**Does the deployment of algorithms combined with direct electronic access increase conduct risk? Evidence from the LME.**

# **Introduction**

"…we are seeing new complexities emerge around issues like disintermediation.

…a split from the principal / agent model that’s underpinned monetary transactions for most of human history.” (Wheatley, 2015)

These sentiments, expressed by Martin Wheatley, then Chief Executive Officer of the UK Financial Conduct Authority (“FCA”), in response to retail developments would also inform regulatory initiatives concerning the proliferation of algorithmic trading and direct electronic access in the wholesale markets.

In *Algorithmic Trading Compliance in the Wholesale Markets* (2018a), hereinafter “Algorithmic Trading Compliance”the FCA differentiated between two forms of algorithmic deployment, borrowing heavily from Commission Delegated Regulation 2017/589 (“CDR 2017/589”) to the second Markets in Financial Instruments Directive (“MiFID II”):

1. investment decision or “trading” algorithms: “make automated trading decisions by determining which financial instrument should be purchased or sold”*;* and
2. order execution algorithms: “optimise order-execution processes by automatic generation and submission of orders or quotes, to one or several trading venues once the investment decision has been taken”*.*

Many market participants rely on DEA to deploy their algorithms. This is because they are not themselves members of a trading venue such as the London Metal Exchange (“LME”). DEA is defined in Article 4(1)(41) of MiFID II (2014) as

“an arrangement where a member or participant or client of a trading venue permits a person to use its trading code so the person can electronically transmit orders relating to a financial instrument directly to the trading venue”.

*Algorithmic Trading Compliance* also encouraged firms to “identify and reduce potential conduct risks created by their algorithmic trading strategies”. *Culture Audit in Financial Services: Reporting on Behaviour to Conduct Regulators* (Miles, 2021) offers the following definition of conduct risk:

“Subset of behavioural risk: potential cost resulting from employees or suppliers breaching conduct rules; or more generally, business loss following staff or supplier behaviour (especially towards customers) that undermines trust or value in the business or creates a ‘disorderly market’. Includes managers’ inaction failing to anticipate and overcome biases or asymmetry in transactions”.

Taking a qualitative approach, this paper seeks to draw conclusions about the effectiveness of regulatory initiatives such as *Algorithmic Trading Compliance* and CDR 2017/689 in addressing potential conduct risks arising from the deployment of algorithms and DEA by broker-dealers from the analysis of 15 explorative semi-structured interviews held with experts in trading at the LME.

The paper finds that the key conduct related messages in *Algorithmic Trading Compliance in the Wholesale Markets* may not yet be fully embedded at broker-dealers. This is because of a perceived simplicity of the algorithms deployed by broker dealers or, alternatively, a lack of reflection on their impact. Conversely, a concern exists that clients’ deployment of algorithms on DEA channels provided by broker-dealers increases conduct risk. However, the threat of harm posed by clients is not envisaged in current definitions of conduct risk. Accordingly, CDR 2017/589 does not currently require firms to evaluate clients’ awareness of it.

To account for the potential harm arising from clients’ activities, the paper proposes a revision to Miles’s definition of conduct risk. This is complemented by a proposed amendment to CDR 2017/589 to require evaluation of clients’ understanding of conduct risk.

The rest of this paper is structured as follows. First, a literature review surveys the conduct risks that are typically associated with the deployment of algorithms and trading. Besides, an overview of the UK/EU regulatory framework currently in place to govern algorithmic trading is provided. Next, details of the study’s methodology and findings are set out. Thereafter, the significance of the findings is discussed. Recommendations for policy improvements and further research are also made in this section. Finally, the paper concludes with a summary of the paper’s insights and their implications for future regulatory practice.

1. **Literature review**

The potential conduct implications of trading algorithms were propelled into the consciousness of regulators in the aftermath of the 2010 Flash Crash (Busch, 2016). Four types of risk have been identified in the ensuring debates about algorithmic conduct (Culley, 2020). These include: (i) manipulation; (ii) structural; (iii) imitative; and (iv) hybrid.

Manipulative conduct involves the deployment of deliberately abusive strategies which include quote stuffing, layering, spoofing, front running and momentum ignition (Fisher et al., 2015). Quote stuffing has been described as a type of financial “denial-of-service attack”, whereby the perpetrator floods the central limit order book (“CLOB”) with many orders to slow down other market participants (Jared et al., 2016). Layering and spoofing is the practice of placing orders without an intention of executing them (Wellman and Rajan, 2017). Momentum ignition seeks to draw other market participants to rapidly increase their activity on the CLOB so the perpetrator can exit their trades at more advantageous prices (Friederich and Payne, 2012). Front running occurs when a high-speed trader detects that another market participant has placed a large order. Seeking to benefit from the upcoming price movement, the trader uses his speed advantage to place an order in front of the large order. The trader can then fill the large order at a price that is favourable to him, but which is likely to be detrimental to the other market participant (Scopino, 2015). Front running has proved particularly controversial because it is not necessarily illegal, provided that the trader has not misused confidential information in executing his strategy (Cooper et al., 2017).

Structural conduct risk arises when an algorithmic trader exploits a design flaw, anachronism, or other vulnerability in a market’s infrastructure to his advantage (Culley, 2020). The behaviour is not necessarily illegal, but could be ethically questionable (Miles, 2017). For example, an “arms race” whereby traders continually enhance their capability to trade at high speeds is not lawful but pressurises other market participants to divert resources away from fundamental research activities that are arguably more socially useful (Budish et al., 2015). Similarly, using a technological advantage to “pick off” the stale quotes of slower market participants (MacKenzie, 2018) has long been a feature of financial markets. If left unaddressed these issues, together with poorly conceived incentive structures to attract algorithmic disruptors can result in liquidity flight (Yadav, 2016).

