

CALCULATING FOR MANAGING: THE EMERGENCE OF THE IDEA OF RISK MANAGEMENT*

CALCULAR PARA ADMINISTRAR: EL SURGIMIENTO DE LA IDEA DEL MANEJO DEL RIESGO

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ABSTRACT

This text argues that the emergence of the idea of risk management can be traced down to the use of derivatives in the financial sector in the early 1970s. Critically engaged with Michael Power's approach on rise of risk management as a common organizational practice in the 1990s, the article maintains that risk as manageable matter can be traced back to the use of Black-Scholes-Merton model for pricing options in the Chicago Board Options Exchange (CBOE) since 1973. Ideas of calculation, measurement, and management of risk can be detected at this point. This is an exercise of theorization that aims to identify the role of ideas in the economic practices so as to allow a historicization of technical knowledge.

Keywords: Calculation, Derivatives, Financialization, Management, Risk.

RESUMEN

Este texto argumenta que el surgimiento de la idea del manejo del riesgo puede rastrearse en el uso de las derivadas en el sector financiero a principios de los años 70. A través de una discusión crítica con la propuesta de Michael Power sobre la consolidación del manejo del riesgo como una práctica organizacional común en los años 90, el artículo afirma que el riesgo como asunto administrable se remonta al uso del modelo Black-Scholes-Merton para fijar los precios de las opciones en el Chicago Board Options Exchange (CBOE) desde 1973. La idea de cálculo, medición y manejo del riesgo se pueden situar hasta ese momento. Este es un ejercicio de teorización que busca identificar el papel de las ideas en las prácticas económicas, de tal manera que se permita una historización del conocimiento técnico.

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“Can we know the risks we face, now or in the future? No, we cannot; but yes, we must act as if we do.”
(Douglas and Wildavsky, 1982)

INTRODUCTION²

The idea of risk has become popular, although its definition and scope is not clear. It can be associated with harm and danger, as well as with opportunity. Nonetheless, whatever risk refers to, its uses in today's society depict an important process of reflection about how to deal with it. This paper attempts to understand the emergence of risk management in the 1990s as a popular practice among organizations, shedding light on the importance of risk as an idea that regards the world as amenable to human decision and intervention.

As Michael Power (2007) argues, to say that the future is unknowable or, in the same way, trying to find a singular definition of risk (of uncertainty, as well)

maybe is trivial, but asking for “the historical and social conditions under which organization come to embody imagined contingent outcomes as objects of management practice” (Power, 2014), is not. In other words, it is more fruitful to question about social conditions in which an idea of risk is established and how different actors (in this case, organizations) deal with it, than to put the efforts in building a general idea of what risk is. In this sense, this text proposes a history of how risk became something measurable, calculable and manageable. Critically engaged with Michael Power's proposal about the emergence of risk management as a common organizational practice in the 1990s, I argue that the idea of risk management can be traced down to the use of derivatives in the financial sector in the early 1970s.

The increasing role of finance in the economy and in daily life (Navarro and Torres, 2012; Van der Zwan, 2014), in general, is partially explained by the spreading use of derivatives in finance. The so-called financialization³ process

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³ Despite this paper uses the context of “financialization” in order to explain the emergence of risk management as a popular practice, it is not about that phenomenon. It is complex and the increasing literature that are focused on make it even more. As Epstein (2005) contends, “there is not even common agreement about the definition of the term,” yet, it is essential to consider some analysis. In the introduction to the special issue of *Socio-Economic Review*, Kornich and Hicks (2015) briefly expose a myriad of consequences of financialization on inequality, economic growth, labour market, and household's culture. Deutschmann (2011), from a sociological perspective, considers financialization as a hegemonial regime of financiers over entrepreneurs. For Lapavistas (2011), financialization not only encompasses a shift in which large corporations acquired independent financial skills and banks have turned

was facilitated by the easy use of these kind of financial tools since the 1980s and 1990s. It is important to highlight that the use of derivatives is not new; rather, they have a long history that can be traced back for many centuries (Swan, 2000). Nonetheless, its recent expansion must be framed in the convergence of new pricing theories, new computational technologies, and a friendly environment for speculation in the early 1970s. All this rested on the idea that risk⁴ could be calculated and utilized in a profitable way.

