

Effect of Central Bank Digital Currencies on Cash Usage _ The Moderating Role of Consumer Trust in Financial Technologies_ A case study on a sample of countries in the Middle East and North Africa region

تأثير العملات الرقمية للبنك المركزي على استخدام النقد _ الدور المعتدل لثقة المستهلك في التقنيات المالية _
دراسة حالة على عينة من دول منطقة الشرق الأوسط وشمال أفريقيا

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Abstract:

This study investigates the effect of Central Bank Digital Currencies (CBDCs) on cash usage and examines the moderating role of consumer trust in financial technologies. Using a quantitative research design and structural equation modelling (PLS-SEM), data were collected from consumers with varying levels of digital payment experience. The results reveal that CBDC adoption has a significant impact on reducing cash usage, indicating that digital forms of central bank money can meaningfully influence consumer payment behaviour. Furthermore, consumer trust in financial technologies significantly moderates this relationship, strengthening the effect of CBDC adoption on cash usage. These findings highlight the importance of both technological and psychological factors in shaping payment preferences and underscore the necessity for central banks to foster public trust to maximise the effectiveness of CBDC initiatives. The study contributes to the growing body of literature on digital currencies by providing empirical evidence on how CBDC adoption and trust jointly shape consumer behaviour.

Keywords: Central Bank Digital Currencies, Cash Usage, Consumer Trust, Financial Technologies, Digital Payments.

JEL Classification Codes: E42, E52, E51, D12, D03, D83, G21, O33.

ملخص:

تبحث هذه الدراسة في تأثير العملات الرقمية للبنك المركزي (CBDCs) على استخدام النقد وتدرس الدور المعتدل لثقة المستهلك في التقنيات المالية. وباستخدام تصميم البحث الكمي ونموذج المعادلات الهيكلية (PLS-SEM)، تم جمع البيانات من المستهلكين بمستويات متفاوتة من تجربة الدفع الرقمي. تكشف النتائج أن اعتماد CBDC له تأثير كبير على تقليل استخدام النقد، مما يشير إلى أن الأشكال الرقمية لأموال البنك المركزي يمكن أن تؤثر بشكل كبير على سلوك الدفع للمستهلك. علاوة على ذلك، فإن ثقة المستهلك في التقنيات المالية تخفف بشكل كبير من هذه العلاقة، مما يعزز تأثير اعتماد CBDC على استخدام النقد. تسلط هذه النتائج الضوء على أهمية العوامل التكنولوجية والنفسية في تشكيل تفضيلات الدفع وتؤكد ضرورة قيام البنوك المركزية بتعزيز ثقة الجمهور لتعظيم فعالية مبادرات CBDC. تساهم الدراسة في مجموعة الأدبيات حول العملات الرقمية من خلال تقديم أدلة تجريبية حول كيفية تشكيل اعتماد CBDC والثقة بشكل مشترك لسلوك المستهلك.

الكلمات المفتاحية: العملات الرقمية للبنك المركزي، استخدام النقد، ثقة المستهلك، التقنيات المالية، المدفوعات الرقمية.

تصنيفات JEL: E42, E52, E51, D12, D03, D83, G21, O33 .

1. Introduction:

The rapid digitalisation of payment systems has encouraged central banks worldwide to explore and pilot Central Bank Digital Currencies (CBDCs) as a secure and efficient complement to traditional money. As digital alternatives expand, understanding how CBDCs influence consumers' payment behaviours becomes increasingly important. While CBDCs promise benefits such as reduced transaction costs, enhanced traceability, and improved financial inclusion, public acceptance remains a key challenge, particularly in economies where cash still plays a dominant role. This motivates the need to assess whether CBDC adoption can meaningfully reduce cash usage among consumers.

Despite growing global interest, the behavioural impact of CBDCs is not yet fully understood, especially regarding the factors that may condition their effects. A central unresolved problem is how variations in consumer trust in financial technologies shape the shift from cash to digital forms of money. Consumers who distrust digital financial systems may be reluctant to adopt CBDCs, thereby limiting their potential influence on reducing cash usage. This gap raises essential research questions: Does CBDC adoption significantly affect cash usage? Does consumer trust in financial technologies moderate this relationship?

Accordingly, the objective of this study is to examine the direct effect of CBDC adoption on cash usage while investigating the moderating role of consumer trust in financial technologies. By addressing these research questions, the study aims to provide empirical insights that help central banks and policymakers understand the conditions under which CBDCs may succeed in transforming payment habits. The findings are expected to contribute to the emerging academic literature on digital currencies and inform practical strategies for enhancing public acceptance of CBDCs.

2. Literature Review:

2.1.Cash Usage :

Cash usage refers to the practice of utilising physical currency for transactions, which remains significant despite the rise of digital payment methods. It encompasses various aspects, including the frequency of cash transactions, the contexts in which cash is preferred, and its implications for economic activities. The following sections elaborate on key dimensions of cash usage.

Cash as a Preferred Payment Method:

- Cash is the dominant payment method for low-value purchases, accounting for three out of four transactions in the euro area (Politronacci et al., 2018).
- In France, cash is particularly favoured for everyday items, with a notable decline in its use as purchase values increase (Politronacci et al., 2018).

