

Ethics and Finance: A Shift to Performance

Christian Walter

Chartered Actuary of the Institute of Actuaries

Director of the Ethics and Finance Chair

Associate Professor at the University Paris 1 Panthéon-Sorbonne

Faculty of Social and Economic Sciences (FASSE)

Institut Catholique de Paris (ICP)

Website: <http://www.icp.fr/fasse/CEF>

Abstract. The ethics of finance cannot be limited to good conduct, but should include consideration of the impact of management tools, especially those that contain a representation of risk. Management tools conveying a representation of risk are a real machinery in professional finance. They have an impact that is organizational (control procedures), institutional (international regulatory standards), technical (evaluation methods), and cognitive (ways of thinking about uncertainty and how to deal with it). The shaping of financial activities by technical and mental tools is called the "performance" of the financial system. It is of prime importance to understand the role played by performance in the 2007-2008 financial crisis, so that the ethics of finance can be integrated into the techniques that shape the financial world.

Keywords: performance, sociology of finance, management technology, financial mathematics, systemic risk, ethics of finance

JEL Classification: A1, B4, C4, G1

Most analyzes of the financial crisis have focused on the responsibilities of the actors, and the report of the Commission of Inquiry established by Barack Obama and the U.S. Congress in 2009 to examine the causes and course of the financial crisis takes a similar approach. It ended with the observation that: "[t]he crisis was the result of human action and inaction, not of Mother Nature or computer models gone haywire." Besides the fact that the notion of a model is reduced here to its computing aspects, this conclusion completely ignores a phenomenon which is nevertheless easy to understand: financial management – and therefore human actions – are instrumented professional practices. That is to say they are equipped with technical and mental tools whose linkages are assumed to be rational (Chiapello and Gilbert, 2009). These various tools clearly shape professional behavior, to the extent that the relationship between effective management, management tools and the managers that use them has been described as "management technology" (Gilbert, 1998). Many studies have shown that there is a real influence of management tools on behavior and the principles of organizational

standardization (Berrebi-Hoffmann and Boussard, 2005). Even if the 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 also equipped with technical and mental tools. It is therefore important to investigate how the command structures and human action are equipped. 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.? It has been shown that modern finance should be treated as a real scientific and industrial sector risk (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 this equipment is therefore necessary in the case of financial supervision.

This article presents and stresses 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. For this, the research here uses the notion of the performance of professional practices by financial theory, through the channel of management measures for financial institutions – the technical and mental tools of professionals in these institutions, but also regulators and standard setters. Part I presents the notion of performance in the way management tools shape professional finance and in this sense constitute a true "invisible technology" (Berry, 1983), which is all the more dangerous as it is ignored. Part II proposes the main outlines of a program of supervision for financial activities, by extending the scope of monitoring to the technical and mental tools of risk representation by professionals.

The financial logos and calculative rationality

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. 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 actions and 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, in the sense that the project manager is rational and technical. The intention of rationality by the project manager has been accentuated in contemporary mathematical finance, whose rationality is essentially computational. This promotes the automation of decision-making, with transaction programs in high-frequency trading being the latest illustration of this approach.

The three dimensions of the project for management, control, performance and rationality have together been called the "manager logos" (Boussard, 2008), that is to say, both an organizing principle of professional practice and a discourse supporting these practices. 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 or equity). This notion is applied and extended here to the financial sphere, characterized by an exacerbation of calculative rationality, and term "financial logos" is introduced. The financial logos is a structuring discourse which is incorporated into the financial management arrangements of banks, insurance companies, asset management companies and into the practices of monitoring and controlling financial activities.

This structuring discourse concerns in particular representations of risk, a specific risk culture controlled by the epistemic authorities of financial standardisation (Lebaron, 2009; Vanel, 2010), that is to say a sharing of mandatory knowledge. 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. Today, despite the 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.

A Dangerous but 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, "portable gospels" (William, 2002), or "simple ideas" (Lordon, 2000). On the other hand, the introduction of automatic behavior: 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 are 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 sense the financial logos in the technical tools. Several reasons have been advanced to explain this blindness (Berry, 1983). First, the idea that decisions follow 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 margin of maneuver 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).

