Algorithmic Trading & Smart Contracts

Novel issues from *B2C2 Ltd v Quoine Pte Ltd*

Algorithmic trading is a method of buying and selling using automated, pre-programmed trading instructions. The idea behind it is to gain an advantage from reacting rapidly through automated execution in markets where information can be acquired from digital data feeds. It is often used to minimize the cost, market impact and risk in execution of large orders. The term is also used to describe automated trading systems that are heavily reliant on complex mathematical formulas and high-speed computer programs (often called 'black box' trading). Algorithms executing trades also generate buy / sell agreements which self-execute to the extent that money and asset transfers follow automatically without human intervention.

The case of *B2C2 Ltd v Quoine Pte Ltd* which was heard in the Singapore International Commercial Court in 2019 raised novel legal issues in the context of algorithmic trading. The traditional contract law issues have been analysed in depth by various law firms and commentators, so this article addresses a different subject: the novel factual elements of the dispute and contractual interpretation of the parties' contract.

The case concerned a claim made by B2C2, a market maker in Cryptocurrency, against Quoine, a Cryptocurrency exchange (also a market maker), for breach of contract and breach of trust arising from Quoines's reversal of automated trades carried out between B2C2 and other margin traders on its platform which caused B2C2 to forego a profit it had made. The claim was vigorously defended by Quoine using different flavours of the doctrine of mistake at common law. Quoine argued that it was entitled to reverse the trades because there was some sort of mistake. The judgement first disposed of the triter aspects of contract law by confirming that:

- Cryptocurrencies are legal property based on existing English case law;
- The parties were identifiable and there was *prima facie* an agreement between B2C2 as market maker and Quoine as operator of the exchange;
- A trust relationship existed over the cryptocurrency assets held by Quoine for B2C2.

The first novel aspect was that both B2C2 and Quoine (acting as a clearing exchange) for other margin traders used algorithmic rules to execute transactions automatically, without human intervention. The second that algorithms of both parties carried out trades according to their respective rules in circumstances which a reasonable human would have known to be so unusual and extreme as to require cessation of trading and pause for thought. The third that both parties agreed to the irreversibility of trades by way of a specific term in the contract even though they were to be conducted automatically by their respective algorithms. With hindsight, it is obvious that the combination of no human involvement, an agreement to make trades irreversible and also no circuit breakers creates the opportunity for problems and disputes to arise in circumstances not anticipated by the algorithms.

And so, a dispute arose out of the fact that Quoine's algorithms did not cater for a certain type of 'malfunction', this being a failure to find a true 'market' price from external

sources which in this case was a result of a routine upgrade and password reset. As B2C2's algorithm could not find a market price on the Quoine platform, it defaulted to the rule of asking for 10 times the last seen market price. That quote from B2C2 to sell (at 10 times the market price) was then used by Quoine as the price to automatically place buy orders for the accounts of several margin traders. This was possible because these traders had agreed to allow Quoine to automatically close out positions which required a cash margin when they did not hold sufficient funds at any available 'market' price, and B2C2's high price was the only quote available. Such mechanisms to protect lenders where there is insufficient margin are commonplace.

B2C2 profited from this because its algorithm, it says, was designed to cater for sudden and extreme reductions in liquidity in the markets by bidding and offering arbitrary 'safe haven' prices at extreme levels (i.e. at a massive spread between bid and offer) to minimise losses or cash in profits rather than to cease market making. As a result of the failure of Quoine's software to establish a market price, the fact that margin traders were forced to close out positions and B2C2's algorithm generating the high price in the perceived absence of market liquidity, B2C2 high offer to sell was accepted by the Quoine algorithm to fulfil the need to buy from Quoine's margin traders. The trades were concluded because the two algorithms followed their respective internal rules and thus carried out automated trades relating to certain Cryptoassets at 10 times the real market price.

Particularly interesting is the fact the absurd price at which the trades occurred would have been blatantly obvious to any human with the most basic knowledge of buying and selling, never mind a Cryptoasset trading expert or algorithm coder. However, an absurdly high price is not a concept which is intuitively obvious to a non-sentient algorithm following codified rules of its programmers unless it is programmed with rules to watch out for this in advance. After all, the numbers 1 and 10 do not have the same 'meaning' to a computer as they do to a human who immediately knows that they differ by an order of magnitude and that such rapid change in the market price in a short time is so suspicious as to require further review before committing to a trade. That is not to say that algorithms can never be taught to apply flexible, heuristic rules, or even that they cannot evolve to learn what rate of change in price should be suspicious, but rather that the programmers of the parties failed to plan for the confluence of factors which occurred when they wrote these algorithms. When the human principals on each side of the absurdly priced trades did see the outcome, it was immediately obvious to both that this outcome was foreseeable ex ante if only they had considered certain unlikely, extreme scenarios. However, unlike, say, *force majeure*, the scenario giving rise to the dispute was of their own making. Even though it was unarguably an outlier 'Black Swan' like event.

