SAFEGUARDING DIGITAL WEALTH: REDEFINING INVESTOR PROTECTION AGAINST PROTOCOL FRAUDS IN DECENTRALIZED FINANCIAL ECOSYSTEMS

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ABSTRACT

The rapid expansion of Decentralized Finance (DeFi) in Indonesia has introduced significant risks to market integrity, most notably through the rug pull phenomenon, which exploits the autonomous and pseudonymous nature of blockchain protocols to defraud investors. This research evaluates the efficacy of the current Indonesian regulatory framework, specifically the Financial Services Authority Regulation Number 23 of 2025, in addressing these deceptive practices. Using a normative legal research methodology with statute and comparative approaches, the study juxtaposes the Indonesian oversight model with the European Union's Markets in Crypto Assets (MiCA) regulation. The findings indicate that while the Indonesian framework provides a solid foundation for centralized trading providers, it remains largely ineffective against truly decentralized protocols that operate without identifiable intermediaries. This creates a critical legal vacuum in terms of investor redress and the determination of liability under existing civil doctrines such as the rule of unlawful acts. Consequently, the research proposes an ideal model for Indonesia by integrating prescriptive MiCA principles, including mandatory standardized white paper disclosures, strict requirements for asset segregation, and the institutionalization of smart contract audits. Such reforms are essential to transitioning from a reactive administrative regime to a proactive and technologically informed shield for investor protection, thereby securing the long term stability of the national digital financial ecosystem.

Key Words: *Crypto Assets, DeFi Rug Pulls, Investor Protection, Financial Services Authority, EU MiCA.*

1. INTRODUCTION

1.1 Background

The global financial landscape is currently undergoing a profound structural transformation as blockchain technology matures and decentralized financial applications gain widespread adoption. At the forefront of this evolution is Decentralized Finance, commonly known as DeFi, a framework designed to provide financial services through an autonomous, permissionless, and transparent ecosystem that operates without traditional intermediaries like commercial banks.[1] By utilizing self executing protocols known as smart contracts, DeFi allows for complex activities such as lending and high frequency trading to be conducted directly between peers.

[1] Dirk A Zetzsche, Douglas W Arner, and Ross P Buckley, "Decentralized Finance," *Journal of Financial Regulation* 6, no. 2 (September 20, 2020): 172–203, https://doi.org/10.1093/jfr/fjaa010.

This shift has not only redefined capital allocation but has also positioned digital assets as a critical pillar of the future digital economy, as highlighted by recent global regulatory studies emphasizing the need for international cooperation in managing these borderless systems.[2]

However, the rapid growth of DeFi has been shadowed by the emergence of sophisticated fraudulent practices, with the rug pull phenomenon standing out as a particularly destructive threat to investor security.[3] A rug pull occurs when developers capitalize on market hype to attract liquidity into a project, only to abruptly withdraw all assets or exploit malicious functions hidden within the protocol code. This leaves investors with worthless tokens and no immediate legal recourse. Unlike conventional financial crimes where a legal entity can be identified, the pseudonymity and decentralization of rug pulls make the determination of liability and the exercise of jurisdiction extremely difficult for national law enforcement agencies.[4]

In Indonesia, the enthusiasm for crypto assets has reached a critical mass, with the number of investors surpassing 21 million by the end of 2024 and transaction volumes reaching unprecedented figures.[5] Despite this momentum, the domestic market has been marred by deceptive schemes that inflict devastating financial consequences on retail investors. Globally, the scale of this threat is massive, with rug pulls accounting for over $2.8 billion in losses in 2021 alone.[6] While comprehensive empirical data on total aggregate monetary losses specifically within Indonesia remains a recognized research gap, the local financial impact is undeniably severe. Domestic incidents, such as the controversies surrounding the ASIX token and various NFT scams, have caused substantial financial harm to consumers.[7] These high-profile cases expose critical legal vulnerabilities; victims face immense difficulties in seeking restitution due to the pseudonymous nature of blockchain networks and the current weaknesses in institutional oversight.[8] This disparity creates a pressing need for a

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[2] Amardeep Kaur Inderjit Singh et al., "Leading in a Future Economy Project — Global Regulatory Frameworks for Digital Assets: Comparative Analysis and Potential International Cooperation," *World Scientific Annual Review of Fintech* 03 (January 6, 2025), https://doi.org/10.1142/S2811004825300030.

[3] Dianxiang Sun et al., "SoK: A Taxonomic Analysis of DeFi Rug Pulls: Types, Dataset, and Tool Assessment," *Proceedings of the ACM on Software Engineering* 2, no. ISSTA (June 22, 2025): 550–72, https://doi.org/10.1145/3728900.

[4] Bruno Mazorra, Victor Adan, and Vanesa Daza, "Do Not Rug on Me: Leveraging Machine Learning Techniques for Automated Scam Detection," *Mathematics* 10, no. 6 (March 16, 2022): 949, https://doi.org/10.3390/math10060949.

[5] Otih Handayani et al., "Legal Framework For Crypto Asset Trading As An Effort To Protect Consumers In Indonesia," *Pena Justisia: Media Komunikasi Dan Kajian Hukum* 24, no. 2 (October 12, 2025): 8252–73, https://doi.org/10.31941/pj.v24i2.7134.

[6] Zewei Lin et al., "CRPWarner: Warning the Risk of Contract-Related Rug Pull in DeFi Smart Contracts," *IEEE Transactions on Software Engineering* 50, no. 6 (June 2024): 1534–47, https://doi.org/10.1109/TSE.2024.3392451.

[7] Dominic Imanuel Vidianto et al., "Legal Protection for Consumers Who Lose Assets on Crypto Exchange Platforms in Indonesia: A Case Study of Hacking and Rug Pull," *Justice Voice* 4, no. 2 (December 31, 2025): 83–93, https://doi.org/10.37893/jv.v4i2.1204.

[8] Febby Mutiara Nelson et al., "Cracking the Code: Investigating the Hunt for Crypto Assets in Money Laundering Cases in Indonesia," *Journal of Indonesian Legal Studies* 9, no. 1 (May 8, 2024): 89–130, https://doi.org/10.15294/jils.vol9i1.4534.

regulatory response that is not only robust at the national level but also aligned with international standards of transparency and market integrity.[9]

The Indonesian government has responded to these risks by significantly overhauling its financial regulatory structure through the enactment of Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector, widely known as the UU P2SK. This legislation mandated the transition of oversight for crypto assets from the Commodity Futures Trading Regulatory Agency, or Bappebti, to the Financial Services Authority, also known as OJK. To operationalize this new mandate, OJK introduced Financial Services Authority Regulation Number 27 of 2024, which was subsequently refined by Financial Services Authority Regulation Number 23 of 2025. These regulations aim to integrate digital assets into the formal financial services sector while strengthening the mechanisms for consumer protection.

