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The Growth of Crypto Assets and Its Impact on CBDC Design and Central Banking Roles: Evidence from Indonesia

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Abstract

The post-COVID-19 digital transformation has accelerated a shift from cash to digital transactions, including increased adoption of crypto assets. In 2024, crypto transactions grew by more than 300 percent, posing challenges for Bank Indonesia in safeguarding rupiah sovereignty in the digital space. This study examines the strategic positioning of the Digital Rupiah as a response to crypto ecosystem developments. Using a qualitative-analytical approach, the research combines literature review, a survey of 74 respondents on crypto usage motivations, econometric modeling to assess crypto's impact on central bank policy, and priority analysis via the Eisenhower Matrix. Findings indicate that the urgency of issuing a Digital Rupiah remains low because crypto is primarily used as an investment instrument and has not significantly influenced Bank Indonesia's policy objectives. However, its strategic importance is high. As financial digitalization accelerates, the central bank must maintain monetary control and ensure a resilient payment infrastructure. Recommendations include strengthening legal enforcement and inter-agency coordination, developing a securities ledger, and leveraging the Digital Rupiah for cross-border payments.

Keywords: CBDC, central bank, crypto, digital, digital rupiah, financial system stability, monetary, payment system, sovereignty.

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Introduction

Indonesia's rapid digitalization has reshaped how households and firms transact, save, and invest. Non-cash retail payments, driven by QR-based instruments, mobile banking, and e-money, continue to expand, while participation in crypto asset markets has become more visible in the public discourse (Bank Indonesia, 2022; Tedianta & Purwaningrum, 2024). These shifts present a classic policy trade-off, where on the one hand, programmable, always-on infrastructures can unlock efficiency, inclusion, and cross-border connectivity (Auer, Cornelli, & Frost, 2020; Malaguti, 2015). On the other hand, they raise questions about the singleness of money, the effectiveness of monetary policy transmission, consumer protection, and the resilience of the national payment system when privately issued digital assets and platforms scale (Moenjak, 2024; Dionysopoulos, Marra, & Urquhart, 2024). For a central bank with statutory mandates over price stability and payment-system soundness, the strategic question is not whether to innovate, but how to do so in a way that is proportionate to Indonesia's risks and opportunities.

Recently, many jurisdictions are exploring Central Bank Digital Currency (CBDC) as part of this response (IMF, 2024; Atlantic Council, 2025). According to a 2024 BIS survey, 85 central banks are currently exploring CBDCs, with wholesale CBDC development more advanced than retail CBDC (Illes et al., 2025). The decline in cash usage and the rise of traditional asset tokenization are key driving factors. More than three jurisdictions have accelerated CBDC development due to the stablecoin and crypto asset trend. However, more jurisdictions are beginning to implement regulations for stablecoins and crypto assets, while asset tokenization continues to advance (Trautman, 2025; Bidder et al., 2025).

Conceptually, CBDC extends public money into native digital form, potentially combining legal finality with interoperability and programmability (Agur, Ari, & Dell'Ariccia, 2022; Auer & Böhme, 2021). Yet CBDC design is not monolithic: choices span wholesale versus retail scope, account versus token-based access, privacy and identity regimes, settlement and interoperability layers, and operating models with intermediaries. These choices interact with local context, financial structure, existing payment rails, legal underpinnings, digital identity frameworks, and cross-border priorities, so international blueprints offer guidance but not a turnkey solution (Dionysopoulos et al., 2024; Wenker, 2022).

Indonesia's central bank, Bank Indonesia, is currently exploring CBDCs under a project called Project Garuda. On 30th November 2022, Bank Indonesia released the white paper "Project Garuda: Navigating the Architecture of the Digital Rupiah" (Bank Indonesia, 2022). The Digital Rupiah was developed to safeguard the sovereignty of the rupiah in the digital era. In accordance with the Indonesian Payment System Blueprint (BSPI) 2025-2030, the development of the Digital Rupiah is geared toward wholesale CBDCs, with development currently entering the second phase of experimentation focused on replicating wholesale market functions and deepening financial markets (Bank Indonesia, 2022; Riani & Akbar, 2024). These initiatives are a response to the growth of digital transactions in Indonesia, driven by shifting demographics. The current population is dominated by Millennials, Generation Z, and Gen Alpha, representing 69.64 percent of the total population. These three generations are considered digitally savvy, accustomed to digital transactions, online shopping, and even investing in digital assets like crypto (Tedianta & Purwaningrum, 2024).

According to the Indonesian Payment System Blueprint (BSPI) 2025-2030, crypto adoption in Indonesia is among the top 10 globally. Crypto transaction value grew by 335.91 percent annually to 650.61 trillion rupiah, with the number of investors reaching 22.91 million, dominated by generations Y and Z (Investor Trust, 2025). In line with the acceleration of crypto transactions globally, countries around the world are issuing regulations governing crypto transactions in their respective jurisdictions. On 18th July 2025, the United States Government issued the Genius Act (Guaranteeing Essential National Infrastructure in US-Stablecoins), which stipulates that stablecoin asset issuance must be backed by reserve assets in the form of USD fiat currency, US Treasury bills, repurchase agreements, and other risky assets approved by regulators at a 1:1 ratio (White House, 2025; Trautman, 2025). Stablecoins are crypto assets whose value can be maintained because they are pegged to fiat currencies. The Genius Act provides a clear regulatory framework for stablecoin issuers and provides certainty for stablecoin users, including their use as a means of payment in United States jurisdictions.

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The rise of crypto assets and stablecoins complicates the calculus. While some studies cast crypto as a substitute for sovereign currency or retail payment instruments, observed usage in many emerging markets is more nuanced (Ozili, 2023; Cong, Ghosh, Li, & Ruan, 2024). Speculative investment often dominates, with limited penetration into day-to-day payments where compliance, price stability, merchant acceptance, and user protection matter (Jonker, 2019; Smales, 2024). In this context, the challenge is to separate signal from noise: to what extent does crypto adoption in Indonesia create immediate macro-financial pressures (e.g., on inflation dynamics, currency demand, or bank intermediation), versus strategic pressures (e.g., on sovereignty over the unit of account, settlement finality, and cross-border competitiveness) that argue for timely but measured CBDC development?

