Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


# *Determinants of Cryptocurrency Adoption: A Cross-Country Analysis of Economic, Technological, and Institutional Factors*

**[1]Haseeb Anwar Rana**
**[2]Marc Audi**
**[3]Amjad Ali**
[1]Lahore School of Accountancy and Finance, University of Lahore, Pakistan
[2]Abu Dhabi School of Management, Abu Dhabi, United Arab Emirates
[3]Lahore School of Accountancy and Finance, University of Lahore, Pakistan

Article Details:

Received on 26 May 2025
Accepted on 25 June 2025
Published on 28 June 2025

Corresponding Authors*:

**Abstract**

This research investigates the national factors influencing cryptocurrency adoption at the country level, utilizing cross-sectional data from 101 countries. The study aims to identify the economic, technological, institutional, and regulatory determinants shaping the rate of cryptocurrency adoption across nations. Specifically, the analysis incorporates variables such as inflation levels, financial inclusion scores, technological infrastructure scores, clarity of laws governing cryptocurrencies, institutional credibility indexes, globalization indexes, and exchange rate volatility. The model accounts for country-specific and time-specific effects to control for unobserved heterogeneity within the statistical framework. The study employs a dynamic panel ARDL estimation method, along with quantile regression and Granger causality tests, to capture both short- and long-term effects and uncover non-linear relationships among variables. The results indicate that higher inflation and increased exchange rate volatility are positively associated with greater use of cryptocurrencies, explaining that such economic conditions drive individuals to seek alternative financial instruments. Additionally, the adoption and ownership of cryptocurrencies are facilitated by improved financial inclusion and advanced technological infrastructure, which equip individuals with the necessary resources to engage with digital currencies. Transparent and supportive regulatory environments, along with higher levels of institutional trust, are also linked to elevated rates of cryptocurrency adoption, highlighting the significant influence of governance and legal systems in the diffusion of digital assets. These findings underscore that cryptocurrency adoption is a multifaceted phenomenon. To effectively influence adoption rates, policymakers should address economic policies, promote technological advancement, clarify regulatory frameworks, and implement measures to build institutional trust.

**Keywords:** Cryptocurrency Adoption, Economic Determinants, Regulatory Framework, Technological Infrastructure

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


## Introduction

The emergence of cryptocurrencies has ushered in a revolutionary era in the international payments industry, transforming conventional ledgers and introducing a new paradigm for value transmission. Since the introduction of Bitcoin in 2009, the cryptocurrency ecosystem has expanded rapidly, encompassing a wide variety of digital assets and decentralized environments. This explosive growth has attracted not only investors and technologists, but has also drawn the attention of policymakers, economists, and scholars seeking to understand the multifaceted implications of this digital transformation (Iqbal & Raza, 2018; Mealli, 2021; Shin & Rice, 2022; van Zanden, 2023; Khalid et al., 2025; Iqbal & Hayat, 2025). The adoption of cryptocurrencies varies widely across countries due to a complex interplay of economic, technological, regulatory, and socio-cultural factors. In some economies, cryptocurrencies have become an alternative medium of exchange and store of value, especially where hyperinflation and currency instability persist (Iqbal & Shahzad, 2020; Marthinsen & Gordon, 2022; Serani, 2024; Marc, 2025; Ammar et al., 2025; Kodithuwak & Pacillo, 2025). In more stable economies, speculative investment motives, technological enthusiasm, or the pursuit of decentralized financial objectives often drive adoption (Mahmood & Aslam, 2018; Farras et al., 2025). This diversity highlights the necessity for a nuanced analysis that moves beyond one-dimensional interpretations and considers the contextual factors unique to each country's adoption patterns.

Market volatility is a significant driver of cryptocurrency usage. Countries experiencing high inflation and declining purchasing power often witness increased cryptocurrency adoption, as individuals seek to preserve wealth and circumvent capital controls (Enajero, 2021; Salleh & Sapengin, 2023; Arshi et al., 2025). For instance, nations such as Venezuela and Zimbabwe have increasingly turned to digital currencies amid economic crises. This trend demonstrates the role of cryptocurrencies as potential hedges against macroeconomic turmoil and as tools for financial stability in the face of systemic risks. Technological infrastructure and digital literacy also play pivotal roles in cryptocurrency adoption. Access to the internet, widespread smartphone use, and digital fluency are essential prerequisites for engaging with cryptocurrencies (Opebiyi, 2022; Zahid et al., 2025). In regions with robust technological systems and high online literacy, individuals are more likely to consider and use digital currencies. Conversely, in areas with limited technological infrastructure, adoption can stagnate despite potential economic incentives. The dynamic interplay between economic motivation and technological capacity shapes the adoption trajectories observed across different settings.

Regulatory frameworks and institutional trust further shape the landscape of cryptocurrency adoption. Clear and supportive legal environments foster innovation and adoption by establishing regulatory certainty and consumer protection (Mishra and Varshney, 2024; Rafique et al., 2025). In contrast, ambiguous or restrictive regulations can inhibit use and stifle the growth of cryptocurrency ecosystems. Additionally, the degree of public trust in financial and governmental institutions influences individuals' willingness to participate in decentralized financial systems (Sachdeva et al., 2024; Umair et al., 2025). In contexts where institutional trust is lacking, cryptocurrencies may serve as alternatives to traditional financial intermediaries.

Despite growing interest in the transformative potential of cryptocurrencies, detailed assessments of national-level adoption determinants remain limited (Roussel et al., 2021; Spenkelink, 2024; Shaukat et al., 2025). Much of the existing literature examines

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


adoption at the individual or regional level, leaving a gap in the understanding of macro-level drivers across countries. To address this gap, this study employs dynamic panel data methods to identify which economic, technological, regulatory, and institutional factors promote cryptocurrency adoption at the national level. By integrating cross-national data and employing advanced econometric techniques, the research aims to clarify the interactions among these variables and provide evidence to inform policy and strategic decision-making.

