

Digital subjectivation and financial markets: Criticizing Social Studies of Finance with Lazzarato

Big Data & Society
July–December 2016: 1–15
© The Author(s) 2016
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/2053951716662897
bds.sagepub.com



Tim Christiaens

Abstract

The recently rising field of Critical Data Studies is still facing fundamental questions. Among these is the enigma of digital subjectivation. Who are the subjects of Big Data? A field where this question is particularly pressing is finance. Since the 1990s traders have been steadily integrated into computerized data assemblages, which calls for an ontology that eliminates the distinction between human sovereign subjects and non-human instrumental objects. The latter subjectivize traders in pre-conscious ways, because human consciousness runs too slow to follow the volatility of the market. In response to this conundrum Social Studies of Finance has drawn on Actor-Network Theory to interpret financial markets as technically constructed networks of human and non-human actors. I argue that in order to develop an explicitly critical data study it might be advantageous to refer to Maurizio Lazzarato's theory of machinic subjugation instead. Although both accounts describe financial digital subjectivation similarly, Lazzarato has the advantage of coupling his description to a clear critique of and resistance to finance.

Keywords

Lazzarato, subjectivation, Social Studies of Finance, financial markets, semiotics, resistance

This planet has – or rather had – a problem, which was this: most of the people living on it were unhappy for pretty much of the time. Many solutions were suggested for this problem, but most of these were largely concerned with the movement of small green pieces of paper, which was odd because on the whole it wasn't the small green pieces of paper that were unhappy. (Douglas Adams, 1992)

In 2014, Dalton and Thatcher launched a series of key research questions for the rising field of Critical Data Studies (CDS). Among these are: “Who are the subjects of ‘Big Data?’” (Dalton and Thatcher, 2014). How are people integrated into data assemblages? If CDS theorists are right to suggest that data are never raw, but always dependent on social contexts that render data meaningful (Kitchin, 2014: 20), then the question arises what kind of subject is needed to cook the data.

Kitchin (2014: 165) shortly hints at Louis Althusser's theory of interpellation to make sense of subjectivation.

In that case we should understand data-driven institutions as ideological state apparatuses that construct data practices to hail individuals by presenting them images of their identity, with which these individuals can identify (Althusser, 2014: 232–272). For instance, the Jawbone Up (Lupton, forthcoming) is a device that measures users' sleep data and presents it to them so that they can ‘discover’ their sleep identity. Although this approach makes sense for some data practices it certainly does not apply to the whole domain. Data practices rarely address individuals' consciousness. Not all data-gathering institutions are, for instance, inclined to share collected data with their subjects (Pasquale, 2015: 9; Tene and Polonetsky,

Institute of Philosophy, KU Leuven, Belgium

Corresponding author:

Tim Christiaens, Institute of Philosophy, Erasmushuis, Leuven 3000, Belgium.

Email: t.christiaens@kuleuven.be



2013: 254–255). As has already been well established, this secrecy leads to normative problems concerning privacy, dataveillance, control creep, etc. (Boyd and Crawford, 2012: 673; Innes, 2001; Kitchin, 2014: 165–183; Lyon, 2014). Of equal importance however is that, even if people are confronted with the data, consciousness rarely figures as a mediator for subjectivation (Cheney-Lippold, 2011: 165). Instead the ‘quantified self’ is a conglomerate of subconsciously extracted data, which is used to subconsciously influence behaviour. Internet companies mostly gather aggregated data on populations in order to construct fluid profiles that govern the conduct of these populations profitably. Big Data is combined with neuromarketing to trigger people subconsciously into buying commodities (Dooley, 2012). Conscious interpellation is neglected in order to “sell to [the pre-conscious] 95% of [the] customer’s brain” (Dooley, 2012: 1).¹

CDS hence requires a specific ontology to grasp these pre-conscious forms of subjectivation. It should avoid theories that take the individual and consciousness as building blocks and look for approaches that bracket the differences between humans and non-humans in data practices in order to understand who the subjects of Big Data are. In this paper I will focus on digital subjectivation in finance, since between 50% and 70% of all trades in equity markets are nowadays conducted through computerized high-frequency trading (Golumbia, 2013: 286), which undermines the assumed subject–object distinction. These devices are more than simple instruments (Pardo-Guerra, 2013: 134). Computerized trading is conducted through the use of algorithms that transform large datasets of information into buying and selling commands. The research question of this paper is consequently: *what philosophical outlook is the most advantageous to think critically about digital subjectivation in financial markets?*

The approach of Actor-Network Theory (ANT) is highly popular within CDS to analyse interactions between human subjects and data (Boyd and Crawford, 2012; Cavanagh, 2013; Dalton and Thatcher, 2014; Lyon, 2014: 8; Ruppert, 2012). Some ANT-researchers, such as Callon, MacKenzie, Knorr Cetina, and Preda, have focused specifically on finance (Völlmer et al., 2009: 625) and constitute a movement called “Social Studies of Finance” (SSF) (De Goede, 2005).² Combining SSF with CDS to study digital subjectivation in financial markets thus seems a fruitful decision (Pardo-Guerra, 2013). Both CDS and SSF argue that non-human agents, like technologically maintained datasets, are not simple representations of reality, but active “producers of the real” (Kitchin, 2014: 23). This field of research is mostly known for its advocacy of the performativity of economics (Callon, 1998; MacKenzie, 2008; MacKenzie et al.,

2007; Svetlova, 2012). According to SSF, economic theories construct markets instead of simply representing them. Financial data are not meaningful in their raw state, but require theory to make sense of them. The financial economy is hence not a neutral testing ground for economic theories, but the result of a battle between different performativities attempting to construct the market (see *infra*). Both CDS and SSF consequently have an interest in developing the performative aspects of the discourses that organize information.

I will however argue that one should proceed with caution when using SSF to develop *critical* theory. ANT has frequently been linked to a “descriptive turn” (Bryan et al., 2012: 305) and criticisms of its lack of critical perspective are numerous (Fuller, 1999; Miller, 2002). That is why I will propose another approach that shares ANT’s ontological commitments, but adds a more clearly critical outlook, namely Maurizio Lazzarato’s theory of machinic subjugation.³

My argument proceeds in five steps. Firstly I will explain Lazzarato’s theory of machinic subjugation in general. Secondly I will introduce SSF’s portrayal of financial markets. Thirdly, I will link both accounts to a shared description of financial machinic subjugation. Afterwards I will show that SSF and Lazzarato can learn from each other when it comes to criticizing finance. Callon shows that the frames used to shape markets produce unintended consequences, but Lazzarato points to three problems missing in the SSF analysis: (1) machinic subjugation in finance leads to a lack of control and political responsibility, (2) it obscures exploitation, since the production of surplus value extends labour time to whenever one performs actions relevant to market prices, and (3) the financial markets trump the possibilities for resistance through the use of debt to keep populations submissive. Lastly I will show that SSF’s idea of developing new performative financial theories cannot adequately address the criticisms Lazzarato levels against finance. This will lead to Lazzarato’s approach to resistance as existential pragmatics.

Lazzarato’s theory of subjectivation: Social subjection and machinic subjugation

According to Lazzarato, subjects are constituted through two different mechanisms: (1) social subjection (*assujettissement sociale*) and (2) machinic subjugation (*asservissement machinique*).⁴

1. Social subjection is Lazzarato’s equivalent for Althusser’s theory of interpellation. Individual identities are constructed in institutions through so-called ‘signifying semiotics’ (Lazzarato, 2014: 39). These are a range of discourses and representations

aimed at individuals' consciousness in order to identify them along the lines of binary categories (male/female, employer/employee, debtor/creditor). Signifying semiotics stabilize social roles within the individual of whom certain behaviour is expected. This is not necessarily a planned endeavour, but the effects remain the same. For instance, in Western societies children learn that blue refers to boys and pink to girls. There is nothing in the colours themselves that justifies such a signification, but it stabilizes the male/female-opposition, because this dichotomy regulates an informal division of social roles. It is only a conventional representation people have learned to identify with.

Social subjection presupposes a firm distinction between subjects and objects. Since signifying semiotics require consciousness as an addressee, only subjects are the targets of signifying semiotics, while objects are tools for instrumental use. It would be ridiculous to expect male behaviour from blue toys because their colour refers to masculinity. Only human subjects are expected to behave according to their social role, since only they can be consciously addressed by signifying semiotics.

