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The Digital Payment Systems in India- Nature and its Role in Promoting Economic Growth

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ABSTRACT

This paper examines the impact of fintech on digital payments in India, highlighting its role in revolutionizing the payment ecosystem. Over the past decade, digital payments have seen exponential growth, with retail digital transactions increasing nearly 100-fold from 162 crore in 2012-13 to over 16,416 crore in 2023-24. Innovations such as UPI, IMPS, RTGS, and NACH have diversified the payment landscape, making transactions faster, safer, and more efficient. The RBI's Digital Payment Index has also seen a four-fold rise since 2018, underscoring the sector's rapid advancement.

Key drivers of this transformation include fintech innovations, increased mobile and internet penetration, and RBI's focus on security, such as mandatory two-factor authentication. While domestic payments have become seamless, cross-border transactions remain costly and slow, prompting RBI's efforts to integrate India's digital payment infrastructure with global systems.

Fintech has also played a crucial role in financial inclusion, making banking, payments, and lending more accessible. However, challenges such as the rural-urban divide, internet connectivity issues, and cybersecurity threats persist. Despite these hurdles, India's digital payment system is among the most advanced globally, driven by continuous innovation, strong regulatory oversight, and an inclusive financial ecosystem.

Keywords: Digital Payments, Fintech, Digital Payment Growth

INTRODUCTION

This paper examines the impact of fintech on digital payments. In recent years, India's digital payments have surged, driven by innovations like UPI. The payment landscape has evolved from card-based systems to diverse options, including instant payments (UPI, IMPS), small-value payments (PPI, UPI Lite), large-value payments (RTGS), bill payments (BBPS), bulk transactions (NACH), offline payments (UPI Lite X), government payments (NACH, APBS), and toll payments (NETC).

Retail digital transactions skyrocketed from 162 crore in 2012-13 to over 16,416 crore in 2023-24—a 100-fold rise in 12 years. The RBI's Digital Payment Index reflects this growth, increasing more than four times in six years (445.50 in March 2024 from a base of 100 in March 2018). India's digital payment system is among the world's most advanced, supported by fintech, mobile penetration, internet expansion, and RBI's emphasis on security. The mandatory two-factor authentication enhances safety, a measure still absent in many developed nations.

While domestic payments are fast and affordable, cross-border transactions remain costly and slow. The RBI is working on international digital payment linkages to address this. Innovation, PSO participation, and regulatory safety measures have driven India's digital payment success.
Financial inclusion, ensuring accessible and affordable financial services, is a key government priority. Fintech has revolutionized banking, payments, lending, and insurance, enhancing accessibility and efficiency. India's thriving IT sector has been instrumental in this progress. However, challenges persist, including the rural-urban divide, internet limitations, and cybersecurity threats.

LITERATURE REVIEW

FinTech's role in economic growth has gained significant attention. Cevik (2024) highlights its statistically significant impact, despite its small GDP share (0.1%). The study suggests that while effects vary across FinTech instruments, the sector is crucial for shaping financial systems and driving inclusive growth.
India's rapid digital transformation has positioned digital payments as a key driver of financial inclusion and economic development. Sreenu & Verma (2024) emphasize that FinTech fosters the digital economy, particularly in advanced regions. They note that digital payment adoption depends on public perception, influencing payment behavior and financial inclusion.
Consumer perception is critical to the success of digital payments. Pandey (2022) finds that trust, convenience, and security concerns significantly affect adoption rates. Increased digital payment acceptance enhances financial efficiency and economic transactions, contributing to overall growth.

OBJECTIVES

To evaluate their impact on economic growth
To analyze how digital payment systems contribute to financial inclusion
To assess challenges and policy recommendations

DATA AND METHODOLOGY

I have used the secondary data sources from official websites, articles, research papers.

Digital Payment Systems nature in India

**RBI, NPCI website

The Digital payment system features observations are as follows:

I. Legal Basis:

Payment and economic activity are always together and it payment are important for financial inclusion and equitable distribution of economic benefits. This can be achieved with modern technology and regulatory framework and promote digital payment solutions. This can be the key driver for transforming the nations financial landscape.
The significant milestones for in India for securing payment are the Negotiable Instruments Act in 1881 (NI Act), The Payments and Settlement Systems Act, 2007 (PSS Act). PSS Act empowers RBI to issue licenses / authorisations to payment system operators. The Act also includes provisions related to the protection of consumers using payment systems. It outlines the rights and liabilities of payment system operators and contribute to the legal framework for payment systems.

