

Modeling as a Case for the Empirical Philosophy of Science

The Benefits and Challenges of Qualitative Methods

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Abstract In recent years, the emergence of a new trend in contemporary philosophy has been observed in the increasing usage of empirical research methods to conduct philosophical inquiries. Although philosophers primarily use secondary data from other disciplines or apply quantitative methods (experiments, surveys, etc.), the rise of qualitative methods (e.g., in-depth interviews, participant observations and qualitative text analysis) can also be observed. In this paper, I focus on how qualitative research methods can be applied within philosophy of science, namely within the philosophical debate on modeling. Specifically, I review my empirical investigations into the issues of model de-idealization, model justification and performativity.

Keywords Empirical philosophy of science · Qualitative methods of research · Modeling · De-idealization · Model justification · Performativity

1 Introduction

In recent years, the emergence of a new trend in contemporary philosophy has been observed in the increasing usage of empirical research methods to conduct philosophical inquiries. Prinz (2008) speaks about a “methodological revolution” in philosophy and identifies its two main paths: “empirical philosophy” and “experimental philosophy”. According to Prinz’s classification, empirical philosophers rely on findings from other disciplines; for example, philosophers of mind use *secondary data* from cognitive sciences and psychology to develop and analyze (historical) case studies. In contrast, experimental philosophers collect data themselves, primarily applying *quantitative methods* of empirical research (experiments, questionnaires, etc.). In addition to investigations into the nature of intuition

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(Alexander 2012), innateness (Griffiths 2002; Griffiths et al. 2009), free will and moral responsibility (Nahmias and Murray 2010) and certain other philosophical concepts, an interesting and promising movement of “experimental philosophy of science” (Griffiths and Stotz 2008) has recently emerged and attracted attention. Its proponents conduct surveys examining scientific practice in order to enrich the philosophical understanding of scientific concepts (e.g., genes).

This classification, though plausible, implies—in my view—an overly narrow understanding of empirical philosophy, the most characteristic trait of which is reliance on all kinds of empirical methods, i.e., on secondary, quantitative and *qualitative* research. What distinguishes empirical philosophy from other disciplines that apply empirical methods (e.g., psychology or the social sciences) is the fact that the collected data are used to address genuinely *philosophical* problems; thus, empirical philosophy can be defined as a branch of philosophy in which answers to philosophical questions are informed by data that has been collected by means of empirical methods.

The workshop “The empirical philosophy of science—qualitative methods” held in Sandbjerg, Denmark, in March 2012 (whose proceedings will include this paper) was an important step in establishing this understanding of empirical philosophy as based on the application of empirical research. The workshop concentrated on the importance of qualitative methods such as in-depth interviews, participant observations of scientific practices and qualitative text analyses as means of studying scientific practices. This “qualitatively informed” philosophy of science is developing into an important branch of empirical philosophy and provides the focus of this paper. In what follows, I address the value of a qualitative empirical approach for philosophers, as well as its limitations. In particular, I elaborate upon how empirical findings can be used to develop philosophical concepts and be integrated into a philosophical framework.

To this end, I will first address the ongoing discussion on the topic of experimental philosophy. The use of empirical (in this case, quantitative) data for philosophical argumentation is often perceived as radically opposed to the traditional philosophical methodology, i.e., formal logic and conceptual analysis. Consequently, experimental philosophers must justify the application of empirical methods in their philosophical investigations. For the emerging field of the empirical philosophy of science, it might be instructive to review this debate in order to clarify proponents’ position with regard to both the benefits and the limitations of an empirical approach to philosophical inquiry (Sect. 2).

In Sect. 3, I will reflect upon the area within the philosophy of science to which I apply qualitative methods of empirical research, namely *modeling*. I will show that philosophers have already recognized that investigations of modeling increasingly require a re-focusing away from the abstract theoretical issue of what models are and how they relate to theories and the world towards a practice-oriented approach, i.e., an increasing concentration on the concrete functioning of models in scientific investigations as well as in applied fields such as politics and economics. This concrete functioning can best be approached by the application of methods that allow investigation into particular human *practices*, i.e., by the application of

qualitative methods of empirical research (interviews, observations, etc.). In other words, modeling represents a good example of a topic within the philosophy of science in which the usage of these methods could be especially beneficial.