Consequently, scholars argue that Bank Indonesia needs to reassess the urgency and importance of developing and implementing the Digital Rupiah (Rumi et al., 2024; Muhammad & Dirkareshza, 2023). This approach is arguably to mitigate potential risks that could threaten the effectiveness of Bank Indonesia's mandate to maintain monetary stability, payment systems, and the financial system to support sustainable economic growth (Izzulhaq, Kurnia, & Maharda, 2024). This paper approaches that inquiry by positioning Digital Rupiah within a clear, evidence-based policy frame. Framed this way, our research question is how does the development of the crypto ecosystem impact the position of the Digital Rupiah in maintaining central bank sovereignty?

The scope of this paper is limited to analyzing the urgency and importance of issuing a Digital Rupiah to maintain the stability of the rupiah's value, payment system stability, and financial system stability. It does not address the design, technology, or infrastructure of the Digital Rupiah.

The remainder of the paper proceeds as follows. Section 2 reviews the relevant literature on CBDC design, monetary sovereignty, payment-system resilience, and crypto asset policy channels, and positions Indonesia within that landscape. Section 3 describes the data and methods. Section 4 presents results that inform the urgency-versus-importance assessment and the Eisenhower Matrix positioning. Section 5 discusses policy implications. Section 6 concludes with priorities for future research and implementation.

Literature Review

Central-Bank Mandates, Singleness of Money, and Digital Public Money

Under Law No. 4 of 2023 on Financial Sector Strengthening (P2SK) and Law No. 23 of 1999 on Bank Indonesia (as amended), Bank Indonesia is vested with statutory authority to maintain rupiah stability, ensure the integrity of the payment system, and contribute to financial system stability in support of sustainable economic growth (Bank Indonesia, 2023). These mandates are operationalized through a policy mix encompassing monetary policy, payment system oversight, and macroprudential measures aimed at preserving systemic resilience (Warjiyo & Juhro, 2019).

According to Warjiyo and Juhro (2019), rupiah stability refers to the stability of prices for goods and services and the stability of the rupiah exchange rate. Price stability is generally measured by low and stable inflation. Meanwhile, rupiah exchange rate stability is measured by the stability of the rupiah against other currencies. To achieve this goal, Bank Indonesia sets the BI-Rate policy interest rate as the primary instrument through the Inflation Targeting Framework (ITF), which was later strengthened to become the Flexible ITF (Izzulhaq et al., 2024).

To this end, various monetary policies are also strengthened by policy coordination with the Government, particularly on the supply side, especially supply availability and smooth distribution. Meanwhile, to achieve the goal of financial system stability, Bank Indonesia establishes and implements macroprudential policies by promoting balanced, high-quality, and sustainable intermediation, while maintaining financial stability and promoting financial inclusion (Warjiyo & Juhro, 2019).

As the designated payment system authority, Bank Indonesia is responsible for regulating, supervising, and operating national payment system infrastructure. Given that payment systems serve as the primary channel for rupiah circulation (as stipulated in Law No. 7 of 2011 on Currency (Bank Indonesia, 2023)), the central bank ensures that all domestic transactions utilize the rupiah as legal tender. In fulfilling this mandate, Bank Indonesia manages both cash and digital payment infrastructures to guarantee the integrity and efficiency of monetary circulation (Ashworth & Goodhart, 2020; Malaguti, 2015). Through the Indonesian Payment System Blueprint (BSPI) 2025–2030, Bank

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Indonesia is advancing a payment ecosystem that is fast, secure, affordable, and reliable, thereby promoting financial inclusion and reinforcing financial system stability (Bank Indonesia, 2022).

Mancini-Griffoli et al. (2018) emphasize that robust domestic payment infrastructure is fundamental to preserving monetary sovereignty, as inadequate control over payment systems undermines the central bank's ability to transmit monetary policy effectively. Similarly, Gravelle, Morrow, and Witmer (2023) demonstrate that modernized payment infrastructures enhance the pass-through of policy interest rates to the real economy. Studies also argue that a well-functioning payment system can significantly strengthen the effectiveness of monetary instruments, such as benchmark interest rates and open market operations, by improving liquidity transmission and influencing public behavior (Malaguti, 2015; Zhou, 2024).

The sovereignty of the rupiah faces increasing pressure from the proliferation of digital financial instruments, particularly crypto assets (Krause, 2025; Moenjak, 2024). In this context, the payment system serves as a strategic lever to ensure that the rupiah remains relevant, inclusive, and competitive. The Bank for International Settlements (BIS, 2020) underscores that full control over domestic payment systems is an indispensable condition for sustaining a nation's monetary sovereignty.

Strengthening Payment System Policies Amid the Rise of Digital Transactions

Bank Indonesia's payment system policy is articulated in the Indonesian Payment System Blueprint (BSPI) 2025 and BSPI 2030. Under BSPI 2025, the central bank successfully introduced key innovations, including the Quick Response Code Indonesian Standard (QRIS), the National Open-API Payment Standard (SNAP), BI-FAST, regulatory reforms, and the electronification program (Bank Indonesia, 2022). These initiatives have been transformative, significantly accelerating national digitalization and driving substantial growth in digital payment transactions (Izzulhaq et al., 2024).

Building on this progress, BSPI 2030 arguably set out five strategic pillars to shape the future of Indonesia's payment ecosystem: (1) infrastructure modernization, (2) industry structure consolidation, (3) digital innovation, (4) international connectivity, and (5) development of the Digital Rupiah (Bank Indonesia, 2022). Collectively, these initiatives fundamentally aim to establish a resilient and integrated payment system that safeguards monetary sovereignty, supports effective policy transmission, and enhances financial system stability while promoting inclusion (Malaguti, 2015; Riani & Akbar, 2024).

