

Statistical Comparison of Transaction Value and Volume between UPI, IMPS and CTS: A T-Test Based Analysis

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ABSTRACT: When finance merged with technology, it marked the beginning of a new era—FinTech—transforming financial services into accessible, real-time, and user-centric systems. This study examines how major digital payment systems have contributed to India’s transaction landscape in the last year, with a specific focus on UPI and IMPS, which consistently report the highest transaction volumes. The research evaluates whether there is a significant difference in the mean transaction value and volume between these payment systems. To further understand the shift from traditional to digital instruments, an additional t-test is conducted between UPI and CTS, representing online payments versus paper-based cheque processing. This comparison identifies whether their mean transaction value and volume differ significantly, highlighting the behavioral transition from manual to digital modes. All transactional data used in the analysis is sourced from NPCI. The findings provide insights into the dominance of UPI, the position of IMPS, and the declining dependency on CTS, thereby reflecting the broader evolution of India’s payment ecosystem.

Keywords: FinTech, Unified Payments Interface (UPI), Immediate Payment Service (IMPS), Cheque Truncation System (CTS), T-test Analysis, Payment Ecosystem

I. INTRODUCTION

FinTech is an industry that has transformed the way financial services are accessed and used by individuals. It has made every financial transaction more accessible, transparent, and convenient by enabling people to make payments at any time, from any location, and for any suitable amount. In addition to payments, FinTech has simplified insurance services by making policy information, claim processes, and maturity values more visible and easier to understand. Wealth-tech platforms have further expanded opportunities for individuals to invest in a range of securities through simple, user-friendly digital interfaces. FinTech has also supported the entrepreneurial ecosystem by making the lending process quicker and more flexible. Start-ups and small businesses can now access funds digitally without long procedures, giving them financial support at the time and place they need it. Overall, FinTech has redefined financial accessibility and created a more inclusive, technology-driven financial environment in India.

II. BACKGROUND OF THE STUDY

India has witnessed a major shift in its payment landscape as citizens—traditionally sensitive about financial security and cash dependence—gradually embraced digital transactions. Events like demonetization and the Digital India initiative significantly accelerated this transformation, making digital payments a routine part of daily life for millions.

The National Payments Corporation of India (NPCI) has played a central role in this transition by developing and managing various payment products while also publishing comprehensive transactional information for each system. Over the years, digital payments in India have expanded rapidly, both in terms of transaction volume and total value, indicating increased trust and reliance on electronic payment modes.

Among NPCI's innovations, the Unified Payments Interface (UPI) has emerged as a groundbreaking system that not only dominates domestic transactions but is also gaining global adoption across multiple countries. This raises an important question about whether UPI's performance is significantly different from or superior to other NPCI products such as IMPS and CTS.

Therefore, the present study examines the contribution of different payment systems over the last year and conducts statistical tests to analyze whether the differences between UPI, IMPS, and CTS are significant. The study aims to understand India's evolving digital payment behavior and the competitive position of UPI within the broader retail payment ecosystem.

III. HISTORY OF DIGITAL PAYMENTS IN INDIA

India's digital payment ecosystem has evolved steadily over the last two decades. In the early 2000s, online banking and prepaid mobile payments introduced users to basic digital transactions, setting the stage for future innovations. Between 2010 and 2016, the introduction of Aadhaar-enabled digital identity, the rise of digital wallets, and demonetization accelerated the shift toward electronic payments and provided momentum to the fintech industry.

From 2017 to 2020, UPI emerged as a central platform for real-time person-to-person and merchant transactions, while regulators encouraged integration of fintech solutions with insurance, investment, and lending services.

The COVID-19 pandemic and subsequent period further increased the adoption of digital payments. UPI became a globally recognized platform, supported by homegrown fintech unicorns that expanded digital lending, payments, and financial inclusion. This phase marked India's emergence as a leader in the digital payment and fintech ecosystem.

IV. OBJECTIVES OF THE STUDY

- To examine the transactional volume and value of major digital payment systems during the last year.
- To determine whether there is a significant difference between growth rate of UPI and IMPS in terms of mean transaction value and transaction volume.
- To determine whether there is a significant difference between growth rate UPI and CTS in terms of mean transaction value and transaction volume.

