An Exploratory Study on Demonetization and the Transaction of India towards a Digital Economy

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Abstract: *The study titled 'Demonetization: The Growth of Indian Economy towards Digital Era; is an exploratory study on the impact of demonetization and the transaction of India towards a digital economy. The study was based on the secondary data collected from the official website of the RBI and central statistical office. Aim of this study was to analyse the growth of digital economy in India and to examine the difference between demonization and CPI rates. By evaluating both we found there is a positive correlation between two variables. Developing new business models based on technology solutions and widening the scope of low - cost mobile platform for the easy availability of the basic banking services to every rural citizen, especially the tribal people can indeed accelerate India's journey to a cashless economy.*

Keywords: Demonetization, Business Models, Digital mode transactions, Digitalization, Cashless Economy

1. Introduction

The demonetisation exercise is on the face of it, a financial affair. Generally, it is undertaken at the time of excessive money supply causing hyperinflation and instability in the economy. Demonetisation is the process where the government declares currently running currency notes illegal to be tender after the declaration is made. The reasons of demonetisation are to control counterfeit notes that could be contributing to terrorism, and to eliminate the black money. Introduction of new banknotes meant the ATM had to be altered to be able to dispense the new currency. The country had to find out huge amount of money only due the demonetisation. The move that was initially explained to eradicate black money, corruption, terror funding and slowly explained as a step towards digital payment, making India a cashless economy Many believed the changes will be temporary but the data shows the other way. For example, Unified Payment Interface transactions shot up 68 million in October 2017 from just 0.3 million at the end of November 2016. Similarly, IMPS transactions clocked an over 100 percent growth to 82 million in October 2017 from 36 million in November 2016. The value of banknotes in circulation declined by 20.2 percent over the year to Rs 13, 102 billion as at End - March 2017. The volume of banknotes however increased by 11.1 percent mainly due to demonetisation. Demonetization provides certain benefits to the economy.

Statement of the problem
The basic objective of the notion of demonetisation is the removal of currency which is in regular transition of money. Demonetisation is the process where the government declares the currently running currency notes illegal to be tendered after the declaration is made. The currency of Rs 500 and Rs 1000 of which were nearly 86% in circulation, became valueless paper on November 8th 2016. The aim of the government was to have certain control over certain problems and thus introduces digital mode of transaction instead of paper currency. For a country like India, although the idea of transition from currency to digital transaction is welcome, certain precautionary measures could have been taken to minimize the negative impact of demonetisation. It is true that the alternative payment methods, such as e - wallets, online transaction using e - banking, debit and credit card usages have been increased.

2. Review of Literature

Kulkarni and Tapas (2017) did a study on Demonetization Comparatists. The decision was believed to have a control over the corruptions. Here we just trying to compare the situations. It is a disaster on economy trust. The way it has been implemented will hurt agricultural growth, small industry and informal sectors of the economy. Some estimate suggested that about 6% of black income was held in cash rest might be in gold, property, benami etc.

Nayar (2017) according to him the demonetization was taken to tackle the rampant corruption, to combat black money and to check fake currency. Since our economy is heavily dependent on cash, the measure has hit trade and consumption. The move is likely to take a big toll on the country's growth and output during the current fiscal.

Rajiv (2017) did a study demonetisation and its impact on Indian economy. He looks into short term costs and medium - term benefits of demonetisation and its impact on the growth of various sectors of an economy where significant cash transactions are involved.

Piyush and DhaniShanker (2017) did a study on Macro - Economic analysis of demonetisation and its economic implication. It changed the buying behaviour of Indian society. It captured black money market. But people face problems in their day to day transactions. The research is based on its usability and affordability while they are affecting its preference to economic conditions of the country.

Selvaraj (2017) did a study on demonetisation: A Boon or Bane. The Indian informal sector, which provides 80 percent of total employment was much affected. The reverse migration of work force necessitated them to adopt to a meal

per day. Nearly, 2.5 lakh workers in leather industry, 20, 000 workers in diamond industry 15% to 20% of daily wagers in Jewel sector have become jobless. New Investments fell by 50% in post cash ban.