The rapid evolution of crypto assets, to this end, has raised concerns regarding the emergence of "shadow currency" and "shadow central banking." If left unchecked, it could undermine monetary sovereignty and disrupt the transmission of monetary policy (Zetzsche, Arner, & Buckley, 2020; Krause, 2025). In the digital era, central banks face the critical challenge of devising sustainable strategies that preserve public trust in their mandates amid accelerating financial innovation (Brunnermeier, James, & Landau, 2019; Hilpert & Tokarski, 2024).

To address these risks, central banks worldwide are actively exploring Central Bank Digital Currencies (CBDCs). CBDCs, denominated in official currency, function as a medium of exchange, a unit of account, and a store of value, thereby reinforcing the role of sovereign money in digital ecosystems (Bech & Garratt, 2017; Dionysopoulos et al., 2024). Bank Indonesia, in this sense, has joined this global trend through the Garuda Project, which prioritizes the development of a wholesale Digital Rupiah (w-RD) as an initial phase, followed by a retail version (r-RD) (Bank Indonesia, 2022).

Fundamentally, the rationale for introducing the Digital Rupiah is arguably threefold: (i) safeguarding rupiah sovereignty as mandated by law, (ii) strengthening Indonesia's position in the international financial landscape, and (iii) accelerating integration within the domestic digital economy (Bank Indonesia, 2022; As-Salafiyah, Rusydiana, & Ikhwan, 2023). The Digital Rupiah is envisioned as (i) a legal digital payment instrument, (ii) a core tool for fulfilling Bank Indonesia's statutory mandates in the digital era, and (iii) a catalyst for financial inclusion, innovation, and efficiency. Practically, its distribution will follow a one-tier model for wholesale issuance and a two-tier model for retail issuance through intermediaries. Technologically, in the end, the Digital Rupiah will leverage a hybrid architecture combining Distributed Ledger Technology (DLT) with centralized infrastructure to ensure resilience, scalability, and compliance (Mills et al., 2017; Lamberty, Kirste, Kannengieser, & Sunyaev, 2024).

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Crypto Asset Development and Implications for Central Bank

The global crypto asset market, initially conceived as a community experiment, has evolved into a multi-trillion-dollar ecosystem that is reshaping conceptions of money, market infrastructure, and digital value governance (Prasad, 2021; Giudici, Milne, & Vinogradov, 2020). Bitcoin, introduced in 2008 through the seminal whitepaper "Bitcoin: A Peer-to-Peer Electronic Cash System" by Satoshi Nakamoto (Nakamoto, 2008), pioneered blockchain-based decentralized payment systems as a response to the erosion of trust in traditional financial institutions following the global financial crisis. Since its first transaction in 2009, Bitcoin has transitioned from a technological novelty to a globally influential digital asset, impacting monetary policy, financial regulation, and payment system innovation across jurisdictions (Aysan, Demir, Gozgor, & Lau, 2019; Harvey, Ramachandran, & Santoro, 2021).

Over the past decade, the crypto ecosystem has advanced from "internet money" to a continuously operating digital value infrastructure, driven by smart contract platforms such as Ethereum and scalability solutions that reduce transaction costs and latency (Prasad, 2021). This evolution reflects not only technological progress but also shifting societal preferences for speed, transparency, and autonomy in financial transactions, challenging the dominance of conventional intermediaries (Ozili, 2023). Despite volatility and project failures, crypto assets exhibit three defining technical attributes i.e., composability, programmability, and cross-border interoperability. Collectively, these have arguably diminished geographic barriers in digital transactions (Davis, 2011).

The next phase of development is characterized by two transformative drivers: stablecoins and decentralized finance (DeFi). Stablecoins, particularly those pegged to the US dollar, function as liquidity bridges between crypto markets and traditional finance, facilitating faster settlements and expanding use cases such as trading, remittances, and treasury management (Catalini, de Gortari, & Shah, 2022). However, their stability hinges on reserve quality and redemption mechanisms, exposing them to money market risks. Concurrently, DeFi introduces automated protocols, such as algorithmic market makers, decentralized lending platforms, and programmable derivatives, which replicate core financial intermediation functions without centralized oversight (Jensen, von Wachter, & Ross, 2021).

The rapid expansion of crypto assets raises critical questions regarding their implications for central bank mandates, particularly in three areas: monetary policy, payment systems, and financial stability. From a monetary policy perspective, the decentralized and pseudonymous nature of crypto assets poses challenges to the effectiveness of conventional policy instruments (Auer & Böhme, 2021). Empirical evidence suggests mixed linkages between crypto assets and inflation expectations. Smales (2024) finds that Bitcoin and other cryptocurrencies exhibit a positive association with inflation expectations, albeit under specific conditions and less robust than gold as a hedge. Similarly, Cong, Ghosh, Li, and Ruan (2024) report that rising inflation expectations stimulate crypto purchases—especially Bitcoin and Tether—in emerging markets, while Krakower (2023) identifies a weak long-term correlation between Bitcoin prices and inflation.

From a payment system perspective, jurisdictions adhering to the principle of monetary singleness (meaning the uniformity of value and function across all forms of money (Moenjak, 2024)) have arguably limited the role of crypto assets as payment instruments. This principle requires that all monetary forms, whether publicly or privately issued, maintain parity in value (Hemingway, 2026). Crypto assets, including stablecoins, often fail to meet this criterion due to price volatility and uncertainty regarding reserve backing (Bidder et al., 2025). Consequently, in economies with integrated payment systems anchored in sovereign currency, crypto assets are generally excluded as legal tender and exert negligible influence on national payment system architecture.

Although blockchain technology and the broader crypto ecosystem present potential as alternative infrastructures for payment systems, their adoption is constrained by significant legal limitations. The decentralized and borderless nature of crypto assets lacks a harmonized regulatory framework across jurisdictions (Weaver, 2022), creating challenges in consumer protection, cross-border transaction oversight, and legal certainty in dispute resolution (Chavez-Perez, Melgarejo-Espinoza, Sevillano-Vega, & Iparraguirre-Villanueva, 2025). In the absence of a robust legal foundation, crypto-based infrastructures cannot substitute official payment systems operated by central banks and highly regulated financial institutions.

