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# MAC COIN ON BCHAIN MAC: A STABLE AND ISLAMIC COMPATIBLE CRYPTOCURRENCY MODEL

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**Abstract**

Cryptocurrency and blockchain technologies have revolutionized the banking industry by bringing efficiency and innovation. The intrinsic volatility, however, makes them incompatible with the tenets of Islamic finance, which place an emphasis on risk-sharing, stability, and moral investing. Using BCHAIN MAC, a private blockchain, secured by message authentication value (MAC), created to produce MAC Coin, a stablecoin linked to MAC Token, this study suggests an architecture uses automatic smart contracts and a seigniorage mechanism to keep the value of MAC Coin between 0.8$ and 1.2$. The study shows that by dynamically modifying supply and demand, smart contracts and transaction fees work together to sustain the coin. Increased transaction averages and less price swings are two important outcomes that correlate with higher stability. By providing a workable, Sharia-compliant method of incorporating digital currencies into Islamic financial institutions, this framework opens the way for morally sound and secure financial innovation.

**Keywords:** blockchain, Stablecoin, Islamic Law, User Fee, Smart Contract.

# عملة *MAC* على *BCHAIN MAC* : نموذج عملة مشفرة مستقر ومتوافق مع الشريعة الإسلامية

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**الخلاصة**

لقد أحدثت تقنيات العملات المشفرة وسلاسل الكتل ثورة في الصناعة المصرفية من خلال تحقيق الكفاءة والابتكار. ولكن التقلبات الجوهرية تجعلها غير متوافقة مع مبادئ التمويل الإسلامي، التي تركز على تقاسم المخاطر، والاستقرار، والاستثمار الأخلاقي. باستخدام BCHAIN MAC، وهي شبكة سلاسل كتل خاصة تم إنشاؤها لإنتاج MAC Coin، وهي عملة مستقرة مرتبطة بـ MAC Token، تقترح هذه الدراسة بنية تستخدم

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العقود الذكية التلقائية وآلية سك العملات للحفاظ على قيمة عملة MAC بين 0.8 دولار و1.2 دولار. وتظهر الدراسة أنه من خلال التعديل الديناميكي للعرض والطلب، تعمل العقود الذكية ورسوم المعاملات معًا للحفاظ على العملة. تعد زيادة متوسطات المعاملات وتقلبات الأسعار الأقل نتيجتين مهمتين ترتبطان بزيادة الاستقرار. ومن خلال توفير طريقة عملية ومتوافقة مع الشريعة الإسلامية لدمج العملات الرقمية في المؤسسات المالية الإسلامية، فإن هذا الإطار يمهد الطريق أمام الابتكار المالي السليم والآمن أخلاقيا.

## 1. Introduction

With the development of decentralized, reliable, and transparent interactions facilitated by blockchain systems and cryptocurrencies which launched with the release of Bitcoin in 2008, the financial industry has been completely transformed. By eliminating dependence on mediators and improving security of operation and efficiency, these technologies led to major improvements in the sector of electronic banking (Mohamed 2024) . However, there are issues with cryptocurrencies' conformity with Islamic financial principles due to their open, informal character and inherent volatility. As opposed to emphasizing the speculating characteristics of the highly unpredictable cryptocurrency markets, Islamic finance places an emphasis on stability, social investing, and risk-sharing (Muedini 2018). The typical cryptocurrency's high level of volatility likes Bitcoin reduces investment trust, risks financial stability, and most blockchain-based financial systems lack guidelines that align with accepted tracking regulations (Chowdhury and Razak 2019).

Considering stablecoins' value depends on real assets, fiat currency, or algorithms, they are a more reliable choice than regularly cryptocurrencies, since they are subject to sharp swings, were created in response to these problems (Mita, Ito et al. 2019). A higher level of confidentiality and oversight is provided by having the ability to dictate who can read and edit information, especially if paired with the private blockchain systems' restrictive environment (Bernabe, Canovas et al. 2019). In order to create MAC Coin, a stablecoin connected to MAC Token and stabilized by a seigniorage process, this paper proposes BCHAIN MAC as a private blockchain. It dynamically controls supply and demand to keep a steady value between $0.8 and $1.2 by utilizing user fees and automated smart contracts.

