

A review of Donald MacKenzie, *An Engine, Not a Camera. How Financial Models Shape the Markets*, Cambridge (Mass.), MIT Press, 2006, 377 pp.

When Milton Friedman presented economic theories as *engines* for the analysis of concrete markets, he probably had in mind more what he was denying (the epistemological relevance of descriptive realism) than the many implications that can be drawn from such a metaphor. It certainly captured the instrumentalist core of Friedman's own methodological stance: theories are *tools* to obtain predictions and, like any other instrument, they can be assessed in terms of their successful performance – i.e., predictive accuracy. Yet, STS scholars have argued for long that the intellectual charm of tools lies in the many uses they can be put to. For instance, why should economists restrain themselves to predict the course of markets, if they could use their theories as *engines* to build them? It is thus for a good reason that Donald MacKenzie's latest book appears in the *Inside technology* collection of the MIT Press, where three other essays by him already feature (on nuclear missile guidance, technical change and mechanized mathematical proof). MacKenzie is indeed one of the finest sociologists of science of our time and shows it by making us rethink the methodological status of many economic models in the light of his analysis of the *performativity* of finance theory.

To use again a Friedmanian distinction, methodologists have so far focused mostly on positive theories, as opposed to normative ones. Expected utility theory (EUT), for instance, can be used to positively predict how economic agents will decide among uncertain prospects. But we can also use it as a *rule* to make our own decisions, thinking it *wise*. In this latter case, EUT will certainly deliver successful predictions but of not much methodological interest. Economists care about general patterns of market decision-making, not about particular individuals who choose to behave in accordance to their theories. But what if everyone in a given market chooses to do so?

Between 1976 and 1987, the Black-Scholes-Merton (BSM) option-pricing model proved to be an excellent fit to market prices –in the words of Stephen Ross «the most successful theory not only in finance, but in all of economics» (cited in p. 177). Yet, there were many option markets in which the traders carried with them sheets displaying arrays of Black-Scholes prices for the stock under exchange to assess their opportunities for arbitrage. These sheets were sold, among others, by Fischer Black himself. It seems thus as if we needed something more than the usual instrumentalism vs. realism dichotomy to account for the success of the underlying theory. What MacKenzie puts forward here is a sociological concept of philosophical ascent: *performativity*. It is aimed at capturing the role played by economics when it becomes «an intrinsic part of economic processes» (p. 16); i.e., an *engine*, rather than a camera portraying them. According to MacKenzie, economics can be performative at three levels (pp. 16-19). There is, first, *generic performativity*, when some of its elements are used by the participants in the process. *Effective performativity* occurs when as a result of that use, something happens in the economic process. Finally, *Barnesian performativity* refers to those instances in which «practical use of an aspect of economics makes economic processes more like their depiction in economics» (p. 17). If the opposite happens, we will talk instead of *counterperformativity*. These set of concepts serves thus to analyse the various degrees in which financial markets are socially constructed through economic theories. But rather than taking this construction for granted, the purpose of MacKenzie's book is to verify whether it actually took place in certain markets. Moreover, the reader is warned that observation alone will not reveal it (p. 18) and its very existence is disputable as such: the ultimate evidence is provided

by the prices finance theory is about and these are elaborated in various degrees, not allowing for a direct comparison to the theory (pp. 23-24).

In this respect MacKenzie is very cautious: Barnesian performativity is only affirmed regarding the effects of the BSM model, namely as it was used in the Chicago Board Options Exchange (and analogue markets) in the period mentioned above. The statement is qualified as a *plausible conjecture*, since «the available evidence does not permit certainty» (p. 165). Yet, the amount of evidence gathered by the author is certainly impressive. The first four chapters after the introduction constitute, in a way, a preamble for the analysis of this case of stronger performativity. Chapter 2 provides a concise discussion of how finance theory was incorporated into mainstream economics in the 1950s and 1960s. Chapter 3 explores the sociology of this emerging profession, showing how their approaches diverged from the theoretical culture of traders. Despite their initial reluctance, the crisis of the stock markets in the 1970s favoured the adoption of the Capital Asset Pricing Model (CAPM), first as an external check of investment performance, and then to develop index funds. Once the CAPM became standard both in academia and the markets, several anomalies were observed. As chapter 4 shows, some of these were namely methodological (the empirical specification of the *market portfolio*); many other were empirical and more or less persistent (the *small firm effect*, etc.). Yet, most of them constituted opportunities for arbitrage and their elimination, unlike other Kuhnian anomalies, could deliver gains or losses: at this stage, there were many academics simultaneously involved in the development of the model and in its practical exploitation. In this context, MacKenzie discusses the statistical analysis of price distributions advocated by Mandelbrot in the 1960s, when the Gaussian assumptions incorporated in the CAPM were questioned. Mandelbrot showed that the distribution of prices was difficult to handle with conventional statistical tools (namely those that depend on a finite variance). Though MacKenzie does not take sides between these two concurrent paradigms, it seems as if Mandelbrot's approach made explicit the practical urgencies associated to the development of financial models: an alternative theory that could not deliver ready-to-use theoretical or investment tools was not *welcome* by the profession at that point.