Despite these efforts, a critical normative gap persists regarding the decentralized nature of DeFi protocols. Financial Services Authority Regulation Number 23 of 2025 is primarily focused on a centralized logic, targeting the licensing and conduct of physical service providers and intermediaries operating within the Indonesian territory.[10] Such an approach is fundamentally challenged by the DeFi space, where the service provider is often not a legal entity but a set of immutable codes on a public ledger. When a rug pull occurs within a truly decentralized protocol, the administrative oversight of the OJK may find no identifiable target to sanction, forcing victims to rely on general civil law doctrines, such as unlawful acts under Article 1365 of the Indonesian Civil Code, which is notoriously difficult to enforce against anonymous actors.[11]

This regulatory dilemma is being addressed in other jurisdictions through more prescriptive and technologically informed frameworks. The European Union has taken a leading role with the introduction of the Markets in Crypto Assets regulation, or MiCA. The MiCA framework establishes a comprehensive set of rules that mandate transparency, the publication of standardized white papers, and the maintenance of mandatory reserve funds to safeguard investors against fraud and insolvency.[12] By comparing the Indonesian regulatory trajectory with the principles established by MiCA, this research identifies structural weaknesses in the local framework and proposes a more resilient model of protection that acknowledges the technical

[9] Alexander Harryandi, Fira Natasha, and Muhammad Akbar, "REGULATING INITIAL COIN OFFERING AMIDST THE DEVELOPMENT OF CRYPTO ASSETS IN INDONESIA," *Journal of Central Banking Law and Institutions* 1, no. 3 (September 30, 2022): 537–70, https://doi.org/10.21098/jcli.v1i3.41.

[10] Ariman Sitompul, "Cryptocurrency Based Money Laundering in Indonesia," *International Asia Of Law and Money Laundering (IAML)* 4, no. 1 (April 24, 2025): 7–12, https://doi.org/10.59712/iaml.v4i1.113.

[11] Mikołaj Barczentewicz and André de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA," *European Journal of Risk Regulation*, November 25, 2024, 1–18, https://doi.org/10.1017/err.2024.80.

[12] Tina van der Linden and Tina Shirazi, "Markets in Crypto-Assets Regulation: Does It Provide Legal Certainty and Increase Adoption of Crypto-Assets?," *Financial Innovation* 9, no. 1 (January 10, 2023): 22, https://doi.org/10.1186/s40854-022-00432-8.

complexities of DeFi.[13] Ultimately, this research argues that a transition from a reactive and centralized supervision model to a more proactive and investor-centric liability framework is essential. Without such reform, the potential of Indonesia's digital economy will remain vulnerable to unregulated financial predation, thereby undermining the trust necessary for sustainable growth in the national crypto ecosystem.

1.2 Researh Problem

The rapid expansion of Decentralized Finance (DeFi) and the emergence of sophisticated protocol exploits, notably rug pulls, present significant challenges to conventional, intermediary-centric legal frameworks. In light of these challenges, the research problems addressed in this study are formulated as follows:

1. How effective is the current Indonesian regulatory framework, specifically the Financial Services Authority Regulation Number 23 of 2025, in addressing and providing legal protection for investors against rug pull schemes within the decentralized ecosystem?
2. How can the regulatory principles established in the European Union's Markets in Crypto-Assets (MiCA) framework be adapted and integrated to construct an ideal legal protection model for digital asset investors in Indonesia?

1.3 Research Objectives

Aligned with the research problems identified, the primary objectives of this research are as follows:

1. To evaluate the efficacy of the current Indonesian regulatory framework, specifically the Financial Services Authority Regulation Number 23 of 2025, in addressing and mitigating the legal risks of rug pull schemes within the decentralized finance ecosystem.
2. To construct an ideal legal protection model for digital asset investors in Indonesia by analyzing and integrating the prescriptive and risk-based principles established in the European Union's Markets in Crypto-Assets (MiCA) regulation.

2. RESEARCH METHOD

The complexity of regulating decentralized protocols and the rapid evolution of financial technology necessitate a structured and rigorous analytical framework. Consequently, this study is conducted using a normative legal research methodology. This method is particularly appropriate for analyzing the current state of digital asset regulation, as it focuses on examining the consistency, clarity, and efficacy of legal norms within statutory frameworks and academic doctrines.[14] By prioritizing the study

[13] Christoph Wronka, "Crypto-Asset Regulatory Landscape: A Comparative Analysis of the Crypto-Asset Regulation in the UK and Germany," *Journal of Asset Management* 25, no. 4 (July 21, 2024): 417–26, https://doi.org/10.1057/s41260-024-00358-z.

[14] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."

of the law as it is written, this research aims to identify whether existing Indonesian regulations are capable of addressing the unique challenges posed by autonomous blockchain systems or whether a significant legal vacuum persists.

A multifaceted approach is utilized to ensure a deep and nuanced analysis of the subject matter. Central to this study is the statute approach, which involves a comprehensive review of the Indonesian legislative hierarchy. This analysis begins with Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector, and proceeds to investigate the specific operational mandates found in Financial Services Authority Regulation Number 27 of 2024. Most importantly, the study evaluates the recent amendments introduced in Financial Services Authority Regulation Number 23 of 2025 to determine how the transfer of authority to the OJK has influenced the protective landscape for crypto investors. Simultaneously, the study applies the statute approach to the European Union's Markets in Crypto Assets regulation to serve as a comparative benchmark.

In addition to the statutory analysis, a comparative approach is employed to contrast the Indonesian regulatory strategy with the standards established in the European Union. Given that the DeFi ecosystem is fundamentally borderless and operates across multiple jurisdictions, a purely domestic perspective is insufficient.[15] By juxtaposing the administrative and licensing focus of the Indonesian OJK framework with the more prescriptive and risk based requirements of the MiCA framework, this research can isolate specific regulatory weaknesses and propose viable reform strategies.[16] This comparative dimension is crucial for understanding how international best practices can be adapted to strengthen the integrity of the Indonesian digital economy.

The legal materials analyzed in this research are drawn from a comprehensive collection of more than fifty specialized sources. These are divided into primary and secondary materials. The primary legal materials consist of the authoritative laws and regulations from Indonesia and the European Union mentioned previously. The secondary legal materials comprise a wide array of academic journals, books, technical reports, and international fintech reviews provided in the research database.[17] These materials provide the necessary context regarding the technical taxonomy of rug pulls and the historical development of blockchain governance. The selection of these materials followed a systematic review process to ensure that the discussion is grounded in high quality and relevant scientific evidence.[18]

Finally, the study employs a qualitative analysis technique to synthesize the gathered information. This process involves the identification and interpretation of

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[15] Wronka, "Crypto-Asset Regulatory Landscape: A Comparative Analysis of the Crypto-Asset Regulation in the UK and Germany."

[16] Yogi Muhammad Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework," *Jurnal Wawasan Yuridika* 8, no. 2 (September 28, 2024): 112–38, https://doi.org/10.25072/jwy.v8i2.4433.

[17] Vincent Gramlich et al., "A Multivocal Literature Review of Decentralized Finance: Current Knowledge and Future Research Avenues," *Electronic Markets* 33, no. 1 (December 27, 2023): 11, https://doi.org/10.1007/s12525-023-00637-4.

