

Estimating the Impact of Digital Payment Transactions on Inflation in India

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1. Introduction

In recent years, India has witnessed a remarkable shift in its financial ecosystem, driven by the rapid adoption of digital payment systems. A defining moment in this transformation was the 2016 demonetisation, when the government removed ₹500 and ₹1,000 notes from circulation. This event disrupted cash-based transactions, prompting millions of people to explore cashless alternatives. In response, digital payment platforms such as e-wallets and the Unified Payments Interface (UPI) gained widespread popularity, becoming crucial tools for daily transactions. Today, India stands as a global leader in digital payments, with UPI alone facilitating over 9 billion transactions each month as of 2024, according to data from the Reserve Bank of India (RBI).

While digital payments offer many advantages, such as convenience, transparency, and financial inclusion, they also bring certain challenges. One emerging concern is the impact of digital payments on inflation, a key factor in economic stability. Inflation refers to the sustained increase in the general price level of goods and services over time. When inflation rises, the purchasing power of money declines, making it more expensive for people to buy the same goods and services. Digital payment systems, by simplifying transactions and encouraging frequent spending, may contribute to inflation by driving up consumer demand. For instance, when people use digital wallets or Unified Payment Interface (UPI), they tend to spend more freely compared to when they rely on physical cash, as digital transactions are quicker and often feel less tangible. This increased spending could, over time, lead to higher demand for goods and services, potentially pushing prices upward.

Although digital payments have been widely studied for their role in promoting financial inclusion and creating a cashless economy, their link to inflation has received relatively little attention. Researchers such as Singh and Malik (2019) have explored how digital payments improve financial access in rural India, while Pal et al., (2021) examined how UPI influences consumer spending in urban areas, noting that people transact more frequently and spend larger

amounts. However, there is limited research on whether the rapid growth of digital transactions might be contributing to inflationary pressures in India.

This research paper seeks to address this gap by investigating the relationship between digital payment growth and inflation. Specifically, it will examine UPI transaction data from 2021 to 2024 to explore whether the increase in digital transactions correlates with rising inflation rates. The central question guiding this study is: *Does the widespread adoption of digital payment systems, particularly UPI, contribute to inflation in India?*

Understanding the link between digital payments and inflation is vital for policymakers and financial regulators in managing India's evolving digital economy. While platforms like UPI have improved transaction efficiency and boosted consumer spending, they may also contribute to inflationary pressures. This paper explores UPI's potential impact on inflation by analysing RBI data from 2021 to 2024 and drawing insights from previous studies. Although digital payments are often celebrated for promoting financial inclusion and convenience, their broader economic effects, particularly on monetary policy, require further investigation. This research aims to provide valuable insights to help balance the benefits of digital payments with the need for economic stability.

2. Literature Review

Rouvinen (2006) analyzes the diffusion of digital mobile telephony and investigates whether adoption patterns differ between developing and developed countries. The study identifies significant disparities in technological penetration and explores how these differences influence economic growth, innovation diffusion, and market structures. **White (2007)** reviewed the payment system innovations in the United States since 1945 and their implications for monetary policy. The paper highlights the gradual shift from traditional cash-based systems to electronic payments, emphasizing the challenges posed by technological advancements for central banks in controlling inflation and ensuring financial stability.

Reddy and Kumarasamy (2015) explored the nexus between electronic-based payments in banking and inflation in India. By studying digital payment adoption in Indian banking systems, the research provides insights into how electronic transactions impact inflationary pressures and macroeconomic dynamics, particularly in emerging economies. **Nathan (2019)** investigates the relationship between electronic payment systems and inflation rates in Nigeria. Using empirical evidence, the study examines how the adoption of electronic payments impacts price stability and identifies potential policy measures to optimize economic outcomes in a growing cashless ecosystem.

Titalassey (2020) examines the impact of cashless payments on inflation, focusing on how transitioning to cashless transactions influences monetary stability and economic growth. The study explores both opportunities and risks associated with widespread adoption of digital payment methods. Reinsdorf and Schreyer (2020) measure consumer inflation in a digital economy, addressing the challenges of accurately capturing inflation metrics as economies increasingly digitalize. The authors emphasize the need to refine traditional inflation indices to reflect changes brought by e-commerce and digital financial services.

