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# **The financial *Logos*: the framing of financial decision-making by mathematical modelling**

## Abstract

This paper introduces the notion of “financial *Logos*”, defined as a structuring discourse embedded in management tools and beliefs of financial practices. I hypothesize that this discourse contains a specific representation of risk mathematically modelled by probability measures. Next I use a performativity based approach to describe the concrete action of the financial *Logos* on financial practices: the framing of financial decision-making by mathematical modelling. I argue that it is not possible to think of a given financial practice without epistemologically and sociologically thinking of the contribution of the mathematical modelling to this practice. I conclude with consequences for ethics of finance: extending ethics of action to epistemic ethics, I suggest that, in finance, any preference in mathematical modelling is also a preference in ethics.

Keywords: performativity, mathematisation, mathematical modelling, financialisation, ethics, finance

JEL Classification: A1, B4, C4, G1

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## 1. Introduction

Most analyses of the 2008 financial crisis have focused on the responsibilities of the actors. The report of the Financial Crisis Inquiry Commission (FCIC) appointed by the United States government with the goal of investigating the causes of the financial crisis takes a similar approach. Although it states that there was “a systemic breakdown in accountability and ethics” (p. xxii), it started with the phrase: “The crisis was the result of human action and inaction, not of Mother Nature or computer models gone haywire” (p. xvii). Besides the fact that the notion of a model is reduced here to its sole computing aspects, this sentence completely ignores a phenomenon which is nevertheless easy to understand: financial management and therefore human action are equipped with technical and mental tools (beliefs). Even if the FCIC analysis stresses human choice – perverted by greed, or power (management boils down to competition between men) – the fact remains that those who decide, those who have power, those who command are equipped with technical and mental tools whose linkages are assumed to be rational (Chiapello and Gilbert, 2009). The relationship between effective management, management tools and the beliefs of managers that use them has been described as a management technology (Gilbert, 1998). Many studies have shown that there is a real influence of management technology on behaviour and the principles of organizational standardization (Berrebi-Hoffmann and Boussard, 2005). To say it differently, these various tools shape professional behaviour.

It is therefore important to investigate how the human actions are equipped with beliefs and tools. For example, are such technical or mental tools made up of: job structures, performance evaluation systems, compensation rules, methods of performance evaluation, calendars, timelines etc.? One of the crucial beliefs is the representation of *risk*. It has been shown that modern finance should be treated as a branch of industry devoted to risk modelling issues (Armatte, 2009), that is an activity which simultaneously implements ideas, theories, models, mechanisms and institutions. The actors’ decision-making equipment in this area is constituted in particular of representations of risk. Vigilance concerning the components of the equipment of this very specific belief is therefore necessary in the case of financial supervision. For example, the Chinese mathematician David Li developed a formula called Gaussian copula function, which was adopted by everybody from bond investors and Wall Street banks to ratings agencies and regulators. It was based on the concept of probability, which here acts as a strong belief concerning the nature of financial uncertainty. The Li’s formula was accused to “kill Wall Street” (Salmon, 2009) because of a wrong belief about uncertainty.

In this paper, I present and stress the importance of the inclusion of these technical and mental tools of representing risk within the area of vigilance to be implemented in the ethics of finance. I introduce the notion of “financial *Logos*” and next I use the notion of performativity of the financial *Logos* to enter the issue of ethics of finance. Section 1 presents the notion of financial *Logos*. Section 2 gives insights of performativity applied to mathematical finance in the way mathematical finance tools shape professional finance and in this sense constitute an “invisible technology” (Berry, 1983), which is all the more dangerous as it is ignored

Section 3 suggests some consequences for ethics of finance by introducing the idea of Archimedean point: epistemology of mathematical modelling.

## **2. Financial theory and financial practices: the “financial *Logos*” at work**

### **2.1 The financial *Logos* and the risk representations**

Technical and mental tools fix the formats of action, and create a unity of action among groups which sometimes have conflicting interests: they produce a sort of organized action (Chiapello and Gilbert, 2013). It is certainly a unified vision of the company, presented as an organization oriented to a clearly defined purpose. This is a sociological perspective that removes all conflicts and any lack of coordination between different departments, as well as internal power issues. It can therefore be regarded as not being especially realistic (Cyert and March, 1963). However, regardless of specific situations or internal conflicts, management tools are responsible for things which remain unified and finalized in a company. The strategy of a company is marked by a system of management and information (e.g., integrated Enterprise Resource Planning or ERP). On a daily basis it creates management actions and decisions embodying a management philosophy in technical measures (Hatchuel and Weil, 1992). Persons responsible for management can thus be considered as “servants of a rational rule” (Boussard, 2005). From this point of view, companies are part of the historical trend to the rationalization of modernity described by Max Weber (1905), in the sense that the “manager project” is rational and technical.

