E-Payment System reforms and its impact on Currency in Circulation in India: Evaluation using Vector Autoregressive Model (VAR)

Abhay Singh Chauhan[1], Navita Nathani[2], Shiv Kumar Singh[3], Nishant Joshi[4]

[1]Assistant Professor, School of Management Sciences (SMS), Varanasi, Uttar Pradesh, India
[2]Professor, Prestige Institute of Management and Research, Gwalior, Madhya Pradesh, India
[3]Professor & Dean, Faculty of Commerce, School of Commerce & Business Studies, Jiwaji University, Gwalior, Madhya Pradesh, India
[4]Professor & Director, Prestige Institute of Management and Research, Gwalior, Madhya Pradesh, India

Abstract

The present study contributes to the literature by investigating the impact of E-Payment System on Currency in circulation after facing three major reforms i.e., Demonetization of 500 and 1000 rupee note, implementation of GST and Current pandemic (Covid-19) situation. Results imply that with the increase in the volume of all the respective electronic payment systems the currency in circulation (in physical form) got minimized in the economy. Moreover, NEFT shows much higher influence on currency in circulation as compare to RTGS and IMPS but PPI's shows the highest influence on currency in circulation from the selected E-Payment systems. Furthermore, Vector Autoregressive model suggests, RTGS, IMPS, NEFT, CARDS (POS), PPI's, M-Banking are expected to increase whereas NACH is expected to observe a downfall in the near future.

Keywords: Electronic payments, Currency in Circulation, Demonetization, Goods and Services Tax (GST); Covid-19, Vector Autoregressive Model (VAR)

Introduction

Since independence, the Indian banking industry has experienced significant expansion. The industry, which had low profitability, a weak capital foundation, and poor asset quality for a decade, has now matured into a lively sector with "enhanced assets" and a "strong capital base." The bank has also improved client convenience by offering a variety of online payment methods. In addition, with the implementation of UPI (Unified Payment Interface), India's banking system is on the cusp of undergoing a major shift. Meanwhile, as the Indian banking system was undergoing transition, three big financial events occurred in India, each of which had an impact on the banking sector in some manner. The issue at hand is whether or not this impact is beneficial. The first change was the removal of 500 and 1000 denomination notes from circulation, followed by the installation of GST (Goods and Services Tax) on November 8, 2016 and July 1, 2017, respectively.

The country's Prime Minister decided on November 8, 2016, to remove the 1000 and 500 denomination notes from circulation. According to the Prime Minister, it will have a significant influence on three of the most pressing issues of our time: corruption, counterfeiting, and black money. Later, at a news conference, India's finance minister stated that this would aid in the country's transition to a cashless society. "Demonetization is the act of stripping a monetary unit of its legal tender status." This is something that happened in Zimbabwe as a result of hyperinflation, and as a result of the hyperinflation, the government chose to demonetize the money in circulation. Without a doubt, this reform has had an

impact on all sectors of the Indian economy. Due to demonetization, online retail stores have temporarily ceased accepting cash on delivery, microfinance institutions' disbursement rates have slowed, and e-wallet companies have done well because cash was not available to the public in physical form at this time Mali, (2016). In India, demonetization boosted the growth of digital payments. This move will reduce the government's carrying costs while also raising income. As a result, cashless transactions are a lot safer and easier way of payment that takes less time (Agrawal and Gupta, 2019; Kaur, 2017). Many people's lives were better as a result of demonetization, and the economy was strengthened. E-wallets, plastic money, and the adoption of the Aadhar card and UPI have all raised the importance of E-banking and transactions (Padiya & Bantwa, 2018; Kaur and Tiwana, 2020; Maunika & Kathirvel, 2017). Furthermore, Srikrishnan (2017) remarked that "digital payments might be shown as world-shattering in banking people who are unbanked," which is in keeping with the preceding assertion. He went on to say that in order to empower the poor, both rural and urban, we need to create micropayments opportunities through digital payments, as this will encourage them to connect with the banking system, and banks will be able to incentivize savings, allowing them to connect with formalized financial institutions in India. In their case study, Mehrotra and Kandpal (2019) explained that India is moving from a cash to a cashless economy, and that digital payments via apps will be the norm rather than using ATMs and other services, while Raj, (2020) emphasised a more decentralised approach to financial literacy among rural women to empower the Indian economy.

