



The Economic and Regulatory Challenges of Decentralized Digital Money: An Analytical Study of Bitcoin

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abstract

This research paper aims to shed light on the economic and legal reality of electronic and virtual money and the most significant problems facing their adoption. The study concludes that virtual currencies are conceptually distinct from electronic money, and that despite the capacity of virtual currencies to perform the classical functions of money, they continue to suffer from pivotal unresolved issues such as legal recognition and legitimacy, and repeated incidents of theft and fraud. Consequently, economic and technical research on this type of money needs to be intensified in order to identify the principal obstacles to, and requirements for, its adoption.

1. Introduction

Technological innovation has fundamentally transformed contemporary society, initiating a structural technical revolution across economic, legal, social, and cultural dimensions. Toward the close of the twentieth century, this progress precipitated significant financial developments, most notably electronic commerce and digital payment mechanisms. Subsequent advancements led to the proliferation of electronic and virtual currencies, epitomized by decentralized assets such as Bitcoin. Operating independently of central banking authorities, monetary policy, and regulatory oversight, these currencies facilitate multi-million-dollar transaction volumes globally. As cross-border internet connectivity deepens, virtual money represents a prospective paradigm shift in the evolution of exchange media, raising the possibility of long-term substitution for sovereign, legal-tender fiat currencies. Consequently, this emerging financial architecture presents critical economic, monetary, and regulatory challenges.

"In light of the rapid expansion of decentralized digital assets, state authorities face a dual

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regulatory challenge: balancing the institutionalization and legal integration of virtual currency mining with the mitigation of its attendant economic, technical, and regulatory risks. Accordingly, this study addresses the following central research question: To what extent can sovereign states establish comprehensive regulatory and legal frameworks for virtual currency mining while effectively counteracting the macro-economic and technical vulnerabilities associated with its operational proliferation?"

To address the central inquiry, this study investigates the following specific sub-questions:

- Conceptual Differentiation: What are the fundamental theoretical, structural, and regulatory distinctions between institutional electronic money (e-money) and decentralized virtual currencies?
- Institutional and Operational Barriers: What systemic, technological, and regulatory challenges hinder the widespread adoption and integration of virtual currencies within formal financial systems?
- Macroeconomic and Developmental Impacts: What are the empirical effects of transitioning toward electronic and virtual payment mechanisms on monetary policy transmission, financial inclusion, and sustainable economic growth?
- Prerequisites for Implementation: What foundational institutional, legal, and technological frameworks are required to support the secure deployment and regulation of digital currencies?

In light of this problem, the subject is examined across three main axes:

- The theoretical framework of electronic money.
- The theoretical framework of virtual money.
- The economic and legal reality of virtual currencies in light of the problems they face and the available means of protection (Bitcoin as a model).

2. Methodology

This study adopts a descriptive-analytical qualitative methodology appropriate to a conceptual and legal-economic review of an emerging financial phenomenon. The approach proceeds in three complementary stages. First, a descriptive stage in which the concepts of electronic money and virtual money are defined and delineated by drawing on the specialized Arabic and international economic and legal literature, including academic references, peer-reviewed journal articles, conference proceedings, and reports of international financial institutions such as the International Monetary Fund. Second, an analytical-comparative stage in which the characteristics, advantages and disadvantages of both forms of money are examined and contrasted, and the major cryptocurrencies competing with Bitcoin are classified and compared according to their technical and functional attributes. Third, a case-study stage focused on Bitcoin as the most prominent and widely traded virtual currency, used to illustrate, empirically and historically, the economic effects (price volatility, monetary-policy implications, inflation/deflation dynamics) and the legal responses of a purposively selected sample of states that have permitted, restricted, or prohibited the use of virtual currencies. Data were collected through documentary analysis of secondary sources — books, university theses, specialized journal articles and international reports — published mainly between 2014 and 2019, and were synthesized thematically around the paper's three axes in order to test the hypotheses and answer the research questions stated above. As a literature-based qualitative study, the paper does not employ primary quantitative data collection or statistical inference; its conclusions are accordingly analytical and interpretive rather than statistically generalizable.

3. The Theoretical Framework of Electronic Money

The idea of moving toward a cashless society free of physical money is no longer a mere fantasy. Many countries around the world are already moving in this direction, supported by governments and major financial-services companies. In a cashless society, paper currency and coins are not used; reliance is instead placed entirely on electronic payments such as credit cards, debit cards, electronic-payment applications like PayPal, mobile-payment services, and mobile wallets such as Apple Pay, among others.