2. Apart from signifying semiotics, Lazzarato also posits the existence of 'asignifying semiotics' (Lazzarato, 2014: 80). These are languages that do not communicate representations to conscious individuals, but act directly on the real, such as the codes of computer languages and microchips. This is Kitchin's Big Data as "producers of the real" (Kitchin, 2014: 23) or Cheney-Lippold's "code as architecture" (Cheney-Lippold, 2011: 166), which regulates flows of information on the Internet. Asignifying semiotics do not represent ideas, but issue commands to make the computer's software perform certain tasks. The ones and zeros of binary code are not meaningful representations of a reality outside the code, but directives for the passing or cutting of electrical currents. The effect is not the alteration of reality indirectly through individual consciousness, but the usage of the appropriate 'diagrams' to change existence itself directly by managing the distribution of flows like electrical currents. Lazzarato use of the term 'diagram' refers to Deleuze's reading of Foucault (Deleuze, 2004: 79–80). Deleuze argues that apart from discursive power/knowledge, Foucault also posits the existence of non-discursive power technologies like the panopticon. The latter organize subjects according to particular schemes to make them subservient to the goals of power. For instance, the play of visibility and invisibility in the panopticon organizes the carceral space to produce docile, disciplined bodies. A

flow of unruly criminals is transformed through the spatial organization of the prison into a queue of docile citizens, without these subjects being aware of the influence of space on their behaviour.

Lazzarato claims these asignifying semiotics perform machinic subjugation by pre-consciously encapsulating individuals in a machinic assemblage. For instance, a car driver does not consciously decide how to act. The car does not demand the individual's whole mental investment, but instead uses those parts of the driver's body necessary for the act. Dashboard signals stimulate automatic reactions from the driver. The driver and the car merge into a single assemblage of machinic parts connected to each other. The opposition between subject and object is hence rendered obsolete. The individual is not invested in the process as a conscious whole, but instead some of his body parts function as nodes of input and output to make the human-machine work. The car as human-machine is an assemblage of parts communicating commands to each other through all kinds of asignifying semiotics (electric currents, dashboard lights, nervous impulses, muscular movements, etc.). Full conscious investment is superfluous when the nodes of the human-machine assemblage are well coordinated. As long as nothing out of the ordinary disrupts the coordination of flows, consciousness does not enter the process of driving.

Internet companies like Amazon.com give a socially more relevant example (Terranova, 2010: 156). The algorithms that predict the customer's behaviour run faster than the consumer's nervous system. This means that the computer knows the consumer's desires more quickly than the consumer herself. Amazon can even anticipate and shape this demand with lists of recommended books. Buying books on the Internet is thus not the activity of a subjective agent on an instrumental object, since the latter has just as much agency as the customer in forming her desires. Machinic subjugation is hence a mechanism of subjectivation that disassembles the individual into a multiplicity of machines that can be made compatible to other machines to regulate flows while circumventing consciousness. Amazon shapes digital consumer subjectivity by making the eye and the brain compatible to a website in order to translate flows of product information into flows of attention and money.

SSF and the construction of financial markets

Since the 2000s a number of sociologists, calling themselves SSF, have developed a similar picture of

subjectivation to describe financial markets. Their focus is primarily on computer screen trading, because trading pits, where traders shout orders instead of using computers, have declined in importance (Borch et al., 2015: 8–11; Zaloom, 2010). The average trading room consists of around 200 traders sitting at desks surrounded by up to five computer screens each (Knorr Cetina and Bruegger, 2002b: 393). All traders have their eyes fixed on their screens ready for the next purchase or sale. These screens appresent informational data, ranging from stock prices to Reuters news feeds (Knorr Cetina and Bruegger, 2002a: 163).⁵ Today traders own smartphones to access the market even outside their offices.

Computer screen trading encourages SSF researchers to develop new models of financial trading. For them, markets are not natural spaces where fully formed subjects meet and exchange goods (Callon, 1998: 8). Callon introduces the mechanism of ‘framing’ to account for the construction of markets (Callon, 1998: 16–23). In everyday interactions one rarely calculates monetary costs and benefits, but follows certain social norms and habits. Establishing a market however necessitates that people are disentangled from their non-economic relations and introduced to a new frame that incentivizes them to calculate costs and benefits.⁶ Technologies help in shaping such a space. For instance, Garcia-Parpet (2007: 20–53) has shown how in French strawberry agriculture the building of new auction houses has facilitated the emergence of a network resembling a competitive market. While in the 1980s trade was conducted on the basis of personal relationships between farmers and salespeople, after the auctions were built, farmer–salesman relations were rendered anonymous and prices were made public, which made comparisons possible. This stimulated farmers to act more on the basis of self-interest instead of personal obligations. Technological devices have transformed farmers into “calculative agencies” (Callon, 1998: 3) without them realizing it, just as the panopticon did for prisoners, according to Foucault. Even if the *homo oeconomicus* does not exist independently, technological framings construct a habitat where people behave *as if* they were *homines oeconomici*.

The same mechanism of disentanglement and framing applies to financial markets. These markets do not exist naturally, but are products of technology. To account for this construction SSF researchers posit the performative character of economic theories. Economics is not a camera representing the economy, but an engine creating it (MacKenzie, 2008). They posit two forms of performativity. Firstly economic theories function as self-fulfilling prophecies (Callon, 2007: 321–324). If a rating agency persuades investors that Greece can no longer pay its debts, then interests on Greece’s

loans will go up to such an extent that eventually Greece will really go bankrupt. Analogously to Lazzarato’s social subjection, self-fulfilling prophecies shape reality by hailing people’s consciousness and making them act according to particular beliefs. Callon (2007: 324–326) posits ‘prescription’ as a second form of performativity. Instead of addressing conscious individuals, economic theories can inform the creation of technological devices. Options pricing is, for instance, calculated with the Black-Scholes model, which is a highly complex mathematical equation (MacKenzie, 2003). In order to facilitate its use there are a number of online calculators where traders can simply put in the data and receive the market option price. Most traders cannot perform the calculations behind this formula independently and would hence price options differently without it. These online calculators have hence made themselves true, because everyone relies on them.

The second form of performativity, prescription, is for SSF the most important one. Thanks to technological devices financial markets are “networks [...] analogous with electric circuits” (Völlmer et al., 2009: 621). Information flows run along computers and sometimes pass through human beings in order to be transformed into money flows. This network is regulated through “signals [that] trigger a reaction in the receiver, while being independent of the cognitive properties of the latter” (Völlmer et al., 2009: 621). Just like Lazzarato and his asignifying semiotics, SSF researchers believe that financial markets are regulated through signals that command traders to perform particular forms of behaviour without addressing consciousness. SSF abandons the subject–object distinction: traders are completely immersed in the screen reality where the human subject is no longer the sole agent, but shares agency with computer algorithms. Traders treat the market presented on the screen as a Greater Life-Form (Knorr Cetina and Bruegger, 2002a: 168), not as a simple piece of equipment. This greater being is not an embodied presence one can talk or relate to, but thanks to the responses it gives to individual actions, traders can develop a ‘feeling for the market’ (Knorr Cetina and Bruegger, 2002a: 179). Buying and selling stocks are largely conducted on intuition and split-second decisions where traders strike a connection with the market through the interactions between bodily movements and algorithms informed by economic theories (Borch et al., 2015).

Describing financial machinic subjugation with SSF and Lazzarato

There are some obvious similarities between Lazzarato and SSF: both deny the subject–object distinction in

order to grasp how technology contributes to digital subjectivation without addressing the consciousness of individuals. Asignifying semiotics, or signals, organize flows of information, money, muscular impulses, etc. to construct a human-machine assemblage, or network, organized by diagrams, or performative economic theories. In what follows, I apply Lazzarato's theory of machinic subjugation to SSF's empirical findings on financial markets.

Before we start describing the financial markets as human-machine assemblages, it is however advisory to state the goal of the assemblage. Lazzarato summarizes financial capital accumulation in a classical Marxist vocabulary as the process of generating more money from money (M-M') (Lazzarato, 2015: 144). In a technologically advanced market, profit depends on acceleration of trading interactions, because whoever is the fastest has a time advantage over his competitors (MacKenzie et al., 2012: 288).⁷ For instance, imagine a pension fund wants to sell a large part of its stocks in a particular company. It makes the order, and two seconds later the stocks are sold. This action makes the price go down, because the supply goes up. A high frequency trader can see and sell his own stocks within these two seconds and buy them again afterwards when the price is lower. He has hence generated a secure profit simply thanks to his velocity.