Widiastuti and Rizky (2021) analyze the effect of e-money on inflation in Indonesia, highlighting the role of digital payment platforms in influencing the monetary base. The study discusses how the widespread use of e-money disrupts traditional money circulation and impacts the central bank's control over inflation.

Tronnier, Harborth, and Hamm (2022) investigate privacy concerns and trust in the digital Euro in Germany. The study examines the critical factors influencing public adoption of central bank digital currencies, particularly issues surrounding data security, privacy, and consumer trust in governmental financial innovations.

Azwari (2024) studies the impact of inflation, interest rates, and the use of electronic money on the money supply in Indonesia during the period 2015–2022. The findings highlight the complex interplay between digital payments, monetary circulation, and macroeconomic variables.

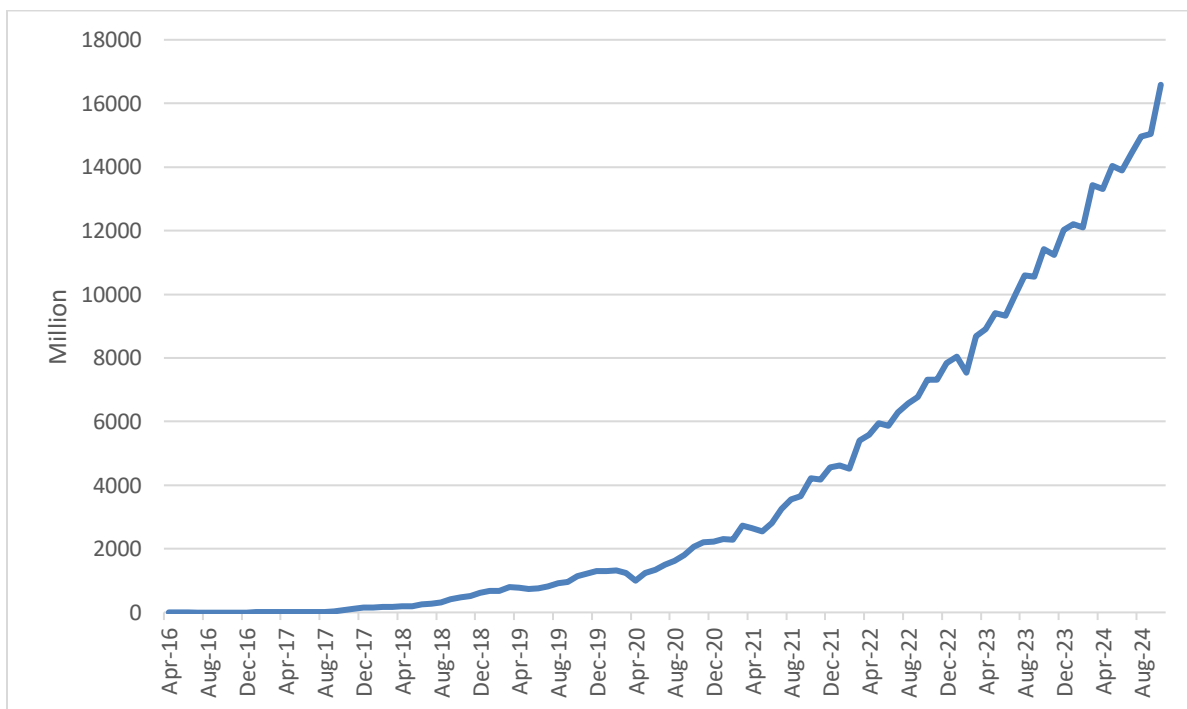
Ben Romdhane and Kammoun (2024) examine the impact of fintech on inflation and unemployment in Asia. The study identifies the disruptive effects of financial technology on traditional economic models, shedding light on the dual role of fintech in driving growth while posing challenges to inflation management. Mukta, Rayhan, and Faruq (2024) study the impact of a cashless electronic payment system on hyperinflation in Bangladesh. The research emphasizes the potential for digital payment systems to stabilize economies facing hyperinflation, while also identifying risks linked to policy mismanagement and inadequate infrastructure.