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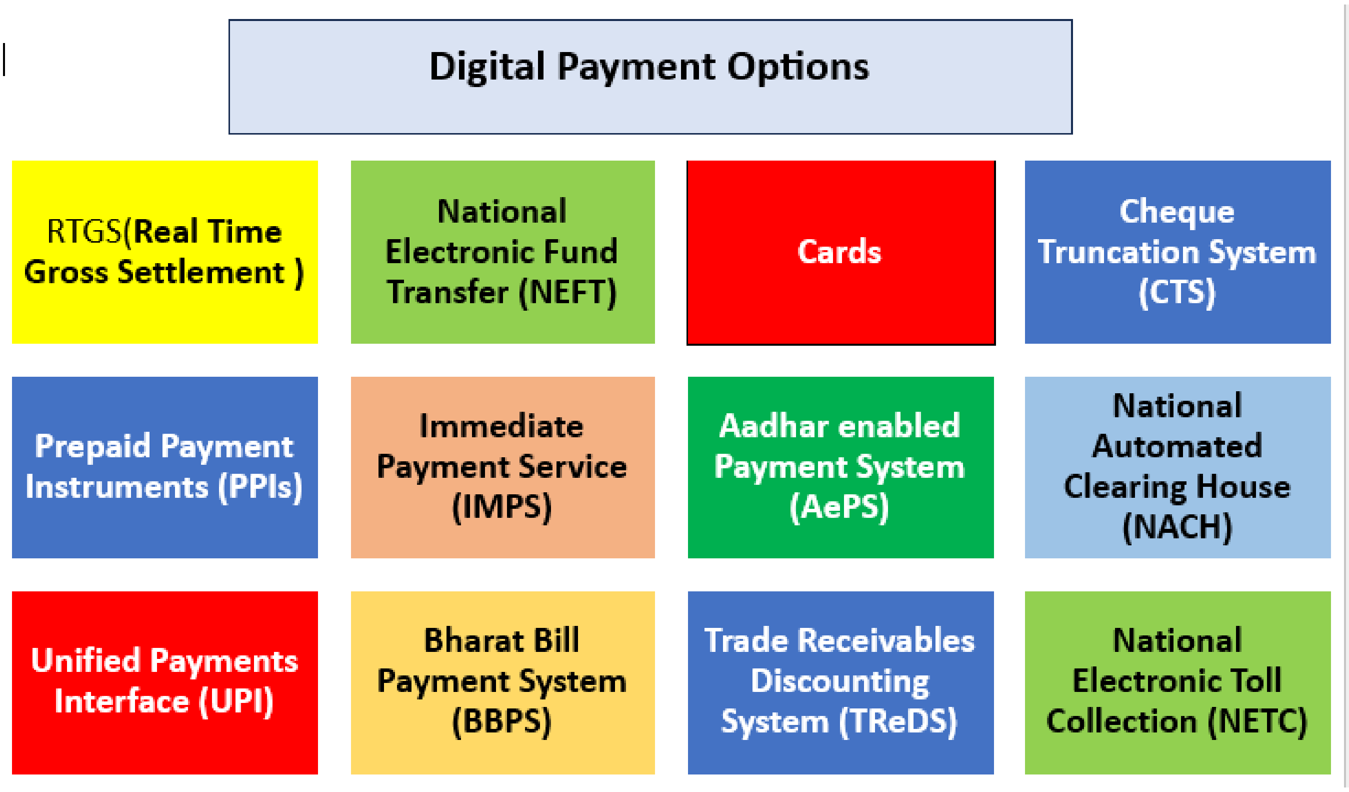
II. Payment Systems Landscape:

India has diverse options of payments systems offered by banks and non-banks participants.



Type	Introduced in	Details
RTGS(**Real Time Gross Settlement)**	March 2004	Large Value Payment System 29.53 crore transactions worth ₹1938.21 lakh crore(2024)
National Electronic Fund Transfer (NEFT)	2005	A retail payment system 926.84 crore transactions worth ₹432.79 lakh crore
Cards		Digital payments credit cards 447.23 crore and 173.90 crore Debit cards payment transactions worth of ₹20.37 lakh crore and ₹5.16 lakh crore respectively.
Cheque Truncation System (CTS)	2008	CTS enables use of the image of cheque for payment processing 62.59 crore cheques worth of ₹71.80 lakh crore
Prepaid Payment Instruments (PPIs)	2009	Smart cards, payment wallets 698.88 crore transactions worth ₹2.23 lakh crore

Immediate Payment Service (IMPS)	2010	An instant payment, electronic funds transfer service 593.83 crore transactions worth ₹70.71 lakh crore
Aadhar enabled Payment System (AePS)		Bank-led payment service 2.4 crore transactions were conducted through AePS (Fund Transfer) and BHIM Aadhaar Pay, amounting to a total value of ₹7.1 thousand crore.
National Automated Clearing House (NACH)	2016	The Centralized Electronic Clearing System, operated by NPCI, →enables the automatic clearing of high-volume, inter-bank electronic transactions that are repetitive and periodic. →supports both distribution (one-to-many) of payments like subsidies, salaries, and pensions, as well as collection (many-to-one) for bill payments (loans, and insurance premiums based on customer mandates) The Aadhaar Bridge Payment System (ABPS) facilitates government benefit transfers, processing 321.91 crore transactions worth ₹5.14 lakh crore.
Unified Payments Interface (UPI)	2016	(P2P) or (P2M) payments instantly through a Virtual Payment Address (VPA), mobile number or by scanning a Quick Response (QR) code. - 16 billion transactions every month - 17,220.80 crore transactions with a total value of ₹246.83 lakh crore
Bharat Bill Payment System (BBPS)	August 2016	217.47 crore transactions amount of ₹7.68 lakh crore
Trade Receivables Discounting System (TReDS)		Platforms facilitate financing of trade receivables of MSMEs from corporate and other buyers, including Government Departments and Public Sector Undertakings (PSUs).

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		42.86 lakh invoices were financed amounting to ₹1.60 lakh crore
National Electronic Toll Collection (NETC)		Nationwide toll payment solution FASTag 405.93 crore transactions, total value of ₹69.99 thousand crore.

III UPI and its growth:

The Unified Payments Interface (UPI) has helped India become a leader in digital payment solutions by treating it as a "public good." This approach can be useful for other countries, no matter their level of development. UPI shows how digital payments can be made accessible to everyone, even for very small amounts, and how they can reach people who previously had no access to such services.

The Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in April 2016, has transformed digital payments in India. UPI simplifies transactions by linking multiple bank accounts to a single app. Its Virtual Payment Address (VPA) enables secure transfers without sharing bank details. With over 16 billion monthly transactions, UPI is widely used for personal and business payments, supporting instant and scheduled transfers.