Accelerating markets struggle with the limited amount of information human brains can process and therefore require computers and software devices (MacKenzie, 2009: 13–16, 2015: 663). Attention is a limited resource (Berardi, 97), so if the market wishes to accelerate, it must find ways to efficaciously allocate these scarce amounts of attention. This can be done either by fuelling traders with Prozac and other drugs (Berardi, 2015: 54), or by making transactions easier for the brain to process with computer software. It does not matter whether the trader understands or even believes in the devices he is using, as long as they work. Many traders do not grasp how the Black-Scholes formula or 'base correlations' work, but that is not necessary. The software at their disposal enables them to achieve desired outcomes despite conscious representations.⁸

The end result of this machinic subjugation is a network of flows (muscular movements, nervous impulses, electric currents, etc.) channelled through circuits that can select, distribute and transform these disparate flows into money-flows. If financial traders experience a 'feeling for the market' that they cannot explicitly describe, they are successfully machinically subjugated to the financial assemblage. Their actions at the computer screen distribute and select flows of money in order to generate profits, and the screens produce signals that affect the brain directly to make split-second

decisions. The immersion described by SSF therefore results from the construction of a machinic assemblage where electric flows serve as inputs into the nervous system and nervous impulses are inputs to the computer software.

In this network, the financial trader becomes an assemblage of multiple bodily functions and characteristics shaping, and being shaped by, his environment. He is a vessel of nervous, hormonal and muscular circuits that respond to stimuli. For instance, some researchers study the trader's body through the prism of testosterone levels as an indicator of performance (Terranova, 2010: 164). It turns out that traders who regularly visit prostitutes consequently have higher testosterone levels and outperform other traders. Even sexual inputs can therefore translate into monetary outputs.

Because traders cannot know all market data exhaustively, they are positioned in a state of preinformation, where information is ready at hand, and only the immediately necessary is displayed on the screen (Knorr Cetina and Bruegger, 2002c: 942). One of the most remarkable examples of this state of preinformation is the so-called 'broker's ear' (MacKenzie, 2009: 12). During their own trades, dealers are able to simultaneously overhear telephone conversations of other traders. Traders acquire the skill to select auditive flows according to monetary needs while listening to multiple flows of information at once, selecting and connecting data.

The computers and telephones at the dealer's desk are therefore not mere instruments, but active agents in the assemblage. They select and translate the information the trader needs in order to make instantaneous decisions. They shape the trader's preferences through transmission.⁹ A trader's preference is not the result of a conscious deliberation, as mainstream economics believes, but the effect of a multitude of stimuli penetrating the trader's senses and interacting with his brain. Only by opening up for these stimuli and by developing the right circuits to deal with them, does the trader learn to 'feel the market'. This is not to say that financial traders lack agency completely. A trader who bases his actions too confidently on his fact sheets is called a 'sheet monkey' by his co-workers (MacKenzie, 2009: 21). A certain amount of creativity is thus expected. Furthermore each financial interaction is a situational encounter for which there are no general or pre-established rules (Preda, 2009a: 679–680). Unpredictability is inscribed in the assemblage and consequently hinders the formation of stringent habits. Each node in the system autonomously decides which flows to cut, which to pass, where to pass them, and how they should be translated into other flows. Every step in the machinic assemblage shapes future

possibilities within the network. Just as the trader lacks full control over what happens inside the computer black box, the latter lacks complete control over the trader's decisions.

Traders even converse with each other through asignifying semiotics. Their conversations do not establish communities of meaning, but flows of information and commands. They communicate through heavily coded electronic messages. The results are cryptic, minimalist messages that issue commands instead of conveying meaningful messages. An example of such a conversation is the following (Knorr Cetina and Bruegger, 2002c: 933):

1. FROM GB4L GB4NY GLOB SPOT LDN *
0923GMT 251196 */3377
2. Our Terminal: GBIZ Our user: <name of spot dealer>
3. CHF 10 PLS
4. # <InSD>6267
5. 67
6. # 10 MIO AGREED
7. # VAL 27NOV96
8. # MY CHF TO DIRECT
9. # THANKS AND BYE
10. # #INTERRUPT#
11. #
12. # #END LOCAL#

This message purportedly describes the purchase of 10 million Swiss Francs for US Dollars, but it is clear that this is not a language for poetry. It is stripped of all superfluous representations in order to reach the essentials of the transaction. In the end the messages are nothing more than codifications to command other actors in the assemblage to exchange certain flows for others.

Instead of human control over financial developments, the organization of machinic assemblages depends on diagrams, i.e. rudimentary schemes that organize the different circuits of the assemblage. Just as Foucault's panoptical diagram distributed flows of prisoners in order to make docile bodies, financial diagrams coordinate human and non-human actors to process data in order to accumulate money. The computers and humans making up the network are the nodes where flows are distributed and selected.

The diagrams install rules of conduct, both for the computers and the people involved. For both, the main challenge is how to avoid 'overheating' (MacKenzie, 2009: 17). Some calculations are so energy-consuming for computers that they risk going up in flames, especially in densely populated cities like London, which lack adequate space. Computers are packed in warehouses where they lack suitable room to cool off.

Consequently they are selected on the basis of their 'performance per watt' and technological constraints are put in place to prevent information overload. This conundrum applies analogously to human brains (Berardi, 2012: 68). The brain's capacity to process information is limited, so rules of conduct ensure its smooth operation. The main function of diagrams is therefore "easification" (Berardi, 2012: 100). One example is the informal 'no odd eights rule' in security sales. Until 1997 stock prices were designated in eighths of dollars, so a stock price could be \$32 and 2/8. Traders who used odd eights (1/8, 3/8, 5/8, or 7/8) however were rebuked by their colleagues. Odd eights proved too complicated for the brain to handle on a regular basis, and so it was informally decided not to use them.¹⁰

Diagrams do not have to augment or facilitate cognition, but they need to block the threat of contagion (Lazzarato, 2014: 99). Flows infect machinic assemblages and spread to other assemblages without passing through cognitive, conscious deliberation (Lazzarato, 2004: 112–115). The 'thinking' is outsourced to computers and algorithms calculating the costs and benefits of transactions, but algorithms can be naive (Arnoldi, 2016). They use formulae without critically reflecting whether the assumption of these formulae apply. This situation stimulates uncritical imitation. A conversation between a dealer and his client can instantaneously circulate to other traders or become an element showing up on the newsfeed in the computer. The eventual product of all these contagious actions should be a stable market, but this stability depends on the existence of the aforementioned diagrams regulating communications. This is not a fixed guarantee (Vogl, 2015), since these diagrams are not fixed laws but mostly informal guidelines. If many people suddenly buy a particular kind of stock, this might infect other financial assemblages, even if there is no good reason for valuing that stock more than before. Eventually everyone starts buying, and financial bubbles are created. The same dynamic fosters panic and chaos in cases where someone starts selling (Marazzi, 2008: 128).¹¹

We can summarize the application to financial traders of Lazzarato's theory of digital subjectivation as machinic subjugation as follows. Traders and computers are equally mobilized to generate financial profits. Both are determined by the stimuli coming from other nodes in the assemblage, while they also autonomously and creatively select and transform these stimuli. The financial trader is hence nothing more than a bundle of circuits to distribute flows of money, electricity, testosterone, etc. The communication between different elements in the assemblage does not occur through conscious representations, but through

assignifying semiotics. The human brain cannot keep up in an accelerated market, so some of its activities are outsourced to computers. The communication of men and computers is contagiously organized through diagrams of predetermined rules of conduct to hinder the overheating of the assemblage by imposing standardized schemes for how to select and distribute flows.