The three dimensions of the “manager project” – control, performance and rationality – have been tied together and called the “manager *Logos*” (Boussard, 2008), that is to say, both an organizing principle of professional practice and a discourse supporting these practices. The intention of rationality by the “manager *Logos*” has been accentuated in financial industry, an industry characterized by an exacerbation of computational rationality which promotes the automation of decision-making: transaction programs in high-frequency trading being the latest illustration of this project. I extend the notion of “manager *Logos*” to the financial industry and I introduce the term “financial *Logos*”. The financial *Logos* is a structuring discourse which is incorporated into the financial management arrangements of banks, insurance companies, and asset management companies and into the practices of monitoring and controlling financial activities. This discourse is composed of three kinds of productions: written (such as the formalization of rules for investment or risk dispersion), oral (e.g., the discourse on what should be the proper financial management of a pension fund or an investment bank) and technical (e.g., the methods of calculation of risk for equity). This discourse engrains financial metrics and reasonings in places where finance was not existent and, in this sense, the financial *Logos* is a vector of “financialisation” (Epstein, 2005) in the Chiapello’s approach: a colonisation by specific financialised techniques and calculation methods (Chiapello, 2015). This discourse concerns in particular representations of risk, a specific culture monitored by the epistemic authorities of financial regulation (Lebaron, 2009; Vanel, 2010), that is to say a sharing of mandatory knowledge.

The choice of randomness embedded in the financial *Logos* stems from a school of thought on risk, based on setting simplistic probabilistic measures in situations of uncertainty. It has had

the effect of contracting time to the most immediate short-term (profitability, solvency) and contaminating prudential and accounting standards in a hegemonic way (see Luchtenberg and Vu (2015) for a recent account on the notion of contagion). Despite the 2008 financial crisis, the financial *Logos* continues to “talk” and continues to influence the ideas at work in attempts to overhaul the economic system. To understand how the financial logos structures professional activities (financial *praxis*) requires understanding how it is incorporated into the systems and tools for managing professional finance.

## **2.2 The financial Logos and the invisible technology**

Management technology has two main functions (Berry, 1983). On the one hand, the reduction of complexity: to respond to the complexity of the situations and the need for action, professionals rely on “abstracts of truth” and “abstracts of good” (in the form of statements that become vernacular thought such as “the expected return on equity is 15 %”), shortcuts that save time, “simple ideas” (Lordon, 2000). On the other hand, the introduction of automatic behaviour: for dealing with most urgent issues and optimizing the judgments of them, professionals rely on organizational routines. These are routines that lead them to make choices beyond their control, or even consciousness.

In the common understanding of management technology, tools are traditionally apprehended only through their technical dimension, confined in a world of pure rationality. Technical and mental tools are seen as neutral, as the means of transmitting objectives and decisions taken at the top, down through the hierarchy. Management tools are a kind of transmission belt of senior executives’ wishes without defects, as a means to safely applying what their users want. According to this understanding of the action of senior executives and management tools, the manager is seen as an engineer of the economy who must choose the right tools corresponding to the problems needed to be solved. The management team is viewed as the crew of a ship that is steered using the best navigation procedures to move forward in the right direction. Management tools are perceived as loyal servants at the hands of their directors’ wishes: “let’s decide correctly, and stewardship will follow”. The economic laws of the market include various constraints which may extend to the non-financial sphere (the environment, social issues, ethical considerations etc.). These constraints may be met by appropriate tools implemented by people who make management decisions. In this mechanistic view of the financial world, management sciences are to decision-makers what ballistics is to gunners (Berry, 1996): effective methods for achieving a specific goal by calculating the best path. The intended effect (as in ballistics) is obtained if the choice of the tool and its use are correct. This is why the U.S. report underlines the aspirations and responsibilities of leaders: as soon as financial management tools are seen as neutral, then only desire corrupted by avarice and greed can explain the collapse of the financial system.

