PRUDENTIAL ARGUMENTS IN THE REALISM DEBATE

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1. *Introduction*

In this paper I investigate whether the controversy between realists and in-strumentalists can be solved by invoking prudential arguments. In section 2 I clarify what prudential arguments are. Then I discuss the functioning of these arguments in general (section 3) and in the realism debate (section 4). In section 5, I develop a prudential argument in favour of scientific realism. In the last section I evaluate this argument and conclude that though pruden-tial arguments might convince some people to become a realist or anti-realist, their value is limited.

2. *Evidential versus prudential arguments*

2.1. *Arguments*

Arguing can de defined as the activity of creating a free, informed consent. An argument can be defined as follows:

> An argument in favour of a proposition S is a set of sentences
> A that, if uttered by person Y, can bring X from a state of
> doubt between S and ¬S to a state in which X accepts S.

If the intended effect (transition from doubt to belief) is realized in a context, we will say that the argument was *successful* in that context.

2.2. *Evidential arguments*

Suppose that X wants to make up his mind about the proposition "Petersen is a Roman Catholic". Y tells him that:

(1) Petersen is a Swede.
(2) The proportion of Roman Catholics among Swedes is 0.02.

X believes what Y says and concludes to accept that Petersen is not Roman Catholic. In this case, X's belief that Petersen is not Roman Catholic is motivated by an argument, more precisely a *probabilistic syllogism*.

According to our definition, *appeals to authority* can also qualify as arguments. Suppose that Y says to X that Z beliefs that Petersen is Roman Catholic. As a consequence of this utterance, Y starts believing this. Then the sentence "Z believes that Petersen is Roman Catholic" was a successful argument in this context. Appeals to authority work if and only of Y regards Z as an expert concerning the subject matter of S. Formally Z is an expert for Y concerning S if $p_y(S \mid p_z(S)=r)=r$: the probability that Y assigns to S equals r if Y knows that Z assigns probability r to S.

Probabilistic syllogisms and appeals to authority have an important common feature: if they are successful, they work because they bring the probability of S close to 0 or 1, so that we decide to reject or accept S. Arguments that work by changing the probability that is assigned to S, will be called *evidential arguments*.

2.3. *Prudential arguments*

Prudential arguments are defined as follows:

> A prudential argument in favour of a proposition S is an argument in favour of S that, if it is successful, works by convincing X that the consequences of believing S are better than the consequences of believing ¬S, without changing the probability that is X assigns to S.

As an example, we consider Pascal's wager:

	God exists	God does not exist
Believe that God exists	Honest, dull life; eternal happiness.	Honest, dull life; no eternal happiness.
Not believe that God exists	Life full of pleasure; no eternal happiness.	Life full of pleasure: no eternal happiness.

The headings of the rows contain the possible actions, the headings of the columns contain the possible states of the world. The cells of the table contain the possible outcomes. The following desirabilities are attached to the outcomes:

	God exists	God does not exist
Believe that God exists	$+\infty$	-1
Not believe that God exists	0	0

With these desirabilities, the expected utility of believing is greater than the expected utility of not-believing, no matter how improbable the existence of God is:

$$\text{EU(believe)} = [p(\text{God exists}) \times +\infty] + [p(\text{God does not exist} \times \text{-1}] = +\infty$$
$$\text{EU(not-believe)} = [p(\text{God exists}) \times 0] + [p(\text{God does not exist} \times 0] = 0$$

Because the expected utility of believing is higher, Pascal concludes that it is rational to believe in the existence of God.

3. *The functioning of prudential arguments*

3.1. *Introduction*

Whether or not a person will be convinced by a particular prudential argument depends first of all on his/her epistemological attitude. Some people are susceptible to prudential arguments, others have epistemological views that makes them immune to such arguments. This topic will be further discussed in section 3.2. The second factor determining the success of a prudential argument, is its intrinsic quality; in 3.3 I will formulate conditions of adequacy for prudential arguments.

3.2. *Epistemological attitudes and the role of prudential arguments*

Whether or not one is susceptible for prudential arguments, depends on the rules we adopt for accepting and rejecting propositions. A possible rule is:

(B$_1$)   Believe S if and only if P(S)=1.