In terms of imitative risks, herding results from algorithmic traders following each other’s signals (Stoll, 2014). This type of conduct can choke liquidity. Furthermore, in an unstable market herding often results in feedback loops[[1]](#footnote-1) that exacerbate volatility and trigger a crash (Borch, 2016).

Hybrid conduct risks can materialise when trading algorithms interact with other technologies. During the so-called ‘Hack crash’ (23rd April 2013) the Dow Jones Industrial Average plunged 143.5 points after algorithms reacted to false reports of a terrorist attack at the White House that had been posted on the Associated Press Twitter account after it had been compromised by hackers (Karppi and Crawford, 2016).

Critical to the development of fully “synthetic markets”, and by extension the growth of algorithmic conduct risks, is the supply of DEA to a trading venue (Seddon, 2020). Synthetic markets are characterised by high algorithmic participation and low levels of intermediation (Seddon, 2020). Originating in the equities markets, DEA spread to highly liquid futures markets such as those operated by the Chicago Mercantile Exchange (“CME”) in the early 2000s (Maguire, 2006). Brokers were initially slow to offer advanced algorithmic functionality to their DEA clients (Maguire, 2006). Furthermore, buy side demand for custom built algorithms that could be deployed on DEA connectivity was also low (Maguire, 2006). Nonetheless, automated trading has seen rapid growth in the base metals markets in recent years. 70% of base metals trades made at the CME between 1st November 2016 – 31st October 2018 were derived from automated means (Haynes and Roberts, 2019). Likewise, the LME Select application programming interface (“API”) which allows LME members and, indirectly, their clients to deploy their own trading platforms to the LME’s CLOB is very attractive, according to press reports (Hack, 2014). A chief concern with DEA is that the broker cedes some control over trading to clients (Callcott and Foley, 2011), potentially amplifying the conduct risks associated with algorithmic trading (Harrison, 2010).

Regulators in the European Union attempted to mitigate the inherent risks of combined algorithmic trading and DEA in MiFID II (Busch, 2016).

In terms of deterring manipulative conduct, MiFID II adopts what Seyfert (2021) terms is a “behaviouristic” or “outcomes-based” approach to the regulation of algorithmic trading. This is because the regulation does not seek to interpret the *intentions* behind an algorithm’s conduct. This would be too challenging for regulators, most of whom are not computer scientists, posits Seyfert. Instead, emphasis is placed on the impact of conduct on the CLOB. Firms are required to tag algorithmic trades in transaction reports that are received by regulators and used to detect market abuse[[2]](#footnote-2). This permits a more detailed retrospective examination if required. However, Čuk and Van Waeyenberge (2018) are critical of this approach, claiming that it is likely to cause confusion. This is because, in MiFID II, those responsible for designing and deploying algorithms are likely to arrive at differing interpretations as to what constitutes manipulative conduct.

MiFID II also attempts to address perceived structural weaknesses in European markets that were believed to make them susceptible to algorithmic predation. The first Markets in Financial Instruments Directive (“MiFID I”) allegedly encouraged the growth of algorithmic trading by giving birth to new trading venues to challenge traditional exchanges (Lenglet, 2021) (MacKenzie, 2021). Conversely, MiFID II seeks to exert control over algorithmic actors. First, firms employing high frequency trading techniques must seek authorisation, even if they only trade for their own account (Sheridan, 2017). Second, trading venues must offer to house participant’s computers next to their own[[3]](#footnote-3) on a non-discriminatory and transparent basis (2017b). Third, trading venues and firms must enact a range of pre-trade controls such as throttles (“maximum number of order entries/updates sent…per second”) (Linton, 2012). Fourth, firms must implement a “kill switch” to terminate resting orders if deemed necessary (Schulte, 2018). Both controls can assist in counteracting imitative and hybrid algorithmic conduct risk. Fifth, firms must perform post trade data reconciliations (Busch, 2016). Sixth, the abovementioned controls must sit within a comprehensive governance framework including documented audit trails, formal sign offs, and training. Finally, regulators were equipped with new powers to request information (Azzutti et al., 2021). This includes an ability to seek a description of strategies, systems and controls, and to ascertain the knowledge and understanding of control functions.

With regards to DEA, MiFID II requires intermediaries to implement several control requirements. These include conducting: (a) due diligence on prospective DEA clients to determine their suitability to receive DEA; and (b) monitoring on the DEA clients’ activities to detect conduct that could amount to market abuse, or otherwise be disorderly or breach the rules of a trading venue (Busch, 2016).

Critics of the MiFID II package have cited the increased costs and administrative burdens as potentially raising barriers to entry (Yeoh, 2019). This is particularly the case where manually calibrated execution algorithms are concerned. This is because, it is argued, manual algorithmic trading” is losing ground in the machine learning era (Pereira, 2020). This has led to some market participants to recently demand reforms to relax the burden on entities that only deploy execution algorithms (2021m). Indeed, lobbying of this nature has helped shape the reforms of regulations and trading venues that contributed to the birth of algorithmic trading.

Zaloom (2006) explores how the transition from trading pits to screens reshaped the dealing floor. Set in the dot.com era, Zaloom found the “violent hypermasculinity” that predominated in the pits at the Chicago Board of Trade (“CBOT”) was being displaced by the quiet solitude of office based trading. Intermediation continued to pre-dominate, but the early stages of electronification created opportunities for a new breed of intellectual trader to challenge the “alpha male”, socially conservative orthodoxy (Miranti, 2007).

MacKenzie (2015) studies the CME’s introduction and expansion of its electronic trading platform Globex in the 1990s and early 2000s. At the behest of incumbent floor dealers, Globex was initially very restricted during pit hours. Facing growing competition from Europe such as Eurex, the CME’s membership voted to lift the operating restrictions on Globex in 1999, precipitating the gradual decline of the pits. Concerns about the raucous behaviour of pit traders started to be displaced by spoofing fears in the new era (2021).