Sazid and Mohd (2017) did a study on Digital Indian Economy. Cashless society has its own challenges. Main challenges are number of internet users, number of smart phone users, internet speed, and literacy ratio and cyber security. Two topmost cashless economies of the world, Singapore and Netherlands.

Bhattacharya and Joshi (2001) did a study on Modelling Currency in Circulation in India. To model and forecast currency in circulation, generally two types of approaches are followed. Standard currency demand equation based on theory of transaction and portfolio demand for money. The household after receiving the amount make their regular payments and after some time the money owns back to the banking system.

Rusakova and Saychenko (2016) did a study on transforming monetary function in the modern global currency system. Demonetisation crisis can be considered a trigger for returning back to the world monetary system. And also need to consider the new trends. Changing behaviour of the countries also have to consider. Thus, under circumstances of ongoing demonetisation has actually gained the status of the most important international reserve asset.

Dornbusch, and Others (1990) did a study on Extreme Inflation: Dynamics and Stabilization. War and revolution were once the settings in which extreme inflation might occur. The interaction between inflation and the frequency of price adjustment represents the second building block of inflationary dynamics.

Objectives of the study
- To analyse the growth of digital economy in India.
- To examine the difference between demonetization and CPI rates

Hypotheses
Ha₁ There is significant difference between demonetization and the CPI rate as combined of rural and urban area.

3. Research Methodology

The study is an exploratory research based on secondary data. The research methodology analytical, partly descriptive and empirical. The study made use of secondary data. Data on CPI, Inflation, GDP and digital transactions etc. are the period of study. The secondary data were collected form books, newspapers, research articles, research journals, E - journals and RBI website etc. The t test, ARIMA statistical tool used with the help of SPSS (21) for analysing the data.

Limitation of the study
The study suffers from the following constrains:
- The collection of the secondary data was limited because there are no proper studies are done in accordance with the demonetization.
- The data was available only for short - term period.

4. Discussion

This project is an exploratory study on demonitisation and the transition of India towards a digital economy. The data was collected from secondary sources which is analyzed and presented below.

**Table 2.6 (a)** Effect of Demonetization on Inflation Combined

Table 2.7 (b) Paired Samples Correlations

	N	Correlation	Sig.
Before & After	12	.864	.000

Table 2.8 (c): Paired Samples Test

		Paired Differences					t	df	Sig. (2 - tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
	Before - After	- 4.30000	1.38367	.39943	- 5.17914	- 3.42086	- 10.765	11	.000

Interpretation
By evaluating the correlation between the demonetization and inflation rate combined of rural and urban area, we found that there is a positive correlation between the two variables, as the test shows the correlation value as.864.

Null hypothesis: There is no significant difference between demonetization and CPI rate as combined of rural and urban area.

Alternative hypothesis: There is significant difference between demonetization and the CPI rate as combined of rural and urban area.

The above paired sample t - test shows the table value as - 10.765. Since the p value (0.001) is less than 0.05 it is significant. Therefore, the null hypothesis is rejected and alternative hypothesis is accepted. It is significance statistical difference between CPI rate as combined of both rural and urban area and demonetization.