According to this *verificationist* rule, we should not have any beliefs about the world (including our own body): all we can be absolutely certain about are the presence of sense data and ideas in our mind (we cannot be sure we have a mind, but if we have one, we know for sure what its content is). Therefore, this rule makes no sense. A second, weaker rule is:

(B$_2$)   Believe S if and only if P(S) $\geq$ 0.95.

I call this the *scientific* rule because it describes standard scientific practice: a probability of 0.95 is generally taken as sufficient for accepting a hypothesis, 0.05 as sufficient for rejection. This rule allows beliefs about the world, but leaves no room for prudential arguments: an adherent of the scientific rule will never be convinced by a prudential argument.

The third possible rule is more complex:

(B$_3$)   (1) Believe S if P(S) $\geq$ 0.95.
       (2) Believe ¬S if P(S) $\leq$ 0.05.
       (3) If 0.05 < P(S) < 0.95, believe either S or ¬S.

The choice in case (3) is arbitrary but exclusive (contradictions are not allowed). If we adopt rule (B$_3$), there is no room for prudential arguments: we make arbitrary decisions instead of invoking such arguments. I call (B$_3$) the *English* rule, because it reflects the English conception of law: everything that is not forbidden is allowed. The idea behind (B$_3$) is that we are allowed to believe S unless we have good reasons to reject it. From this point of view, (B$_2$) could also be called the *Prussian* rule: it says that believing S is allowed if and only if we have good reasons for it; this reflects the idea that everything that is not explicitly allowed by law, is forbidden.

Between the Prussian and the English rule stands the *pragmatist* rule:

(B$_4$)   (1) Believe S if P(S) $\geq$ 0.95.
       (2) Believe ¬S if P(S) $\leq$ 0.05.
       (3) If 0.05 < P(S) < 0.95 and the expected utility of believing S is greater than that of believing ¬S, believe S.
       (4) If 0.05 < P(S) < 0.95 and the expected utility of believing ¬S is greater than that of believing S, believe ¬S.
       (5) If 0.05 < P(S) < 0.95 and there are no arguments for assigning a higher expected utility to S or ¬S, believe either S or ¬S.

Application of the clauses 3 and 4 of this rule requires an adequate prudential argument that satisfies the conditions to be spelled out in 3.3. I call (B$_4$) the pragmatist rule because invoking prudential arguments for resolving philosophical debates is the hallmark of pragmatist philosophers. For instance, William James tries to convince us that we have to believe in free will by pointing out that people who believe that our actions are determined will not try to create a better world and will be pessimistic about the future. These undesirable effects can be avoided by believing in free will. James also argues that people who believe in a God that designed the universe are more

optimistic. However, James' God is not as powerful as Pascal's. Richard Rorty describes the situation as follows:

> Pragmatist theists, however, do have to get along without personal immortality, providential intervention, the efficacy of sacraments, the virgin birth, the risen Christ, the covenant with Abraham, the authority of the Koran, and a lot of other things which many theists are loath to do without. (p. 92)

3.3. *Conditions of adequacy for prudential arguments*

Without claiming completeness, I think that we can identify four conditions a prudential argument should satisfy in order to convince people that adopt the pragmatist rule (B_4). Pascal's wager satisfies only two of the requirements, so it is not a good argument.

Pretending to believe is not good enough
A necessary condition for prudential arguments to be convincing is that calculations about expected utilities can influence our beliefs. If I am an atheist in a religious country in which atheism is a capital offense, I will most probably *act as if* I am a believer. So calculations of expected utilities can certainly influence our *actions*. But this is not sufficient: I can pretend to be a believer while remaining an atheist. In Pascal's argument, we can assume that God can read our minds, so he can distinguish real believers from pretenders. Under this condition, the calculations about expected utility may convince people to believe that God exists. In general, a prudential argument will not work unless it is shown why we have to believe instead of merely pretending to believe.