In Sect. 4, I will present three examples from my research, demonstrating how the use of qualitative empirical methods allows me to address genuine philosophical questions from a new perspective. The examples illustrate three cases in which the application of qualitative methods could be especially valuable: first, where there are many theories about the same phenomenon and the discussion needs a new direction; second, where there is an a priori philosophical theory that could or should be challenged from the point of view of empirical results; and, third, where the background mechanism of a certain phenomenon is unclear. My examples relate to the issues of model de-idealization, model justification and performativity. In all of these cases, the philosophical concepts are used as a baseline to be compared with the empirical findings. In Sect. 5, I will briefly summarize the findings of the paper and discuss the major challenges of the application of empirical methods in philosophy.

2 Lessons from Experimental Philosophy

Recently, a movement has emerged within analytic philosophy whose participants have sought to challenge the traditional philosophical approach by using empirical methods that are typical of the social and cognitive sciences. This movement is discussed in the literature under the label of “experimental philosophy” (e.g., Knobe and Nichols 2008). Characteristically, experimental philosophers collect data using primarily quantitative research methods (experiments, questionnaires, etc.).

Based on their empirical findings, these scholars question, for example, the validity of philosophical intuition (e.g., Alexander 2012). Traditionally, philosophical claims are grounded in intuition, which often does not require any further evidence. There is an assumption “that our own philosophical intuitions are appropriately representative”; however, this assumption “turns out to be a *bad* habit. It ignores our tendency to overestimate the degree to which others agree with us.” (ibid., 1). Experimental philosophers claim that “the favorite method of traditional philosophers—asking yourself what everyone thinks—seems hopelessly outdated” (Lackman 2006); philosophers should not guess what other people are thinking, but must instead ask what and how they think. This “asking” implies the application of empirical methods of psychology and other cognitive sciences, including controlled and systematic experiments and surveys. The goal is to study how other people (i.e., non-philosophers) make judgments about philosophical issues—for example, how they form intuitions about knowledge (Weinberg et al. 2001) or references (Machery et al. 2004). Typically, experimental philosophers construct a case, present the case to the laymen (i.e., those who are not philosophically educated) and collect the responses to their questions about the case. The resulting data allow experimental philosophers to challenge the implicit claim made

by professional philosophers that their positions coincide with the views of ordinary people (“common sense”). There is often also a discrepancy between the philosophical and folk intuitions that underlie philosophical assertions, and it can be demonstrated that intuitions vary among cultures. These findings represent the experimental philosophers’ challenge to traditional philosophy and should be taken into consideration.

However, these challenges and results are often neglected or ignored by “traditional” philosophers who doubt that empirical approaches can make any contribution to philosophy. Demonstrating that such a contribution is possible is the primary goal of the new experimental movement, which explains the sustained focus on the question of why empirical data are philosophically interesting. Experimental philosophers constantly stress the relevance of empirical data for philosophical inquiries: “Whereas the ‘experimental’ part of the name refers to the fact that they run studies and collect data concerning folk intuitions, the ‘philosophy’ part refers to the fact that they discuss the various implications these data have for philosophical debates” (Nadelhoffer and Nahmias 2007, 125). I believe that a convincing demonstration that there are indeed important implications of such data for philosophical debates is crucial for the viability of empirical philosophy in general. The field’s proponents must establish the connection between data and theory in the resolution of genuinely philosophical problems. I agree with Prinz (2008) and Griffiths and Stotz (2008) that the difference between disciplines should not be defined by methodology (empirical evidence vs. introspection) but rather by the types of questions asked by the researchers: “Experimental philosophers have not lost their identity as philosophers through their employment of methods traditionally associated with the sciences, because they employ these methods in an attempt to answer philosophical questions” (Griffiths and Stotz 2008, 3).

For example, experimental philosophers have raised concerns about the use of intuition as the basis of philosophical practice. They have demonstrated that different people have different intuitions, and that this diversity depends on many factors, such as gender, age, ethnicity and culture (Alexander 2012, 3). However, it is important to stress that these findings do not merely contribute to the (for *psychologists*, salient) question of what determines the formation of intuitional judgment; in addition, experimental philosophers use their data to address central *philosophical* questions, such as the consequences this diverse range of intuitions may have for the formation of philosophical judgment, the determination of whose intuition is important and whose may be neglected in philosophy and, more generally, how cognition produces or influences philosophical understanding.

The answers to such philosophical questions may be identified when data are related to theories, which is why philosophers should carefully consider how they can meaningfully *combine* formal conceptual analysis and empirical results (Knobe 2007; Griffiths and Stotz 2008; Crupi and Hartmann 2010). In the case of experimental philosophy, there is a variety of stylistic options: “some experimental philosophers use data about ordinary intuition to support philosophical theories; others use such data to better understand the psychological mechanisms that generate such intuitions, while still others gather such data to show that some intuitions may be

too unreliable to support philosophical theories in the first place” (Nadelhoffer and Nahmias 2007, 123). Note that the “theory-data” axis is the focus of all the projects mentioned here.

