AI Applications in Web3 SupTech and RegTech: A Regulatory Perspective

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EXECUTIVE SUMMARY

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WEB 3.0

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Executive Summary

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The digital realm is experiencing a transformative shift driven by the emergence of Web3 technologies and virtual assets. This new phase of internet technology leverages distributed ledger technologies and smart contracts while fostering decentralization, increasing transparency, and reducing dependence on intermediaries. Such innovations are pivotal in shaping Decentralized Finance. However, the rapid adoption of Web3 technologies presents significant risks underscored by high-profile failures and systemic vulnerabilities.

ADGM has developed a conducive regulatory environment through its Financial Services Regulatory Authority (FSRA) by creating a transparent and progressive regulatory framework aligned with international standards and safeguarding stakeholders' interests.

The whitepaper explores the integration of AI into regulatory technologies to enhance compliance monitoring and risk management. It details the research and development efforts by the National University of Singapore's Asian Institute of Digital Finance, ADGM FSRA, and the ADGM Academy Research Centre. The whitepaper concludes with a summary of key findings and proposes future collaborative efforts to further develop the regulatory landscape.

Keywords:

AI, Cryptocurrency, DeFi, Digital Asset, RegTech, Regulation, SupTech, Virtual Asset, Web3

SupTech (Supervisory Technology) refers to the application of technology to enhance the supervisory and oversight functions of regulatory authorities. It involves the use of advanced tools like data analytics, AI, and automation to improve the monitoring and supervision of regulated activities, and enforcement of regulatory frameworks. SupTech aims to provide regulators with more effective, data-driven insights, and enable them to better identify issues, assess risks, and enforce regulations in real-time.

RegTech (Regulatory Technology) refers to the use of technology to streamline, automate, and improve regulatory compliance processes for businesses. It leverages innovative tools such as AI, machine learning, automation, and data analytics to help companies meet regulatory requirements more efficiently, reduce compliance costs, and enhance transparency and reporting. RegTech aims to simplify complex compliance tasks, such as monitoring transactions, identifying risks, and ensuring adherence to legal standards

Virtual Asset (VA). FSRA›s regulatory framework categorizes digital assets into distinct classes, which also include Fiat-Referenced Tokens and Digital Securities.

VA refers to a digital representation of value that can be digitally traded and functions as (1) a medium of exchange; and/or (2) a unit of account; and/or (3) a store of value but does not have legal tender status in any jurisdiction. A VA is (a) neither issued nor guaranteed by any jurisdiction and fulfils the above functions only by agreement within the community of users of the VA; and (b) distinguished from fiat currency and e-money.[1]

Web3. Web3 represents the next evolution of the internet, transitioning from "read" (Web1) and "read-write" (Web2) to "read-write-own" capabilities.[2] Unlike the centralized platforms of Web2, Web3 leverages blockchain technology to empower users with true ownership of their data, digital assets, and online interactions. This decentralized paradigm reduces reliance on intermediaries, fostering greater user autonomy and privacy while redefining how individuals interact with digital platforms.

ADGM's Role in Innovation and Regulation

The ADGM has established a progressive regulatory environment aligned with international standards. Its FSRA has implemented frameworks to support innovation while maintaining oversight of DeFi and virtual assets. Collaborations with research institutes, such as NUS AIDF, position ADGM as a global leader in exploring AI in RegTech and SupTech applications to mitigate these challenges.

Opportunities for AI in Web3 Regulation

AI presents transformative opportunities in regulatory processes, including:

- » **Adaptive Regulatory Approaches for Web3:** The fast-paced innovation of Web3 demands responsive regulatory approaches that leverage AI to identify emerging risks, enhance rulebooks, and promote efficient, adaptable business models while mitigating fraud and market failures.

- » **Real-Time Risk Monitoring:** AI tools enable continuous analysis of vast blockchain data to identify and mitigate risks proactively.

- » **Cross-Jurisdictional Harmonization:** AI-driven tools can navigate regulatory differences across jurisdictions, reducing compliance costs and regulatory arbitrage.