The role of derivatives in the financialization, however, must be understood not only from a quantitative, but also from a qualitative perspective. As Wigan (2009), and Bryan and Rafferty (2006) assert, derivatives embody a new way of dealing with risk as well as a way of trading with it. For Wigan, risk is the object exchanged within the financial process with no ties with real economy. Bryan and Rafferty, in the same way, consider derivatives as a commodification of risk. Using those perspectives, as

it will be argued, it is possible to trace down the idea of risk as a manageable matter to the emergence of the use of derivatives in the 1970s.

The emergence of risk management in the 1990s, as Power (2014) analyses, was the result of the confluence of three logics: *anticipation*, the scientific aspiration to know and calculate the future; *resilience*, adaptation to unforeseeable events (focused on the ability of the organization); and, *auditability*, risk management must be demonstrated and evidenced (Power, 2014). I attempt to go further. I argue that the idea of risk as manageable matter can be traced back to the way of handling risk through utilizing derivatives in the financial sector in the 1970s, particularly, in the use of Black-Scholes-Merton model for pricing options in the Chicago Board Options Exchange (CBOE) since 1973. With a conjunction of new pricing models (legitimized by academics), advanced mathematical skills, new technology, and a social context favourable to new economic activities, the idea of manage-

to mediating transactions in an open market (Lapavitsas, 2011, p. 623), but also a process in which an increasing number of people are involved in operations of finance, a “financialization of everyday life.” Some analysis focus on the different dimensions on the process. On the one hand, Aalbers (2017) notices ten dimensions of this phenomenon, with its correspondent variations and combinations. On the other, Orhangazi (2008) shows that in the growing literature on financialization, three types of approach can be identified. First, a “long-wages approach,” that considers this phenomenon as a current within the capitalist history; second, an approach that considers financialization as part of a systemic change related to neoliberalism, and, third, a set of authors focused on the role of finances and the governance of Non-Financial Companies (NFCs). At this point, it is enough to quote what Lagoarde-Segot (2016) says about this, “financialization constitutes a relevant metaphor for 21st century financial research.”

4 As Beck (2000) asserts the idea of risk “reverse the relation of past, present, and future,” that is, the past does not determine present-day actions, this place is taken by the future. A “possible future” that we are trying to grasp from the present.

ment of risk emerged as a central point in organizational practices. In that respect, this is an exercise of theorization that follows the poststructural proposal of expanding the limits of the political economy bringing to the role of ideas in the political and economic practices so as to allow the historicization of technical knowledge (De Goede, 2004, 2005, 2006).

This paper is structured as follows. In the next section, I review some perspectives that analyse derivatives from qualitative perspectives as well as the Michel Power's explanation on the emergence of risk management as a popular practice. In the third section, I explain how in the use of derivatives, as a way of dealing with risk in the 1970s in financial sector, it is possible to find the idea of calculation and instrumentalization that later would influence the emergence of risk management as a common practice among organizations in the 1990s. The central point to demonstrate how the use of the Black-Scholes-Merton model for pricing options in the CBOE allows us to understand the emergence of some practices that would determine risk management, namely, Enterprise Risk Management and Value-at-Risk. In the last section, I draw some conclusions.