The primary benefits from empirical (experimental) approaches have thus far included contributions to theoretical concepts, the ability to challenge existing theories and the suggestion of new conceptual directions for research. Some examples of these benefits are described below.

Experiments and questionnaires have been used within experimental philosophy to test hypotheses that were formulated in a purely theoretical context. Moreover, experiments might also lead to new hypotheses; however, “these hypotheses are not put forward in a theoretical vacuum: they might relate to an existing theoretical framework, and so some tinkering may have to be done to fit the new hypotheses (or a modified version of it) into the theoretical framework (or a modified version of it). In short, experimental data may provide guidance and insight in theory-construction in a number of ways” (Crupi and Hartmann 2010, 88). For example, Crupi and Hartmann (2010) demonstrate how philosophers who use empirical data on human cognition and behavior could extend the Bayesian account of confirmation “from basic probability theory to more advanced formal notions with distinct philosophical origins” (ibid., 94). Furthermore, they consider empirical methods to be useful in situations in which there is “a spectrum of different theories” concerning one particular phenomenon (e.g., scientific explanation); in this case, “empirical studies may stir the debate in a new direction” (ibid., 93). The proponents of experimental philosophy of science have stated that empirical data on conceptual diversity within scientific communities could contribute to first-order theories on why certain scientific insights are conceptualized in one particular way and not another (Griffiths and Stotz 2008).

The empirical philosophy of science that is based on the application of *qualitative* methods could claim for itself advantages and benefits similar to those afforded to the field of experimental philosophy. As with experimental philosophy, the “qualitatively oriented” empirical philosophy of science could reveal the discrepancy between *philosophical claims* (which are based solely on intuitive abstraction) and the real practice of knowledge production, as discovered by means of empirical methods. I am convinced that the major contribution of empiricism to philosophy in general lies in its ability to draw attention to the inconsistencies between introspective conceptual analysis and concrete empirical examples, as well as to take such inconsistencies into account theoretically.

The particular advantage of the application of qualitative empirical methods of research, however, is that it allows data—not theory—to take the lead. Usually, philosophical investigations are led by an elaborated argument that is illustrated (confirmed or challenged) by examples from other sciences, or, as in the case of experimental philosophy, quantitative research is conducted that is confirmatory in nature. The central advantage of qualitative methods is their explorative character: Because they are not generally used to test hypotheses that are derived from theory, they are able to produce new insights about phenomena and generate new knowledge (Flick 2009; Silverman 2010). Qualitative methods allow investigation

into the deeper background issues of phenomena that form part of human practices, for example, the various scientific practices of knowledge production. Furthermore, they require that the data speak their own language and are accepted in their own right—not as the confirmation of an argument but as the ultimate focus and point of departure of the (theoretical) inquiry. Even though qualitative methods do not always generate new theories, they actively participate in the development of theories: Situational research that focuses on agents' interpretations permits richer conceptual possibilities and is able to question existing theories more profoundly than quantitative methods can. Thus, the application of *qualitative* methods may leverage the advantages of case-study philosophy as well as those of experimental philosophy, a field that is primarily committed to quantitative methods.

3 Modeling Practice as a Prime Case for the Application of Qualitative Methods

The field within the philosophy of science to which I apply qualitative methods—modeling—could be used as a prime example for the discussion of the benefits of a qualitative empirical approach for philosophers. This is so because the recent philosophical debate on modeling has recognized the need for a deep understanding of scientific practices, e.g., the practices of model creation and model use; to achieve this understanding, qualitative empirical methods could be of particular benefit. The traditional method of epistemology as an a priori, purely analytic investigation has more recently been questioned. More concretely, in addition to the established syntactic and semantic views on models, the practice-oriented focus on the roles and functioning of models in science has slowly but surely crystallized (Morgan and Morrison 1999; Knuuttila et al. 2006). It is significant to note that this theoretical movement has been institutionalized by the Society for Philosophy of Science in Practice.¹ According to its research program, models should be studied as elements of scientific practice and thus the thorough investigation into how models are used and how they function within this practice is crucial for understanding the nature of models, their roles and how they produce explanations or represent phenomena.

