As-if models and scientific realism: a response to Moscati

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Abstract

In a recent paper, Moscati provides an analysis of as-if modelling in economics, more precisely in decision theory. According to him, most of decision theoretical models—be it neoclassical, behavioural or heuristic—are as-if, and that should be no worry at all. That observation is then taken to be a reason to move forward a realist understanding of modelling and embrace a form of instrumentalism.

Here, we wish to support Moscati's claim of the positive epistemic value of as-if modelling while keeping a realist interpretation. We show that the core of the instrumentalist critique he provides is based on a misunderstanding of the very mechanism of as-if modelling. We then propose a realist framework in which the variety of modelling strategies, in economics as well as in physics, can be described.

1 Introduction

In a recent paper [Moscati, 2023],

Moscati first distinguishes three classes of models in decision theory: neo-classical, behavioral and heuristic. The major representative of the first class is rational choice theory, or expected utility theory, in which agents are assumed to attach a utility value (a real number) to each outcome of possible risky choices, and to make the choice which maximizes the expected utility. The second class contains attempts to improve neo-classical models by various means, including more complex assumptions about the form of utility function or accounting for biased perceived probabilities of different outcomes by the decision makers. The third class also aims at amending neo-classical models but unlike the two first ones does not assume that agents maximize anything, but only that they make choices among a finite set of possibilities following some heuristic (simple) rules. Behavioral and heuristic models historically developed in reaction to epistemological criticisms addressed to neo-classical models. The most salient is the lack of realisticness of their basic assumptions due to the accumulating amount of evidence that these basic assumptions seem to be systematically violated in decision theory experiments. That is to say, the first class of models was originally criticized for it seems to commit to an instrumentalist philosophical position known as the "as-if" account of

models in economics, mainstream in this field from the seminal work of Milton Friedman Friedman [1953]. Moscati gives the following definition of the as-if account of modeling in decision theory [Moscati, 2023, p. 2]:

> Broadly speaking, as-if models attempt to account for the observable choices that individuals make, but do not pretend to capture the underlying psychological mechanisms that might generate those choices. Some underlying choice-generating mechanism, such as utility maximization, is attached to the model. However, in the as-if approach the decision theorist is agnostic about whether this mechanism actually operates in the mind of the decision maker. She may even deem, and explicitly acknowledge, that the posited mechanism and its components (such as the utility function, the preference relation or the heuristic rules), are only fictional constructs. Nonetheless, the decision theorist explains, describes or predicts the decision maker's choices as if they were generated by the posited psychological mechanism at issue. Insofar as the as-if model is capable of accounting for the decision maker's choice behaviour or indicating ways to effectively control it for economic policy purposes, the model is considered scientifically valid.

The two other classes of models are made to be more acceptable from an epistemological viewpoint for they rest on human behaviour's assumptions which correspond more to what is otherwise observed in experiments.

In his paper, Moscati defends two main positions: 1/ *all* decision theory models, including behavioral and heuristic ones, are as-if models – whatever they claim to be; 2/ there is *no worry* at all with this situation, as long as it is seen within the right antirealist framework. According to him, the latter goes beyond traditional instrumentalism, as explanation is considered a genuine and important aim of science.

Our paper is structured as follows. In Section 2, we first clarify the discussion by distinguishing between "realisticness" of basic assumptions, in the sense of being compatible or coherent with what is otherwise known, and "realism" of theories' contents, in the philosophical sense of scientific realism. We argue that this distinction is relevant precisely because the question of scientific realism takes on its full meaning in the cases we cannot know directly whether these assumptions are true and whether the entities to which they refer actually exist. We then take some examples in physics to argue that requiring realisticness of basic assumptions is too strong and demanding a criterion which is not even reached in physics, contrary to what is sometimes claimed, without a priori impinging on the acceptability or scientificity of physical models. This observation ties in with the more general fictional view of models, presented in section 3. [Décrire en une phrase de quoi il s'agit] This nevertheless raises two important questions: 1/ can we build an epistemological criterion of model selection escaping mere relativism without demanding realisticness of basic assumptions? (epistemological question) 2/ accepting that unrealistic assumptions still play an important cognitive role in scientific inquiry do condemn us to any form of antirealism? (realism-related question). In this paper we address these questions alternatively. In section 4 we develop an epistemological

criterion encompassing the observations previously made. In section 5 we then argue that embracing the fictional view of models does not force us to any form of antirealism. On the contrary, we build a realist framework compatible with a fictional view of models. Moreover, we show that the answers we provide to both the epistemological and the realism-related questions actually strengthen each other.

