Principle of uncertain future and utility

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The principle of uncertain future: the probability of a future event contains a degree of (hidden) uncertainty. As a result, this uncertainty (in a sense, similar to vibrations, fluctuations) pushes the probability value back from the bounds to the middle of its range (from ~100% and ~0% to the middle probability values). In other words, the real values of high probabilities are lower than the preliminarily determined ones. Conversely, the real values of low probabilities are higher than the preliminarily determined ones. This result provides the uniform solution of a number of fundamental problems: the underweighting of high and the overweighting of low probabilities, the Allais paradox, risk aversion, loss aversion, the Ellsberg paradox, the equity premium puzzle, etc. The principle and its consequences can be applied in the fields of banking, investment, insurance, trade, industry, planning and forecasting. Explanations of the principle and examples of solution of three types of basic utility problems are provided.

Contents

0.1. A simple one-page explanation of the principle of uncertain future

Problems

The well-determined but unexplained facts are:
"When valuing risky prospects, people typically overweight small probabilities and underweight large probabilities." (Fehr-Duda et al 2006)

These facts give rise to a number of problems including the Allais paradox, risk aversion, the equity premium puzzle, the explanation of the shape of the probability weighting function along with other unsolved problems.

The principle of uncertain future

The probability (P) of a future event contains a degree (ΔP) of uncertainty

$$P \sim P_{preliminary\ determined} \pm \Delta P$$

in comparison with the preliminary precisely determined probability ($P_{preliminary\ determined}$).

The repulsion from a (rigid) bound of range

The probability value ranges from 0% to 100%. The value of probability cannot be less than 0% or more than 100% (The bounds of the range are, in a sense, similar to rigid walls).

Because of this, the uncertainty pushes the probability value back from the bounds to the middle of the range (in a sense, similar to the action of vibrations, fluctuations).

For example

Suppose we wish to test the probability values, which are very close (but not equal) to 0% or 100%. For example, we choose 1% or 99%.

Suppose the uncertainty value (ΔP) is essentially more than the distance of the probability value from the bound. For example, $\Delta P = 10\%$.

Then, evidently, (if we make the test as if there is no uncertainty) the mean distance of the probability value from the bound cannot be as small as 1% (if the uncertainty value is 10%).

Generally, the mean distance of the probability value from the bound cannot be considerably less than the uncertainty value.

Thus, the mean value of probability ($P_{real\ mean}$) cannot be as low as 1%. It cannot be as high as 99% also.

Solution of the problems

So, in the above example, denoting the real mean value of probability, which value is near 100% as $P_{high\ real\ mean}$, the real mean value of probability, which value is near 0% as $P_{low\ real\ mean}$ and the preliminary precisely determined probability as ($P_{preliminary\ determined}$) we obtain

$$P_{high\ real\ mean} < P_{preliminary\ determined}$$
$$P_{low\ real\ mean} > P_{preliminary\ determined}$$

Accordingly, the above problems can be solved.

0.2. A slightly more complex explanation

Problems

The well-determined but unexplained facts are:

For positive (gains) risky prospects, people typically overweight low probabilities but underweight high probabilities. For negative (losses) risky prospects, people typically underweight low probabilities but overweight high probabilities.

These facts give rise to a number of unsolved fundamental problems.

The principle of uncertain future

The probability (P) of a future event contains a degree (ΔP) of uncertainty

$$P \sim P_{preliminary\ determined} \pm \Delta P$$

in comparison with the preliminary exactly determined probability ($P_{preliminary\ determined}$).

The repulsion from a (rigid) bound of range

The probability value ranges from 0% to 100%. The value of probability cannot be less than 0% or more than 100% (The bounds of the range are, in a sense, similar to rigid walls).

Because of this, the uncertainty (in a sense, similar to vibrations, fluctuations) pushes the probability value back from the bounds of the range to the direction of the middle of the range.

For example

Suppose we wish to test the probability values, which are very close (but not equal) to 0% or 100%. For example, we select 1% or 99%.

Suppose the uncertainty value (ΔP) is essentially more than the distance of the probability value from the bound. For example, $\Delta P = 10\%$.