The Performativity of the Financial Logos

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 ethics of finance to drop the mechanistic view of the 19th century and to understand that not only does stewardship not follow management decisions, but that in some cases it even betrays them. Analyzes of the crisis based purely on considerations of good conduct and which offer explanations based on arguments of irrationality or greed that corrupt actors' 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 behavior is seen as safe because it remains within possible limits). 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, 200x). To characterize this dimension of actors being swept along by technical and mental equipment, it is possible to speak of a "theory effect" (Bourdieu, 1982). It describes this particular phenomenon in which a theory becomes a social force as soon as it changes professional practices. More generally, inclusive notions of performativity and performance are used today.

The terms "performativity" and "performance" were first employed in economics by Michel Callon (1998) and to describe and generalize the phenomenon whereby the effects of reality are produced by a scientific activity. These words stem from the old French "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. These terms are derived from the philosophy of language and the theory of speech acts, acts called "performative utterances" (Austin, 1962). Unlike statements of observation ("it is beautiful"), descriptive ("this house has three floors"), prescriptive ("you must leave the eggs three minutes in boiling water for them to become hard") and normative ("you must follow the rule of the written investment instructions in the Fund"), the performative utterances produce an effect on the social world. They build social phenomena ("I now pronounce you husband and wife"). A creative word here produces a social effect. By extension to this linguistic sense, the performativity of economics (or finance) means taking the role of theories in practical training in the precise sense that "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). Paraphrasing Psalm 32, it could be said that "the financial logos speaks and what it says happens."

It has been possible to verify the relevance and fruitfulness of the study of performance by highlighting the role of finance theory in several cases: the social construction of contemporary financial markets (Muniesa, 2000; MacKenzie, 2003; MacKenzie and Millo, 2003); the role of portfolio insurance in the crash of 1987 (MacKenzie, 2004); establishing the legal framework for pension funds in the United States (Mountain, 2006); or the imposition of notion of *benchmarks* in asset management (Walter, 2005). Three examples of the performative action of the financial logos stemming from this last field can be given. 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. 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 favors performative index management. 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.

In emphasizing the material nature of the performative effect, and to distinguish it from the intuitive view that "ideas rule the world," it is possible to talk of "device management" (Boussard, 2008) or "socio-technical adjustment" (Callon and Muniesa, 2009). 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. Professional players are driven by technical 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 modeling Brownian fluctuations, it led to the financial meltdown of 2007-2008 (Walter, 2009). Performance thus leads to a simple operational conclusion: it is not possible to think about professional practice without thinking sociologically about its contribution to practice.

To reiterate: the financial crisis will not be solved by a change in behavior. The codes of conduct and ethics (or their consequentialist variant) cannot terminate the hubris of finance. This approach to ethics in finance can be summarized as "regulate the use of instruments by writing a proper code of usage (a mathematical code of good conduct), and all will be well in the best of all financial worlds." 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 will be led in spite of himself/herself by fashions in financial practices that draw him/her onto the path of excess that is to be avoided. 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 theory.

Taking performance into consideration is necessary for ethical finance, which is otherwise limited to codes of conduct with no practical effect. On the one hand, these examples show how an analysis of management tools is inseparable from the work on the organization: management arrangements appear as ways to set professionals boundaries (Boussard, 2005). Performance highlights the importance of change in management tools to improve professional practices in order to correct malfunctions (Moisdon, 1997). On the other hand, performance has a very important consequence for politics: as soon as the performed nature of a financial reality is highlighted, theories can be publicly debated. This promotes the reappropriation of technical issues in the public debate (Callon, Lascoumes, Barthes, 2001; Leclerc-Olive, 2010). It is then possible to question the nature of the elements that have been assembled to show that other layouts or organizations are possible, which in turn must follow a long process of performance.

It is therefore of primary importance to the ethics of finance to initiate research on the performativity of financial theories at work in the causes of the 2007 crisis. The expected results of this work program are twofold: to describe how the mechanism of performance functions in the case of finance, and expand the field of ethical management tools in identifying the adverse effects of mental representations which are erroneous or dangerous concerning risk. The next section outlines such a program based on taking performativity into consideration.

