

General scientific methodology and economic theory have been greatly enriched by unconventional thinkers

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Abstract:

The spectrum of opinions on the question of the degree of definiteness of the states of the world has, over the course of time, changed and developed. The greatest contribution to the current level of cognition in recent times has been made by N. Taleb and D. Kahneman. The results of their new scientific perspectives have significantly influenced the definitory understanding of human behaviour during the decision-making process in uncertain conditions, including the nuances of the functioning of cross-sectional and sectoral economies.

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1. General methodological problem with the prediction of future states of the world including manifestations of randomness

The first opinion of this type was that of the mechanistic philosophers, who based their view on the laws of celestial mechanics. According to them, chance is merely a hidden necessity, which can be eliminated by acquiring a deeper knowledge of phenomena. The spectrum of opinions on the philosophical question of the extent to which the states of the world are uncertain has, however, changed and developed over time. Various positions have gradually emerged, ranging from Heisenberg, who regarded even physical reality as fundamentally indeterminate, via Einstein, who, in connection with certain random phenomena in quantum physics, declared that he did not believe that “God plays dice”, to Monod, a supporter of absolute determinism, who understood the determinism of phenomena as a consequence of finality. Another important figure was Kolmogorov, the author of the zero-one law, according to which, beyond the boundary of real time, chance is transformed into certainty, and the probability of the possible states of the world acquires the value either of zero or one.

The final decades of the last millennium were strongly marked by the sphere of influence of Professor Samuelson, the American economist, who was a convinced supporter of determinism, including its role in the social sciences, such as economics, which he regarded as a highly rigorous, normative, scientific discipline, and viewed the impact of randomness on the economic states of the world, within the context of his concept, fully captured by mathematical models, and, therefore, entirely predictable. The 1990s were the heyday of the risk-based approach, a method derived from Samuelson’s position. As the name of the method suggests, randomness was, within the normative understanding of economics, regarded as knowable, easily anticipatable, and, therefore, modellable.

The illusion regarding the normative concept of economics was ended abruptly by the devastating economic and financial crisis of the second half of the first decade of the new millennium. During that deep crisis, there was an acute danger that the global financial system would collapse. This meant not only the effective end of the era of a normative understanding of economics, but also the ending of reliance on the risk-based approach. The loss of the all-powerful mathematical-economic models was catalysed also by the modern ideological concept of dialectic rationality, when human thinking grasps the historical development of phenomena and the states of the world, including their structures, and the specific contradictoriness of thinking approached in that way can be resolved only by dialectic thinking, but mathematics does not support that modern Hegelian type of thinking.

2 New basic approaches to the methodology of the sciences and economics.

2.1 The unconventional empirical economist and philosopher Nassim Nicholas Taleb.

Because of the critical situation of the global economic and financial system that arose in the second half of the first decade of the new millennium, the community of the mainstream economists of that time came in for criticism from many sides, accusing them of failing to spot in time both the approaching crisis caused by overconsumption and excessive credit growth, and the threat posed by the new phenomenon, that is to say the consequences of the total separation of the real economy from the highly autonomous and virtual financial markets. In the end, the collapse of the global financial system was prevented just in time before it could default, by enormous, and unrepeatable, bail-outs using public finances to cover the massive losses on the markets. At the same time, politicians who supported state interventionism grew in strength, while regulatory measures to restrict speculative excesses were to be strengthened, although they also restricted the natural spontaneity of the markets.

It was during that turbulent time that the empiricist economist, philosopher and writer Nassim Nicholas Taleb made his appearance in the public arena. Taleb is a representative of modern unconventional thinking who expresses his original approach to methodological questions in a hectic period of history in an unambiguous way: We humans suffer from an obvious inability to recognise the full extent of our ignorance and the uncertainty affecting the economic states of the world in which we live, and we have a tendency to overestimate our ability to understand this world and to underestimate greatly the role of treacherous randomness. By its very nature, the unpredictability of the future states of the world affects all the natural and social sciences, the markets, politics, and, consequently, the whole of human society, which, in addition, has little understanding of this ever increasing volatility. Running like a thread through the whole of his writings is the opinion that regulation cannot completely suppress the cyclical nature of economic development. It can only reduce the amplitude of the individual cycles.