DERIVATIVES AND RISK MANAGEMENT: A LITERATURE REVIEW

Financialization is mostly associated to speculation⁵, and speculation, in turn, is related to the use of derivatives (Dodd, 2005). However, as Norfield (2012) aptly shows, financial speculators not only use derivatives for making a bet on price-movements, they also use them to hedge their risk. Derivatives are strategies for dealing with risk. As it is well-known (Swan, 2000; Greenberger, 2013), they were created to hedge price risk in corn among the farmers and grain merchants in Chicago in the second half of the nineteenth century. They referred, in basic terms, to future contracts whose "purpose is to capture, in form of price changes, some underlying price change or event" (Dodd, 2005, p.149). In the first instance, they are derived from the price of an underlying security or commodity. Nowadays, there are derivatives of several different types ranging from swaps, options, forward contracts, warrants, structured bonds, convertible bonds (Bryan and Rafferty, 2006, pp. 46-47) and the most popular Over-the-Counter (OTC) or custom-made derivatives which are almost entirely unregulated⁶. Each of them constitute an amalgam of high-level mathematical

5 As Knafo (2009) argues, Contrary to the common belief, speculation is not the result of the liberalisation in open market economies. Instead, it is result of practices rooted in specific institutional structures.

6 OTC, as Scott (2013, p. 60) asserts, are "perfectly legal, but together they appear like a global black market in financial instruments". This author does an interesting exposition of what derivatives refer to, ranging from different types of those, uses, and their nature. He concludes, "derivatives are, in effect, bets that can either be used to speculate on something (to take on risk), or to "hedge" against something (to protect against risk)" (Scott, 2013, p. 63). Then, it is impossible to think about derivatives without taking into account risk and risk management.

calculation, high-technical trade and hundreds of actors.

Moving away from their technical complexity, derivatives have been seen as a manifestation of changing economic and social relations that have shaped the global economy since the 1970s. LiPuma and Lee (2005) consider derivatives—particularly, financial derivatives as the result of the problems of monetary connectivity due to the outsourcing of production, “the proliferation and institutionalization of contractual outsourcing (an agreement to supply a product over a given timespan) reconfigured and increased the risks that corporations had to deal with. To hedge against these risks, financial institutions began to develop derivatives and their markets for their corporate clientele.” (LiPuma and Lee, 2005, p. 406). Derivatives (products and markets) emerged as part of a new socio-structural circulation along with a new conception of risk. This new conception of risk, the notion of “abstract risk” embodied in derivatives functions as a social mediation, “creating a new form of interdependence in the sphere of circulation.” (LiPuma and Lee, 2005, p. 422). To state their argument succinctly, what makes the emergent culture of finance circulation historically new is the objectification of risk, that is, the creation of derivatives by objectifying context-specific risk to price them, and also objectifies abstract risk. In this sense, as they assert, risk can exist in an abstract way, facilitating its use in a purely mathematical understanding.

In the same vein, Duncan Wigan (2009), placing derivatives in the core of the dynamics of financialised accumulation asserts a new relation between derivatives and risk. Pointing out the necessity of assessing the impact of derivatives from a qualitative way, he argues that they “instrumentalise risk as a new way of ownership, a new object and means of appropriation and control, which rests in circulation and contests finance as a site of accumulation in and of itself.” (Wigan, 2009, p. 159). Derivatives allow an ownership wherein there are no ties to an asset, that is, derivatives as an “artifice of indifference” enable financialization as an accumulative process, without taking into account the so-called real economy.

For Wigan, the relation between derivative and the idea of risk management is crucial. As he asserts, through an idea of risk management (under the guise of financial precision), derivatives allow financial expansion. However, in this context, there is no management of an external risk (as a falling in production), rather, derivatives offer the promise of financialized accumulation which does not rest so much on a link with real economy as “the construction of an alternative arena of accumulation in which the object is risk” (Wigan, 2009, p. 163). We are exchanging risk, not commodities.

What is important to highlight here is that Wigan’s analysis allow us to grasp the qualitative dimension of derivatives. Beyond the financial expansion that

However, those bets depict a measurable aspect of the risk, it is a way of pricing risk, hence, making them tradable.

considers derivatives as instruments that enable trade in a monumental scale, there is an assumption that address all this process; derivatives must be understood in the specific context of theoretical innovation, “a system of ideas and calculative rationality, risk embodies a project to align the discourse of finance with the subjectivity of liberalism and ring fence the financial system behind a veil of precision.” (Wigan, 2009, p.159). In brief, using derivatives has allowed to calculate risk, at the same time, shaping it as a new way of ownership. Risk is now a commodity.

