

The Cash Value of Performativity in Finance¹

Performativity is a concept that relates to the idea that theory and practice interact and influence each other, a theme which runs throughout this dissertation. Performativity can be described as the idea that a theory or an aspect of a theory such as a model in some form enacts the reality it is intended to describe. This chapter scrutinizes the arguments brought forward on the performativity of finance theory, in particular as presented by Donald MacKenzie.

¹ This chapter is an extension of and builds on Daemen, 2008: Review of Donald MacKenzie An Engine, Not a Camera: How Financial Models Shape Markets, MIT Press. Erasmus Journal of Philosophy and Economics.

5.1 INTRODUCTION

Since the beginning of the millennium there has been renewed strong interest in finance from sociological circles. In Knorr-Cetina and Preda (2005) one can find a collection of contributions and Preda (2007) provides a systematic categorization of various strands of work in what has been labelled “the social studies of finance”⁹⁷. That is to be commended since finance has emerged and developed as the pluralist product of a variety of disciplines (see chapter 1). It would do well, even having grown into a distinct field of its own, to keep an eye out for what is said about its subject matter outside of its own narrow scientific community.

Out of the various sociological approaches to finance, quite a bit of attention was caught by work on so-called performativity, originating in the more general performative turn in economics. Performativity of economic theory—a concept introduced by Michel Callon—has drawn considerable attention in various academic conversations (see MacKenzie, Muniesa and Siu, 2007, for a collection of thoughts on the topic). It implies that “(e)conomics performs, shapes and formats the economy rather than observing how it functions” (Callon, 1998).

Donald MacKenzie took Callon’s idea to heart and attempted to apply it in an empirical way to the case of finance and financial markets. In collaboration with others, he has produced a series of papers (MacKenzie, 2003a, 2003b, 2004a, 2004b, 2005, 2006b, 2007; MacKenzie and Millo 2003, MacKenzie, Buenza and Hardie 2006) culminating in his 2006 book “An Engine, Not A Camera: How Financial Models Shape Markets”. His work has received quite a bit of attention from various corners (see for instance Merton and Bodie (2004), Guala (2007), Mirowski and Nik-Khah (2007), Callon (2007), Mäki (2013), Bernstein (2007), Daemen (2008), Teira (2009)).

That attention was well deserved: “An Engine, Not A Camera” was a wonderful book: simply a good read for anyone with an interest in finance and financial markets. But it also provides a different perspective on finance: a sociological perspective, using the concepts, tools and methods of sociology, whilst not shying away from treating the dominating concepts of the discipline of finance itself.

His analysis is also of philosophical interest as an example of actually looking at “science in action” highlighting the Kuhnian notion of science as socially shaped and influenced. But the most waves have been made by the performativity claim: theory shaping and altering its

97 See also De Goede, 2005.

subject matter: the practice it is intending to describe. Judging by the received attention, it would seem that MacKenzie c.s. in examining the development of option pricing theory in combination with the rise of option markets had produced a veritable Kuhnian exemplar for performativity in economics. Indeed, performativity with regard to finance and financial markets, in particular option theory and the Black-Scholes model, is still considered as one of the landmark cases of the program.

While the initial hype surrounding performativity appears to have disappeared somewhat⁹⁸, a couple of more recent publications (Muniesa, 2014, Boldyrev & Svetlova, 2016) have shown that there is still interest in the concept⁹⁹. Muniesa's contribution being more conceptual, for instance dealing with the discussions that have emerged about what performativity in economics exactly means, while Boldyrev & Svetlova provide a collection of essays which essentially is an update on the status of the performativity program and how it could be used. Both Muniesa and Boldyrev & Svetlova explicitly point out the work of MacKenzie, in particular the 2006 and 2007 books, as seminal with regard to performativity in economics.

It should be obvious from the earlier chapters that I share MacKenzie's attention for the important, interactive role that finance theory has played in the evolving practice of the financial markets. He argues persuasively that the theory has had a deep and profound impact on the practice, a performative impact, by which he means that the theory has helped shape the reality it refers to. However it is worthwhile to scrutinize his claims more closely, both from the angle of finance theory and from a philosophical angle with regard to his arguments for performativity of finance theories.

MacKenzie's most remarkable, and probably most controversial, claim was that the Black-Scholes-Merton option pricing model may have been performative in a very strong, so-called Barnesian, sense. Barnesian performativity entails that practical use of a model or theory shapes the process to which the theory/model refers along the lines of the theory/model. While being careful in his assertion, Barnesian performativity was where, in his own words, his main interest lied. In the 2006 book MacKenzie already admits that it might be hard to make a compelling case for Barnesian performativity. In a recent contribution (Bamford & MacKenzie, 2018) his stance appears to be modified somewhat: the phrase "Barnesian" performativity does not feature at all in the 2018 paper. Instead the focus has shifted to the opposite of Barnesian performativity: counterperformativity¹⁰⁰. Counterperformativity

98 Brisset (2017a) remarks that "The two main architects of a performativist sociology, Michel Callon and Donald MacKenzie, seem to have moved on to other subjects, while the critical power attached to performativity is now firmly rejected by several heterodox economists precisely because of its lack of a critical spirit with respect to economic theories".

