is a FLOW “only” guided by expected utility  by FUTURE utility FLOWS. (integral over discounted utility).

We define utility unconventionally by making it dependent on the flow of goods x(t) and the stock of goods X(t). The goods may be material or immaterial like services or knowledge.

|  |  |  |
| --- | --- | --- |
|  |  | (1.1) |

The stock of goods is the result of the historic consumption flow x(t) and the wastage w(t). This wastage encompasses disposal or depreciation of goods and services. It is important to note that utility can be derived from goods or services from a long forgone history without creating current transactions. Examples of the latter are goods that are fully depreciated and only require maintenance. Or services from the past generating position or knowledge that currently still provides utility (like the piece of music that Mozart was paid for by a king in in the 17hundreds).

|  |  |  |
| --- | --- | --- |
|  |  | (1.2) |

The total utility becomes then dependent from the current flow of consumption x(t0), the history of x(t) and w(t):

|  |  |  |
| --- | --- | --- |
|  |  | (1.3) |

If people want to optimise their utility in a (near) future t1 with t1>t0 they have a given starting stock of goods X(t0) and they have to optimise x(t) as well as w(t).

|  |  |  |
| --- | --- | --- |
|  |  | (1.4) |

This puts waste-economics forward as a critical optimisation potential for future welfare. It stresses not only the growth of the flow of consumption, but takes historical accumulation into account and takes into account how long goods are providing utility. There are significant behavioural and cultural differences in how long goods can provide their function. Attitude toward maintenance, durability, historical value etc. determines the “decay rate” of goods in society.

In optimisation economic modelling this formula is significantly different from the common optimisation of expected utility:

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |

The expected utility can be seen as a stock, it is the integral of all future utility from future consumption. Accumulation of goods does not play a role in expected utility. Also past consumption has no influence in the expected utility optimisation. Shifting with consumption in time is only corrected with the time discounting function, and is not corrected for the availability of goods over time. The optimisation of equation (1.5) has a fundamental different frame of mind than the optimisation of equation (1.4). Although optimisation of discounted expected utility is the common workhorse in economic modelling the choice itself is not value free and neglects crucial aspects of economic behaviour.

In an economy where the historical stock of goods and resource efficiency play a role the waste-behaviour of equation (1.4) should be considered. Especially to evaluate results of behaviour over a limited time this provides a clear evaluation criterion.

To calculate the expected utility of a trajectory of consumption and waste behaviour equation (1.4) should be used in (1.5).

6-12-2012: Boek geleend van Ger: (Kümmel, 2011)= theoretical physicist.

Zie eerste twee sheets van <http://youtu.be/iKYir4MxrgA> te gebruiken in economische presentatie.

*Ook op 8 minuten:* Productivity factors are not according to the cost share of capital 25%, labour 70%, energy 5%, and creativity (Solow residual), *maar op 14 minuten:* but on their marginal contribution productive power = output elasticity: resp. 38%, 11%, 52%, 12%.

*Op 18 min:* “Energy is cheap and has a high productive power, labour is expensive and has a low productive power”.

*Op 20 min:* “Haste makes waste”: In thermodynamics: processes speeded up are far from equilibrium and destroy exergy. In society: sudden changes create turbulence, which people react to, and make rational evaluation of the future impossible. Decisions in turbulence are then inherently irrational, not because of a lack of intent to be rational, but because of the astronomical number of options that arise which makes any evaluation of the future futile.

*Op 22 min:* 1. “Energy taxes: shift the relative burden of tax equivalent to productivity power: Labour 10-20%, capital 30-40% and tax 40-50%”. 2. “Increase of tax per energy unit according progress in energy conservation in order to keep revenues constant” Not needed, rebound effect will keep energy consumption quite independent from energy conservation. 3. “Border tax adjustments according to embodied energy”.

# 10-12-2012:Titel for article: General Irrationality and the Price of Equilibrium.

Formulations in search for the 1st and 2nd law of economics:

1. Every transaction produces a net utility increase for the participants,  
   if in the decisions to execute the transaction:
   1. are purely rational
   2. are completely informed
   3. are free of any exertion of power

This assumes:

1. Rationality as a uniquely exactly defined utility evaluation, decision and execution mechanism.
2. The current state of the economy as well as its future developments are exactly defined in probabilities of each possible state at each moment in time.
3. That no power system available that could influence the rationality, the information or decision making. Rationality is not only the mathematical execution of decision rules, but also the frame of mind on which the rules are based.

The consequence of the utility increase is a micro-irreversibility of transactions: each individual transaction in a Pareto-optimal equilibrium can be reverted without utility loss.

1. In a Pareto optimal equilibrium there is no increase of utility possible by further transactions,

This means the transactions:

* 1. are zero (in a pure transaction economy)
  2. or are just compensating the consumption of utility.

The consequence of striving for equilibrium is a decrease in transaction volume. This is the contrary of the general drive to increase GDP. This paradox can be released by creating long transaction chains towards Pareto optimum where the utility gain per transaction is minimised.

If transactions are possible in a Pareto-optimal equilibrium then these transactions are have a zero utility gain. Then there is no driving force to do the transactions, and the transactions are micro-reversible. Micro-reversibility of transactions is a precondition for equilibrium.

1. Externalities of Pareto efficient transactions can only be included in the Kaldor-Hicks utility optimisation by exertion of power on those who gain utility on the transaction. This is an inherent conflict with 1.c. The slow introduction of institutions and legislation that is able to compensate externalities is partially explained by this paradox.
2. Transaction-chains multiply the number of choice possibilities. Complexity for even a few subsequent transactions quickly grows to astronomical numbers. Even if transactions are micro-reversible the complexity of choosing the reverse transaction chain is effectively prohibiting macro-reversibility.

Legislation is effectively blocking reversibility of transactions: a deal is a deal.

This is logical considering the complexity that quickly grows in time as subsequent transactions create a network of interacting optimisation transactions. This tangle cannot be unravelled. But each individual transaction should have a positive utility increase. If a transaction is apparently non-Pareto efficient it should be possible to reverse it. This micro-reversibility should be limited in time and with regard to subsequent transactions which create a path dependency. For chains of several micro-reversible transactions the number of combinations and permutations is soon so large that the chance that the path of transactions can be reversed is virtually zero. This macro-irreversibility of the path-dependency is inherent to systems of real-life complexity.

The legal distinction between micro- and macro-reversibility would be needed in a society that comes closer to Pareto-optimality.

Imagine a stock exchange in which all transactions are micro-reversible: if one of the actors is unhappy with the transaction he can initiate a reversal of the transaction. It would be like a warranty period for a consumer good. Warranty conditions could be related to a (short) time period or up to subsequent transactions. The mere existence of possible reversibility would radically change market dynamics. It should be noted that the possibility to execute transactions that, after closing the deal, are apparently not providing utility, is not consistent with a Pareto-optimal equilibrium state.

Buying put and call options by buyer and seller is, as an insurance, dividing the damage with third parties. It includes the entire market into the reversal of a single transaction. That is different from transaction micro-reversibility that only involves the original actors in guaranteeing the Pareto-optimality of the transactions.

Markets with micro reversibility exist already in some exceptional cases, like consumer warrantee on goods, or in high thrust mutual relations. In order to optimise economical processes towards Pareto-optimality it would be useful to explore the use of micro-reversibility in as many markets as possible. Experimenting with (legal) structures and modelling of micro-reversible behaviour could yield interesting results.

1. (13-12-2012) Assume that every actor in an economic transaction possesses a certain *“degree of rationality”*. Along with his rational intent of utility optimisation there is a certain degree of randomness in his decisions. First his definition of what his utility function is is subject to certain randomness and secondly the evaluation of the utility of each transaction involves some randomness. This is often described as bounded rationality or as satisficing behaviour (Simon, 1957). Here we try to introduce a general measure of this *“degree of rationality”*:

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |

This is analogue to the thermodynamic definition of temperature: T=dQ/dS and the entropy S=kblogΩ. Then we define economic heat with:

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |

This is analogue to the thermodynamic definition of energy: U=B+Q, where U is the total energy, B is the free energy and Q is the heat (for simplicity we omit P\*V, potential and chemical energy). If we use ηcarnot= -B/Q= 1-U/Q = 1-T0/T1 = ΔT/T1 as the maximum efficiency we find a relation between the maximum utility transfer between two systems depending on their respective degrees of rationality.

Define two separate isolated economic systems with each a degree of rationality τ1 and τ2. If we link the two systems with a trade possibility they can exchange value (money) and utility (goods and services). If they have an equal degree of rationality there will be no gain from the trade, as the value transferred is equivalent to the utility gain/loss.

If one of the systems is more rational it will spend more money for the same utility. This will enable transactions.

Transactions lead to an irrationality increase for the producer (more choice space) and an irrationality decrease for the consumer (less money = less choice space).



**2013 8jan**

**“Economic temperature”: is equal** between two systems if transactions will take place if the possibility arises.--> Pareto Equilibrim.

This means that value and utility in both systems are both equal. (in Thermodynamics: both energy and exergy are the same in the connected systems (micro ?&?macro?) H=B + Q = B + TS à T= (H-B)/S)

**“Economic heat”: value flows from irrational to rational**; (In ThDy: Heat from hot to cold)

**Value = Utility + Possibility + EconHeat**

Possibility is the potential utility that can be recovered by trading with another system. In an equilibrium situation the possibility is zero.

--> Value = Utility + EconHeat = Utility + Irrationality \* ChoiceEntropy

With **ChoiceEntropy = k.logΩ**  With omega is the total number of options in combinations&permutations in the system

**Irrationality = (Value – Utility ) / ChoiceEntr** = EconHeat / ChoiceEntr. is economic temperature (see [A.Jonath,](http://www.eoht.info/page/Economic+temperature) with the nice coinage of an “Absolute scale of Excitement in ***Degree Greenspan***” from Depession-enthousiasm-irrational-exuberance-mania. But [paper](http://www.profitandentropy.com/Profit%20and%20EntropyWeb%20FourChap%20031216.pdf)[[3]](#footnote-3) is useless speculation non-understood entropy blabla. Degree Greenspan could be nice unit-name for °Irrationality).

Differential: Irrationality = d EconHeat / d ChoiceEntr

Irrationality in trade is eduvatively explained by the **Fairy tale “Hans in Luck”** of the Grimm Brothers: Page 9 in <http://www.gutenberg.org/files/2591/2591-pdf.pdf> and <http://en.wikipedia.org/wiki/Hans_in_Luck>

Value

Transactions

1

0

2

3

4

5

6

Trade

Steps:

1 cow

Silver

1 horse

1

pig

1

stone

1

goose

nothing

= 2 horses = 4 cows = 8 pigs = 16 geese = 32 stones

= 2

cows

Utility

= 2

pigs

= 2

geese

= 2

stones

=

? \*

**Value is POTENTIAL utility.**

**Utility is a PERCEPTION about the future.**

Lezen: <http://www.vocat.co.uk/TEFPRV2007.pdf> en <http://www.eoht.info/page/John+Bryant> (Bryant, 2007) +++ In (Bryant, 2012) an impressive work is expressing the analogy between thermodynamics and thermo economics. It however mixes both lines of thinking so rigorously that it is too much assuming that definitions do match. Further it is unreadable for economists without a very extensive knowledge in physics and thermodynamics. It biggest problem is the assumption of PV=NRT which applies only for ideal gasses or similar economic systems. Further in most of the book there is an implicite assumption of reversibility when he uses entropy dSrev=dQ/T.

So there is a good amount of thermoeconomic thinking in this book, but the irreversibility consequence of irrationality is not noted.

What I need to find out now is a relation between his thermoeconomic temperature and the irreversibility in Q=TS.

B= U + prefV - TrefS = Intern energy + external energy of the volume taken in – external heat of the entropy in the system.

If pref=0and Tref=0 (absolute vacuum and zero temp as is nearly the case in outer space) then B = U.

If psys= pref=p and Tsys= Tref=T (the system is in open contact and equilibrium with its environment) then B=U +pV –TS. à T= (U+pV-B)/S

Assume no further trade with reference system àVolume=0 à pV=0

Then S = (U-B)/T

If Tref=1 then S=U-B

Places to publish article on economic entropy : <http://econpapers.repec.org/RAS/pbr223.htm>

<http://ideas.repec.org/a/eee/eneeco/v4y1982i1p36-50.html>

Publish exergy in: <http://www.inderscience.com/info/inarticletoc.php?jcode=ijex&year=2007&vol=4&issue=3>

11-1-2013Zie ook <http://en.wikipedia.org/wiki/Fundamental_thermodynamic_relation>

Economics:

If **Free utility = Utility + Value/currency - Irrationality**

Currency is the unit conversion from utility to value, e.g. if utility is measured in the unit horse (see Hans in Luck) then k = 1000 €/horse

Utility = Price·Volume within the system.

Value = Price Referece·Volume is the additional value that can be generated by trade with the surroundings of the system. This is the market value. If the economic system is in price-equilibrium with its reference environment then Price = Price Referece

Irrationality is the amount of value that will be lost by irrational decision making. If fully informed en perfectly rational decisions are made then Irrationality is zero. The other way round: Free utility is that part of value that remains after subtracting the likely inefficiency in choosing from options.

If Irrationality = DegreeOfIrrationality \* EconEntopy

Irrationality = °Irr \* Schoice = °Irr \* k \* log(Ω(value) ) , where Ω(value) is the number of states that are possible with the value in the system.

**°Irr ≝ (Value – Utility)/ EconEntropy**

**EconEntropy = Schoice = k \* log(Ω(value)**

**Utility = Value°Irr=0 = value in perfect market**

**Value = Utility + °Irr∙SChoice**

Utility/Value = (value-°Irr∙Schoice)/value = 1 - °Irr∙.....?

Assume no trade with reference environmentà possibility=0

If °Irr= degree of irrationality in a system:

°Irr =0 if Free utility = Value: System with maximum conversion from value to utility by fully informed perfect rational decision.

°Irr =1 if Free utility = expected value: System with random choice out of the options yields this free utility. No information or rational judgement is involved in decision making.  
°Irr =1 à **EconEntropy ≝ (Value – Utility)/°Irr** in words: the economic entropy is the utility loss of random decision making.

°Irr =∞ if Free utility = 0 : Absolute irrational system, yielding no utility from value.

In economy:

Free Utility = Internal Value + External Value - Cost of complexity =

= Value \* Kvalue/util + Priceref\*Volume - Irreversibilityref \* Choice

Piece of 11-1 has to be homogenised in sefinitions of value, utility and entropy.

17-1-2013 Read and saved some articles. Not saved as file from Jstor: (Schlege, Pfouts, Hochwald, & John, 1973), (Parisi, 2003).

Also see file Frank Witte.

21-1: Voor economic entropy: <http://www.cepe.ethz.ch/>

option to print a book <http://www.iuniverse.com/Packages/PackageCompare.aspx>

Stelling: Economy is a science about human actions and human transactions. As soon as it is used to justify inaction you should question the applicability of this science. Especially using a business case to motivate not to do a project is dangerous.

Top reference: (EU Directorate General Regional Policy, 2008)

For Burn or Burry: to distinguish between ENPV and FNPV: Financial NPV (normal)) and Economic NPV which includes social costs and externalities. And 3.2.1 for Waste specific.

For Discounting: Annex B: the choice of the discount rate, Social discount rate & growth.

13-2 Thermophorese: is enhanced diffusion at temperature difference.

Similar: diffusion in economics is the spread of goods through the economy by the continuous individual transactions between economic actors. An initial concentration will spread out over the concentration gradient till equilibrium is reached. If there is a difference in the degree of irrationality this will increase/decrease the diffusion compared to a homogeneous level of irrationality.

23-2-2013: Read papers van

(Ayres, Resources, Scarcity, Growth And The Environmentand The Environment, 2001)

(Ayres, Eco-thermodynamics: economics and the second law, 1998)

opgeslagen 2010/2011.

14-3 2013: Taleb 2007 Black Swan: **ludic fallacy (Wiki:**

* It is impossible to be in possession of all the information.
* Very small unknown variations in the data could have a huge impact. Taleb does differentiate his idea from that of mathematical notions in chaos theory, e.g. the [butterfly effect](http://en.wikipedia.org/wiki/Butterfly_effect).
* Theories/Models based on empirical data are flawed, as events that have not taken place before for which no conclusive explanation or account can be provided.

There are known knowns; there are things we know we know.  
We also know there are known unknowns; that is to say, we know there are some things we do not know. But there are also unknown unknowns – the ones we don’t know we don’t know.”

[United States Secretary of Defense](http://en.wikipedia.org/wiki/United_States_Secretary_of_Defense), [Donald Rumsfeld](http://en.wikipedia.org/wiki/Donald_Rumsfeld)

....the most dangerous type of unknown: the "unknown known". That is, as Josh Billings famously expressed it, "It ain't what you don't know that gets you into trouble. It's what you think you know that just ain't so".

Wiki Dunning and Kruger: …quoted [Charles Darwin](http://en.wikipedia.org/wiki/Charles_Darwin) ("Ignorance more frequently begets confidence than does knowledge")[[3]](http://en.wikipedia.org/wiki/Dunning-Kruger_effect#cite_note-3) and [Bertrand Russell](http://en.wikipedia.org/wiki/Bertrand_Russell) ("One of the painful things about our time is that those who feel certainty are stupid, and those with any imagination and understanding are filled with doubt and indecision")[[](http://en.wikipedia.org/wiki/Dunning-Kruger_effect#cite_note-unskilledunaware-4)

30-3-2013: Short simple but fundamental paper: **Why central banks should add noise to their interest decisions.**



Financial markets are predictive controller for their interest.

They have a large multiplier (Kp) for decisions of central banks.

To decrease this multiplier they have to have **reduced certainty** on the behaviour of the bank.

This is contrary to common knowledge.

Without losing rationality and longterm confidence in the bank some deliberate noise can be added to the interest decision of the bank. E.g. after the decision for the new interest is made a random correction is added. Both values (decision and correction) are communicated. Although people can still effectively speculate on the decision using their predictive knowledge, the increased uncertainty of the outcome will reduce their power to speculate. Speculation in anticipation of CB-decisions will therefore be reduced.

The size and the shape of the CB-noise can be tuned. If the noise is increased the Financial markets will have less certainty in their decisions. This will decrease the gain (=>multiplier=>leverage) they can use in their anticipation. Therefore adding CB-noise is reducing the loop-gain. Consequentially the CB-noise addition will improve stability of the control loop.

Directly after the CB-decision the choise and the noise will be known to the market. This will then allow for the market to anticipate on the next decision. If the noise term is high at t1 then the market will anticipate on the chance that the noise at the next decision t2 will be lower. As this probability can be well estimated there can be massive speculation immediately ***after*** a CB-decision. This is however limited by the triple effect of uncertainty of (1) evolution of financial markets in time, (2) evolution of the economy in time, (3) CD-assessment of this evolution at that moment and (4) the statistics of the noise at the next time. The CB-noise should be tuned such that (1) and (2) compensate (4). This puts an upper boundary of the amount of CB-noise that can be added.

30/05/2013 Irrationality: see powerpoint sheets of two trading partners with a market in the background as reference environment. (equivalent to exergy of a heat source, a cold sink and a reference environment. °irr is the irrationality, with a similar role as temperature:

* The market value (Value = Utility + °Irr0∙SChoice) is determined by the irrationality in the market.
* The trade transaction value is determined by highest irrationality MAX(°irrA, °irrB).
* If two systems get in contact Net Value= Va-Vb is transferred from high irrationality to low irrationality.

The Market

Stable large scale equilibrium

with homogenous degree of irrationality

°Irr0

System A

°IrrA

System B

°IrrA

a

b

a

Va0

Vb0

b

One-note vakantieaantekeningen op mobile: <https://skydrive.live.com/view.aspx?cid=f4e0d0e4791bf296&id=documents&resid=F4E0D0E4791BF296%211564&app=OneNote&&wd=target%28%2FSnelle%20notities.one%7C%2FPromotie%20ideeen%7C324855e5-c293-4487-9ff1-378d3701fea1%2F%29>

Promotie

**Woensdag 31 juli 2013**

**Maintenance, degradation, waste** as limiting factors for,growth. Implement exell growth model.

Distinguish PID-characteristics:

D waste, degradation growths proportionally to stock, with additional production 1st order time lag.

P:  maintenance growth proportional to stock.

I: degradation is an integrator on stock, minus waste and maintenance. This is second order, so it is lagging behind production and can continue to grow after production is limited.  This is strongly reducing the options for free allocation of resources at the ingrijpen van resources.

If production grows exponentially then maintenance, degradation and waste production are lagging and occupy only a small proportion, of the economy, even if the amounts are in itself high in relation the the amount of production. But when the growth diminishes the MDW lags tand continues to grow till it occupies the equilibrium share of the production.

To have a high welfare at low growth requires  a strict optimization to minimize MDW.

This requires complete, different design goals and optimisation of products and production processes.

Even if MDW is >100% of production this in-sustainable state can be masqueraded by a positive growth which will be leading the lagging growth of MDW. If then, however the growth decreases below the MDW, but still is positive, then the MDW overthrows the production growth and results in a decline. This explains why it is extremely important to minimize  MDW long before growth of production is reaching limitation. The ailing growth of MDW may be a deceiving invisible threat that only becomes visible at the moment that resource-scarcity complicates recovery.

A.v.d.Heijden:Tonio: P.409, H 19:

"Civilisation is = society with a victory over disorder. It is an organisation that does not allow chance, at least should allow it as little as possible. Chaos always finds a spalt to penetrate into order. Still the strive should always be order, organisation,control over chaos."

2013 08 13 Promotie irreversibility and irrationality

Paper kort maar publicabel,schrijven en tonen,met,geheimhoudingsverklaring aan Cees Withagen, Daan van Soest, Jeroen vd Berg, Londen collega Annik, Ook versie bij notaris,deponeren.

Referentieboek Kahneman en Nrc artikel irrationality kopen.

Adding context will change a choice.

A choice between an apple and a pear will provide a higher value than getting just a pear, but it will provide a lower utility because "it offers the option to choose the wrong" option. Having a coin with the option to buy either an apple is heavily influenced by the wealth of options that are available for this,choice. If we assume full rationality and full information then the choice with maximum utility is made. The availability of all the other options enables to make "wrong choices". This increases in practice the value, although it also lowers the average utility that is chosen if non-perfect rationality is assumed.

U=Umax - I.S.     of       V=U + I.S

Umax is the maximum utility that can be achieved for a given set of choices. This requires full information, full rationality about the options and the utility function. The mere existence of suboptimal options allows for the chance that one of these is chosen. This chance is a reduction of the utility that in reality will be achieved. It is dependent on the structure of the choice-set and on the process with which the choice is selected from the choice-set. The I represents the degree of irrationality in this process.

Life is a big optimization project, at least in our western welfare world. That in itself is a major step forward above the struggle for survival that is the real core of living. It is this step, that allows the rationality which we take as a starting point of economics.

