

Insider Information: The Ethicality of the High Frequency Trading Industry

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This study explores the ethical perceptions of employees in the financial industry. Focusing on the high frequency trading (HFT) industry, it analyses a series of interviews with HFT employees (managers, computer programmers and traders). It shows that regulations and firm rules profoundly affect HFT practices. However, they do not provide employees with answers for their ethical questions. To judge the ethicality of HFT, employees choose reference stakeholder groups and assess the way HFT impacts them. The perception that HFT has a positive effect on stakeholder groups is associated with moral satisfaction, whereas the perception that it has a negative effect is related to emotional detachment, sense of meaninglessness and turnover intent. The high variance in employees' choices of stakeholder reference groups emphasizes the subjectivity and uncertainty that HFT ethicality entails. Therefore, this study suggests that the financial industry may lack moral leadership. It makes empirical and theoretical contributions to the 'business ethics as practice' theory and examines management and regulatory applications.

Introduction

Imagine that you were a high frequency computer programmer. You love many aspects of your job: your firm provides you with state-of-the-art computer. You consider it an exhilarating challenge to write programs which buy and sell stocks much faster than the blink of an eye. And your salary is good enough to allow you and your family a comfortable standard of living. As ethical guidelines you are provided with trading regulations, with which your programs must comply; the firm's code of conduct, stating that you should always serve the best interests of your clients; and the promise of your boss and high frequency trading lobby groups, that you provide liquidity to the financial market. Would that be enough for you to feel morally satisfied? Or would you question the ethicality of the regulations, the scope of your so-

cial contribution and the emotional value of providing the market with liquidity? Which criteria would you choose to judge the ethicality of your profession?

High frequency trading (HFT) consists of the use of fast computers to execute trading algorithms. Limited only by the rules of physics (Buchanan, 2015), the timescale of HFT trades ranges between microseconds and nanoseconds; for comparison, the blink of a human eye lasts 400 milliseconds (Manahov, 2016). HFT has been estimated to account for more than 70% of trading volume in US equities (Hoffmann, 2014; Zhou and Olivari, 2013). Thus, it constitutes a substantial part of the financial market.

HFT is an example of a highly influential and innovative, ethically questionable financial industry. Questions about the ethicality of HFT have focused on its practices, influence on the financial market and essence. For example, it has been noted that 'high-frequency traders seem more like gamblers than investors' (Cooper, Davis and Van Vliet, 2016, p. 2). HFT has also raised regulatory

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challenges, stemming from the controversy about its effect on the market (Manahov, 2016) and the technical difficulties which the inspection of HFT's numerous orders entails (Wheatley, 2014). However, HFT is not the only ethically questionable industry: the ethicality of other financial industries has been criticized by policy makers, the media and the public too (Barber, 2018; Knights and McCabe, 2015).

Understanding the way employees in the financial industry perceive the ethicality of their profession has two main applications. First, it could help managers improve employees' well-being and reduce their turnover. Research has demonstrated that organizational ethicality affects employees' well-being, job satisfaction and turnover intent (Schwepker Jr, 2001; Vitell and Davis, 1990). Second, understanding employees' ethical perceptions could help in formulating regulations and codes of conduct, which encourage compliance. Research has linked ethical perceptions and considerations to financial decisions and fraud (Ahlers *et al.*, 2017; Domino, Wingreen and Blanton, 2015). Thus, regulations which take into account employees' ethical perceptions could promote compliance.

Despite the importance of the study of employees' ethical perceptions, research on the ethicality of the financial industry has predominantly taken the perspective of an external observer. Specifically, research on HFT ethicality has aimed at improving employees' conduct by prescribing appropriate regulatory changes. It has contributed important insights into the ethicality of HFT. However, attempting to classify these practices in terms of 'good' or 'bad', it has taken the perspective of an external observer rather than employees' perspectives (Angel and McCabe, 2013; Harris, 2013).

This paper aims to elucidate the way employees in the financial industry, and in particular HFT, perceive the ethicality of their profession and engage with it. Taking employees' perspectives, it explores individuals' experience of ethics. It does not investigate organizational ethical outcomes. It draws on the 'business ethics as practice' theory, which examines how 'ethics play out in practice [...] through an emphasis on the context and interpretation of ethics, the discourse in which they are enacted and their relation to organizational subjects' (Clegg, Kornberger and Rhodes, 2007, p. 107). In line with the 'business ethics as practice' theory, it seeks to understand the uncertainty

and subjectivity which financial ethical judgement entails. Extending the 'business ethics as practice' theory, it investigates the way employees perceive law and regulations, judge the ethicality of their profession and emotionally experience it.

Through a series of interviews with HFT employees, this paper reveals that (1) the HFT industry is characterized by a lack of clear, widely accepted ethical guidelines. Law, regulations, codes of conduct and firm rules provide HFT employees with a framework for the implementation of their practices. However, HFT employees often disagree with them. (2) To evaluate the ethicality of their profession or practices, HFT employees examine the effects of HFT on chosen stakeholder groups. Their choices of reference stakeholder groups and interpretations of the effects of HFT on these stakeholder groups determine employees' outlook on the ethicality of their profession. (3) HFT employees relate the ethicality of HFT to their job satisfaction and well-being.

This study makes empirical and theoretical contributions to the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007). First, it provides the theory with empirical support. It reveals that work in the HFT industry raises non-trivial ethical questions, identifies elements of uncertainty in employees' judgements and highlights the subjective nature of the ethical perceptions of HFT employees.

Second, this study makes theoretical contributions to the 'business ethics as practice' theory by delineating three central ethical phenomena, which have been overlooked by it. The 'business ethics as practice' theory asserts that ethics cannot be codified but does not explain how employees perceive the regulations and law when they engage with non-trivial ethics. This study shows that in cases of non-trivial ethics, employees often consider regulations and law inadequate. When conflicts between ethics, law and firm rules arise, compliance may be motivated merely by the sense of inability to disobey the rules or by the threat of legal punishment. The 'business ethics as practice' theory highlights ethical subjectivity but does not specify the issues which lead to moral disagreement. This study identifies diversity in the stakeholder groups, which employees refer to when they judge the ethicality of HFT, as a source of ethical subjectivity. Ethical subjectivity results also from disagreements about the effect of HFT on its stakeholders. Finally, the 'business ethics as practice'

theory states that ethical deliberation is painful but does not indicate when it is painful. This study demonstrates that employees experience negative emotions when they attribute to their profession a negative effect on their stakeholder groups. These questions have not been addressed by other business ethics theories either. Therefore, this paper complements the 'business ethics as practice' theory, as well as ethics research.

Literature review and research questions

This paper draws on the 'business ethics as practice' theory, stakeholder theory and MacIntyre's moral theory. This section reviews the central ideas of these theories and discusses the research questions they raise. It ends with a review of HFT methods and research.

Stakeholder theory

Stakeholder theory suggests that, to succeed, firms should address the interests of their stakeholders (Freeman *et al.*, 2010). Accordingly, a large body of research has examined antecedents of stakeholders' judgement, behaviours and intentions (Hillenbrand, Money and Ghobadian, 2013; West *et al.*, 2016). A study has found that stakeholders attribute great importance to firms' conduct (Antonetti and Maklan, 2016).

Research has defined a 'stakeholder group' to be any group of individuals or objects which is 'the legitimate object of managerial or organizational attention' (Phillips, 2003, p. 25). Traditional stakeholder groups include shareholders, employees, customers, the community and the market (Perrault, 2017). However, the boundaries of the notion of 'stakeholder' are not well defined (Miles, 2017). Furthermore, stakeholders differ in the extent to which they are salient to firms and individuals (Tashman and Raelin, 2013). The effect of HFT on the market or on other stakeholders (e.g. the community) is unclear (Cooper, Davis and Van Vliet, 2016). Therefore, in this paper I extend the definition of 'stakeholder group' to include any group that employees consider the legitimate object of managerial or organizational attention.

The moral theory of MacIntyre

The moral theory of MacIntyre (2007) is based on the observation that disagreements on moral issues

are prevalent. It attributes these disagreements to the lack of societal ranking rules that determine which norms are more important than others. Thus, the moral theory suggests that moral perceptions are based on rational arguments and moral premises, which are 'a matter of pure assertion' (MacIntyre, 2007, p. 8). MacIntyre's observation resembles the social constructionism paradigm, which states that universal truths are unreachable and that we can only know people's judgements of right and wrong (Burr, 2003; Galbin, 2014). It is especially relevant to HFT, given the controversies that HFT raises (Angel and McCabe, 2013).

How can ethics be defined in such a morally disorganized world? MacIntyre's theory suggests that to be ethical, people should pursue the common good through their practices, lives and traditions. In finance, practice virtue could be achieved by aiming at moral goals apart from profit maximization. Moral unity in employees' lives could be approached by addressing all their social roles. Traditions constitute historical perspectives for the judgement of individuals' ethicality. Intrinsic motivation can lead people to seek practice virtue (Sison *et al.*, 2018). However, as HFT is so innovative, historical perspectives on its morality do not exist.

The 'business ethics as practice' theory

Research has developed many approaches for the study of ethics (Schwartz, 2016). Ethical awareness theories have examined ethical blind spots. They have established that people are only partially aware of situational ethical dimensions (Bazerman and Tenbrunsel, 2011). Rationalist approaches have considered deliberate, conscious reasoning to be the central component of judgemental processes (Rest, 1986). Intuitionist approaches have perceived moral reasoning to follow *ex post facto* quick, intuitive moral judgements (Cremer *et al.*, 2011; Haidt, 2001).

The 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007; Gordon, Clegg and Kornberger, 2009) combines rationalist and intuitionist components. It distinguishes between trivial ethics and non-trivial ethics. Trivial ethical questions can be resolved by the implementation of regulations, rules or norms. Non-trivial ethical questions are situation specific and, therefore, defy codification. In line with the rationalist approach, the theory highlights the deliberation

that non-trivial ethical decision making requires: '[ethical freedom] is manifest precisely when one does not unconsciously or mechanistically follow rules without reflection and deliberation' (Clegg, Kornberger and Rhodes, 2007, p. 112). In accordance with the intuitionist approach, it emphasizes that ethical judgement involves uncertainty and subjectivity: 'the dynamics of practice imply that future oriented action cannot wholly be determined by the past. It is in this moment of "undecidability" that ethical responsibility can be located – a moment that exceeds rational calculation' (Clegg, Kornberger and Rhodes, 2007, p. 111). Given that HFT regulations cannot possibly envisage all novel HFT practices, HFT involves both trivial and non-trivial ethical questions.