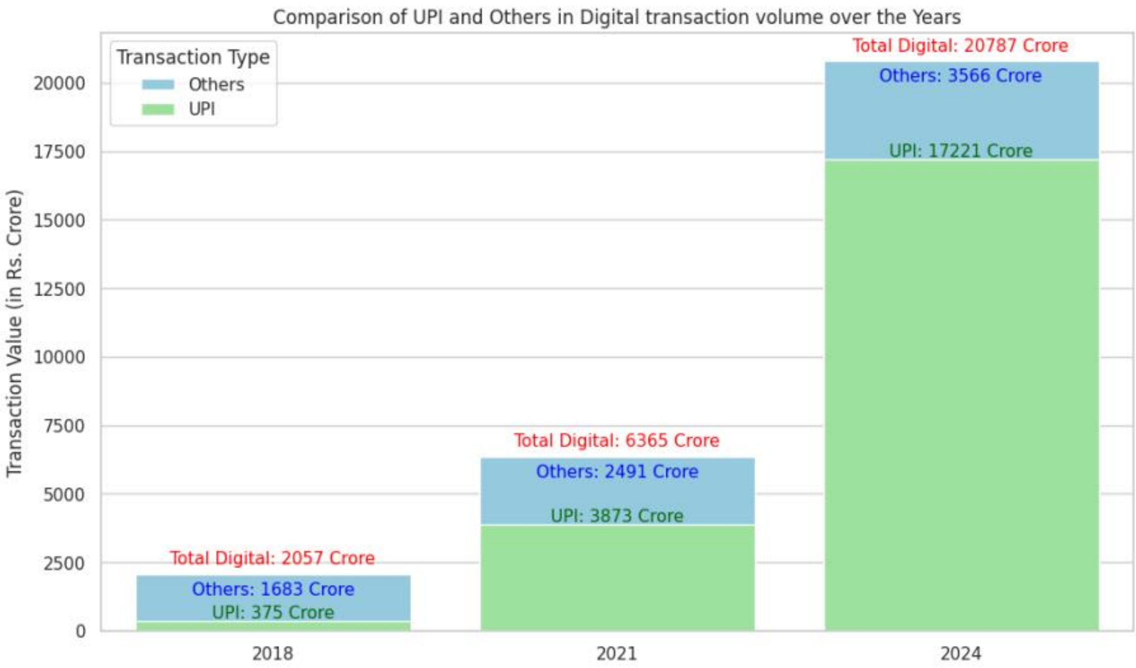


Diagram: Comparison of UPI and other payment systems in Digital transaction volume over the years(RBI Report)

Table: CAGR of UPI transactions for P2P and P2M transactions bucket-wise

CAGR (CY-2019 to CY-2024)	UPI P2P (below ₹500)	UPI P2P (₹500 to ₹2000)	UPI P2P (above ₹2000)	UPI P2M (below ₹500)	UPI P2M (₹500 to ₹2000)	UPI P2M (above ₹2000)
Volume	56%	49%	57%	99%	101%	109%
Value	56%	44%	63%	92%	102%	123%

Low-Value Transactions

Transactions below ₹500 grew significantly in both P2P and P2M categories. P2P rose from 394.26 crore (2019) to 3649.91 crore (2024) at a 56% CAGR, though stagnating after June 2022. P2M surged from 291.54 crore to 9112.72 crore, with a 99% CAGR, reflecting UPI's growing retail adoption.

Medium-Value Transactions

Transactions between ₹500-₹2000 saw notable growth, especially in P2M. P2P increased from 195.70 crore to 1420.57 crore, while P2M jumped from 33.68 crore to 1106.24 crore, indicating rising consumer confidence in UPI for mid-sized retail payments.

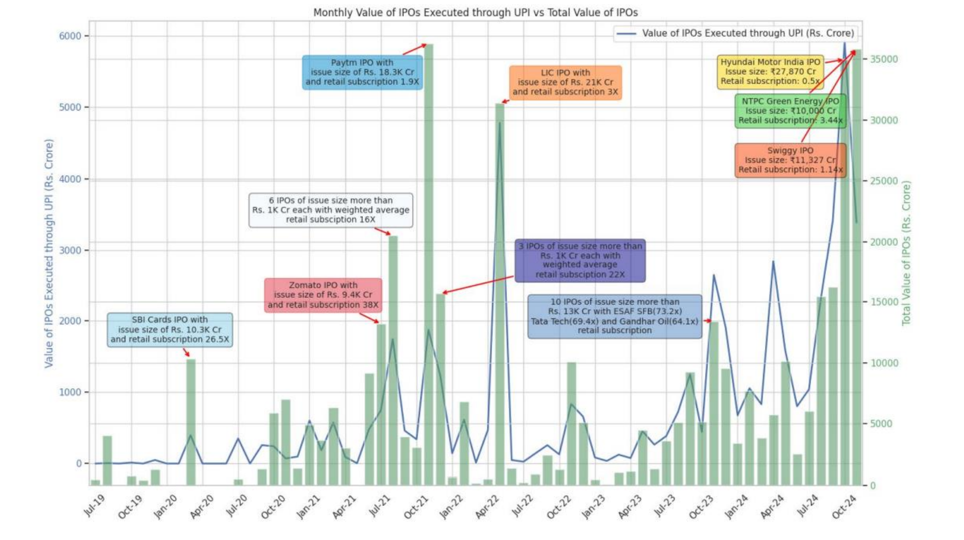
High-Value Transactions

Transactions above ₹2000 followed distinct trends. P2P rose from 151.75 crore to 1452.81 crore (57% CAGR), while P2M increased from 12.02 crore to 478.55 crore (109% CAGR), signaling greater UPI adoption for high-value and B2B payments.