Thus, the studies across both developed and developing economies showcase mixed evidence of the effect of digital payments on inflation. Given that the diffusion model of digital transactions is rapid (Roger et al., 2014), the exponential increase can have both positive and negative consequences for the Indian economy. Therefore, we fill the research gap in this paper by examining how the rapid diffusion of digital payments through UPI affected the Indian economy.

2. Data and statistics

The data analysed in this study examines the association between digital payments (through UPI) and inflation in the Indian economy. For UPI transaction data (Volume in million and Value in crore), data was sourced from NPCI. Inflation rates was derived from the CPI Index, as recorded monthly from the RBI database.

Fig. 1: Trend of volume of UPI transactions (Apr 16 - Aug24). Source: NPCI



Volume of UPI Transactions

The volume of UPI transactions reflects the adoption of digital payment systems by individuals and businesses. In April 2016, UPI began with minimal usage, registering a volume of 0 million transactions. By November 2016, during India's demonetization period, the volume began to rise, reaching 0.29 million transactions. This marked the beginning of a widespread adoption trend, with exponential growth observed year over year.

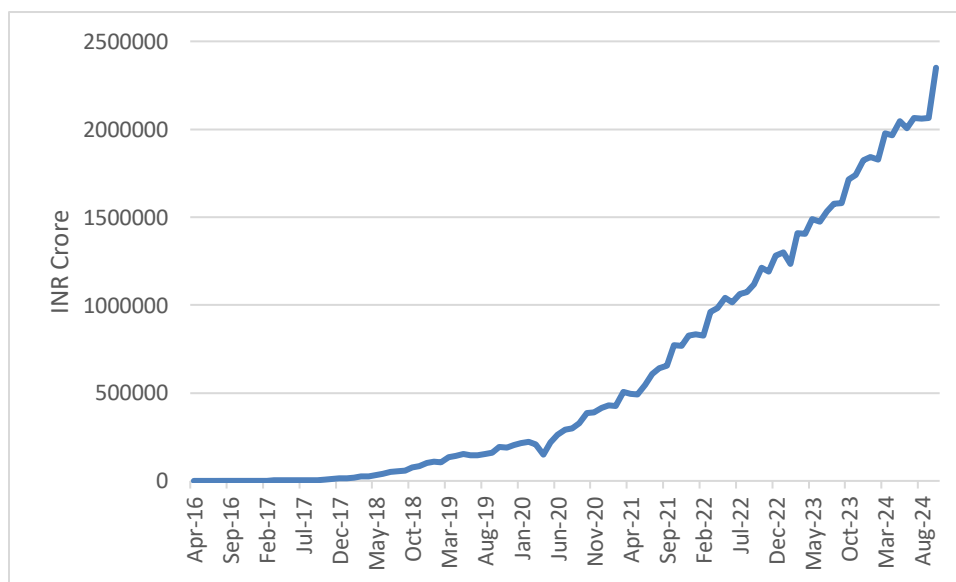
From 2017 to 2020, the monthly volume increased significantly, reflecting the growing popularity of digital transactions. By December 2020, the volume reached 2,234.16 million transactions. The data indicates a peak in October 2024, with a volume of 16,584.97 million transactions. Key events, such as the COVID-19 pandemic, further accelerated the adoption of digital payments due to reduced physical interaction and increased reliance on contactless

methods. The steady and rapid rise in UPI transaction volume signifies a shift in consumer behaviour towards digital payment systems, driven by technological advancements, government initiatives, and socio-economic factors such as the pandemic.

The UPI transaction volume experienced exponential growth since its inception in 2016, driven by demonetization and increased digital adoption. From 0.29 million (Nov 2016) to 145.64 million (Dec 2017), volumes surged dramatically. Between 2018 and 2019, volume grew from 620.17 million to 1,308.40 million, recording over 110% growth.