## 2. Related Works

The selected papers lay the groundwork for the development of Mac Coin within this framework by providing principles that lower volatility and address a few common cryptocurrency-related problems. In the paper "Exeum," Lee et al. offer an innovative approach to create reliable digital currencies based on real assets with the aim of bridge the gap among the physical and electronic economies. These digital assets serve as tools for trading by users on platforms for trading and represent a basis of USDE and other related assets. The mutual dependence of physical and digital assets, which remains intact by asset exchange rate monitoring and supervision, is crucial to the long-term sustainability of these systems (Lee and Cho 2018). Hrytsiuk et al. proved in their study how the Cauchy distribution captures returns for Bitcoin more accurately than the normal distribution. They developed additional methods of analysis to determine VaR (value-at-risk) using this statistical approach to evaluate risks that are associated with cryptocurrencies. Based to this approach, Bitcoin is a popular instrument to establish the best digital asset portfolios because of its relatively small risks and high returns, which reflect its great efficiency (Hrytsiuk, Babych et al. 2019). whereas, Dong et al.'s study presents Elasticoin, an innovative issuance procedure that links the value of issuance to processing time. This approach enables the supply of currency to be automatically altered based on computation efforts, achieving decentralization and reducing volatility in prices with no requiring for request observing or

the outside stabilizing agents. (Dong and Boutaba 2019). A market simulated proxy system for Bitcoin volatile prices was presented by Shibano et al. Results have demonstrated that, without altering the linear nature of the price related over time, putting into effect a price stabilization system lowers fluctuation by around 14 percent with a 3.5% slope adjustment. (Shibano, Lin et al. 2020).

## 3. Stablecoins and Sharia Respect

Since the release of Bitcoins in 2009, the distributed structure of cryptocurrencies—made feasible by blockchain technology technology has significantly altered the commercial sector. Its excessive amount of volatile markets, however, has limited its popularity as a reliable means of business communication (Mahmood and Al Dabagh 2023). By utilizing algorithms methods or connecting their value to more traditional assets like physical currency or materials, stablecoins have emerged as an innovative answer to the issue of cryptocurrency fluctuation, it is an appropriate choice for various kinds of commercial activities, including investments to daily purchases (Mita, Ito et al. 2019). Along with closely following the ethical and sound financial standards frequently highlighted in Islamic banking. By combining modern technologies like blockchain with established standards of ethics, sharia-compliant stablecoins are an important first move towards supporting financial creativity in the Islamic economy. This facilitates financial integration alongside fairer and growth in the economy (Valeri, Fondacaro et al. 2020).

## 4 BCHAIN MAC: Private Blockchain

MAC Coin is issued by BCHAIN MAC, a private blockchain. It is composed of three layers: the gateway layer receives users' transactions, authenticates them using their shared secret key as additional degree of protection by using Message Authentication Codes (MAC) after using the sender's public keys to confirm their digital signatures. Subsequently, when validator layer provides proposed blocks with associated MAC values, the validator layer processes the transactions with MAC values, verifying and adding them to the transaction pool. Lastly, master node layer offers votes, uses Proof of Importance (PoI) and MAC Byzantine Fault Tolerance (MAC BFT) to confirm and choose the final block.

## 5. MAC Coin: A Model for Stability

MAC Coin is a cryptocurrency associated with a token called (MAC Token). MAC Coin is stable (keeping the value consistent between 0.8$ to 1.2$) and dependable because it is carefully engineered to overcome the volatility concerns that are inherent in existing cryptocurrencies. An efficient system that mostly employs the seigniorage algorithms to supervise supply and reach stability.

By using an extra token for changing the amount of of the underpinning coin, the seigniorage algorithm maintains the purchasing power of the cryptocurrency. In order to regulate price within certain limits and guarantee predictability and consistency, new coins get produced when need is overwhelming and burnt when it is lower.

## 6. The Proposed Procedure

This section describes the procedures to make sure MAC Coin's stability, with the focus being on efficient methods for maintaining the coin's price between $0.8 and $1.2.