As the country began to gather pace following this significant reform, another major reform in the shape of the "Goods and Services Tax" (GST) was implemented on July 1, 2017, with the motto "One Nation, One Tax," plainly indicating that India's

conventional taxation structure would no longer be in effect. The traditional taxation system was separated into two categories: direct and indirect taxes. Indirect tax was further divided into numerous tax types that are levied on the general population in an indirect manner. To alleviate the burden of these many indirect taxes, the Indian government has adopted a new tax, GST, which eliminates all indirect taxes. The adoption of GST has a significant influence on India's many industries. One of the government's covert goals was to encourage digital payments in order to reduce India's reliance on cash. Bansal et al., (2020) noted how the Covid-19 negatively impacted the tax collecting process, since the Indian economy was significantly impacted in practically all industries, and hence tax collection and levies levied were also heavily affected.

Corona virus epidemics were the third event that had an impact on the Indian economy. Covid-19 has a negative impact on India, a country with a population of 13 billion people. The rate of economic progress has slowed, and the spread of the virus has damaged practically every aspect of human existence. Businesses were dealing with this unanticipated problem and attempting to address a number of issues. Because of the Corona virus epidemic, which allowed for social separation, lockdowns, and other precautions, consumers have increased their usage of web-based buying, web-based media, and web-based communication, among other things. The sales of B2B and B2C enterprises have expanded by leaps and bounds, but E-commerce firms' incapacity to satisfy demand and supply forces has become the most serious challenge. The government has taken a number of steps to alleviate the issues that E–commerce enterprises face, including decreasing the cost of digital payments and money transfers, as well as enhancing delivery services. As organisations and people around the world attempted to navigate this unprecedented period, we, as researchers, saw this as a significant event in the history of the Indian

economy and wanted to know how demonetization, GST, and the Corona virus, three major events in the country that not only brought revolution but also raised questions about sustainability, impacted digital payments. So, the major topic for our research is if digitalization in payment systems or E-Payment Systems influenced money circulation over these times, and how far we have progressed in the digitization of online payment systems.

Despite the fact that many scholars have sought to examine the impact of GST and demonetization on digital payments, our research will offer up new pathways for understanding the impact by examining three major economic changes and their implications on currency circulation. The main goal of this research is to educate policymakers so that they may better design their programmes. In the domain of cash circulation, there appears to be a gap in implementation. Because there is a shortage of study on digital payments with reference to three important economic reforms, the researcher found a vacuum in the literature and chose to focus on currency circulation and digital payments with reference to demonetization, GST and Covid-19.

Review of Literature

Dzokoto & Mensah, (2010) investigated the experiences of Ghanaian consumers following the demonetization in July 2007, using a standardised questionnaire and a personal interviewing process to collect data. They found that the demonetization has clearly provided some benefits in Ghana, such as the portability issue has decreased, individuals now feel safer than before, and it has also assisted the government in keeping track of the economy. Sunita, (2014), on the other hand, stated that local and global forces will put downward pressure on the rupee in the near future. Her research focused on understanding the trend of the Indian rupee and its exchange rate against the US dollar, as well as the concept of demonetization. She used previous

financial annual reports to uncover a number of causes and consequences of demonetization, and came to the conclusion that, despite the government's efforts, rupee depreciation has become null and void, but the currency remains under pressure, and that RBI should continue to intervene.