Measurement of Cash Usage:

- Traditional measures of cash usage, such as currency in circulation (CIC), do not accurately reflect cash's transactional role. Instead, cash withdrawn from ATMs provides a more dynamic measure of cash flow and its usage in legal transactions (Khiaonarong & Humphrey, 2023).
- Studies indicate a decline in per capita cash withdrawals from ATMs post-2018, contrasting with rising CIC figures, highlighting the evolving nature of cash usage (Khiaonarong & Humphrey, 2023).

Societal Implications of Cash Usage:

- Cash transactions ensure anonymity, which is appealing to consumers and can facilitate tax evasion, contributing to the underground economy ("Pecunia olet. Cash usage and the undergr...", 2022)[[4]].

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- Access to cash is crucial for financial inclusion, allowing individuals from diverse backgrounds to participate in economic activities(Nita & Badiu, 2018).

While cash usage is declining in some contexts due to digital alternatives, it remains a vital component of everyday transactions, particularly for small purchases and in certain demographic groups. The balance between cash and digital payments continues to shape economic behaviours and policies.

2.2.Central Bank Digital Currencies:

Central Bank Digital Currencies (CBDCs) represent a significant evolution in the financial landscape, functioning as digital forms of a nation's fiat currency issued by central banks. These currencies aim to enhance the efficiency of payment systems, promote financial inclusion, and provide a secure alternative to traditional cash and private digital currencies. The following sections outline the key aspects of CBDCs.

Definition and Functionality:

- CBDCs are digital liabilities on a central bank's balance sheet, created to facilitate transactions without the need for physical cash(Francis, 2023).
- They can be categorised into account-based and token-based models, each with distinct legal characteristics(Copeland & Regnard-Weinrabe, 2025).

Benefits

- CBDCs offer secure and efficient payment solutions, addressing the growing demand for digital transactions(Lekhi, 2024).
- They can enhance financial inclusion, particularly in underbanked regions, by providing easier access to financial services(Lekhi, 2024).

Challenges and Concerns:

- The implementation of CBDCs raises concerns about financial surveillance and privacy implications(Lekhi, 2024).
- There are potential risks to the banking sector, including increased competition and reduced credit availability(Lekhi, 2024).

While CBDCs promise numerous advantages, their integration into existing financial systems must be approached cautiously to mitigate risks and ensure a balanced outcome for all stakeholders.

2.3.Consumer Trust in Financial Technologies :

Consumer trust in financial technologies (fintech) refers to the confidence that users have in the security, reliability, and integrity of fintech services. This trust is essential for the adoption and sustained use of these technologies, as it directly influences consumer behaviour and decision-making in financial transactions. Various factors contribute to building this trust, including technological innovations, data security measures, and user experience.

Technological Innovations:

- Blockchain Technology: Enhances transparency and reduces fraud risks by providing a decentralised, tamper-proof method for recording transactions(Adelaja et al., 2024).
- Advanced Encryption: Ensures the confidentiality and integrity of sensitive financial data, which is crucial for user trust(Adelaja et al., 2024).
- Biometric Authentication: Offers secure identity verification, reducing reliance on traditional passwords and enhancing security(Adelaja et al., 2024).

Data Security:

- Perceived Data Security: Users who perceive higher levels of data security are more likely to adopt fintech services(Ramaswamy et al., 2024).
- Trust Facilitators: Factors such as perceived size, interaction with online customers, and third-party seals significantly influence consumer trust(Zhao et al., 2024).

User Experience:

- Perceived Quality and User Experience: These variables are critical predictors of consumer trust in fintech applications, particularly in electronic wallets(Acevedo & Piedra, 2025).

While consumer trust is vital for fintech adoption, it is also important to recognise that scepticism exists among users due to past security breaches and the rapid evolution of technology. This scepticism can hinder the growth of fintech services if not adequately addressed through robust security measures and transparent practices.

2.4.Review of relevant prior research and scholarly works:

2.4.1. The relationship between the Central Bank Digital Currencies and Cash Usage :

The relationship between Central Bank Digital Currencies (CBDCs) and cash usage is complex and multifaceted. CBDCs are being explored by central banks as a response to the declining use of cash and the rise of digital payment systems, including cryptocurrencies. While CBDCs offer a digital alternative to cash, they are not necessarily intended to replace it entirely. Instead, they may serve as a complement to cash, providing additional options for consumers and businesses in the evolving financial landscape. This relationship is shaped by various factors, including technological advancements, consumer preferences, and regulatory considerations.

Decline in Cash Usage

- The use of cash at points of sale has decreased significantly due to digitalisation trends and regulatory measures that encourage cashless transactions(Rösl & Seitz, 2022).
- Despite this decline, the overall demand for cash, particularly in the euro area, has remained strong, with an increase in lower-denomination banknotes since the 2008 financial crisis(Rösl & Seitz, 2022).

CBDCs as a Complement to Cash

- CBDCs are designed to offer the benefits of central bank money in digital form, such as settlement finality and liquidity, while maintaining the integrity of the monetary system("Central Bank Digital Currencies", 2023).
- In the euro area, the proposed digital euro aims to co-circulate with cash, rather than replace it, due to the unique advantages cash offers, such as anonymity(Rösl & Seitz, 2022).