Overall, UPI favors P2P in volume, with businesses preferring digital platforms for efficiency and traceability. P2M high-value transactions grew at 99.65% CAGR, driven by UPI QR Code (70% CAGR) and Bharat QR Code (19% CAGR), strengthening payment infrastructure.

UPI one-time mandate functionality for subscribing to an IPO

The One Time Mandate for IPO payments was introduced in 2019, modernizing the traditionally offline process by enabling online applications via UPI. Investors must create a UPI ID and PIN through a UPI-enabled app from Self Certified Syndicate Banks (SCSBs). This UPI ID allows fund blocking and facilitates seamless payment during the IPO process.

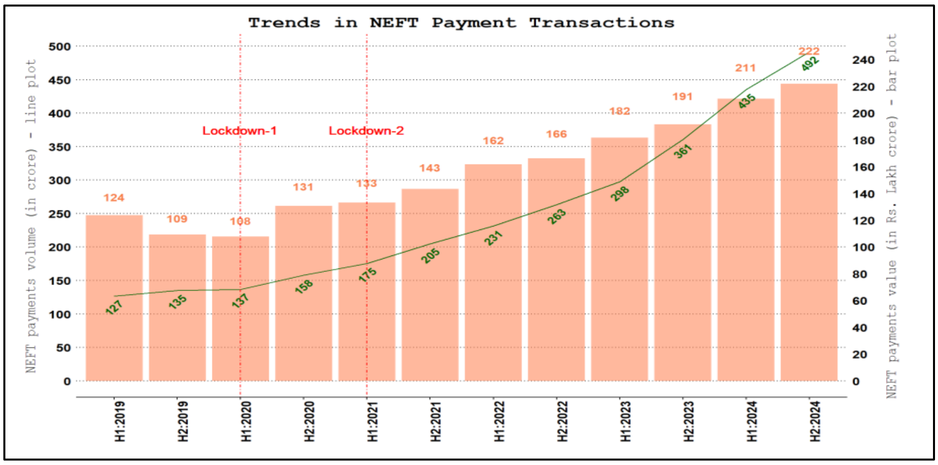


IV Trend in other Digital Payments:

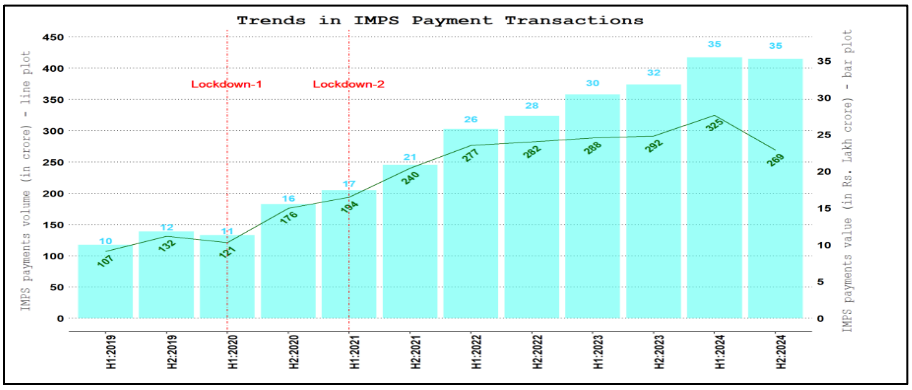
i. Trends in growth of RTGS transactions over the years

Retail Payment Systems (all other domestic payment systems)

ii. NEFT

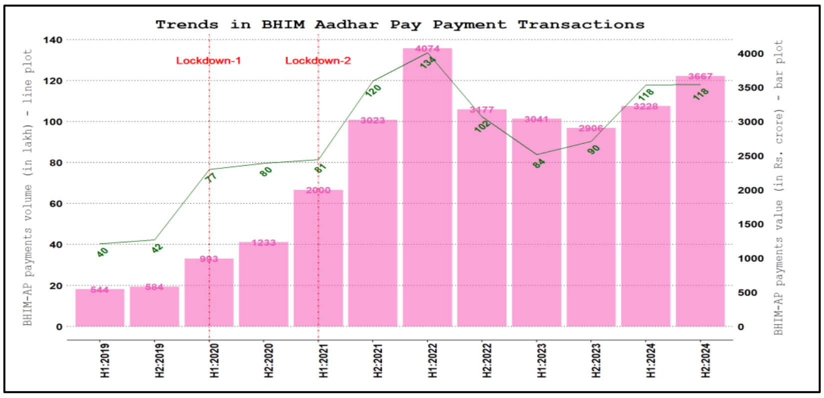


iii. Immediate Payment Services (IMPS)



iv. AePS – Fund Transfer and BHIM Aadhaar Pay

Launched in 2010 by the NPCI, the Aadhaar Enabled Payment System (AePS) is designed to broaden financial inclusion and facilitate interoperability throughout the country.