99 See for instance Braun (2017), Breljak & Kersting (2017), Brisset (2017a), Kuchař (2017), Nørholm (2018).

100 In addition, the (counter)performativity claims appear to be more nuanced and a bit less far-reaching.

entails that the practice develops contrary to what the theory or model posits. In both cases theory operates as a constitutive mechanism: it creates practice.

I urge caution on making the strong, Barnesian en counterperformativity, claims, especially in the way they were presented in the, still influential, 2006 book. In what follows I will provide two objections. The first one is based on the epistemic content of option pricing theory. Second, some methodological clarification and precision is in order about when talking about theories, models, and formulas and their truth in relation to the nature of economic phenomena.

5.2 CALLON'S PERFORMATIVITY

The concept of performativity as such is not novel. It stems from speech-act theory and was conceived in the 1950s by the philosopher of language J.L. Austin. In brief, a “performative utterance” implies not just saying something, but also performing an action, a so-called illocutionary act. Classic examples are the naming of a ship and the phrases used in wedding ceremonies. By using certain words in a particular context something is accomplished: the ship becomes S.S. Queen Elizabeth; Tom and Jen become husband and wife.

Performativity applied to economics is of much more recent date. Michel Callon introduced it in 1998. As far as I understand it, economic theory being performative implies that it shapes and alters its subject matter: the practice it is intending to describe. Economics is embedded in the economy; they constitute a hybrid forum. That provides a reason why economics is relevant. On the other hand it also implies that it makes no sense to regard economics as a positivist discipline separate from the constructed reality of the economy (Callon, 1998). Which indicates that performativity has affinity with what has been called social constructivism or constructionism (see Hacking, 1999).

What about performativity in economics though: what does it mean for an economic theory, or a theory in general, to be performative? Callon himself sets out to answer that question in “Do Economists Make Markets? On the Performativity of Economics” (2007), edited by MacKenzie, Muniesa and Siu. Callon's starting point is clearly connected to his work in Actor Network Theory (ANT) where one of the core ideas is that of the opposing epistemological views of, on the one hand, science as a mirror of reality, versus, on the other hand, science as an intervening and transforming participant in reality (p. 314)¹⁰¹. For economics that translates in seeing economists either as describers and analyzers who produce concepts,

101 See for instance Callon (1986) and Latour (1999).

theories and tools but stand outside the real economy, or seeing them as inventors and innovators who are immersed in the economy (p. 313).

Callon clearly subscribes to the latter view, while acknowledging that the separation between representation and intervention is difficult and ambiguous. He claims that performativity can deal with both. It can do so because in the performativity view the question of truth and non-truth is displaced by the matter of success and failure (p. 320). What is observed in reality is not so much an irrevocable essence, but that what has been actualized as the outcome of a process that is highly contextual in time and place. History and setting matter, results are temporary, fluctuating and constantly under pressure to change (p. 335).

While Callon's ideas have drawn various criticisms (see for instance Miller, 2002; Fine, 2003), it is not my immediate concern here to address the problematic issues of the performativity thesis in general. My interest lies in the practical applications of the concept with regard to finance and financial markets. Callon himself does not really operationalize the performativity concept in an empirical way, but others have made the attempts to do so. In the 2007 book two efforts stand out: the work done by various researchers on the use of game theory in the FCC auctions, and Donald MacKenzie's work on finance theory in relation to financial markets. The former has primarily drawn attention from the directly involved scientific communities such as (economic) sociology, science studies and philosophy of science (see Guala, 2001, 2007; Nik-Khah, 2006; Mirowski & Nik-Khah, 2007).

MacKenzie's work has managed to attract attention outside of the immediate environment of the performativity conversation as well (see for instance Bernstein, 2007). That could be due to his reputation: MacKenzie has long been recognized as an eminent historian and sociologist of scientific knowledge dating back to his earlier work on statistics and technology. Furthermore, MacKenzie explores a whole body of knowledge containing a number of theories instead of a singular isolated case such as the FCC auctions¹⁰². He knows what he is talking about and he knows how to talk about it. That may explain why his arguments are regarded as persuasive enough to serve as a reference example for performativity (see Guala, 2007, Brisset 2017)¹⁰³.

102 Similar singular isolated case can be found in MacKenzie, Muniesa and Siu (2007), such as the case of the strawberry auctions (Garcia-Parpet, 2007) and the fishery quotas (Holm, 2007).

103 Brisset (2017b) labels MacKenzie & Millo, 2003, and MacKenzie, 2006b, "The two most frequently quoted articles in the literature on performativity"; MacKenzie (2006) is among the most innovative and influential in this field" (Fontaine, 2016, quoted in Brisset, 2017a).

5.3 MACKENZIE'S PERFORMATIVITY

In taking financial economics and financial markets as his case in point to demonstrate the entanglement of theory and practice, MacKenzie chose well. Finance theory and the practice of financial markets display a remarkable proximity in that many theoretical concepts are, in some form, used in practice. The insight that academic theory has deeply influenced the practice of financial markets is not new by any means. Peter Bernstein already stressed this aspect of finance in his classic 1992 historical account of finance and financial markets. It is also reflected in this quote from Stephen Ross (2005) on option pricing theory: "Judged by its ability to explain the empirical data, option pricing theory is the most successful theory not only in finance but in all of economics". Finance theory is part of the practice of financial markets.