V. SCOPE OF THE STUDY

The study aims to understand the contribution of major payment systems to India's digital ecosystem over a period of one year, using transactional volume and values as a key indicator. It focuses on examining whether the two largest digital payment platforms—UPI and IMPS—differ significantly in their mean transaction value and transaction volume. The study also evaluates the difference between a fully online payment system (UPI) and a paper-based instrument (CTS) to determine whether their transactional patterns vary over time.

The scope is limited to analyzing transaction value and transaction volume data sourced from NPCI, and it concentrates specifically on UPI, IMPS, and CTS to understand the functioning of India's payment system, with particular emphasis on UPI as a major FinTech innovation.

VI. LITERATURE REVIEW

6.1 FinTech and Digital Payment Ecosystem

The integration of technology with financial services has significantly changed the way financial transactions are conducted across the world. FinTech innovations have made payment systems more accessible, cost-efficient, and operationally

effective. According to Chemmanur et al. (2020), FinTech-based platforms create value by enhancing customer experience, improving efficiency, and promoting financial inclusion, while also posing competitive challenges to traditional banking institutions. Their study highlights that a strong digital payment infrastructure has become an essential element of modern financial systems, especially in emerging economies.

In India, the growth of digital payments has been driven by supportive regulatory frameworks, rapid technological adoption, and increased smartphone usage. The National Payments Corporation of India (NPCI) has played a central role in developing a reliable and interoperable payment framework through platforms such as UPI, IMPS, and CTS. These payment systems facilitate person-to-person, person-to-merchant, and institutional transactions, thereby supporting India's gradual shift toward a less-cash economy.

6.2 Empirical Studies on UPI, IMPS, and CTS

A number of studies have explored the influence of UPI on financial inclusion and economic development in India. Rastogi et al. (2021) find that the adoption of UPI has contributed positively to financial literacy and inclusive growth, with user trust and system reliability acting as important mediating factors. Their research identifies UPI as a significant digital innovation that has altered payment behaviour across the country.

Studies comparing UPI and IMPS have emphasised their importance in enabling real-time fund transfers and shaping monthly transaction behaviour. Paramasivan and Surya (2025) report consistent growth in both transaction volume and value for these platforms, with UPI recording a higher growth rate than IMPS. This trend is largely attributed to greater ease of use, higher digital awareness, and expanding merchant acceptance. However, the study relies mainly on descriptive and growth-based analysis, with limited application of statistical methods to compare mean differences between the two systems.

Existing research on the Cheque Truncation System (CTS) primarily focuses on its role in improving efficiency within the banking sector. Chauhan and Saini (2013) explain that CTS enhances cheque clearing by replacing the physical movement of cheques with electronic image processing, leading to faster settlement and reduced operational risk. While CTS represented a major technological advancement at the time of its introduction, the rapid expansion of digital payment platforms has significantly changed user preferences, raising questions about the relevance of cheque-based instruments in an increasingly digital payment environment.

Taken together, the reviewed studies indicate a rapid expansion of digital payment systems in India, with platforms such as UPI and IMPS emerging as dominant channels. Existing research has primarily focused on adoption trends, operational efficiency, and growth patterns of individual payment systems. However, much of this work relies on descriptive or trend-based analysis. Relatively limited attention has been paid to statistically examining whether the observed differences in transaction volume and transaction value across payment systems are significant. Consequently, the comparative performance of fully digital platforms and paper-based payment instruments remains insufficiently explored from an empirical and hypothesis-driven perspective.

6.3 Research Gap

Although existing studies provide useful insights into the growth, adoption, and efficiency of digital payment systems in India, important gaps remain. Prior research largely relies on descriptive growth trends or examines individual payment platforms in isolation. Limited empirical work statistically compares transaction volume and transaction value across digital and paper-based payment systems using hypothesis-driven methods and official NPCI data. To address this gap, the present study conducts a comparative statistical analysis of UPI, IMPS, and CTS using paired sample t-tests to examine structural shifts in India's payment ecosystem and the relative positioning of digital and traditional payment systems.