[18] Md Hasibul Alam Ratul, Sepideh Mollajafari, and Martin Wynn, "Managing Digital Evidence in Cybercrime: Efforts Towards a Sustainable Blockchain-Based Solution," *Sustainability* 16, no. 24 (December 12, 2024): 10885, https://doi.org/10.3390/su162410885.

legal principles to answer the research questions logically and coherently. The analysis does not merely describe the existing rules but critically evaluates them against the theoretical doctrines of consumer protection and market stability. By integrating technical insights with legal reasoning, the research constructs a prescriptive model for an ideal regulatory framework that can effectively mitigate the risks of rug pulls in the Indonesian DeFi sector.

3. RESULTS AND DISCUSSION

3.1. The Anatomy and Legal Classification of Rug Pulls in the DeFi Ecosystem

The fundamental appeal of the decentralized finance ecosystem lies in its ability to operate through autonomous and immutable protocols, yet this very autonomy provides the technical scaffolding for sophisticated financial predation. To understand the legal challenges posed by rug pulls, one must first dissect their technical anatomy. A rug pull is not a singular event but rather a spectrum of deceptive practices that exploit the trustless nature of blockchain technology.[19] These practices generally fall into three distinct categories: liquidity stealing, malicious smart contract manipulation, and the coordinated dumping of tokens by developers.[20] In a liquidity stealing scenario, developers encourage investors to stake their valuable assets, such as Ethereum or stablecoins, into a liquidity pool in exchange for a new project token. Once the pool reaches a significant value, the developers invoke a function to withdraw the underlying assets, leaving the investors with a worthless token that can no longer be traded or liquidated.

[19] Sun et al., "SoK: A Taxonomic Analysis of DeFi Rug Pulls: Types, Dataset, and Tool Assessment."

[20] Mazorra, Adan, and Daza, "Do Not Rug on Me: Leveraging Machine Learning Techniques for Automated Scam Detection."

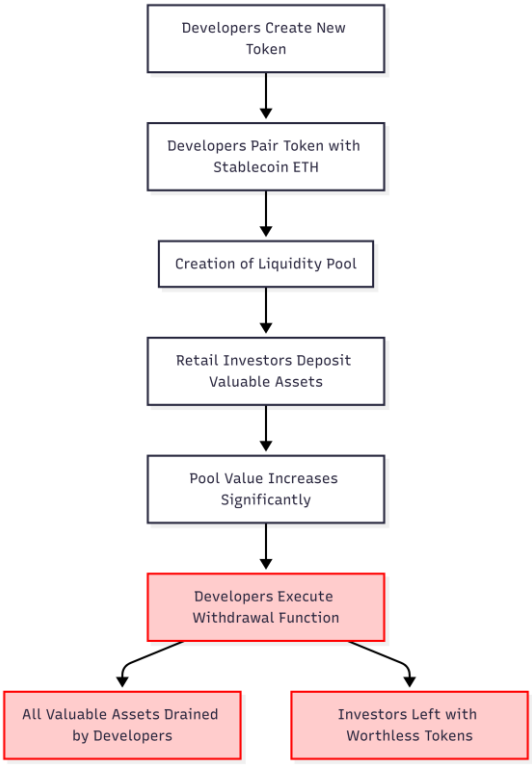

Figure 1. The sequential flow of a liquidity stealing rug pull where developers drain the foundational asset pool.

Malicious smart contract functions represent a more insidious form of rug pull. In these cases, the deception is embedded directly into the source code of the protocol. Developers may include a hidden minting function that allows them to create an infinite supply of tokens for themselves, which they then sell into the market to drain all available value.[21] Alternatively, they may implement a blacklist or a honey pot mechanism, where investors are permitted to buy the token but are technologically barred from selling it. This creates a false sense of market demand and price appreciation while the developers exit with the collective capital of the participants.[22] From a technical standpoint, these actions are often defended by the developers under the radical doctrine of code is law, which posits that if an action is permitted by the smart contract code, it is inherently legitimate within the ecosystem.[23]

[21] Arianna Trozze, Toby Davies, and Bennett Kleinberg, "Of Degens and Defrauders: Using Open-Source Investigative Tools to Investigate Decentralized Finance Frauds and Money Laundering," *Forensic Science International: Digital Investigation* 46 (September 2023): 301575, https://doi.org/10.1016/j.fsidi.2023.301575.

[22] Bingqiao Luo et al., "AI-Powered Fraud Detection in Decentralized Finance: A Project Life Cycle Perspective," *ACM Computing Surveys* 57, no. 4 (April 30, 2025): 1–38, https://doi.org/10.1145/3705296.

[23] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."

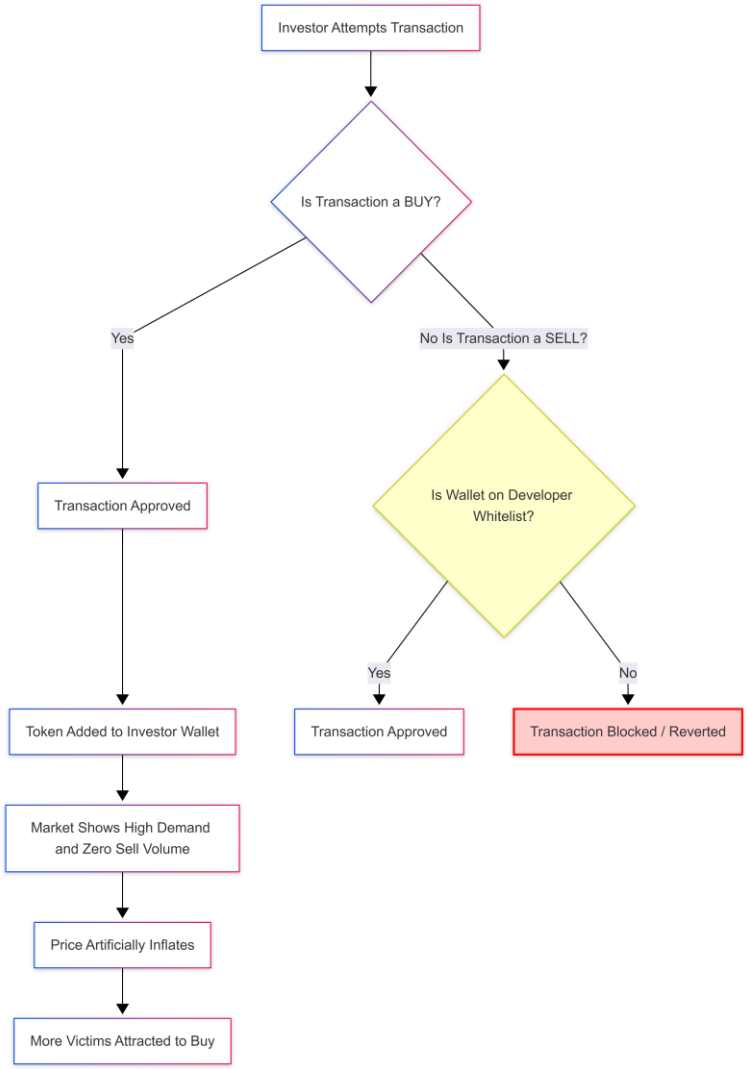

Figure 2. The logic structure of a honeypot smart contract demonstrating restricted sell functions for retail investors.