The danger in such a technical approach to management approach is that it does not see how this technology guides players in a direction they do not necessarily want to take. It does not see the financial *Logos* in the technical tools. Several reasons have been advanced to explain this blindness (Berry, 1983). First, the idea that decision follows mechanically from the effects of the instruments set up by humans – a direction that was not originally intended and

according to a logic that can escape them – seems to be an interference with the exercise of free will and can hurt feelings of human dignity. Second, the mechanism of decision dehiscence (or opening up and implementing decisions) by routines emanating from the technical tools is not visible to those executing decisions or to decision-makers. Neither group perceives the hidden determinism of the management tools, nor do they seek to challenge them: the former because they accommodate themselves all the better to such tools which give them areas of freedom (especially as the more simplistic a management tool is, the greater the flexibility left to the user), and second because it is not in their field of strategic concern. They are occupied by other issues, or lack time to think about it what such tools do (“it is a matter for technicians; see it with the experts”). Finally, the theoretical knowledge necessary for the practice of management usually ignores questions about the impact of the tools on the functioning of organizations. A framework of thinking is created for senior executives in which the inertia of management devices is denied. This is a mechanistic approach which corresponds to an epistemological position dating from the nineteenth century (Hatchuel, 2010).

This technology is particularly dangerous because it is invisible and as its effects are “all the more formidable when left to play in the shade” (Berry, 1983, p. 4). It is therefore of primary importance to the understanding of the framing of financial decision-making to drop the mechanistic view of the 19<sup>th</sup> century and to understand that not only does stewardship not follow management decisions, but that in some cases it even betrays them. Analyses of the crisis based purely on considerations of good conduct and which offer explanations based on arguments of irrationality or greed that corrupt actor’s decisions are incomplete. They overlook the impact of technical and mental tools of risk representation (taken from financial theory) which are used in decision-making. This is the intellectual or material equipment that promotes disastrous decisions or prevents the right decisions from being taken, due to a formatting of cognitive judgment categories. For example, if one considers that the likely loss of a market position is in the order of 100, while another calculation would show a more reasonable order of magnitude of 500, then the representation of the world using tools with the 100 loss does not encourage the financial institution to be prudent in taking risk. Indeed, in the case where an envelope of the equity is invested, it may lead to additional arguments to increase exposure further: the behaviour is seen as safe because it remains within possible limits (Walter, 2009). This 1 to 5 gap is exactly the difference in the level of actual and calculated risk for “subprime” mortgages. These had been undervalued by this order of magnitude using a simplistic representation of default risks, calculated in the models of the credit rating agencies (Le Courtois and Quittard-Pinon, 2006). This dangerousness is one the main reasons why “incompetence is worse than greed” (De Bruin, 2015).

To summarize, management tools conveying a representation of risk have an impact which is: organizational (control procedures), institutional (international regulatory standards), technical (evaluation methods), and cognitive (ways of thinking about uncertainty and so to prepare for it).

### **2.3 The performativity of the financial Logos sentences**

To characterize the action of financial *Logos*, how actors are swept along by technical and mental equipment, it is possible to speak of a “theory effect” (Bourdieu, 1982). This notion describes the particular phenomenon in which a theory becomes a social force as soon as it changes professional practices.

But today, more generally, the notions of performativity and performance are used. These words stem from the old French word “parformer”, meaning to put into format, and refer to the shaping of professional practices by theories underpinning them. The potential of a theory to shape practices, material and concrete devices is called the performativity of theory, while performance refers to the effective shaping action. So, one methodological starting point is the concept of performativity. We now examine this point.

### **3. Moving away from the positivistic view of mathematical models: the performativity of mathematical finance**

Various definitions of performativity have been proffered. Following Muniesa (2014), one defines four different significations to the word “performativity”, which can be sorted in four groups of ideas: a postmodern type of applied knowledge, a scientific idiom describing the institutive capacities of science, a theatrical understanding of representations, the practical efficacy of signs. For each definition, one provides an example of its application in the financial field.

#### **3.1 The postmodern view: mathematical finance as an act of writing**

Ideas in the first group emphasize how the production of knowledge affects the characteristics of knowledge. This first signification comes from the pioneering work of Jean-François Lyotard in his 1979 report for the Department of Higher education of Québec, next published in his book: *The postmodern condition* (Lyotard, 1979, 1984). Lyotard noted that the postmodern knowledge is a performative knowledge. For Lyotard, performativity describes the best ratio between input and output that means logic of optimization. This logic becomes the main criterion for the legitimization of scientific research in a postmodern culture. The engineer-led French tradition on managerial tools (Moison, 1997; Segrestin, 2004) belongs to this first approach of performativity.