3.1. *Concept and Origin of Electronic Money*

Electronic money is also considered one of the electronic means of payment that facilitate e-commerce transactions and support their growth and development. Some scholars define it as the payment or transfer of deposits entered and processed electronically within electronic banking systems (Mounir, 2017, p. 253).

The term electronic money (e-money) covers a diverse range of products designed to provide consumers with alternatives to traditional payment methods, reflecting the diversity of these products and their continuous evolution. Some scholars define it as the electronic representation of traditional money, with the unit of electronic money commonly referred to as digital or electronic currency; electronic currencies are generated through intermediaries/brokers, so that a customer wishing to purchase digital currency contacts a broker, requests a limited quantity of the currency, and pays actual cash in return (Bouafia, 2014, p. 112).

The International Monetary Fund defines it as “monetary value in the form of a claim on the issuer that is stored in electronic form, or in an electronic memory, for the benefit of the consumer” (Bouafia, 2014, p. 113).

In practice, electronic money can be defined as monetary value stored on a prepaid electronic device, not linked to a bank account, that enjoys wide acceptance by parties other than the issuer, and that is used as a payment instrument to achieve various purposes (Al-Shafi'i, n.d., p. 134).

Accordingly, electronic money is the new form of currency, or more precisely, the electronic substitute for paper and metal currency of a physical nature (Bouafia, 2014, p. 113).

Based on the foregoing, electronic money can be defined as a monetary value denominated in a specific currency, issued in the form of electronic data stored on a smart card or a hard disk, such that its holder is able to transfer ownership of it to whomever they choose without the intervention of a third party.

a. *Origin of Electronic Money*

Some trace its origin back to 1860, when a sum of money was transferred by telegraph, while others trace the origin of electronic money to the invention of cryptography. Although money-transfer services began in the United States in 1918, when the Federal Reserve banks began transferring money by telegraph, the widespread use of electronic money did not begin until 1972, with the establishment of the Automated Clearing House, which supplied the United States Treasury and commercial banks with an electronic alternative to issuing checks. In 1974 the Frenchman Roland Moreno further developed this invention by expanding the uses of the electronic card. The United States was among the first countries to adopt electronic money, while Japan adopted it in 1995 (Al-Shafi'i, n.d., pp. 146–147).

3.2. *Characteristics and Importance of Electronic Money*

a. *Characteristics of Electronic Money*

The characteristics of electronic money can be summarized as follows (Al-Shafi'i, n.d., p. 140):

- It is a monetary value stored electronically, placed in electronic media such as plastic cards or on computer memory.
- It is bilateral in nature: it is transferred directly from the consumer to the merchant without the need for a third party, such as the issuer, to intervene.
- It is not homogeneous: this money differs in value and in the number of goods and services that can be purchased with it.
- It is easy to carry, owing to its light weight and small size, making it more practical than ordinary cash.
- There is a significant risk of human and technological error, although it is expected that problems arising from the use of electronic money will diminish over time as its use becomes more widespread and familiar.
- It is considered private money, since in most countries it is issued by private companies or credit institutions, which is why it is referred to as “private money.”

b. *Importance of Electronic Money*

The importance of electronic money can be summarized as follows:

- For consumers: it serves as a means of payment for goods and services, freeing consumers from carrying physical cash. It also speeds up transactions, provides considerable privacy and freedom to its users, and helps consumers manage their budgets by limiting spending to the amount stored on the electronic card.
- For sellers and merchants: it saves them time and money through the speed and ease of concluding transactions; it is a more secure payment method than checks; it helps avoid the problems of counterfeiting and forging ordinary currency; it opens new markets; and it facilitates the collection of data on the market and on consumer preferences.
- For issuers: issuers of electronic money can reduce the costs associated with circulating ordinary cash and combat fraud and deception. Their profit derives from the margin between the actual value of the cards sold and the monetary value stored on them, and naturally their profits increase as the number of cards sold multiplies.

3.3. *Advantages and Disadvantages of Electronic Money*

a. *Advantages*

As shown above, electronic money is a new form of currency, and its difference from traditional money as an electronic means of payment confers on it a number of advantages (Al-Mousawi & Al-Shammari, 2014, pp. 286–287):

- Low circulation cost: transferring electronic money over the Internet is far cheaper than using traditional banking systems; according to some studies, the cost of electronic payment methods can be as low as half the cost of traditional payment, in addition to the ease of circulating and carrying it.
- Ability to pay over the network: electronic money can be transferred from any place to any

other place in the world, at any time.