UCURRENT
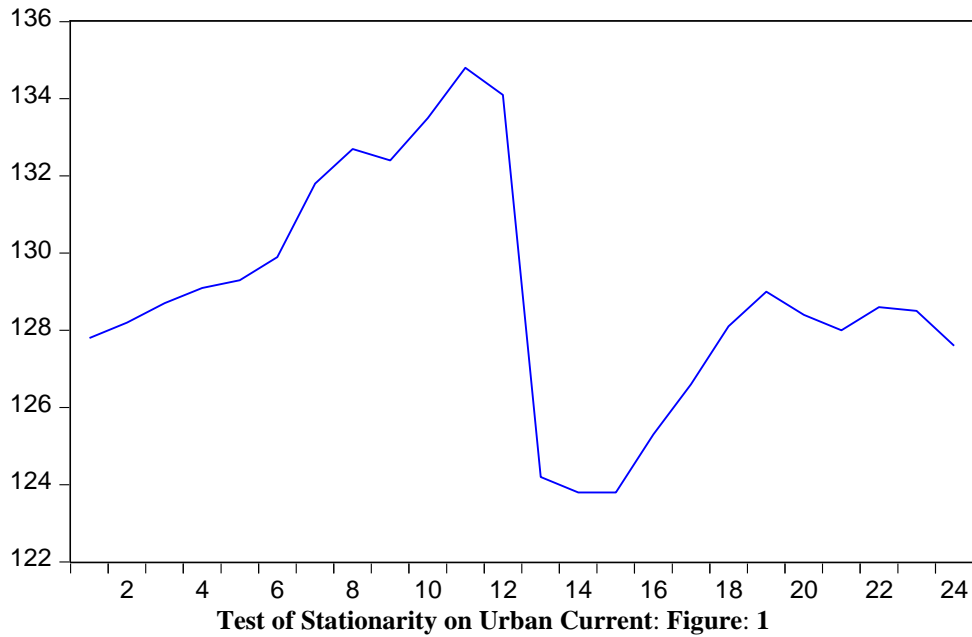
Test of Stationarity on Urban Current: **Figure**: **1**
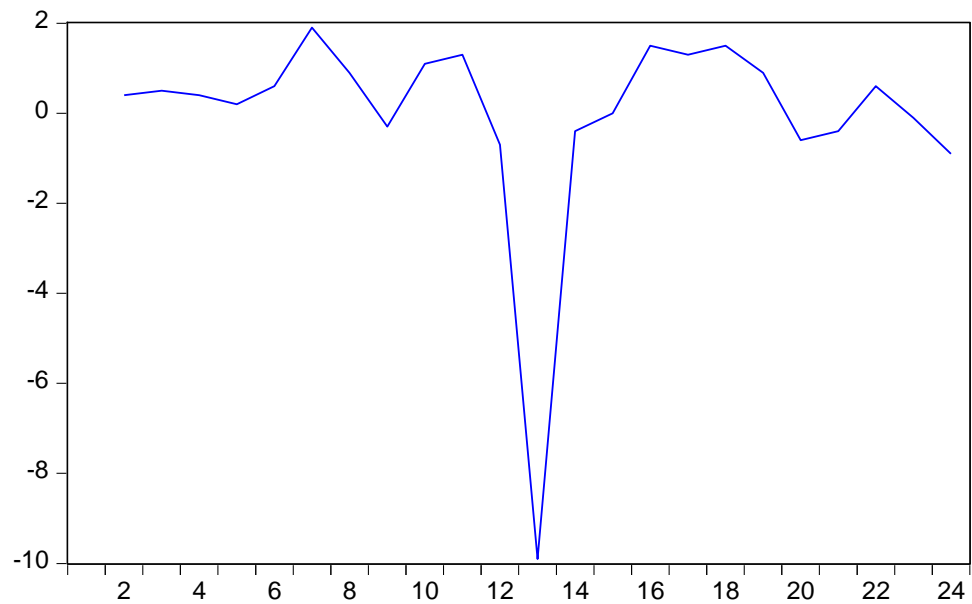
Differenced UCURRENT

Figure 2

Interpretation

The line graph of time series indicates absence of stationary due to significance fluctuations from average and it having high trend and further it falls down and again further having a less trend as compared to the previous trend. But the difference data at first difference seems to have no stationary. This is confirmed by two - unit root test.
Augmented Dickey Fuller test
For both the test the null hypothesis is
H_0: Unit root is present / series is non - stationary.
H_1: Absence of unit root test / series is stationary.
For the series at level ADF test statistic, T= - 1.7968, with P value 0.3725 >0.05. Therefore, accept null hypothesis.
The test shows that series is non - stationary at level.
Similarly, for the series at first difference
ADF Test t statistic = - 3.7730, with P value <0.05

Therefore, reject null hypothesis.

Hence the sample suggest that the given data attains stationary at first difference.