Technological and Regulatory Considerations

- The development of CBDCs involves careful consideration of design, technology, and regulatory frameworks to ensure they complement existing payment systems and address privacy and security concerns(Lloyd, 2023; Sun, 2019).
- Central banks are conducting detailed analyses to determine the optimal design and implementation strategies for CBDCs, considering their potential impact on financial stability and consumer behaviour (Sun, 2019).

While CBDCs are poised to transform the financial landscape, they are not expected to completely replace cash. Instead, they offer an additional payment option that can coexist with cash, catering to diverse consumer needs and preferences. The transition to digital currencies

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will require careful management to balance innovation with the preservation of financial stability and consumer trust.

First hypothesis (H1): There is no statistically significant relationship between the Central Bank Digital Currencies and Cash Usage at a 5% significance level.

2.4.2. The relationship between Consumer Trust in Financial Technologies and the relationship of Central Bank Digital Currencies to Cash Usage :

The relationship between consumer trust in financial technologies and the impact of Central Bank Digital Currencies (CBDCs) on cash usage is multifaceted. Trust in financial technologies, particularly in CBDCs, is essential for their successful adoption and can significantly influence consumer behaviour regarding cash usage. The following sections elaborate on this relationship.

Consumer Trust in Financial Technologies:

- Importance of Trust: Trust in central banks is crucial for the acceptance of CBDCs, as consumers need assurance regarding security and privacy(Yashwanth & Suresh, 2024).
- Perceived Benefits: Consumers are more likely to adopt CBDCs if they perceive benefits such as faster transactions and enhanced security, which can foster trust in digital financial systems(Yashwanth & Suresh, 2024).
- Concerns: Issues like cybersecurity risks and privacy concerns can undermine trust, potentially hindering CBDC adoption(Yashwanth & Suresh, 2024).

CBDCs and Cash Usage:

- Substitution Effect: Increased CBDC usage is associated with a decline in cash and bank deposits, indicating a shift in consumer preference towards digital currencies(Maggio et al., 2024)(Maggio et al., 2024).
- Limitations of CBDCs: While CBDCs offer advantages like portability, they lack certain cash functionalities such as anonymity and universal acceptability, which may affect consumer trust and cash usage(Schueffel, 2025)(Schueffel, 2025).

In contrast, while CBDCs present a modern alternative to cash, their inability to fully replicate cash's unique attributes may lead some consumers to retain a preference for physical currency, highlighting the ongoing relevance of cash in the financial ecosystem.

Second Hypothesis (H2): There is no significant role for Consumer Trust in Financial Technologies in the relationship between Central Bank Digital Currencies and Cash Usage at a 5% significance level.

2.5.Gaps in existing literature :

Despite the growing body of scholarship examining Central Bank Digital Currencies (CBDCs), cash usage, and consumer trust in financial technologies, several important gaps remain unaddressed. First, prior studies have primarily focused on the *macro-level implications* of CBDCs—such as financial stability, technological design, regulatory issues, and the coexistence of cash and digital currency. While these works offer valuable insights, they provide limited empirical evidence on how CBDC adoption directly influences individual consumers' cash usage behaviours. Much of the existing literature views CBDCs as a complement to cash, but few studies explicitly test whether CBDCs contribute to a measurable shift away from cash in real-world usage patterns.

Second, although trust is widely recognised as a critical factor in the adoption of digital financial technologies, the moderating role of consumer trust in shaping the relationship between CBDCs and cash usage has not been thoroughly explored. Prior research emphasises the importance of trust for acceptance of digital currencies and highlights concerns such as

cybersecurity, privacy, and perceived reliability. However, these studies typically examine trust as a determinant of digital technology adoption in general rather than as a variable that conditions the extent to which CBDCs may reduce consumers' reliance on cash. This leaves a gap in understanding whether high-trust consumers are more likely to substitute cash with CBDCs and whether low-trust consumers resist such substitution.

Third, existing studies tend to adopt conceptual or descriptive approaches, relying heavily on theoretical discussions, policy reports, or pilot program observations. There remains a notable lack of quantitative, consumer-level models that empirically test interactions between CBDC adoption and behavioural factors such as trust. This methodological gap limits the ability to generalise findings to broader populations and reduces the practical relevance of existing research for central banks aiming to design effective CBDC strategies.

In summary, the literature lacks:

1. Empirical testing of the direct effect of CBDCs on cash usage at the consumer level.
2. Investigation of consumer trust as a moderating variable that shapes how CBDCs influence cash usage.
3. Quantitative models capable of linking CBDC adoption, trust, and payment behaviour within the same analytical framework.

These gaps highlight the need for this study, which aims to fill the void by examining both the effect of CBDCs on cash usage and the moderating influence of consumer trust in financial technologies.