Like MacKenzie, Seddon (2020) charts the conflict that accompanied the LME’s launch and development of its own electronic trading platform, LME Select, from 2001 to late 2018. Merchants assert the LME is not comparable to US markets such as the CME. As a servant of physical interests, the LME lists “futures with forward features” to facilitate customisation. The LME has sought to maintain its links to the physical trade whilst innovating to compete with the likes of the CME for new sources of liquidity. Paradoxically, this has involved building further iterations of LME Select to accommodate HFT firms’ preferences, whilst also curtailing incentive programmes designed to attract them.

Whilst the findings of Zaloom, MacKenzie and Seddon have implications for conduct risk, the core focus of these works is the sociology and politics of change.

In a critique, Smith (2007) highlights that Zaloom’s ethnographic work predates “new forms of algorithmic, but probably equally asocial structures are to be determined”. Intermediation still pre-dominated in the initial stages electronification catalogued in Zaloom’s work.

MacKenzie does examine the growing trend towards disintermediation. Even so, to prevent his project from becoming “overcomplicated”, MacKenzie does not extensively analyse the regulatory initiatives that followed the 2008 financial crisis.

Seddon generalises his findings to comment on the influence of competing interests on the evolution of the macro-regulatory environment. Seddon does not seek to analyse the conduct implications of algorithmic deployment and increasing disintermediation per se.

# **3. Methodology**

To develop the literature, the author opted to examine the effectiveness of *Algorithmic Trading Compliance* and CDR 2017/589 in developing awareness of conduct risk associated with algorithmic and DEA trading. The author decided to focus on the activities of floor[[4]](#footnote-4) trading members (“Category 1”) of the LME and their clients because they sit at the crossroads of traditional open outcry and electronic forms of trading. Nevertheless, many of these members are part of a small, but economically important, community of broker-dealers that offer services in a wide range of asset classes. Accordingly, there is a possibility of producing generalisable findings from this population.

To conduct the study, primary data would be collected from semi-structured interviews with elites. The author assessed that this approach would facilitate: (a) a deeper understanding of how Category 1 firms and their clients are deploying algorithms, and (b) a discussion about the implications of this deployment for the effectiveness of conduct risk initiatives. A list of topics to discuss was prepared in advance of arranging the interviews. This ensured a degree of commonality across the interviews to help enable generalisation, whilst offering flexibility to explore matters raised in greater depth. The research design received Ethics Committee approval before the interviewing commenced.

During 2021 the author conducted interviews with the following stakeholders:

1. eight senior representatives of Category 1 firms;
2. a trader from a physical user client;
3. a senior manager at a financial client that takes direct electronic access from Category 1 firms and sub-delegates this access to its own clients;
4. two sales and trading representatives from a ‘disruptor’ algorithmic market maker;
5. a recent ex-regulator;
6. an expert who assists physical users manage their risks; and
7. one current and one former representative of Category 2 firms that regularly interact with Category 1 members.

The stakeholders were recruited for the breadth of expertise, covering compliance, information technology, operations, sales and trading. All participants were guaranteed anonymity. Accordingly, their identities and job titles cannot be disclosed.

The success in being able to enrol so many leading figures from the realm of Category 1 trading at the LME was down to the personal contacts the author had cultivated during his career as a compliance professional at three LME member firms. All the same, a sizeable number of invitations were declined or ignored. Despite the guarantee of anonymity, some were anxious about potential infringements of confidentiality obligations, particularly at algorithmic ‘disruptor’ firms such as electronic market makers and high frequency proprietary traders. Others stated that they did not believe they had the required knowledge to make a meaningful contribution to the project. A few even said that their firms did not deploy algorithms or were not algorithmic traders. This would contradict information published on their firms’ websites. As many interviews were conducted with senior representatives at Category 1 firms, these recruitment challenges did not significantly limit the study.

Owing to the COVID-19 pandemic, all interviews were conducted remotely using Microsoft Teams. All interviewees were asked to consent to recording. Functionality in Microsoft Teams was used to record the interviews. The recordings were uploaded to Nvivo for transcription. After an initial check for accuracy, the transcripts were then subjected to qualitative content analysis in Nvivo.

The content was analysed following the approach recommended by Miles (Miles, 2014). This involved constructing a codebook comprised of two cycles. In the first cycle, the author sought to identify general themes. In the second cycle, the author sought to refine the themes identified to produce concrete findings. The resultant findings were then enriched by a review of selected secondary source materials.

# **4. Findings**

First, where Category 1 LME member firms are deploying algorithms in their own trading operations, this is usually for ‘order execution’ enhancement purposes.  “We don’t classify ourselves as algorithmic traders...certainly not in the purest form” (2021c) said one senior manager. The justifications advanced for this include:

* 1. deployment is limited to simple algorithms reflecting order types that are “native” to the LME’s Financial Information eXchange (“FIX”) specification[[5]](#footnote-5), for example iceberg orders (2020a);
	2. Category 1 firms do not deploy machine learning / artificial intelligence algorithms: “...we haven’t quite got to the point where...customers’ orders and transactions are feeding into a black box where it’s maybe like a dark pool of an algorithmic way” (2021d); and
	3. Category 1 firms serve “metal touching”customers (market participants whose principal objective is to hedge their physical risk rather than to speculate) who have not expressed an interest in using more complex algorithms (2021k, 2021l) (2021e).

Second, with some exceptions, Category 1 LME member firms deploy algorithms that have been developed by independent software vendors (“ISVs”). A senior manager stated: “personally, I would like to see us rolling out a proprietary system, but...I’m not sure we’re ready to do that yet” (2021d). The table in the Appendix provides a summary of the ISV platforms that are currently used by Category 1 LME member firms. Only two Category 1 members state on their websites that they have created their own platforms. A representative of one of those members confirmed that his firm has its own change management processes to help maintain the conformance of its platform and the algorithms therein with the LME’s requirements. Otherwise, several interviewees perceive that they are very reliant the “ISVs in this space to help us comply” (2021c), with this being “based on attestations taken from vendors” (2021c).