Taleb has a methodological perspective which must be seen as entirely new and radical and which has significantly enriched the methodology of the sciences and, consequently, economic theory – that is the division of the qualitative category of randomness into, on the one hand, predictable, “sterilised”, Gaussian randomness, typified by a casino or life insurance company, and, on the other hand, unpredictable, “unfettered” randomness, as presented in a publication in 2013. In the category of unfettered randomness Taleb includes those phenomena and events

which defy normal modelling and measuring, and whose onset and subsequent destructive consequences we cannot predict using normal mechanisms.

His best-known and most quoted work is the *Black Swan* (2011), which, at the time of its publication appositely described a particular type of the occurrence of unfettered randomness as a “black swan”, that is to say an event that has an exceptionally great impact and which can be explained retrospectively, but which cannot be predicted.

In his work, Taleb convincingly argues that human beings are not sufficiently mentally equipped to evaluate correctly exceptional random events. People generally underestimate the occurrence of extreme phenomena, because their mind is set to think, rather, about common, repeatable situations. When they make decisions, their thinking is often based not on considerations of probability, but on ideas based on emotions or intuition.

However, as the required degree of unpredictability, Taleb introduced a slight degree of subjectivity when judging what falls, or does not fall, into the category of black swans. Indeed, the characteristic of general unpredictability is subjective in nature. What is unexpected for one person may be taken for granted by another. A clear example of this is the recent Covid pandemic. Although there was talk, in the public arena, of the possibility of a large-scale pandemic, the precise timing of its destructive onset and the subsequent dimensions of its impact, its global scale and its length clearly fulfil the criteria of a black swan. Unpredictability on its own, as the main criterion, seems to be rather misleading and too vague. The approach of the opponents is, therefore, focussed more on the consequences of the phenomenon and the practical inability to predict the timing of its onset and its course rather than the element of surprise.

Taleb himself does not regard the Covid pandemic as a black swan (2013), as, according to him, a pandemic of that kind was to be expected. In this case, some people might consider the event to be a black swan, while others might see it as a grey swan, which is why we consider it to be more objective to think of a black swan above all as an event with an exceptionally extreme, systemic impact rather than simply as an unexpected event. In practice, it is, perhaps, impossible to state unambiguously what was, or was not expected, and the deciding factor is, rather, the extent of the overall impact that the given event has on the whole social system. Those are the events that can be considered to be black swans, because they are unmeasurable and beyond human comprehension, and not because no-one has ever said that they might not happen.

The economist Jana Matysová appears to be on the same wavelength when she predicts the near future of the EU in the midst of a gloomy global economic reality, which she compares to a “gigantic black swan”, ie. a metaphor for an event which has a fundamental impact on society.

Along with the qualitative distinction between determination and randomness, it is important to make a quantitative distinction between randomness in decisive situations in the presence of risk, uncertainty and indefiniteness. These concepts are of fundamental significance for the understanding of extreme phenomena in practice and are categorised according to the extent of the availability of information and the possibility of their quantification. Situations are classified as risky when we know all the possible results and are able to assign a certain level of probability to them. Typical examples of situations where risk plays a role include the throw of a die or a casino. The term “uncertainty” denotes a situation when we know the possible variants of development but do not have at our disposal their probability distribution. Finally, there is the category of indeterminateness, which arises when we know nothing at all about the possible future states of the world. We have no notion even of the set of possible results or their probability.

Situations affected by indeterminateness are a typical feature of most phenomena connected with black swans. In practice, we attempt to use various prediction models and scenarios, but we should take a very sceptical approach when using these tools to quantify the phenomenon of indeterminateness. Without using any mathematical-statistical models at all, we cannot precisely describe a reality dominated by extremes, while the use of common distributions, such as normal Gaussian distribution, leads to distorted results, because, in these models, extreme values are automatically excluded as improbable.

Taleb's concept of a black swan is of an unfettered, random event of great systemic extent. We, however, in addition to that, think that the event need not necessarily be unexpected by an observer. After all, even the economic and financial crisis of 2007 itself, for which Taleb first used the term “black swan”, was actually the continuation of the cyclicity of economic development. It differed, however, due to its extreme global destructiveness.