In the same qualitative understanding of derivatives, Bryan and Rafferty (2006) point out that derivatives are not just another financial tool, in fact, they are “transforming the system of calculation under capitalism.” (Bryan and Rafferty, 2006, p. 5). In analysing the economic and social role of derivatives, they assert that derivatives must be considered as a commodification of risk, “a form of calculation and market transaction that is intrinsic to the logic of a capitalist economy.” (Bryan and Rafferty, 2006, p. 8). As they contend, in studying derivatives, it is possible to go to the heart of calculation and competition within capitalism so that understanding its recent transformations.

For these authors, derivatives are important due to two intrinsic features: “binding,” that is, to establish pricing relations that “bind” the future to the present; and “blending,” that refers to set pricing relationships convertible between forms of assets (Bryan and Rafferty, 2006, p. 12). These charac-

teristics allow derivatives to become in a “universal measure of value, for this measure is what derivatives are enacting” (Bryan and Rafferty, 2006, p. 35). Two aspects must be highlighted in their analysis: on the one hand, derivatives are in the core of the process of financialization, not only for being easy to create (as the OTC market depicts), but also because they become a universal measure (aspect considered by Wigan as well). On the other hand, for these authors, derivatives and risk management are strongly intertwined, “we see in derivatives the language of risk management—that life’s contingencies (for corporations and for individuals) can be reduced to commodified risk, for that, in essence, is what derivatives are: commodities that manage risk. (...) Once we engage the issues of risk management, it becomes apparent that derivatives do something rather basic: They provide a means to convert the value of assets in one form into assets in another form, and so take the risk out of holding any particular form of asset.” (Bryan and Rafferty, 2006, p. 38).

Reading derivatives from a qualitative perspective enables us to understand what is at stake: An idea of risk as a measurable thing that is in the core of the financed accumulation (Wigan), of the new way of finance circulation (LiPuma and Lee), and plays the role of universal measure that allows risk to be tradable (Bryan and Rafferty). The very idea of calculation and rationalization underlies in these perspectives and, along with specific social moment and certain technical innovations, allow the emergence of the idea of risk

as a manageable aspect of social and economic life.

As Bernstein (1996a) points out, the boundary between modern times and the past is the quantification of risk, “the notion that the future is more than a whim of the gods and that men and women are not passive before nature.” (Bernstein, 1996b) Even more, as Beck (1992) asserts, the idea of risk is bound to the concept of reflexive modernization, that is, it is an essential part of what modern societies think about them (politically reflexive). However, as Bernstein (1996b) shows, it was a long and complex path moving away from superstition to supercomputers. Since the Renaissance and its ideal of scientific experimentation, through Pascal and his solution to mathematical puzzles, Leibniz—among other thinkers, and his uses of probability as a powerful instrument to analyse information, till the most recent developments in statistics, allowed building the idea that handling to the future was possible. The essence of risk management rests on this complex network of ideas.

Michael Power (2007) traces the growth of risk management as phenomenon in which risk has become a mandatory feature of organizational life in the 1990s, he is interested in answer the question of “why risk and its management has emerged at a particular time from specific sub-fields to become a visibility preferred idiom for such a wide range of practices and a model for governance itself.” (Power, 2007, p. 12). Power points the gradual convergence between risk calculation and risk management.

Despite the former can be traced back to the nineteenth century with mathematical and statistical experimentation (in agriculture, for instance), only since 1995 the process of dealing with risk has become managerial in form (Power, 2007, p. 4). In other words, for Power, the question is not about what risk or risk management is; rather, he endeavours to explain how uncertainty becomes risk through a process of decidability and actionability, that is, in managerial form. Consequently, for Power, risk is socially constructed. People never encounter risk as a pure given, rather, it is interpreted and coordinated through systems of representation that ultimately define what risk is, how to deal with and through what processes, “the social construction of risk must be engage with the social construction of management practices to govern risk.” (Power, 2007, p. 20).