Outline of a program on the ethics for financial techniques

Documenting mediation chains

The first stage of the program would seek to understand how professional practice is immersed – or embedded – in theoretical models that are often unknown, but are mobilized in technology management, organization or data recording. In other words, to describe how financial theory performs or shapes professional practices. In particular, the aim is to identify the assumptions of financial theory which include the faulty behavior of professionals: i.e., to identify those assumptions which have significant defects, then to remove them and replace them by more suitable assumptions for building new tools and new standards of management, as well as institutional norms (a new financial regulation). To this end, the chain of mediation which links theories from academia to the knowledge of professional practices must be documented. In other words, it is necessary to identify the social or cognitive processes by which the dominant representation is formed, within academia first, and then within the professional community (market actors), followed by market supervisors and finally within international networks of expertise that have legitimized this representation as the only valid one in financial standards. It is also necessary to characterize the systems of forces that secure a dominant representation. It is finally important to identify vectors through which the transmission and circulation of representations operate, in order to determine what factors or levers could change practices when the dominant representation is modified by another.

In the case of representations of risk, the aim is to establish the relationship between probabilistic modeling of uncertainty in financial theory and mathematical professional behavior, and to identify the harmful effects of excessively simplistic representations of risk. This work has been started by examining the social impacts of the Brownian representation of risk (and Pracontal Walter, 2009). It should be continued and extended to other representations used by professionals. One of the expected benefits of this research is the ability to change instruments: i.e., to develop new management tools, new ways of exercising control, a new system of institutional norms or management standards. In short, the goal is the performance of another representation of financial risk, which is better able to take care of the nature of the uncertainty of the world economy, particularly the intrinsically erratic nature of economies. The difficulties of such a program are at the level of its objectives: the complexity comes from its interdisciplinary nature, since it is necessary to investigate both the mathematical content of ideas and their meaning: social processes allow their distribution to be taken into account. Another problem arises for aspects of research relating to the mathematical content of models. It is necessary to consider two questions: why such a theory was adopted – a study of success; and why others were rejected – a study of the failures. So there are two kinds of difficulties which are mathematical and sociological.

Complementing existing work

Many studies already exist in the different disciplines which have examined these tools, especially in the two streams of research mentioned in the sociology of management and the sociology of finance. At first, work in the sociology of management was not applied to the financial sector, due to the extensive use of mathematics in financial theory. The latter creates a real potential barrier to classical

sociological analyzes (Brian, 2002), because it is necessary to go into the technical details of management tools which take a scientific form in the case of mathematical finance. For this reason, economic sociology (Steiner and Vatin, 2009) has drawn on the sociology of science and technology (Pestre, 2006) to enter into the world of modern finance and create a sociology of financial markets (Godechot, 2009). The study of the performance then also draws on the anthropology of science and technology to get to economic sociology and the sociology of science. In fact, the research mentioned in the sociology of finance addresses in detail the question of the social construction of markets by theories, and specifically establishes mediations implemented in certain situations.

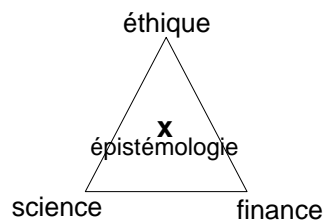
However, in some cases there is still an aspect that has not been completely elucidated by studies in the sociology of finance: the existence of an endogenous effect in financial mathematics that leads to the spontaneous production of new instruments or concepts: this is a kind of proliferation of mathematics which draws professionals into using new practices. I have begun to examine this effect in my own work, which complements research in this sociology of finance through epistemological analyzes where such analyzes are needed to understand the evolution or change of professional practices. The initial results have been encouraging. An endogenous effect of mathematics has been highlighted in the following cases: the shaping of the concept of the informational efficiency of markets based on the development of random walks (Walter, 1996); the emergence of the idea of indexed management drawing on econometric tests of the value-added by managers undertaken by Alfred Cowles in the 1930s (Walter, 1999); and the design of a beta coefficient of the equilibrium model of financial assets based on the development of Lagrangian equations in Markowitz (Walter, 2004). It seems interesting to pursue this promising line of work and investigate other situations in which financial mathematics develop endogenously, to become gradually an element of systemic risk (Bouchaud, 2010).

To draw financial ethics out of the conceptual impasse in which it is trapped by the sole recourse to codes of conduct, and to allow ethical discourses to really enter professional practices and modify them, it is necessary to use epistemology. This is because finance is based, as we have seen, on representations of uncertainty that become sediments in a social organization. Epistemology is a vector of access to the scientific content of models, to the detail of probabilistic techniques implemented in the markets, in order to understand why and how these probabilistic models construct finance, as well as the social, political and symbolic consequences they imply.