DATA ANALYSIS USING MACHINE LEARNING

I have done statistical analysis of **Digital Payment Systems and GDP Growth**, and **Digital Transactions and Financial Inclusion in India (2015-2024) based on trends from RBI, NPCI, and World Bank reports.**

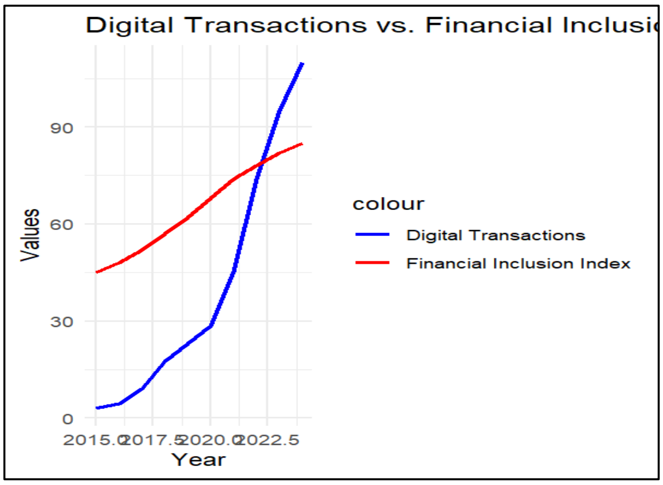
I have used R programming. The secondary data sources are RBI, NPCI, World Bank Data. Timeseries visualisation, Correlation Analysis, Linear Regression Analysis, Ganger Causality and VAR Model techniques is used.

Models and Results

I. Statistical analysis: Digital Payment Systems and Financial Inclusion in India dataset

- **Digital Transactions (Billion)**: Total digital payments processed annually.
- **Bank Account Penetration (%)**: Percentage of adults with a bank account.
- **UPI Users (Million)**: Number of people using **Unified Payments Interface (UPI)** for transactions.
- **Financial Inclusion Index (0-100)**: RBI's index measuring financial inclusion based on banking, digital access, and credit availability. (Data: Annexure 1-Table 1)

Time Series Visualization



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Correlation Analysis

"Pearson Correlation: 0.942336103951746" p-value is > **0.05**

The correlation is statistically insignificant

Linear Regression: Impact of Digital Transactions on Financial Inclusion

Financial_Inclusion_Index ~ Digital_Transactions

```
Call:
lm(formula = Financial_Inclusion_Index ~ Digital_Transactions,
    data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-6.7990 -3.6987 -0.9052  2.7346  7.3910

Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)          50.74864    2.42441  20.932 2.85e-08 ***
Digital_Transactions  0.35012    0.04396   7.964 4.51e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 5.129 on 8 degrees of freedom
Multiple R-squared:  0.888,	Adjusted R-squared:  0.874
F-statistic: 63.43 on 1 and 8 DF,  p-value: 4.51e-05
```

$$\widehat{Financial\ Inclusion\ Index} = 50.74864 + (0.35012 \times Digital\ Transactions)$$

Component	Interpretation
Intercept (50.74864	When **Digital Transactions = 0**, the predicted **Financial Inclusion Index** is **50.75**.
Slope (0.35012)	For **each additional unit increase** in **Digital Transactions**, the **Financial Inclusion Index** increases by **0.35012 units** (on average).
Residuals	✓ **Range: -6.799 to 7.391** → Shows how much actual values deviate from predicted value ✓ A **smaller range of residuals →** a better model fit.
Significance of Coefficients	
p-value for Digital Transactions = 4.51e-05 (<0.001)	✓ p-value is **extremely small**, Digital Transactions is **highly significant** in predicting Financial Inclusion ✓ **Reject the null hypothesis (H_0)** → There is a strong relationship between Digital Transactions and Financial Inclusion.
Model Fit (R-squared and Adjusted R-squared)	
Multiple R-squared = 0.888	**88.8% of the variation** in the **Financial Inclusion Index** is explained by Digital Transactions.

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Adjusted R-squared = 0.874	Adjusted for the number of predictors → Still **very high**, indicating a **strong model fit**.
F-Statistic (63.43, p-value = 4.51e-05)	✓ The model is **statistically significant** overall. ✓ Since the p-value is **very small (<0.05)**, **-Digital Transactions significantly predicts Financial Inclusion.**

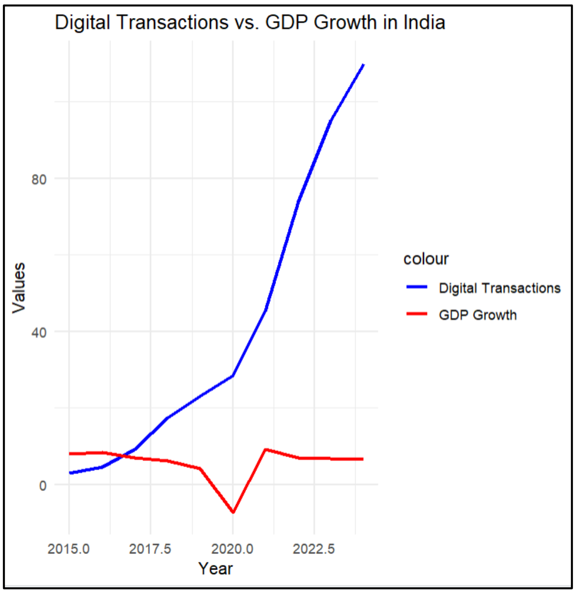
RESULT

- **Strong Positive Relationship** → ***Digital Transactions significantly increase Financial Inclusion.***
- **Model Explains 88.8% of Variation** → ***Digital Transactions are a major driver of Financial Inclusion.***
- **High Statistical Significance** → ***The relationship is not due to random chance.***

II. Statistical analysis: **Digital Payment Systems and GDP Growth in India** dataset

- **Digital Transactions (Billion)**: Total digital payments processed annually.
- **Bank Account Penetration (%)**: Percentage of adults with a bank account.
- **UPI Users (Million)**: Number of people using **Unified Payments Interface (UPI)** for transactions.
- **Financial Inclusion Index (0-100)**: RBI's index measuring financial inclusion based on banking, digital access, and credit availability.