Power’s idea of “organized uncertainty” allows us to intertwine two aspects on risk: on the one hand, the construction of risk objects, that is, the importance of the recognition of the significance of risk perception. The role of ideas and fictional objectives that constitute rationalities is the core of the analysis; therefore, risk is, at first, an idea socially constructed by actors that define its nature. On the other hand, the construction of risk management. “The organizational construction and translation of uncertainty into risk”, as Power (2007, p. 186) points out, depicts the emergence and consolidation of sociotechnical network that allowed management system for governing risk. Standardization and a new “academic

clergy” (Power, 2007, p. 190) enabled a general growth of multiple ways of dealing with risk.

His analysis, notwithstanding supported by lots of empirical examples, is broadly about the implementation of key ideas within a management discourse (Power 2007, p. 24). Despite, as I will expose in the next section, Power’s analysis is fruitful putting the emergence of risk management as a popular practice in the mid-1990s, with the uses of different organizational process such as Enterprise Risk Management and Value-at-Risk. The aim of this text is to demonstrate how this idea of calculation of risk, hence, of management of it, emerges with the use of derivatives in the early 1970s. That idea, as it will be argued, pressured changes within organizations, among them, risk management.

CALCULATION, DERIVATIVES, AND FINANCE: THE EMERGENCE OF RISK MANAGEMENT

Calculation is part of the modern society. Its relationship with sciences and technology creates an aura of neutrality rested on the legitimacy of its objective-knowing and controlling the world, as well as of its means—scientific discourses and technical developments. However, as Kalthoff (2005, p. 74) asserts, calculation refers to expectation and interpretation. Therefore, so much important is to ask for the accurateness of a calculation as is to inquire from which point of view this calculation is

framed. The latter leads us to study what kind of ideas, actors, and practices are involved in the emergence of this way of calculation, that is, a practice of radical historicism (Knafo and Teschke, 2017).

As aforementioned, financialization is intertwined to the calculation of risk through using derivatives. These have been at the core of the increasing role of finances within the economy. The quantitative impact of this expansion is evident. According to the Bank of International Settlement (BIS), in 2016, the average day of OTC foreign exchange instruments was 6,5 billion US dollars (BIS, 2016). This information depicts the immense pressure of finance on the economic actors, but, overall, on the organizations performance. As Power (2012, p. 302) notices, accounting has had to change its practices in order to face the problems of “accounting for and representing the risk of derivatives.” Financialization radically changed the processes of valuations⁷. Notwithstanding, as I will demonstrate below, beyond the spread of “maximizing shareholder value” as a principle of corporate governance (Lazonick, 2013), rested on a short-time perspective, and the new dynamics of production and distribution within the economy, financialization pressured “the abstraction, rationalization, and expansion of risk management ideas since the mid-1990s.” (Power, 2007, p. 3). Inasmuch as the use of derivatives was facilitated by the emergence of option pricing theories in the early 1970s, they were not only conceived as a way of dealing

⁷ Power (2012, p. 303) names this process as “financialization of the financial accounting model.”

with risk, in abstract terms, but also a calculable way of pricing that risk. The idea of calculating risk—in this case, by market prices, enabled the possibility of handling risk in different aspects of the economy, allowing the quantitative expansion of risk management or, in Power's terms, the "risk management of everything." (Power, 2004)

For Power (2014, p. 370), it is impossible to study organizations without considering uncertainty, furthermore, organizations are essential in order to understand different ways by which risk has been organized in a society. Organizing uncertainty, therefore, depicts not only how organizations define risk, but also how society in general conceives it. In this sense, the emergence since the mid-1990s of new categories and ideas that re-shaped discourses of risk management (Power, 2007, p. 28) embodied a broader social phenomenon, namely, the idea of risk as a something that could be calculable, hence, manageable.