### 6.1 Mining/ Burning Mechanism

MAC Token acts as a balancing force to keep MAC Coin stable. A certain amount of MAC Coins mined and a comparable amount of MAC Tokens are burnt (e.g., mine xi coins and burnt xi tokens) whenever the market value passes \$1.20. The same amount of coins burned and an equal quantity of tokens are mined if the price drops below \$0.80. The purpose of this strategy is to keep the MAC Coin within an established price level.

### 6.2 Mechanisms

As shown in Figure 1, a dynamic approach has been adopted to keep the market value of MAC Coin stable, according to two tools: user fees and smart contracts. With per new block, transaction fees are collected, which based on customer behavior and encourages stability. In addition, smart contracts provide an autonomous layer that activates on every ten blocks to adjust the MAC Coin's supply due to market circumstances**.** Where user fees are applied with every new block creation, it contributes to price stability, and the system calculates the average_fees when each transaction value is determined to a 10 % as:

$$Average\_Fees = \frac{\sum(Transaction\_Fees)}{Len(Transaction-Fees)} \quad (1)$$

The amount value specifies how much coins or tokens should be destroyed or mined, in order to preserve stability as:

$$Amount\_Value = (Average\_Fees/\ Total\_Supply) \times Sender\_Amount \quad (2)$$

In the case of users' fees, if the current MAC Coin price 1.2 \$ to mine amount_value of MAC Coin to the wallet of the user that sends the current transaction and burn amount_value of MAC Token from him, otherwise mine amount_value of MAC Token and burn MAC Coin.

This computation incorporates the average_fees, which introduces a dynamic element that adapts to variations in user engagement and the mechanism ensures that the effect corresponds to the total_supply. , the sender_amount, acknowledges the significance of every individual transaction.

**Smart Contract**: once every ten blocks, when the price remains outside of the specified range, and after the stability is improved by applying user fees, it supports Mac Coin in order to bring it to stability. Where Calculation the amount_value and represents the distinct contribution of every user. If price exceeds 1.2 \$ then the value as :

$$Amount\_Value = ((Current_{Price} - 1.2) \times total\_supply)/Len(participants) \quad (3)$$

Otherwise, if MAC Coin price below 0.8 \$, the amount_value :

$$Amount\_Value = ((0.8 - Current_{Price}) \times total\_supply)/Len(participants) \quad (4)$$

In the case of smart contract, if MAC Coin price exceeds1.2 \$ lead to amount_value of MAC Coin to all users' holders and burn amount_value of MAC Token from them, mine amount_value of MAC Token and burn MAC Coin.