Then, evidently, (if we make the test as if there is no uncertainty) the mean distance of the probability value from the bound cannot be as small as 1% (if the uncertainty value is 10%).

Generally, the mean distance of the probability value from the bound cannot be considerably less than the uncertainty value.

Therefore, the mean value of probability ($P_{real\ mean}$) cannot be as low as 1%. It cannot be as high as 99% also.

Solution of the problems

So, in the above example, denoting the real mean value of probability, which value is near 100% as $P_{high\ real\ mean}$, we obtain

$$P_{high\ real\ mean} < P_{preliminary\ determined}$$

Denoting the (positive) value of gain as G and the (negative) value of loss as $-G$, we obtain

$$G \times P_{high\ real\ mean} < G \times P_{preliminary\ determined}$$
$$-G \times P_{high\ real\ mean} > -G \times P_{preliminary\ determined}$$

- the underweight of high probabilities gains and the overweight of high probabilities losses.

Denoting the mean value of probability, which value is near 0% as $P_{low\ real\ mean}$ we obtain

$$P_{low\ real\ mean} > P_{preliminary\ determined}$$
$$G \times P_{low\ real\ mean} > G \times P_{preliminary\ determined}$$
$$-G \times P_{low\ real\ mean} < -G \times P_{preliminary\ determined}$$

- the overweight of low probabilities gains and the underweight of low probabilities losses.

Thus, the above problems can be solved.

Introduction

The final statement of Hey and Orme (1994) was "... we are tempted to conclude by saying that our study indicates that behavior can be reasonably well modeled (to what might be termed a "reasonable approximation") as "expected utility plus noise." Perhaps we should now spend some time thinking about the noise, rather than about even more alternatives to expected utility?"

Harin (2005), Harin (2006) and this paper renew, generalize and develop this statement.

1. Principle of uncertain future
1.1. General principle of uncertain future

Future events may be considered as, at least partially, uncertain.

This uncertainty or partial uncertainty may be invisible or imperceptible. It may be crucial. In any case, the overwhelming majority of future events contain, at least a part of uncertainty. In a simple form this principle may sound like:

Future events contain (at least) a degree of uncertainty.

1.2. Specific principle of uncertain future

The specific principle of uncertain future emphasizes one of uncertain aspects of future events, namely probability. It states probabilities of future events are, to some extent, uncertain. This extent may be invisible, imperceptible. It may be considerable, even crucial. In any case, the overwhelming majority of future events contain, at least, a degree of uncertainty. In a simple form this principle may sound like:

The probability of every future event contains (at least) a degree of (hidden) uncertainty.

1.2.1. Example

Suppose Mr. Somebody offers you a prize. The choice is either a guaranteed prize or one of a lottery. The lottery prize has value which is greater and the probability which is less than those of the guaranteed one. The mean values to win the lottery and guaranteed prizes are equal to each other. The probability to win in the lottery is equal to $P < 100\%$).

This scenario gives rise to a number of unsolved fundamental problems (e.g., the Allais paradox, risk aversion, loss aversion, overweighting of low probabilities, the Kahneman-Tversky paradox and the equity premium puzzle).

Assume two variants of the preliminarily determined probability $P_{preliminary}$. They are regarded as high and low:

$$P_{high\ preliminary\ determined}\ = 99\%.$$
$$P_{low\ preliminary\ determined}\ = 1\%,$$

Suppose the probability's uncertainty is $\pm\Delta P$. Then all variants of the real probability P will be uncertain

$$P \sim P_{preliminary\ determined} \pm \Delta P.$$

Suppose the probability's uncertainty is essentially more than 1% (e.g. $\Delta P = 10\%$) and is uniform. Then the real mean values of probability P_{mean}: will be

$$P_{high\ real\ mean} < 99\%.$$
$$P_{low\ real\ mean} > 1\%,$$

Real low probability will be higher than the preliminary determined one.
Real high probability will be lower than the preliminary determined one.
The unsolved problems may be solved.

1.3. Miscellaneous
Evident and hidden (latent) uncertainties

There are evident and hidden, latent uncertainties. To consider evident uncertainties is, in a sense, obvious and trivial and often not beneficial. The primary (but not the only) goal of the principle of uncertain future is to consider hidden, latent uncertainties.

