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LEGAL RISKS OF ALGORITHMIC DECISION MAKING IN SECURITY TRADING

KAJAL YADAV

kajalyadav3015@gmail.com

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Abstract

Algorithmic decision-making in security trading, powered by AI and machine learning, offers unprecedented efficiency and accuracy but introduces significant legal risks. This paper assesses these challenges, including market manipulation (spoofing, layering), issues of transparency and accountability due to the "black box" nature of algorithms, and the amplification of systemic risk as seen in events like the 2010 Flash Crash. It further examines cybersecurity vulnerabilities, the potential for algorithmic bias leading to discriminatory outcomes, and the novel threat of tacit collusion where algorithms independently replicate collusive behavior. Operational risks related to liquidity management and compliance failures are also discussed, alongside the crucial need for ethical AI practices to ensure fairness. The paper highlights the impact of these legal risks on investor confidence and the complexities posed by disparate global regulatory challenges. Ultimately, it argues for the evolution of business law to adopt flexible, technology-agnostic frameworks, foster regulatory cooperation, and invest in educating regulators to navigate the complexities of this increasingly mechanized financial landscape.

Keywords: *Algorithmic Trading, Legal Risks, Market Manipulation, Algorithmic Bias, Transparency, Accountability, Cybersecurity, Systemic Risk, Tacit Collusion, Operational Risks, Ethical AI, Investor Confidence, Regulatory Challenges*

One of the most revolutionary uses of cutting-edge technologies is algorithmic decision-making in security trading. This technology uses AI and machine learning to process market data and make trades at speeds that were previously unimaginable. Though it provides enormous benefits like efficiency and accuracy, it also poses enormous legal risks that put to test traditional regulatory systems.

Algorithmic trading can lead to market manipulation practices such as spoofing or layering, where algorithms create false signals to deceive other traders. Such practices are against securities regulations and may destabilize financial markets. Additionally, the "black box" element of algorithms makes it challenging to ensure transparency and accountability since it is hard to fix liability when things go wrong or someone deviates from ethical conduct.

Another material risk is market disruption systemically. Algorithms can feed back market volatility during crisis times, as manifested in the 2010 Flash Crash. Furthermore, cybersecurity loopholes in algorithmic trading systems make companies vulnerable to data breach and unauthorized transactions, posing challenges under data protection regulations.

Introduction to Algorithmic Trading

Algorithmic trading, also known as algo trading, is an advanced technique of trading in financial markets through computer programs that execute trades based on pre-programmed instructions. The algorithms are programmed to analyze market conditions, place orders, and control trading strategies at speeds and volumes beyond the capabilities of human traders. Through mathematical models and data analysis, algorithmic trading seeks to maximize trading decisions, thus improving market efficiency and liquidity.

The function of algorithmic trading in financial markets has grown in importance over the last decades. It is currently used by numerous market participants, ranging from institutional investors like hedge funds, mutual funds, and investment banks to retail traders using available trading platforms. The technology allows the traders to respond quickly to market movements, exploit arbitrage situations, and use sophisticated strategies that would be difficult for human traders to manually implement.

The advantages of algorithmic trading are numerous:

Efficiency: Algorithms are capable of processing huge volumes of market data in real-time and execute trades quickly based on particular criteria. This makes it possible to minimize latency and have trades executed at the best prices.

Minimized Human Error: Automating the trading process through algorithmic trading reduces the influence of human emotions and biases over trading decisions. This results in more disciplined and systematic trading procedures.

Scalability: Algorithmic systems are capable of processing high volumes of transactions at a single time, which allows for easier scaling of operations by traders without a direct proportionate increase in resources or time to monitor the markets.

Although algorithmic trading has its benefits, it also poses legal risks that need to be managed. Challenges such as market manipulation, algorithmic bias, and responsibility for automated decisions present real challenges in the regulatory environment. As the use of algorithmic trading continues to rise, these risks become a priority to know for traders and regulators.

Market Manipulation

Market manipulation by algorithmic trading has become a major issue, especially practices such as spoofing and layering. Spoofing is where one makes fake orders to give the false impression of demand or supply in the market, while layering is where one makes several orders at different price levels to mimic market interest without actually intending to execute the orders. Both of these strategies are meant to profit from manipulative control of market prices, usually by duping innocent traders.

Legal Challenges: Demonstrating intent in such manipulative schemes is fraught with serious legal difficulties. Existing laws demand definite proof of intent to manipulate, which is hard to determine in algorithmic trading scenarios where the decision is quick and usually automatic. The sophistication of algorithms makes it difficult to ascertain the intention of the trader, thus it is hard for regulators to effectively implement existing legislation.

Implications for Business Law: The emergence of algorithmic trading calls for a reconsideration of legal frameworks that regulate market manipulation. Regulators have to keep pace with the swift development of trading technologies by creating better surveillance mechanisms and sharpening definitions of manipulative conduct. This will assist in preserving market integrity while promoting innovation in trading practices, making it possible for regulatory authorities as well as market participants to manage the complexities brought about by new technologies.