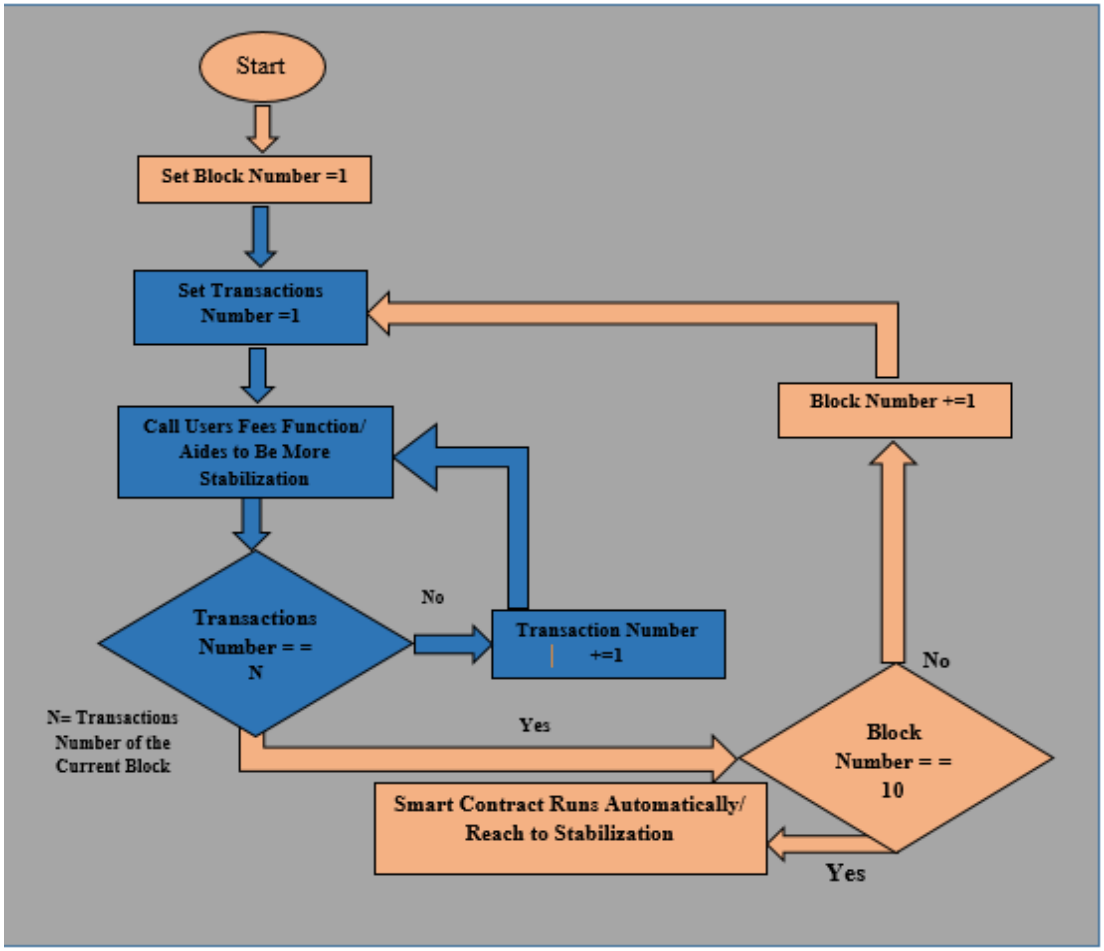


**Figure 1:** The Flowchart of MAC Coin Price Stabilization Procedures

### 6.3 Compiling MAC Coin Price Details and analyses

After adding 10 new blocks (n to n+9) to BCHAIN MAC, we gather data on the major price stability factors (block index, current coin price, the lowest and highest values, mean values, new coin price, price range, and token price) in Table 1.

Table 1 illustrates how the system burns coins and mines tokens through user fees due to the MAC Coin's initial price of $0.72, below the planned range. The fees caused the price of the currency to progressively rise with each new block added. This procedure showed how the scheme stabilizes the price gradually by producing tiny changes which over time volatility and the coin's value closer to the stable range. he last step toward achieving coin stability is the smart contract as in sync in the tenth block (n+9).

**Table 1:** Major MAC Coin Price Stability Factors

| Block Index | Current MAC Coin Price | Min Transaction Value | Max Transaction Value | Transactions Numbers | Transaction Mean | New MAC Coin Price | Prices Range | MAC Token Price |
|---|---|---|---|---|---|---|---|---|
| n | 0.72 $ | 34 | 99 | 10 | 67.45 | 0.7244 $ | 0.0044 | 0.8695 $ |
| n+1 | 0.7244 $ | 50 | 129 | 13 | 85 | 0.7343 $ | 0.0099 | 0.8685 $ |
| n+2 | 0.7343 $ | 59 | 126 | 10 | 91.4 | 0.7426 $ | 0.0083 | 0.8676 $ |
| n+3 | 0.7426 $ | 20 | 97 | 15 | 61.06 | 0.7482 $ | 0.0056 | 0.8671 $ |
| n+4 | 0.7482 $ | 39 | 98 | 18 | 69.7 | 0.7570 $ | 0.0088 | 0.8662 $ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| n+5 | 0.7570 $ | 54 | 98 | 11 | 75.5 | 0.7632 $ | 0.0062 | 0.8656 $ |
| n+6 | 0.7632 $ | 20 | 143 | 19 | 63.4 | 0.7709 $ | 0.0077 | 0.8648 $ |
| n+7 | 0.7709 $ | 29 | 80 | 10 | 52.09 | 0.7739 $ | 0.003 | 0.8645 $ |
| n+8 | 0.7739 $ | 6 | 54 | 13 | 21.5 | 0.7745 $ | 0.0006 | 0.8644 $ |
| n+9 | 0.7745 $ | 37 | 87 | 10 | 51.4 | 0.8 $ | 0.0255 | 0.8626 $ |

Users can swap one MAC Coin for one MAC Token, for example, if MAC Coin is selling for $1.205, they can do so anytime its price rises beyond the top limit of its stable range. The price difference that occurs between the market price and the upper of this range might be profitable for users. Alternatively, if the MAC Coin's price falls below the stable range. As an instance, users may trade $0.795 worth of MAC tokens for one MAC coins.