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Beyond legal concerns, crypto assets pose systemic risks to financial stability due to their pronounced price volatility. Giudici, Milne, and Vinogradov (2020) highlight that the rapid expansion of crypto markets may disrupt traditional financial systems through volatility and opacity, underscoring the need for adaptive regulatory frameworks that balance innovation with systemic safeguards. Similarly, Acemoglu, Ozdaglar, and Tahbaz-Salehi (2015) demonstrate that network structures amplify or mitigate systemic risk, implying that the integration of crypto instruments into complex financial networks could heighten contagion risks. From a regulatory perspective, Goyal and Yadav (2025) advocate for proactive policy innovation, including comprehensive oversight of blockchain technology and crypto assets, to preserve market integrity and prevent crises originating from the digital sector.

The Concept of Money Flower

The proliferation of modern payment instruments, including cash, bank deposits, electronic money, cryptocurrencies, stablecoins, and Central Bank Digital Currencies (CBDCs), has rendered the concept of "money" increasingly complex. To address this complexity, Bech and Garratt (2017) introduced the money flower framework, which categorizes monetary instruments based on key attributes such as issuer, accessibility, form, and transferability. This taxonomy has since been adopted by global policy bodies, including the Committee on Payments and Market Infrastructures (CPMI, 2018) and the Bank for International Settlements (BIS, 2020), and is widely referenced in academic literature and international regulatory discourse.

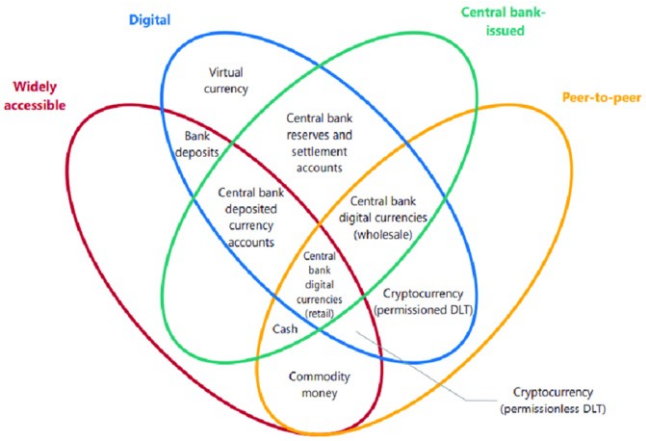


Figure 1. The Concept of Money Flower

The money flower framework serves as a taxonomy of monetary attributes rather than a definitive definition of money (Bech & Garratt, 2017). It identifies four core characteristics: (i) whether the instrument is electronic or physical; (ii) whether it is issued by a central bank or a private entity; (iii) whether it is universally accessible or restricted to specific participants such as banks; and (iv) whether it enables direct peer-to-peer (P2P) transfer without intermediaries (BIS, 2020). These attributes are binary, and their combinations generate distinct monetary forms. To enhance operational analysis, CPMI (2018) introduced an additional dimension distinguishing token-based from account-based instruments, complementing rather than replacing the original framework (CPMI, 2018).

Applying this taxonomy, cash is centrally issued, widely accessible, and P2P, but not electronic, making it unique as a legal retail instrument. In practice, bank deposits are electronic and publicly accessible but neither centrally issued nor P2P, as they require account-based record-keeping (Bech & Garratt, 2017). Central bank reserves are electronic and centrally issued but have restricted access and lack P2P functionality. Public cryptocurrencies such as Bitcoin are electronic, universally accessible, and P2P, yet not state-issued. Commodity money and local currencies vary in attributes depending on design (CPMI, 2018). Conceptually, retail CBDCs could encompass all four attributes i.e., electronic,

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centrally issued, universally accessible, and P2P (Wenker, 2022). Wholesale CBDCs, by contrast, are electronic and centrally issued but limited in accessibility (BIS, 2020; Auer, Cornelli, & Frost, 2020).

Indonesia's current monetary landscape reflects most attributes through cash, bank deposits, and electronic money. While crypto assets provide digital and P2P features, they remain legally classified as investment instruments rather than payment media. CBDCs—both retail and wholesale—are expected to bridge this gap, reinforcing the rupiah's role as a secure, efficient, and adaptable settlement asset in the digital era.

Data and Methods

Data

We utilized three monthly time series in this study. First, inflation is calculated from the Consumer Price Index (CPI), using the official base year as published by Statistics Indonesia (BPS). Monthly inflation is derived through logarithmic differences of the CPI (Aggarwal et al., 2024). Second, economic activity is proxied at a monthly frequency by applying a moving-average interpolation to real GDP, with GDP data also sourced from BPS. Third, cryptocurrency activity is measured by the monthly transaction value or volume denominated in Indonesian rupiah (IDR) at licensed or supervised providers (e.g., exchanges). These figures are transformed using natural logarithms and differenced where appropriate. Cryptocurrency data are obtained from the Financial Services Authority of Indonesia (OJK).

The survey of crypto asset users employed a non-probability purposive sampling approach (Groves et al., 2011), targeting 74 Indonesian residents who had held or transacted crypto assets within the preceding 12 months. Data were collected via an online questionnaire encompassing demographic characteristics, asset composition, primary use cases (investment, payments, or remittance), risk perceptions, information sources, and attitudes toward Central Bank Digital Currency (CBDC) as either a substitute or complement to crypto assets. Ethical safeguards included informed consent, anonymization of responses, and the exclusion of personally identifiable information.

Methods

This study adopts a mixed-methods design, integrating a qualitative approach based on desk research with a quantitative approach involving surveys and econometric modeling. The mixed-methods strategy was selected, as studies suggest, to strengthen the validity of policy inferences through data and methodological triangulation, combining the explanatory depth of qualitative analysis with the empirical rigor of quantitative analysis (Bryman, 2016; Creswell & Clark, 2017). The primary objective is to examine how the development of crypto assets influences central bank policy and to explore strategic options for the Digital Rupiah.