2 What does it mean to have "realistic" assumptions?

2.1 Assumptions' realisticness and theories' realism

Basic assumptions of decision theory models are thus often criticized for their lack of realism, which is seen as a fundamental epistemological drawback. Yet, there are two different - although related - philosophical discussions at play here, which are sometimes confused and that we would like to distinguish. Indeed, when scholars talk about the "realisticness" of basic assumptions in such models, they often mean their *consistency* with what is otherwise known – about human behavior, for instance. Consistency of basic assumptions with what is otherwise known is an epistemological demand – that is, a criterion of acceptability or justification of a good scientific model. However, this "realisticness" of hypotheses should not be strictly confused with "realism" in the sense of *scientific realism*. As Moscati points out in his paper, the latter is a philosophical framework of interpretation of the content of scientific theories, in their ontological, semantic or epistemic aspects, and in relation to their empirical success.

Discussions about scientific realism are particularly focused on hypotheses bearing on entities which are *not* observable but still play an important role, e.g. in the explanation of the phenomenon studied. The distinction between realisticness and realism is thus quite relevant in this case. Indeed, it is precisely because we cannot know directly whether these hypotheses are true (and whether the entities to which they refer actually exist) that the question of realism (semantic and epistemic in particular) takes on its full meaning. Moreover, in the case these assumptions can be assessed and are shown to be false, or more precisely inconsistent with some background knowledge, this distinction allows to ask the question of how knowingly false assumptions can still play an important cognitive role in scientific inquiry. This question is actually relevant because in a lot of cases, models which are fully acknowledged as being of high reliability and scientificity, e.g. in physics, do rest on such not-only-idealized-but-false assumptions. The purpose of the next section is precisely to argue that the comparison with these physics' examples suggests that realisticness does not seem to be a necessary criterion of acceptability.

2.2 Coherence of basic assumptions is not a necessary epistemological criterion

Lack of realisticness of basic assumptions in theoretical models in physics has at least three dimensions that we would like to highlight here: 1/ some basic assumptions are not testable independently of the very theoretical framework within they are used; 2/ when they are, sometimes they are still used as good hypotheses even if they are knowingly

otherwise refuted; 3/ fundamental theoretical frameworks enjoy pluralistic and ontologically incompatible formulations. This observation then suggests that this is not a strong epistemological limitation, and thus that strict realisticness of basic assumptions cannot be a relevant criterion for the acceptability of models. This observation ties in with the more general fictional view of models, presented in the next section 3.

3 As-if modelling and reference

3.1 Models are fictions, and that's no worry at all

The central tension at play may be called the *modelling conundrum* and can be stated as follows:

Definition 1 (Modelling Conundrum (MC))**.** Scientific models play a central role in representing and explaining, and yet they feature idealisations and deliberate falsities.

MC if often taken as a basis of a critique of truth-oriented positions in various sectors of epistemology and philosophy of science. An obvious example is *naïve scientific realism*: if an empirically adequate and predictively powerful model is interpreted as a faithful description of a phenomenon, then how is it possible to account for its idealised characteristics?

There is therefore a close relationship between the emphasis placed on the "as-if" nature of models and antirealist or even instrumentalist conceptions of science. Idealisations, simplifications, abstractions or even the introduction of purely fictional entities or mechanisms, possess obvious epistemic virtues (citer des trucs sur les vertus de l'idéalisation, khalifa etc.): simplicity, computability, etc.