No false dilemmas
Prudential arguments must not be based on false dilemmas. This is the first place where Pascal's argument goes wrong: he does not consider the possibility of believing in Allah or Satan. If Satan rules the world, he may decide that people who believe that God exists go to Hell, while murderers, rapists etc. go to Heaven.

Justification of the causal relations
A third source of concern are the causal relations between actions and outcomes. Pascal presupposes that, if God exists and rules the world, belief is the decisive factor for going to Heaven or not. So he assumes one causal relation and excludes another one (viz. predestination) without any argument. Pascal's argument does not satisfy the third condition either.

Immunity to changes in utility values
In order to convince a considerable number of people, a prudential argument must not depend on specific utility values. Pascal's argument does well in this respect. If a dull life without reward in heaven is given a lower utility than -1, the expected utility of believing remains unchanged, at least if we do not go as far as $-\infty$. So the argument cannot be countered by changing the value in the upper right cell. Neither can be it countered by substituting the zeros in the second row for positive numbers: as long as we do not write $+\infty$ in the second row, the expected utility of believing will be larger than that of not-believing. In the example as we have presented it, it assumed that one is not punished for not believing: the only disadvantage is that we are not rewarded. If one is convinced that there is a punishment, the outcome in the lower left cell becomes *Eternal Burning in Hell*, with utility $-\infty$. This reinforces the argument: the expected utility of not-believing becomes $-\infty$.

4. *Prudential arguments in the realism debate*

4.1. *Introduction*

By a *realist*, I mean an adherent of the following thesis:

(R)   Our current scientific theories provide correct knowledge about the underlying, unobservable structure of the world, more precisely about the entities that exist and about their behaviour.

By an *instrumentalist*, I mean an adherent of the following thesis:

(I)   Our current scientific theories are false: they describe the underlying, unobservable structure of the world in a wrong way. Therefore, they should be considered as mere instruments.

Note that my realist and instrumentalist do not quarrel about the aim of science: both agree that it would be nice if science succeeded in describing the unobservable structure of the world. The instrumentalist thinks that science has failed, the realist that it succeeded.

   Both realists and instrumentalists have developed an evidential argument in favour of their position. These arguments are discussed in 4.2 and 4.3. My conclusion is that they fail: it is not the case that $P(R) \geq 0.95$, nor is it the case that $P(I) \geq 0.95$. In 4.4 we discuss the options this situation leaves us for continuing the realism debate.

4.2. *No miracle arguments*

Realists have tried to convince their opponents by a *no-miracle argument*. The general form of such arguments is:

(NM) (1) If A is true, then B is very probable.
    (2) If A is false, then B is very improbable (a miracle).
    (3) We observe that B.
    _____
    (C) A is true.

The specific argument that realists use, is:

    (1) If R is true, then it is very probable that science is empirically successful.
    (2) If R is false, the empirical success of science is a miracle.
    (3) Science is empirically successful.
    _____
    (C) R is true.

At first sight, no-miracle arguments seem to rest on the implicit assumption that miracles do not happen. This is not the case. No-miracle arguments are applications of Bayes' theorem:

$$z(A \mid B) = \frac{z(A) \times z(B \mid A)}{z(A) \times z(B \mid A) + z(\neg A) \times z(B \mid \neg A)}$$

The first premise of (NM) says that $z(B|A)$ is very high, the second premise says that $z(B| \neg A)$ is very low. If we translate "very high" by 0.95 and "very low" by 0.05, we get:

$$z(A \mid B) = \frac{z(A) \times 0.95}{z(A) \times 0.95 + z(\neg A) \times 0.05}$$

If we assume that $z(A)=z(\neg A)=0.5$, we get

$$z(A \mid B) = \frac{0.5 \times 0.95}{0.5 \times 0.95 + 0.5 \times 0.05}$$

What does this mean? In a situation in which we have no preference *before* we take into account the data B (a priori probability of A and ¬A are equal),

we have to assign probability 0.95 to A (and thus 0.05 to ¬A) *after* we have taken into account B. If the value for $z(B|A)$ is higher or that of $z(B|\ ¬A)$ lower, $z(A|B)$ is even higher. So what a no-miracle arguments comes up to is that we accept A while P(A) is very high but not 1. This is acceptable for everyone, except for verificationists that adhere to rule (B_1).