Research questions

The 'business ethics as practice' theory gives rise to three questions. First, the theory suggests that non-trivial ethical questions cannot be resolved by the application of regulations or law. However, it does not theorize how employees perceive the regulations in this case. I consider this question important, because employees' perceptions of rules affect their compliance (Hofeditz *et al.*, 2017). Thus, the first research question which this paper examines is

RQ1: How do employees perceive law and regulations in ethically non-trivial situations?

Second, the 'business ethics as practice' theory highlights the subjective nature of the answers organizational members find for ethical questions. Following Foucault (1972), it suggests that ethical subjectivity occurs when people define themselves as individuals. This study agrees with this explanation. However, according to the moral theory of MacIntyre (2007), moral disagreement and ethical subjectivity result from the lack of an agreed societal ranking of moral rules. Therefore, I suggest that the explanation for ethical subjectivity, which the 'business ethics as practice' theory offers, may be incomplete. Hence, the second research question which this paper asks is

RQ2: Which moral rules do employees use to judge the ethicality of their practice?

Third, the 'business ethics as practice' theory asserts that ethical deliberation has an emotional effect on organizational members. Following

Bauman, it suggests that 'being moral means being bound to make[s] choices under conditions of acute and painful uncertainty' (Bauman and Tester, 2001, p. 46). However, the theory does not explore further the emotional experiences which are linked to organizational ethical judgements.

Research has demonstrated that organizational ethicality affects members' well-being (Schwepker Jr, 2001). In particular, a stakeholder study has established that stakeholders react emotionally to corporate social irresponsibility (Antonetti and Maklan, 2016). However, not all studies have found evidence of painful moral deliberation (Barraquier, 2011). Therefore, I was interested in examining the question of how the ethical perceptions of employees in the financial industry affect them emotionally.

Throughout this paper, the term 'job satisfaction' refers to the 'pleasurable or positive emotional state resulting from the appraisal of one's job experiences' (Locke, 1976, p. 1300). The term 'well-being' refers to 'the extent to which an individual is satisfied with his or her life, experiences a preponderance of positive affect (such as happiness), and possesses a healthy body and mind' (Promislo, Giacalone and Welch, 2012, p. 209). However, as in organizational reality these constructs often overlap, I consider 'job satisfaction and well-being' as a single attribute. Using this attribute, the third research question that this paper asks is

RQ3: How do employees' ethical perceptions affect their job satisfaction and well-being?

HFT practices and ethicality

The trading techniques HFT uses are based on the strategic advantages which speed and trading regulations offer. For instance, many techniques are based on regulations, which enable different exchanges to trade the same security at different prices. Thus, if traders are sufficiently fast, they can buy securities on exchanges offering them for low prices, sell them on exchanges offering them for higher prices before prices are updated, and gain the price difference. Alternatively, traders may use market-making techniques, in which they post both 'buy' and 'sell' offers. If other traders accept their offers within a short period of time, HFT traders can earn the difference between them (Cooper, Davis and Van Vliet, 2016). As cancelling

orders may mislead other traders, regulators determine order-to-trade ratio limits (Friederich and Payne, 2015). However, within these limits, to avoid losses, HFT traders may cancel orders. Other HFT techniques include collocation, dark pools and algo-sniffing. Collocation is the practice of installing HFT computers in stock exchanges. Collocation enables HFT to reduce risk, because orders which are posted closer to exchange computers reach them earlier than orders which are posted at greater distances. Dark pools are private trading systems, in which participants can trade without disclosing the information which regulated exchanges require (Johnson, 2017). Algo-sniffing techniques forecast future moves of other traders by searching for trading patterns (Cooper, Davis and Van Vliet, 2016).

Ethics research has suggested that if HFT does not use illegal techniques or harm other market participants by negatively affecting market quality, then it could be considered ethical (Angel and McCabe, 2013). To assess the effect of HFT on market quality, research has examined its impact on market liquidity, volatility, flash crashes, price dislocation and market glitches (Goldstein, Kumar and Graves, 2014; Kirilenko *et al.*, 2017). It has found that HFT is associated with lower levels of price dislocation (a form of market manipulation; Aitken, Cumming and Zhan, 2015). HFT reduces 'spreads' (the difference between the prices of sell and buy offers) and increases market efficiency (Conrad, Wahal and Xiang, 2015). Market-making strategies usually increase market liquidity (Friederich and Payne, 2015). However, HFT provides liquidity when it is expensive, consumes liquidity when it is cheap (Carrion, 2013; Hendershott and Riordan, 2004) and reduces market liquidity in certain conditions (Brogaard *et al.*, 2018). Finally, it increases risk (Jain, Jain and McNish, 2016). Therefore, the overall effect of HFT on the market and its ethicality are unclear.

Method

Organizational ethics research has often used closed-ended questionnaires (Mayer, 2014). Closed-ended questionnaires have contributed seminal findings (e.g. Victor and Cullen, 1988). However, they have been criticized for not enabling in-depth examination of organizational practices. Similarly, vignettes and experiments have been

criticized for introducing fictitious contexts. According to the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007), social constructionism theory (Burr, 2003) and the case method principles (Matthews, Goodpaster and Nash, 1985), discourse and narrative analysis of specific cases enables the interpretation of social reality. Discourse has predominantly been analysed using interviews (Hepburn and Potter, 2007). Furthermore, interviews have been acknowledged to provide reliable information about organizations (Saunders and Townsend, 2016).

Semi-structured (informal) interviews have been employed in ethics research (Barraquier, 2011). In semi-structured interviews, interviewers have a list of predefined topics or questions they intend to ask participants. However, interviewers can add and formulate questions according to participants' answers (Edwards and Holland, 2013). Thus, semi-structured interviews enable interviewers to personalize the questions to individual participants. Semi-structured interviews often provide richer and more realistic data than structured interviews. Furthermore, participants in semi-structured interviews feel more relaxed (Coolican, 1995). Thus, I chose to use semi-structured interviews.

Participants

Participants were recruited through LinkedIn (<https://www.linkedin.com/>). Research has emphasized that the interdisciplinary nature of HFT elicits ethical issues (Davis, Kumiega and Vliet, 2013). Sample restriction could narrow the range of observed ethical phenomena. Thus, I did not restrict the sample to a certain role in the HFT industry.

To include in the sample HFT computer programmers and traders, I searched LinkedIn using the keywords 'High Frequency Trader', 'High Frequency and C++', 'Low Latency Trader' or 'Low Latency and C++' (many HFT programmers mention C++ programming on their LinkedIn pages). I sent more than 1,000 individual LinkedIn connection invitations to people who were working or who had worked in the HFT industry. Participation invitations were sent individually to nearly 400 people who accepted the connection request. Of these 400 people, 30 people (29 men and 1 woman) agreed to participate in the study. Their average age was 38.53 years (standard deviation 7.46 years; minimum 25 years; maximum 51 years). The low participation rate may be explained by the

secrecy surrounding the HFT industry and firm rules (Lewis, 2015). For example, an HFT trader who did not participate in this study explained that his boss did not allow him to be interviewed. Many HFT employees have non-disclosure clauses in their employment agreements.

I used data saturation (Guest, Bunce and Johnson, 2006) as the criterion for the choice of participant number. By the time I interviewed the 25th HFT employee, I found that a large part of the information was repetitive. Including 30 participants in organizational behaviour studies has been found to be adequate (Saunders and Townsend, 2016).

The participant group comprised high frequency traders, algorithm developers, code writers (computer programmers), consultants, quantitative analysts, quantitative strategists, ultra-low latency data scientists and managers of HFT companies (a CEO, a director and a vice president). Twenty-two of the participants worked in the UK. Eight participants worked in the USA, Australia, Sweden or China.

The study was anonymous. Throughout this paper, each participant is referred to by two randomly chosen letters (participant code). Any detail which could disclose participants' identities was removed. Participants' codes, countries of residence and professions are presented in Table 1.

Procedure

Twenty-seven participants were interviewed individually in face-to-face meetings (14 participants) or Skype video meetings (13 participants; <https://www.skype.com/en/>). Two participants filled in a questionnaire. One interview was conducted over the phone. The data collection method was determined according to participants' requests or locations. All interviews were recorded, except for three interviews due to participants' requests (see Table 1). The contents of these interviews were summarized.

The interviews were semi-structured. Questions referred to three topics: participants' overall work experience; the extent to which their computer programs or trades reflected their personalities; and participants' engagement with ethics. Participants' answers to questions about the first two topics are not reported in this paper. In the third part of each interview, following the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007), I asked participants whether their work

involved ethical considerations. I instructed participants who asked for clarification about the intention of the question to interpret it in any way they chose. I asked further ethics-related questions according to participants' answers. At the end of interviews 4–30, participants were offered the option to hear other participants' answers. That encouraged participants to elaborate more on certain issues. All participants were offered the option to obtain the results when published. The mean length of the interviews was 72.63 minutes (standard deviation 29.00 minutes; minimum 26.3 minutes; maximum 132 minutes).

Data analysis

Participants' answers were transcribed. Then, the data was analysed inductively. Analysis aimed at creating first-order concepts, second-order themes and aggregate dimensions (Corbin and Strauss, 2008; Gioia, Corley and Hamilton, 2013). It was performed using Atlas.ti, software which enables coding and code grouping. In the first stage, I formulated codes. I attempted to understand participants' intentions and avoided imposing my interpretation on their experience. In the second stage, I categorized the codes into first-order concepts. Concepts are abstractions of codes, which express theoretical ideas (Corbin and Strauss, 2008). Then, I classified the concepts into second-order themes according to the phenomena they described. Finally, I defined aggregate dimensions by identifying groups of related themes and classified the aggregate dimensions into narrative categories.

Findings

I obtained three main narrative categories: 'regulation and compliance-related narratives'; 'judgement of the effect of HFT on its stakeholders'; and 'the relationship between organizational ethicality and employees' job satisfaction and well-being'. The concepts, themes and aggregate dimensions which emerged from participants' answers are presented in Figures 1–3.