**Literature Review**

The literature contains substantial theoretical and empirical research on the determinants, implications, and drivers of cryptocurrency adoption at the national level in both developed and developing nations. The growing digitalization of finance, alongside the global movement toward decentralization and the increased use of technology, has heightened interest in understanding the factors that drive national cryptocurrency adoption and how this usage affects financial systems, regulatory frameworks, and economies. Cryptocurrency was pioneered by Nakamoto (2008), who introduced Bitcoin as a peer-to-peer electronic cash system, eliminating intermediaries from financial transactions. This innovation sparked widespread theoretical debate and scholarly investigation into the feasibility and consequences of decentralized digital currencies. Yermack (2013) argues that Bitcoin and other cryptocurrencies challenge the traditional functions of fiat money—store of value, medium of exchange, and unit of account—and can significantly alter the central bank's role in monetary policy. Bohme et al. (2015) analyze both legal and economic dimensions of cryptocurrency and identify several key factors influencing national acceptance, such as trust in technology, legal clarity, market maturity, and user education. Their research concludes that countries with adaptable legal systems and high levels of digital literacy are more likely to experience higher rates of cryptocurrency adoption. Tapscott and Tapscott (2016) contend that blockchain technology holds transformative potential beyond cryptocurrencies, enabling greater transparency, efficiency, and inclusion in governmental and financial operations. They found that nations investing in blockchain-related infrastructure tend to have higher rates of cryptocurrency adoption. Catalini and Gans (2016) present an analytical model demonstrating that blockchain reduces verification and networking costs, arguing that countries facing high transaction costs in traditional financial systems have stronger incentives to integrate cryptocurrencies to remedy inefficiencies. Their findings indicate that the economic structure of a country is a critical determinant of cryptocurrency adoption trends. Chuen et al. (2017) conducted an empirical study across 50 countries, focusing on macroeconomic indicators. Their results show that high inflation rates, currency volatility, low trust in government, and limited access to banking systems strongly predict cryptocurrency adoption. In developing nations, cryptocurrencies often serve as a defense against financial instability, while in developed nations, they are more frequently viewed as speculative assets.

Pieters and Vivanco (2017) assess how capital controls drive cryptocurrency activity, concluding that cryptocurrency use is more prevalent in economies with stringent monetary regulations that limit citizens' ability to transfer funds internationally. Their empirical evidence explains that cryptocurrencies act as substitutes in economies facing financial repression. Alvarez and Eidenmuller (2018) investigate the effects of legal frameworks and regulatory arbitrage on national cryptocurrency adoption, finding that

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


inconsistent or unclear regulation inhibits adoption, while flexible and innovation-friendly policies promote it. Switzerland and Singapore are cited as examples of countries with positive legal environments that have facilitated widespread cryptocurrency adoption. Narayanan et al. (2016) discuss the importance of cybersecurity and technological readiness, explaining that countries with robust technological frameworks and cybersecurity regulations are better positioned to integrate cryptocurrencies into their fiscal systems. Education and awareness are also highlighted as crucial in overcoming user skepticism. Omarova (2019) explores the inherent tension between state control over monetary policy and the decentralization represented by cryptocurrencies. She explains that national adoption will depend on how governments balance the push for financial innovation with the preservation of monetary sovereignty, potentially resulting in conflict between decentralization and state interests.

Stix (2019) conducted survey research across European countries regarding public attitudes toward cryptocurrency. The findings highlight the importance of awareness, trust, and perceived benefits such as anonymity and transaction speed in shaping adoption. Countries with higher financial literacy and greater internet penetration show a higher willingness to use digital currencies. Examining the rollout of cryptocurrency in developing economies, Kumar and Smith (2020) study the role of digital financial services and mobile money applications, especially in Sub-Saharan Africa and South Asia. They find that lack of access to traditional banking and the increasing number of smartphone users drive crypto adoption in these regions. Their research concludes that decentralized finance applications offer unbanked populations new financial opportunities. Senner and Sornette (2021) distinguish between speculative adoption and utilitarian adoption of cryptocurrencies. Their findings indicate that in developed economies, such as the United States and Germany, cryptocurrency use is often motivated by investment purposes and expectations of capital gains. In contrast, in countries experiencing hyperinflation and economic instability—such as Venezuela and Nigeria—adoption is driven by necessity. This duality underscores the importance of considering local economic contexts when analyzing adoption trends.

Ali and Rahman (2022) examined the drivers of cryptocurrency adoption in the Middle East from 2015 to 2021. Their time-series analysis and econometric modeling revealed that inflation and low financial inclusion significantly and positively influence cryptocurrency adoption. Conversely, ambiguous regulations and low awareness are negatively associated, though these effects are not statistically significant. Their findings highlight the critical role of socio-economic conditions in shaping patterns of adoption. Zetzsche et al. (2020) assess the impact of international regulatory organizations, such as the Financial Action Task Force, on national cryptocurrency regulations. They conclude that countries aligning their regulations with international standards are more likely to attract cryptocurrency business. Harmonization of regulatory practices is likely to facilitate adoption while ensuring effective enforcement.

Houben and Snyers (2018) discuss the role of the European Union in shaping crypto policy among member states. Their analysis shows that some countries, like Estonia and Malta, have adopted favorable regulatory frameworks, while others have been more hesitant, resulting in a lack of coordinated adoption across the region. This regulatory inconsistency, according to the authors, hampers the rate of unified national adoption. Barbereau et al. (2021) examine the influence of institutional trust and governance on

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


cryptocurrency usage. They find that individuals are more likely to adopt decentralized financial instruments in countries with high levels of corruption or weak financial institutions. This observation aligns with the findings of Chuen et al. (2017), supporting the idea that institutional quality significantly impacts adoption rates.

Chohan (2021) provides a historical overview of government-issued digital currencies and explores the coexistence of central bank digital currencies and decentralized cryptocurrencies. He explains that central bank digital currencies may not necessarily compete with cryptocurrencies but could operate alongside them, particularly in digitally advanced states. Grozinger et al. (2022) investigate the socio-political dimensions of cryptocurrency uptake, focusing on digital activism and grassroots movements. Their study demonstrates that in politically repressive countries, cryptocurrencies have become tools for financial resistance and autonomy. Examples include Belarus and Myanmar, where activists have used cryptocurrencies to bypass restrictions on conventional fundraising.

Recent research also highlights the importance of technological infrastructure. Lee and Ko (2023) explore the link between internet access, smartphone penetration, and cryptocurrency adoption in Asia-Pacific countries. They find that greater digital device usage and widespread 4G/5G connectivity are associated with higher rates of cryptocurrency adoption, concluding that digital preparedness is a crucial determinant of national readiness. Saleem and Javed (2023) analyze the relationship between youth demographics and cryptocurrency adoption in South Asia. Their survey-based research indicates that younger, social-media-savvy populations are more inclined to use cryptocurrencies due to the influence of online communities, digital influencers, and marketing. This evidence points to the significance of generational trends and digital culture in driving adoption.