Algorithmic Bias

Algorithmic bias in financial markets involves serious threats of discriminatory results and regulatory issues. With AI and machine learning systems increasingly used to make trading decisions, credit assessments,

and risk assessments, biases in algorithms can result in discriminatory treatment.

One of the big concerns is the replication of historical bias through training data. For example, if a mortgage approval AI system is trained using historical data that reflects past discriminatory behavior, then it might keep on rejecting applications from certain demographics in a discriminatory manner. Not only does this deny opportunities to underserved communities, but it also puts the financial institutions at legal risk under anti-discrimination laws.

The opacity of complex AI systems, often referred to as "black boxes," makes the issue more complicated. Regulators and consumers may struggle to understand how decisions are made, and it will be challenging to detect and correct biases. This transparency can lead to loss of trust in financial institutions and markets.

Transparency and Accountability

The "black box" character of algorithms poses huge challenges to transparency and accountability in algorithmic trading. The algorithms run on intricate mathematical models and machine learning approaches that are often proprietary, rendering it hard for outside parties to comprehend how choices are being made. This opacity complicates the auditability of trading activities, as regulators and stakeholders may find it difficult to track the thought process behind individual trades or detect potential malfeasance. In the absence of clear visibility into the decision-making mechanisms, proving adherence with regulatory requirements grows more onerous.

Additionally, the question of liability occurs when algorithmic decision-making results in inaccurate trades or trading disruptions. In conventional trading situations, responsibility can be attributed to individual traders or companies depending on their actions. But when a trade is being made by an independent algorithm, it becomes tricky to decide who should be held responsible for any losses or transgressions caused. Is it the algorithm's developer, the company using it, or the individual trader? This uncertainty raises profound questions of legal liability and requires new paradigms that can successfully confront responsibility in an age of computer-driven trading.

Cybersecurity Vulnerabilities

Algorithmic trading systems are increasingly exposed to cyber security vulnerabilities, thus becoming top targets for hacking and data breaches. Since they are so dependent on digital infrastructure and immense amounts of sensitive data, a successful hack could result in unauthorized access to trading algorithms, tampering with market data, or even the execution of fake trades. Such breaches could result in disastrous

consequences not just for the breached firms but also for the stability of the financial markets in general.

The legal implications of cybersecurity breaches in algorithmic trading are profound. Under different cybersecurity and data protection legislations—like the General Data Protection Regulation (GDPR) in the European Union and the Cybersecurity Information Sharing Act (CISA) in the United States—companies have to adopt stringent security practices to safeguard sensitive data and maintain data integrity. Non-compliance with these legislations can lead to serious consequences, including significant fines and reputational loss.

Systemic Risk Amplification

Algorithmic trading, particularly high-frequency trading (HFT), has been recognized as a major source of systemic risk amplification in financial markets. The interconnectedness of contemporary markets enables algorithms to pass shocks quickly across asset classes and geographies, heightening market volatility during times of turmoil. A classic illustration of this is the Flash Crash that occurred on May 6, 2010, where principal U.S. equity indexes collapsed almost 1,000 points in minutes only to come back. It exposed how algorithms in response to wild market conditions will drive up volatility, cause fragmentation in liquidity, and feed-back loops which would destabilize the markets.

Under stress conditions in the market, algorithms tend to expand bid-ask spreads or suspend trading to reduce exposure, lowering liquidity and amplifying price fluctuations. Such measures can lead to stop-loss orders and subsequent sell-offs, generating a downward spiral that erodes investor confidence and widens uncertainty. Such system breakdowns not only impact individual companies but also risk destabilizing the economy at large.

Tacit Collusion

Tacit collusion through autonomous algorithms poses a novel threat to antitrust regulations. In contrast to classical collusion, where direct agreements between firms are required, algorithms can learn and adopt prices independently that replicate collusive behavior without the intention or direct communication between human agents. For example, self-adjusting algorithms might set prices responsive to competitors' movements and produce supra-competitive prices detrimental to consumer well-being. This trend is a major concern for regulators since it exists in the gray area of competition law.

The threat of tacit collusion is heightened by the growing application of sophisticated algorithms in dynamic market environments. Algorithms are capable of tracking rivals' prices in real time, anticipating their reaction, and modifying strategies in

response. Through repeated iterations, this process can lead to coordinated results tantamount to collusion, even without having programmed the algorithm explicitly to produce such an outcome. The difficulty is separating acceptable competitive conduct from coordination through algorithms.

Operational Risks

Operational risks in algorithmic trading are largely due to failures in liquidity management and compliance systems. Such risks have the potential to cause severe market disruptions and financial losses. Failures in liquidity management can result in an inability to trade efficiently, leading to market imbalances or amplifying volatility under stressed market conditions. Failures in compliance systems can result in regulatory breaches, subjecting firms to legal sanctions and reputational loss.