The qualitative component was conducted through systematic document analysis to extract concepts and policy recommendations from official documents and scholarly literature (Bowen, 2009). A content analysis method was employed following Krippendorff's (2018) framework, which involves identifying themes, categorizing findings, and synthesizing narratives to construct a conceptual framework. The quantitative component comprised a survey and econometric modeling. The survey, administered to 74 respondents, aimed to capture motivations and preferences related to crypto asset purchases. Given the purposive sampling approach, the survey results were interpreted as behavioral indicators complementing documentary evidence (Groves et al., 2011). For econometric modeling, inflation was specified as the dependent variable, crypto transactions as the independent variable, and Gross Domestic Product (GDP) as a control variable, estimated using Ordinary Least Squares (OLS).

$$\Delta \ln \mathbf{CPI}_t = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\, \Delta \ln \boldsymbol{Crypto\ Transactions}_{\ t} + \boldsymbol{\beta_2} \Delta \ln \boldsymbol{GDP}_t + \ \boldsymbol{\varepsilon_t}$$

CPI: Consumer Price Index
Crypto Transaction: Crypto transaction value in million rupiah
GDP: Gross Domestic Product at Constant Prices

The validity and reliability of the research were maintained through several mechanisms. Validity was ensured through source triangulation, which involves comparing findings from various documents

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(Denzin, 2007). Reliability was guaranteed through scientific reference management with a reference manager, namely EndNote software, data flow documentation, and reporting of replicable analysis steps (Stodden, Leisch, & Peng, 2014). Econometric modeling estimates were run using Google Collab/IPython, allowing for code and statistical packages to be reviewed and rerun (Pérez & Granger, 2007). Ethically, this study used only public and legal data, with survey data collection based on informed consent and anonymization.

Results

Motivation of Crypto Asset Transactions

This study examined the motivations underlying crypto asset transactions in Indonesia and evaluated user perceptions regarding the potential substitution of crypto assets with Central Bank Digital Currencies (CBDCs). A survey was conducted among individuals actively engaged in crypto-related activities to identify transaction patterns, investment drivers, and attitudes toward CBDCs. The findings indicate that cryptocurrency usage in Indonesia is predominantly investment-oriented rather than payment-based, with only 14.9 percent of respondents reporting any use of crypto assets as a means of payment.

The survey was disseminated through social media platforms, primarily targeting individuals with an economics background. A total of 74 respondents participated, most of whom had been involved in crypto trading for more than six months. Specifically, 43.2 percent reported usage exceeding three years, 24.3 percent between one and three years, and 23 percent between six months and one year. This distribution suggests that respondents possessed sufficient experience to provide informed insights into crypto-related behaviors.

The analysis revealed that the most common forms of crypto activity were long-term investment and short-term trading. The three primary motivations for engaging in crypto transactions were portfolio diversification, curiosity or trend-following behavior, and the expectation of rapid financial gains. The survey did not explore in depth the rationale for using crypto as a payment instrument; rather, it focused on determining whether such usage occurred at all.

Regarding decision-making processes, 60.8 percent of respondents relied on personal research when purchasing crypto assets. In relation to CBDCs, 75.7 percent of respondents were familiar with the concept; however, 66.7 percent indicated they would not adopt CBDCs as substitutes for crypto assets. This finding suggests that respondents perceive crypto assets and CBDCs as serving distinct functions, with CBDCs unlikely to replace cryptocurrencies currently utilized as investment instruments.

Overall, these results underscore the investment-centric nature of crypto adoption in Indonesia, aligning with global trends that position crypto assets as speculative assets rather than transactional currencies. Furthermore, the reluctance to substitute crypto with CBDCs reflects a perceived functional divergence between these instruments. It shows that crypto assets are viewed primarily as vehicles for wealth accumulation, whereas CBDCs are associated with transactional efficiency and monetary stability.

Impact on Central Bank Roles

The influence of crypto assets on central bank policy can be mapped in an integrated manner through three interrelated mandate areas: monetary policy, financial system stability, and payment systems. In the context of monetary policy, particularly price stability, crypto asset volatility impacts the wealth of exposed households and businesses, and shifts in liquidity preferences toward crypto assets can alter demand. In terms of financial system stability, the primary risk arises from crypto asset price volatility, which can impact the credit *repayment capacity* of crypto asset holders with credit exposure. In the payment system realm, the primary challenge lies in the suitability of crypto as a means of payment in local jurisdictions and the readiness of infrastructure and transaction settlement mechanisms.

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Monetary Policy (Impact on Price Stability)

The development of crypto assets is increasingly relevant to central bank policy, particularly in the context of monetary policy, which rests on three main pillars: price stability (inflation), exchange rate stability, and adequate foreign exchange reserves. From the exchange rate perspective, the adoption of foreign currency-denominated crypto assets and the ease of cross-border transactions have the potential to increase functional dollarization (Krause, 2025; Kumar, Kumar, & Verma, 2024; Setiawan, 2025). This could strengthen *the pass-through of* the exchange rate to domestic prices and alter demand patterns for local currencies. From the foreign exchange reserve perspective, crypto price cycles and portfolio shifts to digital assets can impact capital flows, including potential foreign exchange liquidity pressures due to withdrawals from crypto assets, which are generally issued in foreign currencies (Aysan et al., 2019; Cong et al., 2024). Meanwhile, from the price stability perspective, crypto volatility affects wealth levels, causing changes in liquidity preferences and payment behavior, which shift the money demand curve and influence the effectiveness of interest rate policy transmission. This paper focused on the price stability aspect.

To test the effect of crypto asset transactions on inflation, we hypothesized that increases in crypto asset values are positively correlated with inflationary pressures. The primary mechanism we identify is through increased income and consumption, particularly for individuals or households with crypto exposure. Hypothetically, when crypto prices rise, portfolio values increase, which in turn boosts perceived wealth and increases liquidity. This has the potential to increase discretionary consumption through the wealth effect, as explained in the economic literature. Conversely, when crypto prices decline, liquidity constraints tighten, and consumption tends to decline. This dynamic suggests that crypto price fluctuations can be a factor influencing aggregate demand and ultimately impacting inflation.