Time Series Visualization



Correlation Analysis:

Pearson correlation coefficient measures the **strength and direction** of the **linear relationship** between **two variables** (e.g., **digital transactions and GDP growth**).

"Pearson Correlation: 0.0778295680695831"

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The value is **very close to 0**, meaning **there is little to no linear relationship** between digital transactions and GDP growth

Checking Residual Plots

```
###############################################
# Augmented Dickey-Fuller Test Unit Root Test #
###############################################

Test regression drift


Call:
lm(formula = z.diff ~ z.lag.1 + 1 + z.diff.lag)

Residuals:
     1      2      3      4      5      6      7      8
-2.439 -0.738 -6.114 -3.807  7.686 11.935 -3.436 -3.086

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  6.10281    4.33742   1.407    0.218
z.lag.1     -0.03505    0.19978  -0.175    0.868
z.diff.lag   0.72917    0.67225   1.085    0.328

Residual standard error: 7.5 on 5 degrees of freedom
Multiple R-squared:  0.4723,	Adjusted R-squared:  0.2612
F-statistic: 2.237 on 2 and 5 DF,  p-value: 0.2023
```

```
Value of test-statistic is: -0.1754 0.9901

Critical values for test statistics:
      1pct  5pct 10pct
tau2 -3.75 -3.00 -2.63
phi1  7.88  5.18  4.12
```

Regression Equation

The test estimates the equation:

The test estimates the equation:

$$\Delta z_t = \alpha + \beta z_{t-1} + \gamma \Delta z_{t-1} + \varepsilon_t$$

Where:

- Δz_t = First difference of the time series
- z_{t-1} = Lagged value of the time series
- Δz_{t-1} = Lagged difference term

Coefficients & Interpretation

- **Intercept** = **6.10281**, p-value = **0.218** → Not significant.
- **Lagged term (z.lag.1)** = **-0.03505**, p-value = **0.868**
  - **This is the key coefficient to determine stationarity.**
  - A **significant negative value** would indicate stationarity.
  - However, here, it is **not significant** (p-value **0.868** is very high).
- **Lagged first difference (z.diff.lag)** = **0.72917**, p-value = **0.328**
  - Not significant, meaning past changes in the series do not strongly impact current changes.

Test Statistic & Decision

- **Test statistic = -0.1754**

Decision Rule:

- If **test statistic < critical value**, we **reject the null hypothesis** (H_0) and conclude **stationarity**.
- If **test statistic > critical value**, we **fail to reject H_0**, meaning the series is **non-stationary**.

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- **-0.1754 is greater than all critical values (-3.75, -3.00, -2.63)**.
- **Conclusion → Fail to reject H_0 → The time series has a unit root and is non-stationary**.

So after first differencing I got stationary time series.

Ganger Causality test & Reverse Ganger Causality test

```
Granger causality test

Model 1: diff_gdp_ts1 ~ Lags(diff_gdp_ts1, 1:2) + Lags(diff_data1, 1:2)
Model 2: diff_gdp_ts1 ~ Lags(diff_gdp_ts1, 1:2)
  Res.Df Df      F Pr(>F)
1      1
2      3 -2 4.0069 0.3331
>
```

Final Summary of Both Tests

Causal Relationship	F-Statistic	p-Value	Conclusion
Digital Transactions → GDP Growth	4.0069	0.3331	❌ No causality
GDP Growth → Digital Transactions	3.4214	0.1683	❌ No causality

There is **no significant Granger causality** in either direction between digital transactions and GDP growth in your dataset. This suggests that the relationship between digital payments and economic growth **may be influenced by other factors** or that the effect is not immediate within the given lag structure.
As there is so significant result, I did VAR modelling.

VAR MODELLING

```
VAR Estimation Results:
=========================
Endogenous variables: digital_diff1, gdp_diff1
Deterministic variables: const
Sample size: 7
Log Likelihood: -33.025
Roots of the characteristic polynomial:
0.7134 0.7134 0.583 0.583
Call:
VAR(y = cbind(digital_diff1, gdp_diff1), p = 2, type = "const")


Estimation results for equation digital_diff1:
==============================================
digital_diff1 = digital_diff1.l1 + gdp_diff1.l1 + digital_diff1.l2 + gdp_diff1.l2 + const

                 Estimate Std. Error t value Pr(>|t|)
digital_diff1.l1   1.9472     0.7152   2.723    0.113
gdp_diff1.l1      -0.7606     0.6002  -1.267    0.333
digital_diff1.l2  -0.9184     0.4722  -1.945    0.191
gdp_diff1.l2      -1.2120     0.5976  -2.028    0.180
const             -1.7811     6.3631  -0.280    0.806


Residual standard error: 5.632 on 2 degrees of freedom
Multiple R-Squared: 0.8586,     Adjusted R-squared: 0.5757
F-statistic: 3.035 on 4 and 2 DF,  p-value: 0.2629
```

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```
Estimation results for equation gdp_diff1:
==========================================
gdp_diff1 = digital_diff1.l1 + gdp_diff1.l1 + digital_diff1.l2 + gdp_diff1.l2 + const

                 Estimate Std. Error t value Pr(>|t|)
digital_diff1.l1   2.0014     0.5618   3.562   0.0706 .
gdp_diff1.l1      -2.0431     0.4715  -4.333   0.0494 *
digital_diff1.l2  -1.1266     0.3709  -3.037   0.0935 .
gdp_diff1.l2      -1.6751     0.4695  -3.568   0.0704 .
const            -15.1972     4.9990  -3.040   0.0933 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