A traditional view on science is that theory describes, and refers to, reality, much like traffic in a one-way direction. But the suggestion here is that we find two-way traffic, running in both directions between theory and practice. "The market provided financial economics with their subject matter, with data against which to test their models and with some of at least the more elementary concepts. Financial economics did more than analyze markets, it altered them" (MacKenzie, 2006a, p. 12). This leads MacKenzie to his claim that important parts of theory in finance have a performative trait. That would present an important challenge to traditional ideas about the relation of theory and practice.

Callon's definition is the starting point for MacKenzie: economic theory being performative implies that it shapes and alters its subject matter: the practice it is intending to describe. But then he chooses his own course. MacKenzie distinguishes three different types or degrees of performativity in "An Engine, Not A Camera". First there is the generic form which implies that an aspect (model, theory, data) of economics is used in an economic process: theory is used as a tool or instrument. Second, effective performativity involves practical, difference-making use of such an aspect: theory acts as an engine of change. The strongest variety he distinguishes is Barnesian performativity: practical use shapes the process along the lines of the theory/model. Finally, there also is the possibility of counterperformativity which is the opposite of the Barnesian kind: the practice develops contrary to what the theory or model posits. In the latter two, theory operates as a constitutive mechanism: it creates practice.

According to MacKenzie finance theory has become incorporated in the infrastructure of the financial markets in three ways (2006, pp.250-251):

- Technically, as evidenced by the use of models in trading software. For example, the use of option pricing models is ubiquitous in derivatives markets: in trading and investing itself, but also in regulation, market organization and risk management;

- Linguistically, as seen in the use of originally theoretical terminology as “beta” and “volatility” becoming standard;
- Legitimizing: (financial) economists actively helped, for example, in the advent of derivatives markets, when options and the like were still very much seen as gambling devices¹⁰⁴.

It would seem that the first two qualifications of performativity clearly apply here. Finance models and vocabulary weren't only used as tools, they also changed the entire setting of financial markets. And this change of setting wasn't restricted to the narrow environment of the market itself, it stretched toward the institutionalization of financial markets in modern society. The incorporation of finance theory in the financial markets was consequential or effectively performative. Generic and effective performativity might thus not be really controversial concepts. As mentioned above, the entwining of finance theory and the practice of financial markets has been noticed by others. MacKenzie provides another excellent illustration of this.

5.4 BARNESIAN PERFORMATIVITY AND COUNTERPERFORMATIVITY

While MacKenzie's analysis of generic and effective performativity is interesting in itself, his self-professed main interest lied with the investigation of performativity in the strongest sense (MacKenzie, 2006 pp. 18-21). He dubbed this type “Barnesian” referring to sociologist of science Barry Barnes. MacKenzie's interest in Barnesian performativity is not surprising given his affiliation with the sociology of scientific knowledge (SSK) and the so-called Edinburgh Strong Program in particular. The concept of performativity can be regarded as an expression of the reflexivity thesis which is one of the characteristics of this line of thinking (Hands, 2001). SSK and the Edinburgh Strong Program, spearheaded by Barry Barnes and David Bloor (see for example Barnes, Bloor and Henry, 1996), are part of what is called the social constructivist approach to science (see Hands, 2001)¹⁰⁵. In very general terms the social constructivist agenda posits that facts and events are not fixed and inevitable, that they are a product of history, social forces and ideology (Hacking, 1999 p. 2). Contingency and contextuality are emphasized. For science that translates into the idea that, contrary to the traditional view of science as independently describing and analyzing the phenomena in the

104 Another example would be the Efficient Market Hypothesis which was crucial in establishing the stock market as a credible and stable institution of modern society. Half a century ago stock markets were seen as an unfair playing field full of insider trading and speculation.

105 The before mentioned Actor Network Theory (ANT), spearheaded by Bruno Latour and where Michel Callon has been active in, is another prominent branch of this school of thought.

world out there, science and scientists are very much part of that world: that science and scientists intervene and partly construct that world.

Social constructivism has led to intense debates in the philosophy of science. Constructivist arguments comes in various guises and degrees (see Hacking, 1999 p. 20) not all of which are controversial but the idea of Barnesian performativity is precisely the type of claim that Hacking would call “unmasking”: the extra-theoretical function takes centre stage, undermining and partially stripping an idea of its authority. The traditional view of science is put upside down. Instead of an independent reality which is described by science and scientists, we encounter the idea that it is science and the community of scientists which enact and create reality.

Let’s take a closer look at MacKenzie’s case for Barnesian performativity. In his journey through finance theory and the financial markets, he considers the performative aspects of the main strands of finance theory (see also chapter two): the Modigliani-Miller propositions, the Capital Asset Pricing Model and the Efficient Market Hypothesis. But the best case, in his opinion (2006a, p.256), is made by Option Pricing Theory, for the purpose of his analysis labelled the Black-Scholes-Merton (BSM) model¹⁰⁶.

MacKenzie’s argument starts with two observations. First of all, option prices became more like those postulated by the Black-Scholes model¹⁰⁷: “The fit between the Black-Scholes-Merton model and empirical patterns of option prices was originally only approximate, but it improved rapidly after the model was published and adopted by market practitioners”. The value of this observation is limited though, as MacKenzie himself remarks, because the Chicago options market started in the same year as the publication of the Black-Scholes and Merton papers. But what also happened was that, as the derivatives markets started to flourish, the market conditions started resembling those assumed in the model more and more. Those assumptions were a well-functioning market, i.e. including the possibility of unlimited short selling and the absence of transaction costs. Indeed, what happened was that liquidity got better and better, and trading costs became lower and lower. The originally rather stringent assumptions became less unrealistic as the derivatives business thrived.