Criticizing finance beyond SSF

Up to this point SSF has elaborated similar descriptions of financial markets, but it is remarkably less critical than Lazzarato's reading of finance. "Although [SSF] has provided vivid accounts of the inner life of financial markets, their self-proclaimed view that they provide a better insight into how financial markets and the involved actors work, think and act [...] is overstated" (Lilley and Papadopoulos, 2014: 980). SSF describes finance from a neutral perspective as if there is no political stake involved. Discussions of power and legitimacy are consequently absent from the works of MacKenzie or Knorr Cetina (Golumbia, 2013). Even when MacKenzie et al. explicitly mention legitimacy (2012: 288–291), they reduce this question to citing a debate among traders and economists about whether high-frequency trading is fair to other companies and ensures market stability. They do not touch upon broader legitimacy issues. Similarly Callon (1998: 45) mentions the existence of unequal calculating capacities, but denies the possibility of overcoming this inequality. A third telling example is Pardo-Guerra, who promises "a critical reassessment of finance" (2013: 131), but afterwards only argues that finance is not as disembodied or lacking in spatial configurations as sociologists tend to suggest. This constitutes a critique of the *sociology* of finance, but not of finance itself.

A more charitable reading of SSF points to Callon's conception of overflowing (1998: 16–18, 244–269).¹² Framing entails the construction of a network built on specific, calculative relations. "[It] establishes a boundary within which interactions [...] take place more or less independently of their surrounding context" (Callon, 1998: 249).¹³ This necessitates the disentanglement of non-economic relations, but some of these resist the frame. People for instance disentangle trees from their role in the planetary ecosystem as neutralizers of greenhouse gasses in order to cut them down and refabricate them as tables or chairs. However, this disentanglement remains incomplete, since the role of trees in the environment cannot be suspended. Environmental deterioration is hence the result of an unsuccessful framing attempt. The current economic frame has failed to mobilize its network to avoid all unintentional consequences. According to

Callon (1998: 252), all frames require extensive work to keep the market together and not succumb to overflowing. The solution, for Callon, is to reframe the economy to include these overflowing relations. One could, for instance, impose a tax on cutting trees. That would oblige businesses to include the environmental costs in their calculations.

Callon's critique makes a poignant observation not explicitly formulated in Lazzarato's evaluation of finance. There are however two problems if the critique of finance stops at this level. Firstly, we should ask ourselves whether Callon is really introducing something new. He mentions himself that his concept of overflowing is identical to the economic concept of externality (Callon, 1998: 17). Economists already know that economic actions have unpredictable side effects and that these should be included into theory as much as possible (Callon, 1998: 251). It is consequently unclear what Callon's approach would add to the existing reform proposals.

More importantly however the call for experimentation runs counter to most other critiques of finance. Most commentators argue that a key factor in the volatility of finance is its ungovernability through complexity (Engelen et al., 2012: 367–368). Experimentation and *bricolage* is part of finance's DNA.¹⁴ Devices like excessively complex derivatives and collateralized debt obligations are responsible for finance's ungovernability. It is therefore hard to see how theoretical *bricolage* would help to avoid future crises. Callon's call for reframing to include overflowing relations is hence essentially more of the same instead of a real break with existing practices.¹⁵ Callon lacks a criterion that would select new frames that are less, instead of more, risky than the previous ones.

Lazzarato's approach to financial traders' behaviour allows us to construct a more far-reaching critique of financial markets. The problem is threefold: (1) machinic subjugation makes markets slip out of conscious control and depersonalizes power relations to the extent that no individual can be held responsible for market failures, (2) it obscures exploitation, since the production of surplus value extends labour time to whenever one generates financial profit, and (3) the financial markets promote an undemocratic politics of the possible and trump the possibilities for resistance or reform through the use of debt.

1. When computers conduct most of the actual trading, humans tend to lose control over their own creation (Lazzarato, 2014: 96). Classical economics makes us believe traders are rational *homines oeconomici* calculating their own private interests and promoting, through the invisible hand of the market, the general

good. Machinic subjugation however demonstrates that large parts of the decision-making process are outsourced to computers. Due to the so-called ‘automation bias’ (Pasquale, 2015: 107), people tend to think that computerized trading is more successful than human agency, because the former is faster and smarter than humans. However, this view obscures the fact that, just like human beings, computerized algorithms work on the basis of assumptions that may not always hold (Arnoldi, 2016). A good example of this problem is the Flash Crash of the 6 May 2010. Algorithms make assumptions about the market, but when something unexpected happens, nobody knows how they will react. In a matter of a few minutes stock prices unexpectedly collapsed, only to recover during the next couple of minutes (MacKenzie, 2015: 646–647). Although high-frequency trading was itself not the root cause, it contributed to the market volatility that made the crash so dramatic (Kirilenko et al., 2010). “Traders had programmed split-second algorithmic strategies to gain a competitive edge, but soon found themselves in the position of a sorcerer’s apprentice, unable to control the technology they had developed” (Pasquale, 2015: 131).

When the market crashes, power relations are depoliticized and depersonalized (Lazzarato, 2014: 41). For purposes of acceleration, agency was divested from conscious individuals and conferred to human–machine assemblages through machinic subjugation. The digital subjectivation of traders hence leads to a lack of political responsibility during crises. The greed of financial traders is too simple a criticism, since each particular individual can justifiably shift the blame elsewhere, because he is not personally responsible. Conscious individual decisions are not the cause of financial crises. Rather, the whole human–machine assemblage is to blame. The legal system demands personal responsibility, but human actors lost this capacity by connecting their brains to the financial assemblage. Some market developments are beyond conscious human control. In the end ‘the system’ did it, i.e. the accelerating financial assemblage of human brains and computer algorithms.

Does this mean we should destroy all the machines and return to a more human form of finance? According to Lazzarato (2015: 203–204), Luddism would not constitute a viable solution. Technological machines in themselves are morally neutral, but everything depends on the ‘social machine’ in which they are embedded. Machinic subjugation in itself is unavoidable, but one should pay attention to what kinds of subjectivation it promotes. There is nothing intrinsically wrong with pre-

consciously driving a car, but Lazzarato objects to outsourcing crucial parts of the economy to human–machine assemblages, because the consequences are sometimes catastrophic for large sections of the population.

2. Machinic subjugation facilitates exploitation by obfuscating the borders between labour and production (Lazzarato, 2014: 43–46). The first is the human activity of generating commodities in exchange for a wage, while the second denotes all processes that generate surplus value. Production is hence broader than the labour people are actually paid for (Lazzarato, 2015: 193).¹⁶ The business model of Internet companies like Amazon.com frequently exploits the invisible nature of this distinction (Tene and Polonetsky, 2013: 254–255). Consumers’ machinically subjugated behaviour on the Internet produces data Amazon appropriates to maximize its profits and augment its market value. Amazon is accumulating profit from its clients’ production of data. Buying a book on the web is hence performing unwaged work for Internet companies.¹⁷

We can even make a more radical argument. As one of Knorr Cetina’s and Bruegger’s interviewees says: “What central banks are doing, what the large funds are doing, what the press is saying, what’s happening to the CDU, what the Malaysian prime minister is saying, [the market] is everything” (Knorr Cetina and Bruegger, 2002a: 168). Every piece of information can become an input to the financial system and hence generate profits. When environmental activists protest against a polluting company, they are not only performing a political action, but they are also indirectly generating profits for financial firms speculating on that company’s stock value going down. The financial assemblage exploits the creative cooperation of brains by capturing these activities within the financial machine (Lazzarato, 2004: 142). As ironical as it might seem, this mechanism allows for the incorporation of anticapitalist forms of protest into the financial assemblage as a resource for profits.