Knuuttila (2005a, 2011) attacks the understanding of models as pure representational structures and takes the practice-oriented approach as a point of departure. Her studies demonstrate how an established philosophical stance toward modeling, i.e., representation, can be challenged by, among others things, empirical insights. She argues that models are epistemic artifacts or tools that are purposely created for particular practical goals and are *made* productive by means of human intervention and manipulation within particular scientific practices. The definition of models as epistemic tools situates them as material objects that are not “ready-made” but

¹www.philosophy-science-practice.org.

rather unfolding elements of situational practices (Knuuttila and Merz 2009; Knorr Cetina 1997, 2001; Rheinberger 1997). This theoretical move “means also leaving the conceptual and ideal world of philosophy and entering into the social and material world of human actors, where material objects, usually human-made artefacts, draw together numerous activities and different actors” (Knuuttila 2005b, 48)—the typical field for the application of qualitative research methods.

Within this practice-oriented debate, there is an increased focus on the pragmatic aspects of model use, which allows for the explanation of what makes models useful tools despite their generic character, their inaccuracy, and their tenuous connections with the real world (Morgan and Morrison 1999; Mäki 2009). Attention is paid not merely to models as such (their structure, means and forms of idealization, etc.) but—again—to modeling practices and their contexts: to comprehend the very nature of models, we must take into consideration the analysis of additional factors such as the role of model users and their prospective purposes and narratives. It is important to keep in mind that qualitative methods are designed specifically for the study of human actions with due regard to their specific context.

The natural consequences of this new conceptualization are an increased interest in the material practice of model construction and manipulation and the empirical aspects of this interest. In this context, a clear connection to science and technology studies (STS) can be observed: “...the studies of models by philosophers and STS scholars can be seen to interact with, intersect and complement one another, with the practice-orientation laying out a bridge between the two” (Knuuttila et al. 2006, 4f.). It is important to stress that the philosophy of science and STS do not just share content; there is also a methodological exchange that occurs when the qualitative methods of empirical research, which are typical for STS, gain a stronger hold of the philosophy of science due to the reasons discussed above.

Knuuttila (2005b, 19) asks: “Provided that we accept the results of empirical science as part of philosophical reasoning, should we then stop at that? Is there a place for empirical study in philosophical argumentation? I think that there is, if only because a lot of research done in the philosophy of science proceeds by presenting cases from specific disciplines, taking historical data into account as well. Since I approach representation and modeling from the point of view of scientific practice, I have felt a need to get some grasp of the practices themselves.” Thus, the adaptation of qualitative empirical methods allows for the extension of the philosopher’s methodological repertoire beyond the customary historical examples, and it is appropriate to analyze relevant human actions (e.g., the process of model use), the tacit knowledge of practice participants (e.g., of model users, audience, and model creators) and, particularly, the practice-specific nuances of objects (i.e. models) applications. Qualitative methods are a part of a methodology that enriches philosophical reasoning through the detailed and substantial study of actual scientific practices.

In line with this argument, Alexandrova (2008) also explicitly makes a case for the development of the “practice-based philosophy of science” (p. 384) and implicitly for the necessity of empirical investigations within philosophical inquiries on modeling. Like Knuuttila, she stresses that models are productive tools not

simply because of their nature, but rather that particular efforts are required to make models work and count. Alexandrova develops a case study of a spectrum auction institutional design that is based on the standard models of game theory. Although she does not specifically apply empirical methods, she uses materials that are based on “numerous observations” of the design process (p. 391). This “practice-based” argumentation allows her to demonstrate the insufficiency of existing accounts of model application, i.e., the satisfaction of assumptions by Hausman and the capacity account by Cartwright and to develop her own account. She shows how—in the practice of auction design—theoretical models serve as open formulae: they inform the process of auction design while they deliver “suggestions for developing causal hypotheses that can be tested by experiments” (p. 396). This specific function of models could not have been discovered by pure analytical reasoning, without analyzing the practice of model use.

Alexandrova’s work implicitly suggests the necessity for accurate empirical methods for philosophical investigations in many places: for example, she claims that interactive holism (the interwovenness of causes in economic life) might “be an empirical issue to be selected by looking at economic reality” (p. 392). Additionally, the success of models and scientific progress should be more generally grasped as an empirical context-dependent issue (also Alexandrova and Northcott 2009).

To summarize, models are no longer considered by philosophers to be purely theoretical and abstract entities but rather “dirty” and insecure tools that must be manipulated and “made to count” in situ to produce knowledge; thus, their investigation requires methods that produce insights into the very practice of model creation and model use.