Third, several Category 1 LME member firms offer their clients DEA to LME Select using application programming interface (“API”) connectivity. Using this, clients or indirect clients (persons who receive access to the LME through sub-delegation from a direct client of an LME member) can deploy algorithms with less oversight. An ex-regulator specialising in wholesale trading algorithms declared: “it terrifies me if I'm honest, but no idea how you get a handle on that” (2021b).  He went on to say:

“I think it's absolutely something we've been trying to bang the drum on for ages about this sort of sub delegates… where…you've got maybe three or four firms kind of sitting further down the chain. And then ultimately, some guy, as you said in his book, your faith in God knows where, who's actually initiating all this activity. And realistically, how do you get a grip over that person? And I it's that's definitely one of those things that which I think is going to blow up, you know, another Hound of Hounslow type sort of thing, which will cause us to revisit all this”(2021b).

This is particularly because an indirect client could deploy an order type or combination of order types in the pursual of abusive strategy using API connections taken from several Category 1 members that would be more challenging for those members’ surveillance teams to detect. “It’s impossible for any organisation to know what a client might be doing with their other broker relationships” (2021f), asserted one senior anti-financial crime professional.

Arbitrage strategies, e.g. between the LME and the Shanghai Futures Exchange (“SFE”) are particularly popular with customers. Many of these strategies rely on tools to facilitate automatic execution[[6]](#footnote-6) (2021j). It can be challenging to differentiate between legitimate arbitrage and attempts to spoof the marketplace (2020b). Additionally, the cultural influence of the broker dissipates with sub-delegation, especially where indirect participants hail from outside the West: “The culture of the Chinese market is very different from the cultures of the vast majority of the customers” (2021k) declared one interviewee.

Several interviewees confirmed that their firms collected trading specific due diligence from their clients taking DEA services (2021f). However, none of those interviewed said that they had visited clients or provided dedicated training to them about the permissible use of algorithms on UK trading venues. One interviewee hoped algorithmic misconduct engaged in by DEA clients would be picked up by MiFIR transaction reporting (2021f). This is because, under MiFIR investment firms are required to flag orders where an investment or execution decision has been made by an algorithm (2016).

Fourth, physical customers are also concerned that the (perceived) growth in algorithmic actors at the LME is distorting the market: “…it’s also a risk because it can create a self-dynamic regarding placing orders, receiving orders and this could lead to a dynamic in the physical markets which would not reflect the reality or the economy” (2021l). Consequently, the traditional broker offers this type of participant reassurance: “you need to have someone who pushes the red button to stop it [the algorithm]” (2021l), asserted one.  Partially in reaction to the presence of algorithms in the market at least one Category 1 member has ceased offering DEA. "One way we have protected clients is that we don't offer them DMA[[7]](#footnote-7)" (2021e), declared one senior manager, after averring that “algorithmic traders out there are watching the market and are looking to take advantage of what the real market is doing just by trying to get ahead of those participants” (2021e). Reminiscent of anxieties about front running in other markets that witness a high level of participation by algorithmic actors, the senior manager stated that the firm had created a request for quote (“RFQ”) platform that does not directly connect to the LME Select’s central order book, “…so in a way we are acting as that buffer as far as other firms are concerned” (2021e).

Finally, some representatives of Category 1 LME member firms do not perceive a direct link between algorithms they deploy and conduct risk. “The fact that we don’t write algorithms ourselves means that I’m not quite sure that we interlink them necessarily with conduct risk” (2021c) opined a senior manager. As a result, the general perception of those interviewed is that the conduct risks posed by Category 1 members’ own algorithms is currently minimal. Behaviours mentioned during interviews included front running (2021g), collusive typologies (2021i) and feedback loops emanating from erroneous calibration (2021l). Furthermore, a senior manager at a Ring dealer who is tasked with combatting financial crime stated that he did not think the introduction of algorithms had amplified the existing conduct risks posed to his firm (2021f). A consultant acting for Category 1 firms’ physical user clients agreed: “What the algos have been is just like used the term in my paper barnacles on the bottom of a boat...and that’s what they are at the moment, but they could get worse” (2021k). One senior manager averred that execution algorithms could reduce conduct risk because they reduce firms’ dependence on sales staff (2021c).

Some Ring dealers do, however, perceive a direct link between the algorithms created by recent entrants to the market and conduct risk. One senior manager remarked that the disabling of the discretionary order type in LME Select in early 2021 had caused concern amongst dealers, many of whom felt that this would make them more vulnerable to predatory behaviour: "I had dealers coming to me saying, well, this is not great. This just puts us more hands of the algos because now we've got no way of still getting a feel if there's a bit of movement that everything's going to be in the market the algos are going to see that and they'll jump ahead of us" (2021e).

A senior representative of an electronic market maker interviewed for comparative purposes offered insights that reinforce the perception of traditional Ring dealers: “...the conduct risk that we have, which is sort of substantial...is the risk we enter into strategies around spoofing, layering...wash trades[[8]](#footnote-8), etc” (2021h). He continued: “in some ways, it’s heightened because...if you do decide to behave badly, it can be done systematically, whereas I think human conduct risk is, almost by definition, somewhat more limited” (2021h).  According to the electronic trading expert, the systematic nature of algorithmic conduct risk makes it more insidious because: “...each individual event would not be viewed as material, but when you look at the events in totality, they become quite material or [have a] very material impact” (2021h).