However, from a legal perspective, the code is law argument fails to account for the presence of fraudulent intent and the broader principles of justice. In the Indonesian legal system, the classification of a rug pull requires an analysis of both the Information and Electronic Transactions Law and the Criminal Code. Specifically, under the Second Amendment to the Law Number 11 of 2008 concerning Information and Electronic Transactions, or the UU ITE, such actions can be categorized as a form of electronic fraud. Article 28 Paragraph 1 of the UU ITE explicitly prohibits the dissemination of false and misleading information that results in consumer losses in electronic transactions. A rug pull inherently involves the promotion of a project under the false pretense of long term viability, which constitutes the dissemination of misleading information intended to induce a financial transfer.

Furthermore, the physical actions involved in a rug pull frequently satisfy the elements of fraud under the Indonesian criminal justice system. With the transition to the new national penal framework, the traditional crime of fraud, formerly governed

by Article 378 of the old Criminal Code, is now codified under Article 492 of the New Indonesian Criminal Code (Law Number 1 of 2023). This updated article identifies fraud as the act of an individual who, with the intent to enrich themselves or others unlawfully, induces another person to hand over goods or money, or to incur debt, through the use of a false name, a false status, deceit, or a series of lies. In a DeFi context, developers often operate under pseudonyms to hide their true identities and present a project as a legitimate investment opportunity when their actual intent is the theft of assets.[24] The use of automated smart contracts does not absolve the perpetrator of criminal liability; rather, the technology serves as the sophisticated tool through which the deceptive scheme is executed.

The legal classification of rug pulls also extends into the realm of market abuse and manipulation. Given that many DeFi projects in Indonesia are now under the regulatory umbrella of the Financial Services Authority, as mandated by the Financial Services Authority Regulation Number 23 of 2025, these acts can be viewed as violations of market integrity. When developers artificially inflate the price of a token through wash trading or by creating a honey pot, they are engaging in market manipulation that distorts the fair value of digital assets. This distinction is crucial because it allows regulators to move beyond simple theft charges and address the systemic damage caused to the stability and reputation of the national digital economy.[25]

In conclusion, a rug pull is a multifaceted technical exploitation that manifests as a clear violation of both traditional and modern legal norms in Indonesia. While the decentralized nature of the protocol may obscure the identity of the actor, it does not change the underlying legal character of the act as a form of criminal fraud and market manipulation. Recognizing this classification is the first step in moving past the technical fog of blockchain and applying the protective power of the law to safeguard investor interests.

3.2. Normative Review of the Indonesian Regulatory Framework: From Bappebti to OJK

The regulatory journey of crypto assets in Indonesia has been characterized by a significant paradigm shift, moving from a commodity based perspective to a sophisticated financial services integration. Historically, the supervision of crypto assets fell under the jurisdiction of the Commodity Futures Trading Regulatory Agency, or Bappebti, which classified these digital objects as commodities rather than financial instruments. This classification was primarily driven by the intent to facilitate trading while maintaining a safe distance from the banking and monetary systems. However, as the market matured and the risks associated with digital assets became more systemic, the limitations of this commodity centric approach became increasingly evident, particularly in the face of complex decentralized protocols that challenge traditional market boundaries.[26]

[24] Sitompul, "Cryptocurrency Based Money Laundering in Indonesia."

[25] Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework."

[26] Arjana Bagaskara Solichin, "Implikasi Hukum Atas Peralihan Kewenangan Pengaturan Dan Pengawasan Aset Kripto Dari Badan Pengawas Perdagangan Berjangka Komoditi Kepada

A pivotal moment in this regulatory evolution occurred with the enactment of Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector, widely known as the UU P2SK. This comprehensive legislation serves as a legal foundation for a massive institutional transition, mandating the transfer of authority over digital financial assets, including crypto assets, from Bappebti to the Financial Services Authority, or OJK. The transition period is set to be completed within twenty four months from the enactment of the law, marking a new era where crypto assets are legally recognized as a subset of the broader financial services landscape.[27] This shift is not merely a change in bureaucratic jurisdiction but represents a fundamental ideological move toward treating crypto assets with the same level of prudential oversight and consumer protection as traditional securities and banking products.

To provide the necessary operational framework for this transition, OJK introduced Financial Services Authority Regulation Number 27 of 2024 concerning the Implementation of Digital Financial Asset Trading Including Crypto Assets. This regulation establishes the initial standards for governance, risk management, and the licensing of service providers in the new ecosystem. However, recognizing the extreme volatility and the rapid introduction of complex financial products like derivatives in the crypto space, OJK subsequently issued Financial Services Authority Regulation Number 23 of 2025. This amendment aims to strengthen the role and expand the scope of digital financial asset trading providers, ensuring that the regulation remains responsive to the innovative yet high risk nature of the industry.[28]

One of the core features of Regulation Number 23 of 2025 is its focus on the Penyelenggara Perdagangan, or the digital financial asset trading providers. The regulation imposes strict requirements on these entities, including the obligation to obtain formal approval from the OJK, maintain specific capital levels, and implement robust systems for the protection of consumer assets. This focus on centralized intermediaries is a hallmark of the OJK regulatory philosophy, which seeks to establish clear points of accountability within the financial system.[29] By bringing these providers under the umbrella of financial services regulation, the OJK aims to mitigate the risks of market abuse and provide a clearer mechanism for dispute resolution when investor losses occur.

Despite the robustness of this new framework, its applicability to the decentralized finance ecosystem remains a subject of intense academic and practical debate. The language used in Regulation Number 23 of 2025 and its predecessor, Regulation Number 27 of 2024, is heavily predicated on the existence of a legal entity that acts as an intermediary. For instance, the regulations define a provider as a party that facilitates the trading of digital assets, implying a centralized structure with a physical presence and a designated management team. This definition creates a significant normative challenge when applied to DeFi protocols, where the facilitator is not a company but a decentralized autonomous organization or an automated smart

Otoritas Jasa Keuangan Pasca Undang-Undang Nomor 4 Tahun 2023," *Lex Prospicit* 3, no. 1 (October 8, 2025), https://doi.org/10.19166/lp.v3i1.7762.

[27] Sitompul, "Cryptocurrency Based Money Laundering in Indonesia."

[28] Handayani et al., "Legal Framework For Crypto Asset Trading As An Effort To Protect Consumers In Indonesia."

[29] Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework."

contract.[30] In such cases, the prescriptive requirements for licensing and administrative reporting become technologically impossible to fulfill, creating a situation where truly decentralized protocols may operate entirely outside the reach of the OJK oversight.