To analyze the influence of crypto assets on inflation dynamics, we built an *Ordinary Least Squares* (OLS) model based on empirical data consisting of crypto transactions obtained from the Financial Services Authority (OJK), the Consumer Price Index (CPI), and Gross Domestic Product (GDP) at Constant Prices from the Central Statistics Agency (BPS). Because GDP data is available in quarterly format, we interpolated using a *moving average method* to generate monthly GDP data. Prior to use in the modeling, all variables were tested for stationarity to ensure statistical validity within a time series framework. The test results (see Table 4.2) showed that all variables became stationary after differencing *the* data logarithms.

Table 1. Regression Results

Variables Independent	Coefficient	Std. Error	t- Statistics	Prob.
Constant	-0.0001	0.002	-0.048	0.962
Log Difference Transaction Value	0.0059	0.005	1.054	0.297
Log Difference of HK GDP	0.1015	0.185	0.549	0.585

Statistics:
• $R^2 = 0.021$; Adjusted $R^2 = -0.016$
• F-statistic = 0.569 (Prob > F = 0.569)
• Durbin–Watson = 1.974
• Number of observations = 56

The regression model presented in Table 1 estimates the log-difference of the Consumer Price Index (CPI) (used as a proxy for inflation) as the dependent variable, with the log-difference of crypto transactions and the log-difference of Gross Domestic Product (GDP) as independent variables. Diagnostic tests indicate that the Durbin–Watson statistic of 1.97 suggests no significant autocorrelation in the residuals. However, the overall model lacks statistical significance, as evidenced by an F-test p-value of 0.56 and a low coefficient of determination ($R^2 = 0.02$).

The estimated coefficients further confirm the absence of significant relationships: the coefficient for changes in crypto transactions is 0.006 (p = 0.29), while the coefficient for changes in GDP is 0.10

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(p = 0.58), both statistically insignificant. These findings are consistent with Mailinda (2023), who reported that crypto assets, particularly Bitcoin, do not exert a measurable impact on inflation. Furthermore, these estimation results align with the findings of Aggarwal, Saini, Kumar, Yadav, and Doifode (2024) in Brazil, India, China, and South Africa, which stated that crypto assets, specifically Bitcoin and Ethereum, do not significantly impact inflation.

From an economic perspective, these results align with the reality that fluctuations in Bitcoin transactions have not yet become a major determinant of inflation, as studies suggest (Krakower, 2023; Ozili, 2024). This is understandable given the relatively limited influence of crypto-related activities on the broader financial system, as explored in the following section.

Financial Stability Policy (Impact on Systemic Risk)

Bureaucratically, Bank Indonesia holds a mandate to maintain financial system stability (SSK), which includes preventing and mitigating systemic risk. To evaluate whether crypto assets pose systemic risk, theoretically, an analytical framework can be applied based on three dimensions: size, interconnectedness, and complexity (Acemoglu, Ozdaglar, & Tahbaz-Salehi, 2015; Giudici et al., 2020). Within the size dimension, the contribution of crypto assets to the financial system can be assessed by calculating the ratio of crypto transaction value to total financial system assets using the following approach:

$$\textbf{Rasio TK}\ (\%) = \frac{\textbf{TK}}{\textbf{TK} + \textbf{TA Bank} + \textbf{SBN} + \textbf{Saham}} \times \mathbf{100}\%$$

TK Ratio : Ratio of Crypto Transactions to the Financial System
TK : Crypto Transaction
TA Bank : Total Bank
SBN : Total SBN
Stock : Stock Capitalization

$$\textbf{Rasio TK}\ (\%) = \frac{\mathbf{650,62}}{\mathbf{650,62} + \mathbf{12.797,28} + \mathbf{7.730} + \mathbf{12.336}} \times \mathbf{100}\%$$

$$\textbf{Rasio TK}\ (\%) = \mathbf{1.94}\%$$

Using 2024 data, the ratio of crypto transactions to total financial system assets is approximately 1.94 percent, a level considered immaterial for generating systemic pressure. Within the interconnectedness dimension, the critical question concerns the extent to which crypto assets are linked to core financial system components such as banks, payment service providers, and money markets. Data from the Indonesian Blockchain Association (ABI) indicate that no domestic banks currently hold investments in crypto assets, suggesting minimal direct exposure (Goyal & Yadav, 2025).

Regarding complexity, although the relatively small size of the crypto market reduces the likelihood of systemic complexity, residual risks persist. This primarily stems from technological vulnerabilities and an uncertain legal framework. These risks, however, tend to be localized and can be mitigated through strengthened internal governance within the crypto ecosystem, as the calculation above suggests. Considering all three dimensions (size, interconnectedness, and complexity) at low levels, the systemic risk potential of crypto assets in Indonesia can be categorized as negligible.

Payment System Policy (Legal Means of Payment)

Under Indonesia's positive legal framework, the rupiah is established as the sole legal tender within the jurisdiction of the Unitary State of the Republic of Indonesia, as stipulated in Article 2(1) of Law No. 7 of 2011 on Currency. Consequently, crypto assets cannot function as a legal means of payment; rather, they are classified as digital assets or investment instruments. This classification is reinforced by Law No. 4 of 2023 on the Development and Strengthening of the Financial Sector (P2SK Law), which places digital financial assets, including cryptocurrencies, under the regulatory oversight of authorities such as the Financial Services Authority (OJK), not as payment instruments. Accordingly, the principle of monetary unity, also known as singleness of money (Moenjak, 2024; Hemingway,

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2026), in the form of the rupiah remains intact, ensuring that payment system policies are unaffected by the existence of crypto assets.

From an international regulatory perspective, Principle 1 of the Principles for Financial Market Infrastructures (PFMI) emphasizes that every Financial Market Infrastructure (FMI) e.g., Real-Time Gross Settlement (RTGS) systems and retail payment platforms, must operate under a clear, transparent, and enforceable legal framework within its jurisdiction (CPSS & IOSCO, 2012). This framework should explicitly define institutional authority, licensing requirements, and transaction finality to minimize legal uncertainty and systemic risk.