106 Strictly speaking this is not correct terminology. Option Pricing Theory is built on the two seminal but separate contributions of, on the one hand, Fischer Black and Myron Scholes (1973) and on the other hand Robert C. Merton (1973). Although “Black-Scholes-Merton” has become somewhat commonplace terminology, Black & Scholes on the one hand, Merton on the other hand, had quite distinct approaches towards tackling the problem of option valuation. This is also acknowledged in Bamford & MacKenzie (2018).

107 It was the Black-Scholes formulation that actually reached the marketplace by means of Black’s “sheets” with option prices, which were used on the trading floor (see also the previous footnote).

So far one could deem this process simply as that of a significant discovery, a genuine breakthrough as MacKenzie himself noted (2006a, p.258), providing a crucial impetus for the derivatives industry which subsequently gathers steam. But he makes a crucial step that leads him to consider this a case of Barnesian performativity. After the 1987 crash, the empirical fit of option prices with the Black-Scholes model deteriorated.

What happened was that the prices of various options on the same underlying asset began to deviate, relative to each other. Each option price contains an implied volatility (i.e. the expected standard deviation of the underlying asset). In the original Black-Scholes model the implied volatility was assumed constant for the various options on the same underlying asset. The price of volatility started to vary with the strike price; options with lower strike prices, which become valuable when the asset price goes down, demanded a relatively higher price than options with higher strike prices. This phenomenon has become known as the volatility skew and is at odds with the original Black-Scholes model which assumes constant volatility.

So now the world of the option markets started resembling the model less, a counterperformative move in MacKenzie's terminology. The emergence of skew tells us one of two things, according to MacKenzie: "if Black-Scholes is the "right" way to price options, then the market has been wrong since 1987; on the other hand, if a pronounced volatility skew in options is "correct", then the market was wrong before 1987". The latter is more plausible, as a case of rational learning, and that makes the Black-Scholes model not a "true" "discovery of what was already there" (2006a, pp. 258-259). What happened in the reality of option pricing, in other words, was a historically contingent process in which the model played a constitutive role.

At some spots in the 2006 book MacKenzie is rather cautious in assigning the label of Barnesian performativity (see for instance p.21). Regarding the BSM model, however, in the end he is quite adamant: "the model was a theoretical innovation, not simply an empirical observation; the relation to the market was not always passive but sometimes active, not always descriptive but sometimes performative, even in the Barnesian sense" (p.259).

In Bamford & MacKenzie (2018) there is no more explicit mentioning of Barnesian performativity, but rather the focus lies on the counterperformative move. The "Barnesian" move is still there though:

Despite the many necessary caveats, we think that it is justifiable to talk of the use of the Black-Scholes model having effects on markets, among which were processes that changed the world in ways that, to put it very crudely, made the world 'more like' the model. A view of performativity, however, that focused only on these processes would be a dangerous

one, and our argument in this article is that it is necessary to give at least equal weight to processes that have the opposite effect, that change the world to make it less like the model's postulates—in other words, counterperformative processes (*ibid.*).

5.5 CONTRA BARNESIAN PERFORMATIVITY

Summarizing MacKenzie, we have a theory which is used by practitioners. Empirical prices started resembling those postulated by the models derived from that theory. But then, after a major event, empirical prices start deviating from the model's prices. This final—counterperformative—move is vital in the argument for Barnesian performativity; the model is not as correct as it was previously thought. Now, in 2018 (Bamford & MacKenzie, 2018) the argument for the counterperformative move is still there, however it is no longer used as a claim for the strongest, Barnesian kind of performativity, but rather as evidence for performativity in general. In addition in terms of appreciation of the model the qualifications are less adamant in the 2018 version.

While that may be a signal of a step back in MacKenzie's ambition, as I see it, there remain problems with his arguments. First, was the model indeed incorrect? Second, and in connection to this, what can we say about models? Does for instance the failure or inappropriateness of an application of theory falsify the entire theory? Third, what do the labels "right" and "wrong" amount to in this context, i.e. the context of finance, economics and the social sciences in general? Finally, if a counterperformative move is evidence for performativity in the strongest sense, doesn't that mean that the claim for Barnesian performativity is still on the table?

Before addressing these issues, a qualification is necessary: MacKenzie's argument is mainly based on the performativity of option pricing theory in the Chicago options markets where mainly stock and stock index options are traded. But option pricing theory is about valuing contingent claims in the broadest sense; stock and stock index options are only examples of the many, many instances of contingent claims. So we need to rephrase the first question slightly: was the Black-Scholes-Merton analysis wrong with regard to the trading of stock and index options; does it matter if the behavior of volatility of those particular assets in the practice differs from what was posited in theory?

The answer is negative because option pricing theory is not a theory which claims to predict, explain, or understand volatility. Six factors affect the price of an option: the current price of the underlying object, the exercise price of the option (i.e. the price where an option becomes intrinsically valuable), the expiration date of the option, the risk-free rate of inter-

est, dividends (if applicable) and the volatility of the underlying object (Hull, 2000). The first five are usually quite readily observable. The sixth one –volatility—quite often is not. That is why volatility is what ultimately determines the value of a contingent claim, since it is the only unobservable variable in the equation: it is the explanans, the explaining variable, not the explanandum, the variable to be explained. The core insight of option pricing theory à la Black-Scholes-Merton is the fact that the value of a contingent claim depends on the variability of the underlying object, i.e. its volatility.