VII. RESEARCH METHODOLOGY

7.1 Research Design:

The study follows a quantitative descriptive research design. This approach suits the nature of the research because the analysis is based entirely on secondary data obtained from NPCI. The focus is on examining the transaction volume and transaction value of each NPCI product over the selected period.

The study relies on numerical comparisons to understand how different products contribute to total transactions during the year. The data allows clear measurement of trends, patterns, and differences across products. Since the aim is to compare the numerical contribution of each product and evaluate the variation between them, a quantitative descriptive design is the most appropriate choice for this research.

7.2 Nature Of The Study:

The study uses a quantitative and comparative approach. It is based entirely on secondary data sourced from NPCI. The first part of the analysis focuses on the transaction volume and value of each NPCI product to understand their contribution over the selected period.

For the hypothesis testing, the study applies an independent t-test to compare the mean transaction volume and value of UPI with IMPS, and UPI with CTS. Data from the defined time periods is used to examine whether the differences in their averages are statistically significant.

7.3 Data Type And Sources:

This research is based entirely on secondary data collected from the National Payments Corporation of India (NPCI). The dataset includes the transaction volume and transaction value of various NPCI products such as UPI, IMPS, CTS, NACH Debit, NACH Credit, NETC, AEPS, BHIM Aadhaar, and others. For the comparative analysis of annual performance, the data covers the period from April 2024 to March 2025.

For the t-test analysis between UPI and IMPS, additional data from NPCI has been used for the period July 2016 to September 2025. Similarly, the t-test between UPI and CTS is based on NPCI data from May 2021 to September 2025. These extended timeframes provide enough observations to calculate meaningful averages, variances, and significance levels for the statistical tests.

7.4 Sampling Framework:

This study does not rely on any sampling method because the analysis is entirely based on secondary data from NPCI. Instead of selecting a portion of the data, the research uses the complete set of monthly transaction figures available for UPI, IMPS, and CTS within the chosen time periods. This makes the approach similar to a census, where every available observation is included. Since all information comes directly from NPCI's official records, there is no need for respondents or primary data collection, and issues like sampling bias do not arise.

7.5 Variables Used:

The study focuses on two core quantitative variables derived from monthly NPCI transaction data:

- Transaction Volume: Represents the total number of transactions processed through UPI, IMPS, and CTS each month. This variable is used to assess the frequency and scale of usage across the payment systems.
- Transaction Value: Indicates the total monetary value of transactions recorded monthly for each payment system. This helps compare the financial magnitude of digital transactions.

Both variables are continuous, numerical, and consistently measured across all systems, making them appropriate for comparative analysis using paired sample t-tests.

7.6 Tools And Techniques For The Analysis:

The study uses quantitative tools and statistical techniques to assess whether meaningful differences exist in the mean transaction volume and value of UPI, IMPS, and CTS. The core analytical method is the **paired sample t-test**, suitable for comparing two related data sets across the same timeframe. The data is organized and processed in **Microsoft Excel**, which is also used to generate essential descriptive statistics such as mean, variance, correlation, and degrees of freedom. Together, these techniques provide a clear and objective basis for hypothesis testing and performance evaluation of the selected payment systems. Year-on-year growth rates of transaction volume and value were computed using NPCI data, and paired sample t-tests were applied to compare the mean growth rates of UPI and CTS.

7.7 Assumptions Of The Paired Sample T-Test:

The paired sample t-test relies on a few basic assumptions. In the present study, the observations are paired because the year-on-year growth rates of different payment systems are compared for the same time periods using NPCI data. The distribution of differences between the paired observations was reviewed and found to be reasonably normal. Considering the moderate sample size and the continuous nature of the growth-rate data, the normality condition is regarded as acceptable under the central limit theorem. Further, the variables used in the analysis are measured on a continuous scale, and the data were checked for extreme outliers, none of which were found to materially influence the results. Accordingly, the paired sample t-test is considered suitable for the analysis undertaken in this study. It is also noted that equality of variance is not a prerequisite for the paired t-test, as the method is based on within-pair differences rather than comparisons between independent groups.