Regulation and compliance-related narratives

Thematic analysis of participants' answers yielded three dimensions: 'effects of regulations and firm

Table 1. Participants' codes, countries of residence, professions and method of data collection

Participant code	Country of residence	Participant's profession	Method of data collection
AD	UK	Senior HFT consultant and software developer	Interview; face-to-face meeting; conversation was recorded
BH	UK	Senior software developer	Interview; Skype meeting; conversation was recorded
BJ	UK	HFT software developer	Interview; face-to-face meeting; conversation was recorded
DV	China	Project manager and software developer at HFT firm	Interview; Skype meeting; conversation was recorded
DW	UK	Senior software engineer	Questionnaire
EH	USA	High frequency proprietary equity trader	Interview; Skype meeting; conversation was recorded
EO	USA	Senior HFT software engineer	Interview; Skype meeting; conversation was recorded
FR	USA	Trader and code writer	Questionnaire
HU	UK	Senior quantitative trader	Interview; Skype meeting; conversation was recorded
JC	Australia	HFT software architect	Interview; face-to-face meeting; conversation was recorded
LQ	China	Data scientist and ultra-low latency trader	Interview; Skype meeting; conversation was recorded
NL	UK	Lead quantitative HFT infrastructure developer	Interview; face-to-face meeting; conversation was recorded
NP	UK	Quantitative HFT researcher	Interview; Skype meeting; conversation was summarized
OG	UK	HFT consultant and quantitative analyst	Interview; face-to-face meeting; conversation was recorded
OM	UK	Director of an HFT firm	Interview; face-to-face meeting; conversation was recorded
OS	Sweden	HFT algorithmic trading developer	Interview; Skype meeting; conversation was recorded
PL	UK	Vice president at an HFT firm	Interview; Skype meeting; conversation was recorded
RC	UK	Director of an HFT company and a software developer	Interview; face-to-face meeting; conversation was recorded
RT	UK	HFT quantitative strategist	Interview; face-to-face meeting; conversation was recorded
SG	UK	Head of technology of an HFT firm	Interview; face-to-face meeting; conversation was recorded
SK	UK	Senior software engineer	Interview; Skype meeting; conversation was recorded
SQ	UK	HFT manager	Interview; face-to-face meeting; conversation was summarized
TF	USA	CEO of an HFT firm	Interview; Skype meeting; conversation was recorded
TG	UK	HFT software engineer	Interview; Skype meeting; conversation was recorded
VR	UK	HFT trader and programmer	Interview; face-to-face meeting; conversation was recorded
VW	UK	HFT trader and code writer	Interview; face-to-face meeting; conversation was recorded
VX	UK	HFT quantitative analyst	Interview; face-to-face meeting; conversation was summarized
XM	UK	Senior software developer	Interview; face-to-face meeting; conversation was recorded
YR	UK	Senior HFT software expert	Interview; Skype meeting; conversation was recorded
YZ	UK	HFT software developer	Interview; phone conversation; conversation was recorded

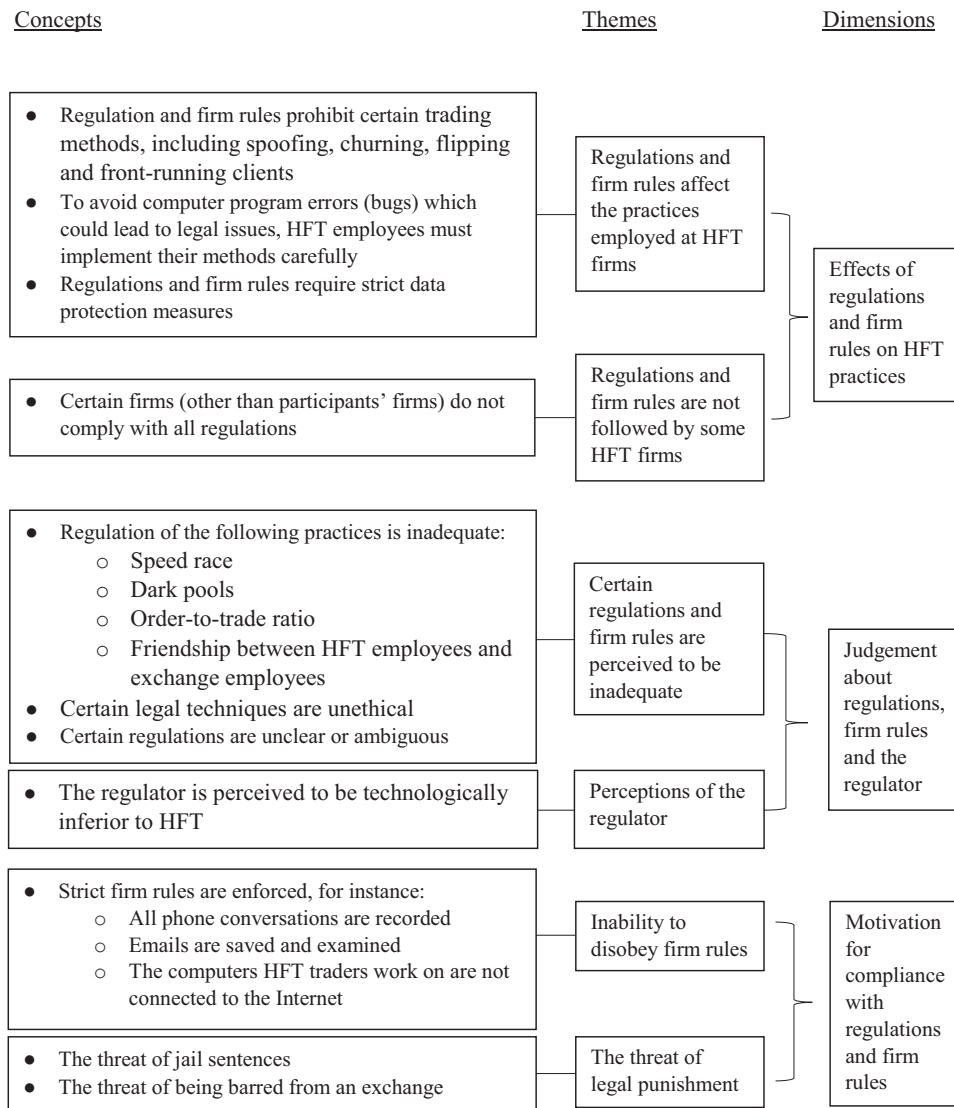


Figure 1. Thematic analysis of regulation and compliance-related narratives

rules on HFT practices'; 'judgement about regulations, firm rules and the regulator'; and 'motivation for compliance with regulations and firm rules' (see Figure 1). Quotations exemplifying some of the related concepts are presented in Table A.1 in the Appendix and all quotations in this section refer to it.

Effects of regulation and firm rules on HFT practices. Two themes gave rise to the dimension 'effects of regulations and firm rules on HFT practices': 'regulations and firm rules affect the practices employed at HFT firms' and 'regulations

and firm rules are not followed by some HFT firms'. Both themes describe the effects (or lack of effect) of regulation on employees' conduct and explain employees' practices when ethics can be codified (trivial ethics situations; Clegg, Kornberger and Rhodes, 2007).

The first theme has emerged from the concepts 'regulation and firm rules prohibit certain trading methods' (quotation 1.1), 'to avoid computer program errors (bugs) which could lead to legal issues, HFT employees must implement their methods carefully' (quotation 1.2) and 'regulations and firm rules require strict data protection

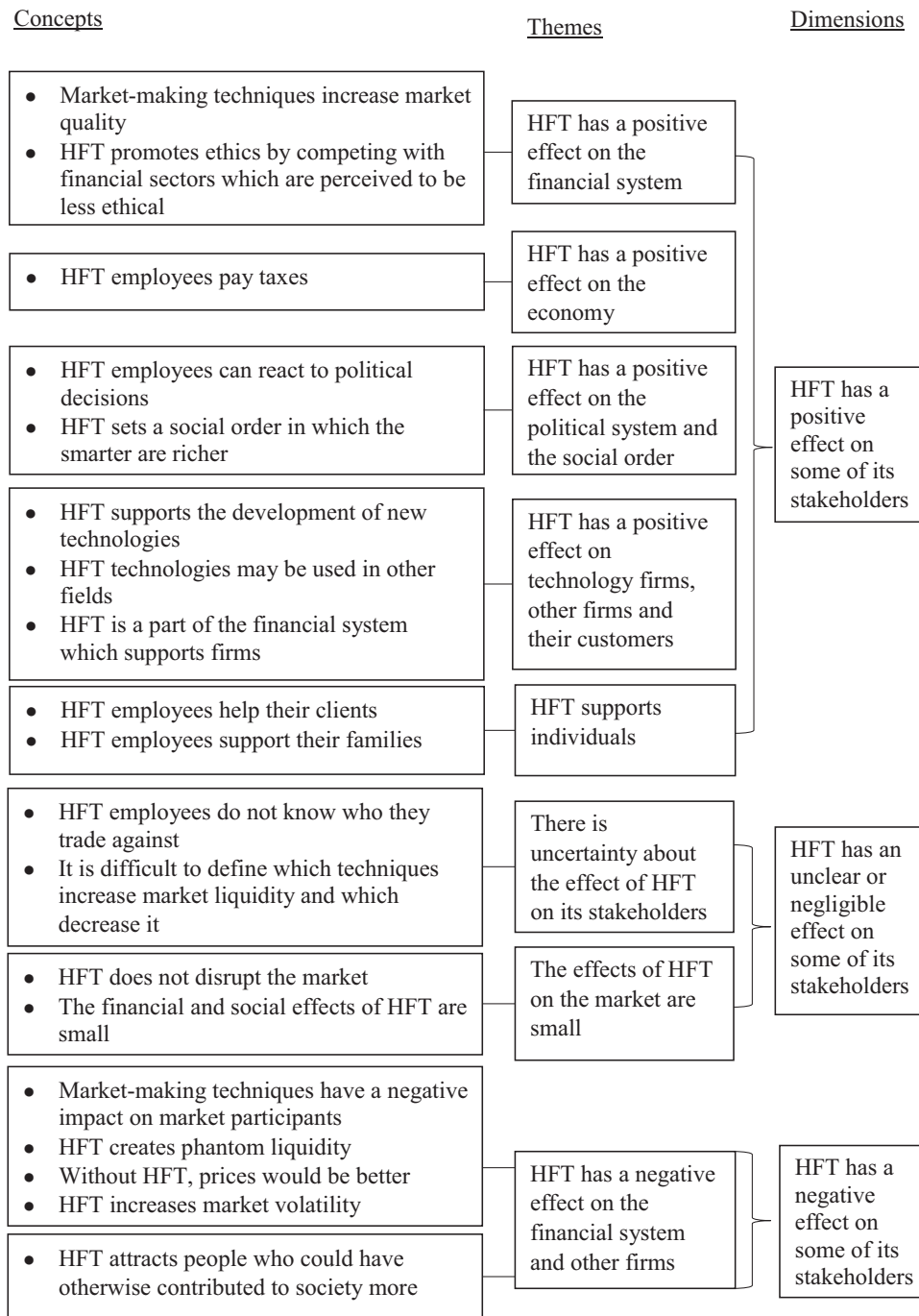


Figure 2. Thematic analysis of narratives referring to judgement of the effect of HFT on its stakeholders

measures’ (quotation 1.3). Prohibited trading methods included spoofing, churning, flipping and front-running clients. For instance, SG (head of technology of an HFT firm) explained that regulations prohibited the use of spoofing:

About ethics, before regulation, I would say, HFT was really [...] the Wild West [...] It used to be, like, if you can scam the guy, if you can slow the guy, if you can spoof the guy, you will do it. As long as you’re making more money than he does [...] At that time

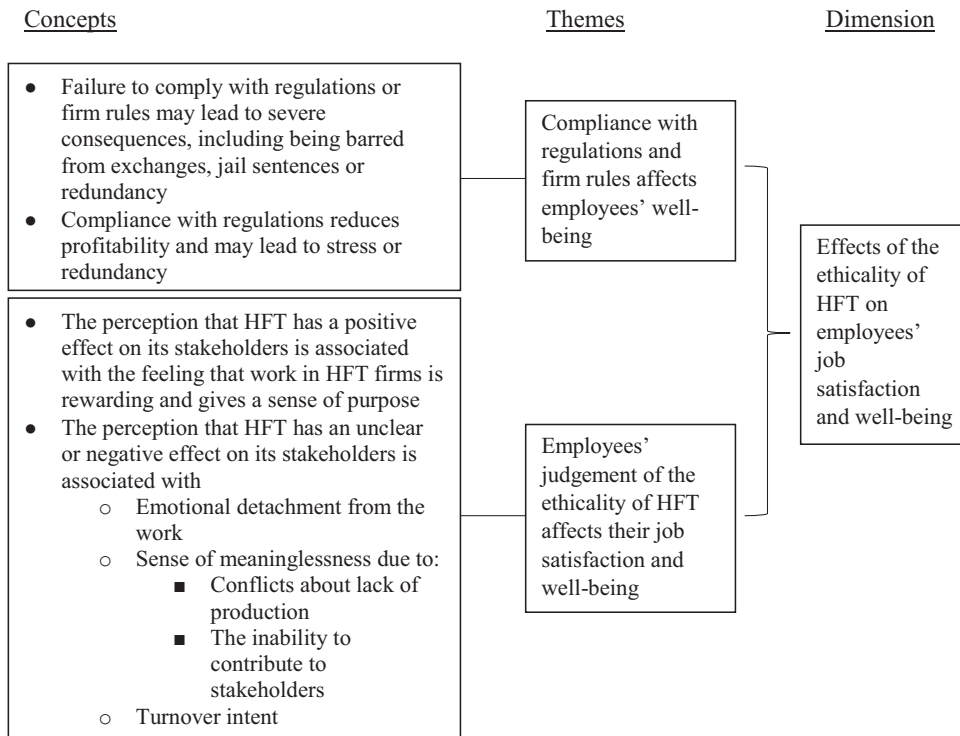


Figure 3. Thematic analysis of narratives referring to the relationship between organizational ethicality and employees' job satisfaction and well-being

[...] you could not know what was going on in an HFT firm. You would not even know who was in an HFT firm. Now that there are regulations [...] it's like any other business.

Participants' answers portrayed HFT data protection practices as strict. For instance, VR (an HFT trader and programmer) described the data protection measures his company employed as follows:

If you try to plug any kind of USB device [...] generally speaking, it would be automatically deactivated [...] Everything that you are printing is recorded, every email that you are sending is recorded, obviously, every conversation that you are having on the phone is recorded, the Bloomberg chats – recorded, and when you send an email externally, before it goes out [of] the door, it gets through, I think, six or seven different checks [...] It is crazy.

The second theme emerged from the concept 'certain firms (companies other than participants' firms) do not comply with all regulations'. Participants emphasized that their firms complied with

regulations. For instance, VX (HFT quantitative analyst) stated that:

In the companies I worked for, they didn't do anything illegal or unethical. But it happens in other companies.

Judgement about regulations, firm rules and the regulator. Two themes related to this dimension were identified: 'certain regulations and firm rules are perceived to be inadequate' and 'perceptions of the regulator'. These themes answer RQ1 and extend the 'business as ethics' theory (Clegg, Kornberger and Rhodes, 2007). They reveal that in ethically non-trivial situations, HFT employees judge the law, the regulations and the regulator. A total of 11 participants (36.67%) expressed disagreement with aspects of regulations or criticism of the regulator.

Descriptions of conflicts between ethics and regulations were more prevalent than mentions of agreement between them. That could be because HFT employees disagree with more regulations than they agree with. Alternatively, employees may

consider the positive aspects of law too obvious to mention.

The first theme ('certain regulations and firm rules are perceived to be inadequate') has emerged from the concepts 'regulation of certain practices is inadequate' (quotation 1.4), 'certain legal techniques are unethical' (quotation 1.5) and 'certain regulations are unclear or ambiguous'. Participants judged as inadequate regulations about the speed race, dark pools, order-to-trade ratios and the relationship between HFT employees and exchange employees. For example, RC (the director of an HFT company and a software developer) perceived selling order flows to be unethical, although it was legal:

The banks' clients would send orders to the banks. What happens now is that the banks have sold this order flow to some of the high frequency trading firms [...] that basically can front-run the client. To me, that's insider-trading. And the fact, that many of this is done in dark pools, with no proper oversight or regulation, I think it is criminal. That, to me, is cheating.

A few participants emphasized that certain regulations were unclear. For instance, YR (a senior HFT software expert) expressed this perception as follows:

I think that there are always areas where exchange rules are interpretable [...] You read the [...] exchange rules and unless you are literally a lawyer, am, you don't know really exactly what they mean [...] If I had such a concern I would always try and speak with somebody, in terms of: 'I don't understand this, tell me what to do' [...] Because [...] if you do it wrong, that can end you up in jail. And it's a jail in America as well, and that's not very nice.

In line with the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007), this perception reveals that HFT employees experience ethical uncertainty. It suggests that regulation is one of the reasons for this uncertainty.

The second theme ('perceptions of the regulator') emerged from the concept 'the regulator is perceived to be technologically inferior to HFT'. For instance, VR (an HFT trader and programmer) expressed this idea:

What is forbidden is basically manipulating the market [...] Since HFT traders are much faster,

they could do it without being noticed, because the regulators would not catch these transactions, because they are too fast [...] I have seen [...] a documentary on French Television about HFT, and they [...] interviewed the French regulator [...] and he said that the main constraint against HFT traders is the number of rows in Excel [...] When they are capturing transactions, they don't have enough space in Excel [...] [laughing]. They use Excel! They have never heard of anything like a [...] high frequency database. You know, they are just not equipped to follow high frequency traders.

The perception that some HFT employees are technologically superior to the regulator may have implications for the extent to which they comply with regulations.

Motivation for compliance with regulations and firm rules. Analysis revealed two themes pertaining to participants' motivation to comply with regulations and firm rules: 'inability to disobey firm rules' (quotation 1.6) and the 'threat of legal punishment'. Participants related the first theme to the strict data protection measures their firms enforced. The second theme was related to the concepts 'the threat of jail sentences' and 'the threat of being barred from an exchange'. For instance, EO (a senior HFT software engineer) portrayed legal punishment as a deterrent factor:

You know, I used to work for [bank name], and, as you know, the company has been on the news for [...] financial crisis issues [...] Seeing first hand these people being disciplined and fired and some of them going to jail, etc. etc., am, I would say, gives [...] a hint, and that's pretty much the culture that was there where I worked, and here as well. If there is a hint that things are shady – we just don't do it.

Both themes describe extrinsic sources of motivation. Intrinsic motivators may improve employee compliance (Sison *et al.*, 2018).

Judgement of the effect of HFT on its stakeholders

Three aggregate dimensions were related to participants' judgement of HFT: 'HFT has a positive effect on some of its stakeholders'; 'HFT has an unclear or negligible effect on some of its stakeholders'; and 'HFT has a negative effect on some of its stakeholders'.

These themes and their related concepts are presented in Figure 2. Quotations exemplifying some of the related concepts are presented in Table A.2 in the Appendix. Of the 23 participants who chose to refer to the effect of HFT on its stakeholders, six participants (26.09%) mentioned negative effects of HFT on stakeholders, six participants (26.09%) described negligible or unclear effects and 11 participants (47.82%) mentioned positive effects.

The three identified dimensions reveal contradictory perceptions of HFT. They demonstrate that, as a group, HFT employees exhibit lack of clarity about their contribution to the common good. Furthermore, the reason for their disagreement is often their choices of reference stakeholder groups. In line with MacIntyre (2007), analysis shows that the arguments HFT employees give for their perceptions are rationally justified, but the core of the disagreement – the choice of stakeholder reference group – is not justified. Therefore, the analysis answers the second research question by showing that, to judge HFT ethicality, employees examine the effect of HFT on an intuitively chosen stakeholder group.

HFT has a positive effect on some of its stakeholders. Participants referred to a wide range of stakeholder groups, including the financial system (quotation 2.1), the economy (through the tax they pay; quotation 2.2), the political system and social order (quotation 2.3), technology firms, other firms and their customers (quotation 2.4) and individuals, including participants' clients and family members (quotation 2.5). For instance, the theme 'HFT has a positive effect on the financial system' was linked to the concepts 'market-making techniques increase market quality' and 'HFT promotes ethics by competing with financial sectors which are perceived to be less ethical'. SG (head of technology of an HFT firm) exemplified both concepts:

[HFT yields] better price discovery, tighter spreads [...] more counter-party, overall the quality of the market has improved. Would you rather have an HFT guy passing an order for you, trying to get the best price over 14 different exchanges at one time [...] and fighting to get the best price for you, or would you rather pass your order to, ah, John, who is an old bid trader, who is drinking Vodka with his friends, you know, at eight o'clock in the morning before the opening bell? And who has already fixed

the price with his buddy, when the market is not even open?