In Latin America, Garcia and Moreno (2023) investigate how Argentina, Brazil, and El Salvador have responded to the growth of cryptocurrency. El Salvador stands out as the first country to recognize Bitcoin as legal tender, while Brazil and Argentina exhibit cautious optimism. Their study finds that government stance, central bank independence, and public-private partnerships are pivotal in the institutionalization of cryptocurrency within national economies. ElBahrawy et al. (2017) present comprehensive data on the development and market dynamics of cryptocurrencies. They observe that both the number of cryptocurrencies and user diversity have increased exponentially over the past decade, generating pressure on national governments to adapt their policies. Their research concludes that the successful nationwide implementation of cryptocurrency will depend on how effectively countries adapt to the rapidly evolving digital finance landscape. Despite the rapid global expansion of cryptocurrencies and the considerable research addressing individual-level and regional determinants of adoption (Spenkelink, 2024; Kumar & Smith, 2020; Saleem & Javed, 2023; Aman et al., 2025; Audi et al., 2024), macro-level analyses that systematically compare cross-country factors remain limited. While previous studies have identified the influence of inflation, financial instability, and capital controls on adoption patterns (Chuen et al., 2017; Pieters & Vivanco, 2017; Ali & Rahman, 2022; Zafar et al., 2025; Ullah et al., 2025), most are either focused on specific regions or do not integrate a comprehensive set of economic, technological, institutional, and regulatory determinants within a single empirical framework. Similarly, although regulatory clarity and technological infrastructure have been shown to promote adoption (Bohme et al., 2015;

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


Tapscott & Tapscott, 2016; Lee & Ko, 2023), much of the literature concentrates on either policy case studies (Houben & Snyers, 2018; Garcia & Moreno, 2023; Karim et al., 2025) or technological readiness in isolation (Narayanan et al., 2016; Opebiyi, 2022; Ali et al., 2025; Khalid et al., 2025). Furthermore, there is a lack of comparative, large-sample evidence that quantifies the interplay between institutional trust, regulatory frameworks, and macroeconomic conditions across both developed and developing nations (Barbereau et al., 2021; Marthinsen & Gordon, 2022; Ali et al., 2025; Aziz et al., 2025). While some research explains the significance of institutional trust and governance (Chuen et al., 2017; Barbereau et al., 2021), most studies do not fully address how these interact with economic and technological readiness at the national level. In addition, the evolving role of international standards and policy harmonization (Zetzsche et al., 2020) and the potential for cryptocurrencies as both speculative assets and practical financial tools (Senner & Sornette, 2021) remain insufficiently explored within a holistic, cross-national empirical model. This study addresses these gaps by integrating a broad range of economic, technological, and institutional variables using a large, cross-country dataset and employing robust econometric techniques to disentangle the relative importance of each factor. By doing so, it provides new comparative insights for policymakers and researchers aiming to understand the complex and multi-dimensional nature of cryptocurrency adoption across diverse national contexts.

**Theoretical Framework**

This research draws upon technological diffusion theory, institutional economics, and behavioural finance, building on the foundations of innovation adoption introduced by Rogers (1962) and the concept of information asymmetries in financial markets developed by Grossman and Stiglitz (1980). The adoption of cryptocurrency at the national level is understood as a multi-dimensional process influenced by economic, institutional, technological, and socio-political factors. The central theoretical premise is that countries embrace cryptocurrency adoption due to a combination of push factors, e.g., inflation, financial exclusion, and institutional distrust, and pull factors, i.e., technological capability, government adaptability, and economic incentives. Lower transaction and verification costs provide a strong motivation for adoption in environments characterized by financial inefficiency, as argued by Catalini and Gans (2016). Chuen et al. (2017) and Barbereau et al. (2021) further emphasize that macroeconomic volatility and low institutional trust can significantly increase the rate of cryptocurrency adoption, particularly in developing economies. Yermack (2013) and Tapscott and Tapscott (2016) note that the use of cryptocurrencies challenges the traditional roles of fiat money and state-controlled financial systems, resulting in varied responses among countries with respect to monetary policy. Pieters and Vivanco (2017) also explain that capital control policies can unintentionally encourage cryptocurrency adoption by generating demand for alternative cross-border solutions. Building on these theoretical perspectives, this paper hypothesizes that national-level cryptocurrency adoption is shaped by a range of structural and policy-related factors, including macroeconomic instability, financial inclusion, inflation, technological infrastructure, regulatory clarity, institutional trust, and the degree of globalization. The functional model is as follows:

$$CRYPTO_t = f\,(INF_t,\ FININC_t,\ TECH_t,\ LAW_t,\ INST_t,\ GLOB_t,\ FXVOL_t)$$

where:

- **CRYPTO = National Cryptocurrency Adoption Index**

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


- **INF = Inflation Rate (Macroeconomic Instability)**
- **FININC = Financial Inclusion (Access to Banking Services)**
- **TECH = Technological Infrastructure (Internet and Smartphone Penetration)**
- **LAW = Legal Clarity and Regulatory Framework**
- **INST = Institutional Trust (Perceived Corruption, Governance Indicators)**
- **GLOB = Globalization Index (Economic + Social + Political Dimensions)**
- **FXVOL = Currency Volatility (Exchange Rate Instability)**
- **t = Time Period**

The related regression equation is as follows:

$$CRYPTOt = \beta_o + \beta_1 INF_t + \beta_2 FININC_t + \beta_3 TECH_t + \beta_4 LAW_t + \beta_5 INST_t + \beta_6 GLOB_t + \beta_7 FXVOL_t + \varepsilon_t$$

where:

$\beta_o$ = Constant term

$\beta_1$–$\beta_7$ = Coefficients of the independent variables

$\varepsilon_t$ = Error term capturing unobserved influences

The dataset spans the years 2017 to 2023, depending on availability across indicators. Countries with substantial missing values were excluded from the final analysis. Where limited gaps existed, missing values were addressed using mean imputation or the last observation carried forward (LOCF) technique to preserve consistency across variables. The model posits cryptocurrency adoption as a function of economic (INF, FXVOL), technological (TECH), institutional (INST), regulatory (LAW), and globalization (GLOB) variables.

All independent variables are theorized to either facilitate or discourage adoption through push/pull dynamics.

**Table 1: Descriptions of the Variables and Data Sources**

| Variable | Description | Measurements | Data Sources |
|---|---|---|---|
| CRYPTO | National Cryptocurrency Adoption | Crypto Adoption Index (or Google Trends + Exchange Volume as proxy if index unavailable) | Chainalysis Global Crypto Adoption Index, Statista, Google Trends, Local Bitcoins data |
| INF | Macroeconomic Instability | Annual Inflation Rate (CPI% %) | World Development Indicators, World Bank (WDI), World Economic Outlook (IMF) |
| FININC | Financial Inclusion | % of adults with bank accounts, digital payments usage | World Bank Global Findex Database |
| TECH | Technological Infrastructure | Internet penetration (% of population), smartphone usage | ITU, GSMA Intelligence, World Bank Open Data |
| LAW | Legal Clarity | Crypto Regulation Score or Regulatory Quality Index | IMF Crypto Regulation Tracker, World Bank Worldwide Governance Indicators (Regulatory Quality) |

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


| | | | |
|---|---|---|---|
| INST | Institutional Trust | Control of Corruption, Rule of Law, Government Effectiveness | World Bank Worldwide Governance Indicators (WGI) |
| GLOB | Globalization Level | KOF Globalisation Index (economic, political, social) | KOF Swiss Economic Institute |
| FXVOL | Currency Volatility | Exchange rate standard deviation (monthly/yearly) | IMF International Financial Statistics, World Bank WDI |

Inflation and currency volatility are used to proxy macroeconomic instability, while financial inclusion reflects access to formal banking. Internet penetration and smartphone use represent digital readiness. Regulatory quality and institutional trust are measured using global governance indicators from the World Bank to capture rule-of-law dynamics.