To complete the discussion about the relevance of qualitative methods for the philosophical debate about modeling, it is important to note that as models have increasingly been incorporated into decision-making and regulatory processes in a large variety of applied fields (e.g., politics, economy, particularly financial markets), philosophers are forced to pay attention to the application of models in a number of *non-scientific* practices. Here, the “dirtiness” and materiality of models and their interwovenness with the pragmatic aspects of practice is even more significant. Thus, if models are no longer analyzed as merely instruments of scientific inquiry, philosophers’ a priori analytical knowledge of how science works in general might be argued to be particularly insufficient. If we perceive models as instruments of guiding fateful decisions in flood management, climate science, health care, financial markets, etc., the qualitative empirical examination of the use of models in the different practical arenas of decision-making will become especially necessary. This is what the most recent, relevant studies suggest (e.g., van Egmond and Zeiss 2010; Lane et al. 2011; Gramelsberger and Mansnerus 2012; Svetlova and Dirksen 2014). These studies radically refrain from approaching modeling as a purely scientific endeavor and emphasize that the traditional separation of science—as a place of model construction and development—from the realm of pragmatic model application by practitioners has lessened. Many models are no longer created in the “ivory tower” of science and then transferred as fixed objects to practical fields in

which they are mechanically applied. Rather, recent research on modeling demonstrates that, in many cases, the “scientific life” of models cannot be separated from their “working life” (the term of Erika Mansnerus) external to science-scientific and practical criteria and interests are entwined. This means that scientific aspects may derive from this “working life” or that non-scientific fields—through their involvement in the creation and application of models—become grounded in scientific modeling as a result of which models influence political and economical decisions. Financial models are case in point for this development.

4 Empirical Examples

At this point I would like to demonstrate with concrete examples from my research some of the ways in which qualitative empirical methods can contribute to the philosophy of science. The examples that follow are from my research on the use of modeling in the field of finance.

My studies are based on research that was conducted in several German and Swiss asset management companies and banks. They consist of twenty-eight guided interviews with investment professionals. Most of the interviews took place in person, and only one was conducted by telephone. All of the interviews were recorded and transcribed. The evaluation included coding and categorizing (Corbin and Strauss 2008; Flick 2009; Silverman 2010).

Formal interviews were complemented by a three-month process of participant observation conducted in the portfolio management department of a private Swiss investment bank in Zurich. The application of financial valuation models (e.g., CAPM, BSM and DCF) was of particular interest during the course of the empirical study.

As indicated in the discussion above, empirical methods could be useful in the following cases:

- *Case (1): If many theories about the same phenomenon exist.* This case applies, for example, to the debate on model idealization and de-idealization. Based on my empirical research about the discounted cash flow (DCF) model, I demonstrate that existing accounts of de-idealization do not apply, especially when we are concerned with the not purely epistemic but with the more pragmatic practice of model use, specifically the application of models in financial markets. I show that the pragmatic aspects of model use, such as audience, market context and narrative, play the most prominent role for the analysis in such cases. Based on my field materials, I propose the concept of “de-idealization by commentary,” which is supposed to be an enrichment of the existing theoretical concepts of de-idealization aimed at steering the whole debate in a more pragmatically oriented direction. Note that my conceptualization arises solely from work with empirical materials.

- *Case (2): If there is an a priori philosophical theory that could or should be challenged from the point of view of empirical results.* In my example, I challenge Boumans' idea of model justification (i.e., the "built-in" mechanism of model justification) and propose the "built-out" mechanism, which applies in the case of the DCF model.
- *Case (3): If the background mechanism of a particular phenomenon is not clear.* Here, I bring an example that refers to the issue of performativity—a broadly discussed concept in philosophy and STS that postulates that knowledge, theories, and models not only represent the world but also influence or constitute that which is represented. However, the performativity thesis remains vague as it does not provide a detailed conceptualization and description of how models create or change reality. Empirical investigations help to clarify which forms of performativity can be found in the practice of financial markets and how exactly financial models influence markets.

Before I go deeper into my examples, I would like to highlight the additional function of empirical investigations in philosophy that results from my research. Empirical studies can expand a philosophical framework by bringing into play new examples and opening new fields. As the Society for the Philosophy of Science in Practice formulates, "[o]ur views of scientific practice must not be distorted by lopsided attention to certain areas of science. The traditional focus on fundamental physics, as well as the more recent focus on certain areas of biology, will be supplemented by attention to other fields such as economics and other social/human sciences, the engineering sciences, and the medical sciences, as well as relatively neglected areas within biology, physics, and other physical sciences". In my case, I expand philosophical investigations into the area of financial valuation models. These models have not yet been analyzed by philosophers of science.