Upon examining the data in Table 1, new details on the factors influencing MAC Coin's stability were discovered, where an increase in volume of transactions is correlated with better stability for MAC Coin, the total number of transactions in each block appears to be an important component in enhancing stability. Where bigger transaction averages periods of better stability, suggesting that a focus on higher-value transactions fosters price stability. The price range, or the difference between the market coin value of each and recently formed, more stable price, has been shown to correlate with less volatility, which strengthens the idea of stability.

Table 2 provides a brief summary of both the benefits and disadvantages of smart contracts and fees in preserving MAC Coin stability, emphasizing how they may work in cooperation to achieve successful price stabilization.

**Table 2:** The distinctions and complementarity between price stability mechanisms of MAC Coin

| Factors | Smart Contract | Users Fees |
|---|---|---|
| **Automated Modifications** | carries out predetermined tasks automatically | in response to demand and real-time user |
| **Benefit** | consistent free from error by humans | dynamical reaction to the state of the market |
| **Restriction** | React to difficult market conditions is difficult | Changes the actions of users. |
| **Dependability** | Clear and unchangeable code | Depends on user behavior, unpredictable |
| **Effectiveness** | Rapid execution with little overhead | closely related to transaction volumes |
| **Market Influence** | Not immediately affected by changes in the market | Provides a feedback loop between stability and utilization. |

Figures 2 and 3 show how the price of MAC Coin has changed as well as the range's values as they progress through ten blocks toward stability.

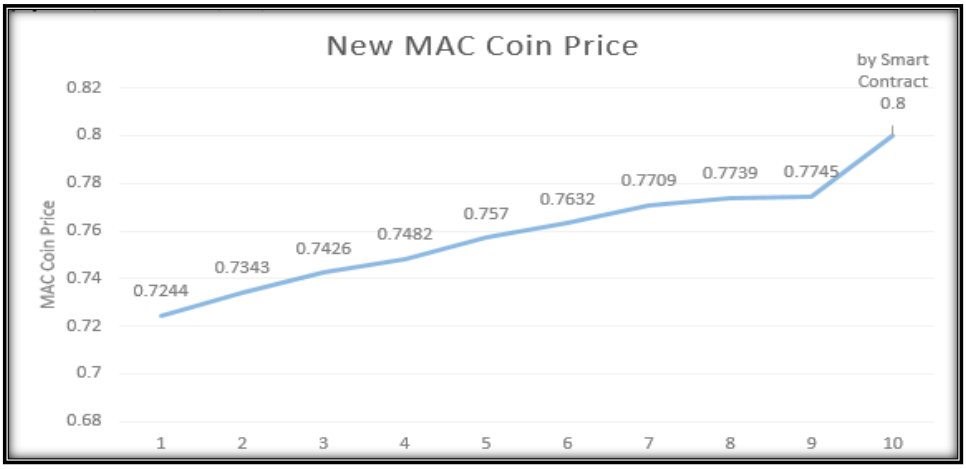


**Figure 2:** Prices of MAC Coins Over Ten Blocks


**Figure 3:** Range Values of MAC Coins Prices Over Ten Blocks

Regarding the MAC coin, Table 3 shows how price leads to stability in the range compared to other stablecoin kinds around a single point.