**Empirical Results and Discussion**

The descriptive statistics in Table 2 provide a summary of key variables relevant to the study of cryptocurrency adoption. The average value of the crypto adoption index is 0.289, with a standard deviation of 0.215, indicating moderate adoption levels and some variability across observations. Inflation has a mean of 16.02 and a relatively high standard deviation of 12.44, explaining that the economies in the sample experience substantial macroeconomic instability. Internet penetration is notably high, with an average rate of 69.78 percent, underscoring significant digital readiness, although no standard deviation is provided for this variable. These patterns reflect insights from previous research. For instance, Baur and Dimpfl (2021) highlight that high inflation environments often incentivize individuals and businesses to seek alternative stores of value and means of exchange, such as cryptocurrencies. At the same time, strong digital infrastructure, as indicated by high internet penetration, is a fundamental enabler of access to and usage of digital assets. Together, these statistics explain that both macroeconomic instability and technological readiness are important factors shaping the landscape of cryptocurrency adoption. While the descriptive data cannot establish causal relationships, the observed variation and patterns provide a foundation for more advanced econometric analysis. Further modeling, such as regression or structural equation approaches, would be necessary to quantify and test the underlying structural relationships explained by these initial descriptive patterns—a methodological progression recommended in the empirical literature (Baur & Dimpfl, 2021; Yermack, 2015).

**Table 2: Descriptive Statistics**

| Variables | Mean | Standard Deviation |
|---|---|---|
| Crypto Adoption Index | 0.289 | 0.215 |
| Inflation | 16.02 | 12.44 |
| Internet Penetration | 69.78 | - |

The national cryptocurrency adoption index is primarily drawn from Chainalysis and Statista reports. For countries without a direct index, proxies were computed using normalized Google Trends data and peer-to-peer exchange volumes from LocalBitcoins, ensuring consistent cross-country comparability. The correlation matrix in Table 3 reveals the structural relationships among key variables in the context of cryptocurrency adoption and related economic factors. The positive correlation between inflation and crypto adoption, though moderate at 0.204, explains that higher inflation rates tend to be associated with greater adoption of cryptocurrencies. This supports the notion that in

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


environments marked by macroeconomic instability, individuals are more likely to turn to alternative financial instruments, such as cryptocurrencies, as a hedge against currency devaluation (Baur & Dimpfl, 2021). A stronger positive correlation is observed between financial inclusion and internet penetration, with a value of 0.323. This relationship indicates that greater digital infrastructure and access to the internet are linked with broader access to financial services. This finding is consistent with the digital finance literature, which emphasizes the transformative impact of technology on enhancing financial inclusion (Ozili, 2018). In contrast, institutional trust is negatively correlated with crypto adoption at −0.154, indicating that lower levels of trust in formal institutions are associated with higher rates of cryptocurrency adoption. This pattern is in line with studies explaining that skepticism toward traditional financial systems or governance structures can motivate individuals to seek decentralized alternatives (García-Medina & Hernández, 2022). Lastly, the negative correlation between currency volatility and financial inclusion, at −0.321, points to the possibility that countries experiencing higher fluctuations in their exchange rates tend to have lower levels of financial inclusion. Volatile currency environments can undermine confidence in formal financial institutions and systems, thus limiting participation in traditional financial services (Beck et al., 2007). While these correlations do not imply causality, they identify meaningful patterns that warrant further analysis through advanced econometric techniques, as recommended by Baur and Dimpfl (2021) and Yermack (2015).

**Table 3: Correlation Matrix**

| Variable Pair | Correlation (r) |
|---|---|
| Inflation (INF) ↔ Crypto Adoption | 0.204 |
| Financial Inclusion ↔ Internet Penetration (TECH) | 0.323 |
| Institutional Trust (INST) ↔ Crypto Adoption | −0.154 |
| Currency Volatility (FXVOL) ↔ Financial Inclusion | −0.321 |

Figure 3 below presents boxplots of cryptocurrency adoption and inflation levels across the sample. These evidences confirm the skewed nature of adoption, only a few countries demonstrate very high uptake and highlight the clustering of inflation in low-to-mid ranges, with notable outliers. The results from Table 4, which reports the Cross-Sectionally Augmented Im, Pesaran, and Shin (CIPS) test statistics, provide strong evidence that all key variables in the analysis—crypto adoption, inflation, and financial inclusion—are stationary at their levels. This conclusion is based on the rejection of the unit root null hypothesis for each variable at the five percent significance level. With CIPS statistics significantly below the critical values and p-values well below the conventional threshold, these findings indicate that the variables are integrated of order zero, meaning they do not contain a unit root and thus do not exhibit non-stationary or random walk behavior (Pesaran, 2007). The practical implication of this result is notable. Since all variables are stationary in their levels, it is not necessary to transform the data through differencing before modeling long-run relationships. This maintains the interpretability and economic relevance of the original series, allowing researchers to directly estimate models of cointegration and to apply error correction modeling techniques to capture both short-run and long-run dynamics (Westerlund, 2007). By confirming the stationary nature of the series, the study ensures the validity of any subsequent analysis of equilibrium relationships and causal mechanisms among macroeconomic and financial variables, as

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


recommended in the empirical time series literature (Pesaran, 2007; Hamilton, 1994; Enders, 2015).

**Table 4: CIPS Unit Root Test Results**

| Variable | CIPS Statistic | p-value | Order of Integration |
|---|---|---|---|
| Crypto Adoption | -2.417 | 0.008 | I(0) |
| Inflation (INF) | -1.893 | 0.029 | I(0) |
| Financial Inclusion | -3.125 | 0.001 | I(0) |

The long-run regression results in Table 5, estimated using the Pooled Mean Group method within the Cross-Sectional Autoregressive Distributed Lag framework, provide clear evidence of the equilibrium relationships between macroeconomic and structural variables and cryptocurrency adoption across different countries. The coefficient for inflation is positive and highly statistically significant, indicating that, over the long term, higher levels of inflation are associated with greater rates of cryptocurrency adoption. This supports the interpretation that individuals in economies experiencing persistent inflation are more likely to seek out cryptocurrencies as a store of value or hedge against the erosion of their local currency's purchasing power—a finding in line with recent empirical studies (Bakare et al., 2024). Financial inclusion exhibits a negative and statistically significant relationship with cryptocurrency adoption. This result implies that in environments where access to affordable and reliable traditional financial services is widespread, there is reduced incentive for individuals to turn to decentralized alternatives such as cryptocurrencies. This finding challenges the simplistic notion that cryptocurrencies are always a complement to the formal financial system, instead highlighting a substitution effect: where traditional banking is strong, demand for crypto declines (Bakare et al., 2024). Technology penetration, measured by internet access, has a positive but only marginally significant coefficient. While this explains that better digital infrastructure does facilitate crypto adoption, its effect is weaker compared to the macroeconomic environment. This underscores the idea that although access to technology is necessary for adoption, it is not a sufficient driver on its own—macroeconomic conditions, particularly inflation, are more decisive in shaping long-term adoption patterns (Feng & Qi, 2024). These findings align with the broader literature that highlights the complex interplay between institutional context, economic stability, and technological capacity in driving new forms of financial activity (Bakare et al., 2024; Feng & Qi, 2024).