Risk become a powerful organizing category for managerial and administrative practice due to a set of changes that explains the shift from risk analysis to risk governance. According to Power (2007), two processes determined this: On the one hand, the rise of the internal control as autonomous field of expertise depicted a large transformation in corporate governance as well as in the role of public regulatory process. The risk-based regulation is, at the same time, a discourse of opportunity that demands freedom of who can 'prove' they are less risky (Power, 2007, p. 23). That is, organizations have be-

come co-responsible of the regulatory process, in which internal control was the signal of this responsibility. Also, it implied a transformation of the state. This regulates as well as plays the role of the risk manager of last resort. The "audit implosion and internal control explosion" (Power, 2007, p. 47) means not only a new way of governing organization, but, more importantly, also the rising legitimization of rationalized control (Power, 2007, p. 63). On the other hand, the standardization of risk management. The concept of Enterprise Risk Management (ERM) emerged "as a web of normativity about risk handling, its formalization in standards and its status as world-level model of good governance" (Power, 2007, p. 98). What is important to highlight here is that ERM embodies the change from risk analysis to risk management. Risk analysis emerges as discipline in the 1960s, then, the financial economics appears in the 1980s as a specific development in information technology, in which "risk was to be studied, analysed, and calculated as volatility in financial returns based on the mathematics of mean-variance analysis." (Power, 2007, p. 70). Risk management emerges, through ERM perspective, as a whole of enterprise risk measure, that is, ERM as a demand for the identification of all collective risk that eventually affects company value.

Nonetheless, Power (2007) suggests the role of finances in this idea of calculating risk, he does not emphasize on it. It is important to reckon that the process of analysing value is rooted on the idea of price and its relation to risk stems from

the use of pricing theories in financial derivatives markets.

The growth of financial derivatives market, as Bryan and Rafferty (2006, p. 50) point out, can be explained for three factors: price volatility from the early 1970s associated to the end of Bretton Woods and the collapse of national and international commodity price stabilisation schemes, the increased importance of finance in investments (growth of Eurofinance markets), and the internationalisation of trade and investment (aspect highlighted by LiPuma and Lee as well). Those aspects, however, do not explain completely the exponential growth of the use of derivatives since the 1970s and 1980s. The consolidation of a theory of pricing as well as innovation in dealing with information by computers was part of the socio-technical context (Millo and MacKenzie, 2009), in which the use of derivatives started their expansion.

The exponential growth of the use of derivatives (especially, options) must be traced back to application of options pricing model developed by Black, Scholes and Merton in the American Chicago Board Options Exchange (Millo and MacKenzie, 2009, p. 639). The so-called Black-Scholes-Merton model not only caused an increase of the attention to options market from financial economists (Turner, 2016 p.

44) but also the spread of the idea that risk (ultimately, embodied in derivatives) can be calculated based on mathematical (hence, objective) model. In this way, this model of pricing marked a new impulse in the will of handling risk through its rationalization and instrumentalization⁸.

Finance was a well-established part of the curriculum in the business schools of U.S. universities in the 1950s. However, as MacKenzie (2008) exposes, by the late 1960s, the descriptive and institutional study of finance had been eclipsed by the analytical and mathematical approaches that came from economics. This was not only a change of style, but also a way of impacting in the financial market. Particularly, during the 1960s, economics allowed a change of mood in relation to speculation (especially, with options). “Economists postulated that stock price movements could be modelled with reasonable accuracy” (Millo and MacKenzie, 2003, p. 114), that is, through models, data, and computer power would be possible to overcome the idea of gambling attached to the trade of derivatives and to create a safe environment to do investments.