**Table 3:** Price Stability procedures, MAC Coin Vs other Stablecoin Kinds

| Aspect | MAC Coin (range) | Other (Single Point) |
|---|---|---|
| **Stability** | 0.8$ -1.2$ | 1$ |
| **Efficiency** | Increased | Simple |
| **Manipulation** | Reduction of price manipulation | Vulnerable |
| **Confidence** | user confidence | predictability |
| **Flexibility** | Increased | Decrease |
| **Complexity** | Increased | Simple |

### 6.4 Verification of MAC Coin's Islamic Compliance

This section examines some of the fundamental characteristics of cryptocurrencies and the trading environment that frequently renders them unsuitable with Islamic law. We also look at how MAC Coin helps lessen the effects of these problems.

The anonymity of public blockchains makes it unattainable to identify locate and return stolen assets, which falls counter to Islamic Sharia's goal of accessibility and possession protection (Saleh, Ibrahim et al. 2020). On the other hand, MAC Coin's private blockchain,

verified nodes, and compliance procedures guarantee legal and transparent transactions that conform to Sharia law. A good place for MAC Coin would be in closed establishments like colleges or banks.

Due to their unpredictable nature and speculation dangers, highly volatile cryptocurrencies such Bitcoin are considered unsuitable for Islamic banking standards (Siswantoro, Handika et al. 2020). By using algorithmic supply changes to keep prices stable within a certain range, MAC Coin lowers the danger of fluctuations in prices and adheres to Sharia principles of stability and justice.

Partners in Musharakah share both gains and losses, representing the concepts of shared ownership and risk sharing. (Sabana and Amaliya 2024). , MAC Coin focuses on maintaining its value by implementing this concept through user fees and smart contracts. By mining and burning of coins and tokens, the cooperative risk sharing and equitable return distribution principles of Musharakah, enabling a transparent and equal allocation of stability related costs and gains among members.

There are no protocols in Bitcoin that allow participants to equitably share risk (Rehman, Asghar et al. 2020). While the MAC Coin smart contracts emphasize stability and conform to and transparency by ensuring an equal distribution of tokens and coins among all holders
Because of its extreme volatility and lack of actual underlying assets, Bitcoin is sometimes compared to gharar (namely uncertainty in transactions) or speculation (Gaol, Morales et al. 2022). The purposeful smallness of MAC Coin's user fees is to avoid major market influence and volatility. These little fees in line with the tenets of Islamic law, MAC Coin keeps fees low in order to deter speculative activity and prevent significant market swings. Where Table 4 presents a comparative analysis of the compatibility with Islamic law for MAC Coin with Bitcoin (Rehman, Asghar et al. 2020) and various stablecoins (Mita, Ito et al. 2019).

**Table 4**: compliance with Islamic Law, MAC Coin Vs Bitcoin and other Stablecoins

| Aspect | MAC Coin | Other Stablecoins | Bitcoin |
|---|---|---|---|
| **Volatility** | Low by smart contract and user fees. | Low by fiats or assets. | High with price fluctuations. |
| **Governance** | Transparent and involved governance. | Different, some decentralized, others centralized. | Less transparent and decentralized. |
| **Speculation** | Low by fees | Low, depends on assets or fiats. | High with price fluctuations. |
| **Fair Distribution** | High by smart contract | Varies, it's not always fair. | Rewards to group of big miners |
| **Asset Backed** | By algorithmic procedure, exchange with MAC Token | by assets or fiat | Without backing, due to the speculation. |
| **Price Range** | 0.8 $ to 1.2 $ | 1 $ | Volatile price |

## 7. Conclusion and Future Works

This paper presents MAC Coin, an algorithmic stablecoin based on seigniorage mechanism, the MAC Token that is connected to. It clarifies how the special reliance of MAC Coin on user fees and smart contracts, which dynamically control the coin's supply to maintain a constant value, it to achieve stability. The paper also provides investigation to MAC Coin's efforts to adhere to Sharia characteristics, promoting truthfulness, fairness, and ethical behavior in financial dealings. These advantages make MAC Coin a desirable choice for adoption in the Islamic financial industry. Future works will involve deploying MAC Coin into practice in Islamic financial organizations to evaluate its practical efficacy and investigating potential improvements to its stablecoin processes that are especially suited to the Islamic finance environment.

**References**


**[1]** A.-M. Mohamed, "The effect of the internal control system in reducing the risks of blockchain technology: Exploratory study of a sample of academics and professionals," *Tanmiyat Al-Rafidain*, vol. 43, no. 141, pp. 312–335, 2024.