So, the situation of the example contains the evident uncertainty in the lottery (You may either win or not). But there is a hidden uncertainty. It is, e.g., the probability of winning in the lottery (and in reality receive your prize) may not be certainly equal to P (The lottery may have a defect or suffer a failure; suddenly, you or Mr. Somebody may become ill; Mr. Somebody's offer may be a joke or trick; anybody (curious person, terrorist, policeman, etc.) may interfere in the process, etc.).

Influence of the principle

In some cases, an influence of this principle will be negligible. In some cases, this influence will improve a precision of calculations. In some cases, it will be essential, even critical. But it is sufficiently essential and usual to prevent the economic theory to be developed as successful as it might be.

So, instead of 50 years of numerous attempts at solving the famous paradox of Nobel laureate Allais, another Nobel laureate, Kahneman, along with Thaler, (2005) noted "… the paradoxes of Allais (1953) … have demonstrated inconsistency in preferences."

In any case, collective elaborate definition, development and application of the principle of uncertain future will improve the scientific accuracy of economic theory.

Literature review

Generally, the approach of the principle renews, generalizes and develops the results of Hey and Orme (1994).

The search of the term "principle of uncertain future" in economic literature found in titles or keywords offers no examples in the predominant meaning of this paper.

The classical review in Schoemaker (1982) and the most recent (one month before Harin (2005), which was the first feature paper on this idea) review in Quiggin and Chambers (2005) do not mention this idea. The author's review of RePEc from 1969 does not find this idea either.

Similar or supporting ideas are primarily in Hey and Orme (1994) and secondly, e.g., in Quiggin (2005) and Novarese (2002).

Questions, generalizations and analogies

At the present time, the name and wording of the principle are open to questioning. Advice is welcomed.

Generally, this principle may be also treated and referred to as the "Economic uncertainty principle" or the "Future uncertainty principle" or the "Principle of future's uncertainty" or the "Principle of hidden uncertainties," etc.

The principle of uncertain future may be, to some extent, treated in terms of incomplete or asymmetric information.

There are evident analogies between Heisenberg's uncertainty principle and Einstein's general and specific theories of relativity on one hand and the principle of uncertain future on the other. There is an evident influence of the great physicians on the new principle.

Moreover, the principle of uncertain future can be, to some extent, the consequence of Heisenberg's uncertainty principle. Indeed, one cannot simultaneously measure both impulse and position better than with uncertainty

$$\Delta p \times \Delta x \geq \hbar / 2$$

where

Δp - impulse uncertainty,
Δx - position uncertainty,
$\hbar$ - Planck's constant divided by 2π.

This fact, along with the actual impossibility to know all the reasons and origins of future events, can give rise to future events' uncertainties.

The situation, when comparing the economic theory without and with the principle of uncertain future, is in a sense analogous to the situation when comparing classical and quantum physics. Classical physics does not consider Heisenberg's uncertainty principle, which is one of the cornerstones of quantum physics. The "classical" economic theory does not consider the principle of uncertain future.

Consider these two processes:

a process which is a basic one for economics – a choice of an outcome which probability is P,
and
a process which is a basic one for physics – a scattering on a barrier which the height is H.

In both cases, when the uncertainty is essential:
for high P and H the choice and the scattering are lower than those of the classical theory;
for low P and H the choice and the scattering are higher than those of the classical theory.

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1.4. Analysis of the specific principle
1.4.1. Mathematical expression of the principle

Mathematically, this principle may be written in the form of two expressions:

The first

(1.1a) $P \sim P_{preliminary} + \Delta_+ P(S_{Situation}; P_{preliminary}) - \Delta_- P(S_{Situation}; P_{preliminary})$

where and below

P	- the value of real or future probability;
$P_{preliminary}$	- the preliminarily determined P;
$S_{Situation}$	- a set of parameters of the situation
$\Delta_+ P$	- the part of probability's uncertainty, which increases P;
$\Delta_- P$	- the part of probability's uncertainty, which decreases P;

or, simplified,

(1.1) $P \sim P_{preliminary} \pm \Delta P(S_{Situation}; P_{preliminary})$

where

ΔP $= (plus)\ \Delta_+ P$ and $(minus)\ \Delta_- P$

The second

(1.2) $P_{mean} = P_{preliminary} + \delta P(S_{Situation}; P_{preliminary})$

where

P_{mean}	- the mean value of P;
δP	- the shift, the bias of the mean value of real or future P in the comparison with the value of preliminarily determined P (δP may be positive or negative).