During the COVID-19 pandemic in 2020, volumes further rose to 2,234.16 million, showcasing UPI's resilience. Growth stabilized from 2021 onwards, with volumes increasing steadily to 7,829.49 million (Dec 2022). By Oct 2024, volumes peaked at 16,584.97 million, reflecting sustained adoption across consumers and merchants.

Fig. 2: Trend of value of UPI transactions (Apr 16 - Aug24). Source: NPCI



Value of UPI Transactions

The value of UPI transactions showcases the economic impact and the scale of digital payment adoption. Initially, in April 2016, the transaction value was negligible. However, with the advent of demonetization, transaction value surged to ₹1.0046 billion in November 2016. By December 2017, the value crossed ₹130 billion, demonstrating the increased trust and utility of UPI for higher-value transactions.

From 2018 onwards, the value of transactions grew exponentially, reaching ₹1.025 trillion by December 2018 and ₹2.025 trillion by December 2019. The trend continued despite economic challenges posed by COVID-19, reflecting the resilience of the digital economy. By October 2024, the transaction value peaked at an impressive ₹23.498 trillion.

The growth in transaction value illustrates not only increased adoption but also the use of UPI for high-value transactions. This shift suggests growing confidence among businesses and consumers in digital platforms for substantial payments, likely fuelled by improved infrastructure and policies promoting digital transactions. The value of transactions improved from a few billions in 2016 to over **20,000 billion** monthly by 2024. The correlation coefficient between transaction volume and value stands at approximately **0.995**, indicating a nearly perfect positive relationship. This underscores that as the number of transactions increases, so does the total transaction value, reflecting the dual adoption for both small-scale and large-scale transactions.

The transaction value also grew remarkably, reflecting UPI's role in handling larger financial transactions. Starting at ₹707.93 crore (Dec 2016), values jumped to ₹13,174.24 crore (Dec 2017). Between 2018 and 2019, values doubled from ₹1,02,594.82 crore to ₹2,02,520.76 crore, with a growth rate of around 97%.

Despite pandemic challenges, transaction values surged to ₹4,16,176.21 crore (Dec 2020), growing by over 105%. Post-pandemic, growth remained strong, increasing from ₹8,26,848.22 crore (Dec 2021) to ₹12,82,055.01 crore (Dec 2022). By Oct 2024, values peaked at ₹23,49,821.45 crore, underscoring UPI's critical role in India's digital economy.

Major Trends and Impacts

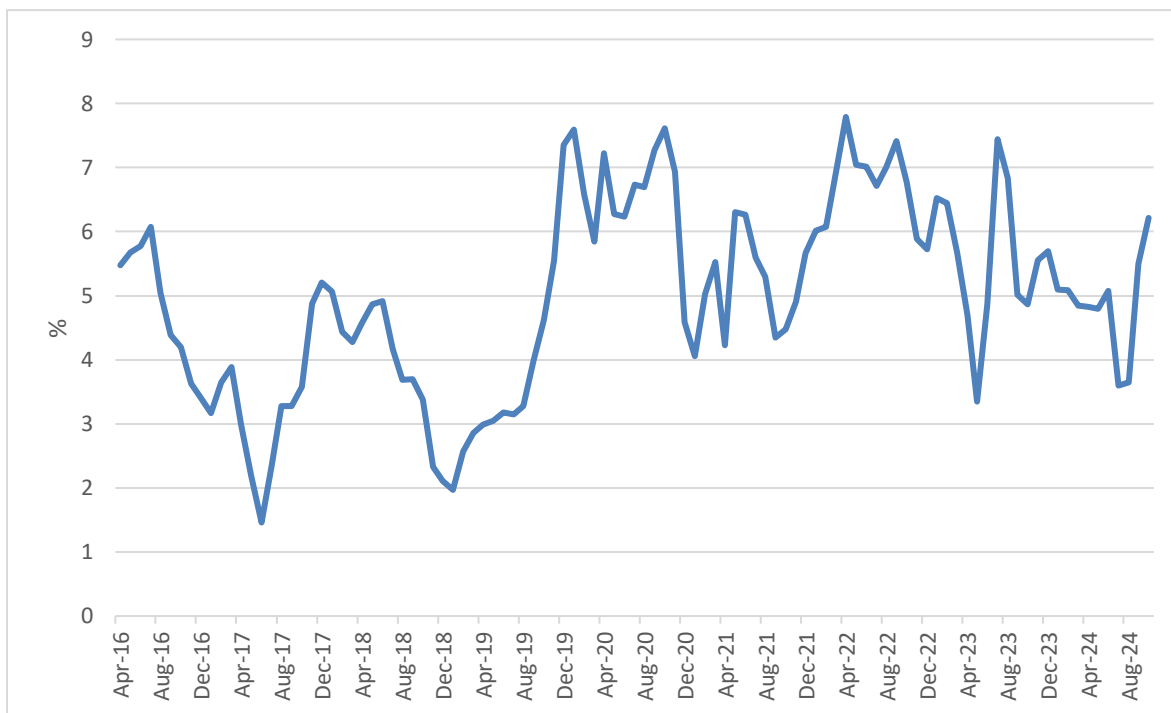
The adoption of digital payments in India has been driven by initiatives like the "Digital India" campaign launched in 2015, aimed at creating a digitally empowered society. UPI, introduced in 2016, became a cornerstone of this initiative by providing a simplified, cost-effective, and widely accessible payment platform. This was further supported by policies incentivizing digital payments and the rapid increase in smartphone users, which exceeded 800 million by 2023, coupled with affordable internet plans. The COVID-19 pandemic accelerated the adoption of digital payments as people sought safer, contactless alternatives, prompting businesses, e-commerce platforms, and small vendors to integrate UPI into their operations, making digital payments central to daily transactions.