Green (2016) found that demonetization has a significant beneficial influence on the government's finances. He stated unequivocally that the government's finances could have been increased through exchange, and that this could be done in two ways: first, depositing black money in banks and raising the tax threshold, and second, if the illegal money does not come in legal form, stripping the illegal money through demonetization at the end of the year. As a result, the burden on the RBI was not considered, and the assets held against that obligation may be sold by the RBI. This method allows for a more realistic management and control of an economy's money supply. However, Tripathi (2016) stated that "the period immediately following demonetization was a great challenge to the common people, farmers, and for families who had planned any wedding function before December 30th due to the shortage of physical money because these are the people and areas where most of the work is done in physical form of cash." He also stated that the Indian financial system and authorities were unprepared for such a drastic reform or shift, and that demonetization was a failure owing to a lack of contingencies. Furthermore, Shirley (2017) concurred with the above remark and stated that demonetization in India will have some influence on the global economy in the future, given that India is the world's sixth biggest economy and a plethora of nations engage in direct commerce with India. As a result, the nations that do direct commerce with India have seen the most turbulence as a result of demonetization. She went on to say that demonetization had a huge negative impact on people's purchasing power, and that while it was a

bold move by the Indian government, it should have been prepared with contingencies for the problems that the common people would face after the announcement of deregulating the currency from the legal framework. In support of the previous study, Mahajan and Singla (2017) investigated the impact of demonetization on financial inclusion in India and concluded that demonetization had a greater impact on ordinary people than on those who were the primary creators of illicit money. Financial inclusion can only be realised if technology reaches the grassroots level, which can only be accomplished if the new generation receives good education. Because financial knowledge is critical to achieving the economy's financial inclusion.

Demonetization has a positive substantial influence on several types of online payment systems like as NEFT, ECS, NACH, IMPS, and AEPS, according to Kaur (2017), who investigated the impact of demonetization on cashless payment systems. Furthermore, another study confirmed that the use of online payment has risen in terms of volume (Ahmad, 2017). Quint & Shubik (2015), on the other hand, demonstrated the link between gold money and flat money and found, using regression analysis, that the economy had inefficient gold consumption. "Both the consumption and transaction services of gold might be used at the same time," says the author. Vally and Divya (2018) gathered data from 183 respondents to determine the amount of digital payment acceptance following demonetization. They discovered a positive correlation across variables such as respondents' age, income, and educational level. Apart from good responses, another concern raised in the research by Santani T, (2017) was security. Sudha et al., (2020) study was crucial since it emphasized the digital payment mechanism that was employed throughout the worldwide epidemic.

Objectives

- To establish the relationship between Currency in circulation and various modes/ methods of E-Payment Systems.

- To examine the future growth movement of E-Payment Systems based on currency in circulation

Research Methodology

Because the study was empirical in nature, we focused on determining the impact of specific electronic payments and currency in circulation in India. The research looked at all of India's electronic payment systems as well as currency in circulation from January 2016 to December 2020. "Real Time Gross Settlement" (RTGS), "Net Electronic Fund Transfer" (NEFT), "National Automated Clearing House" (NACH), "Immediate Payment Service" (IMPS), Cards, and "Prepaid Payment Instruments" (PPI's) are the seven primary electronic payments employed in the study. We researched and aggregated data from the "Reserve Bank of India" for the study, which was based on secondary sources. The analysis was carried out using the E-Views 10 software, which included several techniques such as the unit root test, correlation, and Ordinary Least Square (OLS), as well as the use of the Vector Auto-Regressive Model to verify future growth movement. The residuals were further examined for autocorrelation using the Histogram "Normality test" (Jarque-Bera) and "Serial Correlation LM" tests.

Analysis and Discussions

Unit Root Test

To begin, we examined all of the variables using the Augmented Dickey Fuller (ADF) test, which is "one of the primary forms of Unit Root test that helps to define whether a time series is stationary or

not." At the level, all of the variables become non-stationary, allowing the null hypothesis to be accepted. Further calculations were performed using first differencing and second differencing to make the data stationary, and the variables were found to be stationary at 1% because the P value in all cases was less than 0.05, which is "less than the critical P value thus rejecting the null hypothesis (data series has unit root) and accepting the alternate hypothesis (data series has no unit root and variables are stationary" The data for RTGS, IMPS, CARDS, M-Banking, NACH, and CCI were stationary at order I (1), whereas NEFT and PPI's were stationary at order I (2).