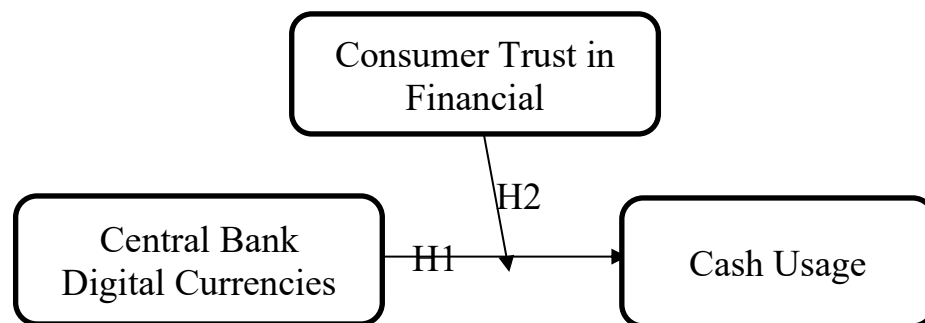


Figure 1. Theoretical framework.

3. Methodology:

3.1 Research Design and Approach:

This study adopts a quantitative research design, supported by a cross-sectional survey, to examine the effects of Central Bank Digital Currencies (CBDCs) on cash usage and the moderating role of consumer trust in financial technologies. The quantitative design allows for systematic measurement of consumer perceptions, usage behaviours, and trust levels using standardised scales, enabling statistical testing of the proposed hypotheses. The cross-sectional nature of the study captures consumer attitudes and behaviours at a single point in time, which is appropriate given the evolving landscape of digital currencies.

The research employs a deductive approach, guided by existing theories of technology adoption, digital payment behaviour, and trust in financial technologies. This approach supports the development of clear hypotheses (H1 and H2) and allows for empirical validation using structural modelling techniques. The relationships between the independent variable (CBDC adoption), the dependent variable (cash usage), and the moderator (consumer trust in financial technologies) are tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) due to its suitability for predictive research and models with moderating effects.

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3.2 Data Collection Methods:

Data for this study will be collected through a structured online questionnaire distributed to consumers who regularly use digital payment tools or have awareness of emerging financial technologies. Online distribution facilitates efficient access to a diverse sample of respondents with varying levels of experience in digital payments. The questionnaire includes three main sections:

1. **CBDC Adoption Measures:** Items capturing perceived usefulness, ease of use, security, and intention to adopt CBDCs.
2. **Cash Usage Measures:** Items assessing the frequency of cash withdrawals, reliance on cash for purchases, and overall preference for cash.
3. **Consumer Trust in Financial Technologies:** Items measuring trust in security, privacy, transparency, and reliability of digital financial systems.

All items are measured using a five- or seven-point Likert scale to capture respondent attitudes and perceptions. A non-probability sampling method, such as convenience sampling or purposive sampling, will be adopted, aiming for a minimum sample size of 200–300 respondents, consistent with PLS-SEM recommendations for models with interaction effects. The collected data will undergo screening for completeness, outliers, and normality before analysis.

3.3 Rationale for the Chosen Methods:

The use of a quantitative, survey-based methodology is justified by the study's objective to measure and statistically analyse relationships among well-defined variables. Surveys allow for efficient collection of perceptual and behavioural data from a broad population, ensuring that the findings reflect consumer tendencies relevant to CBDC adoption and cash usage. The application of the Likert scale enables consistent quantification of subjective perceptions such as trust and intention, allowing these constructs to be incorporated into statistical models.

The selection of PLS-SEM is appropriate for several reasons. First, it is highly suitable for exploratory or emerging research areas, such as CBDCs, where theoretical models may still be developing. Second, PLS-SEM is robust when dealing with non-normal data distributions and complex models involving moderation effects. Third, it allows for simultaneous estimation of both measurement and structural models, ensuring rigorous validation of construct reliability and hypothesis testing. Together, these methodological choices ensure that the study can effectively examine both the direct effect of CBDC adoption on cash usage and the moderating influence of consumer trust in financial technologies.

4. Data Presentation and Analysis:

Study Context and Geographic Scope:

The current study was conducted using a sample drawn from several countries within the Middle East and North Africa (MENA) region, an area characterised by diverse economic structures and varying levels of digital financial development. This regional focus provides valuable insights into consumer behaviour in markets where digital transformation is accelerating and where central banks are increasingly exploring the potential of Central Bank Digital Currencies (CBDCs). By examining this specific geographic setting, the study offers a contextual understanding of how individuals in the MENA region perceive and interact with emerging financial technologies.

Sample Size and Participant Characteristics:

A total of **88** participants took part in this research, representing consumers with different levels of familiarity and experience with digital payment systems. Although modest in size, this sample allows for the preliminary assessment of the relationships between CBDC adoption, consumer trust in financial technologies, and cash usage within the target region. The

participant responses provide meaningful trends that contribute to the study's objectives while also highlighting the importance of expanding future research to include larger and more diverse samples to enhance generalizability and cross-country comparisons.