This rapid adoption has significantly impacted India's economy. UPI has reduced reliance on cash, promoted a cashless economy, enhanced financial transparency, and improved tax compliance. It has also driven financial inclusion, especially in rural areas where banking

infrastructure is limited, allowing small businesses and individuals to participate in the digital economy. Initiatives like Jan Dhan accounts provided a strong foundation for this integration.

During the COVID-19 pandemic, UPI volumes dipped initially but recovered quickly, surpassing pre-pandemic levels by mid-2020. By October 2020, volumes reached new highs, reflecting UPI's resilience and adaptability. The pandemic fundamentally shifted payment behaviours, establishing digital payments as a preferred mode for both consumers and businesses, highlighting UPI's role in India's digital transformation.

Fig. 3 Inflation Rate in India (Aug 2016 – Aug 2024). Source: RBI data base



The highlighted CPI data provides insight into inflation trends across rural and urban regions in India, with indices calculated based on the Consumer Price Index (CPI). This includes general inflation rates, food and beverage prices, and other commodities critical to understanding cost-of-living changes. The indices cover broad categories such as food items, clothing, housing, and miscellaneous expenses, reflecting the economic realities of both rural and urban households.

Trends

The data showcases fluctuations in inflation rates across different months, indicating the varied impact of seasonal changes, supply chain disruptions, and policy interventions on rural and urban economies. The general CPI inflation for October 2024, for example, stood at **6.21%**, reflecting

moderate inflation pressures. The highest inflation rate was observed in October 2020 at **7.61%**, driven by COVID-19 disruptions, while the lowest was in June 2017 at **1.46%**, reflecting stable food prices and favourable conditions.

The pandemic caused sharp inflation spikes, with rates exceeding **7% in 2020** due to supply chain disruptions and increased costs. Inflation began stabilizing in 2021 as supply chains normalized, though it remained above **4%** throughout the year.

Inflation showed cyclical patterns, remaining moderate from 2016 to 2018, rising steadily in late **2019**, and peaking during **2020**. Post-pandemic, inflation showed gradual stabilization but stayed volatile due to global pressures and economic uncertainties.

The Russia-Ukraine war, which began in early 2022, further exacerbated global inflationary pressures. It caused significant disruptions in energy supplies, driving up oil prices globally. This, in turn, raised transportation and production costs, leading to higher inflation rates worldwide, including in India. The volatility in oil prices, combined with geopolitical tensions, added further uncertainty to inflation trends, making it harder for economies to stabilize prices despite policy interventions.