Residual standard error: 4.425 on 2 degrees of freedom
Multiple R-Squared: 0.9045,     Adjusted R-squared: 0.7136
F-statistic: 4.737 on 4 and 2 DF,  p-value: 0.1818



Covariance matrix of residuals:
              digital_diff1 gdp_diff1
digital_diff1        31.723     9.745
gdp_diff1             9.745    19.579

Correlation matrix of residuals:
              digital_diff1 gdp_diff1
digital_diff1         1.000     0.391
gdp_diff1             0.391     1.000
```

RESULT:

- **Digital Transactions (1-lag) positively impact GDP Growth**, but weakly (**p = 0.0706**).
- **GDP Growth is negatively affected by its own past values**, suggesting a possible **cyclical pattern**.
- **The overall model fit is strong (R^2 = 90.45%) but not statistically significant (p = 0.1818)**, meaning more data or variables may be needed for better prediction.

Residual correlation (0.391) suggests some relationship remains unexplained.

Run the Granger Causality Test to check if Digital Transactions *cause* GDP growth:

causality(var_model, cause = "digital_diff1")

```
> causality(var_model, cause = "digital_diff1")
$Granger

        Granger causality H0: digital_diff1 do not Granger-cause gdp_diff1

data:  VAR object var_model
F-Test = 6.3478, df1 = 2, df2 = 4, p-value = 0.0574


$Instant

        H0: No instantaneous causality between: digital_diff1 and gdp_diff1

data:  VAR object var_model
Chi-squared = 0.92829, df = 1, p-value = 0.3353
```

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Granger Causality Test

- **Null Hypothesis (H_0):** Digital Transactions **do not** Granger-cause GDP Growth.
- **Test Statistic:** F = **6.3478**
- **Degrees of Freedom:** df1 = **2**, df2 = **4**
- **p-value = 0.0574**

Output	Interpretation
p-value (0.0574) is slightly above 0.05	• we **cannot reject the null hypothesis at the 5% level**.
	• However, it is **very close to significance**, → ***digital transactions might have a predictive effect on GDP growth***.
At a **10% significance level,** we **would reject the null hypothesis**	• **digital transactions Granger-cause GDP growth at a weak level of confidence**.
Instantaneous Causality Test	
Null Hypothesis (H_0): No instantaneous causality between **digital_diff1** and **gdp_diff1** (i.e., they do not influence each other at the same time).	
Chi-squared test statistic: 0.92829 **Degrees of Freedom:** df = 1	
p-value (0.3353) is much higher than 0.05	→ **fail to reject the null hypothesis** →**digital transactions and GDP growth do not have an immediate relationship**, but rather any impact occurs with a lag.

Result:

1. **Digital Transactions weakly Granger-cause GDP Growth** (significant at the **10% level**, but not at **5%**).
2. **There is no immediate causal relationship** between digital transactions and GDP growth (**p = 0.3353**).
3. **Further analysis (Impulse Response Function, Variance Decomposition) may be useful** to understand long-term effects.

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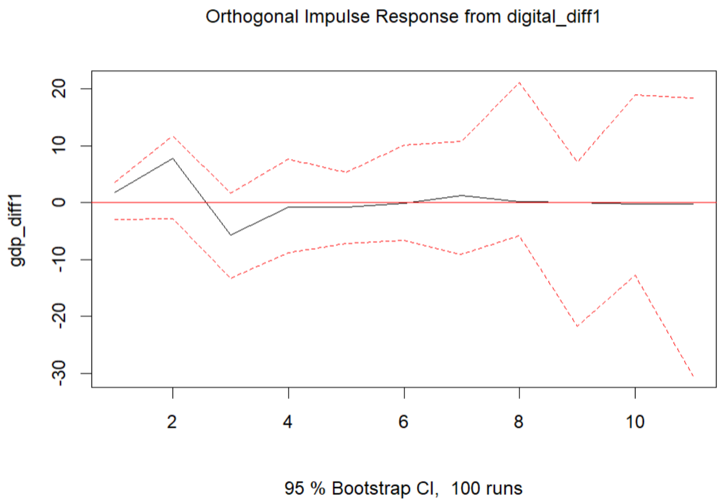
Impulse Response Function (IRF)
to see how a shock in digital transactions affects GDP growth over time



Interpretation of the Impulse Response Function (IRF) Plot

The image shows the **Orthogonal Impulse Response Function (IRF)** of **gdp_diff1** to a shock in **digital_diff1**. Here's what it means:

1. **Black Line**: The estimated impulse response of **gdp_diff1** to a one-unit shock in **digital_diff1**.
2. **Red Dashed Lines**: The **95% confidence intervals** from a bootstrap with 100 runs.
3. **X-axis (Time Periods)**: The number of periods after the shock.
4. **Y-axis (Response of gdp_diff1)**: The impact on **gdp_diff1** due to the shock in **digital_diff1**.

Observations

- **Immediate Response**: Initially, **gdp_diff1** increases slightly, then declines below zero in the next period.
- **Short-Term Fluctuations**: The response shows some volatility in the early periods before stabilizing around zero.
- **Confidence Intervals**: The red dashed lines indicate uncertainty. Since the confidence interval includes zero in later periods, the effect is **not statistically significant** in the long run.

Result:

- A shock in **digital_diff1** has an initial impact on **gdp_diff1**, but the effect diminishes over time.
- Given the wide confidence bands, the response is **not strongly significant** beyond the short term.

