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## Measuring Bitcoin Literacy in Indonesia\*

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### Abstract

The purpose of this research is to discuss the concept of measuring cryptocurrency literacy, especially Bitcoin. This research uses a qualitative approach. The data source comes from a literature review on cryptocurrency and opinions from Bitcoin academics, traders, and investors. Data collection was conducted through desk evaluations and interviews to determine what attributes should be considered for assessing Bitcoin literacy. The results of a literature review reinforced by discussion show that eight attributes can be used to assess basic level Bitcoin literacy, namely Bitcoin supply, regulatory guarantees, transaction recording, the role of third parties, treatment of transfer transactions, initial coin offerings, the smallest Bitcoin unit, and conversion with another currency. These eight attributes can be used to measure Bitcoin literacy through various questions with the choice of *true*, *false*, and *do not know* answers. This research is essential because there is no method to measure Bitcoin literacy. This research can be a measuring tool that becomes a reference or standard in assessing or measuring Bitcoin literacy. This study's results provide benefits to the development of science in the form of a tool that can be used to assess Bitcoin literacy and become a standard in assessing a person's level of understanding of Bitcoin.

**Keywords:** Bitcoin, Bitcoin Literacy, Financial Literacy, Cryptocurrency

**JEL Classification Code:** G53, O16, O33

### 1. Introduction

Financial literacy is the ability to understand and effectively use various financial skills, including personal financial management, budgeting, and investing. Over the last two decades the need for a financially literate population in both developed and developing countries has grown in importance. Hence it is imperative that individuals possess both the financial knowledge and capability to make sound financial decisions. According to Xu and Zia (2012),

improving literacy measurement methods is one step to solve financial literacy problems. Improving how to measure financial literacy will make financial literacy measurement tools more reliable.

Research on financial literacy measurement is essential (Marcolin & Abraham, 2006) because it does not have uniform definitions. Until recently, there have been many definitions of financial literacy (Huston, 2010). Besides, there is not much research that examines financial literacy measures.

The need for the measurement tools of Islamic finance is a major issue because the conventional measurement of financial literacy using conventional financial knowledge is not appropriate when it is used to measure Islamic financial literacy. The absence of a measuring tool of Islamic financial literacy is an important issue because financial literacy has a positive influence on decisions and financial behavior (Hidajat & Hamdani, 2017). Knowledge of cryptocurrency is essential because of the increasingly complex development of cryptocurrencies.

For example, using microdata from 15 countries, Panos & Karkkainen (2019) examined financial literacy and attitudes towards cryptocurrencies. The financially literate are also more likely to be aware of cryptocurrencies, and more likely to report that they do not intend to own them.

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We confirm the external validity of our financial literacy proxy and findings using data from a second novel survey of retail investors in 3 Asian countries. More financially literate retail investors are more likely not to have held any cryptocurrencies

The attention to cryptocurrencies, especially Bitcoin, has increased rapidly since Satoshi Nakamoto created this virtual currency in 2008. Bitcoin is a digital currency created in January 2009 following the housing market crash. Bitcoin offers the promise of lower transaction fees than traditional online payment mechanisms and is operated by a decentralized authority, unlike government-issued by currencies. The subprime mortgage crisis has made people increasingly pessimistic about traditional finance, and Bitcoin has become more popular.

The basic idea of bitcoin is the same as other currencies, namely as a means of payment. In his paper, Nakamoto (2008) stated that Bitcoin uses peer-to-peer technology to operate with no central authority or banks; managing transactions and the issuing of bitcoins is carried out collectively by the network. Bitcoin is open-source; its design is public, nobody owns or controls Bitcoin and everyone can take part. Through many of its unique properties, Bitcoin allows exciting uses that could not be covered by any previous payment system. Bitcoin is a digital asset that is traded with almost all currencies in the world. Although it is not correlated with traditional assets, trading and futures contracts on unregulated exchanges have even become a reference for Bitcoin prices on regulated exchanges (Alexander & Heck, 2020). At the time of the COVID-19 pandemic, the volatility of Bitcoin even increased significantly (Liu & Lee, 2020).