What can we say about volatility? There is an enormous literature on the subject. It is a measure of movement, defined as the standard deviation of returns over a certain period, actual returns that is. As such, actual volatility can only be determined ex-post; it is impossible to observe directly. That means that the unambiguously correct price of a derivative at some point in the past can only be ascertained after the contract has expired. Volatility is the only variable in option pricing theory which is unobservable, which makes its estimation the core problem of derivatives pricing, i.e. the application of option pricing theory.

Any meaningful discussion about volatility is about estimated volatility, not actual volatility. For that is what is entered when calculating the price of a current option in the market. What can be inferred from empirical option prices is the market consensus about those estimates. If one adheres to some form of randomness in the returns on assets, it should become evident how difficult it is to make those estimates or model them.

Fischer Black flat-out refused to postulate or accept any model of volatility: he considered this simply impossible (Mehrling, 2005). And this opinion is widely shared and acknowledged by both academics and practitioners. We can find it in John Hull's classic academic text book "Options, Futures, and Other Derivative Securities" (2000) which is used throughout academia: "one assumption that is clearly not true, is the assumption that the volatility is constant" (p. 446). But we also find it in a book like Sheldon Natenberg's "Option Volatility & Pricing" (1994) with which thousands of derivatives traders, amongst whom myself, have been trained.

Studies have shown that in the long run historical volatility seems to be mean-reverting and displays tendencies of serial correlation, but it is certainly not constant over time as is the assumption in the Black-Scholes-Merton analysis. The biggest problem lies in an enigma that MacKenzie is treating extensively: the shape of the distribution of returns. While in mainstream finance that distribution is assumed to be a normal, Gaussian bell curve, there is ample evidence, that this is not an accurate description (see for example Bernstein, 1992, and more extensively Lo & MacKinlay, 1999). Empirical data suggests that so-called fat-tailed distributions are a more appropriate description of the behavior of stock prices and

indices. However fat-tailed distributions can raise particular modelling problems because they can display infinite variance¹⁰⁸. The (log)normal assumption is made for reasons of simplicity and tractability.

The skew phenomenon, i.e. varying implied volatilities being the market estimate of volatility in various options, is in part a reflection of the actual distribution being different from the distribution assumed in the model. For example, when a market crashes, it tends to start moving more violently; this is reflected in relatively higher prices for options which become valuable when a market falls. Another factor is that demand for such “insurance-type” options by institutional investors is typically higher, especially when expectations of significant events play a role, for example global turmoil or the millennium change. Moreover, in times of turbulence and increased uncertainty liquidity tends to deteriorate, resulting in higher option premiums. Sellers of option, who basically take over the risk from buyers, will demand a higher price; a simple matter of supply and demand¹⁰⁹. There exists substantial evidence that not all volatility arises from moves in the underlying fundamentals or expectations about such moves. Trading activity itself appears to affect volatility, further complicating a meaningful analysis of it.

Finally, why then that the skew phenomenon only emerged after the 1987 crash? MacKenzie partially provides the answer when he talks about the empirical success of the Black-Scholes-Merton model being a historically contingent process. I agree. It took an event of considerable proportions to bring volatility skew on stage. The market simply wasn't aware before; indeed a process of rational learning as MacKenzie suggests. The preeminent problem of trading options is what volatility to plug into whatever pricing model is used. Any observable option price is thus a product of market consensus (built on the estimates of the various market participants), not from an objective form of statistical inference¹¹⁰. People's perceptions change by such momentous events. If a market has crashed, it is likely that their perceived uncertainty, their risk aversion and sense of urgency rise, even in “normal” times. This can

108 The possible accuracy of infinite variance distributions, as put forward by Benoit Mandelbrot, raised widespread concerns amongst economists over the validity of their results, which were based on normal distributions. The issue was settled in a rather pragmatic way by deciding that the assumption of normality was the best workable hypothesis (Mehrling, 2005; MacKenzie, 2006a; Bamford & MacKenzie 2018). The abolition of wild randomness, infinite variance models and the like in favor of the random-walk assumption/lognormal distribution is one of the great and often forgotten stories in economics/econometrics.

109 While skew is usually most visible in out-of-the-money put options which offer protection against a downturn in the market, one can occasionally also witness it in out-of-the-money call options which become more valuable when prices rise sharply. By the end of 1999 in the heyday of the dotcom era certain stocks shot up so violently day after day that each day all call options ended up being in-the-money. New out-of-the-money options would be introduced each day. Driven by huge demand and limited hedging possibilities by spreading, these options were relatively more expensive than in-the money options.

110 Although market participants may, and often do, use historical data to estimate volatility, in the belief—or hope—that history reflects some form of fundamentals.

result in a higher price for insurance, hence a higher implied volatility in option prices¹¹¹. So what did change after the 1987 crash was the method of estimation. It only makes sense that people try to anticipate such events in a way, hence the volatility skew. If they were right to do so can only be determined afterwards; that is the nature of volatility.