======================================================================

14-8-2013: <http://www.volkskrant.nl/vk/nl/3184/opinie/article/detail/3492211/2013/08/14/De-Vlaming-gaat-met-vakantie-de-Nederlander-viert-het.dhtml?utm_source=dailynewsletter&utm_medium=email&utm_campaign>

'Je komt altijd slimmer van de markt terug'

23 aug 2013

<http://www.bernard-mandeville.nl/index_bestanden/Sitemap.htm>

<http://nl.wikipedia.org/wiki/Mandevilleparadox>

Mandeville geeft basis voor Keynes dat niet alleen besparing nodig is, maar dato ok consumptie, zelfs ondeugd, nodig is voor het op gang brengen van de economie: [*The Fable of the Bees*](http://en.wikipedia.org/wiki/The_Fable_of_the_Bees)*: or, Private Vices, Publick Benefits.*

**Vr 29 november 2013**

**Ufree = Umax – I·S**

**Ufree** is the real utility available when (decisions for) transactions are made.

**Umax** is the theoretical maximum utility that is available when (decisions for) transactions are made fully rational and completely informed.

**I** is the Degree of IRrationality (DoiR) in (deciding for) an transaction. At I=0 the transaction is perfectly rational and fully informed. At I=1 the transaction is a perfectly random choice of all the available options to perform a transaction. I≥0 (by definition of perfect rationality), and I can be >1 for “stupid” decisions which yield a lower utility then would have been achieved by a random choice.

**S = k·ln W**  is the economic entropy of the choice space available for the decision making.

**W** is the number of possible choices in the choice space. It involves all combinations and permutations of possible spending of the available resources (e.g. money) on available options for transactions. In a defined limited choice space for spending money W can be counted as all the options to spend the money. The money is discrete (e.g. cent). W=1 if there are no options for transactions and the only option is to stay in the existing state. If a transaction-choice is made randomly (e.g. throwing a dice) W is the number of possible outcomes. W, and hence S, is only defined for limited systems, so it is not available for the free market as a whole. However it is defined for a defined system if a transaction is made with a predefined limited choice space which is part of the free market.

**k** is the Utility per Degree of IRrationality and per unit of choice [e.g. Util / % / cent]. It expresses the Utility loss (Umax-Ufree) if, instead of a fully informed rational choice, for a given choice space a random choice is made.

Calibration is possible for experimental settings (like games) all choices can be evaluated for their resulting outcome. If utilities are assigned to each outcome (eg a financial reward) then a persons score can be translated to his DoiR. In a double blind testing (e.g. in medicine) the choice is by definition made without any information (perfectly uninformed = perfectly random). Then by definition I=1 .

In a transaction with the free market the number of choices is unlimited. But the DoiR can be determined relative to the DoiR of the free market.

DoiRmarket

Gokje om formule te poneren: (echt afleiden net als Carnot uit Exergie daaronder)

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |
|  |  | (1.5) |

Relative Degree of Irrationality (RDoiR) expresses the ratio between transaction and market irrationality. For a RDoiR=1 the transaction is executed at the same irrationality as the market. If RDoiR>1 then the transaction is outperforming the market, if RDoiR<1 then the transaction is under the average market performance.

For financial transactions the input and the output is available in value. Using this value for the utility gain of the transaction the RDoiR can be determined ex-post by investigating what decision would have been the best value. The Doir then is Vtr/Vmax where Vtr is the actual value generated by a set of transactions and Vmax is the absolute maximum value that could have been generated within the given boundary conditions.

Example: If 1000€ is available to trade on a given stockmarket within a given period it is possible to determine ex-post (which equals fully informed) a trajectory of optimal buy and selling. If the value gain

Define the free utility available for an actor on the market as:

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |

This is the maximum utility for a fully informed rational actor minus the irrationalty of the actor times the size of the choice-space.

Define the irrationality as the change in value per change in choice space:

|  |  |  |
| --- | --- | --- |
|  |  | (1.5) |

For a pure exchange transaction (no production or consumption of goods) the market value is a perfect representation of the maximum utility: (?pas op: or market value is a representation of full rationality =/= market rationality

|  |  |  |
| --- | --- | --- |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  |  |  |

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| --- | --- | --- |
|  |  |  |

16 dec 2013: inspiratie zie file:

"C:\Users\MBerlo\Dropbox\2013\Promotie 2013\Irreversibility\Tedesco 2011 MvB, Inspiration on utility value entropy irreversibility.docx"

19-12 2013

EXERGY Energy, Environment and Sustainable Development - Ibrahim Dincer, Marc A\_ Rosen - Google Books: <http://books.google.nl/books?id=ruR7U3IjrR0C&lpg=PP1&pg=PA7#v=onepage&q&f=false>

Citeren paragraph:

1.3.1.Order and disorder and reversibility and irreversibility: eerste 6 regels.

1.4.3. Characteristics of Exergy: similar in economics: Utility is dependent of the deviation of the already available resources, value can be transferred only if the economic agent differs from the market. The larger the deviation, the higher the value.

3-4-2014

Werk-markt-idee: Stoom gedreven hydraulische pomp: zuiger-zuiger als nood-voeding voor NPP.  
Ga naar Hydrodyne met verhaal van Tomas Jelinek SSM, Sweden: Fundamental design bases for independent core cooling in Swedisch Nuclear Power Reactors (Robelsys session 5).

26-4-2014

Google Search: economy utility entropy choice space (irrationality irreversibility temperature)  
See result in: C:\Users\Marcel\Documents\My Dropbox\2014\Promotie\Referenties\Exergy  
(zoek ook: economic utility correction for irrationality and irreversibility temperature equilibrium)

Veel ontwikkeling de laatste jaren op dit vlak, allemaal in mijn richting. Irreversibility <-> equilibrium. Geen combinatie van Irrationality~temp~carnot efficiency. Ook niet 100% irrational=random choice, 0% irrational=perfect markt.

Titel: economic utility correction for irrationality and irreversibility  
of: **Irrationality and Irreversibility modelling of Utility**

In economics equilibrium is generally related to fully rational/informed actors on the market, but at micro-level this implies that there is no utility gain for any transaction and hence the full equilibrium implies a market with perfect prices without any transaction. In this we formulate (in parallel to the first law of thermodynamics):  
 In a full equilibrium there is no net utility gain possible, i.e. the utility is conserved in a perfect market.

In this text we use irrationality as an influence on decision-making by combined effects of lack of information, lack of information processing, biases, emotions, haste and other influences that trouble the utility maximisation.

Here we propose a second equilibrium at which we assume that the actors in the market are equally irrational/uninformed. In this case there is a possibility to gain utility by transactions, but the actors are irrational/uninformed in such a way that *in average* they don’t gain utility by transactions. This means that an actor sees an advantage in a specific transaction that another actor doesn’t see. So this transaction will be executed with a positive utility yield for the first actor. The second actor doesn’t lose real utility, he only loses his opportunity to gain more utility. Even if everybody knows about his own irrationality in this second level equilibrium transactions will be executed. Everybody can accept that he “gives away opportunities” as long as on average all actors gain utility in an equal amount. In this we formulate (in parallel to second law of thermodynamics):  
 Transactions will continue to happen if in an irrational market there is on average a utility gain.

Things change however when there is irrationality that is *in average unequal*. Then a net transfer of utility-opportunities results to those with a lower irrationality. Still transactions can be willingly accepted by those with a high irrationality (even if they are aware of their irrationality) because the transaction can yield real utility from utility-options that they themselves can not observe. In this we formulate (in parallel to zeroth law of thermodynamics):  
 Net utility will flow from those with high irrationality to those with low irrationality.

We define the irrationality between two markets as equal if the utility gain by transactions between the two markets is equal. Stated differently: each transaction creates a utility gain on one or the other side, but *on average* both gain as equally from doing the transactions.

To define a measure of irrationality we use the definitions above in combination with two calibration points. We define the degree of irrationality as zero for a perfect market. And we define the degree of irrationality of one (=100%) for a market in which all choices are made perfectly random.

The case for a perfect market may seem clear as it is defined in all economics text books. It must be stated however that perfect markets don’t exist. They are an assumption that enables the use of many economic models, but in reality the conditions are never fully satisfied. Economic models can give good approximations even in many cases where the conditions are not satisfied. Using a degree of irrationality can help to indicate how reliable the modelling will predict real market behaviour. If the market is well defined (e.g. finite size of choice space) it is in many cases possible to do an ex-post evaluation to use all information to determine fully rational behaviour. I.e. in a defined set of stocks, with a given number of transactions in a given period an optimal trajectory of buy-sell actions can be found. This maximum yield will then correspond to the 0% irrationality for the actors in the market.

Similarly ex-post for the same set of stocks the average yield of a full-random set of trajectory of buy-sell actions can be found with a Monte-Carlo simulation. This yield will then correspond with the 100% irrationality.

Note that irrationality cannot be smaller than 0% (in parallel to third law of thermodynamics), but that it is perfectly possible to be larger than 100% when there are systematic irrational biases. The maximum irrationality is achieved by the choice from the choice-space that yields the minimum utility (this could even be negative utility if the impact of the choice is doing damage). Even if two actors are both worse than random in pursuing the maximum transaction there might be one who gains utility. In this case there is still a transfer from high to low irrationality.

Lets define ***Ufree*** as the average utility yielded from a choice out of a choice space where a perfectly rational fully informed choice would yield ***Urational*** , there is a degree of irrationality ***I***, and a sensitivity ***S*** for degradation of the utility for less the perfect rational and fully informed decisionmaking:

|  |  |  |
| --- | --- | --- |
|  |  | (2.7) |

With defined values for irrationality:

|  |  |  |
| --- | --- | --- |
|  |  | (2.8) |
|  | ) | (2.9) |

Then the lost value at doing a perfectly random choice is:

|  |  |  |
| --- | --- | --- |
|  |  | (2.10) |

Then the irrationality for the real average yield ***Ufree*** is given:

|  |  |  |
| --- | --- | --- |
|  |  | (2.11) |

This irrationality is expresses the return as a percentage of maximum and average yield of this choice space. This irrationality ***I*** expresses how well an actor was capable of yielding the utility out of the possibilities he had in this choice space. The irrationality is a property of the ***process*** of choice making and is influenced strongly by the effort to gather information from available sources and the effort and algorithms to process this information. It can be a predictor of yields when the same actor will be active in the same conditions.

If there are two actors A and B with irrationality Ia and Ib who are both making their choices from this choice-space and Ia > Ib  then there will be a net transfer of utility from A to B.

**Micro-assessment:** If the choice-space is perfectly defined (all possible choices are known with their respective yield) we can define the choice-space constant ***k*** as the value per logarithmic size of the choice space ***W***:

|  |  |  |
| --- | --- | --- |
|  |  | (2.12) |

This constant expresses how difficult it is to make a fully rational decision in this choice space. Enlargement of the choice space with a set of options will not influence the fully rational decision as long as Umax < Urational. If they have an equal Urandom the combination will not influence the average result of a random choice. Nevertheless for a not perfect decision maker it will lower the probability that the best choice is made. It is this complexity that is expressed by the choice-space constant k. Of course the expression (2.12) involves some assumptions on the distribution functions of the utility over the points in the choice space. Different distribution of utility over the the points in the choice space will result in a different definition of k. We now neglect this and leave it for further elaboration in a later paper[[4]](#footnote-4).

Then:

|  |  |  |
| --- | --- | --- |
|  |  | (2.13) |

This Economic Entropy expresses the utility los when a decision is made randomly instead of fully rational & fully informed. It is only a function of the properties of the choice space. It expresses the average loss in utility when a choice is made randomly.

When k has been determined for a (set of) choice space(s) it can be used also for similar choice spaces. The S will express the degradation of the yield if the choice space is enlarged.

When ***I*** is determined for the choice-making process and ***S*** is determined as the choice-space property we can use equation (2.7) to express free utility as a measure of the average expected utility yield.

So we have the properties of the choice space Urational, Urandom, and the number of possible choices W.

And we have a Ufree that a given actor is capable of yielding from the work/investment he makes.

Then the irrationality I is a measure for the rationality of the choice making

Za 10 mei 2014: For growth limitations check on generalisation of logistic function: Sigmoid curve and especially Gompertz curve <http://en.wikipedia.org/wiki/Gompertz_curve> for a groth towards a limitation.

Let op thermodynamics: G=U-TS, S=k.lnW àT=(U-G)/k.lnW

Let op inspiratie: http://en.wikipedia.org/wiki/Maximum\_entropy\_thermodynamics.

***BAD*** EXAMPLE: For participation in a lottery W is the number of tickets in the lottery. Umax is the main price and Urandom is the average return of a ticket. If I have perfect information I choose the ticket with the winning number and my free utility is Umax. If I have partial information the I expresses how much rationality I can use in the decision making  
…..Beware price of the ticket is the input, Umax is the input is the price of the ticket.

The [Ginsberg’s theorem](http://en.wikipedia.org/wiki/Ginsberg%27s_theorem) is a poetic equivalent of these economic laws.

14 mei: <http://youtu.be/PJiMjSscgk4> op min 2:25 Maxwell:  
Use the relations between the thermodynamic potentials as proxy for U~total utility, G~free utility, Q~value, V~number of units=trade volume, P~price per unit , S~choice space, T~degree of irrationality, Cv~, Cp~?,   
<http://en.wikipedia.org/wiki/Maxwell_relations>   
Nice real definition for entropy and heat: <http://en.wikipedia.org/wiki/Fundamental_thermodynamic_relation>   
The distribution of the possible utility yield over the states in the choice space: <http://en.wikipedia.org/wiki/Partition_function_(statistical_mechanics)>   
The Value=Price per unit \* Number of units is to be found in: <http://en.wikipedia.org/wiki/Grand_potential> directly from the distribution function.

16 juni 2014;

See video with speech of Bill & Melinda Gates at Stanford’s 123 commencement ceremony (from 1:06 to 1:30): <http://www.youtube.com/watch?feature=player_embedded&v=p1ek9s7IUdc#t=4007>  
This is an impressive, motivating and empowering speech about optimism and the divide between rich and poor which mentions diagnoses about key drivers to poverty (diseases, social divide, powerless). Nevertheless it needs an additional understanding for a key question: what makes value flow, where does it flow to, will it accumulate to a single point or will it strive to equilibrium and what forces do level the disequilibria?

Maybe the idea about irrationality can provide explanations to these questions. Understanding how a difference in rationality acts as the driver for the transfer of value of each transaction will open the eyes of many. Although it càn provide useful information, in practice often the mighty machine of marketing does not only lead to help to optimise one’s personal utility. Much of the marketing is just leading to choices which are suboptimal. Although we all behave very much along the economic fundamental line of utility optimisation, knowing that in the myriad of options it is virtually impossible to make an optimal choice is a vital insight. That this is not an influence per choice that levels out is not self-evident, and in fact it is contradicting to many of the (mostly hidden) assumptions of economics. A theory to express the deviation from the Pareto-optimal driven general equilibrium can show that additional to the well-studied drive to optimise utility there is another, maybe just as influential, economic force. We could possibly quantify the force that keeps us away from working to utility. Even more we could possibly explore mechanisms that are systematically driving value to those people that are already rich. And seeing these mechanisms could help others to optimise their utility too. Even more: it is conceivable that seeing irrationality as a (one of the) drivers to poverty could curtail some of the mechanisms that keep groups of people sometimes unneeded in their poverty: ……and do not lead us into temptation…. . Providing a better description for irrational behaviour could add a new perspective to the way the negative side of it can be avoided. The straight forward approach would be to provide dedicated education to reach peoples irrational thinking in new ways. The mere awareness could possibly help people to avoid many behaviours leading to disutilities.

On the other hand the irrationality can be seen as a force that is at least as fundamental to our economy as the utility maximisation. Every irrationality on the spending side must be compensated by an at least as rational process in trade or production to generate the value lost at the irrationality. Many of the processes to stimulate the economy can be viewed as ways to influence irrational spending. And a crisis can easily be seen as a period of too little irrationality to keep the economy growing.   
Measuring, quantifying (relative) levels of irrationality is possible by using existing data. In experimental setups even absolute levels of irrationality can possibly be determined. Psychological and sociological mechanisms as drafted so beautiful by Kahneman or S. Levit (Freakonomics) could be captured in quantifiable data and formulas. Although the concept of quantifying irrationality is inherently dealing with stochastic averages there may be areas where predictions can be done that go beyond the mechanistic utility maximisation.

The formulas are expressed as linear relations in order to present the basic idea. It is clear that in most cases the relations will be more complex. The complexity of the formulas is however not needed in most cases where only small deviations are studied and the differential form of the linear functions will be adequate.

In a non equilibrium 0 ..........

19-9-2014: Discussie Nico v.Xanten: **Coase theorem**

Zie Wiki and: "C:\Users\MBerlo\Dropbox\2014\Promotie\Referenties\Coase 1960 The problem of social cost; Free rider problem, Tragedy of the commons.pdf"

Economy:

* Externalities,
* Economic efficiency,
* Transaction costs,
* Property rights,
* Initial allocation,
* Free rider problem,
* Tragedy of the commons

(6-10-2014: Two centuries of transitional growth = Logistic instead of exponential growth theorem.

OECD, mail 4-10-2014, “How Was Life? Global Well-being since 1820”, <http://www.keepeek.com/Digital-Asset-Management/oecd/economics/how-was-life_9789264214262-en#page13> ).

2-10-2014

Samenvatting 2 weken: Island with two traders, fully rational will result in equilibrium with prices perfectly matching the utility. Better: no use of price, only exchange rate (e.g 1 kg wheat is traded against 1 ,5 kg og sugar). In this equilibrium all transactions will be (marginally) reversible; as there is equilibrium a small reversal of the trade will be acceptable for both. The value expresses the marginal utility of both traders. dV/dU1=dV/dU2.

If both now get information of the exchange rate towards the main land they get aware of a difference in their mutual exchange rate and the “value at the market”. Without having a possibility to execute a trade with mainland this should not influence their mutual exchange value, because both utilities remain unchanged basis for their fully rational trade relation.

Still it is often so that the information about market value influences the trade. This can be expressed as an irrationality component which influences the total utility which is perceived by using the information about the market value: Utotal =Ufree + Irrationallity  
where

Now access to the market is created and both traders will exchange mutually and to the market. Assume the market is large enough to remain uninfluenced. A new equilibrium is established with the price/value of the market as the basis.

Latent heat ~= ~ “latent value”. (use wiki latent heat)

6-11-2014: **Poka-yoke** (ポカヨケ[**?**](http://en.wikipedia.org/wiki/Help:Installing_Japanese_character_sets)) [[poka yoke]](http://en.wikipedia.org/wiki/Help:IPA_for_Japanese) is a Japanese term that means "mistake-proofing". A poka-yoke is any mechanism in a [lean manufacturing](http://en.wikipedia.org/wiki/Lean_manufacturing) process that helps an equipment operator avoid (*yokeru*) mistakes (*poka*). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to [human errors](http://en.wikipedia.org/wiki/Human_error) as they occur.

30-11-2014: **Summary** of analogy between thermodynamics and Econo-dynamics (if this is the proper word; find something better !) in the Gibs relation Uirrev = Urev - TS

1. Energy equals the maximum utility in reversible conditions,
2. Exergy eq the maximum achievable utility in non-reversible conditions,
3. Temp (kT) eq the degree of irrationality,
4. Entropy macroscopic eq the utility (or value) per degree of irrationality
5. Entropy microscopic eq “size” of the choice space times (log W),à
6. Heat eq value,
7. Efficiency is the max available utility in non-reversible conditions divided by the value.
8. Minimum degree of irrationality is zero: only when all transactions are perfectly reversible, full equilibrium.
9. Degree of irrationality is one (=100%) at perfect random choices from the given choice space.
10. All utility will boil down to value (all energy will decay to heat). But value can only be converted to utility with an efficiency that is limited by the irrationality used in the conversion.

Wiki: limits to human knowledge: <http://en.wikipedia.org/wiki/The_Black_Swan_(2007_book)>

Scientific Scepticism: <http://en.wikipedia.org/wiki/Skepticism>

Modes of misleading thoughts (CD 5 of NRC luisterboek over de wetenschappelijke revolutie): <http://en.wikipedia.org/wiki/Sextus_Empiricus>

10-12-2014: 17:45-19:05 tekst in mail. Use reference: Hayek 1945: The use of knowledge in society  (n.a.v. NRC luister CD Rossum Kapitalisme)

Cite: “Rational Economic order: If possess all relevant information, if we can start out from a given system of preferences and if we command complete knowledge of available means, then the problem is purely one of logic”. Quod non:  A game of chess is fulfilling all three conditions, but is by no means a problem that can be solved by logic. The complexity of making optimal choices, even in this well defined problem of a very limited nature, is unsolvable and the outcome of a set of games is statistical; albeit with different chances to win depending on the degree of rationality of the players.

For any real world problem the choice-space for an economic agent is so much incredibly larger than in a chess game, that the assumption that with the three conditions optimal choice is anywhere near is ridiculous. The stock markets should be the area where economic rationality is used to its utmost maximum. Yet the economic crises, and unlimited examples before, have shown intelligent people who in full knowledge make choices that other people immediately notice as stupid choices (=far from optimal). Ex-post evaluations of choices, even possessing only a marginal part of the information, reveals not a tendency to make decisions based on a rather limited rationality. Even worse: in investigations a random choice is often shown to be superior to well educated, well informed decision making.

The conventional wisdom since Hayek is however that the market as a whole incorporates all available information. This assumes however that the statistics of all individual decisions cancel out and that the net result is that the market moves to a point of optimal use of resources to produce the maximum utility. Yet in this paper the assumption is different: Assume that there is still a net loss of utility by the irrationality of all the individual decisions. This irrationality can be because of incomplete information about markets, preferences or available means, or because of a lack in reasoning-capacity that should use this information. It is irrelevant wether this irrationality is the result of statistical processes in a massive number of agents that make decisions, or of a certain degree of irrationality in a central planner. In both cases the maximum utility that could be achieved by full rationality will not be achieved, and the freely available utility is lower with Uloss:

   Ufree = Umax – Uloss      where Umax is the utility that could be achieved by perfect economic agents: the theoretical fully rational optimising agent possessing about all information and reasoning power.

A perfect market (perfect economic agents and no transaction cost) would be so much in a Pareto-efficient equilibrium that each transaction would be reversible. In a market with a certain degree of irrationality (yet without transaction cost for simplicity now) each transaction would become irreversible, because after the transaction the experience of doing the transaction will lead to an evaluation of the transaction by the two agents. This experience and evaluation of any not-Pareto-efficient transaction will lead to at least one of the agents not willing to reverse the transaction. We now postulate that:  
   Uloss = Umax – Ufree = U irreversibility      where the utility-difference between the Pareto-optimum and the executed transaction is a measure for the irreversibility of the transaction.

Now we postulate  that U irreversible is a combination of two factors.

First is the degree of irrationality by which the agent(s) make their decisions. This is the factor in which the agent-specific influences are combined: incomplete information about markets, preferences or available means, or because of a lack in reasoning-capacity.

Second is the complexity of the choice-problem. This is a measure for the size of the choice-space and the relative utility influence of making a decision with a limited degree of rationality.

    U irreversible   = I \* S

We combine:

     Ufree = Umax – I\*S     which says that the utility that is freely available for an agent is the utility that could maximally be achieved (and the testing therefore is whether both agents would be willing to reverse the transaction) minus the product of their degree of irrationality and the choice space.