The Bayesian reformulation shows that no-miracle arguments are sound: if we accept the premises, we must accept the conclusion. The reason why instrumentalists are not convinced by this argument, is that the second premise is not correct. This has been clearly established in Laudan 1981. For instance, Newton's theory of space and time, the phlogiston theory of combustion, and the theory that atoms are indivisible were all widely accepted theories (because they were empirically successful) but are now considered false. So false theories are often successful.

4.3. *The pessimistic meta-induction*

All past theories are proven to be false, so it is highly probable that all present and future theories are false. This line of reasoning is known as the *pessimistic meta-induction*. In support of this argument, anti-realists refer to examples of the kind that defeat the second premise of the no-miracle argument. The pessimistic meta-induction suffers from two serious flaws. First, the sample is rather small: there are not that much scientific theories. Second, there is no reason to assume that the sample is representative: what scientists try to do is to create new theories that differ in one crucial respect (truth) form their predecessors.

4.4. *What now?*

Since the evidential arguments produced by realists and instrumentalists are unconvincing, we are in a situation where P(R)<0.95 and P(I)<0.95. For an adherent of the *Prussian* rule, the conclusion is obvious: the debate is undecidable, and both realists an instrumentalist take an irrational decision; agnosticism is the only rational attitude. An adherent of the English rule will agree that the debate is undecidable, but will maintain that being an instrumentalist or realist is neither rational or irrational.

For an adherent of the pragmatist rule, the debate is not finished: the possibility of prudential arguments in favour of one of the positions must be considered. This is what we will do in sections 5 and 6.

5. *A prudential argument in favour of realism*

5.1. *Being a realist is psychologically beneficial*

A well known but bad prudential argument in favour of realism is that a realistic position is heuristically useful for scientist: realists are more successful than instrumentalists. This argument, which can be found in works of a.o. Feigl, Popper and Feyerabend, can at most lead to the conclusion that scientist (not the rest of the world) must pretend to be realists with respect to the domain in which they are specialized (they can be instrumentalists with respect to all areas that do not relate directly to the research). Because the "heuristic route" to prudential arguments does not work, we will try another one. In the work of Nancy Cartwright and Wesley Salmon, we find an interesting idea that can be used to formulate a prudential argument in favour of realism. According to Cartwright (1983, pp. 87–99), a causal explanation cannot be conclusive for a person X unless X regards the entities that are invoked in the explanation, as real. In Cartwright's view, a causal explanation is a set of sentences in which a causal power is ascribed to at least one observable or theoretical entity. In most causal explanations, several entities and causal powers are described; in this case, the explanation must also clarify how the different causal powers interact (composition of causes). Causal explanations are written down or enunciated in order to bring the reader or listener in an epistemic state in which he understands the explanandum. I call an explanation *conclusive for X* if and only if it brings X in this epistemic state (Cartwright does not use the concept of conclusiveness). Whether a causal explanation is conclusive for X depends on his attitude towards the claims made in the explanation. In Cartwright's view, an important part of this attitude relates to the entities that are used: X has to regard them as real, otherwise the explanation does not have the intended effect. This is true for both observable entities and for theoretical entities.

Cartwright defends her claim by means of several examples. In the first one no theoretical entities are used. Suppose my newly planted lemon tree is sick, the leaves yellowing and dropping of. I explain this by saying that water has accumulated in the base of the planter: the water is the cause of the disease. In this explanation a causal power (sickening the lemon tree) is attributed to an entity (the water). This explanation is conclusive only if we believe that the water is really present: if we drill a hole in the barrel in which the lemon tree lives, and no water flows out, we reject the explanation.

The lesson we can draw from the lemon tree example is that explanations make no sense without the direct implication that the entities to which causal powers are attributed, really exist. This conclusion also holds for explanations that invoke theoretical entities. Claiming that a track in a cloud chamber is caused by a particle does not make sense unless we believe that

this particle exists. The only difference with the lemon tree example is that there is no empirical test (like the drilling of the hole) by means of which the presence of the particle can be proved. Cartwright concludes that, unless we deny that humans have a need for conclusive causal explanations, we cannot be agnostic with respect to theoretical entities.