The previous paragraphs aim to show that volatility is by no means a straightforward concept. The ambiguity of the distribution of returns is due to an old economic concept, most prominently treated in the 1920s by John Maynard Keynes and Frank Knight: radical uncertainty. As mentioned in chapter four Knight (1921) makes a threefold distinction. First, there exist a priori probabilities: absolute objective chances like those in throwing a fair die. Second, there are statistical probabilities: objective, empirical evaluations of frequency of association. And third, there are estimates: subjective, more or less educated guesses, liable to error. The first two fall under the heading of risk. When we speak of risk, the distribution is known, either a priori or through empirical work, and we can obtain objective, measurable numbers. The third category is that of true radical, non-measurable uncertainty. According to Knight, it is this third category which characterizes the economic domain, or “business” as he calls it, in reality. It is only logical then that financial assets, which are basically claims on “business”, display the same characteristic¹¹².

The consequence is that the familiar mean-variance approach to asset returns can be seriously unrealistic. The economist’s way to deal with this problem is making simplifying assumptions. In the case of the original Black-Scholes-Merton analysis an assumption was made regarding volatility: that it was constant. This assumption followed logically from the log-normal distribution assumed in other dominant models in finance, in particular the Efficient Market Hypothesis and the Capital Asset Pricing Model. The assumption was unrealistic and turned out to be even more unrealistic than perhaps initially thought. But unrealistic assumptions are part and parcel of economic theorizing. As Harrison (1997) notes: “Thus we have an interesting (ongoing) tension between reality and the abstract theoretical ideal. In economics, this tension is not unique to finance, and it may well be an inevitable by-product of modelling”.

The scholars involved in the development of Option Pricing Theory seem to have been aware of this (see also Brisset, 2017b). One can find it for instance in Merton (1975) where he writes about the shortcomings of finance and the “ivory tower nature” of the assumptions. And in 1988 Black published a paper with the telling title “The Holes in Black-Scholes”.

111 This is only a brief, simplistic account of volatility skew. The point is that skew is not a complete mystery. See Brisset, 2017b, for a more detailed treatment of the skew phenomenon and the intricacies of the distribution of returns, which results in a similar conclusion.

112 2006 Nobel laureate Edmund Phelps made the same observation in a op-ed piece in the Wall Street Journal in relation to the 2007-2008 crisis.

But even in the two seminal contributions, Black & Scholes (1973) and Merton (1973), one can already find awareness of the problematic nature of the constant volatility assumption. In Black and Scholes for example: “The valuation formula assumes that the variance rate of the return on the optioned asset is constant. But the variance of return on an option is certainly not constant: it depends on the price of the stock and the maturity of the option” (1973, p.652). Likewise, Merton writes in a footnote that “the expected return is not directly observable” (1973, p. 161) and later remarks that if investors do not agree on the particular variance, they will arrive at different values for the derivative security (1973, p.169).

Recapping the argument: constant, linear volatility is an assumption, not a hypothesis or truth claim in itself. The Black-Scholes-Merton analysis was aimed at explaining option pricing, not the behavior of volatility.¹¹³

5.6 THEORIES, MODELS AND FORMULAS

If a particular model fails in the wake of unexpected events like the 1987 crash or the 2007-2008 crisis, does that discredit the epistemic value of the entire theory to which that model belongs? Cartwright (1999) sees the difference between a theory and a model as residing in the degree of articulation: theory is a large-scale, not necessarily formalized outline, whereas a model gives a more specified formalized depiction. In this case, option pricing theory is the body of knowledge concerned with the valuation of contingent claims in the broadest sense. This includes the familiar options, traded on exchanges or Over-the-counter, on various securities but also for example the valuation of stocks and bonds as contingent claims on a firm, and the valuation of investment opportunities which have a fixed initial price but whose potential payoff is uncertain, the so-called real options. Models then are used to construct a representation of a specific category of contingent claims: for instance the Black-Scholes model for valuation of stock options. Assumptions about the behavior of the underlying entity need to be spelled out here. Finally, a formula provides a formal recipe which can be applied to a particular contingent claim: for example the Black-Scholes pricing formula for a European call option on a non-dividend paying stock. Specific boundary conditions are entered in the model to end up with an unambiguous number: the supposed price of that option.

113 See also Brisset, 2017b, for a similar analysis of the linear volatility assumption in relation to the supposed Barnesian performativity of the Black-Scholes-Merton model. Brisset adds that market prices of options already deviated from the prices which the BSM model would calculate even before the BSM model was actually introduced on the exchanges.

What MacKenzie shows is that a pricing formula which at first seemed to be substantiated by empirical observation, later on did not fit so well. This failure can be traced to a specific assumption in the model. By no means is the whole theory rendered void and the model meaningless. Scientific knowledge is and never has been static. It is not at all unusual for theory to grow and develop, especially theory that is part and parcel of the reality it refers to and even more so in the social sciences. The original findings of Black, Scholes and Merton are not so much about the exact price of options, but they have delivered a mechanism of contingency, key insights on risk, uncertainty and time. Moore and Juh (2006), using data from the Johannesburg Stock Exchange in the period 1908-1922 give evidence that investors had an intuitive notion of derivative pricing, long before the emergence of BSM-style derivatives pricing. Considering this, the results of Black, Scholes and Merton can be regarded as formalization, rather than a discovery of something entirely new. Their findings have been the take-off point for a “revolution”, as Merton Miller (1999a, 1999b) calls it. Miller talks about the original Black-Scholes-Merton analysis as a model-T Ford: outdated and primitive. “Financial engineers have already reduced the original Black-Scholes-Merton formula to Model-T status”. Indeed I am not aware of any derivatives trader today that employs the formula in its original form.