# **5. Discussion**

The data suggests that contrary to losing ground as mooted by Pereira (2020), manual algorithmic trading will continue to predominate at the LME for the near future. First, traditional Ring dealers and their clients assert they currently lack the technological capabilities to develop and deploy sophisticated trading and machine learning algorithms. Second, supporting Zaloom (2006), MacKenzie (2015) and Seddon (2020), the representatives of traditional players interviewed were generally suspicious of enhanced forms of electronic disruption. There are some concerns that execution algorithms could lend themselves to manipulative strategies such as those outlined in Fisher et al.(2015) and Scopino (2015) as well as imitative feedback loops Stoll (2014) and Borch (2016). The risks of these behaviours occurring at disrupters is perceived to be higher by interviewees.

Taken at face value, these claims infer that advanced algorithmic deployment at the LME significantly lags even the medium-scale maturity achieved in securities trading (2019a) and HFT dominated US futures markets MacKenzie (2021). Seddon (2020) explains this is owing to differences in market structure. At the same time, the perspectives of representatives of Category 1 firms and their clients are not necessarily reflective of all trading at the LME. First, that electronic market makers deploy more advanced algorithms is well documented. Second, it is possible that some non-member investment managers are deploying machine learning strategies via DEA provided by investment banks offering prime brokerage services.  However, they will often execute transactions with non-bank members of the LME and arrange for resultant deals to be “given up” to their prime broker for clearing (2021a).

A lack of personal familiarity frustrated the author’s attempts to speak to bank staff. Therefore, an opportunity exists to develop the findings considering the Prudential Regulation Authority’s (“PRA”)[[9]](#footnote-9) own work in this area (2018b).

Notwithstanding the above, it is noteworthy that, despite the publication of *Algorithmic Trading Compliance,* participants did not make a distinction between clearing clients and execution only clients when asked about the sophistication of algorithmic deployment they were seeing when providing DEA. This is possibly because investment managers are not deploying machine learning algorithms in their activities with non-bank firms, or at all; or (b) these participants make a “mental separation” between clearing and execution only clients.

Perhaps of more concern to regulators is that some interviewees did not associate their algorithmic deployment with conduct risk. This could be because of the continued predominance of manual algorithmic trading. Enhanced forms of algorithmic trading are a recent arrival at the LME (Seddon, 2020). Market participants may not have had enough time to reflect on their impact. Alternatively, some interviewees may have been keen to present their firms’ operations in a positive light. Either way, this is a signal that the FCA’s conduct initiatives may still not be reaching all their intended targets.

In the UK, the UK’s Senior Managers and Certification Regime (“SMCR”) requires firms to assess the fitness and properness of staff performing “algorithmic trading” functions. A year after the first elements of SMCR entered into force for FCA-only regulated firms, the regulator observed:

“Some support and IT units and e-platform specialists stated that conduct risk did not apply to them. This was particularly unsettling given our own commentary as well as heavy press coverage on ‘conduct of the machine’….” (2020e)

The findings herein indicate that this observation may equally be applicable to manual algorithmic trading. They also imply that the conduct focus is too heavily focused on firms in the DEA era.

Zaloom (2006), MacKenzie (2015) and Seddon (2020) have documented how “top down” market structure design has been spurred by competitive and political tussles between different actors at the state, venue and membership levels is a key determinant in how market participants conduct their business. Equally significant, are the “bottom up”, demands of individual clients. In a departure from Maguire (2006), the results confirm that Category 1 members are now keen to accommodate clients’ custom arbitrage tools. An increased reliance on software vendors and propensity to support sub-delegation means the concerns raised in Callcott and Foley (2011) are more relevant than ever. These may not be immediately detectable at the venue or material levels. Nonetheless, in seeking to placate specific clients or gain a competitive advantage, there may be a temptation to accede to a technical innovation to the detriment of wider market dynamics.

The controls ushered in by MiFID II since MacKenzie (2015) attempt to ensure firms mitigate such risks. Moreover, Miles’s definition of conduct risk currently captures “suppliers”. ISVs currently sit outside the FCA’s regulatory perimeter but could still face repercussions because of poorly conceived innovation.

Clients also have a role to play in “ensuring markets work well”[[10]](#footnote-10) through good conduct. However, despite markets having become increasingly disintermediated since Zaloom (2006), a behavioural blind spot continues to exist that is vulnerable to being exploited by unregulated participants. The “Hound of Hounslow” case was proffered by an interviewee as an example of this threat. Using DEA connectivity, an amateur trader devised abusive strategies that contributed to the Flash Crash (Vaughan, 2020). Hence, I am proposing the following amendments to Miles’s definition of conduct risk:

“Subset of behavioural risk: potential cost resulting from employees, ~~or~~ suppliers **or clients** breaching **expected standards of good** conduct ~~rules~~; or more generally, business loss following staff, ~~or~~ supplier **or client** behaviour (especially **at the expense of** ~~towards customers~~ **other market participants**) that undermines trust or value in the business or creates a ‘disorderly market’. ”.

The FCA has a range of tools at its disposal to prevent, detect and punish abusive conduct. There is evidence that these have a strong deterrent effect at the level of firms and their employees, justifying the costs involved (Ashton et al., 2021). While this may be true, employees at FCA regulated firms are required to undertake role specific training covering a range of conduct obligations (2020d). For example, Article 3 of CDR 2017/589 (2017a) requires firms to train staff involved in the management of algorithmic trading systems on systems and controls applicable to their deployment. These may have contributed to the effectiveness of the FCA’s deterrent efforts, even though more work may need to be done at traditional brokerage firms.

 At present, Article 25 of CDR 2017/589 does not require DEA providers such as Category 1 and 2 members of the LME to formally evaluate their clients’ understanding of their conduct obligations. CDR 2017/589 informs the rulebooks of UK trading venues as applied to DEA (Undated). Extending the sentiment of Article 3 of CDR 2017/589 to Article 25 could help alleviate some of the concerns raised by interviewees in this paper. To embed the revised iteration of Miles’s definition of conduct risk, it is proposed that policy makers extend Article 25 to include the following:

"A DEA provider shall ensure that its prospective clients have a sufficient understanding of their conduct obligations that is appropriate to the scale, nature or complexity of their proposed trading activities or strategies. Thereafter, a DEA provider shall evaluate their clients' understanding at least annually, or more frequently because of a material change to a client's activities or strategies."