Table 1: Unit Root Statistics

Variables	ADF-Statistics	Probability	Order of Integration
RTGS	-8.479231	0.0000	1st Difference
NEFT	-9.516297	0.0000	2nd Difference
IMPS	-5.216057	0.0006	1st Difference
CARDS	-4.805176	0.0015	1st Difference
PPI'S	-6.296345	0.0001	2nd Difference
MOBILE BANKING	-5.025004	0.0008	1st Difference
NACH	-4.953507	0.0011	1st Difference
CIC	-6.975510	0.0000	1st Difference

At the first and second difference orders of integration, the unit root tests revealed that all variables were stationary. For "Real Time Gross Settlement" (RTGS), "Net Electronic Fund Transfer" (NEFT), "National Automated Clearing House" (NACH), "Immediate payment service" (IMPS), Cards, M-Banking, "Prepaid Payment Instruments" (PPI's), and Currency in Circulation," Augmented Dickey Fuller unit root test statistics are greater than their critical values at a 1% level of significance (CIC).

To check for stationary behaviour, the absolute ADF statistics value must be larger than the crucial value of any one of the three accessible percentage levels, ignoring the sign. As a result, all of the series were stationary

Table 2: Correlation

	CIC	RTGS	NEFT	PPI_S	NACH	MBANKING	IMPS	CARDS
CIC	1.000000	-0.475926	-0.718110	-0.779454	-0.463901	-0.740503	-0.613247	-0.714500
RTGS	-0.475926	1.000000	0.793229	0.649827	0.459158	0.589465	0.616257	0.526756
NEFT	-0.718110	0.793229	1.000000	0.893992	0.583724	0.873051	0.849328	0.877678
PPI_S	-0.779454	0.649827	0.893992	1.000000	0.701605	0.924638	0.905901	0.814587
NACH	-0.463901	0.459158	0.583724	0.701605	1.000000	0.727896	0.732418	0.647014
MBANKING	-0.740503	0.589465	0.873051	0.924638	0.727896	1.000000	0.925106	0.848664
IMPS	-0.613247	0.616257	0.849328	0.905901	0.732418	0.925106	1.000000	0.840274
CARDS	-0.714500	0.526756	0.877678	0.814587	0.647014	0.848664	0.840274	1.000000

The Correlation table depicts the relationship between E-Payment Systems and Currency in Circulation during major financial reforms such as Demonetization and GST. We can also see that all E-Payment Systems are negatively correlated with Currency in Circulation, implying that as the E-Payment Method increases, the Circulation of currency in the economy decreases.

Combined Ordinary Least Square

Table 3: Coefficient and Model Summary

Dependent Variable	Independent Variable	Coefficient	Std. Error	T-Stats	Prob.
CIC	RTGS	-3195.431	3145.033	-1.016025	0.3282
	NEFT	390.3463	319.6947	1.220997	0.2438
	IMPS	529.9127	209.5844	2.528398	0.0252
	CARDS	-91.81096	47.47954	-1.933695	0.0752
	PPI'S	-114.3547	43.14021	-2.650768	0.0200
	MOBILE	-265.7172	183.1423	-1.450879	0.1705
	NACH	106.6368	92.88361	1.148069	0.2716

R-Squared	Durbin-Watson Stats.	F-Stats.	Prob.(F-Stats.)
0.648850	2.058913	6.279389	0.002277

Since the model we created had a F value of 6.279389, which was significant at 0.002277, and an adjusted R square of 64.88 percent, we may conclude that the Individual variable had a 64.88 percent effect on the Dependent variable. However, because the individual t coefficient was not significant, we used the Individual OLS model and then the VAR model.

Individual Ordinary Least Square

H01: There is no influence of E-Payment Systems on Currency in Circulation

The ordinary least square approach was utilised to assess the potential growth movement of E-Payments based on Currency in Circulation. According to Gujarati & Porter (1999), "despite the F value showing a model fit, if the selected model did not reject the null hypothesis under consideration, the lag method can be used to predict the future value of the dependent variable," but we did not use the lag method in this study because the

Table 4: Coefficient

Dependent Variable	Independent Variable	Coefficient	Std. Error	T-Stats	Prob.
CIC	RTGS	-4831.764	2048.416	-2.358780	0.0292
	NEFT	-341.9470	76.02500	-4.497823	0.0002
	IMPS	-320.3897	94.67467	-3.384112	0.0031
	CARDS	-83.88025	18.84310	-4.451509	0.0003
	PPI'S	-76.85134	14.17023	-5.423436	0.0000
	MOBILE BANKING	-296.5433	61.74310	-4.802858	0.0001
	NACH	-188.8520	82.73663	-2.282569	0.0341