Imagine a stock-broker who has a well defined set of stocks and a limited number of transactions in a limited time. The trajectory of optimal trade could be evaluated ex-post to find Umax. Ufree is the result of the trajectory that the stock-broker has chosen. Then I\*S is the difference between the optimum trajectory and the chosen trajectory.

We now define I=0 for the perfectly rational optimum trajectory, and I=1 for the case with perfectly random choice (monte-carlo simulation to find average of all trajectories).

Then S = (Umax – Urandom)     which is the measure of the relative value of the choice-space, in other words: the sensitivity of the choice-space for taking a less then perfectly rational choice.

For the trajectory that the stock-broker has chosen with the result Ufree we the find a degree –of-irrationality of:  I = (Umax – Ufree) / S

As both I and S can be measured in many different circumstances it might be possible to extrapolate the testing conditions and predict Ufree with a certain degree of confidence in similar situations.

Beyond the stock-market practical absolute value are not easily available we could differentiate around an actual point by doing tests that influence either the degree of irrationality or the choice-space:

    dI/dx  = d(Umax – Ufree) /(Sdx)    |S=constant         which means that the change in degree of irrationality is tested by measuring the utility value of a change in information under the condition that the choice space is not influenced. Compare this with the value of a “hint” given to a chess player. The setting is not changed, but he can express his evaluation as a value of the hint. Similarly the value of a hint could be measured for a stock broker.

    dS/dx  =  d(Umax – Ufree) / (Idx)    |I=constant         which means that the value of the choice-space is tested by adding a new option without giving any new information.

As both dI and dS can be measured in many different circumstances it might be possible to extrapolate the testing conditions and predict responses of agents on either additional information or on changes in their choice-space.

9-1-2015: The science of persuasion: <https://www.youtube.com/embed/cFdCzN7RYbw?list=UU8IMseLCZx2BZe3thxHXnog>

10-2-2015: NRC Herman Philipse, CD: Betrouwbare kennis (2e cd track 13)  
Kant: Kennis.....kenbare wereld en het kenvermogen van de wetenschapper.  
Aristoteles: essenties, Descartes:.. , Newton: Wiskunde, Hume: fork experimenteel-Logisch,   
Kant: synthetic, Popper: falsifier,  
15-2: 4e CD track 14: Economie als niet productieve voortbouwen op de these van Rational Behaviour  
19-2: 7e CD track 7 (+9+10): Thermodynamica: problematische link tussen macro en micro-statistiche thermodynamica vanuit reductionalistisch standpunt. (ik mis in de volgende hoofdstukken het woord “emergentie”).

11-2-2015: Expected Utility of a lottery: if all money input in a lottery is paid out then the expected value vaverage of a lottery is zero. With a utility curve U(v) there is an expected utility that can be different from zero Urational =Integral U(v) dv . These evaluations of value and utility are both assumed to be fully rational. With Ufree=Urational -I.Seconomic the influence of irrationality can be mapped.  
in detail: Ufree= Integral ( U(v) - I . k . Chance(v) ) dv =~= Iaverage . Integral ( U(v) - I . k . Chance(v) ) dv

The decision to participate can be taken on the total utility. Here the impact of the acceptability of a certain irrationality is that the (perceived) total utility is positive while the free utility is negative.

25-3-2015: “WEF\_Global\_Risks\_2015\_Report World Economic Forum +++” (p.51):

Indeed, our self-perception as homines economici or rational beings has faltered in the aftermath of the financial crisis, whose effects are still unfolding socially, as persistent unemployment, ever-rising inequality, unmanaged migration flows and ideological polarization are among the factors stretching societies dangerously close to the breaking point. Social fragility is even threatening geopolitical stability, as breakdowns in cooperation within states make relations between states more difficult.

Juni 2015: Auto luister CD van NRC academie over wetenschaps filosofie door prof. dr. mr. Herman Philipse:

Induction and deduction as basis for generation of knowledge en Skepticism as the result of the limited validity of knowledge. From Aritotoles, Plato, Bacon, Hume, …..to falsification by Popper. Asymmetrical position of knowledge: its proving that it is false is possible, proving that it is right is impossible. Only time, repetition and diversity in the challenges can generate trust in a unit of knowledge. It builds up to till the confidence is general and the limitations of the area of validity are generally accepted. If a general approach is long enough leading to acceptance the basis of this approach can be considered as the laws for that field.

4-8-2015 At Kastel viewpoint near Saarburg After reading last two weeks in The Black Swan from Nasser Nikolas Taleb. Wonderfull book! I have to contct writer and propose him to work out the Degree of Irrationality (he could finance a year of work). It is not matching his ideas exactly as it is working on modelling of economics. Nevertheless it would be a contribution that could also support his idea of the big influence of the Black Swans. The contribution would be that even in the quadrants 1-2-3 the behaviour of people is far from rational, and hence existing modelling is far from representative for real world behaviour. So it would extend the case Taleb makes for the Rare&Extreme cases of Quadrant 4 also to normal life cases that could have been decided rationally. Even in the cases that the real-world process can be dealt with by Gaussian statistics and a Platonic approach people still are not optimising utility. Assuming that people are behaving as utility maximisers that (in average) reach an economic equilibrium is equivalent to Newtonian thinking in which friction was taken out of the model. This works perfect for planet trajectories in outer space where indeed friction is to be neglected. But al physists had to introduce friction in their models in order to make Newtons first law work on real-earth problems. Economists match this friction with transaction cost. In economic modelling this is then mostly set to zero for making it easier to solve the model. Hereby they however miss the point that transaction costs not only mathematically make it more difficult to solve the model, but that introducing transaction costs in the model creates an entire different behaviour. With transaction costs a system will never converge to an economic equilibrium. It will (even in the model) get stuck somewhere in an area around the point of frictionless equilibrium. The size of this area depends on the amount of friction c.q. transaction costs. Anybody who has made some pragmatic real-world non-trivial decisions (any business project) knows that transaction costs can be of huge influence on the outcome of the decision. Anybody really familiar with the ins-and-outs of a specific field of business knows that the realities are far from optimal. In almost any field of business many conceptions of what should be deemed optimal exist at the same time. This is severely limiting the usefulness of the concept of “utility maximisation”, because it yields a different outcome for each economic actor.

Aditionally to the problems of transaction costs and different points of conceived maximal utility the process of choice making is far from perfect. Kahneman (Thinking Fast and slow) and many others have shown extensively how, even in well defined cases, people can be easily influenced by many “distractors”. So even in the quadrants 1-2-3 of Taleb and without transaction costs the individual decisions of actors have a certain spread around a predefined point of maximum utility. Whether this originates from different interpretations (which can change over time or per person) or from an incomplete execution of the optimisation-process in the making of the decision is inconsequential.

In economic theory it is a general assumption that these incomplete optimisations at the micro-level will gravitate towards an equilibrium at the point of maximum utility. Even without transaction costs this assumption is far from trivial. All decisions are necessarily one-sided of the best possible decision. The gravitation towards the optimum would necessarily require that the distances towards the point of maximum utility have to decrease in subsequent transactions between the actors. This would require a learning curve. The existence of such a learning curve is a strong assumption for which we find no evidence. Khaneman shows that people, even in simple cases where oversight is not the problem, have consistently deviations from optimal choices. He’s not mentioning …… …… ……… ……… …………… To be completed Black Swan.

27-8-2015 Discussie Lutz: Opleiding (promotie na werken in kolencentrale) geeft enorme achterstand in inkomen. Op einde studie hadden de vrienden die niet studeerden al een eigen huis gebouwd. Dat haal ik niet meer in met mijn Din A4-diploma. Dus mijn dochter (1 ½ j) moet niet studeren (maar modeshows doen).  
Mijn antwoord: Daartegenover staat de waarde van de keuzevrijheid. Hij heeft een huis en zit daar behoorlijk aan vast (financieel-emotioneel). Jij hebt diploma en kennis waarmee je overal in de wereld terecht kunt. Zonder studie had je nooit deze baan bij ons in NL gekregen, en je had nooit de gedachte gehad om dit soort vrijheids-keuzes te maken. Inderdaad: mijn vrouw heeft geen NL-paspoort, en dat merk je meteen bij reizen naar Londen. Ook de Oostduitsers kennen dit dilemma: voorheen hadden ze Ost-marken, maar hun keuzevrijheid was erg beperkt, zowel in beschikbaarheid van producten als in bewegingsvrijheid. Na de wende hebben ze grote keuzevrijheid (choice-space) maar is de economische toestand zo dat ze weinig geld hebben. Als gevolg daarvan voelen ze heel hard dat ze niet alle keuzes kunnen maken uit de ter beschikking staande keuze-ruimte. Niet mogen (beperkingen keuzeruimte) i.p.v. niet kùnnen kiezen wat je wilt. Er is wel keuzeruimte, maar de beperkte beschikbare middelen dwingen een erg rationele keuze af. Je kunt je de irrationaliteit van gekke keuzes niet permitteren geeft een gevoel van “armoede”. Dit in tegenstelling tot de Oosduitse tijd waarin die gekke keuzes überhaupt niet bestonden waardoor dit armoedegevoel niet getriggerd werd. Alleen in onderlinge vergelijking tussen Ost en West-Duitsland werd door de veel grotere beschikbare keuzeruimte in West-Duitsland het (relatieve) armoedegevoel bij de Ossies getriggerd.

Verder: importand quotes: <https://en.wikiquote.org/wiki/Thermodynamics>

<https://en.wikipedia.org/wiki/Laws_of_thermodynamics>

<https://en.wikipedia.org/wiki/Second_law_of_thermodynamics#Carnot.27s_principle>

Wltz, Gries: Europe’s waste incineration

capacities in a circular economy:…..”From a policy perspective there seems to be a need for innovative planning procedures that might help to avoid such overcapacities through an integrated assessment of recycling and prevention potential. The **basic idea should be to avoid cost-intensive path dependencies** and focus on a comprehensive network structure that allows waste treatment capacities to keep pace with dynamic economic developments.The current planning of the waste infrastructure in Europe”

‎9-‎11-‎2015 Thermo dynamica kerntechniek

Entropie is een maat voor hoe goed een proces verloopt.  
Inwendige energie is de som van de ongeordende kinetische bewegingsenergie van de moleculen. Deze kriskrasbewegingen zijn slechts gedeeltelijk in geordende bewegingen (=leveren van arbeid) om te zetten.   
  
Technical/practical work produces possible (=maximum) utility. Technical/practical work in itsself produces no value but It creates a maximum possible utility, which is than approached by (ideal=reversible) economic transactions.  
Production of value is economical work by doing a transaction. For economical transactions the maximum utility is not changed. The real utility is increased towards it.  
Conservation of maximum utility at economic transactions, (while they ad value).  
  
Work generates a POSSIBILITY to realise maxUtil at consumption.  
Trans.effic x maxUtil = realUtil@consumption.  
RealUtil = maxUtil - irreversibility = maxUtil - Irrationality x   EconomicEntropy

**20-12-2015 Law-of-One price (wiki)**  
The law of one price assumes several things:  
 - there is transport and freedom to make deals over the entire area.  
 - the market levels differences in production-cost transactions and transport till there is no driving force left.  
 - there is sufficient information for actors in the market to sense differences in prices (or conditions for which the prices are valid)   
 - the supply chain has all these conditions over at least the last step in the chain, which can compensate inequalities in prior steps.  
ADITIONALLY:  
 - the rationality at which the product is valued is the same (instead of assuming full rationality, which doesn’t exist). Even if the product is available at the same wholesale price, the last seller in the chain can take advantage of increased irrationality of the final consumer at a specific location, moment or circumstance. This individual targeting” is common in marketing and sales and is gives an upward offset to the price that is based on full rationality. On the other hand it can give a negative offset to the price if the seller is not fully rational. This is especially the case if products are end-of-life and consumers dispose goods that have a certain residual value.

The assumption of a free market with fully rational actors is a wonderful theoretical base for modelling. The hidden additional assumption behind a fully rational market is that all the irrationalities in the market are compensation each other so that the average approaches the fully rational market. Nevertheless every marketing or sales man makes his living on exploiting the irrationalities of his customers. The sheer amount of people in marketing and sales is proof of the existence of a one-sided effect. This effect can be found by the following logic: a fully rational market is optimised in such a way that there is not a single possibility to do an additional transaction that generates additional value. If there is one consumer that is not fully rational he is getting less utility for the money he is spending (or he is working for). So now all the (rational) sellers will want to sell their product to this consumer. This will show him that he’s overpaying and without being really rational he will begin to behave like he’s rational. This however is only true as a consequence of a sustained transactionpattern in which the price-feedback-loop is working.

If we now assume that the irrationality is mainly a statistical effect, then this price-feedback-loop works the other way round. The seller will set a small margin (I\*S) on top of his rational equilibrium price. The rational consumers will take no deals, but if the margin is properly tuned transactions will be generated by the statistical irrationality of the consumers. The mere existence of irrationality of (some of the) consumers is good reason to raise prices above the fully rational equilibrium. It must be noted that this irrationality works only one-sided: An irrational consumer statistical offset to the lower price will simply have no deals. So the statistical irrationality can only raise the prices, upward offset from the equilibrium. (This is only true if the salesman is fully rational, we’ll later deal with the situation of statistical irrationality on both sides.)

7-1-2016 “People consistently act inconsistently”

Uit: [Chris Argyris, HBR 1991, Teaching smart people how to learn.](https://hbr.org/1991/05/teaching-smart-people-how-to-learn) (p.9)

Van training dec .2015 door De Federatie

14-3-2016 N.a.v. De Federatie en kopieën van Kees Jansen:

Transactionele analyse:

"Contamination of the Adult ego state" = rational thinking that is based on premises that have been acquired long before and that have become so integrated with the thinking that they are not re-evaluated in the decision making process.

en OK-model:

"Stroke economy" = the interaction based on feelings, history, way of saying etc. that influence the evaluation of interactions.

22-4-2016: nav. HNF-John von Neuman (computing->nuclear-Entropy->ergodic).

<https://en.wikipedia.org/wiki/Von_Neumann_entropy>

<https://en.wikipedia.org/wiki/H-theorem>

<https://en.wikipedia.org/wiki/Ergodic_hypothesis>

<https://en.wikipedia.org/wiki/Entropy_in_thermodynamics_and_information_theory>

<https://rwer.wordpress.com/2013/02/12/ergodicity-the-biggest-mistake-ever-made-in-economics/> :

“…..basic question: what does risk mean if the notion of time is not irreversible? The only reason risk exists is that we cannot go back and make decisions over again.”

<https://rwer.wordpress.com/2012/03/28/the-ergodic-axiom-davidson-versus-stiglitz-and-lucas/>

In the introduction to his book Against The Gods, a treatise that deals with the questions of relevance of risk management techniques on Wall Street, Peter L. Bernstein [ 1996, p. 6] writes:

 “The story that I have to tell is marked all the way through by a persistent tension between those who assert that the best decisions are based on quantification and numbers, determined by the [statistical] patterns of the past, and those who based their decisions on more subjective degrees of belief about the uncertain future. This is a controversy that has never been resolved . . . to what degree should we rely on the patterns of the past to tell us what the future will be like?”

George Soros has explained why the efficient market theory is not applicable to real world financial markets with a slightly different terminology than Keynes but conceptually in the same way. Soros (2008) wrote: “we must abandon the prevailing [efficient market] theory of market behaviour. ” Soros states that there is a direct connection “between market prices and the underlying realty [that] I [Soros] call **reflexivity**”.

15-6-2016 :  that's why they say "buy in haste, repent at leisure" =~ "Kopen in haast, bekeer u op uw gemak".

25-8-2016: Luisterboeken opnemen in lijst:

Gert Mak: hoe God verdween uit Jorwerd

[John Williams](https://en.wikipedia.org/wiki/John_Edward_Williams): Butchers Crossing

+ Scott Taylor 2011 Buffalo Hunt: international trade and the virtual extinction of the North American Bison

Anna Enquist: Contrapunt ( Goldberg variaties Bach)

21 aug. 2016

Rationele keuze theorie  --  religie,   en andere keuze theorie (Khan) :   these en antithese.

Synthese = degree of irrationality.

E.Klei, Van God los, Pag.24

dinsdag 6 september 2016 10:17  
Begeren: ..because we live in a world full of wants .

Wiki: Rowling mentioned that Dumbledore regrets "that he has always had to be the one who knew, and who had the burden of knowing. And he would rather not know.

**Crisis** = period ruled by rationaly = people optimise their real utility and minimise spending money. For those not touched by the real crisis and (external) budget constraints the utility is fine. Overall expenditure is limited and that causes economic downturn for others.

**Economic boom** = period ruled by euphoric spending = people maximise their spending according to their (increased) budget even if the spending delivers limited real utility and the yield is more in the euphoric feelings.  
  
donderdag 8 september 2016 15:42  
**Art is the ultimate field of irrationality**. The utility of a sculpture or a painting has little to do with its value.

The utility is a personal experience of pleasure.  Its value on the art-market however is generated more by the provenance and spin around the object.

Counterfeit producers as Han van Meegeren, Shaun Greenhalgh and Myatt and Drewe have systematically shown that the value of the irrationality by far exceeds the utility-value of their products which remained after the discovery. (MvB inspired by article in  LeMonde, 13 aout 2016)

On the opposite **stock-markets should be the ultimate field of rationality** according to traditional economics. The prices are easily accessible for everybody, there is (liquidity provided) constant updating of values with the use of any information available to someone in the world. Every information, even if only available to some, will lead to transactions that can yield some rationality-value. But in this process the prices adapt to this information and establish to a new equilibrium in which the prices reflect all information that is somewhere available. Theory holds that this value then purely reflects the utility-value of the share, which reflects future dividend, company profit end property value. In equilibrium this would be the lowest price (value at complete rationality) for the highest utility-value (fully rational incorporation of all utility that contributes to future value).

Just as with art the provenance and spin around a share, its company and its market influence the price.

The irrationality on the value can add additional value on top of the fully rational equilibrium price.

The irrationality on the utility-value can subtract part of the fully informed rational utility.

So if shares are undervalued it’s a utility underestimation and if shares are overvalued it’s a value overestimation. This is just as with art and other things in life.

This makes that real markets can deviate from the perfectly rational fully informed ideal market both ways. The fundamentally different underlying mechanisms may be difficult to separate because both effects can compensate each other more or less.

One thing however is always true: at every transaction value is transferred from the most irrational to the lesser irrational side.

In the rational fully informed ideal market in perfect equilibrium there is no net value transfer at any transaction. Hence there is no reason to perform transactions for any of the economic agents.

So it is the utility that creates the basis of market, but it is the *difference in irrationality* that creates price differences and thereby drives the economic agents to perform exchange-transactions.

So the massive amount of transactions in the stock market shows that there is plenty of irrationality, even in this most rational of all markets.

The transactions do not, however, take place between highest bidder and lowest offeror-price. There is a (mostly random) distribution of transactions between different irrationalities.

For simplicity we will use “average of the distribution of irrationalities” as the proxy “degree of irrationality” to model the economic behaviour of the economic agents and the transfer of value between them.

It is a bit a rude approach to simply use average instead of detailed modelling of behaviour within different types of distributions of degrees of irrationality. But in this phase of development of theory and data about the true distribution of irrationalities would make a detailed approach to an academic exercise. Adding this straightforward “degree of irrationality” and “value of choice-space” (in which this degree of irrationality is applied) still is a significant extension to the possibilities to match modelling with real world behaviour. It will be challenging to calibrate “degree of irrationality” and “value of choice-space” in real world situations. But in well-defined choice settings (like gaming, lottery, betting) theoretical outcome of full rationality and random choice together can be used to accurately calibrate the scale towards real-world behaviour is measured. Also in stock-trading predefined limitations (selected set of stocks, maximum amount of money, maximum number of transactions and a discrete time interval) can create a fixed choice space. In an ex-post evaluation the trajectory of transactions which generates maximum yield is the calibration point for 0% irrationality (fully informed rational choice) and a random choice average (Monaco simulation) generates the yield of 100% irrationality.

This modelling of irrationality for utility and value complements the traditional rationality assumption. It allows to create a synthesis with the psychological / behavioural theories developed in last decades that show vastly irrational behaviour in almost any decision making process.

Di 20 sept 2016

Uit  boek Jeremy Rifkin:  The Zero Marginal Cost society:

Meer citaten nodig, selectie:

P.15 communication, power and logistics comprise the physiology of the *economic organism*. …..Link this to [Progogine](https://en.wikipedia.org/wiki/Ilya_Prigogine) with organism as dissipative structure.

P.64 Growing number of products, structures ever more complex and differentiated (~=entropy) controlled by an ever more rationalized, centralized management.

P.211 Coase was obsessed with the superiority of the capitalist market and Hotelling with the superiority of government management. But what unfolded was a third approach to optimizing welfare. The government threw its support to a distributed collaborative, laterally scaled economic institution – *the cooperative –* as the vehicle for electrifying and transforming rural America. The cooperative turned out an other mechanism to trigger rationality. Not the invisible hand behind market parties matching demand and supply, nor the almighty envisioned visible hand of the government, but properly scaled self initiative directly matching needs for utility with possibilities to fulfill them.

P.233 two centuries of industrial activity have created untold prosperity – the average upper-middle-class person’s wealth exceeding that of emperors and kings just a few centuries earlier. But families began to realize that they had been sold a bill of goods, that they had been sucked into a debilitating addiction fed by billions of dollars of corporate advertising.

P.306 Adam Smith Invisible Hand is interpreted by economists as the collective effect of (partial) rationalism by the economic actors.

But there is also an invisible hand stimulating irrationality. It is the invisible mechanism behind a massive overwhelming amount of marketing, merchandise, spin, tactical and even political maneuvering of parties in the market that are pushing to the opposite of fully informed rational decision making.

P.278 Materialism, fueled this toxic way, “is not just rational, self-interested, utilitarian and driven by the need for autonomy, but is robbed from the primary drive that animates our species – our empatic nature.”

Ma 31-10-2016: Positive utility for products and services is a basic assumption in economic theory. With this assumption some irrationality of the buyer is just reducing the utility yield or increasing the price. Even in cases where a random choice yields negative utility or value it is still possible for a more-or-less rational economic agent to do transactions that are favourable by being carefull and making a better-than-random-choice.

Some “products” have a negative utility or value. To distinguish them here the name ***negaducts*** will be used.

A negaduct can not be traded with any overall advantage for seller and/or buyer. A rational choice would be to do no transaction or just discard it. Only with regulation and “enforcement” a transaction can be arranged. Waste is an example of a negaduct.

The irrationality of the buyer (the ono who takes the waste for treatment) will now

<https://en.wikipedia.org/wiki/Use_value#Use_value_and_utility>: use-value and exchange-value form a dialectical unity.