1.4.2. First consequence

The aforementioned example

$$P_{high\ preliminary} = 99\%.$$
$$P_{low\ preliminary} = 1\%,$$

and

$$P_{high\ mean} < 99\%.$$
$$P_{low\ mean} > 1\%,$$

using equation (1.2)

$$P_{mean} = P_{preliminary} + \delta P$$

may be generalized and written in the following format:

(2.1a) $\qquad\qquad \delta P_{high} < 0$
$\qquad\qquad\qquad\quad\ \delta P_{low} > 0$

where and below (in paragraph 1.4.2)
     high   - refers to $P_{preliminary}$ (and corresponding P), such as $(100\% - P_{preliminary})$ is small in comparison with Δ_+P

where and below
     low   - refers to $P_{preliminary}$ (and corresponding P), such as $P_{preliminary}$ is small in comparison with Δ_-P

or
(2.1b) $\qquad\qquad P_{high\ mean} = P_{high\ preliminary.} - |\delta P| < P_{high\ preliminary.}$
$\qquad\qquad\qquad\quad\ P_{low\ mean} = P_{low\ preliminary,} + |\delta P| > P_{low\ preliminary,}$

or, simplified,
(2.1) $\qquad\qquad P_{high\ mean} < P_{high\ preliminary.}$
$\qquad\qquad\qquad\ P_{low\ mean} > P_{low\ preliminary,}$

1.4.3. First hypothesis

Compare these two events: a preliminarily uncertain event and a preliminarily certain event, e.g., a lottery and a guarantee. When the other conditions of these events are the same or similar to each other, the first hypothesis of the approach (or theory) of uncertain future states:

The shift of the probability of the preliminarily certain event is sufficiently less in comparison with that of the preliminarily uncertain (high probability) event.
(There is no need for such a hypothesis regarding low probabilities)

More precisely (in terms of final mean values):

$\delta P_{certain}$ - the shift of the probability of the preliminarily certain event is as small (in comparison with δP_{high} - to that of the preliminarily uncertain (high probability) event) as to ensure the existence of a finitely small vicinity $v_{100\%}$ near P=100%, such as for the mean real values of probabilities $P_{high\ mean} = P_{preliminary}$ - $|\delta P|$ and $P_{certain\ mean} = 100\% - |\delta P_{certain}|$

$$\frac{P_{high\ mean}}{P_{certain\ mean}} < \frac{P_{high\ pre\lim inary}}{P_{certain\ pre\lim inary}}$$

where and below

      high   - refers to $P_{preliminary}$ (and corresponding P), such as

            100% - $v_{100\%} \le P_{high\ preliminary}$ < 100% ($v_{100\%}$ > 0; $v_{100\%}$ = const).

Typically, it should be sufficient to be true

$$|\delta P_{certain}| \le |\delta P((100\% - v_{100\%})_{preliminary})|$$

This hypothesis is intuitively obvious. Indeed, to be preliminarily certain, the event must have additional means to support this excess of certainty. However it is hard to be precisely and generally proved. Hopefully, it may be proven by collective efforts in the next few years.

Though being not exactly and generally proved, this hypothesis helps, at least partially, to rationally explain a number of remaining unsolved problems (See below in 2. Problems solving).

1.4.4. Example

The first hypothesis allows transformation from absolute values to normalized (relative) ones. From

$$P_{high\ mean} \qquad < P_{high\ preliminary},$$
$$P_{low\ mean} \qquad > P_{low\ preliminary},$$

defining normalized values $P / P_{certain}$ as $P_{normalized}$, we obtain

(2.2) $P_{high\ mean\ normalized} \qquad < P_{high\ preliminary},$
                       $P_{low\ mean\ normalized} \qquad > P_{low\ preliminary},$

And, defining $P_{mean\ normalized}$ as P, we may rewrite (2.2) in the simplified form as

(2.3) $P_{high} \qquad < P_{high\ preliminary},$
                       $P_{low} \qquad > P_{low\ preliminary},$

2. Solution of problems
2.1. General

The principle of uncertain future can explain, at least partially, a number of problems.