Salmon goes a step further by claiming that 'any causal mechanism that is invoked for explanatory purposes must be taken as real' (1984, p. 238). Fictitious causal mechanisms have no explanatory import. According to Einstein's theoretical account of Brownian motion, the microscopic particle undergoes many collisions with the molecules of the fluid in which it is suspended. This explanation is conclusive only if we accept that there are such things as molecules. Like Cartwright, Salmon concludes from examples like this that agnosticism regarding the existence of unobservables is incompatible with the view that people need causal explanations. While Cartwright believes in theoretical entities but not in theoretical laws, it is not clear whether Salmon thinks that his ontic approach to explanation allows agnosticism with respect to theoretical laws. He does not explicitly deny this compatibility, and in his example he focuses on the existence of entities, without mentioning theoretical laws. On the other hand, it is natural to assume that "to take a causal mechanism as real" means more than just accepting that the entities referred to in the mechanism really exist. But this would mean that Salmon claims that his conception of causal explanation leads to realism about theoretical laws.

5.2. *Application*

If we use the ideas of Cartwright and Salmon to construct a prudential argument, we get the following outcome matrix:

	R is true	R is false
Accept R	Causal explanations with theoretical entities and properties; most of these explanations are true.	Causal explanations with theoretical entities and properties; most of these explanations are false.
Accept I	Only causal explanations with observable entities and properties.	Only causal explanations with observable entities and properties.

The utilities assigned to the outcomes are:

	R is true	R is false
Accept R	+	+
Accept I	0	0

In section 6.1 we will check whether this argument satisfies the conditions of 3.3.

6. *The restricted value of prudential arguments in favour of realism*

6.1. *Evaluation of the argument*

It is obvious that pretending to believe here is self-deception, so the argument satisfies the first condition. Furthermore, the causal relations are trivial, so the argument also satisfies the third requirement. However, the second requirement (no false dilemmas) causes trouble. Not all theories provide causal explanations. Only theories that describe the microstructure of the world in a visualizable way (which means that the micro-structure is described in spacetime) can provide causal explanations. This means that there is a third option besides accepting R or I: accepting all *visualizable* theories (and only those) as true. If we take this into account, the prudential argument can only lead to a *restricted* form of realism, which leaves out theories like quantummechanics.

Our last criterion (immunity to changes in utility values) creates additional problems. In the above argument, two different outcomes (true and false causal explanations with theoretical entities and properties) are assigned the same utility. Putting a '+' in the upper right cell instead of '-' is of course only justified if no practical or moral conclusions are drawn from the theories. But even if we agree that the effects of theoretical explanations must be restricted to psychological satisfaction, the '+' is not always justified. People who do not like to change their minds (let us call them traditionalist personalities) might be better off if they are instrumentalists: if a theory is falsified, its empirical success does not fade, so we still can believe that the theory is a good instrument.

6.2. *Conclusions*

We can conclude that for some people it is rational (because of a prudential argument) to adopt a restricted form of realism, involving the acceptance of visualizable theories. Since no universal prudential argument was found and the evidential arguments are unconvincing, the position we choose seems

to a be matter of *temperament*. In my opinion, the debate between realists and anti-realists is one of the debates that fits the following description by William James:

> The history of philosophy is to a certain extent that of a certain clash of human temperaments. Undignified as such a treatment may seem to some of my colleagues, I shall have to take account of this clash and explain a good many of the divergences of philosophers by it. Of whatever temperament a philosopher is, he tries when philosophizing to sink the fact of his temperament. Temperament is no conventionally recognized reason, so he urges impersonal reasons only for his conclusions. Yet his temperament really gives him a stronger bias than any of his more strictly objective premises. (1907, p. 11)

Unless someone develops a universally acceptable prudential argument in favour of one of the positions, we should accept that the realism debate is not rationally decidable.

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