Buyer: ΔUB = ΔGB + ΔRBu = ΔV - ΔRBv

Seller: ΔUS = ΔGS + ΔRSu = ΔV - ΔRSv

* ΔV. is the monetary value transfer of transaction that takes place for buyer and seller
* ΔU. is the perceived gain in utility for buyer and seller.
* ΔR.v is the irreversibility-value of the transaction. It is zero at perfect rational fully informed transaction leading to the minimum price for the transaction. For any real transaction the R.v is a positive contribution:
  + ΔRBv= ΔVB irreversible – ΔVB reversible with ΔVB irreversible > ΔVB reversible.
  + ΔRSv= ΔVS irreversible – ΔVS reversible with ΔVS irreversible > ΔVS reversible.
* ru/v = rate of utils per euro
* I.v\*ΔS.v = R.v

Buyer: ΔUB = ΔGB + IBu\*ΔSbu = ru/v \* ( ΔV + IBv\*ΔSBv)

Seller: ΔUS = ΔGS + ISu\*ΔSSu = ru/v \* ( ΔV + ISv\*ΔSSv)

à for simplicity in explanation now choose ru/v = 1 util/€ for equations below.

<https://en.wikipedia.org/wiki/Frank_P._Ramsey>

<http://www.theschooloflife.com/antwerp/> (van LinkeIn Nicole Smet)

<http://www.thebookoflife.org/>

<http://www.thebookoflife.org/good-vs-classical-economics/>

<http://www.thebookoflife.org/consumer-education-on-learning-how-to-spend/>

<http://www.thebookoflife.org/good-vs-classical-economics/>

for “products” with a negative utility or negative value the irrationality has a different result.

Henry Miller: **“One's destination is never a place, but a new way of seeing things.”**

**(Dec 2016 foto genomen van een truck van thefreightmanager)**

2017 01 05 Dingen voor ons uitschuiven geen zin heeft, heeft iedereen er weleens last van. In deze TEDtalk legt blogger Tim Urban aan de hand van kattenfilmpjes op YouTube, Wikipedia zoektochten en uit het raam staren uit waar we precies voor wegrennen – en of we daar überhaupt aan kunnen ontsnappen.

Drie stuurders:

* Instant gratification Monkey (easy and funà dark playground)
* Rational Decision maker (makes sense à hard things)
* Panic Monster (dormant, but is the only thing that the Monkey is afraid of)

Real problem is when the deadlines are not there: then there is no monster to chaise away the Monkey. 90 jaar x 50 weken/jaar = 4500 weken zijn al grotendeels op!

**http://www.mt.nl/management/tedje-week-zo-werkt-brein-iemand-uitstelgedrag/529796**

2017 01 25

One of the most important theoretical forces of the Industrial Age and beyond was revealed by the Luddites, the early 19th century weavers who rose up against machines that were taking their jobs. Because all or many of the Luddites did find work despite the obsolescence of their manual skills, they became forever associated with numbskulls, in this case those who do not understand that new technologies arise and absorb displaced workers: A new machine negates demand for a certain category of workers, and they suffer a period of joblessness, but they then move on—sometimes to other cities and states—and find new occupations, often in previously non-existing businesses. Milton Friedman, among the leading purveyors of this line of thinking, famously said that human wants are infinite, and that demand for new products thus will keep us employed.

2017 03 26

prof.Dr. Sonja Zweegman; Weten Wist Geweten; 2014 09 19

Uit intrederede VuMC Hematologie pag .9:

“overeenkomstigheid maakt de patiënten nooit zo eender als het verschil ze anders maakt”. Kankercellen onderscheiden zich van normale cellen door genetische veranderingen; dat zijn veranderingen in het erfelijke materiaal, het zogenaamde DNA. Deze veranderingen doen kankercellen ongeremd groeien en voorkómen hun natuurlijke doodgaan. Nu blijkt uit onderzoek van het DNA van bloed- en lymfklierkankercellen, dat wat wij vroeger zagen als één type kanker vele verschillende verschijningsvormen kent. Dat maakt het kiezen van de juiste therapie ingewikkelder. U zou dat kunnen vergelijken met wat de filosoof Rob Wijnberg beschrijft in zijn boek “Nietzsche en Kant lezen de krant” over de moeilijkheden van keuzevrijheid (10). Bij een oneindig aantal mogelijkheden waartussen gekozen moet worden, zijn de verschillen vaak zo klein dat een

keuze onmogelijk wordt(6). Als voorbeeld: ik weet niet of u nog weet welke eieren u verantwoord kunt aankopen of dat nu weide-eieren, graseieren, vrije uitloopeieren of graaneieren zijn. Ik niet, maar ik zal u één tip geven, met het gevaar dat dit het enige is dat u onthoudt van deze rede; als er een stempel met een 0 op het ei staat is het een verantwoorde keuze. Helaas geldt zo’n algemeen advies niet voor de juiste keuze van antikanker therapie, vanwege de grote verscheidenheid binnen één kankersoort.

(6). Kantarjan H et al. Cancer Research in the United States; dying by a thousand paper cuts. Cancer 2013: Nov 1;119(21):3742-5.

(10). Wijnberg R. Zonder innerlijke noodzaak is het moeilijk kiezen. Hoe méér keuzemogelijkheden kunnen leiden tot minder keuzevrijheid. Uit; Nietzsche en Kant lezen de krant.

(Google via 10, via examenbundel Havo 2016 door naar:)  
 [Dan Ariely](https://en.wikipedia.org/wiki/Dan_Ariely): He is the author of [*Predictably Irrational*](https://en.wikipedia.org/wiki/Predictably_Irrational) and [*The Upside of Irrationality*](https://en.wikipedia.org/wiki/The_Upside_of_Irrationality), both of which became [*New York Times*](https://en.wikipedia.org/wiki/New_York_Times) best sellers, as well as [*The Honest Truth about Dishonesty*](https://en.wikipedia.org/wiki/The_Honest_Truth_about_Dishonesty).[[](https://en.wikipedia.org/wiki/Dan_Ariely#cite_note-haa-3)

10-5-2017 uit ben Tichelaar: dit wordt jouw jaar, p.16+116:  
Comparison of happiness of American superrich (Forbes 400-list) with the Amish, an orthodox Christian community that lives very simple and traditional. At a scale of 1-7 both groups scored 5,8. It apparently makes no difference for your happiness whether you move in an Ferrari or in an horse-and-carriage.   
Diener,E,. & Seligman,M.E.P. (2004). Towards an economy of Well-being.  
Social Indicators Research series 37.

3-7-2017 aanleiding absurde thermodynamische claims voor verfsysteem: <https://www.psiram.com/de/index.php/Ziegelphysiker>

Behandeld in website die Glaubenssysteme behandeld, Überzeugungssystemen: <https://www.psiram.com/de/index.php/Hauptseite>

30-10-2017 <https://en.wikipedia.org/wiki/Hyman_Minsky>

30-1-2018: <https://en.wikipedia.org/wiki/Lorem_ipsum>

This is H. Rackham's 1914 translation – in the aforementioned Loeb Classical Library edition – with the major source of lorem ipsum highlighted:

[32] But I must explain to you how all this mistaken idea of denouncing of a pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do **not know how to pursue pleasure rationally encounter consequences** that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasure?

[33] On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure of the moment, so blinded by desire, that they cannot foresee the pain and trouble that are bound to ensue; and equal blame belongs to those who fail in their duty through weakness of will, which is the same as saying through shrinking from toil and pain. These cases are perfectly simple and easy to distinguish. In a free hour, when our power of choice is untrammeled and when nothing prevents our being able to do what we like best, every pleasure is to be welcomed and every pain avoided. But in certain circumstances and owing to the claims of duty or the obligations of business it will frequently occur that pleasures have to be repudiated and annoyances accepted. The wise man therefore always holds in these matters to this principle of selection: he rejects pleasures to secure other greater pleasures, or else he endures pains to avoid worse.

3-1-2019 [Léon Walras](https://en.wikipedia.org/wiki/Léon_Walras) (like all economists) provides a **definition of economic utility** based on economic value as opposed to an ethical theory of value.

Wiki: ["economic man"](https://en.wikipedia.org/wiki/Homo_economicus):

[John Stuart Mill](https://en.wikipedia.org/wiki/John_Stuart_Mill)

[Adam Smith](https://en.wikipedia.org/wiki/Adam_Smith), in [*The Theory of Moral Sentiments*](https://en.wikipedia.org/wiki/The_Theory_of_Moral_Sentiments), in [*The Wealth of Nations*](https://en.wikipedia.org/wiki/The_Wealth_of_Nations),

Aristotle's [*Politics*](https://en.wikipedia.org/wiki/Politics_(Aristotle))

[Francis Edgeworth](https://en.wikipedia.org/wiki/Francis_Edgeworth), [William Stanley Jevons](https://en.wikipedia.org/wiki/William_Stanley_Jevons), [Léon Walras](https://en.wikipedia.org/wiki/L%C3%A9on_Walras), and [Vilfredo Pareto](https://en.wikipedia.org/wiki/Vilfredo_Pareto)

20th century, the [rational choice theory](https://en.wikipedia.org/wiki/Rational_choice_theory) of [Lionel Robbins](https://en.wikipedia.org/wiki/Lionel_Robbins)

Wiki: [Rational choice](https://en.wikipedia.org/wiki/Rational_choice_theory)

Keizer: [Bounded rationality](file:///E:\Marcel\Documents\Archief\2018\Promotie%202018\Keizer%20ESB%202018%20++De%20autoriteit%20van%20de%20economische%20wetenschap.mht) +++

Thesis: conventional wisdom uses Fully informed rational decision making in economic modelling.

Antithesis: People consistently act inconsistently and irrational

[Synthesis](https://en.wikipedia.org/wiki/Thesis,_antithesis,_synthesis): There are two drivers in decision-making:

1. one is rational utility maximization: this leads to a convergence of decisions to a single optimal choice (or limited set of equal decisions).
2. second is the thrive for freedom: as soon as primary needs are fulfilled people like to explore diverging choices based “non-rational needs” like love, greed, thrill, status.
3. Value is the sum of the effort that people want to spend on “rational utility” and “non-rational needs”.
4. “rational utility” is the basis for reversibility of economic transactions: in or near economic equilibrium one way of fulfilling the utility is the equivalent to another. If conditions or prices change marginally transactions can be easily reversed or exchanged to other goods.
5. “non-rational needs” are the basis of irreversibility of economic transactions: decisions that are irrational cannot be reversed because one party will have advantage over the other. This may even lead away from economic equilibrium.

18-1 2019 **Marketing and Yellow-Vests**

In our society we pour a massive amount of marketing out over our population. Off course we know that marketing can, as a byproduct of creating greed, create dissatisfaction or even discontent. In these lines we will work out the discontent feelings of the *“yellow vest movement”* with a reference to relative irrationality.

Marketing tries to sell products. That can be done by informing possible customers about the usefulness or utility of the product. Mark the link between information and utility in this case. It’s appealing to rational decision-making by providing proper information. But marketing can also appeal to irrational decision making. In modern marketing in a world that is overloaded with information this is the focus of most marketing for consumers. It has a long and proven history of ever more, and ever more professional, marketeers that are trained and working to sell their products.

The result is that customers are constantly bombarded with marketing which is appealing at their irrationality, which is addressing their freedom of choice towards the marketed products. This works effectively for those who have, beyond their rational needs, a margin to spend. However, those that have a financial income that requires constant rationality to fulfill their utility will have no room for “freedom of spending”. The basic level of what is perceived as “real needs” has been evolving over time. Currently a TV, a computer and smartphone, and associated ABONNEMENTEN, are implicitly addressed as real needs by most in our society. This vastly exceeds the house with some heating, and sufficient food of only a century ago. This threshold of minimum utility has been raised implicitly by marketing by the extent to which basic needs are assumed as self-evident, and the better options are presented as luxury.

Still customers have an income that limits their choice space. If the income is only just enough for fulfilling perceived needs, and beyond that a massive choice-space is beckoning, it requires constant awareness for proper spending in order to avoid of spending something improperly. The fear of “falling through” is the driver for a constant low degree of irrationality.

So, marketing creates high minimum level of utility and a massive choice-space above that. This

massive choice space can only be handled by a correspondingly low degree of irrationality, which is perceived as unfreedom or poverty.

The widespread discontent in the yellow-vests movement can be explained by the feeling of being trapped to maintain the induced basic-needs and being tempted with massive options that can only be handled by a harsly low degree of irrationality.

Physical poverty is not being able to fulfill basic needs.

Poverty however is having no freedom of choice beyond the fulfillment of the imposed needs.

31-1-2019 **Simple physicists model of the economy** :

Maarten Toonder O.B.Bommel: Windhandel.

- Zaken doen, Illusies, behoefte scheppen

Maarten Toonder O.B.Bommel: Bovenbazen.

- ***Geld trekt geld aan***, voorschriften voor geld, fuziepulaties, grootkapitaal kan niet splitsen

Geld trekt geld aan in een mooi fysisch modelletje gepresenteerd met verrassend resultaat:

<https://www.youtube.com/watch?v=GFxPMMkhHuA> (from 43:43-47:10)

Model: throwing money to other money like gravity is like 3year old’s playing monopoly. Still the model is predicting income distribution in US-economy with surprising accuracy.

***Idea’s that are clearly not sensible can help to find out things on average.***

14-3-2019 Kahneman: [Prospect Theory](https://en.wikipedia.org/wiki/Prospect_theory), Risk aversion/risk seeking

14-3-2019 boek-presentatie: [Reiner Kümmel - The Second Law of Economics, Energy, Entropy and the Origins of Wealth](https://www.youtube.com/watch?v=iKYir4MxrgA) (2011) Shift the taxes from labour to energy. !!

Nicholas Georgescu-Roegen - "The Entropy Law and the Economic Process", (1971)

Beide boeken introduceren entropie (Energy gebaseerde entropy) in de economie. Relatie tussen het scheppen van waarde met behulp van energie.

“Professor Kümmel upends conventional economic wisdom by showing that the productive power of energy far outweighs its small share of costs, while for labor just the opposite is true. Wealth creation by energy conversion is accompanied and limited by polluting emissions that are coupled to entropy production. These facts constitute the Second Law of Economics. They take on unprecedented importance in a world that is facing peak oil, debt-driven economic turmoil, and threats from pollution and climate change. They complement the First Law of Economics: Wealth is allocated on markets, and the legal framework determines the outcome. By applying the First and Second Law we understand the true origins of wealth production, the issues that imperil the goal of sustainable development, and the technological options that are compatible both with this goal and with natural laws.”

<https://en.wikipedia.org/wiki/Theory_of_value_(economics)>

<https://en.wikipedia.org/wiki/Utility>

11-6-2019

**The Value of Choice,   
Theory on general irrationality and irreversibility in economic transactions**

**Basic set of definitions on value, utility and irreversibility:**

*(let OP! TO DO: Teken +/- value niet consequent afgehandeld met de definitie)*

**V = U – I                     V-U= I**

The value you should pay is always less than the utility you get.

“If you pay more than you gain on utility, then you want to reverse the transaction”.

The utility gained by a transaction is the Value that what one wants to pay minus the Irreversibility of the transaction.

**Utility** is the personal measure of pleasure that can result out of an economic transaction.

In a Fully Informed Rational Decisionmaking (FIRD) the utility is maximised over the entire choice space that is available for the transaction. Utility is generally non-measurable. Only in a well-defined setup with limited and perfectly defined choice-space it may be measured (ordinal).

**Value** is the visible and measurable compensation given for the utility obtained by the economic transaction. Value is potential future utility. The conversion of value to utility requires further transactions. In a Fully Informed Rational Decisionmaking (FIRD) the compensation for obtaining the utility is minimised by choosing the optimum out of the entire choice space that is available for the transaction. Thereby the FIRD transactions obtain maximum utility out of the value. In a non-FIRD transaction less utility is gained out of the value than would be possible with FIRD.

Value is often expressed in a currency (cardinal unit without direct utility for itsself), but can also be expressed in barter-trade amounts. In contrast to utility it is a transaction property (non-personal). In a large network of transactions values can iteratively converge. This converged transaction value can form a “market value” which can be seen as the average value per utility.

**Irreversibility** is the difference between value and utility in an economic transaction that makes it unattractive for one party to reverse the transaction. In perfect Fully Informed Rational Decisionmaking (FIRD) the Irreversibility is zero. In a non-FIRD the irreversibility may be unaware because of lack of information or lack of rational evaluation of the available information. Irreversibility may be measured by testing the value needed for reversal of an transaction.

**ΔVtransaction = ΔVa + ΔVb= 0**   the value change for both participants combined is zero. A transaction doesn’t change the total value (currency is transferred, no net change in currency in an transaction).

*For the rest below we introduce a basic transaction scheme. It wil be of a fixed product that can be traded between two participants. The utility of the product is different for the participants “a” and “b”. The participants agree on a price.*

*This is simplified for introduction of the concept of irreversibility only. Of course, the concept of irreversibility can be added to other schemes as well.*

The total gain of direct and future utility of an transaction is:

ΔUa= Ua,after - Ua,before   is the utility change of a participant “a” in an economic transaction

ΔVa= Va,after - Va,before   is the value change of a participant “a” in an economic transaction

.   +   .

**ΔUa + ΔVa = ΔUVa**

In Fully Informed Rational Decisionmaking:

**ΔUa,Perceived = ΔUa,FIRD**

**ΔVa,Perceived = ΔVa,FIRD**

In a perfect equilibrium FIRD-market all optimisation potential is already realised, so there is nothing more to gain by any further transaction:

**ΔUa,FIRD + ΔVa,FIRD = ΔUVa,transaction in perfect market =0**

This applies for all participants in the market, so there is no reason to do any transaction for anybody.

In practical decision making with incomplete information or incomplete rational evaluation of the information for making an optimal choice out of the choice-space will have a difference between the perceived and the realised utility and value. Participants will perceive there is something to gain by doing a transaction:

**ΔUa,Perceived  >=  ΔUa,FIRD**

**ΔVa,Perceived  >=  ΔVa,FIRD**

**ΔUa,Perceived + ΔVa,Perceived >=0**  in any transaction for each of the participants.

The sum of direct utility plus the potential future utility expresses in the perceived can increase for a non-FIRD participant. As he decides on perceived rather than the for him unknown FIRD value he will execute with another participant. He will negotiate with another participant on the market. If this participant “b” is a FIRD they wil come to an agreement for which applies:

**ΔUa,Perceived + ΔVa,Perceived  >=0**

**ΔUb,Real       + ΔVb,Real        >=0**

Both participants are happy with this non-FIRD transaction, otherwise they would not participate in the transaction (that is the definition of utility).

After the transaction the perception of “a” is adjusted to ΔVa,Perceived  = ΔVReal (and because of ΔVtransaction = ΔVa + ΔVb= 0)    we find   **ΔUa,Perceived + ΔVReal  >= 0**

Now we introduce a third trader “c” to introduce an alternative in the negotiation between “a” and “b”. As normal both parties will evaluate the deal on itself:

**ΔUa,Perceived + ΔVReal  >= 0**

**ΔUb,Perceived + ΔVReal  >= 0**

But now “a” and “b”could evaluate the deal also against “c”:

**ΔUa,Perceived + ΔVReal   >= ΔUa,Perceived + ΔVa-c,Real**

**ΔUb,Perceived + ΔVReal   >= ΔUb,Perceived + ΔVb-c,Real**

This results in: ΔVReal   >= ΔVa-c,Real and ΔVReal   >= ΔVb-c,Real

If after the transaction between “a” and “b” one of these gets aware that the deal is not optimal he will be poised to reverse the deal and realise the better deal instead. He will even be willing to pay for this. The maximum amount that he is willing to pay for reversing the deal is what we will call: “the irreversibility of the original deal”:  
**ΔUa,Perceived + ΔVReal   - ΔUa,Perceived + ΔVa-c,Real  = ΔVReal  - ΔVa-c,Real = Ia-c**

**Δb,Perceived + ΔVReal   - ΔUb,Perceived + ΔVb-c,Real  = ΔVReal  - ΔVb-c,Real = Ib-c**This irreversibility is always relative to the alternative.

Sign +/- of value and irreversibility to be checked and to be made consistent.

LOT of WORK !

If after the transaction the three parties will sit together and make a FIRD deal then this deal will reduce the irreversibility for each one.

ΔI=>0

For any transaction irriversibility is always positive or zero.

An economic transaction is only executed if both parties find a positive

Ipractical>0

For all practical cases (where not all cases can be evaluated perfectly) there is a positive Irreversibility.

IFIRD=0

In perfect Fully Informed Rational Decisionmaking the Irreversibility is zero

Now we introduce a fourth trader. For clarity we will use a market maker who in his own represents the “all knowing FIRD perfect equilibrium of the market” and name him Perfect Informed Equilibrium Rational Market (PERM).

If there is one non-FIRD he can trade with the PERM as described before, and as a consequence the market as a whole will move towards the perfect equilibrium.

If there are two non-FIRD’s with different preferences on utility or value, the best option can possibly be that these two make the best deal.

They do this in the presumption doing a deal better than the rest of the market.

As normal both parties will evaluate the deal on itself:

**ΔUa,Perceived + ΔVReal  >= 0**

**ΔUb,Perceived + ΔVReal  >= 0**

But now they could also evaluate it against the PERM price:

**ΔUa,Perceived + ΔVReal   >= ΔUa,Perceived + ΔVPERM**

**ΔUb,Perceived + ΔVReal   >= ΔUb,Perceived + ΔVPERM**

This results in: ΔVReal   >= ΔVPERM

The PERM wil be interested in doing a better transaction with each of the two.

The non-FIRD behaviour (because of any market imperfectness) will not make this happen.

If after the transaction between “a” and “b” one of these gets aware that the deal is not optimal he will be poised to reverse the deal and realise the better deal instead. He will even be willing to pay for this. The maximum amount that he is willing to pay for reversing the deal is what we will call: “the irreversibility of the original deal”. Compared towards the Perfect Informed Equilibrium Rational Market (PERM) the irreversibility can be expressed in absolute terms.

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**Rationality is stifling**

(beknellend/beklemmend =/= oppressive, burdensome, depressing, galling, irksome, nerve-wracking, suffocating),.

Rational searching to a single best solution is reduction of freedom. It is putting deliberate effort in excluding most of the options that are available in choice-space. It is the opposite of the general desire of people to feel free when making a choice. That means that even if the "best solution" is (or could be) known there is a desire to chose deliberately a non optimal solution. In founding economic theory the rationality asumption is then used to labelled this choice as the rational choice. But that is een cirkelredenering that neglects aswell imperfect rationality as deliberate irrationality as fundamental drivers in human behaviour.

Fields with high rationality are probably:

\* stock market: zero sum game, only way to make money is trading with people that are more irrational than yourself.

\*  Poor people: poor people can not afford the luxury of irrational decision making. With limited resources the pyramid of Maslow creates a rather firm frame of thinking.

Fields with high irrationality are:

\* trade in art: the value is more in the story then in the product itself. The utility of a painting is maximal for a good reproduction of it, while costs for security and insurance are minimal. Yet the value of the reproduction is only a fraction of the original. Although the original can only be distinguished from the reproduction the value is much much higher. This difference is the irrational part of the value.

\* beautiful car: similarly, a cheap car provides transport (=utility) efficiently. Safety and speed are only marginal improved for twice the price. Comfort increases also a bit at further doubling the price. But then a design to impress the neighbours is a good reason to spend a year’s salary. That’s freedom to behave deliberately irrational.