2.2. Allais paradox, risk aversion, overweighting of low probabilities …

First old fundamental problems, which can be explained, are the Allais paradox, the Ellsberg paradox, uniform explanation of both gains and losses, overweighting of low probabilities, risk aversion, loss aversion and the equity premium puzzle.

2.2.1. First type of results. High probabilities

Let us reconsider a part of the preceding example for probabilities which are close to 100%:
Suppose Mr. Somebody offers you a choice of only one of the following:
    A guaranteed gain of $99. Or
    A lottery:
        The gain of [1]$100 with the probability $P_{(preliminary)} = 99\%$ or
        $0 with the (preliminary) probability 1%.
The mathematical expectations of guarantee $M_{guarant}$ and lottery M_{lott} outcomes are exactly the same:

$$M_{guarant} = \$99 \times 100\% = \$99, \quad M_{lott} = \$100 \times 99\% = \$99, \quad so, \$99 = \$99.$$

But the well-determined experimental fact is: in similar experiments the obvious majority of people chose the guaranteed gain instead of the lottery (See, e.g., Tversky and Wakker 1995). This is a modification of the aforementioned classical Allais paradox (See Allais 1953).

An explanation

"Anything-can-happen": the lottery may have defects or suffer a failure; Mr. Somebody or you may fall ill; Mr. Somebody's offer may be a joke or trick; anybody (curious person, terrorist, policeman, etc.) may interfere in the process etc.
So, the real probabilities will be uncertain (independently of whether the preliminary ones are or not). For example, for, e.g., $\delta P = -12\%$ and $\delta P_{guarant} = -5\%$ and normalizing $P_{guarant}$ to 100%,

$$100\% - 5\% = 95\%, \qquad\qquad 99\% - 12\% = 87\%,$$
$$95\% : 95\% = 100\% \qquad\qquad 87\% : 95\% = 91.58\% \sim 92\%.$$

$$M_{guarant} = \$99 \times 100\% = \$99, \qquad M_{lott} = \$100 \times 92\% < \$92, \qquad so, \$99 \geq \$92.$$

So, really, the mathematical expectation of the guarantee outcome is more than that of the lottery outcome.
    Therefore, the choice of the majority of people may correspond exactly to the mathematical expectations.
    So, the specific principle of uncertain future and its first hypothesis can naturally and clearly explain this and similar examples.

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[1] For experiment's accuracy, both $99 and $100 should be in $1 banknotes. So 99 and 100 banknotes of $1.

2.2.2. Second type of results. Gains and losses
The complication of the Allais paradox

We may complicate the previous paradox and may compare these two experiments:
1) Mr. Somebody offers you a choice of only one of the following[2]:
     A guaranteed gain of $99. Or
     A lottery:
             The gain of $100 with the probability 99% or
             $0 with the probability 1%.
2) Mr. Somebody offers you a choice of only one of the following:
     A guaranteed loss of $99. Or
     A lottery:
             The loss of $100 with the probability 99% or
             $0 with the probability 1%.
The mathematical expectations of the guarantee and lottery outcomes are exactly the same in both experiments. But in similar experiments, the overwhelming majority of people chose (See, e.g., Di Mauro and Maffioletti 2004):
-   in the case of gains - the guaranteed gain instead of the lottery one.
-   in the case of losses - the lottery loss instead of the guaranteed one.
The possible well-known "natural and clear explanation" of gains in the Allais paradox by means of risk aversion cannot supply any uniform explanation for both gains and losses. The result of this explanation is gains' risk aversion and losses' risk seeking.