7.8 Hypothesis:

Null Hypothesis (H0): There is no significant difference between the mean year-on-year growth rate of UPI and IMPS transaction volumes and values.

Alternative Hypothesis (H1): There is a significant difference between the mean year-on-year growth rate of UPI and IMPS transaction volumes and values.

Null Hypothesis(H01): There is no significant difference between the mean year-on-year growth rate of UPI and CTS transaction volumes and values.

Alternative Hypothesis(H11): There is a significant difference between the mean year-on-year growth rate of UPI and CTS transaction volumes and values.

VIII. DATA ANALYSIS & INTERPRETATION

8.1 Institutional Framework and Functional Architecture of NPCI

NPCI (National Payments Corporation of India) is the organization responsible for developing and managing India's core digital payment infrastructure. It enables seamless, secure, and instant transactions across the country—whether sending money, paying bills, or accessing banking services at any time. NPCI handles 650+ million transactions every day, and more than 30% of Indians use at least one of its payment systems. Through its innovations, NPCI has strengthened India's digital ecosystem and made financial services more inclusive and accessible. Following are the products of NPCI.

UPI – Unified Payments Interface: Used for sending or receiving money instantly through mobile applications. It enables real-time bank-to-bank payments using a virtual payment address (VPA).

BHIM Aadhaar Pay: Allows individuals to make payments through their Aadhaar number and fingerprint. Useful for customers who do not use smartphones or debit cards.

NACH – National Automated Clearing House (Debit): Automatically deducts money from a customer's bank account for recurring payments such as EMIs, SIPs, loans, utility bills, etc.

IMPS – Immediate Payment Service: A real-time fund transfer system that enables instant bank-to-bank transfers 24/7.

AePS – Aadhaar Enabled Payment System: Allows cash withdrawal, balance enquiry, and fund transfer using Aadhaar and biometric authentication at micro-ATMs or agent points.

NACH – APBS (Aadhaar Payment Bridge System): Used by the government to credit subsidies, welfare benefits, pensions, and refunds directly into Aadhaar-linked bank accounts.

NETC – National Electronic Toll Collection: Enables automatic toll payment using FASTag, reducing waiting time at toll plazas.

NFS – National Financial Switch: India’s largest shared ATM network that facilitates inter-bank ATM transactions (cash withdrawal, balance enquiry, etc.).

AePS Fund Transfer: Enables instant fund transfer using Aadhaar and fingerprint through a micro-ATM operated by banking correspondents.

CTS – Cheque Truncation System: The Cheque Truncation System (CTS) is a process that converts physical cheques into digital images, allowing them to be processed electronically.

8.2 Comparative Analysis Of Digital Transaction Channels Based On Volume And Average Daily Volume (April 2024 – March 2025)

Transaction volume represents the total number of transactions processed through each payment system within a specific period. To understand the activity level and user adoption of NPCI platforms, the following table summarizes the annual transaction volumes.

TABLE I
TRANSACTION VOLUME

Facilities	Volume
UPI	185866.02
IMPS	5624.97
NETC	4209.12
NFS	3571.29
AePS: BHIM Aadhaar	23.02
AePS: CASH WITHDRAWN	1164.06
AePs: Fund Transfer	0.36
NACH – APBS	3290.96
NACH-DEBIT	1967.26
NACH – Credit	1684.18
CTS	607.33
Total	208008.57

(Source: NPCI — official website, <https://www.npci.org.in/>)

The analysis of transaction volumes across NPCI-operated payment systems for the last one-year highlights distinct usage patterns. UPI records the highest number of transactions, reflecting its dominant role in India’s digital payment ecosystem. IMPS, NETC, NFS, and NACH-APBS show moderate and relatively close transaction volumes, indicating steady utilization across these services.