The CPI data reveals rural areas' sensitivity to food prices, while urban inflation is driven by housing and discretionary spending. The pandemic highlighted vulnerabilities in supply chains, causing inflation spikes. Recent stabilization reflects economic recovery, though targeted interventions are needed during disruptions.

Table 1: Descriptive Statistics of key indicators in the study

	Minimum	Maximum	Average
Volume(UPI)	0.09	16584.97	4043.07
Value(UPI)	0.38	2349821	641094.1
Inflation	1.46	7.79	4.97

The data highlights the significant growth of UPI transactions in India. The transaction volume ranged from a minimal **0.09 million** in its early adoption phase to a peak of **16,584.97 million**, with an average of **4,043.08 million**, reflecting its widespread acceptance over time. Similarly, transaction values showed a remarkable increase, starting at **₹0.0038 billion** and reaching **₹23.498 trillion**, with an average value of **₹6.4109 trillion**, underscoring UPI's role in both small and large transactions. Inflation trends ranged between **1.46% and 7.79%**, with an average of **4.98%**, indicating overall moderate inflation but with occasional spikes during economic

disruptions like the COVID-19 pandemic. This data emphasizes UPI's transformative role in driving digital payments and its coexistence with fluctuating economic conditions.

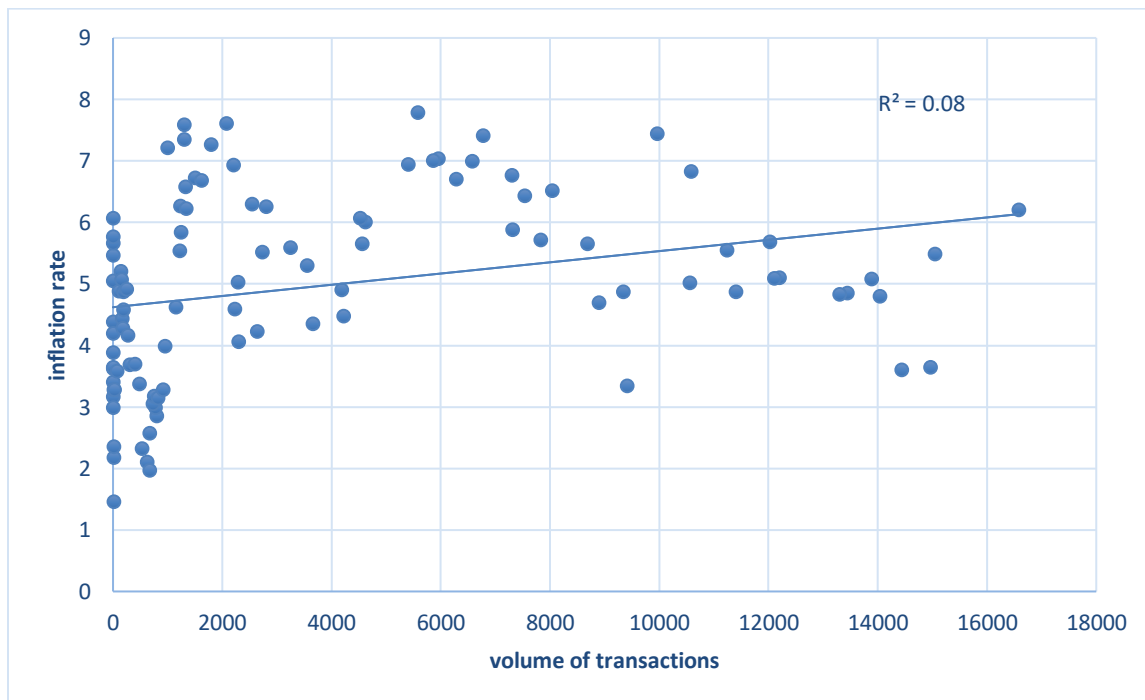
4. Results and analysis

In this section we estimate the association between our independent variables (volume and value of UPI transactions) with inflation rates in India. We begin by plotting a scatterplot to visualise the association between volume of UPI transactions and inflation rates

4.1. Inflation and Volume of Transactions (%)

The scatter plot depicting the relationship between inflation and the volume of transactions shows a generally positive trend. However, the correlation appears weak as the data points are widely dispersed around the trend line, indicating significant variability. The R^2 value of **0.08** reveals that only **8%** of the variation in inflation can be explained by changes in the volume of transactions. This suggests a very modest linear association between the two variables. Despite this weak correlation, the positive slope of the trend line indicates that, as the volume of transactions increases, there is a slight upward trend in the inflation rate.