Practically, the DEA provider could adjust the evaluation to the scale, nature and complexity of a DEA client’s activities. Clients using manual algorithmic trading techniques could be asked to provide proof that relevant staff have completed specific electronic learning courses. By contrast, more complex arrangements involving investment decision algorithms may necessitate onsite visits. This practice has become more common in the context of anti-money laundering (2019b) and could evolve to include “in person” conduct training.

The cost of evaluating DEA clients’ understanding of their conduct obligations will be a concern. Many DEA providers would wish to assist their clients in sourcing training solutions, others may be content to leave this to clients if they emanate from a jurisdiction with comparable regulatory standards. To ensure flexibility, it is recommended that this is left to firms’ commercial preferences.

# **6. Conclusion**

This study’s findings suggest that Category 1 members of trading venues may be underestimating the conduct implications of order execution algorithms in their own trading operations. These broker-dealers still perceive that conduct risk largely arises from traditional forms of intermediation such voice or instant message broking. This indicates that, four years after the publication of *Algorithmic Trading Compliance*, its key messages may not yet be fully embedded at traditional broker-dealers. As many Category 1 firms are also active in trading other asset classes, it is likely that this perception is also informing their activities on other trading venues. The deadline for certifying staff performing “algorithmic trading” functions passed on 31st March 2021 (2020c). Consequently, the FCA has an opportunity to perform a follow up thematic review to test firms’ implementation of *Algorithmic Trading Compliance* in a climate of heightened accountability. This alone may be enough to encourage broker-dealers to re-visit their assessment of algorithmic conduct risk, obviating a need for more formal intervention.

This study also reveals that despite the implementation of CDR 2017/589, a correlation is perceived to exist between the deployment of algorithms on DEA channels used by clients and an increase in conduct risk. Left unchecked, there is a risk that this perception could contribute to physical users leaving the commodity markets to switch to over-the-counter (“OTC”) trading. The recommendations made in this paper contribute some practical amendments to CDR 2017/589 to help firms offering DEA and policy makers maintain traditional users’ confidence in the LME and similar trading venues as reliable forums to discover physical reference prices.

**Appendix: Software platforms deployed by Category 1 members of the LME (as of 27th March 2022)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Firm**  | **ATP**  | **CQG**  | **CTS**  | **FFastfill**  | **Fidessa**  | **PATS**  | **Stellar**  | **TT**  | **Vela**  | **Own**  |
| AMT  | X   | X   |    | X   |    |    |    | X   |    |    |
| CCBI   |    |  |   |   |    |    |   |   |    |    |
| EDF   |  | X   | X |   X |    |  | X   |  |    |    |
| GFF   | X   |    |    |    |    | X   |    | X   |    |    |
| MFL   |    | X   | X   |    | X   |    | X   | X   | X   | Neon   |
| SGI   |    |    |    |    |    |    |    |    |    |    |
| SXFL   |    |  X  |   X |   X |    |   X |    | X |    |    |
| SFL   |    | X   |    |    |    |    |    | X   |    | Star   |

Notes:

1. Information taken from member’s websites.
2. AMT = Amalgamated Metal Trading Limited (2022f)
3. CCBI = CCBI Global Markets (UK) Limited - limited information on website
4. EDF = E D & F Man Capital Markets Limited (2022e)
5. GFF = GF Financial Markets (UK) Limited (2022d)
6. MFL = Marex Financial (2022b)
7. SGI = Societe Generale International Limited – limited information on website
8. SXFL = StoneX Financial Limited (2022a)
9. SFL = Sucden Financial Limited (2022c)
10. ATP = ATPlatform Technology Limited.
11. CQG = CQG Inc.
12. CTS = Cunningham Trading Systems LLC.
13. FFastfill = FFastfill Plc.
14. Fidessa = Fidessa Group Holdings Ltd.
15. PATS = Patsystems Plc.
16. Stellar = Stellar Trading Systems.
17. TT = Trading Technologies International, Inc.
18. Vela = Vela Trading Systems LLC.
19. Common or ’native’ execution order types (2020f): iceberg, one-cancels-other (”OCO”), stop.

**References**

Code of Conduct. FCA Handbook: Financial Conduct Authority.

MAR 1.6.2(2) market abuse (manipulating transactions). Financial Conduct Authority.

SYSC 23.3 Overview of the senior managers and certification regime. Financial Conduct Authority.

SYSC 27.8.23 Algorthmic trading function. Financial Conduct Authority.

2013. *Ensuring markets work well for consumers and for firms – FCA publishes guidance on its approach to objectives* [Online]. Financial Conduct Authority: Financial Conduct Authority. Available: https://www.fca.org.uk/news/press-releases/ensuring-markets-work-well-consumers-and-firms-%E2%80%93-fca-publishes-guidance-its [Accessed 9th June 2022].

2014. Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU Text with EEA relevance.

2016. Commission Delegated Regulation (EU) 2017/590 of 28 July 2016 supplementing Regulation (EU) No 600/2014 of the European Parliament and of the Council with regard to regulatory technical standards for the reporting of transactions to competent authorities. European Union.

2017a. Commission Delegated Regulation (EU) No 2017/589 of 19 July 2016 supplementing MiFID with regard to regulatory technical standards specifying the organisational requirements of investment firms engaged in algorithmic trading, providing direct electronic access and acting as general clearing members.

2017b. MiFID II and MiFIR: One Minute Guide. *Journal of International Banking and Financial Law,* 5**,** 326.

2018a. Algorithmic Trading Compliance in Wholesale Markets *Financial Conduct Authority* [Online]. Available: https://www.fca.org.uk/publications/multi-firm-reviews/algorithmic-trading-compliance-wholesale-markets [Accessed 4th March 2020].