Lyotard refers to the philosophy of language and the theory of speech acts, acts called “performative utterances” (Austin, 1962). Unlike statements of observation (“it is beautiful”), of description (“this house has three floors”), of prescription (“you must leave the eggs three minutes in boiling water for them to become hard”) and of normativity (“you must follow the rule of the written investment policy in the Fund”), the performative utterances produce an effect on the social world. They build social phenomena (“I now declare you husband and wife”). A word here produces a social effect and “performativity” means achievement of tasks and operations. In this sense, finance is an “act of writing”. For instance, writing an option or a derivative product is to bring it into existence. To write an option is to create an option.

This is precisely the logic of the Ayache (2010)'s "Blank swan": nothing like a derivative "exists in reality" if not provoked by an act of writing. There is nothing like "states of the world" or Taleb's "black swans". The so-called black swans are only blanks which have to be filled by acts of writing. Using the notion of *Logos*, I suggest that the only thing that "exists" in finance is the financial *Logos*: paraphrasing the Psalm 32, I say that the financial *Logos* "speaks" and what it says happens.

### **3.2 The machinery: financial world provoked by mathematical finance**

The second signification of "performativity" arose from the pioneering introduction of Michel Callon in his 1998 collection of essays: *The laws of the markets* (Callon, 1998). This idea comes from science and technology studies, in which performativity indicates the institutive capacities of scientific or technical knowledge, i.e. the ability of these knowledge to bring "realities" into existence. It is one of the reasons which led a former sociologist of science, Donald MacKenzie, to efficiently move to the analysis of financial markets (MacKenzie, 2006). Pickering (1995) suggested that, in the social studies of science, what he called a "performative idiom" replaced a "representational idiom": the move to an understanding of science as an attempt to represent nature to an understanding of science as a mechanism creating "reality". The so-called "observations" are nothing but chains of mediation and human choices. For example, a chart of market path is the result of several steps of successive precise choices related to the relevant variables, the time scale, the length duration etc. Walter (2013, Ch. 1) gives an in-depth example of this way of bringing "reality" into existence.

In this case, the mathematical models used in a lot of financial mathematics work as machines, as "an engine, not a camera" (MacKenzie, 2006) in the precise proposition that "financial models shape markets". The social construction of contemporary financial markets by mathematical finance has been evidenced in several works (MacKenzie, 2003; MacKenzie and Millo, 2003). In this sense, "financial reality" or "risk" don't stand there, placidly, but are provoked in the laboratory (universities) or the research departments (banks or financial institutions). The scientific fact stands "objectively" in the sense that they emerge from a social process. Here, "constructivism" means "realism". This is emphasized by Desrosières (2009) who said that statistics are simultaneously real and conventional.

Three examples of this "provoked financial world" by the financial *Logos* can be given in the asset management industry. A portfolio manager who uses a computer routine for calculating the efficiency frontier to obtain the optimal composition of securities according to a risk/return standard mobilizes Markowitz's theory for determining the weight to assign to each security with proper diversification (see however Chen and Lai (2015) for a recent account on the underdiversification phenomenon). A manager of a pension fund presenting reporting activity to members of its Board, using the risk premium/volatility ratio, brings Sharpe's theory to non-specialists. A financial, actuarial consulting firm which prepares the bids for the management of its assets/liabilities by demanding performance criteria relative to a benchmark favours index management (Montagne, 2006). These three examples show how a theory can be mobilized, not in a doctrinaire way, but through the use of the management tools it draws on. To emphasize this point and to distinguish it from the intuitive view that



“ideas rule the world”, Boussard (2008) talks about “device management” and Callon and Muniesa (2005) and Muniesa, Millo, Callon (2007) say “socio-technical agencement”. Both of these expressions signify the incorporation of ideas into material management systems, so that users do not have to know the theory to apply it properly.