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1 Section 258 of FSMR (FINANCIAL SERVICES AND MARKETS REGULATIONS) https://en.adgm.thomsonreuters.com/rulebook/financial-services-and-markets-regulations0-2015-

2 Dixon, C., 2024. Read Write Own: Building the Next Era of the Internet. Random House.

AI Innovations for Regulatory Oversight

Emerging AI Technologies

1. **Machine Learning (ML):** Enhances risk profiling, predictive analytics, and anomaly detection.
2. **Natural Language Processing (NLP):** Automates analysis of regulatory documents and communication streams.
3. **Generative AI:** Creates compliance reports, audits smart contracts, and monitors market sentiment.
4. **AI Agents:** Automate customer interactions, due diligence, and data processing for regulators and businesses.
5. **General AI (Conceptual):** Anticipated to autonomously adapt to regulatory complexities.

Practical Applications

» **Regulatory Reporting:** Automating the collection and analysis of regulatory data.
» **Risk Management Enhancing:** Profiling assets, flagging high-risk transactions, predicting liquidity shortages, and others.
» **Smart Contract Auditing:** Using AI to validate code against industry and regulatory standards.
» **Market Sentiment Analysis:** Leveraging generative AI to monitor public sentiment and detect market manipulation.

Pilot Projects in ADGM

ADGM and NUS AIDF have launched pilot projects demonstrating AI's potential in regulatory activities:

• **Smart Contract Suitability Assessment:**
  » Utilized AI to align smart contract code with VA whitepapers.
  » Combined LLM-based validators and AI-generated code snippets for thorough evaluations.

• **Audit Report Assessment:**
  » Developed an AI tool to assess security audit reports efficiently.
  » Enhanced evaluations using NLP and weighted scoring mechanisms.

• **Smart Due Diligence:**
  » Applied generative AI for onboarding and monitoring Web3 entities.
  » Automated analysis of social media, documentation, and on-chain data to provide insights for regulators and businesses.

Challenges in AI Implementation

Adopting AI in regulatory frameworks presents challenges, including:

- » **Ethics and Bias:** Ensuring fairness and accountability in AI decision-making.

- » **Transparency and Traceability:** Building trust through clear disclosures of AI processes and decisions.

- » **Privacy:** Addressing data security and compliance with privacy regulations.

- » **Vulnerability to Misleading Inputs:** Mitigating risks of misleading inputs and prompt hacking.

- » **Over-Reliance by Users:** Balancing AI tools with human oversight to maintain judgment and adaptability.

Future Directions

- » **Advancements in AI Technologies:** Continued innovation in predictive analytics, quantum computing, and neural networks.

- » **AI Ethics and Governance:** Establishing robust frameworks to ensure ethical and unbiased AI deployment.

- » **Global Collaboration:** Promoting cross-jurisdictional cooperation for cohesive and effective regulatory standards.

- » **Adaptive AI Systems:** Developing explainable and adaptable AI solutions to align with evolving regulations.

Conclusion

The fast-paced evolution of Web3 and VA activities is paving the way for exciting innovations but brings new and complex regulatory challenges. The integration of AI into regulatory processes offers promising outcomes that enhance the toolkits of regulators to monitor, predict, and mitigate risks arising in Web3 and VA activities. The pilot projects introduced in the full paper provide practical examples of AI's application in this space, offering real-world examples of its role in improving compliance practices in the Web3 industry.

Key Takeaways

Transformative Potential of AI in Web3 SupTech and RegTech:

- » AI-driven solutions can significantly enhance regulatory oversight in Web3 by providing real-time risk analysis, proactive vulnerability detection, and more efficient compliance monitoring.

- » Utilizing a range of AI technologies—such as machine learning, NLP, generative AI, and autonomous agents—regulators can better maintain oversight, streamline reporting processes, detect anomalies, and understand sentiment in decentralized ecosystems.

- » Integrating AI into Web3 regulation can simplify cross-jurisdictional complexities, adapt to around-the-clock operations, and make compliance frameworks more accessible, flexible, and innovative.

Challenges to AI Implementation:

» Ethical and privacy concerns, bias in AI models, and the need for transparency and traceability are critical issues.