Which means that black swans should be understood as an inseparable part of a complex and unpredictable world in which extremes play a significant role. The attempt to achieve precise calculations is restricted not only by the imperfection of the models and statistical tools, but, above all, by human cognitive limits, as human beings have a tendency to simplify, to have the illusion of being in control, and, above all, to try to use hindsight to create a narrative, which they use as a basis for

predicting the future. Taleb's theory presents the important message that the world is much less predictable than we usually admit.

To understand black swans, we must admit their existence and adapt our decisions to that fact. Instead of blind trust in predictions and models, we must focus on constructing systems that will be resistant to the impact of extremes without defaulting.

2.2 The cognitive psychologists led by the Nobel prizewinner Daniel Kahneman

In recent decades, the methodology of the social sciences, and especially theoretical economics, has, in the same spirit, been most influenced, alongside economists, by cognitive psychologists, of whom the most important was the Nobel prizewinner Daniel Kahneman, who died recently.

Kahneman, one of the most original thinkers of our time, together with Amos Tversky, founded the school of behavioural economics, a school of thought, which, in recent years, has clearly been better at anticipating the currently ever more complicated economic states of the world. Kahneman and Tversky, unlike the mainstream of the day, were, like Taleb, supporters of the fundamental finding that the economic states of the world are fundamentally unpredictable. The illusion of the possibility of predicting such phenomena resides in our conviction that we understand the past, and from that we derive the illusion that the future will also be knowable.

Within the framework of the new empirical and heuristic approaches, modern cognitive psychologists have understood human beings as multi-criteria decision-makers who take into account subjective points of view as well as the ethics of economic interactions or even emotions, and, in reality, come to decisions in a different way from the orthodox criterion of the theory of the maximisation of expected utility.

In general, Kahneman, Tversky, Ariely and others focussed, like Taleb, on examining situations in which people are not endowed with perfect, rational thinking when it comes to probability or optimal behaviour in conditions of uncertainty and indefiniteness. The representatives of that school of thought discovered the rules of so-called heuristics – for example, the heuristics of the law of small numbers, regression to the mean, hindsight bias, anchoring etc. which are even in stark conflict with the classic idea of human rationality. In this way, they fundamentally changed the way we, as human beings think and regard ourselves.

Before the cognitive psychologists got involved in this research, mainstream economists were convinced that all they needed were mathematical tools, sophisticated formulae, and confidence in human rationality. Finally, but ever more

often, in this complicated and volatile world, the formulae and mathematical tools produced results different from those that reality itself dared to produce. This led to a series of very sophisticated explanations why, this time, they had got it a bit wrong again. And then Kahneman came along with an explanation covering all such cases. It was simply that the error is not in the formulae or in the mathematical tools. It is in us human beings.

The thesis that homo oeconomicus, who always makes decisions on a rational basis, does not exist in reality was known, of course, even before Kahneman's intervention. After all, the rational choice theory arose as a theoretical concept, and there has never been a single example of that one-hundred percent rational creature who thinks only of greater profits and greater efficiency, and who even dreams about added value, let alone a creature who is able to act in that way, evaluate, without regard to circumstances or outside pressure or time pressure, which are the best options and choose the one that will bring the greatest benefits.

The economic mainstream, despite being aware that it had invented this homo oeconomicus, nevertheless believed that, based on that concept, it was possible, within the framework of the models, to work with the variant of maximally rational human behaviour. And so, the concept of the rational choice theory randomly assumed that as long as a person evaluates the potential gains and losses, homo oeconomicus will always act in a balanced way.

In other words, he will measure profit and loss using the same benchmark. Then behavioural economics appeared on the scene and brought back a basic doubt about the rationality of human cognition to considerations of the subject. Moreover, this doubt was based on experiments which showed that however rationally human beings may approach problems, situations or, indeed, life itself, and even if their goals are exceptionally rational, for many reasons, they may not, and, indeed, will almost never act rationally. Psychologists have empirically demonstrated that, perhaps because human beings' aversion to loss is greater than their desire for profit, most of the population is risk averse. They have also shown that people categorise money according to how they acquired it. A typical example is of someone who wins a sum of money in a lottery equal to his monthly income and blithely spends it on completely unnecessary things. However, when he gets a one-off bonus at work equal to his monthly income, he is far more likely to add it to his savings. Homo oeconomicus should not distinguish between different types of money on the basis of how he acquired it. He should always deal with it rationally. But normal humans being will behave in their own sweet way.