### **3.3 The enactment: theatrical effects of mathematical finance**

The third signification of “performativity” relates to the idea of enactment, a theatrical understanding of the effects of the models. For example, when one talks about the performance of a fund manager, it is possible to understand the word “performance” in two ways: firstly, the performance measurement of the manager, using some specific techniques such as Sharpe ratio, searching for the detection of what is due to skill and what is due to luck; secondly a theatrical representation of the fund manager who performs (plays) his professionalism by using the tools described in the model of performance measurement. By performing his talent, the fund manager brings into existence the (for example) Sharpe ratio. Previously I said that to write an option is to create an option. Here I say that to write an option is to write a role.

Professional players are driven by technical mathematical tools whose conceptual foundations they no longer perceive, like Monsieur Jourdain in Beaumarchais’ *The Marriage of Figaro*, who speaks prose without even being aware of it. Furthermore, the players especially do not know what prose they speak. When this prose was related to the representations of risk, and these representations were simplified to the extreme by using Gaussian distribution in the Li’s Copula or Brownian motions in the insurance portfolio techniques, it led to the financial meltdowns of 1987 or 2007-2008. For example, the importance of the Brownian representation of risk in the 2008 crisis has been questioned in Walter (2008), the role of portfolio insurance in the crash of 1987 has been in-depth investigated by MacKenzie (2004) and the “formula that kill Wall Street” is analysed in MacKenzie and Spears (2012).

The fourth group of ideas refer to the efficacy of signs which organize. The semiotic of organizing is based on the linguistic notion of “actant” (what causes action), next adopted in sociology by Bruno Latour, Michel Callon, Madeleine Akrich and John Law to launch a new theory called “actor-network theory” (ANT) or sociology of translation (Callon, 1986).

These four groups of definition share the same idea: social theories may display a feature that sets them apart from theories in the natural sciences, they seem to influence what they want to “describe” and this characteristics meet precisely the notion of postmodern reflexive knowledge: “scientific theories and models are not statements of findings; they are actively engaged in the construction of the reality they describe” (MacKenzie, Muniesa and Su, 2007). It is the reason why financial mathematics becomes gradually an element of systemic risk (Bouchaud, 2010). To say it differently, the performativity of financial *Logos* leads to a practical conclusion: it is not possible to think about professional financial practices without thinking sociologically about the contribution of mathematical finance to these practices.

#### **4. Consequences for ethics of finance**

The financial mess will not be solved by a sole change in behaviours of actors. The deontological approach of ethics (or its consequentialist variant) cannot terminate the *hubris* in finance. This approach to ethics in finance can be summarized as “regulate the use of instruments by writing a proper code of usage (a code of good mathematical conduct) and all will be well in the best of all financial worlds”. I argue that there is no reason to think that this is right. Such a recommendation has an air of being a moral paradox. Ideally, every financial professional should learn to be an autonomous moral agent with tools whose neutral effects are not in doubt. However, while the models are not ethically neutral, each professional financier will be led in spite of himself/herself by fashions in mathematical modelling that draw him/her onto the path of excess that is to be avoided. I argue that the inconsistency of this moral position is that it assumes the ethical neutrality of mathematical models, which is wrong because of the performativity of financial *Logos*. I now elaborate on this.

##### **4.1 The limitations of business ethics for financial issues**

Given the lack of consideration of the performativity of mathematical finance in ethical issues, it follows that ethics of finance is deprived of an essential component of its effectiveness. The commonly held view is that these issues are not questions of ethics but of mathematical modelling or financial techniques, which are only tools (to help, or not, with decision-making, as they say). In contrast to this view, my countersuggestion is that the choice of a mathematical model is not ethically neutral because the mental equipment which is transferred from the model to the user leads to a worldview that encourages or discourages certain behaviours more than others. Therefore I suggest that, in finance, any preference in mathematics is also preference in ethics.

Those who confine ethics of finance to ethics of behaviours do not see that the question of the scientific and technical tools is important. My proposition is: a) the reduction of ethics to ethics of actions is the corollary of the reduction of science to scientism; b) the deontologist approach of financial ethics (codes of conduct) is intimately connected with the positivistic philosophy of science (the intellectual position in which scientific tools are ethically neutral, only their actual use is not). My second proposition is: a postpositivistic view on science makes it possible to go beyond codes of conduct by including the technical and mental tools which form the basis of the daily reality of finance professionals.

Hence I argue that financial ethics cannot ignore the framing of financial decision-making by mathematical financial and the impact of management tools, particularly those which contain a representation of risk given by mathematical finance. It is therefore of utmost importance to extend the deontological ethics to the ethics of technology and to management tools. To say it differently, there is a cleavage between mathematical tools and ethics of actions, an imaginary boundary which results from the positivistic philosophy of science. In repudiating such a boundary I espouse a more thorough ethics for finance.