- Simplicity and ease of use: it greatly facilitates banking transactions, since the entire process is fully automated.
- Speed of payment: financial transactions and the exchange of related coordination information take place instantly, in real time, without the need for any intermediation.
- Encouragement of secure payment: a banking system designed specifically for handling electronic money exists, in which banks use servers that support secure financial-transaction protocols, and web browsers that support secure-layer protocols, making electronic payments more secure and confidential.

b. Disadvantages

- Taxation: in the United States the question of an “Internet tax” raises many problems and questions - for example, can a merchant in the United States collect an Internet tax on goods sold to a buyer in Zimbabwe, and should Zimbabwe receive a share of that tax? Electronic cash, like physical cash, cannot easily be traced.
- Money laundering: this can easily occur through the purchase of goods and services with electronic cash that can be redeemed without disclosing the purchaser's identity for items of value; the goods are then sold for real cash on the open market, and purchases can be made in another country, which further complicates jurisdictional issues.
- Counterfeiting: as with real currency, electronic cash is susceptible to counterfeiting. Although it is very difficult (like any Internet-based activity) to create and spend counterfeit electronic cash, without strong preventive and countervailing measures electronic counterfeiting can occur, and once it does, it can trigger a number of potentially devastating digital economic consequences.
- Central banks' control over the issuance of currency could, if electronic cash expands, be transferred to electronic banks.
- Related to this are the problems arising from the duplication (cloning) of electronic currency, and the protection requirements needed to guard against such duplication.
- Hard-disk failure can lead to the loss of stored electronic funds, although this risk is comparable to the problems that can occur with paper money, such as loss through laundering. (Bouafia, 2014, pp. 118–119)

4. The Theoretical Framework of Virtual Money

Virtual currencies are one of the contemporary topics in economics; a growing number of researchers and economists have begun paying close attention to them, highlighting their principal advantages, which are driving growing global demand and, in turn, raising their value - some are estimated to be worth the equivalent of a billion dollars annually. This is an indicator that sounds an alarm about the potential disorder that could engulf the world should such currencies spread beyond the oversight of official state authorities.

4.1. Nature and Origin of Virtual Money

Virtual money has been defined in several ways (Al-Bahouth, 2017, pp. 22–23):

- A digital representation of value issued by private developers as a unit of account, which can be obtained, stored, accessed and transacted electronically, and used for a variety of

purposes when two parties agree to use it.

- One type of unregulated (decentralized) digital money, issued by developers who typically control it, used and accepted among members of a specific virtual community.
- A medium of exchange that functions like currency in certain environments but does not possess all the attributes of a genuine currency.

Based on the foregoing definitions, virtual money can be described as a virtual digital currency (with no tangible entity or physical existence) produced by computer programs, not subject to the control of any central bank or official international authority, used over the Internet for purchases, sales, or conversion into other currencies, and which enjoys voluntary acceptance among those who deal in it.

a. Origin of Virtual Money

The idea of this money was first put forward by a programmer using the pseudonym Satoshi Nakamoto, who introduced it in a paper published in 2008. He described it as a new electronic payment system in which transactions and transfers take place directly between users on a peer-to-peer basis, without reliance on any intermediary. This currency relies on cryptography between the two parties and is built on a system of anonymity for electronic transactions, with the aim of moving away from the centralization of major banks (Al-Bahouth, 2017, p. 22).

The idea is based essentially on software installed on users' computers, which provides a high degree of protection through exchanges that can, in some countries, be described as confidential, because the currency's value passes directly from one computer to another without any transfer intermediary. Once a user downloads and activates the Bitcoin program or application, it begins producing non-duplicable coins through specialized programs known as mining operations, run on dedicated servers designed to issue a fixed quantity annually, a quantity that is halved every four years (Al-Bahouth, 2017, p. 23).

The founders of this currency state that its issuance will stop by 2040, once the amount issued reaches 21 million units — the maximum quantity that can ever be mined. The issuers intended to create a form of scarcity in the circulating quantity in order to preserve its value from erosion, by increasing the complexity of the algorithms that must be solved as the number of miners grows over time, until issuance eventually stops altogether. As of 16 January 2017, the quantity of Bitcoin units issued had reached 16,104,750 units.