3. If we identify democracy with the idea that those subjected to the law should also be its makers (Kalyvas, 2005: 238), then the financial politics of the possible is undemocratic. Since states and populations depend on financial markets for their sustenance, the latter acquire the final decision over the goals and projects of societies. “We do not have the right to participate in the construction of worlds, the elaboration of problems and the invention of their solutions, outside of the already established alternatives” (Lazzarato, 2004: 98, my translation). Financial markets and

rating agencies hold the power to decide which political communities can exist and which are ‘economically unfeasible’. “The hegemony of neoliberal life appears to foreclose the possibility of any alternative mode of existence” (Kiersey, 2011: 36). Since the goal of financial markets is accumulation of capital, there is a bias within this politics of the possible toward the stimulation of financially profitable behaviour and the deterrence of non-profitable endeavours. Even though a university might value the humanities for their own sake, financial imperatives might oblige it to cut the humanities’ budget in order to stay competitive in the university market. Economic considerations might eventually have the final decision-making authority in domains like education, where people would not necessarily want financial terms to define the debate.¹⁸

The reason why financial markets are able to determine the viability of lifestyles is because most individuals and governments are indebted and therefore need a ‘creditworthy’ reputation (Lazzarato, 2012). As the welfare state declined during the 1980s, access to credit was facilitated in order to sustain high consumption, avoid overproduction and stimulate economic growth (Lucarelli, 2010: 125). For Lazzarato, debt is not an obligation emerging from a contract between free and equal individuals, but is from the start an unequal power relation where the creditor can assert his force over the debtor. As long as he is indebted, the latter’s rights are virtually suspended (Lazzarato, 2015: 66).¹⁹ For instance, a debtor’s property rights can be superseded when he fails to reimburse the creditor by evicting him from his home or selling his property at a public auction.²⁰ State violence is called upon to force non-creditworthy individuals to comply (Lazzarato, 2015: 95). We should not even jump to these extreme cases of state enforcement to see that debt entails a disequilibrium of power. Even the peaceful house loan harbours a concentration of risk on the side of the debtor (Mian and Sufi, 2015). When I take a \$100.000 loan for a house that, during an economic crisis, loses its value, I still have to pay \$100.000 plus interests to the bank. The risk of a housing crash is shifted to the debtor’s side of the bargain. During a financial crisis this risk concentration makes it possible for the creditors to demand a change of lifestyle from the debtor, without the former having to reform themselves.

Entering into a dialogue with finance

The presented image of the financial system is ambiguous. On the one hand, it seems like there is no escape

from finance. Every opposition can be integrated into the financial assemblage (Guattari, 2011: 27). On the other hand, the financial markets are fragile: the assemblage balances on a precarious set of diagrams organizing financial flows. Joris Luyendijk (2015), a Dutch journalist, adequately portrays the financial system by comparing it to an airplane during turbulence with the pilot missing: no one is in control and the markets are increasingly volatile. SSF researchers link this instability to the contingency of performativity and overflowing. Markets are organized through economic theories that shape networks by prescribing people to act as if they were *homines oeconomici*. This prescriptive performativity depends on the use of technological devices to install the conditions of possibility of subjectivation. A trader can only become a node in a stream of financial information thanks to the electric circuits that show him the market on a computer screen, the servers that calculate the options pricing using the Black-Scholes formula, the electronic messaging system that lets them communicate swiftly, etc. Prescription is however never complete, since there are always unintended side effects overflowing the frame.

For SSF repoliticizing finance means opening up the black boxes of finance and developing new theories to perform the market differently (De Goede, 2005). SSF envisions economics as a “*Kampffplatz* of contesting performativities” (Bryan et al., 2012: 307). Mainstream economics can thus be replaced with new performativities, for instance stemming from heterodox economics that frame the market differently. “Our work, together with the actors, is to multiply possible worlds through collective experimentations and performances” (Callon, 2007: 352). Lazzarato is however suspicious of theories of resistance based on performativity because these approaches tend to suffer from a democratic deficit. “The performative [...] is always more or less strictly institutionalized such that its ‘conditions’ as well as its ‘effects’ are known in advance” (Lazzarato, 2014: 173). A performative utterance only works when the conditions of felicity are met, which means, among other things, that the speaker must already possess the authority to persuade others (self-fulfilling prophecy) or to determine the make-up of market technologies (prescription). This authority however relies on past power relations and hence fails to introduce a radical rupture in finance. That is why Callon only mentions engineers, accountants, marketers and market professionals as possible agents of new framings (Callon, 2007: 332–333), while MacKenzie only proposes mild reforms, such as better market models built from the bottom up and more attention to the gaps in evaluation procedures (Engelen et al., 2012: 364). SSF focuses on economic professionals to articulate contesting performativities

because the latter have the authority to firmly establish new framings. Ordinary people lack this authority and are hence deprived of the primary means of resistance.²¹

Lazzarato takes another route, not focusing on linguistic performativity, but on the existential attitudes assumed towards speech acts. According to Lazzarato (2014: 178–182), all language is dialogic: every utterance awaits a response, but cannot completely determine what the response will be. The audience remains free to determine its attitude toward the original utterance. For instance, I can say to a friend “What a lovely day outside” expecting to start a mundane conversation, but I cannot guarantee that my friend will pick up on this invitation. He might answer with philosophical murmurings about the ontological status of the weather. Ruptures consequently occur in the attitudes assumed toward speech acts, not in the speech acts themselves. When discussing speech acts, Lazzarato therefore distinguishes between their linguistic aspects and their “existential pragmatics” (2014: 205). Each utterance contains a linguistic meaning and an attitude towards that meaning. When I say “What a lovely day outside” I do not just describe the weather, but I also position myself optimistically toward my current situation. The self is constructed primarily through the self-positioning attitudes towards speech acts, which leaves room for disrupting dominant meanings. For example, the rules of semantics and grammar might set the stage for what can be said or not, but the individual writer still retains the freedom to develop his own writing style. As in the case of Rainer Maria Rilke’s poem about the archaic torso of Apollo, this writing style can even break the rules in order to make new experiences expressible. We all know that an archaic bust cannot look at us, especially when its head is severed. But Rilke opens up new experiences for linguistic expression by writing that the gaze of the statue compels us to change our lives. By playing with the rules of language, poetry can unravel new forms of existence.

In contexts of power, speech acts are only capable of setting the stage without determining the response. Although the speaker’s authority is a necessary condition for a successful speech act, existential pragmatics guarantees that it is not a sufficient condition. Authoritative figures make “representative claims” (Saward, 2010) about society, finance, the economy, etc., but the public’s reactions are fundamentally unpredictable. Protest movements cultivate an existential pragmatics of refusal to reject the speaker’s representative claims, even if they meet all conditions of felicity. Political authorities’ speech acts are contestable, and opposition to the dominant discourses opens up new ways to represent society. This was the inspiration

behind a number of mass movements after the Financial Crisis, such as Occupy Wall Street, the Indignados and Syriza – or earlier the anti-globalisation movement of Seattle (Lazzarato, 2004: 10). Instead of representing austerity as a necessary instrument for the government’s financial health, they rearticulated it as a technique to consolidate inequality. This opens up new routes for action invisible to the dominant narrative (Lilley and Papadopoulos, 2014: 981–984), such as debt relief or healthcare reform. Which discourse is eventually hegemonic, depends on the public’s responses to both utterances. Everyone is free to determine one’s own existential attitudes toward the representative claims of opposing factions, but where speech act theory in itself assumes power inequalities, Lazzarato’s addition of existential pragmatics introduces a resource equally available to all speakers. The authority of the speaker can never completely determine the public’s response because existential pragmatics makes each speech act dialogic.

These examples however stay in the realm of signifying semiotics. They propose new *representations* of society and the economy addressed to consciousness, whereas in the case of financial markets we have seen that asignifying semiotics are of paramount importance. This partly explains the lack of success of the aforementioned protest movements. They were unable to reform the financial sector, because they do not speak the language this sector speaks. The financial machine can run independently of the representations of outsiders. Is there consequently a possibility for asignifying resistant existential pragmatics? Can the financial assemblage be disrupted on an algorithmic level in order to create new forms of existence?

Initiatives like the Yes Men provide examples of non-representational resistance through asignifying semiotics (Terranova, 2010: 166–170). The Yes Men are a protest movement that falsely pose as representatives of major firms and governments by making fake websites, spreading sham petitions, attending business conferences, etc. They feed the financial assemblage badly cooked data by generating false news about morally questionable company and government policies in order to make stock prices go down. For instance, in 2004 they feigned to represent Dow Chemical at a conference where they said the firm would compensate the victims of an environmental disaster caused by Dow Chemical in Bhopal for \$12 billion. This news sounded so ominous to investors that the stock prices of Dow Chemical fell by 4.24% on the Frankfurt stock exchange (CNN, 2004).

These actions constitute not a competing representative claim about the economy, but an asignifying input that disrupts the financial assemblage. Once the Dow Chemical headline appears on the traders’ screens,

it sets in motion a contagious flow that shocks the whole financial market. This opens up new existential possibilities as the Yes Men construct a new identity by positioning themselves against the financial machine. They do not wish to become a part of it or redistribute its profits more equally, but they endeavour to create existences that the financial assemblage no longer dares to capture. Just as the Greek cynics' critique of ancient society was not aimed at unravelling the theoretically true representation of society, but at finding a truthful way of life (Lazzarato, 2014: 236–237), the Yes Men's actions offend the contemporary powers in order to find ways of life beyond finance.