HFT has an unclear or negligible effect on some of its stakeholders. This dimension emerged from two themes: 'there is uncertainty about the effect of HFT on its stakeholders' and 'the effects of HFT on the market are small'. The first theme was linked to uncertainty about the identity of the traders that HFT trades against and about the effect of HFT on the market (quotation 2.6). This expression of ethical uncertainty provided the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007) with further empirical support.

The second theme emerged from the concepts 'HFT does not disrupt the market' and 'the financial and social effects of HFT are small' (quotation 2.7).

HFT has a negative effect on some of its stakeholders. The theme 'HFT has a negative effect on the financial system and other firms' emerged from the concepts 'market-making techniques have a negative impact on market participants' (e.g. creating 'phantom liquidity' and increasing volatility) and 'HFT attracts people who could have otherwise contributed to society more' (quotation 2.8). For example, RT (a quantitative strategist) expressed the first idea as follows:

Some people, like me, used to have access directly into those dark [exchange] books [...] I can tell you that the market makers are making all sorts of dishonest things [...] Obviously, the other guys will say that, look, with market makers providing liquidity on both sides of the book, you narrow the spread, and therefore a cash-trader [...] is getting a better, good quality price. He is getting a better price, but at what expense, because at the moment he trades, he is getting screwed by the market maker straight away, because the market maker pre-positions himself everywhere on the book and the market maker will make some statistical analysis, identify that it is a stupid client, and mak[e] money on top of it.

The relationship between organizational ethicality and employees' job satisfaction and well-being

Two themes gave rise to the dimension 'effects of the ethicality of HFT on employees' job satisfaction and well-being': 'compliance with regulations and firm rules affects employees' well-being' and 'employees' judgement of the ethicality of HFT

affects their job satisfaction and well-being'. Figure 3 displays these themes and their related concepts. Quotations exemplifying some of the related themes are given in Table A.3 in the Appendix.

Compliance with regulations and firm rules affects employees' well-being. Two concepts gave rise to the theme relating compliance to well-being: 'failure to comply with regulations or firm rules may lead to severe consequences, including being barred from exchanges, jail sentences or redundancy' and 'compliance with regulations reduces profitability and may lead to stress or redundancy'. Therefore, both compliance and the failure to comply could have negative emotional consequences. BJ (an HFT C++ developer) expressed these ideas as follows:

[I]f you see anything at all you suspect, it needs to be reported and you are accountable if it all goes wrong. So, the pressure is there [...] A desk is basically putting a business plan forward at the beginning of the year, saying, if the bigger organisation invests in me and my desk, I would make you this much profit [...] If they don't give the internal investment by the end of the year, then, you know, the business, the wider organisation, will say: ethics is not profitable, get rid of them, sack them [...] Many times I have been on the trading floor, and one day I would come in, and an entire desk is no longer there – they have just been sacked because they were not making the profit. And that is kind of hard [...] it is very much a reality of how cut-throat it's like.

Employees' judgement of the ethicality of HFT affects their job satisfaction and well-being. The theme, suggesting that the ethical valence that HFT employees attribute to their work influences their well-being and job satisfaction, emerged from two concepts. The first concept suggested that judging HFT to have a positive effect on its stakeholders was associated with the sense of purpose and the perception that the work was rewarding (quotation 3.1). The second concept suggested that judging HFT to have an unclear or negative effect on its stakeholders was associated with emotional detachment (quotation 3.2), the experience of a sense of meaninglessness (quotations 3.3 and 3.4) and turnover intent (quotation 3.5). Eight participants (26.67%) reported the experience of emotional detachment, meaninglessness, turnover intent, or combinations of these experiences. These

concepts answered RQ3. They established a positive relationship between employees' perceptions of HFT ethicality and their well-being, in line with previous studies (e.g. Elçi and Alpkın, 2009).

For instance, PL (the vice president of an HFT firm) related his positive effect on clients to the sense of purpose. His use of language ('feel') links ethics with emotions:

It feels like, am, like a useful job to do. Because, am, as opposed to hedge funds, we are not just guys who are pocketing money [...] It's about having good clients who are happy with us [...] I think that's a useful thing to do."

However, NL (a lead quantitative infrastructure developer) associated his doubts about the impact of HFT on the market and the importance of providing liquidity to the market with his emotional detachment:

My boss would say stuff like: 'we provide liquidity,' as if that's the – I don't know, I don't know whether that's good or bad, I have no idea, like I said, I am emotionally detached. You know, when I tell my mum: 'I provide liquidity, mum,' she goes very excited. She does not know what I do [...] I have no idea what HFT contributes to society, but I doubt it whether it's good. At best, I think it's neutral or irrelevant.

RT (a quantitative strategist) related his perception that HFT does not have a positive effect on society to his sense of meaninglessness:

I enjoy the challenge of playing with the data so much that sometimes I forget how useless it all is. It is completely useless. Completely useless. If I were to redesign the financial system, I would regulate trading so badly, because trading is just a big casino for people to play [...] I am providing bread and I am paying rent with doing that, but that sense of meaninglessness – sometimes, you know, I see a YouTube video about some crazy robots [...] that I could have done instead of doing that, and I'm thinking to myself many times, why. But then, financially speaking, I got used to a certain style of life. If I go to the equivalent engineering job, I'm looking at a 40% cut [...] With the kind of tools and knowledge that I'm having, am, couldn't I work in a technological company and make the next product?

EH (a high frequency proprietary equity trader, who had left HFT) explained that he had resigned due to the feeling of lack of production:

I think, what really got me out of it [HFT], was the whole senselessness. I couldn't escape from the fact that there was this voice at the back of my head [...] saying: 'you are creating nothing, you are spinning money in circles and making tiny little profits of it, go build something, go create something'. So, I guess that was [...] what ultimately got me out of it.

Additional aspects of ethics

Participants mentioned additional aspects of ethics. A few of these aspects are presented in Table A.4 in the Appendix. The large number of ethical aspects that participants referred to emphasized the subjective, personal nature of their ethical perceptions, in line with the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007).

Discussion and conclusion

This study examines the ethical perceptions of employees in the financial industry through the analysis of a series of interviews with HFT employees. In line with the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007), this study reveals that work in HFT firms involves non-trivial ethics, ethical uncertainty and subjectivity. It shows that codes and regulations provide answers for certain ethical questions. However, in non-trivial cases, they do not provide adequate answers. It identifies two sources of ethical uncertainty: the regulations, which are sometimes difficult to interpret, and the effect of HFT on the market. Furthermore, it reveals that, as a group, HFT employees disagree about the effect of HFT on the common good. Thus, it demonstrates that HFT entails ethical subjectivity.

In addition, this study answers the research questions that the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007) raises. Answering the first research question, it reveals that in cases of non-trivial ethics, employees criticize the regulations and the regulator. They often judge the regulations to be inadequate or unethical.

Addressing the second research question, the results suggest that HFT employees judge the

ethicality of their profession using the rule 'if HFT has a positive effect on the stakeholder group I am made aware of, consider important, like or love, then HFT is good'. In line with MacIntyre (2007), employees' moral judgements comprise a rational and an irrational component. The results identify the latter to be the unexplained choice of the stakeholder reference group. The importance employees attribute to the effect of HFT on stakeholder reference groups and their unawareness (or disregard) of other stakeholder groups are in line with stakeholder theories (Antonetti and Maklan, 2016) and blind spot theories (Bazerman and Tenbrunsel, 2011). They suggest that employees may focus on one of their social roles rather than pursuing moral unity (Sison *et al.*, 2018).

Examining the third research question, this study highlights the relationship between employees' ethical perceptions, well-being and job satisfaction. It shows that employees who perceive HFT to be ethical associate their work with a sense of reward and purpose. Employees who perceive HFT to be unethical report emotional detachment from their work, a sense of meaninglessness or turnover intent.

Management applications

Human capital drives innovation in the financial industry (Heffernan, Fu and Fu, 2013). Hence, for HFT firms, retaining professional employees is especially important. However, this study reveals that a proportion of HFT employees experience negative emotions and turnover intent due to the lack of social contribution.

The sense of deficiency in social contributions may be due to the innovative nature of HFT. As HFT is so innovative, there are no MacIntyrean traditions that could guide its ethical conduct (Sison *et al.*, 2018). However, employees' perceptions could reflect also the lack of moral leadership. Thus, developing moral leadership could be beneficial for the HFT industry. Organizational ethicality attracts candidates (Prooijen and Ellemers, 2015) and increases job satisfaction (Brown, Treviño and Harrison, 2005).

How can HFT firms develop moral leadership? Research has demonstrated that moral leaders define ethical standards (Van Gils *et al.*, 2015). Therefore, firms could encourage managers to prioritize stakeholders, address their needs and

communicate the outcomes to the employees. Moral leadership could also be developed by encouraging amoral managers (managers who ignore ethical issues unintentionally) to develop moral identification, obligation and tolerance to moral disagreement (Carroll, 1987). However, MacIntyrean philosophy argues that manager-defined ethical guidelines reflect merely managers' perceptions rather than absolute justice. Therefore, it suggests that moral leadership could be achieved by using a participative leadership style, in which the ethical goals of the organization are set in collaboration with the employees (Sinnicks, 2018). Either way, the strategy-as-practice theory (Tsoukas, 2018) and stakeholder theory (Freeman *et al.*, 2010) recommend incorporating ethical goals into firm strategies.

Regulatory applications

This study suggests that many HFT employees consider certain regulations to be inadequate and the regulators technologically inferior. Therefore, it stresses the importance of expanding the cooperation between HFT employees and regulators. Collaborations with regulatory agents have been shown to enhance firms' compliance (Desai, 2016).

Furthermore, the results suggest that it may be beneficial to set regulations or firm rules which directly address the firm's contribution to the common good. For example, to increase market liquidity, research has recommended introducing frequent batch auctions in exchanges (Budish, Cramton and Shim, 2015). I suggest that the same goal may be reached by setting regulations which require firms to produce evidence that they indeed increase market liquidity. Setting direct goals could highlight employees' social contributions.