With the beginning of 2014, a second generation of cryptocurrencies emerged, incorporating advanced features such as stealth addresses, smart contracts, and sidechains, while the number of markets and exchanges on which they were traded also increased.

Since November 2016, the price of Bitcoin has been on a continuous rise, reaching \$1,150 by 5 January 2017, compared with a price of \$435 per unit at the start of 2016.

4.2. Types of Virtual Currencies

There are numerous cryptocurrencies with market value that are actively traded, although their degree of popularity and demand varies considerably. Bitcoin is the best known, and these currencies differ in small technical details such as the time required to create blocks and process transfers, and the hashing algorithms used. The most important are as follows:

- Bitcoin (BTC): the first and, to date, most widely traded cryptocurrency, issued in 2009 by a founder (or group) using the pseudonym “Satoshi Nakamoto.” It is a decentralized virtual currency produced through a process known as “mining.”

- Bitcoin Cash (BCH): a currency that split from Bitcoin in 2018, contributing to faster transaction processing and block verification for both Bitcoin and Bitcoin Cash.
- Ripple (XRP): first proposed by Ryan Fugger in 2004 and issued in 2016, it has become the second-largest cryptocurrency. It is the only major virtual currency that does not use a blockchain of the conventional kind, relying instead on its own decentralized global network; it depends on consensus among its participants to validate and accept transfers.
- Ethereum (ETH): a decentralized virtual currency founded by Vitalik Buterin, who presented a research paper on it in 2013; it first appeared in 2015. It is a platform for smart contracts that uses blockchain technology and offers a high level of security. It was created to enable smart contracts that precisely emulate traditional contracts; notably, its creators are publicly known figures within monetary organizations.
- Litecoin (LTC): founded in 2011 by former Google engineer Charles Lee. The maximum number of Litecoin units that can ever be mined is 84 million (compared with Bitcoin's cap), and it processes transactions faster than Bitcoin. It was ranked among the five strongest digital currencies in 2017, is produced through mining, is decentralized, uses a peer-to-peer system, and relies on the same cryptographic algorithms used by Bitcoin (Al-Najjar, 2019, pp. 33–35).
- Namecoin: created in April 2011, based on Bitcoin's open-source technology, and distinguished by high scarcity, decentralization, security and privacy.
- Peercoin: created in August 2012; like most virtual currencies it relies on a peer-to-peer Internet protocol, but is distinguished by greater mining efficiency and improved security safeguards to prevent misconduct by miners. It ranks fourth among virtual currencies by market value.
- Novacoin: created in February 2013, based on open-source code and a peer-to-peer Internet protocol; unlike most Bitcoin alternatives, it embeds protective mechanisms within the currency's core to prevent abuse by mining groups.
- Feathercoin: an open-source virtual currency similar to Bitcoin and Litecoin, distinguished by frequent adjustment of mining difficulty and regular updates to incorporate new features and improvements.
- E-Dinarcoin: entered the virtual-currency exchange market on 27 September 2016; it runs on modern open-source technology and is characterized by continuous updates to its mining system to enhance security for its users.
- Zcash: its protocol was launched in October 2016, based on Bitcoin's core test source code; it is distinguished by a feature that hides the identity of sender and recipient and the value of all transactions on dedicated blocks, which can only be viewed by holders of the correct key (Al-Bahouth, 2017, p. 29).

4.3. *Characteristics of Virtual Money*

Among the most prominent characteristics of virtual currency, which generally apply to most types of virtual money, are the following (Al-Bahouth, 2017, p. 31):

- It is an intangible digital currency with no physical existence and no intrinsic value.
- It is an unregulated currency, meaning it is not backed by any official, institutional or international body.
- All participants may mine it according to their technical capabilities.
- It is used only over the Internet, within the scope of institutions, companies, bodies and websites that accept it.

- It can be exchanged for official paper currencies such as the dollar, the euro and the pound through encrypted online operations, via specialized platforms or dedicated automated exchange machines.
- Commercial exchange takes place directly from one person to another without the need for bank intermediation (peer-to-peer).
- There is no fixed limit or ceiling on spending or purchasing, unlike various credit cards.
- Regulatory authorities are unable to trace or monitor the commercial operations conducted through it.
- Monetary authorities in any country are unable to control its supply or its price.
- Given its decentralized nature, its reliance on technology, and its responsiveness to technological developments, it is considered a convenient mechanism for buying and selling in a smooth and rapid manner.