Conclusion

It might seem as if financial traders act as conscious subjects determining their private interest, but in reality their behaviour is predetermined by pre-conscious forms of machinic subjugation. They use their computer just as much as their computers use them. Both communicate through asignifying commands that regulate flows of money, testosterone, electricity, etc. in order to generate profit. What philosophical outlook is in such a context the most advantageous to think critically about digital subjectivation in financial markets? Although SSF is quite popular within CDS, it has only revealed this pre-conscious aspect of financial markets without developing a convincing critique or theory of resistance. SSF argues that overflowing is the main obstacle for contemporary finance and that the construction of new performative frames is the key to reform. It is however unclear how this proposal can limit finance's tendency toward complexity or democratize finance's politics of the possible. Lazzarato's framework raises a number of new concerns: machinic subjugation diverts political responsibility away from traders, sometimes with catastrophic consequences; it obstructs escape attempts from the financial system by turning even oppositional actions into productive resources for financial profits, even though the subjects who performed the work are not compensated for this wealth-production; lastly, financial markets determine which future worlds are possible and which are 'unfeasible' given the current economic conditions. This limits democratic participation and is sustained through debt. Lazzarato overcomes the democratic deficit implicit in SSF's theory of resistance as contesting performativities by focusing on existential pragmatics. Since the financial sector runs primarily on asignifying semiotics and every utterance leaves room for free existential self-positionings thanks to the dialogic nature of language, the financial assemblage can be destabilized by feeding false inputs into the financial assemblage in order to open up possibilities for new ways of life.

Acknowledgements

I thank the researchers from the session on Biopolitics 2.0 at the Mancept Conference in Manchester in 2015 for commenting on a talk I gave based on this article. I also thank Naoise McDonagh, Dr Amin Samman, Jeremy Hovda, the guest editors of *Big Data & Society*, Andrew Iliadis and Federica Russo, together with the anonymous reviewers of the journal, and professor Toon Braeckman for guiding me throughout my research on Maurizio Lazzarato's work.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. These recent developments follow from neurological experiments that show that the brain makes decisions even before one is consciously aware of them. Brain scans show that, when given a puzzle, an individual's brain solves it eight seconds ahead of the individual's conscious decision-making (Dooley, 2012: 1).
2. For an introduction to SSF, see Callon (1998, 2007: 311–354), De Goede (2005) and Völlmer et al. (2009).
3. With this debate between SSF and Lazzarato I do not wish to close off other approaches to digital subjectivation. Deborah Lupton (2016) has, for instance, referred to Donna Haraway's cyborg metaphor and Annemarie Mol's body multiple to conceptualize digital subjectivation and its political implications. I will not comment on these perspectives since they are not immediately relevant to the debate concerning *financial* digital subjectivation.
4. The term 'enslavement' (*asservissement*) is a bit harsh, given the examples Lazzarato discusses, such as driving a car (Lazzarato, 2014: 89). He borrows the concept however from Deleuze's and Guattari's *A Thousand Plateaus*, where it makes more sense (Deleuze and Guattari, 1980: 528–592). For them, machinic subjugation refers first of all to actual slaves in the imperial state. They were cogs in the 'megamachine' of the state, and this system returns today as technology encapsulates human beings.
5. Knorr Cetina and Bruegger get the concept of 'appresentation' from phenomenology. They argue that computer screens don't represent a market already in existence, but constitute it by gathering the disparate data and configuring them into one unified whole.
6. Framing is however always incomplete. That is why Callon stresses the phenomenon of overflowing (see *infra*), or what economists call 'externalities' (Callon, 1998: 244–269). Some relations defy the frame imposed on them and hence remain outside the frame, even though they can have tremendous effects. For instance, the environmental impact of consumption is not explicitly part of the dominant economic theories and yet its importance is

incontestable. In Callon's vocabulary, environmental relations overflow the dominant frame. According to SSF researchers, the main way to account for these forces of overflowing is by rearranging the frame in order to include these overflowing relations. One could, for instance, impose a tax on environmental impact, which would include the environment in business accounting frames.

7. Hardin and Rottinghaus (2015) argue that the basis of profit is hence 'network differentials'. If any market participant is temporally faster or spatially closer to the market, she has a competitive edge over others. This is, for instance, why companies practice 'co-location', i.e. renting buildings next to the trading venue in order to minimize the time-lapse between the order and the exchange.
8. The more developed this software becomes, the more its owner gets an information advantage over others (Pasquale, 2015: 130). Since these algorithms are not made public, it is hard to get into the financial business without insider information. This problem is not solely confined to finance, but bothers the whole Big Data industry (Boyd and Crawford, 2012: 673–674).
9. In the ANT-vocabulary, we would say that the computer screens function not as intermediaries, but as mediators (Jerolmack and Tavory, 2014: 66). The screens do not perfectly represent the original stream of data, but transform the data in the process of translation. The software algorithms make assumptions about how the different stimuli are connected and reflect not just the data, but also these assumptions.
10. A more colourful example is the success of the Korean Hangul writing system in digital technology (Berardi, 2015: 191). It is a mostly phonetic alphabet invented in 15th-century Korea. Thanks to its similar number of consonants and vowels, and its eight basic letters, it is very easy to use and makes digital communication faster. "Koreans type faster on Hangul keyboards, on average, than Westerners who use English keyboards. It was no accident that, in January of 2010, a team of two young Koreans beat 24 other competitors from twelve countries in the LG Mobile Worldcup [sic], an international contest to see who could input text fastest on a cell phone" (Oh and Larson, 2011: 19).
11. As brains and machines become more intertwined through financial assemblages and immaterial labour, the psychopathological metaphors to describe financial markets (depression, irrational exuberance, mania, etc.) become more than simple metaphors. According to Berardi (2012) markets start to exhibit the kind of pathologies we normally only find in deranged individuals. Conversely, digital protocols start affecting the social brain and infect individuals with new kinds of diseases. The psychosphere is polluted by semiotic flows that deterritorialize the meanings that structure human lives (Berardi, 2012: 120; Lazzarato, 2004: 149).
12. Bryan et al. (2012: 307) mention MacKenzie's notion of counterperformativity as a critique of finance. Actions conducted on the basis of a particular economic theory can make this theory less instead of more true (MacKenzie, 2008: 259–260). Economic models such as the Black-Scholes equation have assumptions and the widespread use of these models sometimes undermine these assumptions. This is, for instance, what happened, according to MacKenzie (2008), in the 1987 financial crash. Portfolio insurances based on the Black-Scholes formula assumed only mild randomness of price movements. Because everyone was so convinced of this, price movements fluctuated much more randomly than expected. If people had not used Black-Scholes-informed computers, the crash would have been less severe. MacKenzie however does not connect any negative evaluation of finance or mainstream economic theories to this phenomenon. I would therefore claim that it is not MacKenzie's intention to criticize finance with this concept. Counterperformativity only serves as an explanatory factor for unexpected financial troubles.
13. Callon (1998: 249–250) takes the concept of 'frame' from Erving Goffman, who uses a stage performance as paradigmatic example to explain framing. According to Goffman, to make a stage play understandable a series of interconnected expectations must be constructed. The spectators must know that they should not call the police when Othello murders Desdemona or the actors playing Vladimir and Estragon must not wallow in despair when Godot has still not arrived after weeks of performances. The bracketing of the outside world presupposes the drawing of boundaries between the world of the play and the rest of the world. The frame is the set of assumptions that makes this distinction possible. Similarly economics constructs a separate space where different rules apply. Everyday interactions might function on the basis of personal relationships, but economics delimits a space framed by economic rules of cost-benefit calculations instead.
14. Engelen et al. (2012: 364–366) use Lévi-Strauss' concept of *bricolage* to make sense of the recurring tendency toward unexpected financial crises. Government oversight has become increasingly impractical because financial innovation is largely improvised and differentiated through multiple trading strategies. In such a context every government intervention simply becomes a new opportunity to improvise and to find new loopholes. Patterson (2013: 49–58) provides a good example of this phenomenon. When the US government's Securities and Exchange Commission launched the Regulation National Market System to link different electronic market places, the attempt at rationalization and simplification was perverted by high-frequency traders. They used loopholes in the complex architecture of the system to trick other traders into selling stocks at lower prices and buying them at higher prices than they should have.
15. Callon's call for new performativities is not so strange given Bruno Latour's own appraisal of postenvironmentalism as a way to solve the climate crisis (2011: 17–25). Latour compares the environmental crisis to doctor Frankenstein's abandonment of his monster. Frankenstein's mistake was not to make the monster, but his failure to take care of his own creature. Similarly we should not solve the environmental crisis