» Human oversight is necessary to mitigate over-reliance on AI and ensure the reliability of its applications.

Practical Applications Demonstrated in Pilots:

» AI-enhanced smart contract assessments ensure alignment with whitepapers and regulatory standards.

» Automated evaluations of audit reports and due diligence processes significantly improve efficiency.

» Generative AI tools assist in onboarding processes, social media analysis, and providing useful insights to regulators in an efficient approach.

Future Directions:

» Advancements in predictive analytics, adaptive AI systems, and global collaboration will drive more effective regulatory practices.

» Establishing AI governance frameworks and ethical standards will be key to maintaining trust and accountability.

ADGM's Role in Innovation:

» The Abu Dhabi Global Market (ADGM) is a pioneer in integrating AI into SupTech and RegTech, demonstrating global leadership in digital finance and regulation.

» Collaborative efforts with institutions like the National University of Singapore's AIDF highlight the potential of AI to reshape regulatory landscapes.

Acknowledgments

This whitepaper was developed through collaboration between ADGM FRSA, ADGM Registration Authority (ADGM RA), ADGM Academy Research Centre, NUS AIDF, and Mooncheck.

Abu Dhabi Global Market (ADGM)

ADGM[3] is a globally recognised international financial centre that brings unique value to the emerging economy of Abu Dhabi and the broader region. Established in 2015, ADGM has significantly enhanced Abu Dhabi's stature as a leading financial centre and business hub, bolstering its role as a key player in the Falcon Economy. It serves as a vital strategic link between the growing economies of the Middle East, Africa, South Asia, and global markets.

ADGM FSRA

ADGM Financial Services Regulatory Authority[4] was established to advocate a progressive financial services environment and uphold the integrity of the whole international financial centre by managing any potential risk exposure and undesirable impacts. The regulatory framework of the FSRA, the regulations and rules of which are modelled on internationally recognised standards and best practices, ensure that financial entities operate in ADGM with certainty and do so on a level-playing field, and that the best interests of customers, clients and investors are safeguarded. The FSRA has an open and progressive approach in the maintenance and development of its regulatory framework, looking towards the international standard-setting bodies and responding to market innovations, and undertaking meaningful stakeholder engagement through public consultations, when considering amendments to its regulatory framework.

ADGM RA

The ADGM Registration Authority[5] is responsible for the registration, incorporation and licensing of legal entities in ADGM and supports with all government-related services. Providing a range of activities to facilitate market entry, growth and the emergence of a vibrant and sustainable business community, the Authority guides and supports companies through the application and set-up of ADGM-registered entities.

ADGM Academy Research Centre

The ADGM Academy Research Centre[6] brings together an ecosystem of academics, financial industry practitioners, government and technology experts to unlock the shared potential to improve the financial environment in MENA and beyond. The financial industry continues to transform at a rapid pace with new technologies, disruptors, threats and opportunities appearing all the time. Independent research is crucial to be able to understand and utilise this transformation for the benefit of your business, your customers and society in general. The Research Centre provides that understanding through insights developed in collaboration with the academic community.

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3   https://www.adgm.com/
4   https://www.adgm.com/financial-services-regulatory-authority
5   https://www.adgm.com/registration-authority
6   https://www.adgmacademy.com/adgma-research-centre

NUS AIDF

The Asian Institute of Digital Finance[7] is a university-level institute within The National University of Singapore (NUS), co-founded by the Monetary Authority of Singapore (MAS), the National Research Foundation, and NUS. The institute aims to be a leader in FinTech thought leadership, a hub of knowledge, and a platform for experimenting with digital financial technologies, all while nurturing both current and future FinTech professionals.

Mooncheck

Mooncheck[8] is a deep-tech startup that builds an AI-powered platform advancing transparency and accountability in digital asset markets. Combining AI expertise with blockchain domain knowledge, the platform provides accurate, validated, and user-friendly data insights, helping crypto projects navigate regulatory standards while delivering clear, reliable information to all stakeholders.

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7   https://www.aidf.nus.edu.sg/
8   https://www.mooncheck.com/

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