4.4. Advantages and Disadvantages of Virtual Money

Virtual money has a number of advantages that make it acceptable to those who use it, as well as some drawbacks or risks associated with its use, as set out below (Al-Bahouth, 2017, pp. 35–36):

a. Advantages

- Low fees: users do not pay the transfer and transaction charges typically levied by banks and credit-card companies, since no intermediary is needed between customer and merchant to move funds.
- Speed, privacy and confidentiality: purchase and sale operations cannot be monitored or interfered with, reducing government and bank control, since funds can be transferred at any time and to any place in the world with complete privacy.
- Global reach: it is not tied to a specific geographic location and can be used as though it were a local currency, since it is available worldwide; no state can confiscate it because it is not subject to that state's control in the first place, and it cannot be frozen or seized.
- Transparency: everyone can observe, with complete transparency, the movement of the currency between wallets, while at the same time no one can determine the identity of its owner; this reflects universal recognition among participants of the existence of this money and the transfer of its ownership.
- Security: Bitcoin technology is one of the largest distributed-computing projects in the world, making it difficult to counterfeit or duplicate; users can also apply security practices to protect their funds, giving it a very strong security record.

b. Disadvantages

- Anonymity and encryption: these features make it somewhat easier to conduct suspicious and illegal transactions over the Internet, turning it into a vehicle for money laundering and for selling stolen or prohibited products such as drugs, making it difficult for security agencies to trace the source of the funds.
- Mining: it is difficult for an ordinary user to mine (issue) the currency, given the complexity of the access software and of the computations required for mining, even though in theory mining is open to everyone.

- Price: its price and its considerable volatility constitute a major problem for those dealing in it, and may limit its spread and acceptance; on the other hand, the fluctuating price encourages fraudsters to exploit it through fake currency-exchange websites.
- Hacking: because it is a digital currency stored in a digital wallet, it is exposed to hacking, theft, and tampering with or altering users' accounts through cyberattacks.
- Other risks: including legal violations, tax evasion, technical risks, and the absence of a supervisory authority.

5. The Economic and Legal Reality of Virtual Currencies in Light of the Problems They Face and the Means of Protection (Bitcoin as a Model)

5.1. The Economic Reality of Virtual Currencies

Understanding the nature of the economic effects caused by a form of money is linked, on the one hand, to its economic reality and the extent of its connection to that reality, and, on the other hand, to the international recognition it enjoys and its acceptance as a financial medium of exchange.

Monetary Unification and Its Relationship to Virtual Currencies

Numerous attempts have been made to unify currency at the global level; some have succeeded while others have failed — the European Union's shift to the euro is one example of success. Viewed as a project, virtual currency is itself a form of unified currency, since it is a global currency that allows everyone to transact according to unified monetary and technical policies and at globally uniform prices, thereby supporting economic growth and resolving problems related to the imposition of heavy taxes on money transfers. In addition, its decentralization — the fact that it does not answer to any particular issuing authority and does not follow the policies of any given party — allows it to escape dependency on major powers, avoiding subjection to the mercy of their currency prices and economic tutelage. The following outlines the principal positive and negative effects of entering a monetary union (Al-Najjar, 2019, pp. 83–86):

a. Positive effects of entering a monetary union:

- Increased efficiency in carrying out financial transfers easily and quickly among participants, without exposure to the exchange-rate risks that traditional-currency users sometimes face.
- Elimination of the problem of fees when converting from another currency.
- The currency enjoys a high degree of international strength arising from the large geographic scope over which it is used.
- Increased efficiency of monetary policy, since the currency has a fixed exchange rate.
- Increased volume of trade exchanges and higher levels of investment among the countries that use it.
- Reduced volatility of monetary flows, and greater stability within the internal monetary-flow environment of the currency zone.

b. Negative effects of entering a monetary union:

- States lose their monetary sovereignty, represented by the power to design, issue and

supervise monetary policy, in addition to losing the profit (seigniorage) derived from issuance.

- States lose the freedom to pursue the economic approach they consider appropriate to their own economic circumstances, such as raising or lowering exchange rates as a means of correcting balance-of-payments imbalances when they seek to influence domestic prices and production costs.
- Negative effects on less productive countries suffering from balance-of-payments deficits, through lost investment opportunities, owing to the absence of barriers preventing capital from moving from less productive to more productive markets.