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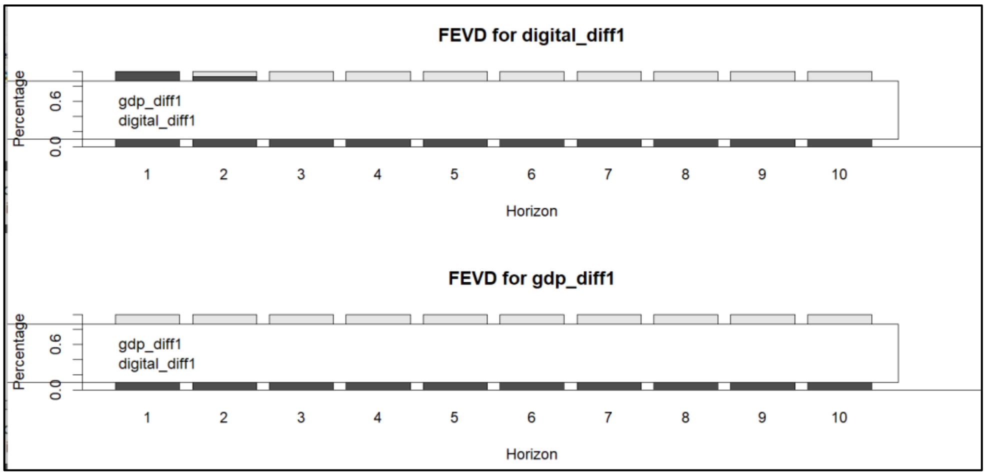
Variance Decomposition: how much of GDP's variance is explained by Digital Transactions:



Interpretation :

The Forecast Error Variance Decomposition (FEVD) plot provides insight into how much of the forecast variance of a variable is explained by shocks in itself versus shocks in another variable.

Key Observations from the Plot

Top Panel (FEVD for digital_diff1)

The forecast variance of digital_diff1 is mostly explained by itself across all horizons.

The contribution of gdp_diff1 appears minimal or negligible.

This suggests that digital_diff1 is largely self-driven and not significantly influenced by GDP changes.

Bottom Panel (FEVD for gdp_diff1)

The forecast variance of gdp_diff1 is also primarily explained by itself over all horizons.

The contribution of digital_diff1 remains very low.

This implies that GDP changes are mostly driven by their own past values rather than by digital_diff1.

Result:

- There is weak or no strong interaction between the two variables in terms of their forecast variance.
- Each variable's shocks explain most of their own future variations, indicating limited dynamic influence between them.
- If the goal was to establish a strong relationship where digital_diff1 impacts gdp_diff1, these results suggest that the effect may be minimal.

CONCLUSION

India's digital payment evolution has transformed its financial ecosystem, driven by the Payments and Settlement Systems Act (2007) and technological advancements. From traditional systems like RTGS and NEFT to innovations like UPI, digital payments have enhanced financial inclusion and economic efficiency.

UPI has led this growth, expanding across low-, medium-, and high-value transactions. Its adoption in P2M transactions, IPO payments, and QR-based systems reflects changing consumer behavior and trust in cashless payments.

Despite these advancements, statistical analysis shows no conclusive impact of digital payments on GDP growth (p-value 0.1683). While they improve efficiency and reduce cash dependency, their direct influence on GDP remains uncertain. Future research could explore long-term economic effects, policy interventions, and advanced methodologies to assess their broader impact.

Recommendations

1. **Enhancing Financial Inclusion**
- Strengthen digital literacy initiatives, particularly in rural and semi-urban areas, to encourage the adoption of digital payment methods.
- Promote the use of Aadhaar-enabled Payment Systems (AePS) and mobile-based payments for unbanked and underbanked populations.

2. **Encouraging Business and Government Adoption**
- Encourage micro, small, and medium enterprises (MSMEs) to integrate digital payments into their operations by providing incentives and technical support.
- Promote digital payments for government transactions, welfare distribution, and public services to drive adoption and efficiency.

3. **Regulatory and Policy Support**
- Introduce policies that reduce transaction costs for merchants and consumers, making digital payments more attractive.
- Enhance data privacy laws and consumer protection frameworks to ensure safe and secure transactions.

4. **Promoting Innovation in Digital Payments**
- Encourage the development of new fintech solutions, such as blockchain-based payment systems and AI-driven fraud detection tools.
- Support research on integrating digital payments with emerging technologies like central bank digital currencies (CBDCs) and cross-border payment systems.

By implementing these recommendations, India can further strengthen its digital payment ecosystem, ensuring sustainable growth, financial inclusivity, and improved economic efficiency.

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ANNEXURE:

TABLE 1

Year	**Digital Transactions (Billion)**	**GDP Growth (%)**
2015	3	8
2016	4.5	8.3
2017	9.1	7
2018	17.5	6.1
2019	23	4.2
2020	28.5	-7.3
2021	45.3	9.1
2022	74	7
2023	95	6.8
2024	110	6.5

TABLE 2:

Year	**Digital Transactions (Billion)**	**Bank Account Penetration (%)**	**UPI Users (Million)**	**Financial Inclusion Index (0-100)**
2015	3	53	0	45
2016	4.5	58	5	48
2017	9.1	63	20	52
2018	17.5	68	50	57
2019	23	72	100	62
2020	28.5	78	150	68
2021	45.3	81	220	74
2022	74	85	300	78
2023	95	88	400	82
2024	110	90	500	85

Source of data: **RBI, NPCI, and World Bank reports.