Furthermore, the transition from Bappebti to OJK highlights the ongoing struggle to balance the promotion of fintech innovation with the imperative of financial stability. While the Bappebti framework was often criticized for being too lenient, the OJK framework risks being too restrictive for the more experimental aspects of the digital economy.[31] The requirements for a standardized platform, as outlined in the recent OJK regulations, may effectively bar the entry of innovative but decentralized protocols that do not fit the traditional mold of a financial service provider. This tension underscores the need for a more nuanced approach that can distinguish between the systemic risks posed by centralized exchanges and the unique, code based risks inherent in DeFi platforms.

In summary, the Indonesian regulatory framework has made significant strides by centralizing authority under the OJK through the mandate of Law Number 4 of 2023 and the implementation of Regulation Number 23 of 2025. This transition has successfully elevated crypto assets into the realm of formal financial oversight, providing a more structured environment for investor protection. However, the current normative review reveals that the framework remains anchored in a centralized logic that is fundamentally at odds with the decentralized and autonomous nature of DeFi. As long as the regulation continues to rely on the existence of a legal intermediary, the phenomenon of rug pulls within truly decentralized protocols will continue to escape effective administrative control, leaving a critical gap in the shield of investor protection.[32]

3.3. Identifying the Legal Vacuum: Challenges in Investor Redress and Liability

The shift toward a more structured oversight under the Financial Services Authority does not automatically resolve the fundamental obstacles regarding investor redress when a rug pull occurs within a decentralized protocol. The core of the problem lies in a profound mismatch between traditional legal doctrines, which are built upon the existence of identifiable legal subjects, and the anonymous, automated reality of the DeFi ecosystem. This creates a significant legal vacuum where, despite the clear presence of a criminal act and financial loss, the mechanisms for civil liability and victim compensation remain largely theoretical and difficult to execute.

The first and most formidable challenge is the issue of anonymity and the identification of a liable party. In a traditional financial fraud case, a victim can bring a lawsuit against a corporation or its directors. However, in the DeFi space, projects are often launched by developers using pseudonyms, as noted in recent forensic studies that highlight the difficulty of linking on chain activities to real world identities.[33]

[30] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."
[31] Harryandi, Fira Natasha, and Muhammad Akbar, "REGULATING INITIAL COIN OFFERING AMIDST THE DEVELOPMENT OF CRYPTO ASSETS IN INDONESIA."
[32] van der Linden and Shirazi, "Markets in Crypto-Assets Regulation: Does It Provide Legal Certainty and Increase Adoption of Crypto-Assets?"
[33] Trozze, Davies, and Kleinberg, "Of Degens and Defrauders: Using Open-Source Investigative Tools to Investigate Decentralized Finance Frauds and Money Laundering."

While investigative tools can trace the flow of stolen assets through the blockchain, they often lead to obscured endpoints or non custodial mixers that effectively sever the link between the stolen funds and the perpetrator. Consequently, even if a court in Indonesia were to rule that a rug pull constitutes an unlawful act, the judgment would remain unenforceable without a physical or legal entity to serve as the defendant.

This difficulty in identifying a subject directly impacts the application of the doctrine of unlawful acts as stipulated in Article 1365 of the Indonesian Civil Code. This foundational principle requires the fulfillment of four cumulative elements: the presence of an unlawful act, fault on the part of the perpetrator, a clear financial loss, and a causal relationship between the act and the loss. In a rug pull, while the loss and causality are often obvious, the element of fault becomes a complex legal knot. Many developers argue under the code is law philosophy that because the investors voluntarily interacted with a smart contract whose functions were publicly visible, any subsequent loss is a result of market risk rather than a legal fault.[34] Without a specific regulation that explicitly defines the duty of care for protocol developers, the Indonesian civil courts are left to struggle with whether a technically valid execution of a smart contract can be deemed a legally faulty act.

Furthermore, the current focus of the Financial Services Authority Regulation Number 23 of 2025 on centralized providers creates a protective blind spot for those participating in pure DeFi. The regulation establishes a liability framework for the Penyelenggara Perdagangan, or trading providers, who must take responsibility for system failures or losses occurring on their platforms. However, this framework is predicated on the assumption that a centralized intermediary exists to facilitate the transaction. When an investor interacts directly with a decentralized exchange or a liquidity pool through a personal digital wallet, they are effectively bypassing the registered providers that the OJK is capable of supervising. In these instances, the administrative protections and the dispute resolution mechanisms provided by the OJK find no application, leaving the investor in a state of regulatory exclusion.[35]

The international and borderless nature of DeFi rug pulls further exacerbates the challenges of legal redress. Most DeFi protocols are deployed globally, and the perpetrators may be located in jurisdictions that do not recognize Indonesian court orders or have no mutual legal assistance treaties in the realm of digital assets. This jurisdictional fragmentation means that even a successful criminal investigation by the Indonesian National Police or the OJK investigators may not result in the actual recovery of assets if they have been moved to offshore decentralized platforms.[36]The lack of a global standard for the segregation of client assets and the absence of a cross border insurance fund mean that the burden of loss is almost entirely borne by the individual investor, regardless of the domestic legal protections in place.

Lastly, there is a technical barrier to redress known as the irreversibility of blockchain transactions. Traditional banking systems allow for the freezing of accounts

[34] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."

[35] Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework."

[36] Maria Girich, Ivan Ermokhin, and Antonina Levashenko, "Comparative Analysis of the Legal Regulation of Digital Financial Assets in Russia and Other Countries," *International Organisations Research Journal* 17, no. 4 (December 27, 2022): 176–92, https://doi.org/10.17323/1996-7845-2022-04-07.

or the reversal of fraudulent transfers upon the discovery of a crime. In contrast, once a smart contract function is executed and the liquidity is withdrawn in a rug pull, the transaction is immutable and cannot be undone by a central authority. This technological finality stands in direct opposition to the legal principle of restitution, which seeks to restore the victim to their original position. Without a legal requirement for developers to include administrative backdoors or emergency pause functions, which themselves are controversial within the decentralized community, the law remains a passive observer to an irreversible financial loss.[37]

In summary, the legal vacuum in the Indonesian DeFi landscape is not caused by a lack of will but by a structural inability of current laws to address the trustless and subjectless nature of decentralized finance. While Law Number 4 of 2023 and Regulation Number 23 of 2025 provide a robust shield against fraud in the centralized crypto market, they offer little more than a paper thin defense against the algorithmic predation of rug pulls. As long as the legal system relies on identifying a centralized intermediary to assign liability, the most vulnerable participants in the digital economy will continue to face a crisis of redress that undermines the broader goals of market integrity and investor confidence.