Null Hypothesis: UCURRENT has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=5)			
		t - Statistic	Prob. *
Augmented Dickey - Fuller test statistic		- 1.796870	0.3725
Test critical values:	1% level	- 3.752946	
	5% level	- 2.998064	
	10% level	- 2.638752	

Non - stationary at level

Null Hypothesis: D (UCURRENT) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=5)				
			t - Statistic	Prob. *
Augmented Dickey - Fuller test statistic			- 3.773063	0.0099
Test critical values:	1% level		- 3.769597	
	5% level		- 3.004861	
	10% level		- 2.642242	
*MacKinnon (1996) one - sided p - values.				

Attains stationarity at first difference

Date: 01/30/18   Time: 17:08
Sample: 1 24
Included observations: 24

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.726	0.726	14.316	0.000
		2	0.373	-0.32...	18.259	0.000
		3	0.074	-0.11...	18.423	0.000
		4	-0.12...	-0.08...	18.936	0.001
		5	-0.29...	-0.19...	21.699	0.001
		6	-0.33...	0.009	25.688	0.000
		7	-0.26...	0.054	28.282	0.000
		8	-0.20...	-0.16...	29.881	0.000
		9	-0.17...	-0.08...	31.116	0.000
		1...	-0.11...	0.015	31.751	0.000
		1...	-0.05...	-0.04...	31.892	0.001
		1...	-0.03...	-0.09...	31.962	0.001

Using the best selection parameters based on AIC values

$\Delta Y_t = \mu + \alpha_1 \Delta Y_{t-1} + \alpha\ 2\Delta Y_t - 2 + \varepsilon_t + \beta_1 \varepsilon_t - 1$

Initial assumption can be taken as p = 1 of ARIMA (p, d, q) since AIC cuts after lag 1 but about the value of q & d it was indecisive so we had to test for all possible values of d = 0 & 1 & q=1, 2, 3 to get the model parameters according to model based on parsimony principle of optimality. Comparing two different combinations of p, d, q of ARIMA model value of p =1.

Dependent variable: Urban Current				
Method: Least Squares				
Date: 01/30/18 Time: 17: 13				
Sample: 6 24				
Included observations: 19				
Convergence achieved after 26 iterations				
MA Backcast: 5				
Variable	Coefficient	Std. Error	t - Statistic	Prob.
C	127.7716	0.376855	339.0471	0.0000
AR (1)	1.515073	0.161584	9.376361	0.0000
AR (2)	- 0.683029	0.150104	- 4.550358	0.0004
MA (1)	- 0.999357	0.143968	- 6.941508	0.0000
R - squared	0.704048	Mean dependent var		129.0053
Adjusted R - squared	0.644858	S. D. dependent var		3.455346
S. E. of regression	2.059173	Akaike info criterion		4.467149

Sum squared resid	63.60288	Schwarz criterion	4.665979
Log likelihood	- 38.43792	Hannan - Quinn criter.	4.500799
F - statistic	11.89463	Durbin - Watson stat	1.839288
Prob (F - statistic)	0.000301		
Inverted AR Roots	.76+.33i	.76 - .33i	
Inverted MA Roots	1.00		

The value of Durbin - Watson (DW) was 1.839288 for the inflation rate in urban area from 2016 to 2017which indicates that the data is suitable for time - series analysis. As DW ≈ 2 [1 - ρ (1)] hence ρ (1) = 0.726 which indicates that at 1st order auto - correlation. The ACF and PACF correlogram was plotted to identify the model of ARIMA

Estimate table ARIMA (2, 0, 1)

	Estimate	SE	t	Sig
Constant	127.7716	0.376855	339.0471	0.0000
AR 1	1.515073	0.161584	9.376361	0.0000
AR 2	- 0.683029	0.150104	- 4.550358	0.0004
MA 1	- 0.999357	0.143968	- 6.941508	0.0000

Thus, the model using the above table is

$X_t = 127.77\ (1+1.515) + X_{t-1} - 0.683\ (X_{t-1} - X_{t-1} - X_{t-2}) + 0.999\ e_{t-1}$

Reason for selecting ARIMA (2, 0, 1)

AR / MA	0.000000	1.000000	2.000000	3.000000	4.000000	5.000000
0.000000	5.368918	4.868183	4.710177	4.797944	4.897684	4.639557
1.000000	4.709116	4.728469	4.793844	4.898146	4.705894	4.696724
2.000000	4.692522	4.467149	4.897447	4.711570	4.697707	4.987741
3.000000	4.786589	4.892855	4.668728	4.747881	4.871415	4.848976
4.000000	4.886694	NA	4.726016	4.839080	4.895411	4.863841
5.000000	4.947086	5.052307	4.836816	4.935552	4.959973	4.977714

Here we have done the chow breakpoint test to find out any specified breakpoint. Through this test we found there is no breaks at specified breakpoints.