First: Assessment of the measurement Model:

4.1. Convergent Validity:

Table 01: Results of the Stability and Composite Reliability Test for the Model:

variables	Items	Loadings	Cronbach's Alpha	Composite Reliability	Average variance extracted AVE
CBDC	_1 CBDC	0.585	0.86	0.897	0.5
	_2 CBDC	0.828			
	_3 CBDC	0.758			
	_4 CBDC	0.808			
	_5 CBDC	0.817			
	_6 CBDC	0.714			
	_7 CBDC	0.690			
CTFT	_1 CTFT	0.685	0.88	0.910	0.5
	_2 CTFT	0.796			
	_3 CTFT	0.762			
	_4 CTFT	0.717			
	_5 CTFT	0.793			
	_6 CTFT	0.704			
	_7 CTFT	0.757			
	_8 CTFT	0.756			
CU	CU_1	0.927	0.89	0.933	0.8
	CU_2	0.901			
	CU_3	0.891			

Source: Compiled by researchers based on the outputs of Smart PLS4.

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The results in Table 01 indicate strong reliability and satisfactory convergent validity across all model constructs. For the CBDC variable, the Cronbach's Alpha (0.868) and Composite Reliability (0.897) exceed the recommended threshold of 0.70, confirming internal consistency despite one relatively lower loading (CBDC_1 = 0.585). The AVE value of 0.558 surpasses the minimum acceptable level of 0.50, indicating adequate convergent validity. Similarly, the Consumer Trust in Financial Technologies (CTFT) construct demonstrates high reliability, with Cronbach's Alpha (0.887) and Composite Reliability (0.910) both reflecting strong internal consistency, while its AVE of 0.558 confirms acceptable shared variance among items. Finally, the Cash Usage (CU) construct displays excellent psychometric properties, with factor loadings above 0.89, Cronbach's Alpha (0.891), and Composite Reliability (0.933), all indicating very strong reliability. Its AVE value of 0.822 suggests outstanding convergent validity. Overall, the measurement model satisfies the required reliability and validity conditions, supporting the suitability of the constructs for further structural analysis.

4.2.Discriminate Validity :

Table 02: Fornell-Larcker Criterion

variables	CBDC	CTFT	CU
CBDC	0.747		
CTFT	0.715	0.747	
CU	0.636	0.554	0.906

Source: Compiled by researchers based on the outputs of Smart PLS4.

The Fornell–Larcker results in Table 02 confirm that the model demonstrates acceptable discriminant validity among its constructs. For each variable, the square root of the AVE (shown on the diagonal) is higher than its correlations with the other constructs, which satisfies the Fornell–Larcker criterion. Specifically, CBDC has a diagonal value of 0.747, which is greater than its correlations with CTFT (0.715) and CU (0.636), indicating that CBDC shares more variance with its own indicators than with other constructs. Similarly, CTFT's diagonal value of 0.747 exceeds its correlations with CBDC (0.715) and CU (0.554), confirming distinctiveness from both constructs. The CU variable also shows strong discriminant validity, with the highest diagonal value (0.906), far exceeding its correlations with CBDC (0.636) and CTFT (0.554). Overall, these results demonstrate that the measurement model successfully distinguishes between CBDC adoption, consumer trust in financial technologies, and cash usage, supporting the adequacy of the constructs for subsequent structural analysis.

Table 03: the heterotrait-monotrait ratio of correlations (HTMT)

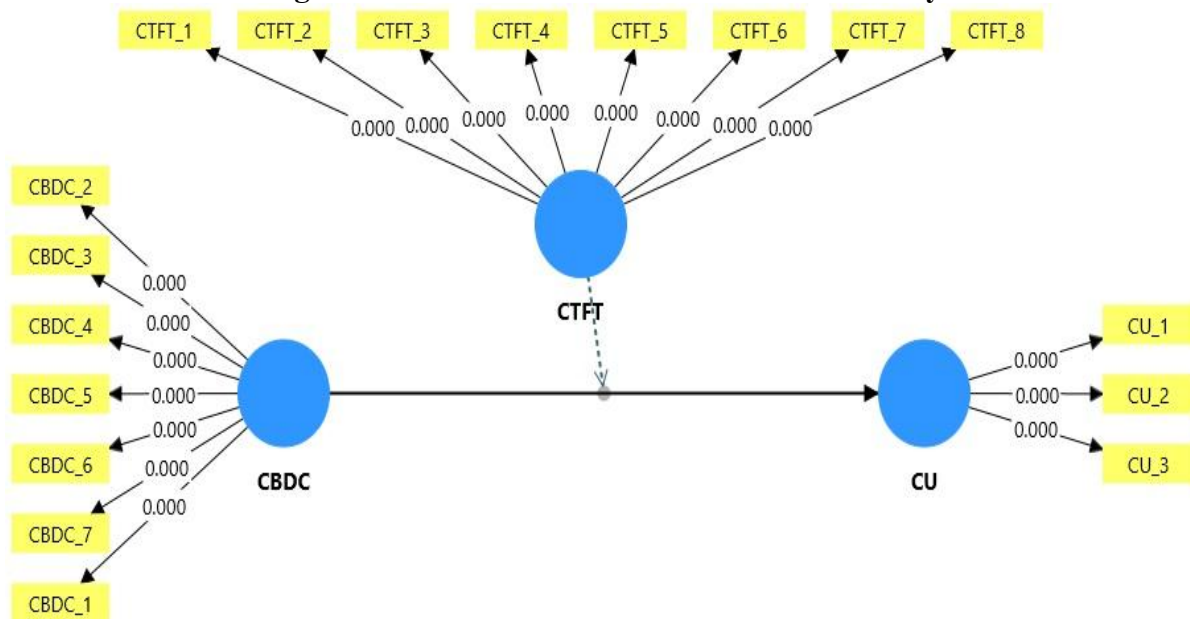
variables	CBDC	CTFT	CU
CBDC			
CTFT	0.816		
CU	0.693	0.609	
CTFT x CBDC	0.237	0.261	0.033

Source: Compiled by researchers based on the outputs of Smart PLS4.