Eleftheria and Nikiforos (2019) investigated the short- and long-run dynamic linkages between selected cryptocurrencies, several major world currencies and major equity indices. The results showed that despite sharing some common characteristics, the cryptocurrencies do not reveal any short- and long-term stochastic trends with exchange rates and/or equity returns. If Bitcoin is a currency, it should theoretically be correlated with a fiat currency. Fiat money is a government-issued currency that isn't backed by a commodity such as gold. Fiat money gives central banks greater control over the economy because they can control how much money is printed. If used as an investment, it should associate with other assets such as bonds, stocks, and commodities. However, Jalal et al. (2020) found that Bitcoin can be used for risk diversification and money making. According to Lee et al. (2018), the potential use of cryptocurrencies in a retail environment proposes a rapid shift from the traditional financial system. However, the use of Bitcoin is in the real world is still sparse. Despite the growing attention and

purported benefits, it is doubtful whether the Bitcoin will be eagerly accepted by ordinary consumers. The attitude towards Bitcoin may vary depending on whether the fin-tech product is viewed as an asset or as a currency. Based on the arguments, they proposed that asset attitude and currency attitude will influence consumers' intention to adopt Bitcoin in the mainstream market.

There are irrational behaviours such as herding, optimism, overconfidence, confirmation bias, loss aversion and gamblers' fallacy in Bitcoin transactions (Hidajat, 2019). In Bitcoin transactions that are fraught with risk, transactions occur by imitating or following someone else. Using a rolling-window analysis, Liu (2018) showed that there is significant herding in Bitcoin transactions. Several other studies from Ajaz and Kumar (2018), Vidal-Tomás et al. (2018), Bouri et al. (2018), and Poyser (2018) also showed that Bitcoin prices are driven by herding.

Optimism arises when one sees that many people benefit from the increase in the price of Bitcoin. Caferra (2020) investigated the relationship between news-driven sentiments and the convergence of behavior in cryptocurrencies market. It was found that the rises and falls of optimism shape returns variability. Indeed, the paper evidence how an increase of news positivity is associated with a lower returns dispersion, evidencing the convergence of beliefs among investors. They are optimistic that they can experience the same thing, which is to make a profit. This advantage makes traders have overconfidence, namely a feeling of having the ability and knowledge to beat the market. This condition is not surprising because risky activities are preferred by those who are overconfident (Weber & Camerer, 1998; Xia et al., 2014).

Confirmation bias is our tendency to search for and favor all information that confirms our beliefs while ignoring or devaluing information that contradicts our beliefs (Pompian, 2006). The decline in Bitcoin price is considered only temporary and will reverse upward. They will only seek information that supports their opinion. According to Duong et al. (2014), stock investors have confirmation bias in response to good and bad news.

Loss aversion occurs when a losing trader is holding Bitcoin. Loss aversion is the tendency to prefer avoiding losses to acquiring equivalent gains (Rau, 2014). As explained in Prospect Theory, is a behavioral model that shows how people decide between alternatives that involve risk and uncertainty (percentage likelihood of gains or losses). It demonstrates that people think in terms of expected utility relative to a reference point (current wealth) rather than absolute outcomes. Shefrin & Statman (1985) proved that most people will immediately sell assets that have just made a profit but hold assets that are losing money.

Gambler's Fallacy occurs when an individual erroneously believes that a certain random event is less likely or more likely, given a previous event or a series of events. Gamblers' fallacy in Bitcoin transactions occurs when the price continues to fall; traders expect a price reversal, but the price continues to fall. Many traders fall into the clutches of this fallacy. Many traders tend to increase their position size after a losing streak because they feel their luck has to turn around soon but the reality is they're just increasing their risk on a trade that has the same probability of success of all the ones they just lost money on. The market does not know or care if your last few trades were losers or winners.

Behavioural biases are irrational beliefs or behaviours that can unconsciously influence our decision-making process. Behavioural bias and inadequate knowledge of financial activities such as Bitcoin transactions are risky. Without being based on the adequate experience of cryptocurrencies and behavioural bias, a person will quickly become a 'victim' in the financial market. So, the increasingly complex financial world, especially with cryptocurrency, requires everyone to have adequate knowledge about cryptocurrency. Lack of knowledge and unpreparedness to manage economic activities can make everyone, especially the younger generation, target crime and financial fraud. PricewaterhouseCoopers (2015) showed that 83% of respondents are unfamiliar with cryptocurrencies. Bitcoin is also a place for money laundering (van Wegberg et al., 2018) and other illegal activities (Yelowitz & Wilson, 2015).

To anticipate problems caused by cryptocurrency developments, several parties have stated the importance of cryptocurrency literacy. The Ministry of Finance in Russia has proposed that cryptocurrency is included in a strategy to increase the population's financial literacy from 2017 to 2023.