An inseparable part of the problem is cognitive distortion, which affects not only ordinary citizens, but also specialists or experts. It is a systemic error affecting

human reasoning and the perception of probability, chance, or the consequences of unusual events. A good illustration of this problem is Bernoulli's St. Petersburg paradox, which is about a simple coin-tossing game. When the coin lands repeatedly with the chosen side facing upward, the player's win increases exponentially, but the game ends when the other side faces upwards. The theoretical mean value of the win is infinite, and a potential player should be willing to bet an infinitely large sum of money to take part in the game. However, although the mathematical calculation of the expected mean value of the win tends to infinity, for an ordinary player this game is, in reality, disadvantageous. The value of the win may indeed increase exponentially with every throw, but the probability that the throw will produce the desired result also falls sharply. In practice, most players estimate that after the first or second throw the coin will land tails up, meaning that, although though the formal calculation promises an extremely large win, the potential win will actually be small in size, and any normal person will, therefore, not be so keen to take part, precisely because he intuitively senses the discrepancy between the mathematical model and the true risk or profit.

It is said of many great thinkers that they took economics to a new level. The Nobel prizewinner Kahneman and other cognitive psychologists took, above all, understanding of the human being to a new level. They showed us that we are not nearly as perfect as we would like to think we are. Apart from our inability to grasp the whole complexity of the states of the world, we succumb, when making decisions, to strange influences which are often irrational and, moreover, often have nothing at all to do with the decision-making process.

3 Practical applications based on the new approaches

The insurance business, as an important part of the financial sector, as well as the science and theory of insurance, must base the creation of their paradigms and the acquisition of knowledge on economic theory and general scientific methodology, as the functioning of the insurance sector, within the framework of the financial system, is closely connected with phenomenon of randomness. Within the framework of actuarial science, along with the theory of finance, insurance law is of particular importance as a specialised part of jurisprudence.

In the segment of life risk insurance products, there is, however, practically no problem with unpredictable randomness, as randomness is manifested here as typically Gaussian and mathematically resolved as a model, unlike the manifestations of unfettered, unpredictable randomness which can occur in property

insurance or liability insurance. Moreover, the economy of life insurance is further stabilised by a capital-forming element, provided that it is included in the product. This fundamental difference in relation to, on one side, sterilised randomness, and, on the other side, unfettered randomness and, by extension, in relation to the dual content of the internal economy in both segments of insurance products and to the way in which the insurance technical reserves are created in life insurance products, is very important for insurance theory, and, in practice it is necessary to respect its principles unconditionally.

The fundamentally different influence on the two insurance segments can be seen in a certain nuance in the defining of the category of insurance. It is clear from the title of A. Klimta's publication (2022) that the content of the book should deal primarily with the insurance of persons, but most of the content applies also to the segment of general insurance, in particular property and liability insurance. An explanation of the title, and possibly other parts of the book dealing with this topic, can be found in the different views of economists and lawyers on the connection between insurance and the category of randomness.

For economists, the function of insurance is important precisely because it compensates for the consequences of randomness in non-life products. At the current time, the question of the extent of the role of the insurance sector in resolving catastrophic events is topical, as the financial impact of those events is increasing geometrically. In the case of the insurance of persons, this problem does not arise. Its randomness is Gaussian, in sharp contrast to the possible manifestations of unpredictable randomness in property and liability insurance. A failure to understand this difference in 2021 led the Czech government of the day to take a totally wrong step, when sums amounting to about ten billion Czech crowns were diverted from life insurance reserves to cover populist public spending.

From the point of view of private law, insurance is a contractual agreement between the insured party and the insurer, according to which the insurer commits to pay the insured party, or a third party, an insurance payout if an insured event covered by the agreement occurs, while the insured party commits to pay an insurance premium. According to Professor Macková (2025), these are legal relationships marked by uncertainty regarding the potential benefit, or detriment, ie. an uncertain outcome. In her opinion, its characteristic is the uncertainty of the outcome, even if it is possible to quantify uncertainty statistically, using probability or another mathematical approach. In legal theory, as we can see, it is not about the use of the concept of uncertainty in the sense accepted by methodologists in the context of the quantitative aspect of the category of randomness. Uncertainty is understood by

lawyers linguistically as an attribute of an aleatory contract, and their argument is based on the fact that it is not certain whether or when the ensured event will occur.