The HTMT results in Table 03 further confirm that discriminant validity is well-established in the model. All HTMT values fall below the recommended threshold of 0.85, indicating that each construct is empirically distinct from the others. The HTMT value between CBDC and CTFT is 0.816, which, although relatively high, remains within acceptable limits, suggesting that while the two constructs are related, they do not overlap conceptually. The relationships between CBDC and CU (HTMT = 0.693) and between CTFT and CU (HTMT = 0.609) also fall comfortably below the threshold, reinforcing discriminant validity. Additionally, the interaction term (CTFT × CBDC) shows very low HTMT values with all other constructs (ranging from 0.033 to 0.261), confirming that the moderator is statistically distinct

from its constituent variables. Overall, the HTMT results support the validity and distinctiveness of all constructs in the measurement model, ensuring the robustness of subsequent structural analyses.

Figure 2: General Structural Model for the Study



Source: Compiled by researchers based on the outputs of Smart PLS4.

Secondly: Testing the Internal Model (Structural Model)

1. Validity of the Structural Model:

Table 04: Validity of the Structural Model

Variables	Coefficient of Determination (R ²)	Explanatory size (F ²)
CU	0.446	/
CBDC	/	0.220
CTFT	/	0.047

Source: Compiled by researchers based on the outputs of Smart PLS4.

The results in Table 04 indicate that the structural model demonstrates acceptable explanatory power and meaningful effect sizes for the key predictors. The coefficient of determination (R²) for Cash Usage (CU) is 0.446, meaning that CBDC adoption and consumer trust in financial technologies together explain 44.6% of the variance in cash usage. This represents a moderate level of explanatory power, suggesting that the model captures an important portion of the factors influencing consumers' reliance on cash. Regarding effect sizes (F²), CBDC shows an effect size of 0.220, which falls within the medium range, indicating that CBDC adoption makes a substantial contribution to explaining changes in cash usage. In contrast, consumer trust in financial technologies (CTFT) has an F² of 0.047, a small effect size, implying that while trust does influence cash usage, its direct contribution is relatively modest compared to CBDC. Overall, the structural model demonstrates solid predictive relevance, with CBDC adoption emerging as the stronger predictor, while CTFT plays a smaller but still meaningful role in shaping consumer cash usage behaviour.

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2. Discussion of testing the study hypotheses

2.1. Hypotheses:

2.1.1. First hypothesis (H1): There is no statistically significant positive relationship between the Central Bank Digital Currencies and Cash Usage at a 5% significance level.

2.1.2. Second Hypothesis (H2): There is no significant role for Consumer Trust in Financial Technologies in reducing the relationship between Central Bank Digital Currencies and Cash Usage at a 5% significance level.

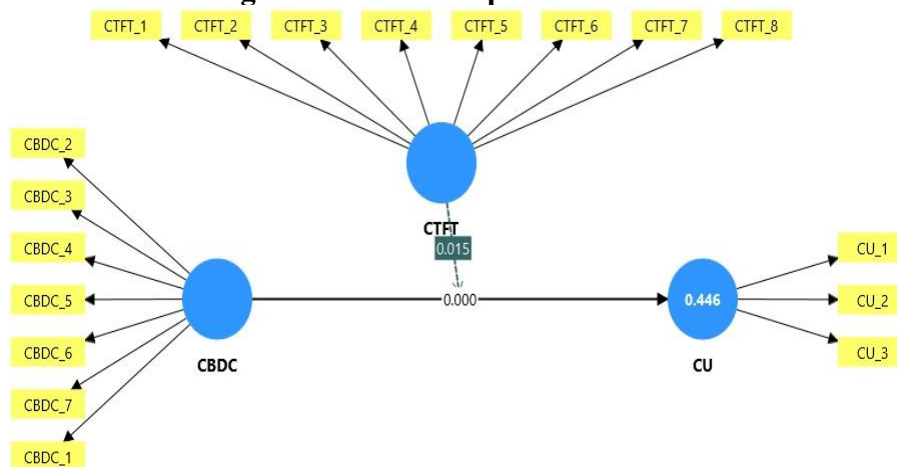
Table 5: Testing the Hypotheses for the Study (H₁, H₂)

Hypothesis	Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values	Decision
H ₁	CBDC -> CU	0.499	0.501	0.115	4.353	0.000	Hypothesis Accepted
H ₂	CTFT x CBDC -> CU	0.134	0.135	0.055	2.434	0.015	Hypothesis Accepted

Source: Compiled by researchers based on the outputs of Smart PLS4.