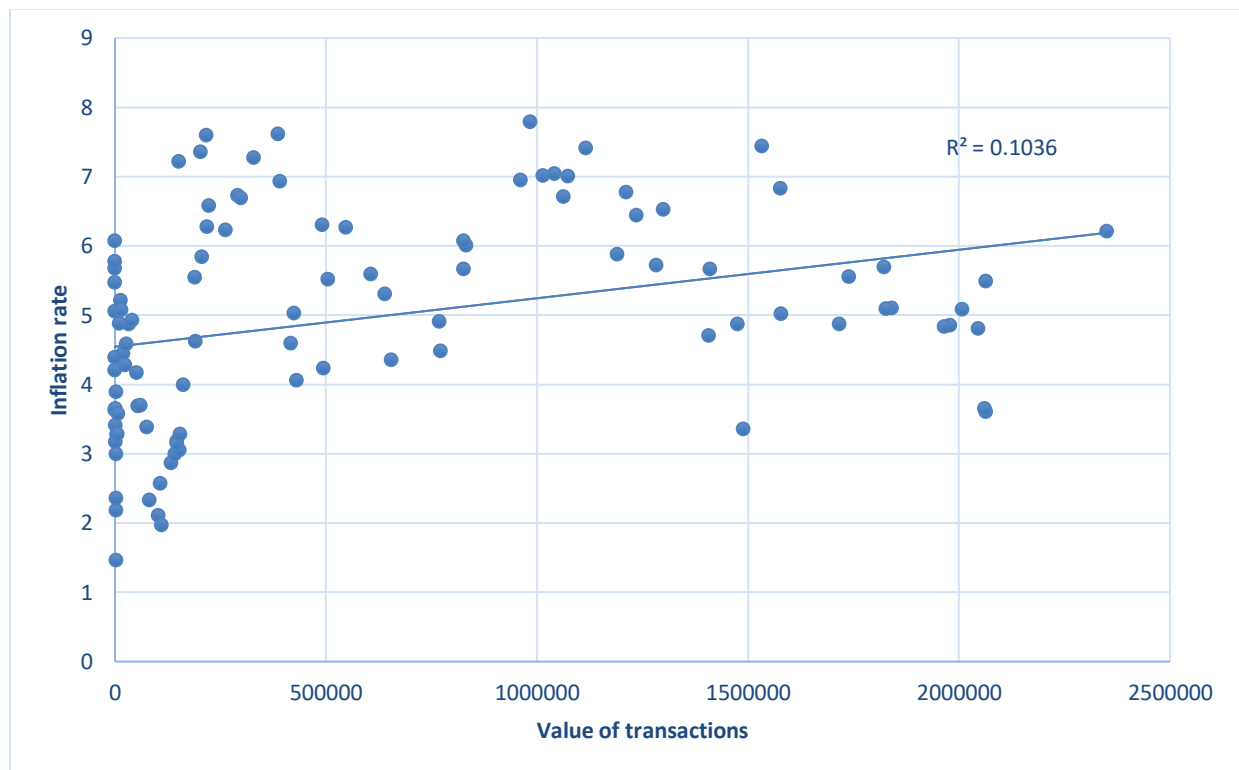
Fig. 4: Association between Volume of UPI transaction and inflation rates in India (2016-2024)



4.2 Inflation and Value of Transactions (%)

In comparison to the previous graph, this scatter plot demonstrates a weak positive relationship between inflation and the value of transactions, but with less dispersion around the trend line. This suggests a slightly stronger linear association between the two variables. The R^2 value of **0.1036** indicates that approximately **10.36%** of the variation in inflation can be explained by changes in the value of transactions. While still modest, this relationship is stronger than that observed with transaction volume. The upward slope of the trend line further highlights that higher transaction values correspond to a slight increase in inflation rates.