But it has been the take-off point for a research program, in which many various applications have been initiated, and many of the unrealistic assumptions and weak points, the “holes in Black & Scholes”, so to speak, have been tackled and improved upon. The old-timer has turned into a multi-purpose, all-terrain hybrid vehicle, able to deal with all kinds of contingent claims and different boundary conditions¹¹⁴. However, there would not have been such a vehicle, had there not been a Model-T Ford. Odds are that something must have been “right” about it.

Typical of economic models is that they often isolate and idealize a feature (see Mäki, 1992, 2009, 2018). This doesn't need to be a problem if the isolation has an essentialist character: the theory captures a primordial causal mechanism, the model reveals something crucial. As such unrealistic assumptions can be (and often are) part of economic theorizing. But the truth of a model doesn't necessarily reside in the assumptions being realistic, rather it resides in capturing something meaningful. Mäki (2006, 2011) calls this central aspect a truthbearer: the core assertion, given various assumptions, which states a claim to (possible) truth. I have argued that in option pricing theory as conceived by Black, Scholes and Merton this claim to fame is the –somewhat counterintuitive– insight that the price of a derivative crucially depends on the variability of the underlying, its volatility. The fact that volatility

¹¹⁴ See, for instance Merton (1998) and Miller (1999a) .

is assumed linear and constant in the model, which it is most often not in reality, does not make the model wrong.

While it can be argued that isolation and idealization are present in any scientific endeavour, their presence in economic theorizing is particularly relevant. That is because economic phenomena do not behave according to universal, iron laws of nature but often appear to be rather more like tendencies. In economics and the social sciences in general typically many causal factors are simultaneously at work instead of one or a few which can be singled out¹¹⁵.

Dan Hausman, for instance, has argued that economics is a “separate and inexact science” (1992, 2001). In the case of economics, the multiplicity of causes and their interaction gives rise to what he calls inexact laws. This applies to finance as well, I believe. Asset prices reflect certain “objective” fundamentals, but they also reflect subjective expectations and intuitions of a more tentative nature. Despite the ubiquitous presence of formal modelling and quantitative approaches, and boatloads of empirical data to back up claims, finance is still a social science, as is economics. Dating back to Adam Smith’s invisible hand, at the heart of the matter are the unintended consequences of human action and their interactions. Often the outcome of this process is uncertain. This is illustrated in the financial markets where there are no fixed recipes for success: even the best and brightest occasionally take their lumps¹¹⁶.

Making assertions about right and wrong in such a setting is a perilous affair. Yet that is what MacKenzie did in 2006 in making his argument for Barnesian performativity: “if Black-Scholes is the “right” way to price options, then the market has been wrong since 1987; on the other hand, if a pronounced volatility skew in options is “correct”, then the market was wrong before 1987”. That was somewhat surprising for someone with strong affiliation to the Sociology of Scientific Knowledge (SSK) program which devotes much attention on the complicated and reflexive relation between science and reality. MacKenzie 2018 appears to be more nuanced, though the counterperformativity arguments still appear to hinge on some form of truth appreciation.

That the BSM-model is not simply wrong was argued extensively above (see also Brisset, 2017b). As far as it concerns the market being right or wrong it might be fitting to paraphrase a quote from John Maynard Keynes: “markets can remain wrong longer than you can remain solvent”¹¹⁷. It only makes sense that, if “business”, i.e. economic activity, is characterized by

115 This idea traces back to the work of John Stuart Mill (1844) which has had significant impact on many who are active in the field of methodology and philosophy of economics.

116 The case of Long Term Capital Management, mentioned in chapter three and also treated by MacKenzie (2003a, 2006a), remains an excellent illustration of this. See also Lowenstein (2000), Scholes (2000), Stulz (2000), Mehrling (2005).

117 The original quote is that “markets can remain irrational longer than you can remain solvent”.

uncertainty like Knight argued (see chapter four), financial markets where claims on these businesses are traded, are also characterized by that same uncertainty. The upshot is that we can only truly assess “right” and “wrong” in the market a posteriori.

5.7 PERFORMATIVITY: PRAGMATICS AND PERSUASION

Where does that leave performativity in finance; is it a straw man? I think not: performativity is an interesting and useful concept as long as we stay away from the strongest varieties. Those strong claims are ill-advised because attributing right and wrong is ill-suited for the domain of finance where theory and practice intermingle. Bruno Latour has stressed the pointlessness of all kinds of bipolar distinctions such as theory and practice: “The difference between theory and practice is no more a given than the difference between content and context...it is a made divide, unity that has been fractured” (1999). The classic view of science describing and referring to an objective reality, “the world out there” so to speak, has been found lacking. But the strong, Barnesian performativity claim does exactly the same, only in the opposite direction: science creating a beforehand non-existing reality¹¹⁸. The relation between science and the world is not one-way traffic in either direction but rather two-way traffic.

What performativity in its less extreme versions does, is precisely recognize that two-way traffic. It provides us with a viewpoint to deal with the blurred complex reality, in which finance theory and the practice of the financial markets both are located. More specifically, it points at two important aspects of theory: what we can do with it and how that is accomplished.