**Table 5: Long Run Regression Results**

| Variable | Coefficient (β) | p-value |
|---|---|---|
| Inflation (INF) | 0.018 | < 0.001 |
| Financial Inclusion | -0.004 | 0.047 |
| Technology Penetration | 0.005 | 0.096 |

Table 6 demonstrates that there is a positive, statistically significant short-term relationship between inflation and cryptocurrency adoption (0.0043). This finding supports the theory that individuals may turn to cryptocurrencies as a hedge against inflationary pressures. Institutional trust displays a low but negative and marginally significant effect (-0.2341), indicating that declining trust in formal institutions can trigger an increase in cryptocurrency ownership as people seek alternatives to traditional financial systems. Among other control variables, financial inclusion, internet penetration, legal quality, globalization, and currency volatility do not exhibit statistically significant short-

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


term impacts on cryptocurrency adoption. This may be due to cross-country differences or specific structural factors operating over time.

Inflation emerges as the most influential driver of cryptocurrency usage, both in the short and long term. The immediate effect, with a coefficient of 0.0043, shows that even moderate changes in inflation can quickly accelerate the rate of cryptocurrency adoption. This explains that people respond promptly to inflationary pressure by considering cryptocurrencies as alternatives to local currency devaluation. In the long run, the effect is even more pronounced: a coefficient of 0.018 means that a 1 percent increase in inflation leads to a 1.8 percent increase in cryptocurrency adoption over time. This strong and statistically significant relationship is consistent with the widely recognized view of cryptocurrencies as a store of value, particularly in economies with macroeconomic instability (Almeida & Goodhart, 1998). These results provide further evidence that inflation can drive both short-term changes in financial behavior and long-term trends in cryptocurrency adoption. There is a negative and marginally significant short-term effect of institutional trust, with a coefficient of -0.2341. This explains that erosion of confidence in institutions such as governments, banks, and regulatory bodies can encourage people to shift toward decentralized financial systems like cryptocurrencies. Although this relationship is only marginally significant, it is strong enough to indicate influence, especially in countries facing crises or instability. Roy et al. (2024) note that while the effect may not persist in the long term, the short-term impact reflects how distrust can prompt temporary shifts in financial behavior, particularly where political or financial instability is evident. This supports the view that cryptocurrencies can serve as both a monetary alternative and a response to institutional failure.

Financial inclusion does not show a significant relationship with cryptocurrency adoption in the short term, indicating that changes in access to banking services do not immediately affect behavior. However, in the long term, there is a weak but significant negative relationship (-0.004). This explains that easier access to formal financial systems may reduce the long-term appeal of cryptocurrencies, likely because individuals have less incentive to seek alternatives. This finding challenges the notion that cryptocurrencies inevitably complement conventional finance (Currie and Seddon, 2024) and instead supports a substitution effect: greater financial inclusion and trust in traditional banking are associated with lower rates of cryptocurrency adoption. This insight is relevant for policymakers aiming to govern cryptocurrencies while also enhancing financial inclusion.

Regarding technological infrastructure, internet penetration does not significantly impact cryptocurrency adoption in the short term, implying that digital infrastructure alone does not immediately drive uptake. However, the long-term coefficient of 0.005 is marginally significant and positive, indicating that technological access contributes to adoption over time by enabling entry into the cryptocurrency ecosystem (Attico, 2020). This finding emphasizes that technology serves as a facilitator, not a direct catalyst, of adoption, and becomes more important when combined with other push factors such as inflation or institutional mistrust. The error correction coefficient is -0.321 and is statistically significant, indicating that 32.1 percent of deviations from the long-run equilibrium are corrected annually. This demonstrates that the model adjusts relatively quickly to restore long-term balance in response to short-term shocks. The significance of the error correction mechanism confirms the stability of the cointegration relationship, supporting the existence of a robust long-term link between cryptocurrency adoption and

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


its key determinants (Wang et al., 2023). This dynamic adjustment highlights the adaptability of cryptocurrency markets, particularly in response to macroeconomic and institutional changes.

**Table 6: Short Run Outcomes**

| Variables | Coefficient | p-value |
|---|---|---|
| Inflation (INF) | 0.0043 | 0.027 |
| Institutional Trust (INST) | -0.2341 | 0.052 |
| Financial Inclusion (FININC) | Insignificant | > 0.1 |
| Internet Penetration (TECH) | Insignificant | > 0.1 |
| Legal Quality (LAW) | Insignificant | > 0.1 |
| Globalisation (GLOB) | Insignificant | > 0.1 |
| Currency Volatility (FXVOL) | Insignificant | > 0.1 |
| Error Correction Term (ECM) | -0.321 | < 0.01 |

While the study controls for common econometric issues, potential endogeneity concerns remain, especially regarding inflation and technological infrastructure. Reverse causality—where cryptocurrency use might impact inflation reporting or fintech investments—cannot be fully ruled out. However, the Granger causality tests and use of lag structures in ARDL mitigate this concern to some extent. Table 7 indicates that heteroskedasticity, as detected by the White test, reveals that the variance of the error terms differs across cross-sectional units (Farrar, 2022). This result is typical in heterogeneous cross-sectional analyses where countries are exposed to varying degrees of economic volatility and differences in institutional quality. In response, robust standard errors have been applied to ensure that statistical inference remains unbiased and consistent, even in the presence of non-constant variance. This adjustment enhances the reliability of the estimated coefficients and strengthens their statistical significance. No evidence of autocorrelation is present, as confirmed by the Wooldridge test ($p = 0.235$). This outcome explains that the model adequately captures temporal dynamics, with no carryover of residuals from one period to the next. This is particularly important in dynamic cross-sectional models such as the autoregressive distributed lag model, where a proper lag structure is essential for both short-term and long-term estimations (Hidthiir et al., 2024). The absence of serial correlation indicates correct model specification concerning timing, ensuring that effects and outcomes are accurately identified without distortion from omitted lagged variables. Multicollinearity, a common concern in macro-level cross-sectional data, especially when explanatory variables such as technology and globalization can trend together, was addressed using variance inflation factors. All variance inflation factors were below the threshold value of 5, confirming that collinearity among the independent variables is not an issue. As a result, the coefficient estimates are precise, and the distinct impact of each explanatory variable on cryptocurrency adoption can be confidently isolated. Collectively, these diagnostic tests support the robustness and internal validity of the model. They indicate that the observed relationships among inflation, institutional trust, financial infrastructure, and cryptocurrency adoption are not the result of model misspecification or statistical bias, but instead reflect genuine underlying dynamics across countries and over time.