3.4. Comparative Perspective: The European Union MiCA Framework as a Global Gold Standard

The global search for a balanced regulatory approach to crypto assets has found its most comprehensive answer in the European Union through the implementation of the Markets in Crypto Assets regulation, widely known as MiCA. This framework represents a landmark achievement in digital asset governance, moving beyond fragmented national rules toward a unified and highly prescriptive regime for all member states. Unlike the Indonesian approach, which is currently undergoing a transitional phase under the Financial Services Authority Regulation Number 23 of 2025, MiCA was specifically designed to provide a high level of legal certainty and robust investor protection across the entire lifecycle of a crypto asset. It serves as a gold standard because it acknowledges the technical nuances of blockchain technology while imposing strict accountability on the actors who profit from the ecosystem.[38]

At the core of the MiCA strategy against fraud and rug pulls is the mandatory requirement for a detailed and standardized white paper. Under the Markets in Crypto Assets regulation, issuers of crypto assets are legally obligated to publish a white paper that includes essential information about the issuer, the project, and the specific risks associated with the asset. This document is not merely a marketing tool but a legally binding prospectus that must be notified to the relevant national authority before any public offering occurs. This proactive disclosure mechanism is designed to eliminate the information asymmetry that developers exploit during a rug pull.[39] By mandating transparency regarding the underlying technology and the rights of the investors,

[37] Sun et al., "SoK: A Taxonomic Analysis of DeFi Rug Pulls: Types, Dataset, and Tool Assessment."

[38] van der Linden and Shirazi, "Markets in Crypto-Assets Regulation: Does It Provide Legal Certainty and Increase Adoption of Crypto-Assets?"

[39] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."

MiCA ensures that any deviation from the promised roadmap can be prosecuted as a clear breach of statutory duty.

Furthermore, MiCA introduces stringent requirements for the segregation of client assets and the maintenance of reserve funds, particularly for issuers of stablecoins and service providers. This is a critical defensive measure against liquidity stealing rug pulls. The regulation requires that crypto asset service providers must hold their customers assets separately from their own corporate funds, ensuring that investor capital is protected even in the event of insolvency or project failure.[40] In the context of Indonesia, where Regulation Number 23 of 2025 is still refining these standards, the MiCA model provides a more advanced blueprint for preventing developers from treated investor deposits as their personal treasury. This structural separation of assets creates a technological and legal barrier that makes the sudden withdrawal of liquidity far more difficult to execute without triggering immediate regulatory intervention.

Liability and redress mechanisms under the European framework are also significantly more defined than those currently available in the Indonesian civil system. The Markets in Crypto Assets regulation explicitly establishes that issuers can be held liable for damages if the information provided in the white paper is misleading or incomplete. This creates a prescriptive liability regime that moves beyond the general and often difficult to prove requirements of a typical unlawful act lawsuit.[41] For investors who fall victim to a project that fails to live up to its technical promises, MiCA provides a direct legal pathway to seek compensation from the responsible individuals or entities. This clarity in liability is precisely what is missing in the Indonesian DeFi space, where victims are often lost in a jurisdictional and evidentiary fog.

Moreover, MiCA addresses the challenge of market abuse through a set of rules that mirror those found in traditional financial markets. The regulation prohibits insider trading, market manipulation, and the dissemination of false information within the crypto market. This is particularly relevant for the coordinated dumping of tokens, a common tactic in rug pull schemes. By defining these actions as market abuse, the European Union empowers its regulators to intervene in the market and impose substantial fines or criminal sanctions on developers who manipulate token prices for personal gain.[42] This comprehensive oversight ensures that the integrity of the market is maintained not just through administrative licensing, but through the active policing of trading behavior.

In summary, the Markets in Crypto Assets regulation provides a sophisticated and investor centric framework that addresses the technical and legal loopholes inherent in decentralized finance. While Indonesia has made significant progress through the enactment of Law Number 4 of 2023 and the subsequent OJK regulations, the domestic framework still lacks the granular and prescriptive protections found in the European model. The MiCA framework demonstrates that it is possible to regulate

[40] Wronka, "Crypto-Asset Regulatory Landscape: A Comparative Analysis of the Crypto-Asset Regulation in the UK and Germany."

[41] Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework."

[42] Girich, Ermokhin, and Levashenko, "Comparative Analysis of the Legal Regulation of Digital Financial Assets in Russia and Other Countries."

the digital asset market without stifling innovation, provided that the law is informed by a deep understanding of the technology it seeks to govern. For Indonesia, the MiCA framework represents more than just a foreign law; it is a strategic roadmap for building a secure and trustworthy digital financial ecosystem.[43]

3.5. Constructing the Ideal Model: Integrating MiCA Principles into the Indonesian Crypto Ecosystem

The formulation of an ideal legal framework for investor protection in Indonesia requires a fundamental shift from a purely administrative approach to one that is deeply integrated with the technical realities of the digital asset market. Before proposing specific regulatory adoptions from the European Union Markets in Crypto Assets framework, a rigorous cost benefit analysis must be conducted to ensure viability within the national economic context. On the cost side, the primary impact is an increased operational expenditure for domestic digital asset service providers. These entities would be required to allocate significant capital to implement standardized white paper disclosures, engage in periodic third party smart contract audits, and maintain higher reserve funds. There is an inherent risk that highly restrictive regulations might momentarily slow the pace of domestic financial technology innovation. However, the long term benefits of this reform significantly outweigh the immediate compliance costs. By establishing a secure and predictable environment, the Financial Services Authority can dramatically reduce the frequency of rug pull incidents, which currently result in massive unrecoverable losses for retail investors. A robust regulatory environment also enhances national global competitiveness, making the Indonesian digital market more attractive to institutional investors who prioritize market integrity over unregulated growth.[44]

To transition effectively toward this ideal model without stifling the existing market, the Financial Services Authority should implement a strategic roadmap divided into three operational phases. The first phase, designated as the Diagnostic and Technical Audit Phase, involves a comprehensive mapping of the current ecosystem. Given that many rug pulls are executed through malicious functions embedded in the source code, the law must require a third party technical validation of any protocol accessible to Indonesian retail investors. This prescriptive requirement moves beyond traditional licensing by focusing on the security of the underlying technology itself. During this stage, the OJK should require all domestic exchanges to submit independent audit reports for every smart contract accessible to their users. By creating a certified list of approved auditors and requiring an audit certificate as a condition for listing digital assets, the OJK can provide a proactive layer of defense that identifies and eliminates obvious vulnerabilities such as honeypot functions before further regulations are enacted.[45]

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[43] Voicu D. Dragomir and Valentin Florentin Dumitru, "Recognition and Measurement of Crypto-Assets from the Perspective of Retail Holders," *FinTech* 2, no. 3 (August 17, 2023): 543–59, https://doi.org/10.3390/fintech2030031.

[44] Rahman et al., "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework."

[45] van der Linden and Shirazi, "Markets in Crypto-Assets Regulation: Does It Provide Legal Certainty and Increase Adoption of Crypto-Assets?"