5.2. Trends in the Regulation of Virtual Currencies

One of the biggest questions surrounding virtual currencies concerns their legality. In the United States, for example, the federal government holds an exclusive right to issue currency: the U.S. Constitution does not merely reserve the power to issue money to Congress, but also limits the ability of private parties to issue money. Consequently, the legal treatment of virtual currencies depends on their legal characterization — whether they are considered money, commodities, an electronic currency transfer, or investment contracts.

Bitcoin is a case in point: many countries have warned against it and banned dealing in it, while other countries have seen in the invention of Bitcoin a qualitative leap in payment methods and a wave of modernization in financial dealing that must be embraced and benefited from, and have accordingly permitted dealing in it, or extended it provisional recognition pending further observation of developments. The following briefly outlines states that have accepted the idea of virtual currencies such as Bitcoin and those that have opposed it.

States that have tended to permit dealing in virtual currencies while withholding full official recognition

- Germany: one of the countries attempting to regulate Bitcoin transactions for tax-collection purposes, treating it as a type of electronic money. The government has stated that it can tax the profits earned by companies dealing in Bitcoin, while individual transactions are exempt from such taxes.
- United States: Washington began establishing regulatory frameworks for virtual currencies from 2013, after U.S. security agencies seized at least 144,000 Bitcoin units following the shutdown of a network — known as “Silk Road” — used for illicit Bitcoin transactions in 2013. The Internal Revenue Service has classified virtual currencies as property, meaning that trading and using them to purchase goods and services gives rise to tax obligations.
- Japan: has tended toward regulating Bitcoin, granting it legal-tender status as part of its effort to become a global hub for financial technology.
- Estonia: currently hosts a number of Bitcoin ATMs and start-ups such as Paxful, which offers a global peer-to-peer Bitcoin buying and selling service.
- Canada: home to a community of digital-currency start-ups such as the Vanbex Group, as well as thousands of merchants who accept Bitcoin payment. The city of Vancouver alone has more than 20 Bitcoin ATMs, while Toronto was scheduled to host a major blockchain conference on 19 September 2016.

States that have banned, criminalized, or warned against dealing in virtual currencies

- China: announced its intention to close and ban Bitcoin trading exchanges. These markets accounted for roughly \$150 billion in China, representing a global trading share of about 23%, reflecting growing fear of the risks of such dealings amid concern over the

disappearance of real capital through virtual transactions; China subsequently imposed a trade ban on the currency, which caused its trading price to fall by about 10%.

- Morocco: banned Bitcoin as a precautionary measure, out of concern over the currency's large price fluctuations.
- Jordan: its central bank issued warnings against dealing in Bitcoin, coinciding with a ban on importing any equipment related to this type of currency.
- Other countries that also prohibit dealing in it include: Saudi Arabia, Algeria, Bangladesh, Bolivia, Ecuador, Vietnam and Iceland.

In light of this, it is important to note that the nature and degree of legal recognition and acceptance can vary from one country to another and may change from time to time, just as the degree of criminalization, prohibition, and non-recognition may also vary even among countries that warn against it. There is also the problem that Bitcoin does not fall under any specific, clear legal or judicial framework, which may allow criminals to exploit legal gaps between countries. Legislative bodies therefore need to achieve a shared understanding of, and scrutinize, blockchain mechanisms, and to develop them cooperatively among states and international policies in order to produce regulations that legalize the use of this technology in a manner that guarantees a secure economy and outstanding performance. On this basis, virtual currencies, including Bitcoin, remain in a legally grey area, including with respect to their formal recognition and licensing — a matter that may require a considerable period of time before serious legal measures are adopted in this regard.

5.3. *Economic Problems*

The idea of a virtual economy requires social awareness and understanding that supports the use of technology in a manner consistent with humanity's future, while highlighting the repercussions that any technological progress may bring, and the importance and advantages of such progress. (Al-Najjar, 2019, pp. 95–104)

Stability

Bitcoin has experienced continuous price fluctuations, including at least five major swings since 2011 that most closely resemble financial bubbles, in which the currency's price has at times far exceeded the prices of all other currencies and even gold, before quickly falling again, generating both profits and losses for speculators and investors alike who rode the wave of price volatility in pursuit of quick speculative gains. Given Bitcoin's situation, its future remains clouded by many open questions, including the question of stability, on which a great deal depends, since instability may confine dealings to speculation and quick profit rather than adoption of the currency as a genuine medium of exchange at the commercial level. This is what makes forecasting its future a matter that requires more time and caution before issuing definitive judgments.