In contrast, the crypto ecosystem arguably lacks such legal clarity (Weaver, 2022; Chavez-Perez et al., 2025). Operating across borders and relying on decentralized code and smart contracts, crypto transactions often fail to meet enforceability standards. For instance, ambiguity persists regarding transaction finality, especially whether it occurs at block inclusion, after a confirmation threshold, or upon settlement in fiat currency. Furthermore, ownership rights and asset segregation in custodial arrangements are not consistently protected in cases of default. Cross-border transactions exacerbate these challenges, as legal conflicts arise when issuers, custodians, users, and courts are located in different jurisdictions.

Since 2022, the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) have stressed that crypto arrangements with systemic implications should comply with PFMI standards. Under Principle 1, contractual relationships between issuers and holders must explicitly define claims, redemption rights, payment priorities, and suspension procedures (CPMI & IOSCO, 2022). Reserves should consist of low-risk assets, be legally and operationally segregated, and undergo regular audits with enforceable reporting standards (CPMI & IOSCO, 2022; Catalini, de Gortari, & Shah, 2022). Absent these elements, crypto transactions risk false finality, where blockchain records suggest completion but lack legal enforceability.

From the PFMI perspective, in the end, domestic payment activities must occur on official infrastructures with settlements governed by applicable regulations, which the crypto ecosystem cannot satisfy (CPSS & IOSCO, 2012; Rumi et al., 2024). Therefore, crypto transactions do not influence the integrity or stability of Indonesia's payment system.

Positioning the Digital Rupiah

Given the above analyses and discussions, it is suggested that the development of crypto assets is not sufficiently significant to influence central bank policy (Aggarwal et al., 2024; Mailinda, 2023). However, to assess the implications of crypto developments for Project Garuda (the Digital Rupiah initiative), a systematic analytical approach is indeed required. One relevant framework is the Eisenhower Matrix, originally introduced as a time management tool that categorizes issues along two dimensions: urgency and importance (Bratterud et al., 2020). This matrix divides tasks into four quadrants: (1) urgent and important, requiring immediate action; (2) important but not urgent, requiring scheduled attention; (3) urgent but less important, suitable for delegation; and (4) neither urgent nor important, appropriate for elimination (Bratterud et al., 2020). Celestin and Vanitha (2017) further clarify the conceptual distinction between urgency and importance within this framework.

Applying this approach to the Digital Rupiah, the urgency dimension reflects whether immediate issuance is necessary. As scholars suggest, several factors indicate low urgency including Indonesia's legal framework explicitly classifies crypto assets as investment commodities rather than legal tender (Muhammad & Dirkareshza, 2023; Rumi et al., 2024). Further, this paper's survey data show crypto is predominantly used for investment rather than payment. This paper's econometric analysis, moreover, confirms crypto's negligible impact on inflation. Importantly, crypto transactions remain legally excluded from payment system infrastructure. In the end, the ratio of crypto transactions to total financial system activity is minimal, suggesting no systemic pressure for immediate CBDC issuance.

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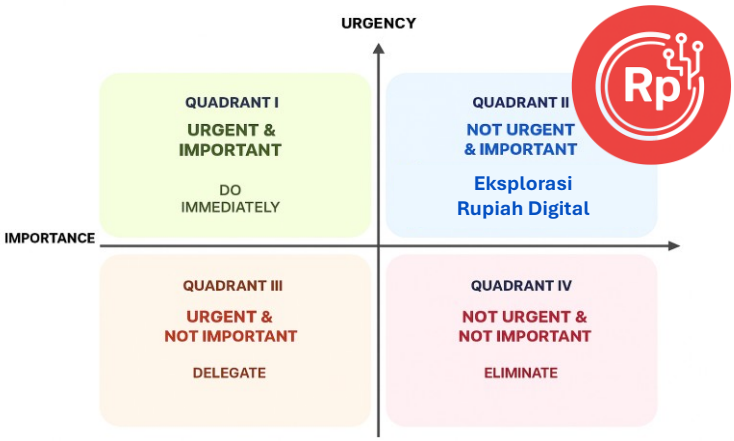


Figure 2. Eisenhower Matrix Analysis of Digital Rupiah

Conversely, the importance dimension is substantial. Structural shifts in public behavior toward digitalization, coupled with the rapid expansion of the digital economy, significantly highlight the need for central bank money to remain relevant and accessible in a cashless era (Ashworth & Goodhart, 2020; Hilpert & Tokarski, 2024). Global trends reinforce this imperative: approximately 90 percent of central banks worldwide are exploring or piloting CBDCs to safeguard monetary sovereignty and enhance payment system efficiency (Illes et al., 2025). CBDC initiatives also serve as strategic platforms for monetary policy innovation and secure digital payment infrastructure development. To this end, amid accelerating technological advancements, such as blockchain, distributed ledger technology (DLT), and tokenization, central banks must not only understand these transformations but actively engage in shaping them to maintain their role as trusted monetary authorities.

In an increasingly integrated global financial environment, competitiveness and cross-border connectivity depend critically on a country's capacity to deliver fast, efficient, secure, and interoperable payment systems. The development of the Digital Rupiah represents a strategic response to this challenge. Leveraging distributed ledger technology (DLT), ISO 20022 messaging standards, and smart contract functionality, the Digital Rupiah arguably holds significant potential as an instrument for direct cross-border settlement, enhancing efficiency, security, and interoperability within the global payment ecosystem. For Indonesia, this initiative is particularly valuable for improving remittance flows, facilitating trade in services, and strengthening regional economic integration.

Within the Eisenhower Matrix framework, the Digital Rupiah is positioned in Quadrant II (important but not urgent, as illustrated in Figure 4.2). The priority is not immediate deployment but rather the establishment of a robust foundation through research, experimentation, and phased implementation. This approach ensures monetary sovereignty and payment system resilience amid the accelerating digitalization of economic activity. In the era of the "future of money" (Lloyd, 2022), the Digital Rupiah serves as a strategic instrument to maintain state control over national currency while providing an adaptive, secure, and reliable payment infrastructure.

At the cross-border level, the Digital Rupiah could function as a direct settlement mechanism for international transactions, supported by advanced technological standards and programmable features. Such capabilities would reinforce Indonesia's monetary sovereignty, enhance payment system efficiency and transparency, and foster deeper regional economic integration in the digital age.