\* expensive restaurant: eating is a basic need. When there is scarcity of food the rational choice is for getting the needed calories for a minimum of work. If the situation is more relaxed a good taste and variation of food can add to the utility-feeling. In a full luxury situation additional requirements pop up: nice colours, special make-up for presentation of the food, and a context that adds comfort. Here we see the shift in what’s a rational choice depending on the available resources. When resources get scarce there will be an immediate return to more rational decision making.

\* addiction: if animal spirits take the ruling the brain loses control. That’s why addicted people pursue their addiction even if they have all the information that their choices are dramatically negative.

\* fear:

\* power of other people forcing into decisions

\* corruption

All thrive to rational optimisation is in the end only generating value to be spend on more irrationality.

That big companies, with all their economy of scale and resources for rational optimisation, have not a really higher profit margin than smaller companies is a result of the massive irrationality they also incorporate. Every serious employee knows about tons of decisions that are clearly suboptimal, but need to be taken because of bureaucracy, incompetence or corruption.

Corruption is a really bad driver for deliberately organising suboptimal decisions ( in order to reach personal profits).

Verzonden vanaf mijn Samsung Galaxy-smartphone.

18-8-2019 On the unavailability of full information in the market.

Fully informed Rational Decisionmaking (FIRD) is the basic assumption behind how the Homo Economicus operates to perform his transactions on the market. This forms the basis for the framework of modelling the “Invisible hand” that guides the market towards prices that establish an equilibrium between supply and demand. The assumptions are creating an abstraction that enables to leave out all the individual reasonings of the participants in the market. This allows for clean concise mathematical description of market dynamics that forms the basis for much of modern economic theory. However, there are many points in which the real market does not, or not at all, fulfil the FIRD requirements. Yet, the theory resulting from the assumption is often remarkably well in describing or predicting real market behaviour. In this PhD w’ll add some constructs that extend the conventional mathematical descriptions with means to include non-FIRD components of behaviour.

But first we will show an example in which even a well-established transparent market does not fulfil FIRD, not because of flaws in the information provision or in the rationality of the participants, but because of principal multistability in the patterns that guide decision-making. For this example we look at the electricity market. A nice property of the electricity market is that on the grid there is virtually no storage so that equilibrium between supply and demand must always be established instantaneously. However the ways to establish this equilibrium have clearly different mechanisms for different time-spans:

* 1-100 milli seconds: grid impedance (inductance and capacity) provides energy storage and levelling of voltages (locally).
* 10-1000 milli seconds: Voltage control of generators adapts the tension supplied to the grid to compensate changing demand
* 1 second – 1 minute: Inertia of the rotating mass of generators stabilises the frequency of the grid (locally)
* 10 seconds - 1 hour: control of steam supply to turbines matches the power needed to stabilize the frequency of the grid.
* 15 minutes- 1 day: Operators chose to increase/decrease setpoints for powerplant units to match demand. In older times this was generally managed by a regulator which had oversight of production and demand (real time and predicted). Nowadays market mechanisms have been established to create a price driven equilibrium of production and demand, with a regulator that comes only into action to engage backup-power facilities if margins for stable operation of the grid are compromised.
* 1 hour - 1year: Operators chose to activate additional/less powerplant units to match demand, based on merit order of plant units and market price modelling. Some large power consuming industries tune their activity (=power demand) to market prices.
* Quarter- 2 years: operators plan maintenance and optimisation projects
* 1 year- 10 year: operators plan obsolescence or construction of new powerplants
* >10 years: demand develops depending on technical developments and prices of electricity compared towards other power sources.

The first four shorter-term equilibria are established purely with technical means that require delicate technical engineering to ensure stability at all times. In the equilibria over times longer than a quarter price and market mechanisms play a vital role. The “merit order” for deploying powerplants in this fast-market is established purely on a “marginal rate of substitution” ([Marshall](https://en.wikipedia.org/wiki/Marginalism)). This means that only short-term costs (like additional coal or gas that is needed) are taken into account for decisions to deploy specific powerplants. The sunk-costs of the construction of powerplants are not taken into account in this “marginal rate of substitution” decision. So even if in this market a FIRD is assumed, a significant part of the cost information is discarded. For some sustainable sources like windmills or photovoltaic solar cells the marginal costs are nearly zero and investment costs are dominating total costs of ownership by more than a factor ten.

As a consequence there exist two equilibria with totally different FIRD mechanismes, each in its own timeframe.

……..

28-8-2019 <https://en.wikipedia.org/wiki/Prospect_theory>

10-10-2019 [Steve Eiceman (Youtube Oxford)](https://www.youtube.com/watch?v=73OZncDEDks&frags=wn)

[They mistook leverage for genius](https://www.youtube.com/watch?v=NJodqhzqPKQ)

**Film: The big short.**

[Kathryn Petralia (Youtube, Oxford)](https://www.youtube.com/watch?v=RfBADXu-LGo)

Humans are predominantly motivated by two basic instincts: fear and desire.

We fear the worst: not being able to care for ourselves and our families.

Desire, also named as greed by some, seeks to improve our lives.

For most of us this means to work for money that pays the bills, pair rent, take care about children. We hope to live mostly happy lives. For some desire pushes this even further. Nowhere this is more evident than at Wallstreet where the bankers, lawyers, analysts and trader relentlessly pursue the ever-increasing baseline of wealth…..

Wallstreet, the regulators, the buyers of the securities and the consumers, each with the desire to move themselves along the happiness continuum, known as greed and a confluence of macroeconomic factors caused this crisis.

30-3-2020 Wiki Einstein: Near the beginning of his career, Einstein thought that [Newtonian mechanics](https://en.wikipedia.org/wiki/Newtonian_mechanics) was no longer enough to reconcile the laws of classical mechanics with the laws of the [electromagnetic field](https://en.wikipedia.org/wiki/Electromagnetic_field). This led him to develop his [special theory of relativity](https://en.wikipedia.org/wiki/Special_theory_of_relativity).

**Verantwoording:**

During my entire career I have developed a growing uneasiness with the beauty of the mathematical-economy framework based on the assumption of Rational Decision Making. The starting points, the thinking and many results have given the economic science a robust position in the humanities. Nevertheless, there are many clear deviations between economic models and actual observations that require ever more complicated corrections and additional assumptions to bridge the gap.

This is like the inability of Newtonian mechanics to correctly handle movement, energy and heat in the world of the steam-engine. Yet in outer space and in mechanics it had already proved it worth so much that it could not be discarded. It was to be complemented.

The new theory I propose tries to reconcile the laws of rational economics with the findings of the general irrationality observed by an endless stream of observations in economic, social and psychological sciences. Starting point is the existing framework based on rational behavior. However, a component is added that reflects non-rational behavior.

Creating a framework to do this systematically helps to match observed behavior with models, using some fundamental assumptions instead of a case-by-case introduction of corrective mechanisms in the models. The fundamental assumptions describe the observations in a clear and easy to understand and comprehensive way. The difference between the rationality-based modelling and the observed behavior can so be quantified. This provides a clear basis for reconciliation of rationality-based models with the observations is daily life, keeping the value of the framework and adding room to extend it. Like thermodynamics extend Newtonian theory.

I name it: Theory of general irreversibility and irrationality in economics.

12-4-2020 Lijst films om uitleg te geven over irrationality (bv. voor zomergasten):

2007 [Randy Pausch: Last Lecture](https://www.youtube.com/watch?v=ji5_MqicxSo) = dosis wijsheid

1980 [The Gods Must Be Crazy](https://en.wikipedia.org/wiki/The_Gods_Must_Be_Crazy) = How far we are deviated from natural environment, How much background knowledge is needed for "normal life”

1982 [Koyaanisqatsi](https://en.wikipedia.org/wiki/Koyaanisqatsi) = relatie tussen mens en natuur, grote aantallen. We denken individualist te zijn, maar zijn een massale stroom. Minder individu dan een mier.

2002 [Catch me if you can](https://en.wikipedia.org/wiki/Catch_Me_If_You_Can) = hoe makkelijk we manipuleerbaar zijn. Dus een prooi voor de marketing.

2006 [The devil wears prada](https://en.wikipedia.org/wiki/The_Devil_Wears_Prada_(film)) = mooie scene waar Miranda uitlegt hoe de marketing industrie werkt op de "individuele" keuze van de kleur van een trui. En hoe zij de opper-manipulator speelt.

2000 [Les glaneurs et glaneuses](https://fr.wikipedia.org/wiki/Les_Glaneurs_et_la_Glaneuse)  = hoe weinig je nodig hebt om gelukkig te zijn als je niet meedoet aan de economische groei.

Idem de powerpoint fotoserie van de oude fransman in zijn berghutje.

~Zelf maken: filmpje over glanzende auto in showroom met verkoper die de features aanprijst. Doorsneden met beelden van stilstaan in eindeloze files en shots van soortgelijke auto die in schredder roemloos tot stukjes vermalen worden.

~ [Slumdog millionaire](https://en.wikipedia.org/wiki/Slumdog_Millionaire) = extreme armoede leidt harde tot gemene rationaliteit die beschikbare macht maximaal benut. Indrukwekkend stukje over afval stortplaats met toilet in Indiase armoede

18-7-2020 Normally evaluating the degree of irrationality is only possible to obtain ex-post when all information is available. An indication of the degree of irrationality can however be obtained before the decision making by asking specifically for the difference between rational and irrational choices.

People will be induced to maximise the rationality component with a question like:    
          What “should” be your choice if it has to be a wise decision?

To reveal the more irrational component in the decision the second question then is:   
  What “would” you like to choose?

Mark the distinction between should (which indicates a single option) and would (which induces a free thinking). Also, the "wise decision" triggers the perspective of ex-post evaluation where "like" triggers primary feelings now available.

The combination of these two questions helps people to get an awareness of the rationality and irrationality in their own thinking. The two answers reveal two points in the choice space that people are aware of. Of course, the real choice space may be larger and the real optimum may be better than the answer on the "wise question". The "like question" may yield a result which is spread more over the choice space than the real choice that will be made. In repeated ex-ante and ex-post evaluations it is however maybe possible to calibrate the ex-ante points to the ex-post points in choice-space to each other. That would create an option to do ex-ante evaluations of the degree of irrationality in some dedicated choice settings.

13-10-2020 Nobel prize: Paul Milgrom en Robert Wilson: Auction theory, winner’s curse

<https://www.nobelprize.org/prizes/economic-sciences/2020/press-release/>

<https://en.wikipedia.org/wiki/Paul_Milgrom>

<https://en.wikipedia.org/wiki/Robert_B._Wilson>

<https://en.wikipedia.org/wiki/Winner%27s_curse>

"**winning the battle but losing the war**". This describes a poor strategy that wins a lesser objective, but overlooks and loses the larger objective. In less militaristic terms, this phrase is applied to situations where a small victory may be achieved but the "overarching goal" is lost.

17-11-2020 Erickson 2019 Unintended Consequences, The Lie that killed millions; climate-nuclear, NRC - ML19267A173

Pres. John F Kennedy For the great enemy of the truth is often not the lie - deliberate, contrived, and dishonest – but the myth - persistent, persuasive, and unrealistic. Too often we hold fast to the clichés of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought.

“To overturn orthodoxy is no easier in science than in philosophy or religion…” Ruth Hubbard

2020 04 26 Maxims **Rochefoucaulds** op besluitvorming, rationaliteit en wijsheid.

Naar aanleiding van Anja Dijkman’s boek-opmerkingen bij afscheid van Sander Banus:

Francois Duc de La Rochefoucauld :  Reflections, or sentences and moral maxims,  1613

Nr.1, page 1: “**Who reasons wisely is not therefore wise,**

**His pride in reasoning, not in acting, lies.”**

            Pope, Moral Essays, Ep. i. line 115

*Hij die wijs denkt is daarom nog niet wijs,*

*Zijn trots in redeneren, niet in doen, liegt.*

Nr.106, page 15: To understand matters rightly we should understand their details,

and as knowledge is almost infinite, our knowledge is always superficial and imperfect.

*Om de zaken goed te begrijpen, moeten we hun details begrijpen,*

*en aangezien kennis bijna oneindig is, is onze kennis altijd oppervlakkig en onvolmaakt.*

Nr.110, page 15: Nothing is given so profusely as advice

*Niets wordt zo overvloedig gegeven als advies*

Nr.115, Page 15: It is as easy unwittingly to deceive oneself as to deceive others.

*Het is net zo gemakkelijk onbewust zichzelf te bedriegen als anderen te misleiden.*

<https://books.google.nl/books?id=vQEzAAAAMAAJ&pg=PA2#v=onepage&q&f=false>

2021 05 09 Via:

Maxime Drenth Februari 2000 Thesis Homo economicus irrationaliteit

Naar:

Amartya Sen 1977 Rational Fools, A Critique of the Behavioral Foundations of Economic Theory

+++

2021 07 28 in La Londe

In many transactions there is a strong asymmetry in the information that is available for the buyer and the seller. The seller can have past experiences with the goods to sell which are not generally available or are even difficult to formulate code for transfer of the information. This asymmetry can legitimate a reversibility of a transaction that's different for buyer and seller.

Additional to the information asymmetry there can be a property of the good that creates an asymmetry of the interests. If for example a house is sold for money it is generally not important for the seller to whom he sells the house. So if a transaction is reversed he has all the possibilities to get the money from another buyer. But for the buyer it makes all the difference if he can, or has to, live his live in this specific house. The 'general' properties of money are incomparable with the 'specific' properties of a house. This too can be a legitimate reason to organise different options for reversibility at the buyers and the seller’s side. That might be different if the house is bought as a commercial investment.

2021 10 02 Naar aanleiding van Kahnemans boek: Noise

The problem is of choice making is even bigger than Kahneman describes in his (perfect) book:   
Bias + Noice + no way of deciding structurally. The example is perfectly described in the song of Loekie Knol:

“Wat heb ik nou aan algebra

Nu ik voor de keuze sta

Jij vraagt van wie ik nou

Het meeste hou

Ik hou van jou maar ook van hem

Ik hou van kaas maar ook van jam”

Bron: https://muzikum.eu/nl/loeki-knol/algebra-songtekst

What's the use of algebra,

Now I'm faced to make a choice,

You ask who it is that I love most,

I love you, but also him,

I like cheese, but also jam....

2021 10 11 Definition of choice space and Degree of Irrationality

We define choice space as the set of all choices that are possible for a buyer within a defined choice that specifies exactly what choices, conditions and limitations are considered/allowed/possible for a specific choice.

The choice space for a set of multiple successive choices consists of all combinations and permutations that are considered/allowed/possible for this set. The choice space for any practical set of choices quickly amounts to astronomical number of points, each representing a distinct set of choices. Each point in the choice space for specific choice will create a result for the person making that choice, and hence each point. For a rational evaluation of an economical choice a function that defines the utility or value is necessary, even if this function is not explicitly known or considered by the rational agent.

If the choice can be expressed and evaluated in purely financial terms an ex-post evaluation at each point in choice space can be made for the net value generated with the associated choices.

The point in choice-space that generates the highest net value is then the choice that a Fully Informed Rational Decision (FIRD) maker would make. This point has a degree-of-irrationality of zero (definition). A FIRD is automatically a decision that the decisionmaker does not want to undo (reverse) if that option is available for some time.

The average value of all possible choices (is all points in choice space) represents the absolute random choice making and hence represents the absolute non-informed non-rational decision making. This point has a degree-of-irrationality of 1 (100%) (definition).

Now for example every point in choice space a Degree-of-Irrationality (DoI) can be defined as:

DoI == (value of the FIRD-choice - value of choice)  
 / (value of the FIRD-choice - average value over choice-space)

If the net value of choices that are made in a later evaluation turns out to be lower than expected (so there are points in choice space with a higher net value) there is a margin for reversibility of the transaction. We can address the following regions:

DoI = 0 Optimal choice, no margin for reversibility.

DoI << 1 Good choice, only a small margin for reversibility, so there is little drive to do the effort of undoing the transaction.

DoI ~ 0,5 The transaction is substantially suboptimal. There could be a drive to undo the transaction if the buyer is confident that next time he will have a better DoI.

0,9<DoI<1 The transaction is only slightly better than random. Undoing the transaction will have a big chance that, if there is any learning effect, a next time a better transaction can be achieved.

DoI = 1 The transaction is just as good as the average transaction in this choice space. This would normally mean that the transaction has been made without any preparation (no rational evaluation and no information available).

DoI > 1 The transaction is worse than a random choice. So all reason to undo the transaction.

DoI >> 1 The transaction is outright stupid. Nevertheless, it could be fun: an FIRDu evaluation based not on value but on utility could still make this a good transaction that should not be reversed(DoIu<<1).

**Example1:** Let's assume we buy a ticket in the lottery for 1,00€. In the legal documents we have read a maximum price of 1.000.000€ and an average payback of 0,75€ per lot.

A FIRD buyer would only buy the ticket with the number that will give him the one million euro.   
A lucky Gladstone Gander would get at least another high price and score a DoI close to zero.  
An average buyer would have a DoI=((1000000-1) -0,75) / ((1000000-1) -0,75) = 1   
A small luck with a price of 10€ would yield a DoI=((1000000-1) – 10) / ((1000000-1) - 0,75) =0,99999075 which is so close to 1 that it expresses that even this small luck is only a pure random choice.   
If nothing is won in the lottery the DoI=((1000000-1) – 0) / ((1000000-1) - 0,75) =1,00000075 which is again so close to 1 that it expresses also a random choice.  
Mark that in this lottery, although in average there is a loss of 0,25€ on an investment of 1€ it is not possible to have DoI significant above 1. That means that in this choice-space there is no point with a really bad outcome. There is no value of information to avoid possible nasty outcomes. (For examples like an insurance where rationality and information are used to *avoid a worst case outcome* instead of aim at a best case a similar inverse metrics should be developed.)

An evaluation on utility can possibly show a different picture. The pleasure/utility of all prices higher dan 100€ could be similarly high. The pleasure to buy a lot and have pleasant expectation that there might be wonderful price could compensate the cost of buying, even if the average would yield a loss.

**Example 2:** A stock trader has a budget of 1000€ to buy and sell one time one specific stock within one week.

To reach a maximum gain it is clear that a FIRD stock trader should buy at the lowest point and sell at the highest point that the stock is listed in this week (precluded that the lowest point lies before the highest point is reached). Ex-post it is easy to determine the FIRD gain that is available in the given choice space. Also, the average gain can be calculated by averaging a large set of randomly chosen trade moments (Monte-Carlo simulation). The set of FIRD and average gain define the irrationality properties of this choice space.

For any transaction pattern that the actual trader has chosen de DoI can be calculated which defines the irrationality of the behaviour of this trader in this choice space. As there might be a big statistical noise in this determination of the DoI it is of little value. However, averaging over many traders can give a DoI that can be representative for the complexity of making optimal choices in that period.

Or averaging with the same conditions over many successive periods might give a DoI value that can be representative for the quality of choices that this trader makes within these definitions of the choice space. This would constitute a new formal measure for the performance of a trader.

**Example 3:** Similar to example 2 the trade could be expanded to a choice of several trades (fixed maximum number) in several defined stocks within a fixed period.

Each path of buy and sell transaction moments will constitute a unique point in choice space. With more choice-possibilities the choice space will quickly grow to astronomical size. Finding the FIRD choice set becomes correspondingly more difficult, even if in the ex-post situation all information is readily available. So, the route that a FIRD stock trader must choose for reaching the maximum possible gain is quickly getting much more complex. For an actual trader (with time-limited information) it cannot be expected that he reaches a DoI close to zero, but with his knowledge and the available (growing amount of) information he should be able to perform better than randomly (DoI<1). It should be marked that the average value of all points in the choice space is a property of the defined choice space. This is not the same as the average gain of all transactions that are done in this market which is a property of the market (stocks movements and behaviour of all traders).

**Conclusion**

Again, there will be substantial noise in the determination of any DoI and only averages over many equivalently defined choice-spaces might have any value in assessing the pattern of irrationality. Still having a value that constitutes a well-defined measure of irrationality makes it possible to address changes in the rational behaviour of people. A lot of research and testing will have to be done to map the actual DoI for many different areas of economical choice making. But this mapping of DoI could be a better basis for optimising behaviour. The DoI could possibly form a formal link between the many social and psychological studies that are performed on choice making and mapping the influence on economic models.

Up to now economic modelling is predominantly based un purely rational agents. In these economic models the value of transactions is always assumed to converge to an equilibrium of FIRD-transactions. By adding an irrationality component to the transaction value, a different equilibrium can be established: Value = FIRD-value \* (1+DoI) or correspondingly: Sales-price = FIRD-price \* (1+DoI).

Such extensions can use the existing structure of economic models and hence incorporate findings of irrational behaviour of Kahneman and the like.

2021-11-10 **Definition: Making a decision** is *choosing* out a number of *options*. This choosing is based on a *feeling* that is developed on a (mental) *model* of the (perceived) availability, advantages and disadvantages of the *available options*. This model development is a process in which existing knowledge is combined with information about the choice space and the options in it.

2021-11-26 Promotie choice space, radiation

Rationality is a very binding condition. The search for an optimal choice is explorative, challenging formal and practical conditions ("tussen wetten en praktische bezwaren"), but for many problems our imagination is the most limiting condition. Real life problems often have astronomical numbers of possible choices, especially if choices have multiple sub choices that influence each other on several degrees of freedom. The final optimal FIRD choice however, has no freedom left. Only if several choices have an identical value of optimisation (utility or value) a FIRD choice gets some freedom if will, that in this case however is highly irrelevant. Irrationality is where the real freedom of choice making is. There it is possible to explore parts of the choice-space that are clearly non-optimal, not bound by rationality or information that that excludes interesting choices. A FIRD choice challenges imagination, sometimes leading to dreaming of wonderful suboptimal choices. This can go so far as violation of formal and practical boundaries to the choice-space. Here it is where real freedom is. And where innovation is. Innovation generally requires the out-of-the-box thinking that is the opposite of FIRD thinking. The optimum may lie within the choice-space but …………..

An economic market is an assembly of all the possible choices for the transactions of all marketplaces. (In physical terms is the micro canonical ensemble of all the individual choice spaces.) The irrationality of the players in the market has a tendency to even out, more rational decisions tend to be copied and the resources that enable irrational behaviour are literally consumed.

In language we often speak about the state of the economy in terms as "overheated" or "the economy is cooling down", using thermodynamic terms equivocating irrational behaviour to physical heat.

From experience we know that irrationality behaviour is highly contagious. It transfers by the transactions themselves in the chain of delivery and production (like conduction of heat) where all subsequent choices are influenced towards less rational choices. Or by shifting the market (like convection of heat), or by "influencing the neighbours" (like radiation of heat).

2021-12-2 [Bill Gates Has a Master Plan for Battling Climate Change - WSJ](https://www.wsj.com/articles/bill-gates-interview-climate-change-book-11613173337); At 3:37

What's the one that makes you laugh?

Bill Gates:  One of Warren Buffet. He always talks about his worst investments, he never breaks about his best investments. And yet his understanding of investing is far better than anyone that I've ever met, so to bring that sense that "hey this is all pritty easy, I should have been able to do that better." You almost start laughing before he tells the story.