Within Aadhaar-enabled systems, AEPS Cash Withdrawal, NACH Debit and NACH Credit display higher volumes compared to CTS, AEPS BHIM Aadhaar and AEPS Fund Transfer. This shows that Aadhaar-linked platforms are used more for withdrawal and automated debit/credit functions than for transfer-based transactions. However, the overall contribution of AEPS-based channels remains limited when compared with major digital payment systems like UPI and IMPS.

The comparative analysis therefore suggests that the digital ecosystem is largely driven by instant mobile-based payment platforms, while Aadhaar-linked and paper-supporting systems continue to operate at lower but consistent levels.

8.3 Comparative Analysis Of Digital Transaction Channels Based On Value And Average Daily Value (April 2024 – March 2025)

The table displays how different NPCI products have contributed to the total transaction value from April 2024 to March 2025. It offers a quick view of which product holds the largest share in the overall value processed during the year.

TABLE II
TRANSACTION VALUE

Product	Value
UPI	26056954.65
IMPS	7139109.97
NETC	72930.83
NFS	1556225.85
AePS: BHIM Aadhar	6886.71
AePS: Cash Withdrawn	296622.11
AePS: Fund Transfer	188.88
NACH-APBS	552351.97
NACH-DEBIT	2191625.52
NACH-CREDIT	1657925.36
CTS	7084548.99
Total	46615370.84

(Source: NPCI — official website, <https://www.npci.org.in/>)

UPI accounts for the largest share of total transaction value, making it the dominant contributor among all NPCI products. IMPS and CTS follow as the second-highest contributor, reflecting their continued relevance for high-value transfers.

NFS, NACH Debit, and NACH Credit show similar levels of contribution, indicating moderate but steady usage across automated and card-based transactions.

In contrast, NETC, AePS: BHIM ADDHAR and NACH APBS contribute only a small fraction of the total transaction value, highlighting that these systems remain less utilised for high-value payments.

8.4 A Hypothesis-Based Comparative Analysis Of Upi And Imps Growth In India

Null Hypothesis (H0): There is no significant difference between the mean year-on-year growth rate of UPI and IMPS transaction volumes and values.

Alternative Hypothesis (H1): There is a significant difference between the mean year-on-year growth rate of UPI and IMPS transaction volumes and values.

TABLE III
T-TEST: PAIRED TWO SAMPLE FOR MEANS (VOLUME)

	YOY Growth (UPI)	YOY Growth (IMPS)
Mean	21.87314658	0.355887884
Variance	8710.838163	0.150495199
Observations	99	99
Pearson Correlation	0.473448883	
Hypothesized Mean Difference	0	
df	98	
t Stat	2.298408064	
P(T<=t) one-tail	0.011831617	
t Critical one-tail	1.660551217	
P(T<=t) two-tail	0.023663233	
t Critical two-tail	1.984467455	

The t-test for transactional volume uses data from July 2017 to March 2025. The results show that the mean transaction volume of UPI is 21.87, whereas the mean transaction volume of IMPS is 0.355. This gap is mainly a result of the large difference in variance between the two systems, as UPI handles a significantly higher and more fluctuating number of transactions.

The calculated t-statistic is 2.298, while the t-critical value (one-tailed) is 1.66 and the t-critical value (two-tailed) is 1.98. Since the t-statistic is higher than both critical values, the test indicates a significant difference at the 5% level.

The p-value for the one-tailed test is 0.01, and the p-value for the two-tailed test is 0.02366. Both values are below 0.05, confirming that the null hypothesis is rejected. This means there is a statistically significant difference between the mean transaction volume of UPI and IMPS during the study period.

TABLE IV:
T-TEST: PAIRED TWO SAMPLE FOR MEANS (VALUE)

	YOY GROWTH (UPI)	YOY GROWTH (IMPS)
Mean	110.5083198	0.425656638
Variance	828863.2538	0.129941623
Observations	99	99
Pearson Correlation	0.310431901	
Hypothesized Mean Difference	0	
df	98	
t Stat	1.2032294	
P(T<=t) one-tail	0.115893116	
t Critical one-tail	1.660551217	
P(T<=t) two-tail	0.231786231	
t Critical two-tail	1.984467455	

The t-test for transaction values is conducted using data from July 2024 to September 2025. The results show that the mean transaction value of UPI is 110.5, whereas the mean transaction value of IMPS is 0.426. The large difference in these mean values reflects the wide gap in scale and usage intensity between the two systems. This difference arises mainly due to the high variance observed in UPI values compared with IMPS.