- by reducing the human impact on the world, but by managing it more efficaciously. That is why Latour supports postenvironmentalist calls to combat, for instance, greenhouse gasses, not by reducing human emissions, but by counterbalancing emissions with other chemical substances artificially pumped into the air. Callon calls for a similar level of experimentation in solving economic crises. The question is whether we have so much faith in our own imaginative capacities as to ensure that we will not destroy the planet in a vain attempt to save it.
16. The same argument applies to social subjection. According to Lazzarato, social subjection restricts the range of activities that people recognize as deserving remuneration. For example, financial firms frequently deal with over-worked interns (Neate, 2015). These unpaid employees work long hours because they are interpellated by a discourse that professes a life-style of work without sleep. They are told that, in order to become a financial broker themselves, they have to survive the hostile months of internship. They hence produce surplus value for the firm, but are unpaid because it is framed as an ‘opportunity’ instead of ‘employment’. For an overview of the history of financial social subjection, see Preda (2005, 2009b).
 17. Marazzi (2011: 55) calls this the “Google model of production”. Instead of investing in constant or variable capital, firms focus on capturing wealth-production outside the official production process. For instance, the consumer is allowed to book flight tickets online instead of having to go to the airport to buy them. Consequently the firm does not need to pay workers, because the consumer is performing the same work unwaged in exchange for lower prices. This sounds like a fair development, but we mostly do not know this is not a hidden scheme to generate higher profits while the decline in consumer prices remains quite modest (Pasquale, 2015). Eventually the firm with the most consumer data, gathered on the Internet, accumulates the greatest amounts of wealth. This is the reason why Jaron Lanier (2014) proposes that ‘the siren server’ should pay everyone for the data they provide about themselves on the Internet.
 18. It seems as if neoliberalism celebrates difference and innovation (Foucault, 2004: 148). The goal of the *homo oeconomicus* is to turn his human capital into profit, and so he is invited to find his niche market to transform his talents into sources of income. This is, according to Lazzarato (2015: 167), only partly true. One is only free to express one’s unique differences insofar as one can commodify them. Solely those differences that respond to economic demands are praiseworthy. The semiotics with which people can express their identities are all homogenized to the capitalist semiotic of profitability. One can be different as long as there is a market for it. Green hippies buying sustainable goods is fine, but green activists cutting on consumption are not. “The semiotic assembly line not only produces knowledge and information, but also attitudes, stereotypes of behaviour, and submission to hierarchies” (Lazzarato, 2014: 71). The ideology of free enterprise mystifies a politics that determines which subjectivities are possible under current economic conditions and which are impossible.
 19. Lazzarato here misses an opportunity to link his theory of debt to Agamben’s theory of the state of exception (1998). Agamben argues that human rights include people into the legal system, but through exclusion. One can only enjoy human rights as long as one fulfils the criteria for ‘humanity’ and can rely on a state willing to enforce these human rights. According to Lazzarato as well, the debtor is precariously included in the economic sphere, but can always be excluded by his creditors.
 20. Balibar (2013) rightly remarks that every creditor is also someone’s debtor in a financialized economy. Consequently, forgiving another’s debts is not so easy. Financial firms have to insist on the creditworthy behaviour of governments, because otherwise they will be left with untrustworthy investments and go bankrupt to their own creditors. Debt forgiveness is therefore a dubious solution without a more radical reform of the financial system.
 21. Although Callon (1998: 259) mentions that the ones suffering from negative externalities should participate in the negotiations to reframe the network that produced these externalities, he does not connect this finding to the equally valid point of unequal calculating capacities (Callon, 1998: 45; Van Dijk, 2013: 115–117). Not all actors have equal means to participate in negotiations because some have more devices at their disposal to perform the market than others. Economists have computer models, mathematical competences, persuasion skills, etc. to rearticulate economic theories, while ordinary people lack these resources. That is why eventually Callon can only think of engineers, market professionals and similar profiles to reframe the market.

References

- Adams D (1992) *The Hitchhiker’s Guide to the Galaxy*. London: Pan MacMillan.
- Agamben G (1998) *Homo Sacer*. Stanford: Stanford University Press.
- Althusser L (2014) *On the Reproduction of Capitalism: Ideology and Ideological State Apparatuses*. London: Verso Books.
- Arnoldi J (2016) Computer algorithms, market manipulation and the institutionalization of high frequency trading. *Theory, Culture & Society* 33(1): 29–52.
- Balibar E (2013) The politics of debt. *Postmodern Culture* 23(3).
- Berardi F (2012) *The Uprising: on Poetry and Finance*. Los Angeles, CA: Semiotext(e).
- Berardi F (2015) *Herous: Mass Murder and Suicide*. London: Verso Books.
- Borch C, Hansen KB and Lange A-C (2015) Markets, bodies, and rhythms: A rhythmanalysis of financial markets from open-outcry trading to high-frequency trading. *Society and Space* 33(6): 1080–1097.
- Boyd D and Crawford K (2012) Critical questions for Big Data: Provocations for a cultural, technological, and