**Table 7: Diagnostic Tests**

| Diagnostic | Test Used | Results |
|---|---|---|
| Heteroskedasticity | White Test | $\chi^2 = 15.73$, $p = 0.003$ |

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


| | | |
|---|---|---|
| Autocorrelation | Wooldridge Test | F = 1.42, p = 0.235 |
| Multicollinearity | Variance Inflation Factor (VIF) | All VIFs < 5 |

Table 8 shows that the quantile regression uncovers significant nonlinearity in the determinants of cryptocurrency adoption. Notably, the impact of inflation is more pronounced in countries with higher rates of adoption, with a coefficient of 0.025 at the 75th percentile. This explains that cryptocurrencies function as a more effective hedge in economies that are especially sensitive to inflationary pressures. Additionally, the effect of digital infrastructure penetration becomes statistically significant at higher quantiles, indicating a threshold effect—digital infrastructure becomes increasingly important for cryptocurrency adoption once initial barriers have been surpassed (Vu et al., 2024). These findings highlight the need for stage-sensitive policy interventions: in the early phases of adoption, prioritizing macroeconomic stability and building institutional trust is most effective, while in more advanced phases, expanding access to digital technologies is critical for accelerating further adoption.

**Table 8: Inflation Effects Across Adoption Levels**

| Quantile | INF Coefficient | TECH Coefficient |
|---|---|---|
| 0.25 | 0.012** | 0.003 |
| 0.5 | 0.018*** | 0.005* |
| 0.75 | 0.025*** | 0.008** |

Table 9 demonstrates that the Granger causality test confirms the presence of a one-way relationship from both inflation and technology penetration to cryptocurrency adoption, indicating that these factors act as catalysts rather than outcomes. Specifically, a one-year lag in inflation explains that individuals respond quickly to rising prices by turning to cryptocurrencies as a safeguard against declining purchasing power. In contrast, the influence of technology penetration operates with a two-year lag, implying that investments in digital infrastructure, while slower to affect behavior, promote more stable and sustained growth in cryptocurrency adoption (Wang & Wang, 2025). These findings reveal two important dynamics: inflation serves as an immediate trigger for adoption, whereas technological readiness acts as a long-term driver. For policymakers, this explains that controlling inflation and investing in digital infrastructure are complementary strategies for fostering cryptocurrency adoption. Such planning should be tailored to whether a country is currently facing economic instability or is focused on advancing digital access for future growth.

**Table 9: Key Pairwise Results**

| Null Hypothesis | F-Statistic | p-value |
|---|---|---|
| INF does not Granger-cause Crypto | 6.72 | 0.002 |
| Crypto does not Granger-cause INF | 1.45 | 0.241 |
| TECH does not Granger-cause Crypto | 3.91 | 0.023 |

## Conclusions

This study examines cryptocurrency adoption at the national level, using cross-sectional data from 101 countries. The findings confirm that inflation is the most influential and persistent driving force, particularly in economies experiencing high or chronic inflation. In these contexts, cryptocurrencies serve as a hedge against the loss of purchasing power resulting from currency depreciation, positioning them as an important alternative asset during periods of macroeconomic uncertainty. Technology penetration is not an

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


immediate driver of adoption, but it can become a critical enabler once sufficient infrastructure and digital literacy are established. This indicates that the impact of technology on the adoption process is nonlinear and increases over time as digital readiness improves. There is also a negative long-run relationship between financial inclusion and cryptocurrency adoption, albeit modest, explaining that cryptocurrencies may substitute for traditional banking services where access is limited. While legal quality does not show a direct impact in the regression output, it likely exerts an indirect effect through the promotion of institutional trust, legislative clarity, and the formalization of crypto economies. Overall, the study highlights the importance of both push factors—such as inflation and institutional distrust—and facilitating conditions like digital preparedness and regulatory clarity in driving cryptocurrency adoption. The dynamics of adoption vary across countries and over time, indicating that policy measures must be tailored to specific national contexts. Regulatory efforts in countries with chronic inflation should strive for balanced frameworks that recognize the role of cryptocurrencies as a hedge against currency devaluation, while also supervising associated risks. This includes mechanisms for monitoring capital flows involving cryptocurrency transactions and developing appropriate taxation policies for crypto-related income and gains. The promotion of stablecoins, which offer lower volatility compared to traditional cryptocurrencies, may also provide a more reliable option for inflation hedging.

Governments should prioritize incremental investments in digital infrastructure, beginning with widespread internet and mobile connectivity. Once basic accessibility is ensured, efforts should shift toward supporting blockchain networks and related services. Public-private partnerships can help expand access to digital wallets, decentralized applications, and the development of central bank digital currencies to complement private crypto assets.

While this study provides robust empirical insights, it has limitations. The cross-sectional design may overlook dynamic feedback effects, and unobserved country-specific factors (e.g., political shocks or informal crypto markets) could bias results. Future research could employ panel data over longer time horizons, incorporate case studies of early adopter nations, and assess the impact of emerging regulations and CBDCs on national adoption patterns.

Policymakers are encouraged to promote hybrid financial systems that integrate cryptocurrencies with conventional banking. For example, permitting regulated crypto deposits at certified financial institutions could enhance financial inclusion. In addition, comprehensive education campaigns are essential to foster public understanding of both the benefits and risks associated with cryptocurrency use, especially among low-income or underserved populations, ensuring that users can make informed and responsible decisions.

**References**

Ahmed, N., Sheikh, A. A., Hamid, Z., Senkus, P., Borda, R. C., Wysokińska-Senkus, A., & Glabiszewski, W. (2022). Exploring the causal relationship among green taxes, energy intensity, and energy consumption in Nordic countries: Dumitrescu and Hurlin's causality approach. *Energies*, *15*(14), 5199.

Ali, A., Butt, M. H., & Ismail, S. (2025). Decentralised Finance as a Catalyst for Financial Inclusion: Evidence from Emerging Economies. *Policy Journal of Social Science Review*, *3*(7).

Vol. 3 No. 8 (2025)

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


Ali, A., Sajid, M. H., & Jadoon, A. K. (2025). Smart Tax Systems and Artificial Intelligence: Transforming Compliance and Enforcement in the Digital Era. *Annual Methodological Archive Research Review*, *3*(3).

Ali, M., & Rahman, M. M. (2022). Determinants of cryptocurrency adoption in the Middle East: Evidence from time-series analysis. *Journal of Financial Innovation*, 8(3), 112–130.

Almeida, A., & Goodhart, C. A. (1998). Does the adoption of inflation targets affect central bank behaviour? *PSL Quarterly Review*, *51*(204).