Future research

This study is the first to explore the ethical perceptions of employees in the HFT industry. Drawing on the 'business ethics as practice' theory (Clegg, Kornberger and Rhodes, 2007), it uses qualitative research methods. Although the results have answered the examined research questions, I consider it important to further the understanding of HFT ethicality using complementary quantitative research methods.

It has been shown that gender diversity reduces the probability that firms engage in fraud (Cumming, Leung and Rui, 2015). However, participants in this study provided anecdotal evidence suggesting that HFT is a 'world of men' (as reflected also through the gender composition of the employees I found online and in the participant sample). Thus, I hypothesize that the inclusion of women in the HFT industry would increase its ethicality. Future research could test this hypothesis.

Research has demonstrated that nationality and culture affect individuals' ethical perceptions (Chung, Eichenseher and Taniguchi, 2008). Moreover, nationality affects HFT legislation (Aldridge, 2015; Xie, 2016). For instance, US regulators aim to provide all market participants with equal trading opportunities. Australian regulators attempt to increase market integrity. UK regulators take a forward-looking approach, trying to assess the impact of future developments (Aldridge, 2015). Although participants in this study resided in different countries, the results reflected neither cultural nor national effects. That could be because the large variance of participants' answers masked national and cultural effects. Alternatively, it could reflect the global nature of HFT. Studies about the effects of culture and nationality on HFT employees could further the understanding of the nature of this industry.

Moral disengagement research has identified several emotional defence mechanisms which disable the cognitive links between unethical behaviour and self-sanctioning (Bandura, 1990). These mechanisms enable people to maintain positive self-perception while engaging in ethically questionable behaviours. For instance, euphemistic labelling occurs when people use sanitized language instead of terms which could reveal the unethical nature of their behaviour. A proportion of HFT employees describe their work using the words 'game' and 'play'. Thus, they may exhibit the use of euphemistic labelling. Furthermore, some employees seem to refrain from addressing central moral questions, such as whether the social benefits of HFT are worth its costs. The theme 'regulations and firm rules are not followed by some HFT firms' – but not by participants' firms – may reflect additional defence mechanisms. Moral disengagement has been related to fraud (Moore *et al.*, 2012). Future studies could investigate moral disengagement mechanisms in the financial industry.

Research on stakeholders' perceptions has emphasized stakeholders' emotional response to corporate social irresponsibility (Antonetti and Maklan, 2016). This study raises the question: How do HFT employees choose their reference stakeholder groups? Answering this question could promote HFT and stakeholder research.

Finally, only one of the participants in this study mentioned the corporate social responsibility (CSR) programmes of his firm (Table A.4 in the Appendix, concept 4.5). That raises the question of whether most HFT firms do not engage in CSR, engage in it but do not communicate their engagement to the employees, or engage in it but the employees do not associate this activity with ethics. Research has identified a few factors which promote firm involvement in CSR, including employer–employee relationships, humanistic culture and the provision of incentives for participating in CSR activities (Chih, Chih and Chen, 2010; Dahlmann, Branicki and Brammer, 2017; Galbreath, 2010). Future research could characterize these factors in the HFT industry.

Conclusion

This study made empirical and theoretical contributions to the 'business as ethics' theory (Clegg, Kornberger and Rhodes, 2007). Focusing on the HFT industry, it highlighted the subjective, uncertain nature of the ethical perceptions of employees in the financial industry. It showed that they often criticized the regulations and HFT's contribution to the common good. The perception that HFT had negative social impacts was related to the sense of meaninglessness, emotional detachment and turnover intent.

These results have management and regulatory applications. They suggest that the development of moral leadership in the financial industry could be beneficial. This study proposed practical methods to achieve this goal. Furthermore, it called for regulatory changes aimed at increasing HFT's contribution to the common good and enhancing employees' well-being and compliance.

Appendix

Table A.1. Representative quotations of participants' answers, referring to their relationship with regulations and firm rules

Dimension and theme	Concept	Exemplary quotation
Effects of regulations and firm rules on HFT practices: Regulations and firm rules affect the practices employed at HFT firms	Regulation and firm rules prohibit certain trading methods	1.1 They would put a very large order on the other side of the book, to make the price move that way, and then they pull in all of a sudden and put an order on the other side. That's called 'flipping' [...] It was around for years. And it took a long time for the regulatory authorities to catch up with it [...] In the company I worked for [...] they were using 30 billion dollars, you are not going to muck around when you [are working with] 30 billion dollars. Everything is by the book, you know. (YR)
	To avoid computer program errors (bugs) which could lead to legal issues, HFT employees must implement their methods carefully	1.2 People come to me to trade. Before I act to their trade I know [...] what their supposed execution is before the actual execute of the trade. So, I have to be careful not to use this information in an inappropriate manner. [...] It wouldn't be good at all if we took that input, that order, and then execute the same order on the market on our own behalf and then told the client to get lost [...] This is considered 'front running the client' [...] We have to be very careful to avoid [that], not because we might be tempted, but because some stage of the programming might just lead to such an effect. (PL)
	Regulations and firm rules require strict data protection measures	1.3 [In internal computers] you can't even put headphones. You have to ask [for] permission so someone will come with a key, [and] plug in the headphone [...] If you plug USB keys, nothing works [...] If you try to email stuff – nothing goes in or out of the system. And if it can go in or out, you can be 100% sure that everything is monitored. (NL)

(Continued)

Table A.1. Continued

Dimension and theme	Concept	Exemplary quotation
Judgement about regulations, firm rules and the regulator: certain regulations and firm rules are perceived to be inadequate	Regulation of certain practices is inadequate	1.4 I think that the speed race is stupid [...] I think that in the HFT industry most people secretly would appreciate levelling of the playing field, right, we just do not have to complete as much as we do [...] But, ironically most of the exchanges would not stop this fire, they would suddenly offer even faster data services and then everybody has to do it. (HU)
	Certain legal techniques are unethical	1.5 About 10 year ago, if you look at the price updates [...] one in ten orders coming into the exchange were actually genuine [...] Now I think that ratio is probably more like a 100 to 1. [...] HFT companies [...] get paid by the exchange for posting these prices. So, they have no intention of trading whatsoever. So, what they do is that they constantly replace their orders [...] The exchanges are well aware of this and the exchanges do nothing about that [...] I think that's misleading [...] They are creating phantom liquidity. (RC)
Motivation for compliance with regulations and firm rules: inability to disobey firm rules	Strict firm rules are enforced	1.6 We are heavily regulated, and we need to follow all the rules, even when we think they are stupid, and they are, a lot of them are, the regulators actually don't know everything. But we follow them, and I know that all of my conversations are recorded, every email is saved for ten years, so there is all of the track record [...] so we have no possibility to do anything outside the framework of the regulators. (OS)

Table A.2. Representative quotations of participants' answers, referring to the perceived effect of HFT on its stakeholders

Theme	Concept	Exemplary quotation
HFT has a positive effect on the financial system	Market-making techniques increase market quality	2.1 There is a lobby group called [group name] that produces independent research and papers about [...] how high frequency trading provides more liquidity and tighter spreads in the market [...] [They] have commissioned independent studies on the benefits of high frequency trading. (OM)
HFT has a positive effect on the economy	HFT employees pay taxes	2.2 [...] the trader thinks, well, ok, we have just paid enough tax to pay for a nurse's salary for a year. That's why the government [...] likes the City, because it gives them a lot of income tax from all of those traders. (AD)
HFT has a positive effect on the political system and the social order	HFT sets a social order in which the smarter are richer	2.3 I have no shame and I have no [need for] excuses for people who just try to be better than everybody else. And if they spend lots of, tens of years in university programs, courses, trainings, I don't know, reading books, it's ethical to be better than others and, of course, to make money. And in fact, that's kind of [...] economy of brains, when you don't make money just bidding and selling, you make money by your intellect. And that's a huge advantage for every society [...] I really like these people [...] and I think that they are the heroes of our time. (TF)
HFT has a positive effect on technology firms, other firms and their customers	HFT supports the development of new technologies	2.4 When Intel comes out with a new family of processors, or CPUs, right, the first customers who are paying are HFT firms, right, because they don't care for the costs. Right, so, in effect, you know, they subsidize the cheaper computers [...] for the rest of society. (HU)
HFT supports individuals	HFT employees support their families	2.5 The only ethical consideration that I can think of, I am going to call it ethical, I am not saving children in Africa. You know, I am doing something that makes money. So maybe I am not doing good for the world, so to speak, but I stopped thinking about these things a long time ago because, you know, whatever profits I make, you know, they are going to support my family, and I don't care about those things. (EO)

(Continued)

Table A.2. Continued

Theme	Concept	Exemplary quotation
There is uncertainty about the effect of HFT on its stakeholders	HFT employees do not know who they trade against	2.6 In HFT it's purely, am, it's very pragmatic and scientific, there is no malice. I don't know whether it's good or bad [...], but there is definitely no intention to harm [...] HFT is not directional in general, so it does not care whether the market is going up or down; it just cares that there is volume in the market [...] Now, this can be seen as good or bad [...] Good: it does not seem to be aligned with what you could perceive as intentionally, you know, manipulating the market [...] Having said that [...] you must understand that I don't even know sometimes what we are trading against [...] I don't know what is the impact of that in the market. Frankly, I have no clue. (NL)
The effects of HFT on the market are small	HFT does not disrupt the market	2.7 If you ask me what [are the] benefits to society of having an efficient market on the millisecond scale [...] then the answer is: zero. But I don't think that society is hurt [...] I think that the public perception is ... it's not an easy subject, I think that the public's perception is off in this particular case. For example, I watched the <i>60 Minute</i> episode when they talked about <i>Flash Boys</i> and I think it should tell you something if they had to bring out Goldman Sachs the hedge fund billionaire as the poor victim. (HU)
HFT has a negative effect on the financial system and other firms	HFT attracts people who could otherwise have contributed to society more	2.8 I have a colleague, 22 years old, he makes me laugh a lot. And actually I often tell him that I feel sorry that [...] people like him are being sucked by this [HFT], because [...] it would be nicer if we all worked to do the kind of stuff that the brain power and the computer power could be applied [...] We could have sequenced the genome [...] The sequence of the genome is actually pattern matching, it's something that probably [could be done] with high computer power or HFT [...] When you log in to the NHS site, or the UK.Gov site [...] the website is terrible, because all the good people are being sucked by [HFT firms]. (NL)

Table A.3. Representative quotations of participants' answers, referring to the relationship between organizational ethicality and employees' job satisfaction and well-being