There is an upward limit to what you can optimise and gain on investments. Although the difference between a good investment and a very good investment can be big, it is important to realise that there is a much much bigger chance to make an average decision which is significantly worse than a somewhat good decision. And than there is is a good chance that even with all good intentions, attention, information and active thinking a choice can still turn out to be worse than an average over the choice space.

Even the best investors like Warren Buffet, or the most succesfull business men like Bill Gates, Steve Jobs, Mark Zuckerberg or Jeff Bezos have made missed opportunities or made transaction choices that were absolutely bad if reviewed in retroperspective. That must humble every other human beïng; how dramatically bad have my investment decisions been?

2021-12-7 The choice-space concept in examples.

If I propose a child to "Do you want to have a vanilla ice cream of 1$?" when we are standing in front of an ice stand, I create a well-defined binary choice of yes-or-no, which results in a choice-space with only two points. Still the evaluation can compromise factors like hunger, thirst, taste, temperature and a lot of other feelings that need to be processed into an utility function for making a conclusion. Rephrasing my question into: "Do you want to have a vanilla or chocolate ice cream of 1$?" creates a choice-space of three points, complicating the utility evaluation.

Having a dollar myself, with the aim to spend it within half a kilometre of my place in New York, creates many alternatives of ice stands, cup or cone, maybe a can of coke, beer or Fanta. The choice-space is then a large set of discrete points. The choice-space can be further detailed if I include the time of the day that I'll spend my dollar as part of the choice. This time can be defined as discrete steps of a quarter or an hour or as a continuous variable. Each choice-option is variable with its own axis in the choice-space for a binary choice with only two points on the axis, for a discrete choice with multiple options there will be an integer-number of points and for continuous variables like time or weight the axis can be a real number within the defined boundaries.

Next, I can extend the nested choice definition into spending 10$ in two consecutive purchases. The choice-space then consists of all possible combinations of available choices. The discrete choices and the continuous variable choices are each an individual dimension.

It may be clear that extending the definitions of limitations to a day and a budget of100$ will create a choice-space with a lot of points. A fully informed rational set of decisions will have to define a composed utility maximisation over all these points. In practice some heuristics are used to find an approximation of an optimal choice, especially because the utility functions are not precise anyway.

That is different if the choices are to be evaluated on value instead of utility.   
Assume the next case: buy and sell 100 pieces of stock X on the stockmarket in only two transactions today so that your gain is maximised. If you are trader, you estimate a good low point to buy and higher point to sell. Both can be based on additional information that you have additional to the trend of the course. The choice space is two dimensional on the axes of time of buying and selling. An FIRD ex-post analysis gives a gain (value) for each point in this two-dimensional choice-space in which a maximum can be easily found. This will be the point with a Degree-of-Irrationality (DoI) of zero (by definition). The average gain of all available points in the choice-space will have a DoI of 100% (one, by definition).

The DoI of the actual choices can now be calculated as percentage to express how close to FIRD the trader has actually operated. Of course, this DoI is a very noisy parameter that has only some value if it is averaged over sufficient similar transactions so that it converges to a stable limit.

2021-12 11 Freakonomics radio:  479 Economists guide to Parenting (education)

Sophya Assasido: “ ...politics of care, in contrast to economists that have to be different reductive: a lot of economics is reducing people to competitive players in the market.

Reductive is not the worst critique on economists. It goes beyond reducing people to data that makes ambivalent about economics.

When you take the economists approach to the logical extreme it is troublesome to see how market economics and capitalism are meeting people’s needs, our goals of taking care of people; it is treating people not as people, but as workers and interchangeable bodies, not as seeing people in their complexity that they are. It is leaving up things to a chance and a market that has been rigged from the very beginning. I want the world more to look like networks of care like my family.”

2022 01 17 What will be the use of using irreversibility in economic modelling?

Main consequence of irreversibility in economic modelling will be a shift in the equilibrium from a zero-profit for a full competition FIRD market to a profit that depends on the Degree of irrationality in a market with significantly irreversible transactions. This shift in producer surplus alone can be a reason important enough to extend existing models with a component of irreversibility that is the result of an average degree of irrationality in the economic transactions.

Secondly a degree-of-irrationality will have implications on how transactions are modelled: some types of transactions are driven by the most rational consumer in the market, others are driven by the most irrational consumer in the market. Example of the first are goods where the consumer spends a significant time to gather information, communicates with other consumers and has repeated decisions that allow evaluation of decision quality, e.g. supermarket consumables or cars.

Markets driven by the most irrational buyer are large, complex single-case transactions like tendering of big projects or the purchase of art. The lack of robust information or the emotions involved can mostly not be compensated by the preparation work that these decisions are often getting. In economic modelling distinguishing between the drive of most rational or least rational decisionmaker might be a useful addition in understanding deviations between real world economics and general equilibrium models.

Using a degree-of-irrationality as shift in the economic equilibrium modelling will further help to understand where in the economy profits are precipitating and where not. This will offcourse require a thorough study of the actual values that the DoI has in many specific conditions. It will take probably a decade of combined research of (behavioural)economists and social sciences to gather a palette of reliable data on how important the contribution of irreversible behaviour is in our economic decisionmaking. In parallel it will be a massive work to establish a robust modelling approach to extend existing models with the deviations that result from irreversible behaviour.

The equivalence with thermodynamics in physical modelling shows that releasing the assumption of reversibility can introduce a hurdle in comprehension of the mechanisms. It, however, als shows the immense value of the true comprehension of mechanisms of irreversibility.

2022 01 20

How is the choice-space  chosen?

In this paper we assume that the choice-space and its boundaries are pre-defined or given by the circumstances.

In all practical situations the choice-space that is, explicitly or implicitly, used is a very small subset of all conceivable, possible or allowed choices. The process of creating the choice-space for a decision is seldom a specific and well defined process. Especially is the case of small practical choices a small set of time and location specific criteria are sufficient boundaries to drastically reduce the available choice-space. There are many influences in creating conditions that create subsets of the conceivable or possible choice-space, e.g.:

- practical limitations by time or location.

- external demands, rules or wishes.

- available budget

- available information

- internal needs, disgusts or wishes

- available motivation, drive or energy

- priming by recent information

- priming by history of choices,

- priming by experiences, education, culture

The choice of the choice-space is a non-rational process, even if it is triggered as a specific process.  If it is done by external forces, it implies generally moral, cultural or political influences, generally unaware and not specifically listed or named.

A choice for a (nested) subset of the possible choice-space is making the process of choosing significant simpler. However, the impact of the implicit or explicit limitations is easily larger than the degree-of-irrationality of the choice itself.

The choice of the choice-space is often path dependent of earlier choices, but in many cases also implicitly of the use of earlier choice-space definitions. With proper attention cultural influences can be easily detected in a set of more or less repeated choices. For example, a plumber in Germany uses different materials and techniques, even if the principles of flowing water and the practical requirements are the same as in the UK.

In all practical situations the choice-space that is, explicitly or implicitly, used is a very small subset of all possible choices. Especially is the case of small practical choices a small set of time and location specific criteria are sufficient boundaries to drastically reduce the available choice-space. In this paper we assume that the choice-space and its boundaries are pre-defined or given by the circumstances.

**Titles for papers:**

Irrationality in economic theory

Irrationality in economic transactions

Choice-space as economic concept

Degree-of-irrationality in micro economics, evaluation at transaction level

Degree-of-irrationality at macro economics, evaluation in choice-space

Irrationality as basis for irreversibility of economic transactions

Irreversibility of economic transactions as fundamental economic property

**Title for book:**

General irrationality and irreversibility in economic transactions, a synthese for economic and behavioural theory.

2022-01-25 Book gelezen: Justin E.H. Smith: Irratonality; 2019. Mostly chapter 2, rest niet interessant. Book is highly philosophical collection of 1000's of references to ancient and recent philosofers. A bit 'warrig', without a pun. Some quotes in chapter 2 are usefull.

But most of it is the signal that rationality and irrationality are ill defined subjects. For a paper about economics there is a need a very clear and concise definition. A clear description of the concept of choice-space should be the basis, the way it is each time defined with boundaries and additional boundaries for smaller sub (nested) choice-spaces.

Within a predefined choice-space a criterium for unequivocally evaluating the quality of choosing is needed. 'Value' would normally be the easiest, most logical and most used criterium. Buy for end-users (consumers) utility is the ranking criterium.

DEFINITION: A rational decision is a choice for the option within the choice-space that has the highest added value (or utility) in an ex-post fully informed evaluation of values of all points in choice-space.

So first map the choice-space, than define the boundaries of the available choice-space. Than define the value-functions. These definitions are the basis of the decisionmaking which can be done as normal.

After the decisions are made the ex-post evaluation requires that all possible information is gathered and evaluated for determining the value of all points in choice-space with the predefined value functions.

The point with the best value will be the FIRD. The average of all points in the choice-space is the expected value of a fully random choice. Both are a function of the value-function and the available choice-space.

With the properties of the given choice-space and value-function we define a Degree-of-Irrationality for a given transaction in this choice-space:

VTransaction = VFIRD + DoI \* (Vaverage – VFIRD)

This rewrites as :

DoI = (VTransaction - VFIRD) / (Vaverage – VFIRD)

We can now find the average DoI for a given decisionmaker by evaluating many transactions in this choice-space. If we repeat this for different choice-spaces we can map what the consequence for the Degree-of-Irrationality is.

We can now map the possible profit by reducing the irrationality:

VProfit = Vtransaction1 - VTransaction2 = VFIRD + DoI1 \* (Vaverage – VFIRD) - (VFIRD + DoI2 \* (Vaverage – VFIRD))

= ( DoI1 - DoI2 ) \* (Vaverage – VFIRD) =

= ( DoI1 - DoI2 ) \* VSpecific Choice-Space

In this (DoI1 - DoI2) expresses the behavioural influence in the two transactions and VSpecific Choice-Space expresses the characteristic sensitivity for irrational behaviour in this choice-space.

7-2-2022 Drivers for rationality and for irrationality

Rational behaviour is the cornerstone assumption in economic theory. It emerged over two or three centuries of gradual development of the basics of economic thinking. This new and developing field of science sought for explanations of the fast development of trade, the existence of general poverty and of the generation of massive wealth for some others. Over all this time scarcity was the dominating driver in the world. So it is no surprise that dealing with scarcity was the attention of the developing field of economic theory. With rationality as coping mechanism for scarcity trade could be explained, poverty could be managed, explained and (possibly) be reduced. And wealth could be justified as a result of rational behaviour that also contributes to general welfare. In this story irrational behaviour was at best only a deviation from optimal behaviour. This deviation couldn't be avoided altogether, but for serious people it could be neglected as a minor deviation from economic theory.  For the others it was the cause of their poverty.

And reducing complex behaviour into rational behaviour created a basis for formulation of mathematical descriptions of concepts like profit, property and productivity. The summum were concepts like general equilibrium theories in which 'every' interaction was covered. A holy grail that the much-envied science of physics is still searching.

Important is the influence of this economic thinking of the foundations of the legal structures of our (Western) societies.  Well defined bases for rules on property and the execution of transactions are the basis of our economies. And how much the countries of the world may differ, these economic bases have emerged all over the world, even if political philosophies were not aligned.

And yet from the very beginning of economic theory development the consideration that human behaviour is not at all rational has been around. Adam Smith devoted even the title of his most important book on the Moral....  .

Over the past century behavioural sciences have massively shown that humans have many many drivers other than rational optimisation of their choices. Look around and see the cars on the street. How many percent of them is chosen to optimal transport from A to B, even if you include additional criteria like comfort? How many of the choices you made in the supermarket have been optimised rationally? Even using only the available information in the schappen\* (so not being fully informed) there is generally much to win in a few seconds of consideration.

This is not a matter of individual neglect, but has become a key driver of our economies. It is institutionalised into a massive marketing business.

In the last century we have moved from an economy driven by scarcely to a world driven by affluence (Keynes: Affluent society). Marketing is the fundamental mechanism to deal with affluence.

Growth of the economy is no longer driven by the fulfilment of needs (certainly not basic need) but by creation of wants. If a small aberration of senses leads to a marginal reduction  of these senses the economy stops growing which we label as a crisis. This is not because  the needs are no longer fulfilled, but only the rationality is slightly increased which makes us less sensitive to the marketing and somewhat more focused o  the needs.

Drivers for irrationality:

Insensitivity for consequences of decisions is the basic driver for irrationality. Behind it may be many mechanisms, e.g.:

POWER: Brian Klaas, die dit onderzoek heeft opgenomen in zijn binnenkort te verschijnen boek *Macht. Waarom de verkeerde mensen het vaak voor het zeggen hebben en hoe het anders kan* (uitgeverij Nieuw Amsterdam). See: FD 2022 01 07

RICH: Having so much money that a loss is inconsequential. This is the opposite of poverty which is the hardest and most general driver for sharp rationality in making decisions. Even if people have a strong personal bias or tendency to cling to some irrationalities, they will optimise everything they do if poverty is being felt.

**Resource curse** is the decline of economic strength if a country suddenly discovers large natural resources (like the “Dutch disease” after discovery of natural gas in the 1960s). In economic theory the mechanism behind it is generally described as the out crowding of existing businesses by the new, more profitable, business. This relies on the local rationality of the economic agents. But additionally, and maybe more relevant, could be that the additional influx of money creates room for decisions that are less rational. Once this mechanism is emerging it may spread to many other decisions, leading to a general increase of irrational behaviour. For example in the Arabic oil countries the out crowding of the original economic activities was almost complete in the 1960s, but the increase of irrational economic behaviour is still going on.

9-2-2022 Finding the most optimal point in choice-space

Each point in a choice-space represents a unique set of decisions. This set of decisions results in a change in value. Finding the point which represents the FIRD would be possible by calculating the value-change for each point. For a larger number of transactions in a choice-space with several dimensions (eg. Choosing timing for buying and selling out of several stocks) will soon lead to astronomical numbers of points in choice-space for which the value-functions have to be calculated. In such a choice-space a search strategy can be developed depending on the properties of the curves of the value for each individual stock. This would encompass selecting high and low points from the curves and from their first derivatives and then searching for optimal combinations to maximise the value change. The author assumes that for a larger number of allowed transactions the number of degrees of freedom (=dimensions of the choice-space) grows so much that even an optimal search strategy the number of points that have to be evaluated grows NP-complete with the number of allowed transactions. This assumption needs a rigorous mathematical proof which is beyond the scope of this thesis. But if the assumption of NP-completeness is true this would prove that FIRD decision-making is impossible (formally: unachievable) in choice-spaces with realistic real world seizes, even in an ex-post analysis where all information is available and time is not a direct constraint.

That would make the classical assumption about the rational agent in economic theory unrealistic, even without regard of all behavioural deviations from fully informed rational decision-making. Nevertheless, economic theory's often have surprisingly good representation of real world problems. This could possibly be improved by introducing an estimated Degree-of-Irrationality as extension to existing economic modelling.

19-2- 2022 Bedenktermijn = reflection period

In the legal framework for economic transactions the fundamental starting point  is "contract is contract". This is as much a trigger for good thinking before signing a contract  as it is a way to assure a well consolidation of the mutual expectations. Both are needed to enable rational decisionmaking as much as possible. So, without explictly stating it, the assumptions of economic theory are solid foundations for the way we organise trade in our society. Nevertheless, there is a growing number of exceptions where options to correct or reverse a transaction  are explictly enabled. Classic is a guarantee period in which an non performing apparatus can be returned. In internet shopping there is normally an return period of 30 days for returning with full refund without questions. This comes as close to transaction reversibility as it gets. And the motivation is that the buyer has often a worse position to obtain a good judgement remotely. To convince him to still buy goods reversibility is a premium requisite that has quickly conquered internet shopping. Also in big personal transactions often some sort of reflection period has been introduced. Even for buying a house, which is such a big decisionthat full attention and awareness might be assumed.  Again this is a response to the awareness that Fully Informed Rational Decisionmaking FIRD is not a realistic assumption and that measures to accommodate some irrationality in economic transactions can be important for the buyer, and indirectly also for the seller.

It might be important to give more consideration to the irrational part of economic transactions. Even in assumedly Fully informed rational environments, like the stock market, reversibility can play an important role. A put option bought at the same time as the underlying stock can be seen as creating reversibility.  The price of the option is then the irreversibility value of the transaction to buy the stock. This option price is the result of the negotiated equilibrium of the assessments of nonFIRD-ness in the stockmarket seen from a ex-ante position. Only at the time of expiration of the option the ex-post evaluation becomes clear.

21-2-2022 Start van de film The Big Short:

It ain't what you don't know that get you into trouble,  
It's what you know for sure that just ain't so.

Mark Twain

Other films about massive irrationality: Wulf of Wallstreet + Catch me if you can.

23-2-2022 Besmettelijk = Contagious 🡪 Irrational exuberance

In conventional economic modelling the term DiR x S is assumed to be zero or negligible. This means that as well the behavioural impact as the properties of the choice-space are neglected.

This can be justified with the reasoning that more profit will be made by those who are more rational in their economic decisions. The general drive to make profit then creates a regression to zero for the DiR.  This assumption, however, is not generally true.

* First, people have, along their drive to optimisation, also a drive for pleasure, laziness and show-off. So below a certain point the drive to decrease the DiR will be balanced. This is very much determined by the level of welfare. Although poverty has a massive influence in decreasing the available choice space, it also is the main driver for rational decision-making. Increased welfare also increases the DiR. The consequence is that conventional economic modelling is less accurate if the level of welfare is higher.
* Even more: there are situations where special additional mechanisms work to specifically increase the DiR. Examples are the contagious nature of show-off on the DiR of other people. The jealousy created by the fancy car of the neighbour will be expressed by an increase of the DiR.
* As long as the contagious effect is small enough the regression towards FIRD behaviour will dominate. But above a certain point a runaway effect can increase the DiR towards unsustainable levels (compare to thermal runaway in a chemical process, leading to fire or explosion). In the dot-com crisis this was the contagious atmosphere at the stock market that drove the general DiR up, leading to massive profit for those who could exploit this (film: Welfare of Wallstreet). In the housing crisis of 2007, it was the contagious effect of the seemingly easy affordability of a luxury house that drove up the DiR of the buyers. The increasing house prices enlarged the choice-space for many people, and the banks didn't check the rationality of the house buyers with regards to the means they has available nor were there rules to limit their choice-space. The combination lead to the runaway effect that could grow till it exploded in 2007 (see the film: the big short).

23-2-2022 Besmetting

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* Vtransaction = VFIRD + DiR x S expresses that the buyer pays a premium on top of the fully informed rational decision price. This means that the transaction is non-reversible because the seller will want to keep this premium. This non-reversibility is so crucial in our economic system that it is deeply ingrained in all our legislation around economic transactions. Only in very specific sales contracts there are exemptions that enable to invoke a reversal of a transaction. These exemptions are generally organised in order to compensate for a big information and knowledge backlog position of the buyer compared to the seller. This is often the case when the seller knows the market and is repeatedly doing similar transactions and the buyer is new in the field and will only do one or a very few of comparable transactions. Yet, although non-reversibility is at the core of the economic trade, the fundamental assumption of economic theory is that all transactions are based on Fully Informed Rational Decisions that lead to transactions that are in principle reversible.

18-3- 2022

Life is a turbulent, irregular and chaotic activity on earth. The assumption that human life can be modelled with rational behaviour is absurd, just like Newton's assumption of frictionless motion. The models work well in space, but in real life each model has to include friction.  That is not a detail, but a necessity to create stability.

Just as well in economic modelling transactions needs to incorporate the irrationality component of human behaviour. In a fully rational equilibrium, there would be no margin for making profit. Then there is no reason to do a transaction, nor is there a reason to stop with an endless chain of transactions. That works just like the first law of Newton in linear modelling of mechanical systems. We can include transaction-cost as a linear friction to dampen the model, similar to the inclusion of friction in mechanics. Transaction cost and friction are however a linear approach. That is valid is modelling of simple systems with a limited number of components. In complex system, like those that are studied in economics, chaotic behaviour is an essential property. Conservation of energy is like a perfect match of utility in a transaction.

In practice a transaction needs a driver to make it happen. That means that someone will make a profit, which is the irreversibility of the transaction. In more complex systems with chaotic characteristics general absorption should be modelled additional to adding friction. It is like notion of irreversibility in thermodynamics that goes beyond a linear friction. It realises that in complex systems there is never a perfect reversibility of transactions. Hence there is always a partial conversion of utility to profit, just like the partial conversion of (mechanical) work to heat.

Where value can be compared to energy, utility can be compared to work (exergy) and the margin of irreversibility (~profit) can be seen as similar to the generation of heat.

22-3-2022

[Cardinal virtues - Wikipedia](https://en.wikipedia.org/wiki/Cardinal_virtues)       Kadinale deugden 4x in de oudheid Prudentia, Iustitia, Fortitudo, Temperantia (Wijsheid, Rechtvaardigheid, Moed, Gekte)   +3x Fides, Spes, Caritas (geloof, hoop en naastenliefde)

[Just price - Wikipedia](https://en.wikipedia.org/wiki/Just_price)                  Rechtvaardige prijs, deel van Golden Rule, Ethics of recipricity

[Laesio enormis - Wikipedia](https://en.wikipedia.org/wiki/Laesio_enormis)               [rescission](https://en.wikipedia.org/wiki/Rescission_(contract_law)) for [lesion](https://en.wikipedia.org/wiki/Lesion) beyond [moiety](https://en.wikipedia.org/wiki/Moiety_title).

[Inequality of bargaining power - Wikipedia](https://en.wikipedia.org/wiki/Inequality_of_bargaining_power)        ….. has available to him a workably competitive range of alternative sources of supply.

[Usury - Wikipedia](https://en.wikipedia.org/wiki/Usury)                        Woekeren,   …. Christian doctrine is reinforced by Aristotelian [natural law](https://en.wikipedia.org/wiki/Natural_law) rationalism.

[Thomas Aquinas - Wikipedia](https://en.wikipedia.org/wiki/Thomas_Aquinas#Economics)

[Ethics - Wikipedia](https://en.wikipedia.org/wiki/Ethics#Descriptive_ethics)

**27-5-2022 Reality check**

Our human behaviour is guided by a mental model of the world. When walking downstairs we immediately notice when one step is different then what we expect from the steps before. We can walk downstairs without looking on a stair that we know, because our mental model provides sufficient information for making our steps. Small sensory feedback will update the information about our position in the model of the stair. But we can significantly faster and easier downstairs if we can update our mental model of the world by looking at the stair.

So, all our behaviour is based on anticipation on the mental model in our head rather than on sensory information about the environment in which we move, behave or live. These mental models can be highly accurate in an environment we know well. Our brain invests massive amounts of energy in a continuous process of verification and validation of the mental model of the world that is the basis of our behaviour. This is of course the result of an evolutionary process that awards better founded and better anticipating behaviour with better survival.

Yet the continuous mistakes and deviations in the model need a delicate process of correcting and updating of the model in our head. This is the core of psychology and behavioural studies. We have dreams, visions, perceptions and fata-morganas in which the model in our head is more than a rationally verified and validated representation of the world around us. So irrationalities in our behaviour are partially small deviations of the model in our head that can be reduced or eliminated by the continuous process of updating with new sensory input, but another part is beyond that. These are "constructions" in our model of the world that are beyond that that can be verified or corrected by new inputs of "data".