a. Bitcoin and Monetary Policy

It is clear that this currency exerts a considerable influence on the tools of monetary policy, since the development of electronic money and its substitution for legal tender can affect open-market operations — one of the key tools used by central banks in setting monetary policy. Friedman emphasizes this point, considering that what is fundamental to the implementation of monetary policy is the combination of the central bank's monopoly power in securing these reserves and balances with its ability to impose rules and conditions relating to the extent of

increases or decreases in those reserves and balances. While the European Union has addressed this problem by prohibiting any electronic means of payment except through, or under the supervision of, financial and credit institutions, this reflects the fact that the issuance of money is tied to economic policies that the state alone must determine.

b. The Question of Inflation and Deflation

It is well known that the Bitcoin protocol will stop once 21 million Bitcoin units have been issued, expected around 2040, because the rate of issuance slows progressively as larger quantities of Bitcoin units are released. This raises the question of whether the issuance process under this protocol is compatible with humanity's future and the future financial system, and how monetary policies will be adjusted to meet market needs accordingly. Controlling the process of money creation and issuance in a measured manner is difficult even for individual states, let alone for automated protocols and algorithms, particularly since most of the transactions carried out on virtual-currency trading platforms are speculative operations seeking quick profit.

5.4. Theft of Funds, Money Laundering, Tax Evasion, and Illicit Markets

a. Theft and Disappearance of Funds

An illustrative example is what happened to Mt. Gox, a Tokyo-based financial company for storing and exchanging Bitcoin, which began operating in 2009. By 2010 it had begun exchanging Bitcoin for real money; the exchange rate started at \$5 per Bitcoin, and by February 2011 the price of one Bitcoin had reached \$1. By 2014 the company handled roughly 70% of total global Bitcoin transfers. Suddenly, in that same year, the company announced the loss of more than \$450 million worth of BTC, leading to its bankruptcy, in addition to hackers leaking the names and passwords of its account holders, resulting in the loss of thousands of accounts.

b. Money Laundering

The relationship between virtual money and the crime of money laundering is characterized by money launderers exploiting this currency to commit their offense. There is no doubt that Bitcoin serves as an ideal electronic repository for funds obtained from illegitimate sources, highlighting the negative side of virtual payment methods and their potential conversion into a vehicle for laundering money.

c. Tax Evasion

Given the impossibility of tracking the funds in circulation and holding their users accountable, Bitcoin has become a haven for many tax evaders, since such evasion leads to a deficit in the balance of payments and an inability to collect revenue to service the state's public debt.

d. Terrorism and the Black Market

The anonymity features the currency provides is, in itself, a powerful draw for the criminal

community. One example of such use is the so-called “Silk Road” market, considered one of the most active criminal venues on the Internet owing to its ability to conceal the identities of its users; Bitcoin was widely used among the participants of this market.

6. Conclusion

This study examined the development, diffusion, and regulatory treatment of virtual currencies, with particular emphasis on Bitcoin, as an emerging component of the contemporary digital financial ecosystem. The findings indicate that cryptocurrencies have progressively attracted international attention and have experienced increasing adoption among individuals, businesses, investors, and other economic actors. Bitcoin, in particular, has established itself as one of the most prominent and widely recognized crypto-assets, contributing to the broader development of decentralized financial technologies.

However, the growing use of cryptocurrencies should not be interpreted as equivalent to universal legal recognition or acceptance as an official form of money. The regulatory status of virtual currencies varies considerably across countries and jurisdictions. While some countries have developed regulatory frameworks that permit or regulate their use under specific conditions, others have adopted restrictive approaches because of concerns related to financial stability, consumer protection, money laundering, terrorist financing, taxation, market volatility, and the potential misuse of decentralized financial instruments. Consequently, the legal and institutional treatment of cryptocurrencies remains heterogeneous and continues to evolve.

The analysis also demonstrates that Bitcoin presents both opportunities and challenges. On the one hand, blockchain technology and decentralized digital assets may contribute to financial innovation, facilitate new forms of digital transactions, and encourage the development of alternative financial services. On the other hand, the high volatility of crypto-assets, the absence of uniform regulatory standards, cybersecurity risks, and difficulties associated with monitoring decentralized transactions constitute significant challenges for users, financial institutions, and public authorities.