Theme	Concept	Exemplary quotation
Employees' judgement of the ethicality of HFT affects their job satisfaction and well-being	The perception that HFT has a positive effect on its stakeholders is associated with the feeling that work in HFT firms is rewarding and gives a sense of purpose	3.1 I know it [HFT] has a very bad reputation, but [...] there is a lot of good stuff which is going to leak out to the surrounding industry because technologists want to share [...] they believe in peer reviews and openness [...] the lessons learnt and the techniques we learn will apply elsewhere and we do share them on [website names]. Not the trade's secrets, not the trading models, but the 'how you make system work fast', and that, by itself, for me, is great, because you put yourself in that environment, you learn all these interesting things, then you share. So, that's rewarding. (BJ)

(Continued)

Table A.3. Continued

Theme	Concept	Exemplary quotation
	The perception that HFT has an unclear or negative social contribution is associated with emotional detachment, sense of meaninglessness and turnover intent	<p>3.2 <i>Emotional detachment from work.</i> So, in terms of ethics, [...] a lot of traders try to find excuses, saying that HFT market makers and markets takers or liquidity providers – reversely, who cares about liquidity, why would so many dollars change hands every day, there is no reason why [...] I think people just better do real things than that, real things being – I don't know, just, ah, fishing [...] or] grow some fruits, or grow some vegetables [...] Or build sustainable environment, world – this is 'real things' for me [...] This is why I am just taking it so cynically. Because I know that what I am doing here at [firm name], whether it will be used, or not, I don't care. I don't care. (VW)</p> <p>3.3 <i>Experiencing a sense of meaninglessness due to conflicts about lack of production.</i> I agree with what they [other participants] are saying [about experiencing meaninglessness] Yes, I can understand that, because we don't produce anything [...] We just move ones and zeros back and forth... [It's like a] casino. [...] On the one hand, [...] we mitigate transactions between companies which are, maybe, producing shovels, or, I don't know, dynamite, or [...] building stuff, so they can do their trades and buy stuff for other parts of work. (OS)</p> <p>3.4 <i>Experiencing a sense of meaninglessness due to the inability to contribute to stakeholders.</i> So, when I was an undergrad I always wanted to go into research [...] I did absolutely nothing to benefit society directly, and I always used to feel terrible about that [...] Ever since I started working in Finance [...] I found that I simply don't contribute to society in any meaningful way. And the only thing that makes me feel better about myself is the fact that I pay my taxes. That's all that I do to help society. I feel terrible about it [...] You can see some of the predictions of Einstein last week in the collision of black holes [...] and that's fantastic, that he was able to help us in some way 100 years down the line. (XM)</p> <p>3.5 <i>Intention to leave HFT.</i> I actually feel about this, ah, business, [that it] is meaningless. This is a part of the reason that maybe I will go to other business [...] I am currently not interested in trading anymore [...] I have been trading for money, but my career will be other than trading. (LQ)</p>

Table A.4. Additional aspects of the ethicality of HFT

Participant	Ethics-related concepts
RT	<p>4.1 <i>Expression of virtue ethics</i></p> <p>I am very, very happy sitting at a quantitative strategist job, because it's all about the ethics. If I were working in sales then, as everyone working in sales knows, that you cannot sell a product as it is, you have to repackage it in a nice [package] within the boundaries of the law [...] But when you are working in a quantitative work, providing solutions to risk traders sitting within the bank, there is no bullshit, you have to be real, you have to know your numbers, you have to provide the exact, accurate solution. If it's horrible, [...] you work on a new solution. You don't just fudge the numbers and send it through [...] All I say is that it's all about integrity in my line of work and I love it [...] One of the most important things for me is that there is no such a thing as coming up with some numbers and go ahead and present them to the client. The way that I ensure that these numbers are accurate is the essence of ethics. And I think that another person looking at it and confirming that those numbers make sense, that those numbers have been calculated correctly, is a crucial thing and I always make sure it happens. It's not about going to jail and it's not about being prosecuted etc. etc., it's about doing an honest, realistic job, job that I can be proud of, job that is professional and accurate.</p>

(Continued)

Table A.4. Continued

Participant	Ethics-related concepts
VW	4.2 The value of money is unclear; for instance, values of companies may change significantly in a single day.
SK (a woman)	4.3 Male HFT employees often use strong language and that makes HFT female employees feel uncomfortable or even on the verge of being harassed.
NP	4.4 Sharing strategies with colleagues raises ethical conflicts between relationship values and profitability.
VR	4.5 <i>Participation in CSR programmes is not necessarily considered ethical</i> Of course, there is this whole [volunteering programme name] bullshit, the whole helping charities and stuff [...] [Bank name] has that programme, where they give money to charity. [...] Every year [...] for an entire day [...] every single employee [has to volunteer]. These are great initiatives, but to me it's that they are trying to get a better image for the public [...] The money we raised was entirely made up from people donating [...] It's not the bank that donated out of their profits, it's people working at the bank making donations, and they are highly incentivized to do so. Like, the [programme] is called [a name which includes the word 'volunteering'], but you are actually forced to do it, so it's not a real volunteering. Well, you are not forced, but your manager says: 'OK, we have got statistics, and our department is not doing very well, so please attend and do the [volunteering]' [...] Banks are trying to get themselves a better image to the public. To me, being charitable is doing something to help others without [...] searching for something in return.
SG	4.6 <i>The public image of HFT is negative and distorted</i> So, regulation is pretty tight in the financial markets [...] All of the stories that I see, you know, in the movies and so on – I have never experienced them in real life [...] I have never met a single trader who was making a million dollar a year [...] One very good friend of mine is a seven-year trader in a very large American bank [...] and during his best year he was making, you know, 250, 260 [thousand] pounds. So, this is a lot of money [...] but it's very far from people's imagination [...] All the glamour and so on, that you see in the movies – it's gone, it's completely gone. If you go on a trading floor it's actually very quiet [...] So, it's not at all like in the movies [...] When I started I was paid £40,000. In London. So, with the rent and everything, at the end of the day, you are not so well off [...] It's not like a glamour life. [...] I think that the mistake that HFT has done [...] is miscommunication. We didn't communicate at all. And we let people build on fantasies that HFT traders were, you know, manipulating the market and scamming [...] – no guys, you lose money because you are not fast enough, because the technology is better than you, that's it. It's not because someone on the opposite side is trying to scam you. It's just, he is doing his job automatically, million times faster than you can even imagine doing it.

References

- Ahlers, O., A. Hack, K. Madison, M. Wright and F. W. Kellermanns (2017). 'Is it all about money? – Affective commitment and the difference between family and non-family sellers in buyouts', *British Journal of Management*, **28**, pp. 159–179.
- Aitken, M., D. Cumming and F. Zhan (2015). 'High frequency trading and end-of-day price dislocation', *Journal of Banking and Finance*, **59**, pp. 330–349.
- Aldridge, I. (2015). *High-Frequency Trading: A Practical Guide to Algorithmic Strategies and Trading Systems*. Hoboken, NJ: Wiley.
- Angel, J. J. and D. McCabe (2013). 'Fairness in financial markets: the case of high frequency trading', *Journal of Business Ethics*, **112**, pp. 585–595.
- Antonetti, P. and S. Maklan (2016). 'Social identification and corporate irresponsibility: a model of stakeholder punitive intentions', *British Journal of Management*, **27**, pp. 583–605.
- Bandura, A. (1990). 'Selective activation and disengagement of moral control', *Journal of Social Issues*, **46**, pp. 27–46.
- Barber, B. (2018). 'Bankers need higher standards to regain trust', *Financial Times*, 13 March, p. 11.
- Barraquier, A. (2011). 'Ethical behaviour in practice: decision outcomes and strategic implications', *British Journal of Management*, **22**, pp. S28–S46.
- Bauman, Z. and K. Tester (2001). *Conversations with Zygmunt Bauman*. Cambridge: Polity Press.
- Bazerman, M. H. and A. E. Tenbrunsel (2011). *Blind Spots*. Princeton, NJ: Princeton University Press.
- Brogaard, J., A. Carrion, T. Moyaert, R. Riordan, A. Shkilkov and K. Sokolov (2018). 'High frequency trading and extreme price movements', *Journal of Financial Economics*, **128**, pp. 253–265.
- Brown, M. E., L. K. Treviño and D. A. Harrison (2005). 'Ethical leadership: a social learning perspective for construct development and testing', *Organizational Behavior and Human Decision Processes*, **97**, pp. 117–134.
- Buchanan, M. (2015). 'Trading at the speed of light', *Nature*, **518**, pp. 161–163.
- Budish, E., P. Cramton and J. Shim (2015). 'The high-frequency trading arms race: frequent batch auctions as a market design response', *Quarterly Journal of Economics*, **130**, pp. 1547–1621.
- Burr, V. (2003). *Social Constructionism*, 2nd edn. London: Routledge.
- Carrion, A. (2013). 'Very fast money: high-frequency trading on the NASDAQ', *Journal of Financial Markets*, **16**, pp. 680–711.
- Carroll, A. (1987). 'In search of the moral manager', *Business Horizons*, **30**, pp. 7–15.
- Chih, H. L., H. H. Chih and T. Y. Chen (2010). 'On the determinants of corporate social responsibility: international