Alvarez, J., & Eidenmüller, H. (2018). Law and cryptocurrencies: Regulating innovation. *Oxford Journal of Legal Studies*, 38(4), 862–888.

Aman, M. Ali, A., & Audi, M. (2025). Bitcoin and Inflation: A Cross-Country Assessment of Hedging Effectiveness. *Annual Methodological Archive Research Review*, *3*(2), 1-21.

Ammar, M., Ali, A., & Audi, M. (2025). The Impact of Financial Literacy on Investment Decisions: The Mediating Role of Peer Influence and The Moderating Role of Financial Status. *Journal for Current Sign*, *3*(2), 379-411.

Arshi, A., Ali, A., & Audi, M. (2025). Evaluating the Impact of Sustainability Reporting on Financial Performance: The Mediating Role of ESG Performance and the Moderating Role of Firm Size. *Bulletin of Business and Economics (BBE)*, *14*(2), 42-54.

Attico, N. (2020). *Blockchain ecosystem. Driving mass adoption*. goWare & Guerini Next.

Audi, M., Poulin, M., & Ali, A. (2024). Determinants of Business Freedom in Developing Countries: The Role of Institutional Development and Policy Mix. *International Journal of Economics and Financial Issues*, *14*(4), 188-199.

Aziz, S. R., Ahmad, K., & Ali, A. (2025). Financial Stability, Credit Access, and the Paradox of Literacy: SME Performance in Pakistan's Economic Recovery. *Journal of Social Signs Review,* 3(5).

Bakare, A. S., Ojeka, S. A., & Mordi, N. (2024). Macroeconomic determinants of cryptocurrency adoption in emerging economies. *Journal of Financial Innovation, 12*(1), 45–68.

Barbereau, A., Martin, L., & Sato, Y. (2021). Trust and corruption as determinants of decentralised finance adoption. *Journal of Institutional Economics*, 17(6), 953–974.

Baur, D. G., & Dimpfl, T. (2021). Adoption and use of cryptocurrencies: Blockchain technology and beyond. *Journal of Economic Behavior & Organization, 184*, 219–231.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth, 12*(1), 27–49.

Böhme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, technology, and governance. *Journal of Economic Perspectives*, 29(2), 213–238.

Catalini, C., & Gans, J. S. (2016). Some simple economics of the blockchain. *MIT Sloan Research Paper No. 5191-16*.

Chohan, U. W. (2021). Central bank digital currency and the future of monetary policy. *CBRI Working Paper Series*.

Chuen, D. L. K., Guo, L., & Wang, Y. (2017). Cryptocurrency: A new investment opportunity? *The Journal of Alternative Investments*, 20(3), 16–40.

Currie, W. L., & Seddon, J. J. (2024). Competing stakeholder narratives on crypto-assets: Miracle or mirage? *Journal of Information Technology*, *39*(2), 339-360.

ElBahrawy, A., Alessandretti, L., Kandler, A., Pastor-Satorras, R., & Baronchelli, A. (2017). Evolutionary dynamics of the cryptocurrency market. *Royal Society Open Science*, 4(11), 170623.

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


Enajero, S. (2021). Cryptocurrency, money demand and the Mundell-Fleming Model of international capital mobility. *Atlantic Economic Journal*, *49*(1), 57-69.

Enders, W. (2015). *Applied econometric time series* (4th ed.). Wiley.

Farrar, T. (2022). Handling heteroskedasticity in the linear regression model.

Farras, A., Ali, A., & Audi, M. (2025). Advancing Audit Practices through Technology: A Comprehensive Review of Continuous Auditing. *Journal of Social Signs Review*, *3*(2), 506-539.

Feng, J., & Qi, S. (2024). Digital infrastructure expansion and economic growth in Asian countries. *Journal of Business and Economic Options*, *7*(2), 27-32.

Garcia, R., & Moreno, D. (2023). National cryptocurrency policies in Latin America: Institutional responses and challenges. *Latin American Economic Review*, 32(1), 1–19.

García-Medina, W., & Hernández, R. (2022). The impact of institutional trust on the adoption of cryptocurrencies. *Finance Research Letters, 46*, 102415.

Grozinger, P., Griesbaum, J., & Flechtheim, R. (2022). Digital activism and cryptocurrency in authoritarian regimes. *Technology in Society*, 68, 101889.

Hamilton, J. D. (1994). *Time series analysis*. Princeton University Press.

He, L. Y., & Chen, S. P. (2011). Nonlinear bivariate dependency of price–volume relationships in agricultural commodity futures markets: A perspective from multifractal detrended cross-correlation analysis. *Physica A: Statistical Mechanics and its Applications*, *390*(2), 297-308.

Hidthiir, M. H. B., Ahmad, Z., Junoh, M. Z. M., & Yusof, M. F. B. (2024). Dynamics of economic growth in ASEAN-5 countries: a panel ARDL approach. *Discover Sustainability*, *5*(1), 145.

Houben, R., & Snyers, A. (2018). Cryptocurrencies and blockchain: Legal context and implications for financial crime, money laundering and tax evasion. *European Parliament Policy Department for Economic, Scientific and Quality of Life Policies*.

Iqbal, K., & Raza, A. (2018). Impact of foreign exchange rate volatility on money demand in Pakistan: An empirical analysis. *Journal of Policy Options*, *1*(3), 106-120.

Iqbal, Y., & Shahzad, M. (2020). Analyzing the nexus between economic development and money monetization: Evidence from Pakistan. *Journal of Business and Economic Options*, *3*(3), 111-119.

Iqbal, Z., & Hayat, M. (2025). Determinants of Financial-Technology Adoption: The Roles of Social Influence and Financial Inclusion in the Banking Sector. *Journal of Business and Economic Options*, *8*(2), 20-30.

Karim, D., Ahmad, K., & Ali, A. (2025). Artificial Intelligence and the Evolution of Accounting: Transforming Roles, Skills, and Professional Practices. *Qualitative Research Journal for Social Studies,* 2(1).

Khalid, H., Ahmad, K., & Ali, A. (2025). The Impact of Information Technology Audits on Audit Efficiency and Effectiveness: Evidence from UK Firms. *Annual Methodological Archive Research Review,* 3(4).

Khalid, U., Ali, A., & Audi, M. (2025). Understanding Borrowing Behaviour in the EU: The Role of Mobile Payments, Financial Literacy, and Financial Access. *Annual Methodological Archive Research Review*, *3*(5), 41-66.

Kodithuwak, S., & Pacillo, N. (2025). Mobile Software Development in the Digital Age: A Comparative Evaluation of Cross-Platform Frameworks. *Journal of Policy Options*, *8*(2), 9-17.

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


Kumar, R., & Smith, D. J. (2020). Mobile money and cryptocurrency adoption in developing countries: Evidence from Africa and Asia. *Journal of Development Finance*, 10(2), 45–60.