This paper discusses a cryptocurrency literacy measurement tool, especially Bitcoin, based on the importance of knowledge and understanding of cryptocurrencies. A Bitcoin literacy measurement tool is essential because it can measure a person's level of knowledge of cryptocurrencies. Research on Bitcoin literacy has been conducted among others by Bannier et al. (2019) and Henry et al. (2019), but both do not specifically discuss the attributes to measure literacy.

The purpose of this paper is to produce a concept used to measure Bitcoin literacy. This study is essential since there is no method to measure Bitcoin literacy. Most of the cryptocurrencies research focuses on regulation, bubble, diversification, efficiency, cyber criminality, underlying technology and economic incentive structures (Hidajat, 2019). The advantage of this research is that it produces novelty in financial literacy, namely the Bitcoin literacy measurement tool.

## 2. Research Method

This research uses a qualitative approach. Sources of data come from literature reviews and opinions from academics, traders and investors regarding Bitcoin cryptocurrency measurement. Data collection was carried out through interviews to get input about what attributes to use to assess Bitcoin literacy.

The results of the interviews were then discussed in a focus group discussion (FGD). A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative research where questions are asked about their perceptions attitudes, beliefs, opinion or ideas. The results of the FGD are an agreed attribute to measure Bitcoin literacy for a basic level.

## 3. Results and Discussion

### 3.1. Measurement Concept

From the results of interviews with resource persons and a review of the literature, several attributes can be used to measure Bitcoin literacy, namely (i) Bitcoin supply, (ii) regulatory guarantees, (iii) recording transactions, (iv) the role of third parties in transactions, (v) treatment of transfers, (vi) initial coin offerings, (vii) the smallest unit of Bitcoin, and (viii) conversion to other currencies.

The attributes i, ii and iii are the same as those used by the Bank of Canada in Bitcoin surveys; the iv and v attributes are the same as those used by Bannier et al. (2019) and other attributes are the attributes developed from this study.

#### i. Bitcoin Supply.

The Bitcoin supply is fixed. One of the main features of Bitcoin is that it is limited to 21 million, which is much rarer than gold. Supply is regulated by software and algorithms, not by political or governmental forces. The use of technology and limiting the quantity produced can create a balance (Dwyer, 2015).

If this distribution is done in the wrong way, it will cause problems. If Bitcoin circulates too fast, there will be a surplus, and its value will fall. For this reason, Satoshi Nakamoto made a rule that every four years (210,000 blocks), the amount is halved from 12.5 BTC to 6.25 BTC (halving). Once mining meets these limits, no more Bitcoins will be issued by 2140.

Why the number of Bitcoin is only limited to 21 million units is still a mystery. Some explain this because the global M1 money supply at the time Bitcoin was created was roughly \$21 trillion. Each dollar can be divided into 100 cents, bringing the total amount of money available to about 2.100 trillion.

## ii. Regulatory guarantee.

Bitcoin is not guaranteed by the government. Nobody can control Bitcoin, including the government of a country. Bitcoin is controlled by all its users worldwide and can only work by full consensus among all users.

The more widespread adoption of Bitcoin will depend on user trust as a medium of exchange and a stable value. However, hackers, bad actors, and black markets undermine this trust, so regulation is needed to protect users from malicious actions (Tsukerman, 2015).

## iii. Recording transactions.

Bitcoin transactions are recorded on a public ledger. Bitcoin uses blockchain technology, where transactions are recorded in a ledger digitally and are not managed by any particular party. The notes in the ledger are disseminated to the public and maintained by millions of computers connected so that everyone can be aware of every transaction. This record contains all transactions that have ever been processed. Although Bitcoin can be owned without requiring the owner's identity, this digital currency is not entirely anonymous. The owner's identity can be traced easily in every transaction recorded on the Blockchain. The blockchain technology that sparks cryptocurrency has received attention in recent years. This technology can develop, encourage innovation and increase efficiency (Hughes et al., 2019). Cryptocurrencies are getting attention regarding technology security, low transaction fees and high returns on investment (Fauzi et al., 2020).

## iv. The role of the third party.

In Bitcoin, there is no central repository. Bitcoin is stored in a bitcoin wallet in the form of a bitcoin address and can be transferred anywhere without a third party's role. Bitcoin has a decentralized nature. Neither party is an intermediary because transactions are conducted peer-to-peer (Dwyer, 2015).