For evaluation of the source of irrationality in our behaviour it is important to distinguish the difference between many small deviations in our mental model of the world and the larger and more fundamental extensions of our model of the world. The first group is continuously verified and updated in a process that we are generally unaware of. This is also the basis of what Kahneman calls the fast thinking.  The second group cannot be verified by direct observations, but needs a validation.

Marketing can optimise rational behaviour by providing data for good decision making. This is what Kahneman calls slow thinking of system 2.

 But it can also aim at triggering irrational decisions. This is what Kahneman calls fast thinking of system 1. This can be done by triggering unaware fast thinking

In modern marketing the trick is actually to shift as much as possible into our direct model of the world which provides a base for the fast-thinking process. But actually, marketing is also creating irrational behaviour by planting visions or fata-morganas on our mental model of the world.

So irrational behaviour has many sources for deviating from rational behaviour.  Modern marketing exploiting them as much as possible. Our evolutionary developed update, verification and validation processes have difficulty to keep up with the concerted marketing effort. As a result, in a time where true information is more abundantly and easily available, we are still massively induced (seduced) into really irrational behaviour.

Our grandparents would shake their heads when seeing our behaviour. In their mental model of the world our luxury behaviour is the utmost irrationality, often pure stupidity that leads to a degradation of actual wellbeing.

**Vr 10-6-2022 INTRODUCTION:    Why this book needed to be written.**

I have a very good friend for 35 years that bought a house two years ago. We were still due to visit him, but with corona this was postponed again and again. With corona more or less being out of sight I was due to call him to finally see his new home and the spring-garden that he was so proud of.

That afternoon, out of the blue, he called me; telling that that morning his loved wife was found dead in a ravine. She was working abroad for a week for a charity organisation which she had been doing already for many years. The call struck me like few things can do and left me in utter disturbance. An hour later, while hanging the laundry to dry, it flashed into my mind that the basic paradigm of economics, the thrive towards rational behaviour, is even further from reality than I’ve ever thought. My quest for explaining that irrationality and irreversibility are jointly at the core of our lives became suddenly more pronounced, much wider than only economic transactions alone. It also brought back the death of a gifted, social talented girl of 22, a year ago. At a distance we saw her growing up till that moment pulled the carpet underneath everything her parents had done.

These two moments are just a very few of the occasions where reality comes hard into daily life. They are “Black Swans”, unlikely, rare events with big impacts. These events are of course irreversible in itself. But more, they also instantly transform the world around us, making our frame of mind instantly obsolete. The rationality that we used for all the decisions we made before, was based on a mental model of the world that was, in hindsight, utterly wrong at the essential points in life. These changes in perspective happen in real life, and are in every aspect way more impactful than all our considerations on what to buy, where to buy it and against what price.

Yet, rational utility optimisation is thè fundamental assumption behind the theory on the behaviour of the decision making of the ‘economic agent’. But it is not only an assumption on the mental effort that a person does to optimise his behaviour and his decisions. It is also an assumption on the possibility to get full information about the purchase. And even more, this Fully Informed Rational Decision-making (FIRD) assumes that a mental model of the world is available in which all the possible choices can be evaluated against future utility. Defining such a `choice-space` is a very intriguing process. It is nearly always subconscious and guided by norms and values, culturally transferred or inherited, and of course heavily influenced by a massive marketing industry. This industry has long recognised that transferring information or rational argumentation is *not* the way that makes economic transactions happen.

In our mind mental processes like love, fear and greed are really import and they form a basis that defines for a great part the choice-space that we are considering while making a decision. Actually, this choice-space is mostly defined way before we start the decision-making process. And maybe, with the ‘black swans’ in mind it is even a good idea to fundamentally accept that rationality is *not* the sound basis for optimisation of the decisions that we think to shape our life. And even more: in real life reversibility is an assumption that is even further from reality.

This book is an attempt to reconcile real-life behaviour with existing economic theory by introducing irrational behaviour and irreversibility in economic formulas.

19-6-2022

In the theory of decision-making in this book we add two components of the value-evaluation:

- Rationality:  which is the projection of our experiences in the past on our decisions now.

- Irrationality:  which is the actual value of the mismatch between our mental model of the world and the real world evolving in its course of events.

It may seem that we can reduce this mismatch by better understanding the world. In a scientific sense this is true, but yet, only till the next surprise. So instead of just neglecting the second part, in this book we assume that, without knowing the content of the Irrationality, we can at least estimate the size of the value of the Irrationality. Of course, such an estimation is based on past experience and is not a prediction for future value of irrationality. Yet, accepting that there is a significant degree of irrationality in every (economic)decision, is a major step. It can help to (slightly) improve economic modelling by including some of the behavioural aspects that are known to be systematically relevant in human decision-making.

17-07-2022 Promotie 2e boek

**1e boek: General irrationality and irreversibility for economic transactions.**

Academische verhandeling met onderbouwingen voor waarde-evaluatie als basis voor keuzeprocessen.

**2e boek: Guidelines for organising and making rational political decisions.**

Praktische handleiding voor politici om in discussies systematiesch de keuzeruimte af te tasten, en het waarde-bepalingsmechanisme te verkennen.

Volg de IAEA structuur:

Level 1: Fundamentals for rational decision-making:

1.1 importance of the decision must be proportional with the effort and scrutiny of the decision-making.

1.2 timing is always important

1.3 grading is mostly important (binary, ternary, quaternary, numerical-integer, digital-fraction)

1.4

1.2 stakeholders need to be considered

1.3 tracible reasoning

1.4 distinguish what is possible to distinguish

Level 2: Principles

Separation of logic, questioning of interactions, grading of strength of relation, reality check, measuring of what is measurable, experimentation of what is doable, validation and verification, awareness of scaling effects, double blind testing where possible, separation of first, second, third and higher order effects, mechanisms of induction

Level 3: Mechanisms

Formal power, physical power, military power, military thread,

Money

Memes, frames, stories, traditions, culture,

Personal interest, personal internal drive (freedom, hobby, lust), personal need (air, water, food, safety), personal desire (taste, feeling safe)

Group interests, scale effects of group, subgroup and metagroup at seral levels.

Bystander effect

05-08-2022 2e boek

The principal problem of the electricity market is the gap between the marginal cost based short-term trade and the total cost based long term evaluation. A FIRD in the choice-space of the short-term marked can result in a disastrous systematic decision for the long term. The electricity markets have the most extreme gap between short-term real-time (quarter-of-an-hour) and long term evaluation (decades lifetime of the installation). The electricity trade in over the counter, daily, quarterly and year contracts is so prevalent in that it leads to near perfect optimisation in the short-term choice-space. This success of economic theory is obscuring the massive failure in the long term. The gap between marginal cost and LCOE is systematic and so will the failure of electricity production companies be systematic.

22-07-2022 Within a given choice-space rationality is a benchmark, it leads to a single solution that is not a choice. In the irrationality lies the freedom of choice. It ranges from corruption (which is selfish rationality within the very limited choice-space of self-interest) to areas that motivate people to do things for others, to work together, to begeister people, to enable people and to love them, even if that is contrary to one’s own interest.

We need the rationality to make the world sufficiently efficient to enable irrationality that gives us the freedom to do good things. We have to avoid rationality in a too small choice-space that is named self-interest.

“It’s money that makes the world go round”.

For understanding how and why this should be split in two:

It is the rationality that generates the true value of action, but it is the irrationality that generates the vibes that makes the world go round. (Brainwave after the show of André Rieu)

02-08-2022 ***Chapter on NOT treated subjects*** that are directly coupled with this paper.

1. Transaction-costs as part of irreversibility

In classical economic theory irreversibility clearly exists as a consequence of the transaction costs that are needed to organise and execute economic transactions. Examples of transaction costs are transportation and packaging costs for the goods, financing and insurance costs, time to organise the transaction and wear, maintenance and energy use of needed tools. These transaction costs can range from less than a few thousands of the price of the purchase to even a major part of the purchase and are a clear source of irreversibility in economic transactions. Nevertheless, in this paper we assume zero transaction cost in all cases because we want to introduce and clearly distinguish another source of irreversibility. It’s an irreversibility that arises as a principal consequence of non-perfect decision-making in the organisation of economic transactions. It is a principal goal of this paper to introduce this fundamental mechanism in a didactical way so that the reader will hence forth always be able to understand this additional mechanism of irreversibility. Of course in all actual application of economic theory and formulas both sources of irreversibility should be included.

2. Overlapping choice spaces

Introducing the concept of choice-space is a crucial prerequisite in distinguishing a Fully Informed Rational Decision as the optimum choice within the choice-space from less optimal deviations from the FIRD.

Choice-space is the collection of all choices that are to be considered for a specific decision. Every point in choice-space represents one specific possible choice. Making the choice is the process of overlooking the choice-space, evaluating the value-function and then making a decision. The choice-space to be evaluated is specific per decision and its decision-making process. That means that many different choice-spaces could be considered for a single choice. This might greatly complicate discussions on decision-making processes. In fact, most discussions in real world are more on implicit assumptions on the choice-space that is to be considered than on the criteria and parameters of the evaluation of the optimum choice within the choice-spaces.

Therefore, in this paper we consider only nested choice-spaces when discussing different choice-spaces for a choice. That means that discussion starts with determining a clear agreement on a single minimum size choice-space with clear boundaries in which an evaluation function exists with a clear optimum based on a FIRD.

The choice-space can be:

- a binary choice; e.g. between yes and no.

- from a list of possible items; e.g. choose between vanilla, strawberry or chocolate ice-cream.

- single numerical property; e.g. length or weight.

- multidimensional over separate properties; e.g. the optimum combination of length and weight.

Further evaluation of more complicated cases of the choice then exist by extending the choice-space with more points. These additional points can be in the same dimensions of space by shifting boundary-conditions, or by adding an additional dimension which multiplies the number of points by the allowed number in the new dimension.

In this paper we explicitly stick to choice-spaces that are nested in size and dimensions and do not go into the complexity of choice-spaces that are partly non-overlapping. So, in this book the smaller of the considered choice-spaces is completely part of the larger one(s). Of course, in many real-world discussions this is the case, but for a clear understanding of the importance of the concept of choice-space nesting is already enough complication.

In nested choice-spaces the optimum choice (FIRD) of the larger choice-space is always better than (or equal) the optimum choice of the smaller one. So, every extension of the choice-space can only improve the FIRD. The additional points in the larger can however be of lower value which can lower the average value of the random choice. This is the basis of the fallacy that more choice is (supposedly) better but that in reality more choice can also increase the chance on a bad choice.

Considering only nested choice-spaces is also clearly linked to the path-dependency of choices over time. All evaluation of FIRD is automatically an ex-post evaluation. So for two consecutive choices the first choice will practically always have a small subset of all the options that exist for the two choices combined.

In separate work later the evaluation of FIRD optima in non-nested partial overlapping choice-spaces can be studied.

05-08-2022  **Loss aversion**

In economic theory loss aversion is the general preference of avoiding a small loss above a larger gain. This asymmetry is generally assessed as a behavioural case of irrationality. The mechanism has been proved by behavioural research quite consistently over many different cases and conditions and is normally assessed as a prime example of irrationality in economic transactions. It has however been difficult to model it consistently.

Here we want to show that loss aversion can be seen as perfectly rational behaviour, but is a result of evaluating different choice-spaces. (This new perspective came from the personal experience that, when cycling on a slope, losing 1 joule in hight is to be assessed completely different from providing 1 joule with your muscles.)

When assessing the loss of 1 euro this happens in a choice space where there are many many possible choices to do so, while the number of options to gain 1 euro is in all normal choice-spaces much lower. This means that a random choice will likely be close to a loss, while it will require a significant degree-of-irrationality to organise a profit. So even if the actual effort for the loss and the profit will have the same size (just like the direction-less joule in cycling) the required quality of the decision is significantly different. In other words, statistically it is way easier to lose one euro than to win one euro. This assessment is well incorporated in the behavioural wisdom, but is not modelled in conventional economic modelling.

So loss aversion, that is generally labelled as one of the prime examples of irrational economic behaviour, is indeed a rational behaviour that is based on asymmetrical value as a consequence of uneven distribution of chances on profit and loss. This is also the fundament for our legal organisation of irreversibility for economic transactions.

8-8-2022 Robustness of aiming at FIRD

The value-functions for the possible choices (=points in choice-space) can have very different properties. It might be a smooth function in which small variations in the choice to be made will also lead to small differences in the value of the result. This makes the degree-of-irrationality relative robust for the quality of the decision.

On the other hand, is it possible that the value function has a very discontinuous character over the points in choice-space. This makes the degree-of-irrationality very sensitive for the quality of decision making.

13-8-2022 Daniel Kahneman in Noise.

Chapter introduction: p12 "**The judgement that you make, even in a seemingly unique situation, is one in a cloud of possibilities."** This statement is part of the description of the variability in large numbers or singular decisions. This variability consists of two types:

1. Bias: a deviation that has a systematic pattern.

2. Noise: a random statistical pattern.

P.51 A final decision entails a predicative judgement to provide input, and an evaluative judgement to resolve trade-offs between pros and cons of the options.

P.52 "System noise [in making judgements] is inconsistency, and inconsistency damages the credibility of the system." [This of course aplies also for bias.]

20-8-2022 Dan Ariely on Making Decisions - videotutorial Dan Ariely on Making Decisions | LinkedIn Learning <https://www.linkedin.com/learning/dan-ariely-on-making-decisions/dan-ariely-on-making-decisions>

22-8-2022 Naar aanleiding van Zomergasten Sandra Philippen, hoofdeconoom bij ABN-AMRO bank:

The economist’s reflex is always to use the price-mechanism to organise changes.  This is a well-founded and established efficient method. For example, in the emission trading for acid rain and in numerous other regulations using the price elasticity is a proven effective and efficient method. For climate effect however, instead of organising high investments to remove sulphur, the mechanism has to influence behaviour in the entire society. This means that a measure that is efficient for society as a whole means that the higher price has to push the great majority of the people to a significant more rational behaviour. Only those that are affluent enough will have the freedom to spend as they were used to do. In a society that is organised to tempting people into irrational spending that will create a feeling of poverty as well as loss of freedom for a majority. That is why the economists push to use the price mechanism is socially not sustainable.

27-8-2022 For the nested choice-spaces there can be different dimensions in which the choice-space is extended.

One dimension to extend is the time in/over which the choice-space is evaluated. Eg. whether a few dollars should be used for one ice-cream now, or could be split between now and a second one later today, or even being saved for later use.

Another dimension is to extend the scope of evaluation from basic needs to security or to higher order needs following Maslow pyramid.

3-9-2022 It is easy to fool the world. You can even make a living on it.

But fooling others slides to fooling yourself. And that is the surest way to disaster.

6-9-2022 Eind augustus na lange vakantie en ruime week ziek in een opwelling spreadsheets opgezet met formules van Degree of Irrationality.

Excel gemaakt: Berlo 2022 09 06 Excel voor Optimality of stock trades r3

Goed om op basis van één koop/verkoop transactie in choice-space van één aandeel te laten zien hoe het werkt. Formule DoI ligt hiermee ook vast in een daadwerkelijk rekenvoorbeeld.

The spreadsheetmodel is a downloaded dataset of 2111 datapoints of a week of one dutch stock. Fortunately the minimum price lies before the maximum price which allows for an easy buy and sell choice to achieve a FIRD optimal choice.

De Fully Random Choice (FRC) is approached simply by taking the average of the first half of the data points for the buy and the average of the second half for the sell.

Calculating the Degree of Irationality (DoI) proved a bit nasty. Luckily the clean formulation of the formulas in the Dagboek van december 2021 provided a quick clean and clear solution. For any set of buy&sell choices the DoI is calculated in an simple to explain way. A graph shows the data and the calculated input for the DoI.

7-9-2022 Yesterday I programmed the concept of Degree-of-Irrationality for a simple setup of two transactions (buy and sell) of one stock. I downloaded a few days of data of Shell at the AEX as basis. The value of random choice in the choice-space was approximated by averaging buy and sell over two consecutive periods. This should later be based on averaging over all points in choice-space in a 2D matrix. The FIRD is a simple difference between MIN and MAX price in the data. This happens to be possible because the data shows a proper shape between low and high price. This should later also be a search in the 2D matrix in order to find the true FIRD combination in datasets with all possible patterns.

The spreadsheet helps to show the points in the graph to explain the concept and makes the calculation of the Degree-of-Irrationality traceable. For four transactions in a row a 4D matrix is needed, which is not practical in Excel. A transfer of this mock-up to MATLAB would be the next step. That would allow even higher dimensional matrices to match multiple transactions.

In Excel to sets of buy-sell could be made in a 2x 2D choice-space. This could be used to show the effect of trade limitations, like online one transaction per day, on the choice-space and on the DoI performance of the traders. Possibly the information better used with such a limitation, and the DoI is the correct was to formally correct check this.

The advantage of the stock market is that all ex-post information of the choice-space is readily available. But for other choice-spaces the effort of gatherings the data can be just as valuable in order to map the behavioural impact on the use of information in economic decision making.

A full implementation of the concept could be a valuable product for banks to evaluate and optimise their trading room performance. The software package could help to properly define choice-space and limitations. It should be capable to handle the massive choice-spaces for complex multi-transaction setups. Implementations handling 100 transactions (buy-sell) in 50 stocks would require a 100-dimensional dataset with minimum 1000 points per dimension. The sheer size of this choice-space (10^300 different sets of choices) shows that FIRD is fundamentally impossible, even if all data (in this case of the stock prices) is fully available at ex-post evaluation. It would require dedicated software for sparsely populated matrixes and specific mathematical knowledge to “fill”, search and average this choice-space in a manageable approximation.

7-9-2022 Action: Calculate the value of information by the RMS value of price deviations. RMS is the “energy” of the information (squared instead of the value itself). Think on the energy-concept!  
The two graphs in the Excel show that the value-changes are way more between two consecutive data points in there is a day in-between.

12-9-2022 [Stiglitz: Globalization and Its Discontents](https://en.wikipedia.org/wiki/Globalization_and_Its_Discontents) - Wikipedia

16-9-2022 Jevons, The Coal question p.193 MOOIE zin !:  
“So far indeed as trade is dependent on legislation and social and political conditions, its future must be almost wholly uncertain and beyond the reach of reasoning. The development of history cannot be predicted, for in the "still and mental parts" of a single unborn individual may reside the forces which are to move the world.”

**23-9-2022 Apart artikel over falen elektriciteitsmarkt, nu door Oekraïne, later door PV+wind overproduktie:**

**Marginal Cost Electricity Market, failures revealed by Putin**

Putin reveals failure of the electricity maket: on the short run we have unreasonable, unbearble prices with over-profit for a number of companies. But in the ong run we will just have the opposite problem: sustained low prices by zero-marginal cost wind and solar power wil drive out all investment posibilities.

**Zero-Marginal Cost Electricity Market**

[Exclusive Dealing or Requirements Contracts | Federal Trade Commission (ftc.gov)](https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/dealings-supply-chain/exclusive-dealing-or-requirements-contracts)

[The dangers of marginal cost based electricity pricing (tandfonline.com)](https://www.tandfonline.com/doi/pdf/10.1080/1406099X.2013.10840525)

**Anti-dumping regulation forbidding sustained selling below total-cost**

[Dumping (pricing policy) - Wikipedia](https://en.wikipedia.org/wiki/Dumping_(pricing_policy))

[Competition law - Wikipedia](https://en.wikipedia.org/wiki/Competition_law)

[European Union competition law - Wikipedia](https://en.wikipedia.org/wiki/European_Union_competition_law)

[United States antitrust law - Wikipedia](https://en.wikipedia.org/wiki/United_States_antitrust_law)

[Price gouging - Wikipedia](https://en.wikipedia.org/wiki/Price_gouging)

[Predatory pricing - Wikipedia](https://en.wikipedia.org/wiki/Predatory_pricing)    !!   ....method of **undercutting** on a larger scale, where a [dominant](https://en.wikipedia.org/wiki/Article_102_of_the_Treaty_on_the_Functioning_of_the_European_Union#Dominance) firm in an industry will deliberately reduce the prices of a product or service to loss-making levels in the short-term.[[1]](https://en.wikipedia.org/wiki/Predatory_pricing#cite_note-1) The aim is that [existing](https://en.wikipedia.org/wiki/Article_102_of_the_Treaty_on_the_Functioning_of_the_European_Union#Actual_Competitors) or [potential](https://en.wikipedia.org/wiki/Article_102_of_the_Treaty_on_the_Functioning_of_the_European_Union#Potential_Competitors) competitors within the [industry](https://en.wikipedia.org/wiki/Industry_(economics)) will be forced to leave the market, as they are unable to effectively compete with the dominant firm without making a loss.  
Russian Law: ...."the setting of an unjustified high or unjustified low price..."

23-9-2022 Na betermelding 50% vorige week deze week beoordeling EPZ afgerond. Vakantieweek voor de kinderen, maar door corona, nu bij Annik, thuisgebleven. Ondanks de betermelding eigenlijk meer dan half ziek. Maar nu wel periodes dat het hoofd wel weer werkt. Toch kostte de brief voor EPZ moeite. Vr en Za een helder hoofd en kinderen zijn op pad. Ondanks lichamelijk slap en moe zijn en heel veel hoesten toch een opvatting gehad om het spreadsheet netjes uit te werken. Daarin heel productief geweest. Het is nu "klaar" voor de 2D-keuze-matrix variant, met een zuivere opbouw en goed uitgewerkte formules. De userinterface begint wat te worden. Maar vooral heeft het door programmeren gedwongen formalisme een grote sprong gemaakt.

Daardoor is er groot enthousiasme om verder te gaan: 3D-weergave van matrix (plus een genormaliseerd op DoI) om het concept keuzeruimte te visualiseren. Ook een platgeslagen grafiek van aantallen mogelijke keuzes per DoI-interval kan dan laten zien hoe de eigenschappen van de keuzeruimte kunnen verschillen. Or the other way round: the DoI over the sorted cohorts of possibilities.

Grote behoefte om nu brief naar Sandra Philippen te schrijven voor een gesprek. Soort open sollicitatie naar onderzoeksfunctie voor paar dagen in de week. Als het fysiek allemaal een beetje wil. Snel doen om voor eind Januari een paper in te kunnen dienen.

Titles: The concept of choice-space introduced for distinguishing behavioural parameters from the properties of the possible choices.

*Op Za 24 september corona positief getest. Moe, brak, hoesten en veel gesnotter (als van hooikoorts). Op Do weer Ok, maar Vr avond weer ingestort met een ontploft hoofd met vette gele snot. Pas op Wo 5 oktober weer een beetje mens. 's Avonds verrassend helder en ook op Do 7 oktober in een ongeloofelijke helderheid het spreadsheet fantastisch uitgewerkt. Op vr dan alleen maar geslapen en griepprik gehaald.*

A choice-space modelling for buy&sell is added as a 2D-matrix with 2111 x 2111 points. From this the true average and FIRD are determined. Instead of the earlier user interface to choose buy and sell moment now a game-simulation of choosing in time is created to be used in a group presentation for introduction of the concept.