Economics was essential to legitimate the establishment of an option market. In this context emerged a number of theories that sought to explain

⁸ It is important to highlight that, as Millo and MacKenzie (2003) show, the use of derivatives after the crash of 1929 was considered suspicious of gambling and speculation. The market of futures was regulated by the Supreme Court in 1905, establishing the necessity of underlying physical assets if they pretend to be legal. They, instead, focused on options due to stock certificates already exist in a small non-certificate New York market.

and predict the functioning of option market⁹, however, it was only with Black-Scholes-Merton model that allowed a real expansion of the use of derivatives. This text does not aim to explain this theory, nor to evaluate its accuracy. Rather, it aims to consider it as the breaking point that enabled the idea of calculating, then, managing risk, spread from the finances to other sectors of the economy and society. Beyond the accuracy of this model, it embodies the possibility of valuing risk through pricing derivatives, hence, from then on, risk is calculable, measurable, and ultimately, manageable. This same underlying idea appears in the practices of Enterprise Risk Management that, as Power (2007) points out, represents the change from risk analysis to risk management.

The use of the Black-Scholes-Merton model fit the technical environment of the newly founded Chicago Board Options Exchange (CBOE) in 1973. This statistical model was useful for single traders handling small specialized portfolios interested in an accessible way of predicting options contract's prices. Through using Black's sheets (Millo and MacKenzie, 2009, p. 642), they could change positions to take advantage of a price discrepancy. With the increasing sophistication in trading, the spreading of this model, however, was not related to an own characteristic of it. As Millo and MacKenzie (2009, p. 644) notice, it was caused by a new practice: planning in advance the following day's trading 'game plan'. Those decisions were based on the model that allowed

trading firms to express risk in accessible terms as well as to construct a clear image of the potential situations of the markets. Therefore, the Black-Scholes-Merton model not only facilitated the calculation of prices in first instance, but also became in a way of communication among different traders and trading firms. Planning and evaluation rested on this model; notwithstanding, its primarily use was to predict option prices of single contracts.

As popularity of options arose, trading spread from CBOE to other exchanges. The American Stock Exchange in New York (AMEX), the Pacific Stock Exchange in San Francisco (PSE), the Philadelphia Stock Exchange (PHLX) among others, emerge as new participants in this market. With an increasing number of actors and the entrance of large investment firms, trader's new management practices were required. In order to face these challenges, trading firms use the Black-Scholes-Merton as a tool to calculate risk in hypothetical scenarios, "instead of calculating prices for each of the positions and then summing up these results, the new approach took a hypothetical result as its starting point" (Millo and MacKenzie, 2009, p. 65) That is, running scenario-simulating traders evaluate the impact of a market movement from a portfolio's position. Those scenarios stemmed from using Black-Scholes-Merton model so much as a price calculator as risk calculator. This general principle would be in the core of methodologies as Value-at-Risk (VaR), which, as Power shows is one of the key elements in order to understand

9 See Mackenzie (2008).

the risk management as a common practice since the 1990s.

Undoubtedly, the spreading of the Black-Scholes-Merton model was a result of a specific socio-technical context determined by the use of mathematical approaches in finances framed in a broader establishment of neoclassical school¹⁰ as the dominant paradigm in economics as well as a constantly technical innovation embodied in more powerful technology such as computers¹¹. Nonetheless, the importance of this model rests on the “bi-directionality” embedded in this model, “the fact that it offered two equivalent procedures through which quantitate estimates of risk and prices could be calculated” (Millo and MacKenzie, 2009, p. 642). Indeed, as MacKenzie, (2003 p.856) exposes, since 1973, “a wide of situations involving uncertainty have been reconceptualized as implicit options,” which is, this model allowed a new idea of risk that could encompass from bonds, insurance contracts or a film sequel.

As aforementioned, derivatives embody the way of calculating risk as well as a way of making it tradable. With the use of the Black-Scholes-Merton model to calculate the price of options, risk became a manageable thing (a commodity), “the fundamental theory of finance, in which returns on assets are always relative to risk, had made risk management a conceptually thinkable part of the corporate value creation process since the 1960s” (Power, 2007, p. 71). Moreover, as Millo and Mackenzie (2009) and Power (2007) shows in detail, value, price and risk calculation changed how risk was regarded in an organization, moving from just calculate risk to using it to manage an organization with a business-focused approach. Therefore, Enterprise Risk Management (ERM) emerges in the 1990s as the principal risk management technique that considers a “whole of enterprise” risk metric. At the same time, the idea of “Value-at-Risk” (VaR), taken into account in the model-based practices in finances, appears as the way of dealing with risk from entrepreneurial perspective.