## v. Treatment of transfers.

Bitcoin owners can send and receive bitcoins. When the transfer has been made, the transaction cannot be cancelled but can be returned. Bitcoin wallets store a piece of confidential data called a private key (seed), which is used to sign transactions and is a proof that the transaction originated from the wallet owner. The authenticity of each transaction is protected by a digital signature so that all users have full control over sending Bitcoins from their wallet (Bamert et al., 2014).

## vi. Initial coin offerings (ICO)

As the initial public offering (IPO) of shares, Bitcoin also recognizes the public offering, namely

the ICO. An ICO is an offer to potential investors to buy a portion of the total coin supply before the mining process begins. ICOs are blockchain technology-based smart contracts designed for entrepreneurs to get external funds by issuing tokens without intermediaries (Momtaz, 2020). According to Domingo et al. (2020), sentiment on social networks affects ICO returns.

## vii. The smallest unit of Bitcoin.

Satoshi is the smallest Bitcoin unit recorded on the Bitcoin Blockchain network. The value of 1 Satoshi is a millionth of a million of 1 Bitcoin (0.00000001 BTC). There are 100 million satoshis in every Bitcoin. There are only 2.100 trillion satoshis, an amount roughly the same as the global supply of 2009. It is why Bitcoin is considered suitable to replace all fiat currencies and become a global currency.

## viii. Conversion to another currency.

Just like currency exchange, Bitcoin can also be exchanged into other currencies and cryptocurrencies. In cryptocurrency exchange trading, there is a bid and offer side of Bitcoin to other cryptocurrencies. Traders can buy and sell Bitcoin in a specific currency. Bitcoin can also be used as a means of payment. The use of Bitcoin as a means of payment first occurred on May 22, 2010. At that time, Laszlo Hanyecz exchanged two slices of Papa John's pizza for 10,000 Bitcoin, which was valued at 41 US dollars. At that time Bitcoin value was \$0.0025 per coin.

According to Kim (2017), Bitcoin transaction fees are lower than the retail foreign exchange market due to the simpler Bitcoin infrastructure. The average bid-ask spread is 2% narrower than the retail foreign exchange market.

## 3.2. Development of Attributes in Question

According to Salehudin (2010), there are two ways to measure literacy in the context of behaviour, namely based on perceived literacy) and the use of tests (actual literacy). Perceived literacy uses self-evaluation that measures literacy levels based on subjective assessments of themselves. Actual literacy measures the level of literacy based on an objective evaluation through the evaluation of test results.

In this paper, Bitcoin literacy is measured using actual literacy test of the attributes obtained from interviews and literature study. Questions with *True/False* answers and *Don't know* are used to give scores regarding cryptocurrency literacy. The score for the correct answer is 1 (one) while for *False* and *Don't know* is 0 (zero). Of course, questions can be varied with TRUE (T) and FALSE (F) answers.



**Table 1:** Attributes Development Results and Research Questions

Questions	Questions for Bitcoin Literacy (TRUE answer)	Reference
Q1	The Bitcoin supply is fixed.	Henry et al. (2019) Bannier et al. (2019)
Q2	The government does not guarantee Bitcoin.	Henry et al. (2019) Bannier et al. (2019)
Q3	Bitcoin transactions are recorded on a public ledger.	Henry et al. (2019) Bannier et al. (2019)
Q4	Bitcoin transactions do not require the role of a third party.	Bannier et al. (2019)
Q5	Transfer transactions cannot be changed.	Bannier et al. (2019)
Q6	Initial coin offerings (ICO) are offers to potential investors to buy a portion of the total supply of coins before the mining process begins.	Proposed from this research.
Q7	Satoshi is the smallest Bitcoin unit recorded on the Bitcoin Blockchain network.	Proposed from this research.
Q8	Bitcoin can be converted to and from other currencies.	Proposed from this research.

## 4. Conclusions

This study notes that Bitcoin literacy can be measured using the attributes of Bitcoin supply, regulatory guarantees, transaction recording, the role of third parties, treatment of transfer transactions, initial coin offerings, the smallest Bitcoin unit, and conversion to other currencies. These attributes are used to measure the level of Bitcoin literacy through questions with *True* and *False (Don't know)* answers. *True (False/Don't know)* answers which are assigned a value of 1 (0). The maximum (minimum) score is 8 (0).

This study is still in the stage of building attributes to measure Bitcoin literacy at a basic level. Bitcoin and cryptocurrency, which are very complex, are certainly not sufficiently assessed by these eight attributes. Further research can redevelop existing attributes to produce advanced literacy.

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