As mentioned above, financial modeling delivers an interesting example of the field in which the tight entwinement of the academic efforts and the context of application is especially distinct. This kind of modeling surpasses the pure "doing science"; however, this fact does not justify neglect of financial models by the contemporary philosophy of science. Financial models can be considered to be scientific objects that unfold and acquire different meanings through the various phases of their biographies, including construction, application, further development and, perhaps, later non-existence. Financial models may be developed in fundamental science and then travel to the field of their application in financial markets, or they may be constructed in the practical field of investment banking and then move to fundamental science to be further developed. Here, we are concerned with peculiar practices where scientific knowledge is produced and used in a specific way. Though many phases of the financial models' biographies take place in the academia, the focus is on models' use for the not purely scientific inquiry. Unlike scientists, financial market participants not only look for good descriptions, explanations or predictions of real-world phenomena, but also seek out and develop models that enable them to know how to act in every particular market situation—that is, how to gain positive investment returns and how to manage risks. Those

practices as a specific way of doing and using science deserve an attention of philosophers of science. The pragmatic context of the models' application (actors, their goals and their practices) within financial practices differs greatly from traditional scientific settings and plays the more prominent role. Thus, financial modeling is a field where empirical methods could be of particular help.

Below, I return to my examples through which I outline exactly how qualitative methods can be beneficial for philosophical discussions.

Case (1): De-idealization by commentary

In the first empirical case study (Svetlova 2013), I discuss how a popular valuation model (the discounted cash flow model) idealizes reality and how the market participants de-idealize it in market practice. I contrast the existing accounts of model de-idealization (the relaxing of simplifying assumptions by Hausman (1992) and McMullin (1985) as well as the concretization or re-addition of the excluded unessential properties by Nowak (1980, 1989) and Cartwright (1989) with an in-depth empirical description of how the market participants de-idealize the DCF model in concrete market situations. The empirical research demonstrates a discrepancy between established philosophical accounts and what we find in the markets.

In contrast to Cartwright's view that economic models are generally over-constrained (Cartwright 1999, 2009), I suggest that valuation models are under-constrained. Although, at first glance, the DCF model is based on a theoretically valid causal mechanism that contains just two main factors (i.e., future cash flows and the discount rate), one can demonstrate that those determinant parameters are non-observable and vague and that they depend on the calculation of additional parameters (future sales, growth rates, profit margins, capital expenditures, assumptions about investments, including working capital and fixed investment as well as some macro parameters; this list is not exhaustive). Thus, the DCF model is not based on a narrow clear structure (i.e., it is not over-constrained), and it is not perfectly idealized; rather, the model is too rich and loose.

This observation serves as the reason why, in the financial markets, neither the relaxation of assumptions nor concretization is the prevailing method of de-idealization. It is not a problem of the omission of many relevant causes that should be added back; on the contrary, too many factors are implicitly included in the model. Thus, the introduction of more realistic assumptions in the form of adding back or the making explicit of further factors would increase the model complexity and fail to provide a bridge between the model and the world. In the case of under-constrained models, the implementation of additional factors misses the point. How then are the under-constrained financial models de-idealized and used?

By answering this question, the power of qualitative empirical methods can be seen: they provide an insight into how de-idealization *happens*. Interviews with model users as well as observations of particular examples of model application show that every user specifies his or her own DCF model; i.e., he or she determines the definitive structure and parameters and, hence, completes the process of idealization in situ. Surprisingly, the use of empirical methods also demonstrates that

valuation models are not so actively manipulated and changed as philosophical accounts suggest in the case of scientific models. Rather, once the model has been finalized, the users in financial markets prefer to keep their individual model version stable and avoid the constant changing and adjustment of parameters. They arrive at investment decisions while they compare model results with their own feelings or judgments concerning asset classes or companies. If there is no fit between the numerical model outputs and the investors' qualitative views, then the subjectively perceived inadequacies of the model are corrected in situ, or, as market participants say, they are "overlaid": decisions are guided by investors' views rather than by formal models. In my research, I adopted the "native" empirical term and described the whole process of model de-idealization as "qualitative overlay."

These empirical findings reveal the necessity of accounting for the discrepancy between pre-established philosophical views and the realities of markets. I suggest directing the theoretical work toward the already discussed pragmatics of model use, specifically highlighting the *empirically verified* importance of story-telling as an external factor of model adjustment. Thus, I focus on de-idealization through the commentary of users. Using my empirical materials, I demonstrate how portfolio managers use narrative as a vehicle to express their holistic judgments about the market, the asset class or the company and how those judgments are formed. Narratives include all of the factors and dynamics that have been excluded, not specified or merely implied by the model in the process of decision-making; in this sense, judgment is the instrument of de-idealization.