- scholarly phenomenon. *Information, Communication & Society* 15(5): 662–679.
- Bryan D, Martin R, Montgomerie J, et al. (2012) An important failure: Knowledge and the financial crisis. *Economy & Society* 3: 299–315.
- Callon M (1998) An essay on framing and overflowing: Economic externalities revisited by sociology. In: Callon M (ed.) *The Laws of the Market*. Oxford: Blackwell, pp. 244–269.
- Callon M (1998) Introduction: The embeddedness of economic markets in economics. In: Callon M (ed.) *Laws of the Market*. Oxford: Blackwell, pp. 1–57.
- Callon M (2007) What does it mean to say that economics is performative? In: MacKenzie D, Muniesa F and Siu L (eds) *Do Economists Make Markets?: On the Performativity of Economics*. Princeton, NJ: Princeton University Press, pp. 311–354.
- Cavanagh A (2013) Imagining networks: The sociology of connection in the digital age. In: Orton-Johnson K and Prior N (eds) *Digital Sociology: Critical Perspectives*. London: Palgrave MacMillan, pp. 169–185.
- Cheney-Lippold J (2011) A new algorithmic identity: Soft biopolitics and the modulation of control. *Theory, Culture & Society* 28(6): 164–181.
- CNN (2004, December 3) *Bhopal hoax sends Dow stock down*. Available at: <http://edition.cnn.com/2004/WORLD/europe/12/03/bhopal.hoax/index.html?s=PM:WORLD> (accessed 14 September 2015).
- Dalton C and Thatcher J (2014, May 18) *What does a Critical Data Studies look like, and why do we care? Several points for a critical approach to 'Big Data'*. Available at: <http://societyandspace.com/material/commentaries/craig-dalton-and-jim-thatcher-what-does-a-critical-data-studies-look-like-and-why-do-we-care-seven-points-for-a-critical-approach-to-big-data/> (accessed 14 September 2015).
- De Goede M (2005) Resocializing and repoliticizing financial markets: Contours of Social Studies of Finance. *Economic Sociology Newsletter*, May: 19–28.
- Deleuze G (2004) *Foucault*. Paris: Editions de Minuit.
- Deleuze G and Guattari F (1980) *Mille Plateaux*. Paris: Editions de Minuit.
- Dooley R (2012) *Brainfluence: 100 Ways to Persuade and Convince Consumers with Neuromarketing*. New York, NY: Wiley.
- Engelen E, Ertürk I, Froud J, et al. (2012) Misrule of experts? The financial crisis as elite debacle. *Economy & Society* 41(2): 360–382.
- Foucault M (2004) *La Naissance de la Biopolitique*. Paris: Gallimard.
- Fuller S (1999) Why Science Studies has never been critical of science: Some recent lessons on how to be a helpful nuisance and a harmless radical. *Philosophy of the Social Sciences* 1: 5–32.
- Garcia-Parpet M-F (2007) The social construction of a perfect market: The strawberry auction at Fontaines-En-Sologne. In: MacKenzie D, Muniesa F and Siu L (eds) *Do Economists Make Markets?: On the Performativity of Economics*. Princeton, NJ: Princeton University Press, pp. 20–53.
- Golumbia D (2013) High-frequency trading: networks of wealth and the concentration of power. *Social Semiotics* 23(2): 278–299.
- Guattari F (2011) The vertigo of immanence. In: Alliez E and Goffey A (eds) *The Guattari Effect*. London: Continuum, pp. 25–39.
- Hardin C and Rottinghaus AR (2015) Introducing a cultural approach to technology in financial markets. *Journal of Cultural Economy* 8(5): 547–563.
- Innes M (2001) Control creep. *Sociological Research Online* 6(3). Available at: <http://www.socresonline.org.uk/6/3/innes.html> (accessed 27 July 2016).
- Jerolmack C and Tavory I (2014) Molds and totems: Nonhumans and the constitution of the social self. *Sociological Theory* 32(1): 64–77.
- Kalyvas A (2005) Popular sovereignty, democracy, and the constituent power. *Constellations* 12(2): 223–244.
- Kiersey N (2011) Everyday neoliberalism and the subjectivity of crisis. *Journal of Critical Globalisation Studies* 4: 23–44.
- Kirilenko A, Kyle A, Samadi M, et al. (2010, October 1) The Flash Crash: The impact of high frequency trading on an electronic market. Available at: http://www.cftc.gov/ucm/groups/public/@economicanalysis/documents/file/occe_flashcrash0314.pdf (accessed 13 September 2015).
- Kitchin R (2014) *The Data Revolution: Big Data, Open Data, Data Infrastructures and their Consequences*. London: SAGE Publications.
- Knorr Cetina K and Bruegger U (2002a) Traders' engagement with markets. *Theory, Culture and Society* 19: 161–185.
- Knorr Cetina K and Bruegger U (2002b) Inhabiting technology: The global lifeform of financial markets. *Current Sociology* 50(3): 389–405.
- Knorr Cetina K and Bruegger U (2002c) Global microstructures: The virtual societies of financial markets. *American Journal of Sociology* 107(4): 905–950.
- Lanier J (2014) *Who Owns the Future?* New York, NY: Simon & Schuster.
- Latour B (2011) Love your monsters. In: Schellenberger M and Nordhaus T (eds) *Love your Monsters*. Oakland: Breakthrough Institute, pp. 17–25.
- Lazzarato M (2004) *Les Révolutions du Capitalisme*. Paris: Les Empêcheurs de Penser en Ronde.
- Lazzarato M (2012) *The Making of the Indebted Man*. Los Angeles, CA: Semiotext(e).
- Lazzarato M (2014) *Signs & Machines*. Los Angeles, CA: Semiotext(e).
- Lazzarato M (2015) *Governing by Debt*. Los Angeles, CA: Semiotext(e).
- Lilley S and Papadopoulos D (2014) Material returns: Cultures of valuation, biofinancialization and the autonomy of politics. *Sociology* 48(5): 972–988.
- Lucarelli S (2010) Financialization as biopower. In: Fumagalli A and Mezzadra S (eds) *Crisis in the Global Economy*. Los Angeles, CA: Semiotext(e), pp. 119–138.
- Lupton D (2016) Digital companion species and eating data: Implications for theorising digital data-human assemblages. *Big Data & Society* 3(1): 1–5.

- Lupton D (Forthcoming) You are your data: Self-tracking practices and concepts of data. In: Selke S (ed.) *Lifelogging: Theoretical Approaches and Case Studies about Self-tracking (Provisional Title)*. New York, NY: Springer.
- Luyendijk J (2015) *Dit kan niet waar zijn: onder bankiers*. Amsterdam: Atlas Contact Uitgeverij.
- Lyon D (2014) Surveillance, Snowden, and Big Data: Capacities, consequences and critique. *Big Data & Society* 1(1): 1–13.
- MacKenzie D (2003) An equation and its worlds: Bricolage, exemplars, disunity and performativity in financial economics. *Social Studies of Science* 33(6): 831–868.
- MacKenzie D (2008) *An Engine, Not a Camera: How Financial Models Shape Markets*. Cambridge: MIT Press.
- MacKenzie D (2009) *Material Markets*. Oxford: Oxford University Press.
- MacKenzie D (2015) Mechanizing the Merc: The Chicago Mercantile Exchange and the rise of high-frequency trading. *Technology and Culture* 56: 646–675.
- MacKenzie D, Buena D, Millo Y, et al. (2012) Drilling through the Allegheny Mountains: Liquidity, materiality and high-frequency trading. *Journal of Cultural Economy* 5(3): 279–296.
- MacKenzie D, Muniesa F and Siu L (2007) *Do Economists Make Markets?: On the Performativity of Economics*. Princeton, NJ: Princeton University Press.
- Marazzi C (2008) *Capital and Language*. Los Angeles, CA: Semiotext(e).
- Marazzi C (2011) *The Violence of Financial Capitalism*. Los Angeles, CA: Semiotext(e).
- Mian A and Sufi A (2015) *House of Debt: How They (and You) Caused the Great Recession, and How We Can Prevent It from Happening Again*. Chicago, IL: University of Chicago Press.
- Miller D (2002) Turning Callon the right way up. *Economy and Society* 31(2): 218–233.
- Neate R (2015, June 17) Goldman Sachs restricts intern workday to 17 hours in wake of burnout death. Available at: <http://www.theguardian.com/business/2015/jun/17/goldman-sachs-interns-work-hours> (accessed 19 June 2015).
- Oh M and Larson J (2011) *Digital Development in Korea: Building an Information Society*. London: Routledge.
- Pardo-Guerra JP (2013) Trillions out of ones and zeros: The sociology of finance encounters the digital age. In: Orton-Johnson K and Prior N (eds) *Digital Sociology: Critical Perspectives*. London: Palgrave MacMillan, pp. 125–138.
- Pasquale F (2015) *The Black Box Society*. Cambridge: Harvard University Press.
- Patterson S (2013) *Dark Pools: The Rise of A.I. Trading Machines and the Looming Threat to Wall Street*. New York, NY: Random House Business Books.
- Preda A (2005) The investor as a social figure of global capitalism. In: Knorr Cetina K and Preda A (eds) *The Sociology of Financial Markets*. Oxford: Oxford University Press, pp. 141–162.
- Preda A (2009a) Brief encounters: Calculation and the interaction order of anonymous electronic markets. *Accounting, Organizations & Society* 34: 675–693.
- Preda A (2009b) *Framing Finance: The Boundaries of Markets and Modern Capitalism*. Chicago, IL: University of Chicago Press.
- Ruppert E (2012) The governmental topologies of database devices. *Theory, Culture & Society* 29(4/5): 116–136.
- Saward M (2010) *The Representative Claim*. Oxford: Oxford University Press.
- Svetlova E (2012) On the performative power of financial models. *Economy and Society* 41(3): 418–434.
- Tene O and Polonetsky J (2013) Big Data for all: Privacy and user control in the age of analytics. *Northwestern Journal of Technology and Intellectual Property* 11(5): 239–273.
- Terranova T (2010) New economy, financialization and social production in the Web 2.0. In: Fumagalli A and Mezzadra S (eds) *Crisis in the Global Economy*. Los Angeles, CA: Semiotext(e), pp. 153–170.
- Van Dijk J (2013) Inequalities in the network society. In: Orton-Johnson K and Prior N (eds) *Digital Sociology: Critical Perspectives*. London: Palgrave MacMillan, pp. 105–124.
- Vogl J (2015) *The Specter of Capital*. Stanford, CA: Stanford University Press.
- Völlmer H, Mennicken A and Preda A (2009) Tracking the numbers: Across accounting and finance, organizations and markets. *Accounting, Organizations & Society* 34: 619–637.
- Zaloom C (2010) *Out of the Pits: Traders and Technology from Chicago to London*. Chicago, IL: University of Chicago Press.

This article is a part of special theme on Critical Data Studies. To see a full list of all articles in this special theme, please click here: <http://bds.sagepub.com/content/critical-data-studies>.