The insurance business, which, within the framework of its own functioning and its economic essence, works with the qualitative aspect of the definiteness of the states of the world – randomness and its own quantitative aspects, risk, uncertainty and indefiniteness – must consistently use the generally accepted methodological terminology.

From the point of view of behavioural decision-making problems, we may observe the recurrent behaviour of the clients of insurance companies, which may be categorised as one of the consequences of the above mentioned cognitive distortion: This attitude is a clear characteristic of the behaviour of under-insured people – Most people, when they are setting the extent of their insurance coverage, are not very willing to admit the possibility of their own involvement in the appreciable negative consequences of random events.

By contrast, an insurance company has to deal with the problem of including the unclear upper limit of maximum possible losses in the calculation of the insurance premium. All insurance companies use pragmatic solutions in which, instead of trying to determine the maximum possible losses precisely within the framework of insurance cover, which, in the case of a non-Gaussian random phenomenon is a virtually impossible task, they introduce a so-called policy limit, that is, an artificially set ceiling, above which insurance cover does not apply. By doing so, they effectively admit that some insurance losses cannot be precisely calculated, and that therefore they cannot be financially covered, even if the principle of equivalence between the income and expenditure of the insurance company is respected.

We have already mentioned that phenomena connected with cognitive distortion play an important role in connection with expert predictions and their credibility. In his work, Taleb has argued convincingly that human beings are not sufficiently mentally equipped to evaluate rare events correctly. In addition to common cognitive distortion, we must also take into account the overestimation of factual data which, at a particular moment, may appear to be unquestionable or logical, as well as the overlooking of more significant, but less conspicuous information.

A good example of this is the problem that arises in the methodology used to stress test financial institutions, especially banks, insurance companies and investment companies. By using the statistical prolongation method, we, of course, exclude the possibility of “upgrading” randomness, meaning that future events could be far more destructive than any previous historical cases. Even applying the Monte Carlo

method does not help in this case, as it only simulates other probability distributions of historical values. Stress tests may thus create the false impression that we can control the future.

So if we wish to use expert analysis as the basis for such predictions, we must bear in mind the generally valid reservation about the abilities of experts: Even the leading experts may succumb to the illusion that they understand complex phenomena and may have more faith in their own hypotheses than in chance. Cognitive distortion is a fundamental weakness of human decision-making, especially in an environment dominated by randomness, which constitutes the limits of human understanding. This fact applies fully even to otherwise respected experts.

4 Conclusion

Part of the history of human society is the development of opinions on the determinateness of the states of the world - opinions which may even be dichotomous, ranging from those of the deterministic mechanistic philosophers influenced by the laws of celestial mechanics, to current-day thinkers who view reality as highly descriptive. Similarly, schools of thought have developed, from Aristotelianism and Cartesianism to modern dialectic thinking.

At the end of the last millennium, this development took a new turn under the influence of Professor Samuelson, a firm supporter of normative approaches to economics and a believer in the risk-based approach towards randomness. In parallel with the impact of the onset of the economic and financial crisis in the first decade of the new millennium, a phenomenon whose characteristics can clearly be classified as extreme, publications started to appear presenting new, unconventional, and at the time non-mainstream, perspectives on the states of the world. These views of empirical economists and cognitive psychologists better anticipated the states of the world. The main figures of this new approach to scientific methodology, the category of randomness, the demythologisation of rationality and the behaviour of human beings as multi-criteria decision-makers, were N.N. Taleb, the behavioural economists, and the cognitive psychologists led by D. Kahneman. The results of their scientific contributions have had a significant influence on the definitive understanding of the category of randomness, human behaviour during the decision-making process in uncertain conditions, and the nuances of the functioning of cross-sectional and sectoral economies.

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Obecnou metodologii věd a ekonomickou teorii aktuálně významně obohatili nekonvenční myslitelé

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Abstrakt

Spektrum názorů na otázku míry určitosti stavů světa se v průběhu času měnilo a vyvíjelo. Největší přínos k současné úrovni kognice v poslední době přispěli N. Taleb a D. Kahneman. Výsledky jejich nových vědeckých pohledů významně ovlivnily definitivní pochopení lidského chování během rozhodovacího procesu za nejistých podmínek, včetně nuancí fungování průřezových a sektorových ekonomik.

Klíčová slova:

kontingentnost, pojíšťovnictví, černá labuť

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