To summarize, the empirical investigations in this case produced an interesting example of a de-idealization pattern that does not fit with the existing philosophical accounts and even allowed for the development—out of the empirical materials—of a proposal for an alternative account. This account, as suggested in the general discussion about methods above, is not isolated but is rooted in and connected to the existing theoretical (specifically, pragmatic) account of modeling. Furthermore, the empirical findings suggest that there is no unique way to de-idealize models; i.e., there are many possible ways to reduce the distortion between models and reality depending on *the style of model use*. Thus, it would be beneficial to search for further styles of de-idealization and to investigate them empirically.

At the end of the study, I also empirically constructed the hypothesis that the more under-constrained the model is, the larger the role that narrative and other pragmatic elements outside of the model play when the model is applied. This hypothesis is also one of the results of empirical research, and it should be examined on the basis of further case studies from both economic theory and practice.

Case (2): The "built-out" mechanism of model justification

To provide another example of the advantages of empirical methods for the practice of philosophy, I would like to focus on the issue of model justification. I continue with my empirical case study on DCF and ask the following: if the traditional account of de-idealization does not apply, how can we justify the use of valuation models? Can the whole issue be reduced to the application of narrative?

The issue of model justification again allows for the discussion of the discrepancy between the pure philosophy-of-science position and the empirical view. The detailed empirical description of the application of valuation models notes the differences in the justification mechanisms of the purely scientific models on the one hand and the financial models on the other.

The pragmatic accounts of models—e.g., models as “open formulae” or “raw materials” (Alexandrova 2008, 2009), as “epistemic objects” (Boon and Knuuttila 2009; Knuuttila 2011), as “mediators” (Morrison and Morgan 1999) or “boundary objects” (Star and Griesemer 1989)—suggest that there are some useful approaches to the justification of model use in cases where the traditional concepts of idealization and representation do not apply. However, all of the pragmatic accounts mentioned here focus on the *epistemic* function of models. They concentrate on the practice of scientific inquiry and investigate how scientists construct or manipulate models to create institutional design (Alexandrova 2008), draw inferences and reason (Boon and Knuuttila 2009) and provide understanding between various scientific communities (Star and Griesemer 1989). However, because de-idealization takes different forms in financial markets than it does in the scientific context, the justification of model use needs to be analyzed differently; the precise ways in which this process occurs can be determined empirically.

The justification of financial models is not based on a “built-in” mechanism, as is often the case for scientific models (Boumans 1999). Scientific model-builders constantly include elements of theory, data, tacit knowledge and experience directly into the model so that “a trial and error” process goes on “until all the ingredients, including the empirical facts, are integrated” (Boumans 1999, 95; van Egmond and Zeiss 2010, 65). In the case of financial valuation models, there is no such process because the models are, as described above, kept stable. The role of the “built-in” mechanism is undertaken by the ongoing commentary that takes place “outside” of the model and provides for the necessary adjustments to a continually changing, complex world.

This “outside-of-model” adjustment mechanism facilitates investment decisions on the one hand and determines the important but still subordinate role that valuation models play in decision-making on the other. This observation stresses the intermediateness of model influence on markets. Models do not enable decisions by indicating what the correct valuation of an asset is. Market participants often stressed in interviews that they do not trust models’ calculations. As models are constantly overruled in the “outside” process of judgment application, they do not entirely determine the success or failure of decisions. The success of a model and the success of a decision are two different things. The justification of model use lies not in their facilitating correct decisions but in providing guidance in structuring the decision making process; the fulfillment of this function could make even a flawed model successful.

Case (3): The mechanism of performativity

Using empirical methods, I also investigated the mechanism of performativity (Svetlova 2012; Svetlova and Dirksen 2014). The performativity thesis has its roots in philosophy (Austin 1962; Derrida 1988); it has been, however, adapted

and further developed by social scientists studying finance and economics (Callon 1998; MacKenzie 2003, 2006), and recently it was echoed again in some philosophical inquiries on modeling (e.g., Mäki 2011; Knuuttila 2005b).

Performativity is a slippery concept because its mechanism cannot merely be grasped analytically. First of all, it remains unclear if performativity implies that a new phenomenon (a social fact like marriage or market) is created in the process of speaking (“Austrian performativity,” and later, “Barnesian performativity” in the work of MacKenzie (2006)) or whether reality is merely influenced or changed by any kind of speech, theory or model (“generic” or “effective” performativity by MacKenzie (2006)). Furthermore, one finds only vague indications in the literature concerning the question of *how* exactly a speech act or a model (understood as an utterance) create a new state of affairs, i.e., new social facts, in the very moment of utterance or through which channels the influence of, for example, financial models on markets takes place. What is the exact mechanism behind such influence?