The SICC judgement does not specifically address whether unforeseen (but foreseeable) errors in coding in the context of a self-executing contract driven by and formed between algorithms requires different legal treatment to one formed directly by humans. The judge did, however, deem trading via algorithmic computer programs to be distinguishable from, say, a face-to-face interaction: he said, in effect, that the algorithmically generated trades which reflected the risks and rewards B2C2 and Quoine's margin traders had chosen to undertake and moved on to the basis of claim and the common law defence of mistake. From that, it seems reasonable to assume that algorithms are to be treated as having the actual (binding) authority of their principals in law and not just apparent authority.

It's worth pausing to note that gains and losses arising from algorithmic trades conducted at clearly absurd prices are different to the situation when a bank or trading house employs a human 'rogue' trader who for reasons of self-enrichment, self-preservation or panic knowingly breaches his employer's rules which he would normally receive in natural language. In such cases the employer of the 'rogue' cannot normally escape any contractual liability to third parties the rogue may have created. But whereas an algorithm provides a direct link between its output and the employer as coder, with a rogue trader the direct linkage is broken by the insertion of a human employee acting as an agent of the employer. The human agent's behaviour is binding on the employer under the law of agency, with the breach by the rogue employee being an internal issue. To that extent the judge's approach can be said to be consistent with treating an algorithm as at least an agent and possibly a direct representation of its creator.

Another interesting issue arose from Quoine arguing that it was contractually entitled to reverse the trades between B2C2 and the margin traders as this was expressly allowed by a generic risk disclosure statement displayed on its website even though it was not explicitly part of their agreement. This was rejected in the decision on the grounds that simply putting up a generic notice on a website was not enough to amend an agreement. To the extent that this is settled law, it implies that firms creating digital contracts, especially smart ones created 'on the fly', need to expressly incorporate all the terms into the agreement with the counterparty and not rely on posting generic disclaimers as to liability and other terms in the hope that they will be read into the original by tribunals.

The defence of mistake at common law and equity also raised interesting and novel issues. That a clear mistake was made by Quoine's algorithms and procedures which enriched B2C2 was not in doubt. Also, that Quoine ought to bear responsibility for it unless the non-mistaken party (B2C2) had taken advantage of Quoine's mistake through actual or constructive knowledge unconscionably. Thus, Quoine proposed in its defence that B2C2, through its algorithm, had set the sale price at 10 times the actual market price to Quoine's margin traders with actual or constructive knowledge of Quoine's actual mistake in order to render the trades void and so their reversal legal. This argument relied on the assumption that B2C2 in programming its algorithm to make extraordinarily large bid / ask spreads was acting in an unconscionable manner to exploit some anticipated mistake of either Quoine alone or the parties together. B2C2 argued that when its algorithm sold Cryptocurrency at 10 x the market price, it could not have 'known' that the extreme prices the algorithm generated would be traded on and so generate profit. It said that even though it aimed to make profit, this safety net was also there as a defensive tool and so it could not be said that the algorithm's rules existed solely to make a large profit from other traders' mistakes on Quoine's platform or by virtue of failures of Quoine's trade matching algorithm. The judge agreed and found that there was no unconscionable aspect in the algorithmic decisions set up by B2C2's coders which amounted to impropriety and Quoine's defence of mistake under the doctrine of equity was rejected. He also determined that knowledge was required to be held by B2C2 at the time when it created its algorithm and not at the time of execution of the trade.

It is surely the case that the output of an algorithm can only be attributable to the controlling mind of the programmer behind the algorithm because, after all, an algorithm cannot have a conscious will or legal personality. But what about when the algorithm is self-

evolving, such as when Machine Learning is embedded in it so that the rules which had a fixed starting point are changed over time by the algorithm itself with the arrival of new data? Does it not make sense to assume by analogy with this case that where an algorithmic trader allows the algorithm the flexibility to 'evolve' the decision-making rules over time, any new rules should also be attributed to the coder because he knowingly built in that feature? Or is it more persuasive that, even though the coder was responsible for allowing the algorithm to be able to evolve its own rules without reference to him, he could not have known exactly how the algorithm would evolve the rules once it was let loose and so he should be released from liability? Based on this judgment it is the former argument that will likely prevail but we will have to wait for other disputes arising from algorithms created by Machine Learning to be brought to the courts before this issue can be said to be settled.

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