What we can do with theory is a matter of pragmatic value. That value has been extremely high. There is no theory in finance which has had a bigger practical impact than option pricing theory: “A few academic scribblers have created a huge and still-growing industry” (Miller, 1999b). The trillion dollar derivatives industry hardly existed before Black-Scholes-Merton. But the products did already exist: options, contingent claims have existed for centuries in formal and less formal appearances. And agents using them had some intuitive grasp on their valuation (see Moore and Juh, 2006). If we want to use the performativity vocabulary, then we should talk about effective performativity here. Moreover, such a

118 In addition, Mäki (2013) adds that the expansive use of performativity blurs the difference between constitutive and causal relationships, both of which actually are involved in economics and the economy. MacKenzie clarified his position in 2018: “We are dealing here not with matters of the philosophy of language, not with ‘acts [that] are constituted’ by utterances, but with causal effects” (Bamford & MacKenzie, 2018).

pragmatic reading would seem to be in accordance with Callon's idea of truth and non-truth being displaced by success and failure.

How that practical success is accomplished is above all a matter of persuasion. A theory or model as such, doesn't do anything by itself; it is people who do something with it. And while they may be involved in some capacity, it isn't always the scientists who do something with it. The involvement of scientists can range from mechanism design, as in the FCC auction, to lobbying, as in the case of the Chicago derivatives markets, to active participation. The latter ranges from the various professional money management activities of finance scholars (see chapter three) to Fischer Black selling sheets with option prices to market makers. But it is hardly ever the case that economists actually make markets themselves, to answer the suggestion of the book title of MacKenzie, Muniesa & Siu (2007): "Do Economists make Markets?" A more apt description would be that they are involved in spreading the news. Deirdre McCloskey (2008) has extensively argued for the role of persuasion in economics, including the role of talk, linguistics and communication in the marketplace, in economic life. Theories, models, ideas are used because a sufficient number of people are convinced of their adequacy or usefulness. As Mäki (2013) notices:

Literally speaking, economic theories do not shape the economy. Nor does economic inquiry. People do. In their various roles (as policymakers, students, investors, entrepreneurs, workers, consumers) people are exposed to the results of economic inquiry and they learn, directly or indirectly, about the contents of economic theories, explanations and predictions, and are inspired by them, perhaps by being persuaded by the proponents, so as to modify their beliefs and perhaps their motives. These modified beliefs and motives make a difference to their behavior, and this has consequences for the economy. The flow of these complex connections is a matter of indirect causal influence rather than direct constitution.

To some extent MacKenzie appears to agree with the above when he quotes Judith Butler as saying that "financial theories . . . do not function as sovereign powers or as authoritative actors who make things happen by saying them" (Bamford & MacKenzie, 2018).

The cash value of performativity, I believe, resides in its emphasis on the pragmatic and persuasive roles that theory and models can possess. Those roles are particularly relevant in a situation where theory and practice are entwined, as is the case for finance and financial markets. But the pragmatic and persuasive functions stressed by the performativity approach, are not the only roles that are performed by theory and models; engine and camera, and some more.

5.8 CONCLUSION

The impact of finance theory on financial markets has been used as a premier example of what has become known as the performativity thesis. This case, as most prominently brought forward by Donald MacKenzie, has been scrutinized from two angles. First, from an epistemic viewpoint by looking at the contents of the particular theory itself. Second, from an methodological stance by reflecting on the distinctions between theories, models, and formulas, and their truth content and the nature of economic phenomena.

While MacKenzie provides an excellent illustration of performative aspects of finance theory, he does not present a convincing case for the strongest instances of performativity. The empirical observation of the emergence of volatility skew does not refute option pricing theory, as conceived by Black, Scholes and Merton. It is only proof of one assumption being false and/or unrealistic, an assumption which is and was well-known to be problematic and not to be accurate.

More in general it was argued that the bonds between reality and knowledge of that reality are complex in this case; at the least too complex to simply dish out labels of “wrong” and “right”. Alternatively it was suggested to consider performativity as highlighting pragmatic and persuasive functions that models and theory can have, while at the same time acknowledging that these are not the only, or a priori most important, roles. Such a reading would also appear to be in accordance with the broader literature on performativity, in particular with Michel Callon’s writings.

Perhaps the metaphor of maps can serve to illustrate. Almost all world maps we use are false and/or wrong and/or unrealistic in a great number of aspects. The world is portrayed as flat while it is not. The sizes of the continents, counties, oceans, etc. are often not accurate. Countries and terrains are usually represented in some color scheme just for the sake of distinction. And so on, and so on. Yet we all use these maps. We use them because there are also important things right about them. Ergo, they even affect our actions and enterprises, a performative effect. They capture something that apparently is of great use to us and that we are convinced of that it is of use. I suggest that likewise is the case for option pricing theory.

The performativity thesis can be regarded as an interesting way of looking at science in its workings and its effects on our daily lives. But it should not be regarded as a full-blown, universal statement about finance and economics¹¹⁹.

119 MacKenzie appears to have come to the somewhat the same insight when he discusses the place of performativity and counterperformativity in the analysis of finance in the 2018 paper: “Neither concept is a panacea; both can only be supplements to other forms of enquiry, including more traditional political economy” (Bamford & MacKenzie, 2018).