Therefore, the findings suggest that the future development of virtual currencies will depend not only on technological innovation and market demand but also on the capacity of national and international institutions to establish appropriate regulatory and supervisory mechanisms. Effective regulation should seek to balance technological innovation with financial stability, consumer protection, transparency, and the prevention of illicit financial activities.

In methodological terms, the findings should be interpreted within the scope and limitations of the data and sources examined in this study. The rapidly changing nature of cryptocurrency markets and regulatory frameworks means that conclusions concerning their adoption, legal status, and economic implications may evolve over time. Further empirical research could therefore examine cryptocurrency adoption using longitudinal data, cross-country comparisons, and quantitative indicators of market activity and regulatory development.

In conclusion, virtual currencies, and Bitcoin in particular, represent an important development in the transformation of the contemporary financial system. Their growing visibility and adoption demonstrate the increasing relevance of digital financial assets, while the diversity of regulatory responses illustrates the continuing debate surrounding their economic, legal, and institutional implications. Rather than constituting a uniform global monetary system, cryptocurrencies currently represent an evolving financial phenomenon whose future role will depend on technological developments, market dynamics, user adoption,

and the regulatory choices made by national and international institutions.

7. Results

- **Ontological and Operational Structure of Virtual Currencies:** Virtual currencies constitute a distinct class of intangible, private digital assets that operate over distributed peer-to-peer computer networks without physical representations or sovereign underlying assets.
- **Conceptual Distinction from Electronic Money:** Unlike traditional electronic money (e-money)—which serves as a digitized balance of legal-tender fiat currency issued by institutional intermediaries—virtual money functions as an independent, algorithmically governed unit of account and medium of exchange.
- **Pivotal Role of Bitcoin in Modern Financial Architecture:** As the foundational implementation of decentralized ledger technology (DLT), Bitcoin established the paradigm for peer-to-peer financial clearing, significantly reshaping global transaction infrastructures and traditional financial intermediation models.
- **Algorithmic Issuance Mechanisms:** The generation and verification of virtual currency units rely on cryptographic consensus algorithms—commonly termed "mining"—which automate issuance, secure transaction history, and enforce supply elasticity parameters without centralized authority intervention.
- **Systemic Risks to Sovereign Economic Security:** The architectural principles governing decentralized virtual assets create structural tensions with traditional monetary control frameworks. Pseudonymous transaction channels introduce multidimensional national security and financial integrity risks, including:
 - Diminished monetary policy effectiveness and potential loss of central bank seigniorage.
 - Circumvention of capital flow controls and anti-money laundering (AML/CFT) regulatory oversight.
 - Increased exposure of macroeconomic stability to unbacked asset price volatility.
- **Functional Deficits and Legal Inadequacies:** Although virtual currencies demonstrate technical capacity to fulfill classical monetary functions (as a medium of exchange, store of value, and unit of account), their widespread institutional integration remains hindered by high exchange-rate volatility, lack of sovereign legal-tender status, and fragmented regulatory recognition globally.

8. Recommendations

Based on the empirical and theoretical findings of this research, the following multi-tiered policy and legislative measures are recommended to mitigate economic risks while enabling controlled financial innovation:

8.1. Legislative and Classification Frameworks

- **Establish Clear Statutory Taxonomy:** Jurisdictional authorities should enact unified legal definitions distinguishing standard e-money, decentralized cryptocurrencies, and stablecoins to resolve regulatory ambiguity.
- **Define Legal Status and Property Rights:** Formulate clear guidelines regarding the classification of virtual assets under commercial and property law to enforce contractual clarity and protect investor rights.

82. Regulatory Supervision and Financial Integrity

- Enforce AML/CFT Compliance: Mandate that virtual asset service providers (VASPs)—including centralized exchanges, custodial wallet providers, and fiat gateways—comply fully with Know Your Customer (KYC) protocols and Financial Action Task Force (FATF) standards.
- Implement Controlled Regulatory Sandboxes: Establish supervisory sandboxes that allow fintech innovations to be tested within bounded live environments under direct oversight from central banks and capital market regulators.

83. Monetary Oversight and Sovereign Alternatives

- Strengthen Macroeconomic Surveillance: Financial stability committees should establish monitoring systems to track cross-border virtual currency flows and evaluate systemic exposure within the traditional banking sector.
- Advance Central Bank Digital Currency (CBDC) Strategy: Sovereign authorities should explore issuing retail or wholesale CBDCs to offer safe, state-backed, and efficient digital payment alternatives that counter the operational risks of unregulated private currencies.

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