Fig. 5: Association between Volume of UPI transaction and inflation rates in India (2016-2024)



4.3 Regression Results

When comparing the relationship between inflation and transaction metrics, it is evident that the association is stronger for the **value of transactions** compared to the **volume of transactions**. This is supported by the R^2 values, where the value of transactions shows an R^2 of **0.1036**, while the volume of transactions has a lower R^2 of **0.08**. These results indicate that inflation is more

sensitive to changes in the value of transactions than to the volume, highlighting the greater influence of monetary transaction value on inflationary trends.

In this section we estimate the impact of total volume and value of digital transactions (as defined by UPI) on the inflation rate in India. An ordinary least squared regression is estimated to study the analysis. Accordingly there are two hypothesis in this study

Null hypothesis: there is no association between volume of digital transactions and inflation rate in India

Alternate hypothesis: There is an association between the volume of digital transactions and inflation rate in India.

Null hypothesis: there is no association between value of digital transactions and inflation rate in India

Alternate hypothesis: There is an association between the value of digital transactions and inflation rate in India.

Table 2: Regression Results of the impact of volume and value of UPI transactions on inflation in India

	Coefficient
Constant	0.43 (0.33)
Volume of transactions	0.11 (0.12)
Value of transactions	-0.02 (0.13)

Note: R-Squared value is 0.32

On running the regression we get the following estimated results

$$\text{Inflation} = 0.43 + 0.11(\text{UPI Volume}) - 0.02(\text{UPI Value})$$

Table 2 illustrates the coefficients along with the standard errors and the p value of the association between UPI volume and UPI value on inflation. The R² value of 0.32 indicates that about 32.57% of inflation variability is explained by the model. The coefficients show a positive relationship with UPI volume (0.11) and a negative relationship with UPI value (-0.02).

However, the high p-values ($p=0.37$ for volume and $p=0.86$ for value) suggest these relationships are not statistically significant.

The results indicate that while volume is positively associated with inflation, value is negatively associated with inflation. However none of these effects are significant. One limitation of this model is that there are missing explanatory variables that could affect inflation rates in India. The results of the study are contrary to previous economics research that indicates the behavioural effect of individuals dealing with digital transactions that lead to overspending and hence affecting inflation rates. One possible reason why this is not seen in the Indian context is due to the fact that the central bank of India keeps a vigilant check on the inflation rates during its policy measures. Moreover, unlike other countries where digital transactions are small part of the overall financial transactions, in India post demonetisation digital transactions have become ubiquitous. Therefore, individuals are as mindful in their spending patterns while paying digitally, similar to the case as cash transactions

5. Conclusion, Policy Implications and Further Research

These findings imply that UPI facilitates economic activity without introducing significant inflationary pressures. This may be due to its use in both high-value and low-value transactions, balancing its overall economic impact. Policymakers can confidently promote digital payments as a tool for financial inclusion. Future research could explore sector-specific impacts or include additional macroeconomic variables to enhance the understanding of UPI's role in India's economy.

The aim of this study was to examine the relationship between digital financial transactions and inflation rates in India. Using data from the nation payments corporation of India on digital transactions, and inflation data from the reserve bank of India for the years April 2016 – October 2024, the results of the study indicate that there is no significant effect of the volume and value of digital transactions on inflation rates in India. The implication of these results have positive impacts on policy making as the widespread adoption of digital transaction in India do not impact the prices of goods and services in the economy. This is a positive impact on the economy as digital financial transactions have multiple benefits compared to cash such as low possibility of money laundering, higher transparency in transactions, and better financial literacy across individuals in the economy. There are two major limitations in the study. First, the limited availability of data does not allow us to study this relationship over a long term. Hence, future research should leverage the better data to analyse the long term trends. Second, as mentioned previously, there are missing factors such as per capital GDP, literacy rates, and other factors that could possibly affect inflation. Since these variables are not measured at the monthly level it

could not be included in the study. However, future research should also take into account these factors while estimating the association between inflation and digital transactions.

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