The computed t-statistic is 1.203. The t-critical values for both the one-tailed and two-tailed tests are the same as in the earlier analysis (1.66 for one-tailed and 1.98 for two-tailed). Because the t-statistic is lower than both critical values, the test result shows no significant difference at the 5% significance level.

The p-value for the one-tailed test is 0.11, and the p-value for the two-tailed test is 0.23. Both p-values are greater than 0.05, meaning the null hypothesis cannot be rejected.

Therefore, even though UPI shows a much larger transaction value in absolute terms, the statistical test indicates that the difference in their mean transaction values is not significant during the study period.

8.4 A Hypothesis-Based Comparative Analysis Of Growth Trends Between Upi And Cts In India

Null Hypothesis(H01): There is no significant difference between the mean year-on-year growth rate of UPI and CTS transaction volumes and values.

Alternative Hypothesis(H11): There is a significant difference between the mean year-on-year growth rate of UPI and CTS transaction volumes and values.

TABLE V
T-TEST: PAIRED TWO SAMPLE FOR MEANS (VOLUME)

	YOY Growth (UPI)	YOY Growth (CTS)
Mean	0.564954415	2.202218941
Variance	0.048076878	20.26770295
Observations	41	41
Pearson Correlation	0.830575537	
Hypothesized Mean Difference	0	
df	40	
t Stat	-2.425875923	
P(T<=t) one-tail	0.009937541	
t Critical one-tail	1.683851013	
P(T<=t) two-tail	0.019875083	
t Critical two-tail	2.02107539	

The t-test for comparing UPI and CTS transactional volume uses data from May 2022 to September 2025. The results show that the mean transaction volume of UPI is 0.564, whereas the mean for CTS is 2.2022. The difference in their averages is mainly due to the higher variance in CTS, which shows more fluctuation in the number of transactions over the period.

The calculated t-statistic is -2.42. The t-critical values are 1.68 for the one-tailed test and 2.02 for the two-tailed test. Since the absolute value of the t-statistic (2.42) is greater than both critical values, the test shows a significant difference between the two means.

The p-value for the one-tailed test is 0.0099, and the p-value for the two-tailed test is 0.01987. Both values are below 0.05, confirming that the null hypothesis is rejected.

Therefore, there is a statistically significant difference between the average transactional volume of UPI and CTS during the study period.

TABLE VI
T-TEST: PAIRED TWO SAMPLE FOR MEANS (VALUE)

	YOY Growth (UPI)	YOY Growth (CTS)
Mean	0.427459054	0.021365398
Variance	0.037094404	0.017241161
Observations	41	41
Pearson Correlation	0.711157533	
Hypothesized Mean Difference	0	
df	40	
t Stat	19.18708315	
P(T<=t) one-tail	4.39922E-22	
t Critical one-tail	1.683851013	
P(T<=t) two-tail	8.79843E-22	
t Critical two-tail	2.02107539	

The t-test for transaction values of UPI and CTS is conducted using data from the study period. The results show that the mean transaction value of UPI is 0.427, while the mean for CTS is 0.0213. Their variances are also relatively similar across the observed months.

The computed t-statistic is 19.187, which is much higher than the t-critical values (1.68 for the one-tailed test and 2.02 for the two-tailed test). Since the t-statistic is far above both critical values, the test indicates a clear significant difference between the two means.

The p-value for the one-tailed test is 4.39922×10^{-22} , and the p-value for the two-tailed test is 8.79843×10^{-22} . Both p-values are extremely small and well below the 0.05 significance level.

Therefore, the test confirms a statistically significant difference between the average transaction values of UPI and CTS during the study period.