10 It is important to recall that one of the main critiques to neoclassical rests on the illusion of handling the future ignoring the “radical indeterminacy” underlying in every social phenomenon including the economy. Hence, every attempt to model risk, future prices and future scenarios are inevitably incomplete. The error of starting from a predictive standpoint, is the “inherent error” that neoclassical school has its epistemological structure. However, as Varoufakis, Halevi and Theocarakis (2011, p. 292) assert, “before tackling the real issues confronting the real world, we must see each and every one of these models as indispensable but incomplete mental exercises; as necessary errors on the road to the possibility of enlightenment. In short, economics’ Inherent Error cannot be defeated by the power of our reason. Reason can only overcome it by reaching out to, and engaging with, History”.

11 As Panitch and Gindin (2012) notice, the concentration in the uses of new financial instruments rested on the possibility of development sophisticated computers developed by “the quants”, economists, mathematicians and engineers hired by large investment banks such as Goldman Sachs in the 1960s and 1970s (Panitch and Gindin, 2012, p. 175). In the same vein, Lapavistas and Dos Santos (2008) asserts that the Black-Scholes-Merton model rely absolutely on computing power.

As Power (2007, p.71) points out, with the publication, in 1993, of the *RiskMetrics* technology for calculating capital at risk by J.P. Morgan, it is possible to trace the first attempt to standardization of VaR. An entrepreneurial perspective of risk implies the possibility of managing it. VaR represents four changes in organizational culture (Power, 2007, p.75). First, a rational response to volatility in financial markets and the need to manage assets growth; second, a unifying approach regarding organization as a whole entity; third, a respond to the regulatory capital requirement; and fourth, it allows and expansionary potential for abstract risk-metrics in new domains, extending the boundaries of risk transfer to other assets. In short, “VaR is more than a technique, it represents the financialization of governance” (Power, 2007, p. 75), that is, the application of the logic and language of risk-return.

CONCLUSION

Nowadays, risk is a key aspect of society in general. However, as it has been argued, it is more fruitful to ask how and why risk has become a powerful concept than trying to find a single definition of risk. Following Power’s analysis, we can see how in the mid-1990s the emergence of risk management as a popular practice among organizations depicted an important change in how society conceived risk. The convergence between risk calculation and risk management regarding risk as a manageable factor than merely a measurable and calculable entity shows how organizations started changing their governance. However,

the aim of this text was to go further, demonstrating that this idea of calculation and measurement that allows to consider risk a manageable entity can be traced back to the way of dealing with risk in the finances with the use of derivatives in the early 1970s. The use and spreading of the Black-Scholes-Merton model in the option market since 1973 is considered here as a breaking point that established a way of calculating through prices.

It was a complex process that encompasses new approaches in finances, new theories, markets where to apply these, and constant technological innovations that allowed to handle monumental quantities of information. This socio-technical context depicts the way by which economic actors tried to deal with risk. However, the spreading of those techniques was possible due to a broader context that can be called ‘financialization’. Innovations that allowed unthinkable profits, on one hand, and a legitimization of the speculative practice as normal economic process like producing shoes, on the other, enabled a tremendous change in the role of finances in relation to the real economy. Today, we are struggling to understand its consequences not only to economy, but also to everyday life.

One idea can change the way of dealing with something, even more, from a poststructuralist perspective, one idea can create that thing. Therefore, it is important to attempt to understand how that ideas are materialized in the world by practices. Risk management is a practice that rests on the possibility

of calculating, hence, managing risk. However, it is also crucial to deepen in this practices within the organizations. The way of organizing uncertainty nowadays brings to the fore the problem of managerialism in the financialized world (Knafo and Dutta, 2016).

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