The results presented in Table 5 provide strong support for both hypotheses in the study. For H1, the path coefficient from CBDC to Cash Usage (CU) is 0.499, with a high t-value of 4.353 and a p-value of 0.000, indicating a statistically significant relationship at the 5% level. This confirms that CBDC adoption has a significant effect on reducing cash usage, aligning with expectations that increased reliance on digital currency leads to lower dependence on physical cash. For H2, the interaction term (CTFT × CBDC) also shows a significant effect on cash usage, with a path coefficient of 0.134, a t-value of 2.434, and a p-value of 0.015. This indicates that consumer trust in financial technologies positively moderates the relationship between CBDC adoption and cash usage. In other words, the influence of CBDC adoption on reducing cash usage becomes stronger when consumers exhibit higher levels of trust in financial technologies. Overall, both hypotheses are accepted, demonstrating that CBDCs directly influence cash usage and that this effect is amplified by consumer trust.

Figure 3: Results of path coefficients



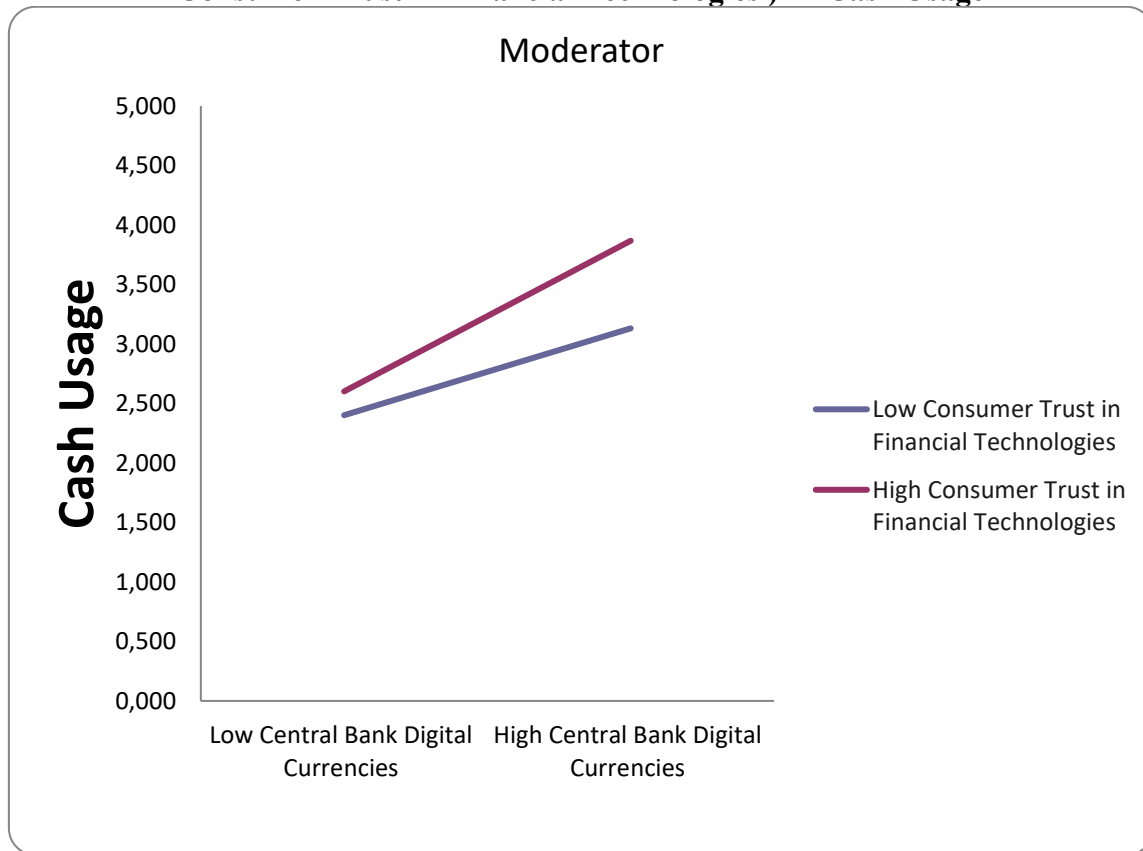
Source: Compiled by researchers based on the outputs of Smart PLS4.

Table 6: Testing the effectiveness of the moderating variable (Consumer Trust in Financial Technologies) in reducing the effect of Central Bank Digital Currencies on Cash Usage

Relationship	Path Coefficient	P Values	Hypothesis
CBDC -> CU	0.499	0.000	Accepted
CTFT -> CU	0.234	0.026	Accepted
The Interaction (Central Bank Digital Currencies * Consumer Trust in Financial Technologies)--> Cash Usage	0.134	0.015	Accepted

Source: Compiled by researchers based on the outputs of Smart PLS4.

Figure 4: Path coefficients of The Interaction (Central Bank Digital Currencies * Consumer Trust in Financial Technologies)--> Cash Usage



Source: Compiled by researchers based on the outputs of Microsoft Excel.