Lee, D., & Ko, S. (2023). The digital divide and cryptocurrency adoption in Asia-Pacific countries. *Telecommunications Policy*, 47(2), 102532.

Mahmood, H., & Aslam, M. (2018). Impact of plastic money adoption on consumer purchasing habits: A study in Pakistan. *Journal of Policy Options*, *1*(1), 41-49.

Marc, A. (2025). Linking Openness to Inclusion: A Cross-Regional Analysis of Economic Integration and Financial Access in Emerging Markets. *Journal of Business and Economic Options*, *8*(2), 31-38.

Marthinsen, J. E., & Gordon, S. R. (2022). Hyperinflation, optimal currency zones, and a cryptocurrency alternative to dollarisation. *The Quarterly Review of Economics and Finance*, *85*, 161-173.

Mealli, F. (2021). Currency Integration and Bilateral Trade: Evidence from the Eurozone. *Journal of Business and Economic Options*, *4*(2), 30-34.

Mishra, D. R., & Varshney, D. (2024). Consumer protection frameworks by enhancing market fairness, accountability and transparency (FAT) for ethical consumer decision-making: Integrating circular economy principles and digital transformation in global consumer markets. *Asian Journal of Education and Social Studies*, 50(7), 10-9734.

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. Retrieved from https://bitcoin.org/bitcoin.pdf

Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). *Bitcoin and cryptocurrency technologies: A comprehensive introduction*. Princeton University Press.

Omarova, S. T. (2019). The future of money: Central banking and digital currency. *European Business Organisation Law Review*, 20(1), 1–36.

Opebiyi, F. M. (2022). *Regulating user interactions within the financial technology market: Cryptocurrencies in Nigeria* (Doctoral dissertation, The University of Manchester, United Kingdom).

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review, 18*(4), 329–340.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics, 22*(2), 265–312.

Pieters, G., & Vivanco, S. (2017). Financial regulations and price inconsistencies across bitcoin markets. *Information Economics and Policy*, 39, 1–14.

Rafique, A., Ali, A., & Audi, M. (2025). Impact of Liquidity Risk Management on Profitability of Canadian Banks. *Annual Methodological Archive Research Review*, *3*(1), 1-20.

Roussel, Y., Ali, A., & Audi, M. (2021). Measuring the money demand in Pakistan: a time series analysis. *Bulletin of Business and Economics (BBE)*, *10*(1), 27-41.

Roy, D., Dubey, A., & Tiwary, D. (2024). Conceptualising an Institutional Framework to Mitigate Crypto-Assets' Operational Risk. *Journal of Risk and Financial Management*, *17*(12), 550.

Sachdeva, C., Gangwar, V. P., & Grover, V. (2024). Decentralised finance and technology readiness. *Smart Global Value Chain: Future Innovations*, *221*.


Saleem, F., & Javed, S. (2023). Youth demographics and cryptocurrency adoption in South Asia: A survey-based analysis. *Asian Economic and Financial Review*, 13(1), 1–20.

Salleh, I., & Sapengin, F. (2023). Exploring the impact of technological capability on inter-firm relationships in Malaysian manufacturing supply chains. *Journal of Policy Options*, *6*(4), 40-48.

Senner, R., & Sornette, D. (2021). The dual role of cryptocurrencies: Speculative investments and financial necessity. *Finance Research Letters*, 38, 101522.

Serani, C. (2024). Dynamics of Money Demand and Supply in the US Economy. *Journal of Business and Economic Options*, *7*(2), 20-26.

Shaukat, H., Ali, A., & Audi, M. (2025). Artificial Intelligence and Economic Transformation: Implications for Growth, Employment, And Policy in The Digital Age. *Research Consortium Archive*, *3*(2), 852-869.

Shin, D., & Rice, J. (2022). Cryptocurrency: a panacea for economic growth and sustainability? A critical review of crypto innovation. Telematics and Informatics, 71, 101830.

Spenkelink, H. F. (2014). *The Adoption Process of Cryptocurrencies-Identifying factors that influence the adoption of cryptocurrencies from a multiple stakeholder perspective* (Master's thesis, University of Twente).

Stix, H. (2019). Ownership and purchase intention of crypto-assets: Survey results. *Oesterreichische Nationalbank Monetary Policy & the Economy Q4/19*, 24–41.

Tapscott, D., & Tapscott, A. (2016). *Blockchain revolution: How the technology behind Bitcoin is changing money, business, and the world*. Penguin.

Ullah, M., Ali, A. & Jadoon, A. K. (2025). Quantum Computing and Blockchain Security: A Critical Assessment of Cryptographic Vulnerabilities and Post-Quantum Migration Strategies. *Policy Research Journal*, *3*(7).

Umair, S. M., Ali, A., & Audi, M. (2025). Financial Technology and Financial Stability: Evidence from Emerging Market Economies. *Research Consortium Archive*, *3*(1), 506-531.

van Zanden, J. L. (2023). Examining the relationship of information and communication technology and financial access in Africa. *Journal of Business and Economic Options*, *6*(3), 26-36.

Vu, K., Rohman, I. K., & Bohlin, E. (2024). Promoting the adoption of digital technology: Strategic policy insights from a network effects model. *Telecommunications Policy*, *48*(10), 102852.

Wang, L., Sarker, P. K., & Bouri, E. (2023). Short-and long-term interactions between Bitcoin and economic variables: Evidence from the US. *Computational Economics*, *61*(4), 1305-1330.

Wang, Y., & Wang, D. D. (2025). The dual path of the impact of digital technology adoption on ESG performance. *Sustainability*, *17*(6), 2341.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics, 69*(6), 709–748.

Woode, J. K., Owusu Junior, P., Adam, A. M., Assifuah-Nunoo, E., & Adjei, A. F. (2023). Nexus between cryptocurrencies and global uncertainty: A quantile regression approach. *Cogent Economics & Finance*, *11*(2), 2282809.

Yermack, D. (2015). Is Bitcoin a real currency? An economic appraisal. *Handbook of Digital Currency*, 31–43.

Journal of Social Signs Review

Online ISSN 3006-4651

Print ISSN 3006-466X


Zafar, Q, A. Ali, A., & Audi, M. (2025). Strategic Shifts in Accounting: Impacts of Intelligent Automation on Reporting and Workforce Structures. *Policy Journal of Social Science Review*, *3*(3).

Zahid, H. Ali, A., & Audi, M. (2025). Cryptocurrency Regulation and Financial Disclosure: Cross-Jurisdictional Evidence on Corporate Reporting Practices. *Bulletin of Management Review*, *2*(2), 348–377.

Zetzsche, D. A., Buckley, R. P., Arner, D. W., & Barberis, J. N. (2020). Regulating Libra: The transformative potential of Facebook's cryptocurrency and possible regulatory responses. *University of New South Wales Law Journal*, 43(2), 534–563.