IX. FINDINGS

- The assessment of NPCI's data from April 2024 to March 2025 clearly shows that UPI stands as the dominant force in India's digital payment ecosystem, recording the highest transaction volume and value across all platforms. Its performance substantially surpassed IMPS, NETC, NFS, NACH variants, AePS services, and CTS, reflecting broad national adoption and consistent day-to-day usage. IMPS, NETC, NFS, and NACH products displayed steady and moderate utilisation, whereas AePS services contributed only marginally. CTS registered the lowest activity, underscoring the continued contraction of cheque-based payments.
- The value-based assessment further reinforced that UPI remains the principal contributor to total payment value, followed by IMPS and CTS. IMPS continues to be an important channel for mid- and high-value transactions, while CTS, though

still processing some value, has been gradually overshadowed by more efficient digital alternatives. Systems such as NETC, NACH Debit and Credit, NACH-APBS, and AePS retained limited but essential operational importance, serving specific transactional functions within the broader ecosystem.

- The t-test analysis highlighted a significant difference in transaction volume between UPI and IMPS, confirming UPI's wider adoption and higher frequency of use. However, the lack of a significant difference in transaction value indicates that both platforms continue to support high-value transfers, despite their differing transaction scales. This suggests that IMPS remains integral for secure and formal transfers, whereas UPI predominates in routine, high-frequency digital payments.
- The comparative t-test between UPI and CTS revealed significant differences in both transaction volume and value, providing strong evidence of the marked decline in cheque usage and the shift towards digital payment modes, while UPI reflected sustained growth, highlighting its central role in accelerating digital adoption.
- Collectively, the findings indicate that India's payment landscape is increasingly centred on fast, interoperable, and user-driven digital platforms, with UPI leading in both scale and transactional value. IMPS continues to occupy a specialised position in high-value transfers, while CTS functions largely as a diminishing legacy mechanism. These insights validate the strength of NPCI's digital architecture and signal India's ongoing movement toward efficiency, speed, interoperability, and a digital-first financial environment.

X. DISCUSSION

The findings of this study provide important insights into the structural transformation of India's payment ecosystem. The statistically significant differences observed between UPI and CTS reflect not merely numerical variation but a fundamental shift in user behavior and institutional preference toward digital platforms. This transition highlights how technological convenience, interoperability, and policy support collectively shape payment adoption patterns.

The results are consistent with earlier empirical studies, including those by Rastogi et al. (2021) and Paramasivan and Surya (2025), which emphasize the expanding role of UPI in India's financial landscape. However, unlike previous research that primarily relied on descriptive trend analysis, the present study strengthens existing literature by statistically validating the observed differences in growth patterns. The application of hypothesis testing enables a more rigorous examination of structural shifts within the payment ecosystem, thereby offering deeper analytical insight.

From a policy and regulatory perspective, the findings reinforce the importance of continued investment in digital payment infrastructure and innovation. The widening growth gap between UPI and CTS underscores the increasing dominance of real-time digital platforms and the diminishing role of paper-based instruments. While cheque-based systems may continue to serve niche or transitional functions, their relevance in routine transactions is steadily declining. Overall, the results highlight the accelerating transformation of India's payment ecosystem toward efficiency, accessibility, and digital integration.

XI. CONCLUSION

The present study examined the comparative growth performance of major payment systems in India by analysing the mean year-on-year growth rates of transaction volume and transaction value using NPCI data. The paired sample t-test results reveal statistically significant differences between UPI and CTS, leading to the rejection of the null hypothesis. This indicates that digital payment platforms, particularly UPI, have experienced substantially higher growth than traditional cheque-based systems.

The findings provide quantitative evidence of a structural transformation in the Indian payment ecosystem, characterised by a gradual shift from paper-based instruments to digitally enabled payment platforms. By employing hypothesis-driven statistical analysis rather than relying solely on descriptive growth trends, the study contributes to a more rigorous empirical understanding of payment system evolution in India. Overall, the results highlight the increasing dominance of UPI in

promoting efficient and inclusive digital transactions, while also underscoring the declining relative importance of traditional payment mechanisms such as CTS in a rapidly digitalising economy.

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