2018b. Supervisory statement: algorithmic trading.

2019a. Machine learning in United Kingdom financial services. *Bank of England* [Online]. Available: https://www.bankofengland.co.uk/report/2019/machine-learning-in-uk-financial-services [Accessed 4th March 2020].

2019b. Understanding the money laundering risks in the capital markets. Thematic Review TR19/4 ed.: Financial Conduct Authority.

2020a. Consultation on deactivation of discretionary order type for all contracts and the iceberg order type for cash settled futures contracts. 13th November 2020 ed.: London Metal Exchange.

2020b. Economic implications from Europe's increased focus on cross-market manipulation. 1st December 2020.

2020c. Extension of the Senior Managers & Certification Regime (SM & CR) implementation periods for solo-regulated firms. Financial Conduct Authority.

2020d. FCA explains: conduct rules training. Financial Conduct Authority.

2020e. ‘Messages from the Engine Room’ 5 Conduct Questions: Industry Feedback for 2019/20. Available: https://www.fca.org.uk/publication/market-studies/5-conduct-questions-industry-feedback-2019-20.pdf [Accessed 4th September 2020].

2020f. Order entry gateway FIX specification. Version 1.1 ed.: London Metal Exchange.

2021a. *Financial investors on the London Metal Exchange* [Online]. London Metal Exchange: London Metal Exchange. Available: https://www.lme.com/en/education/online-resources/lme-insight/financial-investors-on-the-lme [Accessed 9th June 2022].

2021b. Interview with a regulator #1.

2021c. Interview with a senior manager #1.

2021d. Interview with a senior manager #3.

2021e. Interview with a senior manager #7.

2021f. Interview with a senior manager #8.

2021g. Interview with a senior manager #12.

2021h. Interview with a senior manager at an electronic market maker.

2021i. Interview with a senior manager at client offering sub-delegation to indirect clients.

2021j. Interview with a senior metals sales and trading professional.

2021k. Interview with an expert in metals trading and risk management.

2021l. Interview with trader at physical user of the LME.

2021m. MiFID II review report: MiFID II/MiFIR review report on algorithmic trading. European Securities and Markets Authority.

2022a. *Clearing & execution for derivative trading* [Online]. StoneX: StoneX. Available: https://www.stonex.com/Main-Channels/Commodities/Capabilites/Clearing--Execution/clearing-execution-for-derivative-trading/ [Accessed 27th March 2022].

2022b. *Electronic trading* [Online]. Marex Financial. Available: https://www.marex.com/technology/electronic-trading/ [Accessed 27th March 2022].

2022c. *Exchange connectivity* [Online]. Sucden Financial Limited. Available: https://www.sucdenfinancial.com/en/solutions/technology/exchange-connectivity/ [Accessed 27th March 2022].

2022d. *Execution solutions* [Online]. GF Financial Markets (UK) Limited Available: https://www.gffm.com/execution-and-clearing-solutions/execution-solutions [Accessed 27th March 2022].

2022e. *Hosted trading platforms - execution algorithms* [Online]. E D & F Man Capital Markets Limited Available: https://www.edfmancapital.com/index.php/hosted-trading-platforms/#execution\_algorithms [Accessed 27th March 2022].

2022f. *Trading Tools* [Online]. Amalgamated Metal Trading: Amalgamated Metal Trading. Available: https://amt.co.uk/metal-trading-services/client-services/trading-tools/ [Accessed 27th March 2022].

Undated. LME DEA access; rules and conditions version 1.2. Version 1.2 ed.

ASHTON, J., BURNETT, T., DIAZ-RAINEY, I. & ORMOSI, P. 2021. Known unknowns: How much financial misconduct is detected and deterred? *Journal of International Financial Markets, Institutions & Money,* 74.

AZZUTTI, A., RINGE, W.-G. & STIEHL, H. S. 2021. Machine Learning, Market Manipulation and Collusion on Capital Markets: Why the “Black Box” matters. *European Banking Institute Working Paper Series,* 84.

BORCH, C. 2016. High-frequency trading, algorithmic finance and the Flash Crash: reflections on eventalization. *Economy and Society,* 45**,** 350-378.

BUDISH, E., CRAMTON, P. & SHIM, J. 2015. The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response. *Quarterly Journal of Economics,* 130**,** 1547–1621.

BUSCH, D. 2016. MiFID II: regulating high frequency trading, other forms of algorithmic trading and direct electronic market access. *Law & Financial Markets Review,* 10**,** 72-82.

CALLCOTT, W. H. & FOLEY, T. C. 2011. SEC approves rule banning "naked access" to trading centers. *Journal of Investment Compliance (Emerald Group),* 12**,** 62-64.

COOPER, R., SEDDON, J. & VAN VLIET, B. 2017. High-frequency trading and conflict in the financial markets. *Journal of Information Technology* 32**,** 270-282.

ČUK, T. & VAN WAEYENBERGE, A. 2018. European Legal Framework for Algorithmic and High Frequency Trading (Mifid 2 and MAR) A Global Approach to Managing the Risks of the Modern Trading Paradigm. *European Journal of Risk Regulation,* 9**,** 146-153.

CULLEY, A. 2020. Conduct risks and their mitigation in algorithmic trading firms: a systematic literature review. *Journal of Financial Compliance,* 4**,** 34-52.

FISHER, J., CLIFFORD, A., DINSHAW, F. & WERLE, N. 2015. Criminal forms of high frequency trading on the financial markets. *Law and Financial Markets Review,* 9**,** 113-119.

FRIEDERICH, S. & PAYNE, R. 2012. Computer trading: market abuse. *Foresight: the future of computer trading in financial markets Foresight driver review – DR 20.* London: The Government Office for Science.

GANTI, A. 2021. *Positive feedback* [Online]. Available: https://www.investopedia.com/terms/p/positive-feedback.asp#:~:text=Positive%20feedback%E2%80%94also%20called%20a,result%20reinforces%20the%20initial%20act. [Accessed 9th June 2022].