At this point, it might be objected that the moral behaviour of professional actors has been cast aside too quickly. In reality, this dimension of financial ethics is not neglected, but I

argue here that epistemology is the vector which is currently lacking in this ethical approach, because of the double performativity of mathematical financial modelling (technical and cognitive). My proposition is: the lack of epistemology is responsible for the fact that professional finance is impervious to ethical discourses. The reason is: without epistemology, the financial practices are armoured against any attacks on their foundations. The thickness of its armour corresponds to the technical barrier of its mathematical content: the “cost of entry” into the discipline using Bourdieu’s terminology. One effect of turning our attention to the framing effect of mathematical modelling is a shift towards the role of mathematics in finance.

In *Reorienting Economics* (2003), Tony Lawson emphasizes the role of mathematical-deductivist methods in the poor performance of the mainstream economic project (Lawson, 2003, p. 11). The limitations of ethical purpose of business ethics for “reorienting finance” can be enlightened by this precise Lawson’s comment. If those who claim to formulate ethical principles for financier moral agents are unable to grasp the social and anthropological issues of mathematical modelling in finance, then their recommendations will remain inadequate to meet their purposes. Each moral financial discourse existing in a vacuum merely testifies to the failure of attempted ethical constructions which do not take into account the scientific content of the technical and mental tools of finance professionals. The role of modern probability theory is crucial in this perspective. The intrication between the random walk model and the dominant paradigm of financial economics, as explained in Walter (1996), can illustrate a canonical case of the usefulness for ethics to consider the role of mathematical modelling and the risk representation embedded in the financial *Logos*.

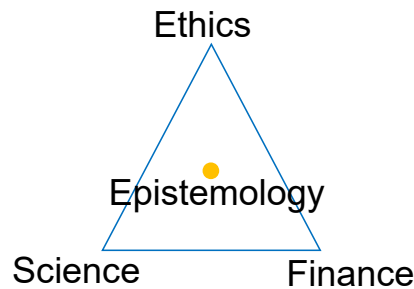
#### **4.2 The Archimedean point**

Ethics of finance has been conditioned in large part by the positivistic view of mathematical modelling. For most of the past twenty years positivistic view of financial ethics and attempts to promote an “alternative finance” has revolved around questions concerning actions and behaviours. In *After the crisis: rethinking finance* (2011), Thomas Lagoarde-Segot called for a new way of searching new paths in finance theory by examining the crisis from perspectives which fall outside the conventional theoretical paradigm. Echoing this call, I suggest that these attempts for rebuilding finance could be united by a shared refusal of positivistic apriorism. To say it differently, after the 2008 financial crisis, the apriorism of positivistic philosophy of science has to be set aside for ethics of finance.

A geometric diagram can illustrate my proposal. The triangle’s three vertices represent the three disciplines: finance, science and ethics. The situation today can be summed up by the autonomous existence of three pairs of vertices of the triangle, but with no overall linkages. The science-ethics side of the triangle is widely explored: for example, in the domains of biomedical ethics, and medicine. But finance is absent for the reasons we seen above. The finance-ethics side of the triangle is also the subject of numerous studies and seminars. But the exclusion of the “science” vertex reduces ethical questions to the issue of codes of good conduct. On the science-finance side, scientific research is developing in mathematical finance with its performative effects. But it is devoid of any ethical concerns. As science

progresses, so will society... following finance. Epistemology is thus the centroid of the triangle and some important issues of financial ethics are located in this point.

I suggest that, in the contemporary issue of ethics in finance, the centroid of the finance-science-ethics triangle would be the Archimedean point of ethical finance. This epistemology-based ethics (or epistemic ethics) paves the way for the epistemic virtue approach, as recently developed by De Bruin (2013).



At the end, it is interesting to recall a Pierre Duhem's 1893 warning, particularly lightening in the case of finance, and particularly lightened by the performativity approach of mathematical modelling in finance:

“To industrialists who do not care about the correctness of a formula provided it is convenient, we recall that the simple, but false equation, it is sooner or later, by an unexpected contrast of logic, the company that fails, the dam that bursts, the bridge that collapses, it's financial ruin, when this is not the disaster that mowing lives.”

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