The P-value of t-stats, i.e. of E-Payments, was calculated using the aforementioned results and found to be less than 5%, indicating that E-Payments had a substantial impact on currency in circulation (CIC). Furthermore, the beta coefficient of the E-Payments variables demonstrates a negative effect of E-Payments on Money in Circulation, implying that as the volume of all of these electronic payment systems increased, the currency in circulation in the economy decreased.

Table 5: Model Summary

	R-Squared	Durbin-Watson Stats.	F-Stats.	Prob.(F-Stats.)
RTGS	0.226505	1.010970	5.563844	0.029197
NEFT	0.515682	1.619712	20.23042	0.000246
IMPS	0.376072	1.989747	11.45221	0.003114
CARDS	0.510510	1.514326	19.81593	0.000274
PPI'S	0.607549	1.282844	29.41366	0.000031
MOBILE	0.548344	1.400578	23.06745	0.000124
NACH	0.215204	1.844546	5.210120	0.034149

Continuing with the previous discussion, the degree of effect of E-Payments by Currency in Circulation may be clearly observed in the table of model summary. A fascinating aspect to notice is that, in comparison to RTGS and IMPS, NEFT has a significantly greater impact on currency in circulation. Furthermore, all F-Statistics values are significant at less than 5% threshold of significance, indicating that the model is well-fit.

Table 6: Histogram-Normality Test of Residuals (Jarque-Bera)

H0: Residuals are normally distributed

	Jarque-Bera	Kurtosis	Skewness	Probability
RTGS(Resid)	0.802828	2.071836	0.118352	0.669373
NEFT(Resid)	0.675743	2.693453	0.411797	0.713287
IMPS(Resid)	0.837031	2.072286	0.154882	0.658023
CARDS(Resid)	0.590869	2.320445	-0.231021	0.744208
PPI'S(Resid)	0.507681	2.793080	0.366535	0.775816
M-BANKING(Resid)	1.179537	2.338125	0.476960	0.554456
NACH(Resid)	1.524710	1.994452	-0.427609	0.466566

Jarque-bera statistics were used in the preceding table 6 to determine if the residuals are normally distributed or not. The P value of all residuals is more than 5%, suggesting that the null hypothesis has failed to reject and that all residuals are normally distributed. The Serial Correlation LM test was used to examine the serial correlation in the residual values in Table 7.

Table 7: Serial Correlation LM Test

H0: There in no serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
	F-Statistics	Obs*R-Squared	Probablity
RTGS	2.603274	8.604815	0.071773
NEFT	1.671519	3.450999	0.178084
IMPS	2.827676	5.242134	0.072725
CARDS	0.511418	1.191797	0.551067
PPI'S	1.715551	3.526640	0.171475
MOBILE BANKING	0.661425	1.516131	0.468572
NACH	2.540080	8.480287	0.075487

From the above table of Breusch- Godfrey Serial Correlation LM test we tried to check whether the regression model is serially correlated or not. For this purpose, we developed a regression model for each variable independently i.e.

i.   CIC = C + RTGS
ii. CIC = C + NEFT
iii. CIC = C + IMPS
iv. CIC = C + CARDS
v.   CIC = C + PPI'S
vi. CIC = C + M-BANKING
vii. CIC = C + NACH

It is found that the probability value of all observed R-squared is higher than the P value of 0.05. So, the "null hypothesis that there is no serial correlation" has failed to reject. So, the model is free from serial correlation and therefore this model can be used for hypothesis testing and forecasting.