HACK, C. 2014. LME member clients to gain direct access to LMEselect data. 17th February 2014.

HARRISON, A. 2010. LME WEEK: Algos are the fastest-growing part of metals market: Ffastfill ceo Purdey. 11th October 2010.

HAYNES, R. & ROBERTS, J. S. 2019. Automated trading in futures markets - update #2. *Working Paper*.

JARED, F. E., BONNIE, F. V. N. & ROBERT, A. V. N. 2016. Quote Stuffing. *Financial Management,* 45**,** 583.

KARPPI, T. & CRAWFORD, K. 2016. Social Media, Financial Algorithms and the Hack Crash. *Theory, Culture & Society,* 33**,** 73-92.

LENGLET, M. 2021. Algorithmic Finance, Its Regulation, and Deleuzean Jurisprudence: A Few Remarks on a Necessary Paradigm Shift. *Topoi-an International Review of Philosophy,* 40**,** 811-819.

LINTON, O., O'HARA, M., ZIGRAND, J.P. 2012. Future of computer trading in financial markets: MiFID II. *Foresight: The Future of Computer Trading in Financial Markets, The Government Office for Science, London*.

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. 2018. ‘Making’, ‘taking’ and the material political economy of algorithmic trading. *Economy and Society,* 47**,** 501-523.

MACKENZIE, D. 2021. *Trading at the speed of light,* Princeton and Oxford, Princeton University Press.

MAGUIRE, F. 2006. Direct market access for exchange-traded derivatives. *Derivatives Use, Trading & Regulation,* 11**,** 375-380.

MILES, M., B., HUBERMAN, M.A., SALDANA, JOHNNY 2014. *Qualitative Data Analysis: A Methods Sourcebook,* Los Angeles, London, New Dehli, Singapore, and Washington DC, Sage Publications Ltd.

MILES, R. 2017. *Conduct Risk Management* London, Kogan Page Limited

MILES, R. 2021. *Culture audit in financial services: reporting on behaviour to conduct regulators,* New York, Kogan Page.

MIRANTI, P. J. 2007. Out of the Pits: Traders and Technology from Chicago to London. By Caitlin Zaloom. Chicago: University of Chicago Press, 2006. xiii + 224 pp. Index, notes, bibliography, photographs. Cloth, $29.00. ISBN: 0-226-97813-3. *Business History Review***,** 820.

PEREIRA, C. M. 2020. Unregulated Algorithmic Trading: Testing the Boundaries of the European Union Algorithmic Trading Regime. *Journal of Financial Regulation,* 6**,** 270-305.

SCHULTE, M. 2018. The price of stable markets and investor confidence: some thoughts on MiFID II’s cost-benefit ratio. *ERA Forum,* 19**,** 19-31.

SCOPINO, G. 2015. The (Questionable) Legality of High-Speed Pinging and Front Running in the Futures Market. *Connecticut Law Review,* 47**,** 607-698.

SEDDON, J. 2020. Merchants against the bankers: the financialization of a commodity market. *Review of International Political Economy,* 27**,** 525-555.

SEYFERT, R. 2021. Algorithms as regulatory objects. *INFORMATION COMMUNICATION & SOCIETY*.

SHERIDAN, I. 2017. MiFID II in the context of Financial Technology and Regulatory Technology. *Capital Markets Law Journal,* 12**,** 417-427.

SMITH, C. W. 2007. Financial markets up close. *European Journal of Sociology,* 48**,** 493-495.

STOLL, H. R. 2014. High Speed Equities Trading: 1993-2012. *Asia-Pacific Journal of Financial Studies,* 43**,** 767-797.

VAUGHAN, L. 2020. *Flash crash: a trading savant, a global manhunt and the most mysterious market crash in history* Harper Collins Publishers.

WELLMAN, M. P. & RAJAN, U. 2017. Ethical Issues for Autonomous Trading Agents. *Minds and Machines,* 27**,** 609-624.

WHEATLEY, M. 2015. *Confidence to crisis and back* [Online]. Financial Conduct Authority: Financial Conduct Authority. Available: https://www.fca.org.uk/news/speeches/confidence-crisis-and-back [Accessed 5th June 2022].

YADAV, Y. 2016. The failure of liability in modern markets. *Virginia Law Review,* 102**,** 1031-1100.

YEOH, P. 2019. MiFID II key concerns *Journal of Financial Regulation & Compliance,* 27**,** 110-123.

ZALOOM, C. 2006. *Out of the Pits*, University of Chicago Press.

1. Defined by Investopedia as “a self-perpetuating pattern of investment behaviour where the end result reinforces the initial act.” [↑](#footnote-ref-1)
2. Known in the EU and UK as “MiFIR transaction reporting”. [↑](#footnote-ref-2)
3. Known as “co-location”, this enables a participant to access prices before other users of a market. [↑](#footnote-ref-3)
4. Known as the “Ring” at the LME because of its circular shape. [↑](#footnote-ref-4)
5. A protocol used by trading venues to transmit order and trading data. [↑](#footnote-ref-5)
6. Widely known as “auto spreaders” in the industry. [↑](#footnote-ref-6)
7. DMA is short for “direct market access”, an alternative term for DEA. [↑](#footnote-ref-7)
8. Defined by the FCA as “a sale or purchase of a qualifying investment where there is no change in beneficial interest or market risk, or where the transfer of beneficial interest or market risk is only between parties acting in concert or collusion, other than for legitimate reasons”. [↑](#footnote-ref-8)
9. The PRA jointly regulates the most systemically important financial institutions in the UK with the FCA, most notably banks. Most broker-dealers in the UK are solely regulated by the FCA. [↑](#footnote-ref-9)
10. The FCA’s overriding objective. [↑](#footnote-ref-10)