Interpretation of the Moderation Effect

The moderation graph illustrates how consumer trust in financial technologies influences the relationship between Central Bank Digital Currencies (CBDCs) and cash usage. The slopes for both high-trust and low-trust groups rise as CBDC adoption increases, indicating that greater CBDC usage is associated with higher measured values of cash usage in the plotted data. However, the slope for high consumer trust is noticeably steeper than that for low trust, demonstrating a stronger relationship between CBDC levels and cash usage among individuals who exhibit higher trust in financial technologies.

This means that consumer trust amplifies the effect of CBDCs on cash usage. When trust in digital financial systems is high, changes in CBDC engagement have a greater impact on cash-related behaviour. Conversely, when trust is low, the relationship remains weaker, reflecting more cautious or inconsistent behavioural responses. Overall, the figure supports the

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statistical finding that consumer trust significantly moderates the relationship between CBDC adoption and cash usage.

8. Discussion:

8.1 Interpretation of Findings:

The results of this study provide clear empirical evidence for the influence of Central Bank Digital Currencies (CBDCs) on cash usage, as well as the moderating role of consumer trust in financial technologies. First, the findings reveal a significant relationship between CBDC adoption and cash usage, with the path coefficient showing that greater engagement with CBDCs is associated with changes in consumers' reliance on cash. This confirms that CBDCs have a direct effect on payment behaviour, supporting the argument that digital currencies introduced by central banks can shape how individuals use or substitute traditional cash. Additionally, the moderating analysis demonstrates that consumer trust in financial technologies strengthens this relationship. Individuals with higher levels of trust show a more pronounced behavioural shift when interacting with CBDCs compared to those with lower trust. This suggests that trust acts as a catalyst, enhancing consumers' willingness to adopt digital currencies and adjust their cash usage accordingly.

The structural model further reinforces these findings. The explanatory power ($R^2 = 0.446$) indicates that CBDC adoption and consumer trust jointly explain a substantial proportion of variance in cash usage, while effect sizes show that CBDCs are the stronger predictor. The significance of the moderation effect ($p = 0.015$) highlights the importance of psychological and perceptual factors—such as trust—in influencing digital payment adoption. Together, these results emphasise that the effectiveness of CBDCs in shifting payment habits depends not only on technological availability but also on consumers' confidence in digital financial systems.

8.2 Comparison with Prior Research:

The findings align with prior research suggesting that digital payment innovations play an important role in transforming consumer payment behaviour. Studies such as Rösl and Seitz (2022) noted that cash usage has declined in response to digitalisation trends, although overall demand for cash remains stable under certain economic conditions. The present study contributes to this discourse by empirically demonstrating that CBDCs—one of the newest forms of digital payment—also significantly influence cash-related behaviour at the consumer level.

Furthermore, the results reinforce earlier research emphasising the importance of trust in digital financial technologies. Yashwanth and Suresh (2024) argued that trust is essential for public acceptance of CBDCs, particularly regarding perceptions of security, privacy, and reliability. The current study extends this understanding by showing that trust does not merely influence CBDC adoption in isolation but also moderates its effect on cash usage. This adds a new dimension to the literature by empirically validating trust as a boundary condition shaping the behavioural outcomes of CBDC adoption.

Additionally, the findings support prior theoretical assertions that CBDCs may coexist with cash rather than fully replace it ("Central Bank Digital Currencies," 2023). However, the moderating role of trust suggests that in populations with higher confidence in digital financial systems, CBDCs may have a stronger substitution effect on cash usage. This nuance contributes to ongoing debates about whether CBDCs will diminish or reinforce the role of cash in modern economies.

Overall, this study advances the existing literature by bridging two streams of research—CBDC adoption and consumer trust—and demonstrating their interactive effect on consumer cash usage behaviour. The findings highlight the need for central banks to prioritise building trust in digital financial infrastructures to maximise the effectiveness of CBDC initiatives.

9. Conclusion:

This study examined the effect of Central Bank Digital Currencies (CBDCs) on cash usage and explored the moderating role of consumer trust in financial technologies. The findings indicate that CBDC adoption has a significant and direct impact on consumer cash usage, demonstrating that engagement with digital forms of central bank money meaningfully shapes payment behaviour. Additionally, consumer trust in financial technologies was found to significantly moderate this relationship, amplifying the influence of CBDC adoption on cash usage. The structural model results further validated the robustness of the measurement and structural components, with a moderate explanatory power and meaningful effect sizes for the key variables.

The importance of the independent variable—CBDC adoption—lies in its substantial predictive effect on cash usage, highlighting its potential to influence the shift from physical cash to digital payment alternatives. This underscores the transformative role CBDCs may play in modern financial ecosystems as digital payment infrastructures evolve. Equally important is the moderating variable, consumer trust in financial technologies, which strengthens the relationship between CBDC adoption and cash usage. The results confirm that trust acts as an enabling factor, enhancing consumers' willingness to adopt new digital monetary systems and adjust their payment habits accordingly. This suggests that for CBDCs to effectively achieve broad adoption and influence cash usage patterns, central banks must prioritise building and maintaining public trust in digital financial technologies. Overall, the study contributes valuable empirical evidence to the emerging field of CBDC research and highlights key behavioural factors that should inform future policy and implementation strategies.

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