The second phase is the Normative Integration Phase, which focuses on the legislative refinement of the Financial Services Authority Regulation Number 23 of 2025. This phase introduces the mandatory white paper regime inspired by the MiCA standards. Indonesia should adopt the European model of the crypto asset white paper as a legally binding document rather than a mere technical summary. Under this regime, the white paper serves as a prospectus that creates clear legal obligations for issuers, holding developers liable for any misleading information regarding the protocol code. Furthermore, this phase must enforce strict asset segregation rules and mandatory reserve fund principles. One of the most effective defenses against liquidity stealing rug pulls is the requirement for service providers to maintain a structural separation between corporate funds and client assets. By mirroring the MiCA standards, Indonesia can mandate that any entity facilitating decentralized asset trading maintains liquid reserves proportional to the volume of assets under management. This technological and financial buffer ensures that even in the event of a protocol exploit or a sudden market withdrawal, the collective interests of the participants remain shielded from total loss.[46]

The final phase is the Institutional Resilience and Global Cooperation Phase. In this stage, Indonesia should establish a national Digital Asset Insurance Fund to provide a financial safety net for victims of complex protocol exploits. Furthermore, the ideal model must acknowledge the borderless nature of the decentralized finance ecosystem by fostering international regulatory cooperation. As highlighted in recent global studies on financial technology, no single jurisdiction can effectively combat decentralized fraud in isolation.[47] Indonesia should actively participate in global regulatory networks to establish mutual legal assistance treaties specifically tailored for the recovery of digital assets. By aligning domestic standards with international benchmarks like MiCA, the OJK can more effectively collaborate with foreign authorities to trace stolen funds and enforce court orders against anonymous actors operating across multiple jurisdictions.[48] This holistic approach ensures that the Indonesian legal system remains responsive to the evolving complexities of the global digital economy while maintaining the trust of its domestic investors.

In conclusion, the integration of MiCA principles into the Indonesian regulatory landscape represents a strategic necessity for the sustainable growth of the crypto market. By following this structured roadmap, the transition becomes a measured and strategic evolution. Moving toward a more prescriptive and technologically informed model empowers the Financial Services Authority to transform the current state of investor protection from a reactive administrative process into a robust and anticipatory shield.[49] This reform is essential to ensuring that Indonesia remains a competitive and secure environment for digital financial innovation in the years to come.

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[46] Wronka, "Crypto-Asset Regulatory Landscape: A Comparative Analysis of the Crypto-Asset Regulation in the UK and Germany."

[47] Singh et al., "Leading in a Future Economy Project — Global Regulatory Frameworks for Digital Assets: Comparative Analysis and Potential International Cooperation."

[48] Barczentewicz and de Gândara Gomes, "Crypto-Asset Market Abuse Under EU MiCA."

[49] Dragomir and Dumitru, "Recognition and Measurement of Crypto-Assets from the Perspective of Retail Holders."

5. CONCLUSION

The emergence of decentralized finance has presented a transformative opportunity for the global financial system, yet it has simultaneously introduced unprecedented risks that challenge the traditional boundaries of legal protection. This research has demonstrated that a rug pull in the DeFi ecosystem is not merely a technical failure but a sophisticated manifestation of criminal fraud and market manipulation. From a legal standpoint, these acts satisfy the elements of electronic fraud under Article 28 of the Information and Electronic Transactions Law, as well as the traditional definition of fraud, which has transitioned from the old Criminal Code to Article 492 of the New Indonesian Criminal Code (Law Number 1 of 2023). However, the decentralized and anonymous nature of these protocols often renders these traditional provisions difficult to enforce, creating a crisis of redress for retail investors.

In addressing the first research question, it is concluded that the current Indonesian legal framework is in a state of critical transition. The enactment of Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector has successfully centralized oversight under the Financial Services Authority, providing a more professional and prudential foundation for the crypto market. Furthermore, Financial Services Authority Regulation Number 23 of 2025 establishes clear operational standards for centralized trading providers. Nevertheless, a significant normative gap remains. The current regulations are heavily predicated on an intermediary centric model that assumes the existence of a central legal entity. Consequently, when a rug pull occurs within a truly decentralized protocol that bypasses these registered providers, the existing OJK framework finds no identifiable subject to sanction, leaving a vacuum in investor protection.

Regarding the second research question, the ideal legal framework for Indonesia lies in the strategic integration of principles derived from the European Union's Markets in Crypto Assets regulation. The MiCA framework offers a superior model of protection through its prescriptive requirements for mandatory white papers, strict asset segregation, and the maintenance of reserve funds. For Indonesia to effectively mitigate the risks of rug pulls, the OJK should move beyond administrative licensing toward a more technologically informed and risk based oversight model. This includes mandating independent smart contract audits for any asset accessible to the public and fostering international regulatory cooperation to address the borderless nature of DeFi crimes.

In final recommendation, the Indonesian government and the Financial Services Authority must acknowledge that the protection of the digital economy requires a law that understands the code. Future policy should focus on establishing a Digital Asset Insurance Fund and implementing "Law as Code" principles where certain investor protections are embedded directly into the regulatory technology requirements. Failure to evolve the legal framework in this direction will leave the domestic crypto market vulnerable to algorithmic predation, ultimately hindering Indonesia's ambition to become a leading and secure player in the future global economy.

REFERENCES

Barczentewicz, Mikołaj, and André de Gândara Gomes. "Crypto-Asset Market Abuse Under EU MiCA." *European Journal of Risk Regulation*, November 25, 2024, 1–18. https://doi.org/10.1017/err.2024.80.

Dragomir, Voicu D., and Valentin Florentin Dumitru. "Recognition and Measurement of Crypto-Assets from the Perspective of Retail Holders." *FinTech* 2, no. 3 (August 17, 2023): 543–59. https://doi.org/10.3390/fintech2030031.

Girich, Maria, Ivan Ermokhin, and Antonina Levashenko. "Comparative Analysis of the Legal Regulation of Digital Financial Assets in Russia and Other Countries." *International Organisations Research Journal* 17, no. 4 (December 27, 2022): 176–92. https://doi.org/10.17323/1996-7845-2022-04-07.

Gramlich, Vincent, Tobias Guggenberger, Marc Principato, Benjamin Schellinger, and Nils Urbach. "A Multivocal Literature Review of Decentralized Finance: Current Knowledge and Future Research Avenues." *Electronic Markets* 33, no. 1 (December 27, 2023): 11. https://doi.org/10.1007/s12525-023-00637-4.

Handayani, Otih, Esther Masri, Panti Rahayu, Achmad J. Pamungkas, and Muhammad Azam. "Legal Framework For Crypto Asset Trading As An Effort To Protect Consumers In Indonesia." *Pena Justisia: Media Komunikasi Dan Kajian Hukum* 24, no. 2 (October 12, 2025): 8252–73. https://doi.org/10.31941/pj.v24i2.7134.

Harryandi, Alexander, Fira Natasha, and Muhammad Akbar. "REGULATING INITIAL COIN OFFERING AMIDST THE DEVELOPMENT OF CRYPTO ASSETS IN INDONESIA." *Journal of Central Banking Law and Institutions* 1, no. 3 (September 30, 2022): 537–70. https://doi.org/10.21098/jcli.v1i3.41.