As we showed earlier, the conundrum has less to do with the realisticness of the model's basic assumptions than with the interpretation of its empirical and predictive power. Even in physics, models feature this kind of false, or incompatible with background knowledge, assumptions.[1]

If Moscati's first assumption about "as-ifness" of models is inaccurate, we can still make sense of the core of his argument: the as-if nature of modelling is problematic for truth-oriented conceptions of scientific succes.

The problem can now be framed in more specific terms: is it possible to accept Moscati's second claim, namely that as-ifness is not problematic, while resisting antirealist or instrumentalist tendencies? We think the response is positive and the remainder of this paper is intended to defend this claim.

MC is particularly noticeable when adopting the so-called "fiction-view of models". In this perspective, models are conceives as props in a game of make-believe: an agent using a model of some target system, be it physical, social or economical, is engaging in a game of make-believe by accepting a set of hypotheses for the sake of manipulating

[1]For example, the billiard ball model of gases describes entities that simply cannot exist in a quantum universe.

the model, i.e. deriving new fictional propositions (propositions true inside the fiction) from known ones.

This framework is interesting because it makes clear the distinction between what is true inside the model and what is possibly true outside, i.e. in what the model portrays. Engaging in a game of make-believe involves accepting some knowingly false assumptions only for the sake of the game: no ontological weight is attached to them.

That explains the coexistence of incompatible hypotheses or models, as in the case of semi-classical models in physics. A physicist manipulating the billiard ball model in order to work out the temperature or pressur of a perfect gas using the well-known equation $PV = nRT$ is not committed to the claim that molecules bounce off each other.

Therefore, we see that the critique of economical as-if models as faithful representations of target systems and mechanisms rely on a inaccurate understanding of the status of idealisations and knowingly false assumptions in modelling. The latter have epistemic virtues and explanatory power (see Section **??** hereunder for a further discussion of the explanatory power of fictional models), but they do not reduce the models as predictive tools. (faut avoir dit avant qu'il existe un moyen de justifier ces modèles as-if. Putain, Antoine, tu structures aux fraises, là)

Regarding as-if modelling, and keeping in mind the content of MC, we can now better understand Moscati's proposal of being agnostic about "whether this mechanism actually operates in the mind of the decision maker". [Moscati, 2023, p. 2]

This attitude is exactly what the make-believe view of modelling puts forward: an agent might want to use the assumption that such and such mechanism operates in the mind of the decision maker while not believing id does, just as a reader might engage in a novel without believing a school of magic does exist. All the reasons we have to believe that these assumptions are not realistic (because they are not compatible with what is known of human psychology, for example) do not change anything to the kind of game the modeller is playing when using the model. Trying to save the realisticness of these hypotheses by assuming they are not conscious in the mind of the decision maker simply shifts the problem. As Moscati puts himself about these model-mechanisms: " it is more appropriate to acknowledge that they take place in the conscious mind of the decision theorist." [Moscati, 2023, p. 12]

3.2 Fictions, reference and justification

As we have seen, the realist challenge is not about interpreting psychologically the functions that appear in the economical models. With this regard, they are perfectly acceptable as they are: fictional statements true only in the model.

The realist challenge rather concerns the possibility of establishing independent means of justification of the model. To understand the very nature of the problem, let us take a closer look at Moscati's flavour of antirealism. As he defines it [Moscati, 2023, pp. 18-20], following the three-fold definition of [Psillos, 1999], he:

- Accepts the metaphysical thesis according to which there is a mind-independent reality which is the object of scientific inquiry

- Accepts the semantic thesis about observable, but remains sceptical about unobservable (expliquer ce que ça veut dire plus en détail parce que je pense qu'on a un point de désaccord là-dessus. Faut qu'on en parle)
- Accepts the epistemological thesis about observables, models are true descriptions of the observable, while being sceptical about unobservable entities and mechanism that produce the observed behaviour.

4 "Unrealistic" assumptions as substrates of modeling and classification principles

5 As-if modeling, justification and realism

6 Realism and explanation veritism

7 Conclusion

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