**[2]** F. Muedini, "The compatibility of cryptocurrencies and Islamic finance," *Eur. J. Islamic Finance*, no. 10, 2018.

**[3]** M. A. M. Chowdhury and D. B. A. Razak, "Dynamism and mechanism of digital currency (cryptocurrency) towards Islamic finance," *Eur. J. Islamic Finance*, no. 14, 2019.

**[4]** M. Mita, K. Ito, S. Ohsawa, and H. Tanaka, "What is stablecoin?: A survey on price stabilization mechanisms for decentralized payment systems," in *Proc. 8th Int. Congr. Adv. Appl. Informatics (IIAI-AAI)*, 2019, pp. 60–66.

**[5]** J. B. Bernabe, J. L. Canovas, J. L. Hernandez-Ramos, R. T. Moreno, and A. Skarmeta, "Privacy-preserving solutions for blockchain: Review and challenges," *IEEE Access*, vol. 7, pp. 164908–164940, 2019.

**[6]** K. Shibano, R. Lin, and G. Mogi, "Volatility reducing effect by introducing a price stabilization agent on cryptocurrencies trading," in *Proc. 2nd Int. Conf. Blockchain Technol.*, 2020, pp. 85–89.

**[7]** Y. Dong and R. Boutaba, "Elasticoin: Low-volatility cryptocurrency with proofs of sequential work," in *Proc. IEEE Int. Conf. Blockchain Cryptocurr. (ICBC)*, 2019, pp. 205–209.

**[8]** J. Lee and M. Cho, "Exeum: A decentralized financial platform for price-stable cryptocurrencies," *arXiv preprint*, arXiv:1808.03482, 2018.

**[9]** P. Hrytsiuk, T. Babych, and L. Bachyshyna, "Cryptocurrency portfolio optimization using Value-at-Risk measure," in *Proc. 6th Int. Conf. Strategies, Models Technol. Econ. Syst. Manage. (SMTESM)*, 2019, pp. 385–389.

**[10]** M. S. Mahmood and N. B. Al Dabagh, "Blockchain technology and internet of things: Review, challenge and security concern," *Int. J. Electr. Comput. Eng.*, vol. 13, no. 1, p. 718, 2023.

**[11]** M. Valeri, R. Fondacaro, C. De Angelis, and A. Barella, "The use of cryptocurrencies for hawala in the Islamic finance," *Eur. J. Islamic Finance*, 2020.

**[12]** P. Yunita, "The evolution of money to cryptocurrency: Are they eligible to be Islamic digital money," *J. Middle East Islamic Stud.*, vol. 9, no. 1, p. 7.

**[13]** L. Zhekova, "Stablecoins classification and assessment of risks," in *Econ. Social Dev.: Book Proc.*, 2022, pp. 119–128.

**[14]** A. Saleh, A. A. Ibrahim, M. F. Noordin, and H. M. Mohadis, "Islamic approach toward purification of transaction with cryptocurrency," *J. Theor. Appl. Inf. Technol.*, vol. 98, no. 6, pp. 1050–1067, 2020.

**[15]** D. Siswantoro, R. Handika, and A. F. Mita, "The requirements of cryptocurrency for money, an Islamic view," *Heliyon*, vol. 6, no. 1, 2020.

**[16]** M. A. Sabana and I. Amaliya, "Understanding accounting and Sharia views on Bitcoin cryptocurrency as a digital-based financial instrument," *Kajian Akuntansi*, vol. 25, no. 1, pp. 56–66, 2024.

**[17]** M. U. Rehman, N. Asghar, and S. H. Kang, "Do Islamic indices provide diversification to Bitcoin? A time-varying copulas and value at risk application," *Pacific-Basin Finance J.*, vol. 61, p. 101326, 2020.

**[18]** C. P. L. Gaol, U. Morales, and V. Lopez, "Juridical review concerning the legitimacy of cryptocurrency in Islamic law," *At-Tasyrih: J. Pendidik. Hukum Islam*, vol. 8, no. 2, pp. 115–125, 2022.