In chapter 5, MacKenzie presents the origins and articulation of the BSM option pricing model, whose performative effects are studied in chapter 6. The former is mainly focused on the mathematical tinkering that yielded an equation featuring the prices of stocks and options as well as time in a way that allowed the user to hedge her portfolio against any arbitrage. In the latter, it is shown how under the guidance of Leo Melamed a market for derivatives was created in Chicago. Here we have political tinkering supported again by academics (Milton Friedman, no less) and a trading floor culture in favour of a project, whose ultimate intellectual legitimation came from the BSM. Their model allowed to differentiate it from gambling and make it legally viable. It worked and not only for the regulators, but for the traders themselves, who saw their market practices transformed in accordance to the model: they talked about options using its vocabulary and justified their decisions concordantly; software implementing it was used at various levels to calculate prices; new financial products were created, etc. For MacKenzie, this would be a case of Barnesian performativity: «The “practice” that the BSM model sustained helped to create a reality in which the model was indeed “substantially confirmed”.» (p. 166)

Yet, it seems as if performativity had its own dialectics: after the performative rise of a BSM world in the stock markets, the two following chapters tell us its fall. The seventh one addresses the October 1987 crash as a possible instance of counterperformativity,

after which the BSM model fit with the actual prices became again poor, as it had between its creation and 1976. The eighth one tries to explain the social mechanisms underlying the bankruptcy of the hedge fund Long Term Capital Management in 1998. In both chapters, MacKenzie illustrates how the use of BSM-related models by a particular set of traders sparked reactions in their fellows that prevented its proper functioning and led to their replacement.

The ninth and final chapter surveys the central topics of the book. One we have not mentioned so far is the application of the concept of *epistemic culture* to economics, in which economic methodology plays quite a prominent role. Hypotheses such as the irrelevance of capital structure or the efficiency of the markets were equally dismissed as *irrealist* by economists and practitioners alike. Against these, Friedman's instrumentalist stance was often invoked to justify the acceptability of the CAPM or the BSM. Assuming the independence of academic research was no less crucial ingredient in this culture: even if «the majority of the finance theorists discussed in this book» became involved in business, their main goal in developing the model was intellectual. Their practical success (or that achieved by traders without theoretical foundations) never counted much for them. Yet, as the Mandelbrotian challenge showed, analytical tractability was a methodological commitment that turned out to be decisive when it came to practical implementation. I would have liked to read more about the various degrees in independence that apparently coexisted among finance theorists.

It is interesting to note here how MacKenzie reconstructs their epistemic culture through an extensive series of interviews (with 67 theorists and practitioners). Though several archives were punctually visited, oral history allows the author to come very close to the intentions of the *performers*. The use of an engine is necessarily *intentional* and the quotes that appear in the book show very precisely the traders' beliefs and desires about financial models. Indeed, in my opinion, much of the plausibility of MacKenzie's conjecture about Barnesian performativity it is gained here. It also constitutes a nice example of the kind of *conversation* that MacKenzie, in a McCloskeyan spirit, intends to promote (p. 25): the interviews show financial models and markets in the making, in a way that makes them easier to understand and discuss in terms of the sort of world that we would want «to see performed». Yet, in this respect, the reader is equally indebted to MacKenzie's own literary style that, together with the glossary and the collection of appendixes explaining the models under discussion make the book a very accessible reading. If the *Social Studies of Finance* are pursued along these lines, we certainly may expect the best from this conversation.

To contribute to it, let me just add a few critical remarks. One is regarding the explanation of the success of the financial engines here discussed. MacKenzie is very clear as to the performative limitations of authority: he denies that «any arbitrary formula for option prices, if proposed by sufficiently authoritative people, could have “made itself true” by being adopted. » (p. 20). Yet, I cannot help wondering what the precise contribution of the BSM formula to the performative success of its adoption was. The usual methodological response is not very promising, since its predictive accuracy or purported realism were, in this framework, more a result of adopting it than intrinsic epistemic properties of the model. The author's own answer as to «Why BSM?» (pp. 162-64) relies on a combination of academic authority, simplicity to grasp by the practitioner and public availability. But, since we are talking about an engine, shouldn't it capture some sort of causal mechanism in the market? MacKenzie certainly assumes that technology is socially dependent in many different ways, but not to the point of making it causally inert. Some *material efficacy* should be thus granted to

economic theories. However, for many, these are not still *cold as facts*, to use Latour's terms, but still *warm* under discussion: as of yet, we cannot take the markets, in general, to be the cause of any accurate description of themselves. Given that the combination of explanatory factors considered by MacKenzie is also present in other markets, what is so particular about the financial marketplace that made the BSM engine performative? This remains an open question.

A second remark is about the perspective assumed in the analysis. In my view, MacKenzie's account points out more to *rules* than to technology. It seems as if the adoption of the BSM as a benchmark to calculate prices in stock markets was due to a sort of *imitative* process propelled by *normative* concerns. As Friedman and Savage once put it in respect of expected utility theory, the success of any particular decision model depended not only on its empirical verification, but «on its acceptability to individuals who are particularly concerned with such decision, as a rule guiding "wise" behaviour in the face of uncertainty». Apparently, the traders in Chicago were eager to build their decision rules upon BSM models, considering it wiser than their own pre-theoretical criteria –whose authority, as MacKenzie illustrates, had been empirically undermined by their practical failure in the 1970s. Since the normative force under these rules is purely consequentialist (i.e., depends only on the attainment of one's purported goals), their performativity is necessary to adopt them: if their use did not make economic processes more like their depiction in economics, they would be ineffective and therefore ungrounded as rules. Yet, unlike engines, the effectivity of rules can be often transient. It seems possible to experiment in the coordination of agents who coincide in adopting similar decision criteria and see what their performative effect on prices is (until they opt for something different).

MacKenzie's book shows that performativity is a formidable *conceptual engine* for the analysis of concrete markets. Let us take as much advantage of it as we can.

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