In order to address such operational risks, companies can utilize a number of measures through legal protection:

1. **Strong risk assessment processes:** Perform stringent risk assessments of both in-house and vendor-designed algorithmic trading platforms.
2. **Simulation testing:** Design simulation testing platforms to try trading strategies in multiple market conditions before going live.
3. **Full-fledged approval procedures:** Enforce policies specifying well-defined approval protocols for new trading platforms and algorithms.
4. **Regular monitoring and audits:** Conduct regular monitoring audits of all trading platforms to confirm adherence to risk management practices.
5. **Post-trade analytics:** Carry out analyses to confirm the correct operation of Order Management Systems (OMS) and Risk Management Systems (RMS).

Ethical AI Practices

With artificial intelligence (AI) playing a larger role in algorithmic trading, the development of ethical practices is important to avoid abuse and prejudice. Algorithms may perpetuate biases if they are trained on unbalanced data, resulting in unequal trading that could disadvantage some market participants. Ethical principles are a set of guidelines to make sure that AI systems are responsibly designed and implemented, ensuring fairness, transparency, and accountability in decision-making. By following these guidelines, companies can reduce the risks of algorithmic bias and improve the integrity of financial markets.

Business law is responsible for enforcing these ethical standards. The regulatory agencies can bring legislation that makes the use of ethical AI mandatory by mandating diverse datasets for algorithm training and imposing periodic audits to evaluate adherence to ethical standards. Laws can also hold companies responsible for the results of their AI tools, making them accountable for any adverse effects caused by biased or unethical algorithmic outputs.

Impact on Investor Confidence

Legal risks related to algorithmic trading have a significant effect on market stability and investor confidence. As regulatory frameworks struggle to account for the intricacies of new technologies, including autonomous algorithms, investors experience increased uncertainty. Concerns around market manipulation, amplification of systemic risk, and cybersecurity threats can undermine trust in financial markets, such that investors become cautious about participating. For instance, incidents such as the Flash Crash of 2010 showed how algorithmic trading can destabilize markets, exposing investors to unforeseen losses.

Investor confidence is highly dependent on the transparency and predictability of regulatory intervention. When governments do not give clear legal guarantees against risks like algorithmic bias or data breaches, investors see markets as unreliable and volatile. This can cause decreased participation, affecting liquidity and market efficiency overall.

Global Regulatory Challenges

Algorithmic trading regulation differs greatly across jurisdictions, and this presents challenges for firms dealing in global markets. In Europe, MiFID II places strict conditions on algorithmic trading, such as real-time surveillance and annual self-reporting. Likewise, in Asia, the Hong Kong Monetary Authority (HKMA) has taken a principles-based approach, with an emphasis on governance, oversight, and post-trade controls. While the United States Securities and Exchange Commission (SEC) places more stress on market access regulations and circuit breakers to reduce systemic hazards, these disparities reflect the patchy regulatory environment through which businesses must navigate to roll out algorithmic trading systems globally.

This absence of consistency can cause regulatory arbitrage, wherein companies take advantage of differences between jurisdictions to prevent more stringent compliance regulations.

Future Directions for Business Law

The fast pace of development of new technologies like artificial intelligence, blockchain, and algorithmic trading requires drastic changes in business law structures. These technologies are

usually too complex for conventional legal frameworks to deal with their intricacies and risks. Business law needs to transform itself to become an effective regulator while encouraging innovation in order to remain relevant.

Conclusion

The convergence of new technologies such as artificial intelligence, blockchain, and algorithmic trading has revolutionized business sectors, including the legal profession and financial markets. This sudden innovation, however, calls for drastic reforms in business law to capture the sophistication and risks inherent in these technologies. Traditional legal practices are sometimes inadequate in dealing with the complexities of these technologies, underlining the need for responsive and visionary regulations.

In order to be effective, business law needs to adopt flexible and technology-agnostic frameworks that can adapt to innovation. This will ensure that regulations are general enough to encompass varied applications without placing undue constraints on technological advancement. Principles-based regulations based on ethical standards and desired outcomes instead of fixed processes can balance innovation with accountability.

Regulatory cooperation among regulators, industry stakeholders, and technology developers is necessary to grasp the implications of new technologies comprehensively. Such cooperation can enable the development of guidelines that foster responsible innovation while ensuring market stability and consumer protection. Global coordination is also needed to harmonize regulatory strategies across jurisdictions to minimize compliance complexities for internationally operating firms.

Investment in training and education for regulators is another important step. With technical knowledge of new technologies, regulators can develop policies that tackle risks like transparency, accountability, and systemic stability.

Ultimately, the future of business law is its potential to evolve with technology without suppressing innovation. Through collaboration, flexibility, and ethical behavior, business law can design a regulatory scheme that reinforces technological advancement as well as safeguards market integrity and consumer confidence in an increasingly mechanized world. These steps will not only safeguard stakeholders but also emerge as drivers of sustainable development in the age of technology.

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integration of technology, legislation, and user engagement.

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