Lin, Zewei, Jiachi Chen, Jiajing Wu, Weizhe Zhang, Yongjuan Wang, and Zibin Zheng. "CRPWarner: Warning the Risk of Contract-Related Rug Pull in DeFi Smart Contracts." *IEEE Transactions on Software Engineering* 50, no. 6 (June 2024): 1534–47. https://doi.org/10.1109/TSE.2024.3392451.

Linden, Tina van der, and Tina Shirazi. "Markets in Crypto-Assets Regulation: Does It Provide Legal Certainty and Increase Adoption of Crypto-Assets?" *Financial Innovation* 9, no. 1 (January 10, 2023): 22. https://doi.org/10.1186/s40854-022-00432-8.

Luo, Bingqiao, Zhen Zhang, Qian Wang, Anli Ke, Shengliang Lu, and Bingsheng He. "AI-Powered Fraud Detection in Decentralized Finance: A Project Life Cycle Perspective." *ACM Computing Surveys* 57, no. 4 (April 30, 2025): 1–38. https://doi.org/10.1145/3705296.

Mazorra, Bruno, Victor Adan, and Vanesa Daza. "Do Not Rug on Me: Leveraging Machine Learning Techniques for Automated Scam Detection." *Mathematics* 10, no. 6 (March 16, 2022): 949. https://doi.org/10.3390/math10060949.

Nelson, Febby Mutiara, Maria Dianita Prosperiani, Choky Risda Ramadhan, and Priska Putri Andini. "Cracking the Code: Investigating the Hunt for Crypto Assets in Money Laundering Cases in Indonesia." *Journal of Indonesian Legal Studies* 9, no. 1 (May 8, 2024): 89–130. https://doi.org/10.15294/jils.vol9i1.4534.

Rahman, Yogi Muhammad, Mentari Jastisia, Siti Barora, Belardo Prasetya Mega Jaya, and Ariesta Wibisono Anditya. "Legal Reform for Investor Protection in Indonesian Crypto Markets: A Comparative Analysis With The MiCA Framework." *Jurnal Wawasan Yuridika* 8, no. 2 (September 28, 2024): 112–38. https://doi.org/10.25072/jwy.v8i2.4433.

Ratul, Md Hasibul Alam, Sepideh Mollajafari, and Martin Wynn. "Managing Digital Evidence in Cybercrime: Efforts Towards a Sustainable Blockchain-Based

Solution." *Sustainability* 16, no. 24 (December 12, 2024): 10885. https://doi.org/10.3390/su162410885.

Singh, Amardeep Kaur Inderjit, Ahmad Derry, Chuleekorn Tontivanichanon, and Lê Th Kim Nga. "Leading in a Future Economy Project — Global Regulatory Frameworks for Digital Assets: Comparative Analysis and Potential International Cooperation." *World Scientific Annual Review of Fintech* 03 (January 6, 2025). https://doi.org/10.1142/S2811004825300030.

Sitompul, Ariman. "Cryptocurrency Based Money Laundering in Indonesia." *International Asia Of Law and Money Laundering (IAML)* 4, no. 1 (April 24, 2025): 7–12. https://doi.org/10.59712/iaml.v4i1.113.

Solichin, Arjana Bagaskara. "Implikasi Hukum Atas Peralihan Kewenangan Pengaturan Dan Pengawasan Aset Kripto Dari Badan Pengawas Perdagangan Berjangka Komoditi Kepada Otoritas Jasa Keuangan Pasca Undang-Undang Nomor 4 Tahun 2023." *Lex Prospicit* 3, no. 1 (October 8, 2025). https://doi.org/10.19166/lp.v3i1.7762.

Sun, Dianxiang, Wei Ma, Liming Nie, and Yang Liu. "SoK: A Taxonomic Analysis of DeFi Rug Pulls: Types, Dataset, and Tool Assessment." *Proceedings of the ACM on Software Engineering* 2, no. ISSTA (June 22, 2025): 550–72. https://doi.org/10.1145/3728900.

Trozze, Arianna, Toby Davies, and Bennett Kleinberg. "Of Degens and Defrauders: Using Open-Source Investigative Tools to Investigate Decentralized Finance Frauds and Money Laundering." *Forensic Science International: Digital Investigation* 46 (September 2023): 301575. https://doi.org/10.1016/j.fsidi.2023.301575.

Vidianto, Dominic Imanuel, Aloysius Mardiana, Nurul Hikmah, and Aliif Ahmad Akbar. "Legal Protection for Consumers Who Lose Assets on Crypto Exchange Platforms in Indonesia: A Case Study of Hacking and Rug Pull." *Justice Voice* 4, no. 2 (December 31, 2025): 83–93. https://doi.org/10.37893/jv.v4i2.1204.

Wronka, Christoph. "Crypto-Asset Regulatory Landscape: A Comparative Analysis of the Crypto-Asset Regulation in the UK and Germany." *Journal of Asset Management* 25, no. 4 (July 21, 2024): 417–26. https://doi.org/10.1057/s41260-024-00358-z.

Zetzsche, Dirk A, Douglas W Arner, and Ross P Buckley. "Decentralized Finance." *Journal of Financial Regulation* 6, no. 2 (September 20, 2020): 172–203. https://doi.org/10.1093/jfr/fjaa010.

Laws and Regulations

European Union. *Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets* [Markets in Crypto-Assets / MiCA Regulation]. Official Journal of the European Union L 150/40.

Indonesia. *Kitab Undang-Undang Hukum Perdata* [Indonesian Civil Code]. Burgerlijk Wetboek.

Indonesia. *Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik* [Law Number 11 of 2008 concerning Information and Electronic Transactions]. Lembaran Negara Republik Indonesia Tahun 2008 Nomor 58.

Indonesia. *Undang-Undang Nomor 1 Tahun 2023 tentang Kitab Undang-Undang Hukum Pidana* [Law Number 1 of 2023 concerning the Criminal Code]. Lembaran Negara Republik Indonesia Tahun 2023 Nomor 1.

Indonesia. *Undang-Undang Nomor 4 Tahun 2023 tentang Pengembangan dan Penguatan*

Sektor Keuangan [Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector]. Lembaran Negara Republik Indonesia Tahun 2023 Nomor 4.

Indonesia. *Undang-Undang Nomor 1 Tahun 2024 tentang Perubahan Kedua atas Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik* [Law Number 1 of 2024 concerning the Second Amendment to Law Number 11 of 2008 concerning Information and Electronic Transactions]. Lembaran Negara Republik Indonesia Tahun 2024 Nomor 1.

Otoritas Jasa Keuangan. *Peraturan Otoritas Jasa Keuangan Nomor 27 Tahun 2024 tentang Penyelenggaraan Perdagangan Aset Keuangan Digital Termasuk Aset Kripto* [Financial Services Authority Regulation Number 27 of 2024 concerning the Implementation of Digital Financial Asset Trading Including Crypto Assets].

Otoritas Jasa Keuangan. *Peraturan Otoritas Jasa Keuangan Nomor 23 Tahun 2025* [Financial Services Authority Regulation Number 23 of 2025].