Table 8: Vector Auto-Regressive (VAR) Model

	CIC	RTGS	NEFT	IMPS	CARDS	PPI_S	MBANKING	NACH
CIC (-1)	0.537685	2.77E-05	-6.76E-05	0.000164	0.001050	-0.000791	-0.000643	0.002347
	(0.79028)	(9.4E-05)	(0.00044)	(0.00057)	(0.00622)	(0.00286)	(0.00092)	(0.00044)
	[0.68037]	[0.29538]	[-0.15389]	[0.28894]	[0.16872]	[-0.27668]	[-0.69689]	[5.31929]
CIC (-2)	0.539899	4.93E-05	-8.87E-06	3.61E-05	-0.001119	-0.000305	-0.000162	0.001233
	(0.51926)	(6.2E-05)	(0.00029)	(0.00037)	(0.00409)	(0.00188)	(0.00061)	(0.00029)
	[1.03974]	[0.80031]	[-0.03073]	[0.09674]	[-0.27366]	[-0.16236]	[-0.26636]	[4.25101]

Based on Currency in Circulation, the Vector Auto-regressive Model (table 8) was used to forecast future E-Payment movements. So, we can see that the coefficient values of RTGS and IMPS are expected to rise in the future as the coefficient value is observed to be more positive, whereas NEFT, POS (CARDS), PPI's, and M-Banking are expected to rise slightly in the near future as the coefficient values of all these values are moving towards positive, and NACH is expected to fall in the near future.

Major Findings

- There is a negative link between cash in circulation and electronic payments.

- In OLS, the beta coefficient of the E-Payments variables demonstrates a negative effect of E-Payments on Money in Circulation, implying that as the volume of all these electronic payment systems increased, the currency in circulation in the economy decreased.

- In comparison to RTGS and IMPS, NEFT has a far greater impact on the currency in circulation.

- PPIs reveal that the selected E-Payment systems have the greatest impact on cash in circulation.

- In VAR, the coefficient values of RTGS and IMPS are expected to rise in the future as the coefficient value is observed to be more positive, while NEFT, CARDS (POS), PPI's, and M-Banking are expected to rise slightly in the near future as the coefficient values of all these values are moving towards positive, and NACH is expected to fall in the near future.

Implications and Conclusions

Despite the aforementioned data, it is easy to conclude that the Indian economy has experienced a succession of important events from 2016 to 2020, demonstrating that the Indian economy is very resilient to these types of problems. The results reveal that there is a negative association between E-Payments and money in circulation, and that E-Payments have a significant impact on currency in circulation, implying that currency circulation has been significantly impacted by payment system digitizationIt is also expected that, when the Indian economy picks up speed following these important

events, the digital payment system would gain traction in contrast to real cash. Another factor for the rise in E-Payments might be the development of smart phones and simple internet connection, which allows consumers to conduct more online transactions, resulting in a decrease in money circulation. People are readily adopting digital payment methods since they are a simpler, safer, and faster means of payment. However, there is still a long way to go, as the situation in rural sections of the country is considerably different. People in rural regions still use the physical form currency Singhal owing to a lack of information about the digitalization system (2017). As a result, the goal of making India a "Less-Cash Economy" is still a long way off, requiring appropriate and well-structured policy design and timely execution with adequate contingencies in place. Financial changes are a component of the economy, and if effective planning and implementation of those plans are carried out, it will be simpler to overcome the consequences of financial reforms. Since 2016, the country has seen a succession of financial and non-financial crises, including the current pandemic (Covid-19), which has prompted the expansion of digital technology, driving people to shift toward a more technologically friendly atmosphere. Following the pandemic, the banking industry will face new difficulties as new private competitors enter the market with more modern technology, making the system more user-friendly. As a result, India's financial reforms (Demonetization and GST implementation) and present pandemic (Covid-19) conditions might pave the way for a digital revolution in the banking industry.

Limitations

The current study on cash in circulation and selected E-payment systems produced some extremely intriguing findings and potential implications. However, there are several limitations to this research. Because the sample size is so small, the study relies on four years of monthly data. To examine the impact of these e-payment systems in distant parts of the nation, no specific technique was used.

Future Research

Financial reforms and the present pandemic scenario in the economy appear to have had a greater impact on the study's findings. For more universal results, future research should look at various types of e-payments. Second, the findings give up possibilities for future development in a variety of developed and poor countries. Furthermore, future studies should look into post-pandemic (Covid-19) scenarios.

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