At this point, it might be objected that the moral behavior of professional actors has been cast aside too quickly. In reality, this dimension of financial ethics is not neglected, but it is argued here that epistemology is the vector which is currently lacking in this ethical approach, because of the double performativity (technical and cognitive) of probabilistic financial modeling. The view here is that this lack of epistemology is responsible for the fact that professional finance is impervious to ethical discourses. It is armored against any attacks on its foundations, and the thickness of its armor corresponds to the technical barrier of its mathematical content: the "cost of entry" into the discipline use to Bourdieu's terminology. If those who claim to formulate ethical principles for rational moral agents are unable to grasp the social and

anthropological issues of mathematical modeling in finance, then their recommendations will remain inadequate to meet their purposes. Each moral 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. That is why it is argued here that in the required epistemological deconstruction, the (bary)center of a finance-science-ethics triangle (shown below) would be the Archimedean point of ethical finance.

A geometric diagram can illustrate this 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 practice (when this is not just some sort of spiritual reflex). On the science-finance side, scientific research is developing in finance, with its performative effects. But it is devoid of any ethical concerns. As science progresses, so will society (CHECK companies)... following financial markets. Epistemology is thus the centroid of the triangle, and issues of financial ethics are located in this point.



Conclusion

Given the lack of consideration of mathematically modeled representations of uncertainty and their performativity, it follows that financial ethics 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 or financial techniques, which are only tools (to help, or not, with decision-making, as they say). In contrast to this view, it is argued here 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 behaviors more than others. It may therefore be considered that, in finance, any preference in mathematics is also preference in ethics. It is hardly surprising that those who confine ethics to behavior do not see that the question of the scientific-technical tools is important, because the reduction of ethics to codes of conduct is the corollary of the reduction of science to scientism: the intellectual position in which scientific tools are axiomatically neutral, only their actual use is not. We have seen how the current controversies on the role of mathematics in the financial crisis and consequently the ethical debates on research responsibility are marked by a scientific conception of science. Instead, an epistemological position on contemporary science makes it possible to go beyond codes of conduct and include the technical and mental tools which form the basis of the daily reality of finance professionals in the field of financial ethics.

In conclusion, we can say that ethics cannot ignore the financial impact of management tools, particularly those which contain a representation of risk. As a real machinery for finance professionals, management tools with 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). It is therefore of utmost importance to extend the ethics of codes of conduct to the ethics of technology and to management tools. This requires a better understanding of the role played by performance in the 2007-2008 financial crisis.

References

- Armatte M. (2009) « Crise financière: modèles du risque et risque de modèle », *Mouvements*, 58, avril-juin.
- Austin J. L. (1962) *Quand dire c'est faire*, tr. fr. 1970, Paris, Seuil.
- Berrebi-Hoffmann I., Boussard V. (2005) « L'emprise des outils de gestion », *Sociologies pratiques*, n° 10, p. 1-6, Paris, PUF.
- Berry M. (1996) « Savoirs théoriques et gestion », in J.-M. Barnier (dir.), *Savoirs théoriques et savoirs d'action*, Paris, PUF.
- Berry M. (dir.) (1983) *Une technologie invisible : l'impact des systèmes de gestion sur les comportements humains*, Ecole polytechnique, Rapport pour le ministère de la Recherche et de la Technologie.
- Bouchaud J.-P. (2010) *ParisTech Review*, 7 juin, <http://www.paristechreview.com>
- Bourdieu P. (1982) *Ce que parler veut dire*, Paris, Fayard.
- Boussard V. (2005) « Introduction » in V. Boussard (dir.), *Au nom de la norme. Les dispositifs de gestion entre normes organisationnelles et normes professionnelles*, Paris, L'Harmattan.
- Boussard V. (2008) *Sociologie de la gestion. Les faiseurs de performance*, Paris, Belin.
- Brian E. (2002) « Ad directionem ingenii », *Archives de sciences sociales des religions*, 2, 141, p. 5-7.
- Callon M. (1998) « The embeddedness of economic markets in economics », in M. Callon (dir.) *The laws of the markets*, Oxford, Blackwell.
- Callon M., Lascoumes P., Barthes Y. (2001) *Agir dans un monde incertain. Essai sur la démocratie technique*, Paris, Seuil.
- Chiapello E., Gilbert P. (2009) « La gestion comme technologie économique », in Steiner et Vatin (2009).
- Cyert R., March J. (1963) *Processus de décision dans l'entreprise*, tr. fr. 1970, Paris, Dunod.
- Gilbert P. (1998), *L'instrumentation de gestion. La technologie de gestion science humaine ?*, Paris, Economica.
- Godechot O. (2009) « Concurrence et coopération sur les marchés financiers. Les apports des études sociales de la finance », in Steiner et Vatin (2009), p. 609-645.
- Guillaume M. (2002) *Virus vert. Entretiens avec Isabelle Bourboulon*, Paris, Descartes & Cie.
- Hatchuel A. (2010) « La place des sciences de gestion dans la culture contemporaine et dans l'après-crise », Centre de gestion scientifique (CGS), Mines ParisTech.
- Hatchuel A., Weil B. (1992) *L'expert et le système*, Paris, Economica.
- Lebaron F. (2009) « La formation des économistes et l'ordre symbolique marchand », in Steiner et Vatin (2009), p. 249-288.
- Leclerc-Olive M. (2010) « La crise financière a-t-elle quelque chose à dire aux sciences sociales ? De l'expertise à l'espace public : propositions pour une enquête partagée », document de travail, EHESS.