Work to be added:

- optimise presentation of the output values

- show results in graphical presentation

- make average on true Bayesian-probability of number of sell moments

- ad a second buy&sell of the same stock and couple this via a second matrix to link 1st-sell maximum and 2nd-buy maximum

- add a second stock and 3rd matrix.

- play with inverted, shifted, multiplied and smoothed stock-data and download new example sets.

- optimise calculation time (use ROW() instead of reference)

- in Excel een **dataset voor loterij** maken op basis van toewijzen van vaste prijzen aan RANDOM lotnummers.

23-10-2022 Terugblik op proces van de ontwikkeling van het idee van Irrationality en irreversiblity:

2003-2008 frustratie over de extreme en slecht begrepen invloed van economische parameters op het besluitvormingsproces. We nemen rationaliteit aan zoals Newton wrijvingsloosheid aanneemt. We weten dat dit niet klopt in de aardse werkelijkheid, maar het maakt het mogelijk om eraan te rekenen en modelleren er rustig op los.

2008-2011 verdieping in economische theorie (1 d/w aan de VU). Zoeken naar equivalenten tussen fysische theorieën en de economie. Veel geleerd, maar vruchteloos.

2012 Ouderschapsverlof-Sabattical, heel veel tijd verdaan aan ontwikkeling van een handige tool voor AVI rendementsberekening. Modellering vraagt echt begrip van thermodynamica. Mijn al 10 jaar bestaande fascinatie voor exergie hierin zuiver verwerkt en de formules die eigenlijk niemand echt kent moeten hanteren. Daarbij de vonk dat exergie en energie overeenkomen met waarde en prijs.

2013-2016 Pauze door nieuwe baan, maar het broeit wel door.

2017/2018 door ziekte rust, en versnelde rijping. Opschrijven van rauwe tekst-ideeën tot patroon gemaakt. Rationaliteit en efficiency aan elkaar gekoppeld.

2019/2020 Weinig door werk en ZZP werk belasting.

2021 door corona wat rust, broeit opnieuw. Eind 2021 zoveelste formulering snijdt hout en consistentie begint.

2022 sept na 2 weken ziekte oud idee voor uitwerking in klein spreadsheetmodelletje.

2022 oktober na corona nog brak maar heldere momenten in het hoofd. Spreadsheet explodeert tot formele basis met demonstreerbare delen. Is basis voor een mock-up en helpt en dwingt om formeel zuiver te denken.

Nu opschakelen om mezelf een stabiele omgeving voor uitwerking te geven. Rust is nodig want excel programmeren kost erg veel energie. "A quilt time is what I need; the wind of God is inspiration".

31-10-2022 Explanation Choice-Space with: Discrete Choice-Space in ice-saloon

FIRST DIMENSION:

Binary: (Yes, No) or (vanilla or strawberry)

Ternary: (vanilla, strawberry, chocolate)

SECOND DIMENSION:

Numerical: 1, 2, 3 or 4 scoops

Third dimension: cup or cone

The choice-space contains 3 x 4 x 2 = 24 discrete choices that have to be evaluated.

If there are 14 tastes, small and large cones and small, large and XL cones and up to 10 scoops the choice-space contains 14 x 5 x 10 = 700 discrete choices. With some heuristics the 10 scoops in a small scone can be skipped as unpractical, but still a large number needs to be evaluated.

And this is if all scoops are of the same taste. If multiple different tastes may be combined even a fixed

So, a 4 scoop large cone combines to a choice-space of 14 x 14 x 14 x 14 = 38.416 discrete choices.

With possible whipped cream and toppings, the number of dimensions grows and the number of combinations explodes. Choice-spaces quickly grow to sizes that are impossible to evaluate completely, even if the decision of the choice-space is restrictive with clear boundaries and the evaluation-criterion is one-dimensional (in this ice saloon "preference" for each of the dimensions).

This might explain why it is so impractical if a parent asks his 3-year-old child "what do you want?" In an ice saloon. The development of heuristics to not-evaluate all choices is a crucial development in growing up. The acceptance of not-willing to find the very best choice is contrary to the economist’s presumption of Fully Informed Rational Decision-making, but even economists do no follow their believe in their daily behaviour.

And with a simple definition of practical choice like: "in June in New York find an ice cream for a maximum of 5$ within a 15 minutes’ walk." the choice-space explodes to astronomical figures. Nobody will even imagine to pursue the Fully Informed Rational Decision. Yet this is The presumption of economic theory.

Even with clear numerical criteria, a complete set of data a powerful computer is never capable of doing a complete evaluation. To a certain extent this can be circumvented by smart algorithms that efficiently search for the optimum. But real-world problems (which are often NP-complete) even out-grow the possibility to do this in a way that guarantees finding the optimum. So, on the very best, we rely on heuristic approaches to do something that with a reasonable reliability approximates the FIRD.

In practice we do some simple heuristics, scratch our head, and make a choice before enjoying our ice cream. And as Kahneman showed us we mostly don't think so slow, but let some temptations determine a fast decision.

5-11-2022 Geachte mevrouw Phlippen,

Tijdens een rijke technische carrière heb ik een bijzondere economische interesse ontwikkeld. Van 2008 tot 2012 heb ik aan de VU naast mijn baan een aanloop naar een promotie gedaan. Door carrièrewisseling heb ik dat destijds gepauzeerd. De afgelopen 10 jaar is het onderwerp uitgerijpt en inmiddels ben ik een sabbatical aan het regelen om de ontwikkelde theorie uit te werken tot een proefschrift. Het onderwerp bevindt zich op het grensvlak van de gangbare en de behavioural economie. Met mijn uitbreiding op de gangbare modellering wordt het mogelijk om behavioural "afwijking" van Fully Informed Rational Decisionmaking in genormaliseerde parameters te vangen. Daarmee kan in alle economische modellen het (general) equilibrium, ten minste gedeeltelijk, rekening houden met de gemiddelde afwijking van Fully Informed Rational Decisionmaking.

De basis van mijn theoretische uitbreiding is inmiddels rond en kan m.i. een belangrijke brug slaan tussen de behavioural en de gangbare economische kennis.

Met name in omgevingen waarin veel data beschikbaar is, zoals de aandelenhandel, is het relatief eenvoudig om het verschil tussen Fully Informed Rational Decisionmaking en het daadwerkelijke gedrag wiskundig zuiver te normaliseren. Deze parameters zijn zowel te gebruiken om besluitvorming te optimaliseren als voor een benadering om irrationele gedragscomponenten in generieke modellen mee te nemen.

Hierbij verzoek ik u om een gesprek om te kijken of en hoe een promotie traject ingevuld kan worden. Datumvoorstel: .....november

Met vriendelijke groeten, MvB

6-11-2022 S7MMARY

The central idea is that all economic transactions have a certain Degree-of-Irrationality.

The Choice-Space in which the choice for the transaction is made and evaluated can be formally defined.

Then the properties of this Choice-Space can be summarised mathematically in a few parameters.

The choice itself can then be normalised to a Degree-of-Irrationality. This DoI expresses the behavioural distance towards a Fully Informed Rational Decision.

Researching the DoI of many many decisions can reveal behavioural patterns and mechanisms.

Conventional economic theories can be extended with a term that expresses the DoI. This will express and compensate for how far real equilibria are from the basic assumption of Fully Informed Rational Decision-making.

Voor voorlopig: gebruik alleen **Degree-of-Rationaliy (DoR)** in externe communicatie.

13-11-2022 Introduction  
The current basic paradigm in economic theory is that the choices of economic agents are guided by a strive for utility and that this tends towards rational evaluation of the available options.

On the other hand, the paradigm in behavioural economics is that decisions are at least noisy and biased (Kahneman), and can be easily influenced by many different mechanisms that lead to choices that are clearly farm from rational optimisation.

This paper wants to build a small bridge between these two paradigms by creating a framework to map the behavioural deviation from FIRD into a formal framework that then can be used as an extension to mathematically models for (general) equilibrium. Without going into the details and types of behavioural deviation of FIRD the average effects of it can then be incorporated as shifts in general equilibria models.

It will be a challenge to gather data for determining the DoI in many cases. And in many cases accuracy of the measured DoI will be difficult to achieve, but even a roughly estimated DoI can provide a tendency in how the (general) equilibrium is influenced by dropping the assumption that Fully Informed Rational Decision-making is the only or leading mechanism in economic behaviour. And above all this bridge will provide an intellectual challenge to all who want to economic theory better suited to real world behaviour of people in real world conditions.

13-11-2022 Zomergasten

1. Bessel van der Kolk, Psychiater voor trauma's

Shakespeare:

"geef woorden aan verdriet

Het onverwoorde leed

Fluister 't in het overladen hart

Zodat het breekt"

Mijn eerste interpretatie:

Luiseteren naar verdriet,

Onverwerkt verleden,

Fluisteren naar het hart,

Totdat het breekt.

2. Joan Baez 1963 civil rights movement mars to Washinton, song  
We shal overcome

We are not afraid, we a

Decision making as a psychological process requires imagination of multiple options. Being able to think about other possibilities requires a freedom and lot of energie.

3. Marieke Marsman: song of Joni Michell: Both sides now, clouds I have seen both sides

13-11-2022 The current basic paradigm in economic theory is that the choices of economic agents are guided by a strive for utility and that this tends towards rational evaluation of the available options.

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First connecting the new bridge to the behavioural side will be a challenge to invent test settings for choice-spaces that deal with real behaviour and can provide the data for well defined cases. These cases should ideally be ready for real life experiments that can be repeated in many configurations. It will be an interesting impulse to behavioural sciences that all the complexity in behaviour can be measurable into a parameter that expresses the average impact on economic consequences.

Second connecting the bridge to economic modelling will require a clear mathematical framework. As with thermodynamics it will be challenging to didactically explain the vast consequences of irreversibility. The comprehension that all deviations from FIRD choices at micro scale work out in one direction of the DoI at macro scale is fundamental. But non-linear mechanisms are not an easily understood nor incorporated in modelling that is predominantly based on linear equilibria.

Compare this to physics: Newtonian mechanics and even differential equations are commonly educated at secondary school. Thermodynamics however is avoided even for many of the university courses. And in popular sciences it is common to explain much about relativity-theory, quantum mechanics or astronomical phenomena, but the backgrounds of thermodynamics are commonly avoided. Even if these are of profound influence in everyday life, visible and tactible as the Newtonian mechanics, but still difficult to understand. Mind you that it took 250 years after Newton to develop the theory of thermodynamics, much longer than the theory of the far less visible electromagnetic fields.

16-11-2022 Book David Graeber, David Wengrow: The Dawn of everything.

Page 66 The freedom of choice depends on a baseline of mutual support and living quality, "since, after all, people who are starving or lack adequate clothes or shelter in a snowstorm are not really free to to much of anything, other then whatever it takes to stay alive".

18-11-2022 Warren Buffet: price is what you pay, value is what you get.

23-11-2022 The economist’s assumption of FIRD is pervasive in society. In current time's of Internet and massive availability of information it is a contribution to, or even a driver behind, the burnout pandemic. Our welfare is based on the results of a fantastic combination of scientific-technology progress and economic-efficiency improvements. But our well-being is not growing, or even hampered, by the stress of the overload of information that we need to process by this combination of scientific-technology progress and economic-efficiency improvements.

24-11-2022 The theory for economic transactions developed in this book is closely related to the thermodynamics:

- the choice-space defined here is equivalent to the phase-space [see

<https://en.m.wikipedia.org/wiki/Phase_space>] in which

"every [degree of freedom](https://en.m.wikipedia.org/wiki/Degrees_of_freedom_(physics_and_chemistry)) or [parameter](https://en.m.wikipedia.org/wiki/Parameter) of the allowed or possible choices is represented as an axis of a multidimensional space; a one-dimensional system is called a [phase line](https://en.m.wikipedia.org/wiki/Phase_line_(mathematics)), while a two-dimensional system is called a [phase plane](https://en.m.wikipedia.org/wiki/Phase_plane). For every possible choice of the decision or allowed combination of values of the system's parameters, a point is included in the multidimensional space."

- the decision is made on an evaluation of the value that is a function of the point in the choice-space. The aim is to chose the maximum value point, but due to incompleteness of the evaluation an approximate maximum will be chosen. The incompleteness can be caused by lack of information or by incomplete assessment of the choice-space.

- the value received by an transaction is the evaluated (or perceived) net value of the forth-and-back bartertrade, or in case of a money payment the net value that the buyer associates with the transaction.

Delta Value buyer = VALUEFUNCTION (Value of product, Value of the payment)

Be aware that the value of money for the buyer is not necessarily constant, but can be influenced by his cash position or duties.

- the value-function that is used by the decisionmaker is in general specific for him and the specific choice-space. It its fixed and can be re-evaluated at a later time wit more information or a greater part of the choice-space.

- a decisionmaker may want to undo the transaction if at a later time a point in the choice-space is found with a higher value. The study of the reversibility and the margin of irreversibility of economic transactions is the quintessence of this book.

1-12-2022 Freakonomics episode 479 guided to parenting:

Economists have a reductive view on people, reducing behaviour to data.

31-12-2023 Marketing is pervasive in our society. Several of the biggest companies in the world have it as their corebusiness. And the visible and explicit commercials that we get to see and hear is only a small part of the marketing. Also the arrangement of the products in the supermarket, the collection of products that are presented to us, and even the size of the respective subsets of product-categories are all tried and tested ways to influence our behaviour. This marketing business can provide us with information and tools to make better decisions. But in practice an asymmetrical business: it aims at leading us away from good and rational choices for ourselves and tries to make profit by leading us to good choices for the producer.

The budgets for marketing are so hughe that they dwarf the research in behavioural sciences. This might explain why there is much knowledge on the "effectiveness" of each second of videocommercial. And yet we have no indicator of how good our choices are in general. One that can express how much we are influenced by the temptations that we are exposed to and that are often engineered with precision to exploit the flaws in our human judgement. Such an indicator should be easily intuitively understandable and yet have a rigorous scientific definition that makes it widely usable. In this paper the basics of a method are defined to provide such an indicator.

It's definitions allow for extending economic modelling, that is based on Fully Informed Rational Decisionmaking (FIRD), with the influence of irrational part of economical transactions. So it could be part of a theoretical and practical bridge between economic modelling and behavioural economics.

24-12-2023 CONCEPTJE VOOR UITNODIGING, DOOR ZIEKTE NIETVERSTUURD:

*Beste....   Jeroen van den Bergh, Cees Withagen, Sandra Phlippen, Daniel Khaneman, Steven Pinker, Henk Lekkerkerker,......en andere geïnteresseerden*

*Hierbij nodig ik u uit voor een presentatie op Wo 8 maart waarin ik mijn promotieonderzoek zal toelichten. Het onderwerp is: "General Irrationality and Irreversibility in economic transactions, a synthesis bridging economic modelling and behavioural economics".*

*Het betreft mijn onderzoek dat ik de afgelopen 10 jaar naast mijn werk gedaan heb. De theorie is rijp en er is al veel tekst gereed voor uitwerking komend jaar. Deze presentatie is ingepland als een versnelling van de planning doordat afgelopen week een lymfoom bij mij is vastgesteld.*

*Ik beloof een inspirerende presentatie van ca. 1 uur en ga uit van een levendige discussie de rest van de middag. Locatie moet nog geregeld worden (zaaltje bij de VU?). U wordt uitgenodigd om ook geïteresseerde behavioural- en modelleringsconomen (studenten, PhD en staf) mede uit te nodigen voor deze presentatie. Graag een copietje van de uitnodiging naar mij. Omdat de ontwikkelde synthese losjes geïnspireerd is op thermodynamische concepten kan het ook voor daarbij betrokken natuurkundigen interessant zijn.*

*Met inspirerende groeten,*

*Marcel van Berlo*

*06-50602831*

Concept 5-11-2023

*Geachte mevrouw Phlippen,*

*Tijdens een rijke technische carrière heb ik een bijzondere economische interesse ontwikkeld. Van 2008 tot 2012 heb ik aan de VU naast mijn baan een aanloop naar een promotie gedaan. Door carrière wisseling heb ik dat destijds gepauzeerd. De afgelopen 10 jaar is het onderwerp uitgerijpt en inmiddels ben ik een sabattical aan het regelen om de ontwikkelde theorie uit te werken tot een proefschrift. Het onderwerp bevind zich op het grensvlak van de gangbare en de behavioural economie. Met mijn uitbreiding op de gangbare modellering wordt het mogelijk om behavioural "afwijking" van Fully Informed Rational Decisionmaking in genormaliseerde parameters te vangen. Daarmee kan in alle economische modellen het (general) equilibrium, ten minste gedeeltelijk, rekening houden met de gemiddelde afwijking van Fully Informed Rational Decisionmaking.*

*De basis van mijn theoretische uitbreiding is inmiddels rond en kan m.i. een belangrijke brug slaan tussen de behavioural en de gangbare economische kennis.*

*Met name in omgevingen waarin veel data beschikbaar is, zoals de aandelen handel, is het relatief eenvoudig om het verschil tussen Fully Informed Rational Decisionmaking en het daadwerkelijke gedrag wiskundig zuiver te normaliseren. Deze parameters zijn zowel te gebruiken om besluitvorming te optimaliseren als voor een benadering om irrationele gedragscomponenten in generieke modellen mee te nemen.*

*Hierbij verzoek ik u om een gesprek om te kijken of en hoe een promotie traject ingevuld kan worden.*

*Datumvoorstel: .....november*

*Met vriendelijke groeten,*

*Marcel van Berlo*

*06-50602831*

6-12-2023 Nietsche said: erst kommt das Fressen und dann die Moral.  But still many are more than full of food and still are lacking any moral consideration.

In choosing the optimum point in a choice-space there are internal and external rules and conditions that schape the boundaries of the choice-space. The shape of the value-function can be complicated and noisy so that the optimum can lie everywhere, but with a smooth surfaced value-function it is likely that the optimum lies on one or more of the boundaries of the choice-space. Even more, in many cases, (just) outside the choice-space can be points with an even higher value. If this is noted it might be tempting to extend the choice-space to a larger one by deleting, shifting or bypassing one of the boundaries. This extension then is a (new) nested version of the actual choice-space. This shifting of the boundaries can be formalised as an expression of greed, theft or corruption.

The value-function incorporates needs, preferences and possibly also moral values. This might even include that it is (morally or as a measure of risk avoidance, or both) possibly better to stay away from the explicit boundaries. With such an inclusion of morality in the value-function the optimal choice will be much less dependent on the exact formulation of the boundaries of the choice-space.

The distinction between morality incorporated in the boundary definitions or in the value-function can be noted in the reasoning at the (formal) discussion in defining the boundary definitions. If it is about shall and must it will be formal or legal boundaries to 'impose' or 'organise' agreed moral values. If it is about should or may it will translate to an adaptation of the value-function.

In an ex-post evaluation of a decision it is therefore interesting to check whether the choice lies on a boundary or the intersection of several boundaries of the choice-space. If so then the exact definitions of the boundaries can have a major impact on the decision, then the choice made is mostly defined by the choice-space definition and is not so much a property of the value-function.

Only if the choice that is made is within the choice-space and is not touching any boundary it is a fully free decision based only on the properties of the choices themselves and the value-function of the decisionmaker. This is where wisdom and morale are leading. But the difficulty to follow-up wisdom and morale leads to the good practice to implement practical and formal boundaries to choice-spaces. That is also leading to the heuristics that choices are mostly made on the edges of a choice-space. This is greatly reducing the mental (and computational) effort for finding the optimum choice.

========================================================================

Uit VDI en Martin Mürer correspondentie die afleiding voor exergie en Carnot:

#### Fixed temperature: MAXIMUM exergy

#### If the temperature is fixed (e.g. when saturated steam is condensing) we get the MAXIMUM amount of work available in a certain amount of heat.

We start with the following definitions:

|  |  |  |
| --- | --- | --- |
|  | Definition of exergy available in a mass flow with given enthalpy, entropy and the temperature of its environment (also Gibs free energy). | (1) |
|  | Specific exergy, enthalpy and entropy per kg-mass. | (2) |
|  | Definition of entropy. | (3) |

And as we are assessing the delivery of heat we can state:

|  |  |  |
| --- | --- | --- |
|  | For heat delivery all enthalpy will be transferred as heat. | (4)(4) (4) |

This leads us to the well-known Carnot formula.

|  |  |  |
| --- | --- | --- |
|  | From (2,3,4).  which gives the change of exergy relative to the change of heat in an equivalent formula to Carnot | (5) |

For a finite process we have to integrate over the trajectory of the heat exchange:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | If a mass is changing from state 1 to state 2 the amount of exergy is an integral over the trajectory for the heat exchange. | | | | (6) |
|  | |  | | (7) | |
|  | | | Just as stated by the Carnot law. | | (8) |

#### Varying temperature

For heat exchange without condensation the amount of heat is directly depending on the temperature change. For example hot water is delivered with a temperature Tfeed and returned with Treturn.

When the heat is delivered as a liquid with a specific heat of cp in a flow which is circulated from the source with the temperature Tfeed to the user, and a return temperature Treturn back to the heat source:  
This is the Carnot law for a mass flow that is recirculated to deliver heat (Wall, 1986 pp. III-37)  
For steam virtually all heat is delivered at the condensation temperature. This is equivalent to  and  which is makes formula above equivalent to

The formal mathematical derivation for the Carnot law is given below.

|  |  |  |
| --- | --- | --- |
|  | Eg. The relation between temperature and energy for heating of water is linear with a fixed constant cp for the calorific value. | (9) |
|  | From (6 and 8). | (10) |

To finally get the more general variant of (7), expressing the amount of exergy available in normal materials (with a constant cp).

|  |  |  |
| --- | --- | --- |
|  |  | (11) |

|  |  |  |
| --- | --- | --- |
| With |  | (12) |

|  |  |  |
| --- | --- | --- |
|  | this has again the structure of the Carnot formula. | (13) |

This formula can be used easily because in daily practice for the measurement of  the temperatures T1 and T2 are always available.

**Books read (or audio-books on CD in the car).**

oktober 2014:

[Erik Hazelhoff Roelfzema](http://nl.wikipedia.org/wiki/Erik_Hazelhoff_Roelfzema): Soldaat van Oranje

Energetic Corpsbal in the war resistance, escape to londen, england spiel, RAF pilot, return to Holland with queen Wilhelmina. Wisdom on the working of bureaucratie.

November 2014

Cecelia Ahern: The book of tomorrow.

16year old Irish spoiled child loses father (selfmurder) and makes a great transition in wisdom.

1. <http://en.wikipedia.org/wiki/Maxwell's_demon> [↑](#footnote-ref-1)
2. <http://en.wikipedia.org/wiki/Kaldor-Hicks_efficiency> [↑](#footnote-ref-2)
3. Arthur Jonath and Richard Goldwater, 2009-2016: Profit and Entropy; An Inquiry into the Nature and Causes of the Wealth of Persons  
   [www.profitandentropy.com](http://www.profitandentropy.com), FILE: Profit and Entropy Web Four Chap 031216 [↑](#footnote-ref-3)
4. E.g. look into Boltzmann distribution for a chance of F : Which has for a large group an average utility of Uaverage and a maximum of NIET AF, ZIE Excel Gordon sheafer file 2014 [↑](#footnote-ref-4)