- evidence on the financial industry', *Journal of Business Ethics*, **93**, pp. 115–135.
- Chung, K., J. Eichenseher and T. Taniguchi (2008). 'Ethical perceptions of business students: differences between east Asia and the USA and among "Confucian" cultures', *Journal of Business Ethics*, **79**, pp. 121–132.
- Clegg, S., M. Kornberger and C. Rhodes (2007). 'Business ethics as practice', *British Journal of Management*, **18**, pp. 107–122.
- Conrad, J., S. Wahal and J. Xiang (2015). 'High-frequency quoting, trading, and the efficiency of prices', *Journal of Financial Economics*, **116**, pp. 271–291.
- Coolican, H. (1995). *Introduction to Research Methods and Statistics in Psychology*. London: Hodder & Stoughton.
- Cooper, R., M. Davis and B. Van Vliet (2016). 'The mysterious ethics of high-frequency trading', *Business Ethics Quarterly*, **26**, pp. 1–22.
- Corbin, J. M. and A. L. Strauss (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Thousand Oaks, CA: Sage.
- Cremer, D., R. Dick, A. Tenbrunsel, M. Pillutla and J. K. Murnighan (2011). 'Understanding ethical behavior and decision making in management: a behavioural business ethics approach', *British Journal of Management*, **22**, pp. S1–S4.
- Cumming, D., Y. T. Leung and O. Rui (2015). 'Gender diversity and securities fraud', *Academy of Management Journal*, **58**, pp. 1572–1593.
- Dahlmann, F., L. Branicki and S. Brammer (2017). "'Carrots for corporate sustainability": impacts of incentive inclusiveness and variety on environmental performance', *Business Strategy and the Environment*, **26**, pp. 1110–1131.
- Davis, M., A. Kumiega and B. Vliet (2013). 'Ethics, finance, and automation: a preliminary survey of problems in high frequency trading', *Science and Engineering Ethics*, **19**, pp. 851–874.
- Desai, V. M. (2016). 'Under the radar: regulatory collaborations and their selective use to facilitate organizational compliance', *Academy of Management Journal*, **59**, pp. 636–657.
- Domino, M., A. Wingreen and S. Blanton (2015). 'Social cognitive theory: the antecedents and effects of ethical climate fit on organizational attitudes of corporate accounting professionals—a reflection of client narcissism and fraud attitude risk', *Journal of Business Ethics*, **131**, pp. 453–446.
- Edwards, R. and J. Holland (2013). *What is Qualitative Interviewing?* Bloomsbury Academic. <https://doi.org/10.5040/9781472545244>.
- Elçi, M. and L. Alpkan (2009). 'The impact of perceived organizational ethical climate on work satisfaction', *Journal of Business Ethics*, **84**, pp. 297–311.
- Foucault, M. (1972). *The Archaeology of Knowledge and the Discourse on Language*. New York: Pantheon Books.
- Freeman, R. E., J. S. Harrison, A. C. Wicks, B. L. Parmar and S. De Colle (2010). *Stakeholder Theory: The State of the Art*. Cambridge: Cambridge University Press.
- Friederich, S. and R. Payne (2015). 'Order-to-trade ratios and market liquidity', *Journal of Banking and Finance*, **50**, pp. 214–223.
- Galbin, A. (2014). 'An introduction to social constructionism', *Social Research Reports*, **26**, pp. 82–92.
- Galbreath, J. (2010). 'Drivers of corporate social responsibility: the role of formal strategic planning and firm culture', *British Journal of Management*, **21**, pp. 511–525.
- Gioia, D. A., K. G. Corley and A. L. Hamilton (2013). 'Seeking qualitative rigor in inductive research', *Organizational Research Methods*, **16**, pp. 15–31.
- Goldstein, M. A., P. Kumar and F. C. Graves (2014). 'Computerized and high-frequency trading', *Financial Review*, **49**, pp. 177–202.
- Gordon, R., S. Clegg and M. Kornberger (2009). 'Embedded ethics: discourse and power in the New South Wales Police Service', *Organization Studies*, **30**, pp. 73–99.
- Guest, G., A. Bunce and L. Johnson (2006). 'How many interviews are enough?', *Field Methods*, **18**, pp. 59–82.
- Haidt, J. (2001). 'The emotional dog and its rational tail: a social intuitionist approach to moral judgment', *Psychological Review*, **108**, pp. 814–834.
- Harris, L. (2013). 'What to do about high-frequency trading', *Financial Analysts Journal*, **69**, pp. 6–9.
- Heffernan, S. A., X. Fu and X. Fu (2013). 'Financial innovation in the UK', *Applied Economics*, **45**, pp. 3400–3411.
- Hendershott, T. and R. Riordan (2004). 'Algorithmic trading and the market for liquidity', *Journal of Financial and Quantitative Analysis*, **48**, pp. 1001–1024.
- Hepburn, A. and J. Potter (2007). 'Discourse analytic practice'. In C. Seale, G. Gobo, J. F. Gubrium and D. Silverman (eds), *Qualitative Research Practice*, pp. 73–90. London: SAGE Publications.
- Hillenbrand, C., K. Money and A. Ghobadian (2013). 'Unpacking the mechanism by which corporate responsibility impacts stakeholder relationships', *British Journal of Management*, **24**, pp. 127–146.
- Hofeditz, M., A. M. Nienaber, A. Dysvik and G. Schewe (2017). "'Want to" versus "have to": intrinsic and extrinsic motivators as predictors of compliance behavior intention', *Human Resource Management*, **56**, pp. 25–49.
- Hoffmann, P. (2014). 'A dynamic limit order market with fast and slow traders', *Journal of Financial Economics*, **113**, pp. 156–169.
- Jain, P. K., P. Jain and T. H. McInish (2016). 'Does high-frequency trading increase systemic risk?', *Journal of Financial Markets*, **31**, pp. 1–24.
- Johnson, K. N. (2017). 'Regulating innovation: high frequency trading in dark pools', *Journal of Corporation Law*, **42**, pp. 833–886.
- Kirilenko, A., A. S. Kyle, M. Samadi and T. Tuzun (2017). 'The flash crash: high-frequency trading in an electronic market', *Journal of Finance*, **72**, pp. 967–998.
- Knights, D. and D. McCabe (2015). "'Masters of the universe": demystifying leadership in the context of the 2008 global financial crisis', *British Journal of Management*, **26**, pp. 197–210.
- Lewis, M. (2015). *Flash Boys: Cracking the Money Code*. London: Penguin Books.
- Locke, E. A. (1976). 'The nature and causes of job satisfaction'. In M. D. Dunnette (ed.), *Handbook of Industrial and Organizational Psychology*, pp. 1297–1349. Chicago, IL: Rand McNally.
- MacIntyre, A. (2007). *After Virtue: A Study in Moral Theory*, 3rd edn. Notre Dame, IN: University of Notre Dame Press.
- Manahov, V. (2016). 'Front-running scalping strategies and market manipulation: why does high-frequency trading need stricter regulation?', *Financial Review*, **51**, pp. 363–402.

- Matthews, J. B., K. E. Goodpaster and L. L. Nash (1985). *Policies and Persons: A Casebook in Business Ethics*. New York: McGraw-Hill.
- Mayer, D. M. (2014). 'A review of the literature on ethical climate and culture'. In B. Schneider and K. M. Barbera (eds), *The Oxford Handbook of Organizational Climate and Culture*. Oxford Handbooks Online. <https://doi.org/10.1093/oxfordhb/9780199860715.001.0001>.
- Miles, S. (2017). 'Stakeholder theory classification: a theoretical and empirical evaluation of definitions', *Journal of Business Ethics*, **142**, pp. 437–459.
- Moore, C., J. R. Detert, L. K. Treviño, V. L. Baker and D. M. Mayer (2012). 'Why employees do bad things: moral disengagement and unethical organizational behavior', *Personnel Psychology*, **65**, pp. 1–48.
- Perrault, E. (2017). 'A "names-and-faces approach" to stakeholder identification and salience: a matter of status', *Journal of Business Ethics*, **146**, pp. 25–38.
- Phillips, R. (2003). 'Stakeholder legitimacy', *Business Ethics Quarterly*, **13**, pp. 25–41.
- Promislo, M. D., R. A. Giacalone and J. Welch (2012). 'Consequences of concern: ethics, social responsibility, and well-being', *Business Ethics: A European Review*, **21**, pp. 209–219.
- Prooijen, A. M. and N. Ellemers (2015). 'Does it pay to be moral? How indicators of morality and competence enhance organizational and work team attractiveness', *British Journal of Management*, **26**, pp. 225–236.
- Rest, J. R. (1986). *Moral Development: Advances in Research and Theory*. New York: Praeger.
- Saunders, M. N. K. and K. Townsend (2016). 'Reporting and justifying the number of interview participants in organization and workplace research', *British Journal of Management*, **27**, pp. 836–852.
- Schwartz, M. (2016). 'Ethical decision-making theory: an integrated approach', *Journal of Business Ethics*, **139**, pp. 755–776.
- Schweper Jr, C. H. (2001). 'Ethical climate's relationship to job satisfaction, organizational commitment and turnover in the sales force', *Journal of Business Research*, **54**, pp. 39–52.
- Sinnicks, M. (2018). 'Leadership after virtue: MacIntyre's critique of management reconsidered', *Journal of Business Ethics*, **147**, pp. 735–746.
- Sison, A. J. G., I. Ferrero, G. Guitián, M. Rocchi and A. Roncella (2018). 'Virtues and the common good in finance'. In A. J. G. Sison, I. Ferrero and G. Guitián (eds), *Business Ethics: A Virtue Ethics and Common Good Approach*. New York: Routledge.
- Tashman, P. and J. Raelin (2013). 'Who and what really matters to the firm: moving stakeholder salience beyond managerial perceptions', *Business Ethics Quarterly*, **23**, pp. 591–616.
- Tsoukas, H. (2018). 'Strategy and virtue: developing strategy-as-practice through virtue ethics', *Strategic Organization*, **16**, pp. 323–351.
- Van Gils, S., N. Van Quaquebeke, D. Van Knippenberg, M. Van Dijke and D. De Cremer (2015). 'Ethical leadership and follower organizational deviance: the moderating role of follower moral attentiveness', *Leadership Quarterly*, **26**, pp. 190–203.
- Victor, B. and J. B. Cullen (1988). 'The organizational bases of ethical work climates', *Administrative Science Quarterly*, **33**, pp. 101–125.
- Vitell, S. J. and D. L. Davis (1990). 'The relationship between ethics and job satisfaction: an empirical investigation', *Journal of Business Ethics*, **9**, pp. 489–494.
- West, B., C. Hillenbrand, K. Money, A. Ghobadian and R. D. Ireland (2016). 'Exploring the impact of social axioms on firm reputation: a stakeholder perspective', *British Journal of Management*, **27**, pp. 249–270.
- Wheatley, M. (2014). 'Regulating high frequency trading'. Speech by Martin Wheatley, CEO, the FCA, at the Global Exchange and Brokerage Conference, New York. Available online at <https://www.fca.org.uk/news/speeches/regulating-high-frequency-trading>. [accessed 7 May 2019].
- Xie, J. (2016). 'Criminal regulation of high frequency trading on China's capital markets', *International Journal of Law, Crime and Justice*, **47**, pp. 106–120.
- Zhou, W. and N. Olivari (2013). 'EBS take new step to rein in high-frequency traders', *Reuters Newswire*, August 23.

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