Here, again, empirical methods could provide some useful insights. Semi-structured interviews and participant observations demonstrated that there is no evidence of strong (Austrian or Barnesian) performativity in the markets; however, the empirical materials do support notions of generic and also in part effective performativity. The explanation for those findings could be provided through deeper empirical investigations into the practice of model use.

An extensive and rigorous use seems to be the essential pre-condition for a model to become performative: MacKenzie’s example is most often the Black Scholes option pricing model (BSM), which (at least in a period after the introduction of the model) had the effect that the real market prices came to approximate the calculated prices (MacKenzie 2003, 2006). This happened because market participants applied the Black schools model more and more as the basis for their market positions. MacKenzie and Millo (2003, p. 123) describe how the BSM became “a guide to trading”: initial doubts and concerns about the model were overcome so that traders started to believe in the model and to use it to calculate option prices. Thus, the practice of model use is also, in the case of performativity, the crux for understanding how models work and influence reality, and this fact again justifies a commitment to qualitative empirical methods.

An extensive empirical study on the application of various valuation models (e.g., the DCF model, the capital asset pricing model and some option trading models) demonstrated that most examples reveal models’ indirect use as described in the DCF case study in the sub-sections *Case (1)* and *Case (2)*: investors’ judgments overlay the model results which—through this process—can become irrelevant for the decisions. Models, even if applied to value assets, do not have a chance to directly influence markets: as the model results are not strictly incorporated into decisions and, hence, do not enter the market, models’ “utterances” stay irrelevant for what happens in the market. Hence, the actual ways in which models are used in practice prevent them from shaping reality.

Thus, the assumption of the performativity thesis that the relationship between models and reality is straight and direct; i.e., that if models are used, they immediately create or change reality, contradicts the empirical findings. Empirical

investigations suggest that the relationship between models and reality is rather strongly mediated by use in *social context*: the impact of models on the economy is framed by institutional and organizational settings (e.g., the institutionalized decision-making process, the structure of departments, institutional culture with respect to the trust or mistrust of models, etc.). The social context determines whether models are strongly or just “generically” or “effectively” performative. In some institutions, the performative power of models is obviously limited in the process of their application; in some others, models have a more direct and strong influence and, thus, more power to influence markets. I deliver a detailed empirical description of this mechanism for the case of the wealth management department in a large bank in Zurich. Again, I could not have come to those insights about the importance of the mediated institutional context for understanding the performativity mechanism by way of a purely analytical methodology.

5 Conclusion and Open Questions

In this paper, I delivered arguments for the use of qualitative empirical methods in philosophical research and discussed examples to demonstrate how those methods can provide philosophical insights. I showed that qualitative methods are particularly useful if their application aims to contribute to philosophical concepts that are related to practices of any kind, to ways of how people do things. Scientific practices in general and modeling as a particular way of knowledge production are concrete powerful cases in point. Hence, qualitative methods should further be promoted to become established instruments of empirical philosophy of science.

Over the course of writing this paper, however, I noticed how many open questions and unsolved problems still confront any philosophers who choose to commit to the application of qualitative methods. Though the detailed methodological discussion would go far beyond the scope of this paper, I would like to highlight the following problems.

In addition to the rather traditional methodological questions of how to cope with subjectivity and one-case orientation of qualitative methods, empirically oriented philosophers need to address *the peculiarities of methods use in philosophy*: How should an empirical project be designed to facilitate the collection of philosophically relevant data? Are there any peculiarities concerning data analysis? In other words, what are the specificities of a *philosophical* empirical project? I think that—though qualitative methods are explorative in nature—their application in philosophy should be strongly theory-oriented (my examples in the paper support this view). It means that interview guidelines and participant observation concepts should result from a thorough analysis of philosophical texts and intensive work with philosophical notions of topics in question. This was the case in examples 1 and 3 in this paper: the concepts of de-idealization and performativity guided the empirical work. At the same time, the importance of question how models’ results are justified appeared to me during the evaluation of the data; however, this

prompted me to carefully read the relevant philosophical texts on model justification, to identify discrepancies between my empirical findings and philosophical theory and to reflect on those discrepancies. Thus, in contrast to social science where pure, empirically based description is sometimes accepted as an investigation result, philosophical empirical projects are much stronger related to or guided by the theoretical considerations. Still, the question of how exactly one can design a methodologically correct empirical project in philosophy is, in my view, open. This question though needs to be answered carefully by philosophers who are convinced of the benefits of qualitative empirical methods to maintain a voice in the general philosophical discussion. The workshop in Sanbjerg was obviously just the first step of a long journey.

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