Conclusion and Policy Recommendation

Conclusion

In line with global trends, Indonesia has experienced significant growth in crypto asset adoption. As a form of digital asset, cryptocurrency carries potential implications for financial and payment systems (Ozili, 2023; Izzulhaq et al., 2024). Its increasing popularity as an alternative financial instrument raises critical challenges related to regulation, consumer protection, and financial system stability. These are issues, as studies also express, that require proactive oversight by regulatory

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authorities (Goyal & Yadav, 2025; Chavez-Perez et al., 2025). The role of regulators is therefore pivotal in ensuring that interactions between the conventional financial system and the crypto ecosystem remain safe, efficient, and sustainable.

Despite this growth, current developments in crypto asset transactions have not exerted a material influence on Bank Indonesia's core mandates of maintaining price stability, payment system integrity, and financial system stability. This conclusion is supported by three key observations: (1) econometric analysis using an Ordinary Least Squares (OLS) model indicates that crypto transaction growth does not significantly affect inflation; (2) crypto assets do not impact the payment system, as Indonesian regulations prohibit their use as legal tender and they fail to meet infrastructure requirements under PFMI Principle 1; and (3) the ratio of crypto transactions to total financial system assets remains relatively low at 1.94 percent.

Survey data further reveal that crypto users in Indonesia predominantly regard these assets as investment instruments, consistent with regulatory provisions restricting their use to investment purposes. Although a small proportion of transactions involve crypto as a payment medium, such usage is marginal. Consequently, the current trajectory of crypto adoption has not compromised Bank Indonesia's ability to uphold rupiah sovereignty or payment system stability.

Globally, interest in Central Bank Digital Currency (CBDC) initiatives continues to expand (Atlantic Council, 2025; IMF, 2024). As of July 2025, more than 130 countries and monetary authorities were actively engaged in various stages of CBDC exploration. Motivations for these initiatives include promoting financial inclusion, enhancing payment efficiency, and strengthening monetary policy transmission. In Indonesia, the Garuda Project reflects a strategic effort to design and explore a CBDC primarily to safeguard monetary and payment sovereignty and ensure interoperability within the national payment ecosystem.

Given that crypto transactions remain investment-focused and exert minimal influence on Bank Indonesia's policy objectives, the urgency of launching a Digital Rupiah is currently low. However, its strategic importance is high. As financial digitalization accelerates, the central bank must preserve control over national currency and guarantee a resilient, adaptive payment infrastructure. Accordingly, the Digital Rupiah should be positioned as a forward-looking policy instrument to maintain monetary sovereignty and support the stability of Indonesia's financial system in the digital era.

Policy Recommendations

Ultimately, the overall analysis of this paper significantly indicates that the development of crypto assets has no material impact on central bank policy and that the urgency of issuing a Digital Rupiah in the near term remains low, it is essential to emphasize its strategic importance. The Digital Rupiah should be positioned as a forward-looking policy instrument to safeguard monetary sovereignty amid the accelerating pace of financial digitalization. In line with this perspective, the recommendations of this paper are as follows.

Law Enforcement and Inter-Agency Coordination

Effective law enforcement is a fundamental prerequisite for safeguarding the sovereignty of the rupiah, particularly through the reinforcement of regulations mandating its exclusive use as legal tender. Prohibiting the use of crypto assets as a payment instrument requires a clear and enforceable sanctions regime supported by robust supervisory mechanisms. The normative foundation for this enforcement lies in the legal stipulation that the rupiah is the sole legal means of payment (Law No. 7 of 2011). Consequently, any transaction conducted in crypto assets, whether directly or indirectly through mechanisms such as automatic conversion, constitutes a violation of the law.

Implementation of these provisions necessitates strong inter-agency coordination, particularly between Bank Indonesia, the Indonesian Financial Services Authority (OJK), which oversees the crypto ecosystem, and law enforcement authorities. A tiered sanctions architecture is recommended: administrative measures may include written warnings, corrective orders, and, where necessary, license suspension or revocation for payment service providers. Criminal sanctions should be applied selectively, targeting repeated, organized, or aggravated violations, especially those linked to other financial crimes.

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Development of the Digital Rupiah Securities Ledger

The Digital Rupiah Securities Ledger, built on distributed ledger technology (DLT), is designed as a rupiah-denominated digital platform for issuing, recording, validating, and settling digital securities transactions. This infrastructure offers solutions through atomic transaction settlement, end-to-end ISO 20022 implementation, and guaranteed finality supported by Service Level Agreements (SLAs) and fallback mechanisms. Empirical studies (Mills et al., 2017) demonstrate that DLT adoption significantly enhances settlement efficiency and mitigates operational risk.

The ledger employs an event-driven architecture enabling real-time monitoring of latency, throughput, liquidity utilization, and transaction failure rates. This approach aligns with the evolution of regulatory technology (RegTech), which leverages real-time data for risk monitoring and mitigation (Brunnermeier, James, & Landau, 2019). Furthermore, smart contract integration within the ledger facilitates the development of flexible financial products, thereby supporting financial market deepening and innovation.

Digital Rupiah to Support Cross-Border Payments

The Digital Rupiah can play a transformative role in strengthening Indonesia's position in cross-border payments, which currently face structural challenges such as high transaction costs, slow settlement times, lengthy correspondent banking chains, and limited transparency (BIS, 2020). By enabling direct settlement in rupiah, the Digital Rupiah reduces reliance on foreign currencies and minimizes costs associated with multiple conversions. This mechanism also mitigates Herstatt risk (Mourlon-Druol, 2015) and frequent settlement failures, which remain key obstacles in cross-border transactions.

Beyond operational benefits, the Digital Rupiah enhances trust among monetary authorities and improves liquidity certainty for banks and market participants operating across jurisdictions. Simultaneously, the adoption of internationally recognized standards and interoperable infrastructure fosters regional economic integration, expands the use of local currencies, and reduces dependency on foreign currencies in cross-border trade and financial flows.

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