An explanation

The ideal preliminary equalities are:

for gains   *$99 × 100% = $99,*   *$100 × 99% = $99,*   so, *$99 = $99.*
for losses   *-$99 × 100% = -$99,*   *-$100 × 99% = -$99,*   so, *-$99 = -$99.*

For real biases, e.g. (See 2.2.1), $\delta P = -12\%$ and $\delta P_{guarant} = -5\%$ and normalized $P_{guarant\ mean} = 100\%$ and $P_{mean} = 92\%$ we have:

for gains: *$99 × 100% = $99,*   *$100 × 92% = $92,*   so, *$99 > $92.*
for losses: *-$99 × 100% = -$99,*   *-$100 × 92% = -$92,*   so, *-$99 < -$92.*

So, actually:
     the mathematical expectation of the guarantee gains' outcome is more than that of the lottery one.
     the mathematical expectation of the lottery losses' outcome is more than that of the guarantee one.

Therefore, in both experiments, the choice of the majority of people may be considered from the unified point of view and uniformly. This choice may correspond exactly to the mathematical expectations.
Therefore, the specific principle of uncertain future and its first hypothesis can naturally and clearly explain this and similar examples as well.

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[2] For experiment's accuracy, both $99 and $100 should be in $1 banknotes. So 99 and 100 banknotes of $1.

2.2.3. Third type of results. Low probabilities

Let us reconsider a part of the previous example for probabilities which are close to 0%:
Suppose Mr. Somebody offers you a choice of only one of the following[3]:
    A guaranteed gain of $1. Or
    A lottery:
        The gain of $100 with the probability P_{lott} =1% or
        $0 with the probability 99%.
The mathematical expectations of guarantee M_{guar} and lottery M_{lott} outcomes are exactly the same:

$$M_{guar} = \$1 \times 100\% = \$1, \quad M_{lott} = \$100 \times 1\% = \$1, \qquad \text{so, } \$1 = \$1.$$

But the well-determined experimental fact is: in similar experiments the obvious majority of people chose the lottery gain instead of the guaranteed one (See, e.g., Tversky and Wakker 1995). This fact is additionally not explained.

An explanation

Due to the specific principle of uncertain future and its first hypothesis

$$P_{lott\ low\ mean} / P_{certain\ mean} > P_{lott\ low\ preliminary} / P_{certain\ preliminary} = 1\%.$$

For shifts from the preliminary to real values, which are equal to, e.g., $\delta P = 1\%$ and $\delta P_{guarant} = -2\%$ and normalized $P_{guarant\ normalized} = 100\%$ and $P_{mean\ normalized} = 2\%$ we have:

$$M_{guarant} = \$1 \times 100\% = \$1, \qquad M_{lott} = \$100 \times 2\% < \$2, \qquad \text{so, } \$2 > \$1.$$

So, really, the mathematical expectation of the lottery outcome is more than that of the guarantee outcome.
Therefore, the choice of the majority of people may correspond exactly to the mathematical expectations.
So, the specific principle of uncertain future and its first hypothesis can also naturally and clearly explain this and similar examples.

2.3. Universality and uniformity of the approach of the principle

Thus, the principle of uncertain future, particularly the specific principle of uncertain future, can, from the unified point of view and uniformly, explain more than one type of unsolved fundamental problems with the additional help of only one hypothesis.
(Hopefully, this hypothesis may be proven by collective efforts in the next few years)

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[3] For the experiment accuracy, both $99 and $100 should be in $1 banknotes. So 99 and 100 banknotes of $1.

3. Arrangements' infringements
3.1. This paper

The approach of arrangements' infringements was introduced in Harin (2005). However, instead of following explanatory papers, this approach was not understudied by the scientific community.

A paper about the economic uncertainty principle (as the generalization of arrangements' infringements) (Harin 2006) has not achieved such understanding either.

So, more than a year's worth of attempts of explanation of the new approach have shown:
The author, dealing with the approach for more than 5 years, has failed (and, probably, cannot) to explain it clearly to researchers facing the approach for the first time.

So, explainers and interpreters of the approach are needed.

3.2. Arrangements' infringements

The idea of arrangements' infringements is essentially the same as that of the principle of uncertain future. Actually (and historically), the principle of uncertain future is the generalization of the idea of arrangements' infringements. Arrangements' infringements are, in a sense, more particular and exact approach. The first and second hypotheses of the arrangements infringements approach (See Harin 2004) are somewhat similar to the specific principle of uncertain future and its first hypothesis.