- Lordon F. (2000) « La force des idées simples. Misère épistémique des comportements économiques », *Politix*, vol. 13, n° 52, p. 183-209.
- MacKenzie D. (2003) “An equation and its worlds: Bricolage, exemplars, disunity and performativity”, *Social Studies of Science*, vol. 33, n°6, p. 831-868.
- MacKenzie D. (2004) “The big, bad wolf and the rational market: Portfolio insurance, the 1987 crash and the performativity of economics”, *Economy and Society*, vol. 33, n°3, p. 303-334.
- MacKenzie D. (2006) *An Engine Not a Camera. How Financial Models Shape Markets*, MIT Press.
- MacKenzie D., Millo Y. (2003) “Constructing a market, performing theory : The historical sociology of a financial derivatives exchange”, *American Journal of Sociology*, 109, vol. 1, p. 107-145.
- MacKenzie D., Muniesa F., Siu L. (2007) *Do Economists make markets. On the performativity of Economics*, Princeton UP.
- Moisdon J.-C. (1997) *Du mode d'existence des outils de gestion*, Paris, Seli Arslan.
- Montagne S. (2006) *Les fonds de pension. Entre protection et spéculation financière*, Paris, Odile Jacob.
- Muniesa F. (2000) « Un robot walrasien. Cotation électronique et justesse de la découverte des prix », *Politix*, vol. 13, p. 121-154.
- Muniesa F. Callon M. (2009) « La performativité des sciences économiques », in Steiner et Vatin (2009), p. 289-324.
- Muniesa F., Millo Y., Callon M. (2007) « An introduction to market devices » dans M. Callon, Y. Millo, F. Muniesa (dir.), *Market devices*, Oxford, Blackwell, p. 1-12.
- Pestre D. (2006) *Introduction aux Science Studies*, Paris, La Découverte.
- Steiner P., Vatin F. (dir.) (2009) *Traité de sociologie économique*, Paris, PUF.
- Vanel G. (2010) « Les autorités épistémiques de la normalisation financière », in C. Walter (dir.), *Nouvelles normes financières. S'organiser face à la crise*, Springer, p. 137-159.
- Walter C. (1996) « Une histoire du concept d'efficience sur les marchés financiers », *Annales Histoire Sciences Sociales*, juillet-août, n°4, p. 873-905.
- Walter C. (1999) « Aux origines de la mesure de performance des fonds d'investissement : les travaux d'Alfred Cowles », *Histoire et Mesure*, vol. 14, n°1-2, p. 163-197.
- Walter C. (2004) « Le modèle linéaire dans la gestion des portefeuilles : une perspective historique », *Cahiers du Centre d'analyse et de mathématiques sociales (CAMS)*, série « Histoire du calcul des probabilités et de la statistique », n°65.
- Walter C. (2005) « La gestion indicielle et la théorie des moyennes », *Revue d'économie financière*, 79, p. 113-36.
- Walter C. (2009) « Le virus brownien et la déroute des professionnels en finance », in *Repenser la planète finance*, Paris, Eyrolles, p. 89-101.
- Walter C., Pracontal M. de (2009) *Le virus B. Crise financière et mathématiques*, Paris, Seuil.