Below, the approach of arrangements' infringements is summarized.

3.2.1. Definitions

Arrangements will refer to arrangements, agreements, assumptions, regulations, bargains, contracts, plans, projects, etc.

Infringements will refer to infringements, breaches, modifications, disturbances, deviations, alterations, etc.

A condition will refer to a condition, term, circumstance, characteristic, etc. Naturally, the term "condition" means the essential, material condition.

An arrangement infringement will refer to an infringement of at least one of the arrangement conditions that take place after the decision to fulfill this arrangement was made.

3.2.2. Hypotheses. First results. Applications.

The first hypothesis of the approach is:
When risky outcomes have probabilities, which are almost the same as the guarantee (100%), the arrangement infringement possibility can lessen real, objective probabilities and mathematical expectations of such risky outcomes in comparison with the guaranteed ones.

This hypothesis is obvious though challenging to prove. It is actually the result, even two types of results: explanations of problems of high probabilities and gains and losses.

Arrangements are the fundamental concept of economics and widespread economic events. They are the constituent elements of the majority of items in economic theory. Infringements of arrangements have similar significance. The variety of applications' fields of idea's approach can be as important and as wide as that of arrangement infringements. In particular, these fields can be investment, banking, insurance, trade, industry, business projects estimation, planning and forecasting.

3.2.3. Analogies

Arrangements' infringements have rich analogs in other sciences:

Arrangements' infringements can be, in a sense, referred to as a "friction," "dissipation," "noise," "Brownian motion," etc. in economics. (Problems of noise, noise traders, etc. are discussed in economics. See, e.g., Capuano 2006, Chay et al 2005 and Hey 2005.)

These analogs are of obvious original importance.

Moreover, often, friction, dissipation and noises hide or mask the action of an important law or laws. An example is Galilean's insight regarding uniform motion. Such motion could not be observed in practice during Galilean times because of the hidden action of friction.

Arrangements' infringements (even their possibilities) can hide the action of economic laws.

The accurate accounting of arrangements' infringements and their possibility can clear this action and these laws.

So, arrangements' infringements can be, to some extent, as fundamental, important and widespread in economics as their analogs in other sciences.

So, arrangements' infringements can be, to some extent, as fundamental, important and widespread in economics as economic laws, whose actions they hide.

These analogies and conclusions may also be, at least partially, applied to the principle of uncertain future.

Conclusions

Harin (2005), Harin (2006) and this paper renew, generalize and develop the results of Hey and Orme (1994). In a simplified form, the conclusions of this paper may be drawn as follows:

The general principle of uncertain future:

Future events contain a degree of (hidden) uncertainty.

The specific principle of uncertain future:

The probability of every future event contains a degree of (hidden) uncertainty.

Mathematically:

$$P \sim P_{preliminary} \pm \Delta P$$

$$P_{mean} = P_{preliminary} + \delta P$$

where and below

P	- real (future) probability;
$P_{preliminary}$	- the preliminarily determined value of P;
ΔP	- the uncertainty of the real (future) probability;
δP	- the shift of the real mean value of P in the comparison with the preliminarily determined value of P (δP may be positive or negative).

The first result of the application of the specific principle of uncertain future:

$$P_{high} < P_{high\ preliminary}$$
$$P_{low} > P_{low\ preliminary}$$

where

high	- refers to probabilities, which values are near 100%
low	- refers to probabilities, which values are near 0%

This result can, at least partially, solve the Allais paradox, risk aversion, loss aversion, overweighting of low probabilities, the Ellsberg paradox, uniform explanation of choices for both gains and losses, the equity premium puzzle and other unsolved problems.

Already this simple result provides the (preliminary) first of three stages of the explanation of the shape of the probability weighting function (See, e.g., Tversky and Wakker (1995) and Fehr-Duda et al (2006)).

So, the principle of uncertain future, approach of arrangements' infringements and results of their application may help the progress of utility & prospect theories (and the progress in neighboring research fields.

Acknowledgement

The author dedicates this paper and, mainly, a subsequent article to Maurice Allais, whose fundamental paradox created the initial interest in the author to this sphere of research.

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