Chow Breakpoint Test: 11			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 6 24			
F - statistic	3.715963	Prob. F (4, 11)	0.0378
Log likelihood ratio	16.24407	Prob. Chi - Square (4)	0.0027

WARNING: the MA back casts differ for the original and test equation. Under the null hypothesis, the impact of this difference vanishes Asymptotically.

This is significant and there is a break.

The effect of demonetization studied on the inflation time series. Using ARIMA. The series attains stationarity at first difference. The ARIMA model revealed a structural break.

Test of Stationarity on Urban Inflation

UINFLATION

Figure 3

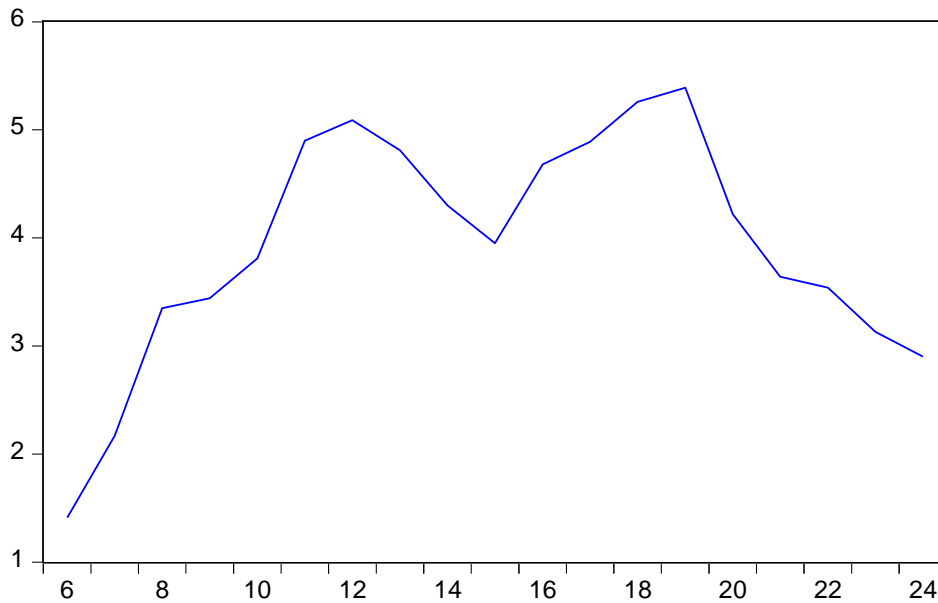## Differenced UINFLATION

Figure 4

Interpretation

The line graph of time series indicates absence of stationary due to significance fluctuations from average and it having high trend and further it falls down and again further having a less trend as compared to the previous trend. But the difference data at first difference seems to have no stationary. This is confirmed by two - unit root test.

Augmented Dickey Fuller test

For both the test the null hypothesis is

H_0: Unit root is present / series is non - stationary.

H_1: Absence of unit root test / series is stationary.

For the series at level ADF test statistic, T= - 1.7968, with P value 0.3725 >0.05. Therefore, accept null hypothesis.

The test shows that series is non - stationary at level.

Similarly, for the series at first difference

ADF Test t statistic = - 3.7730, with P value <0.05

Therefore, reject null hypothesis.

Hence the sample suggest that the given data attains stationary at first difference.

Null Hypothesis: UINFLATION has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=3)				
			t - Statistic	Prob. *
Augmented Dickey - Fuller test statistic			- 2.487485	0.1338
Test critical values:	1% level		- 3.831511	
	5% level		- 3.029970	
	10% level		- 2.655194	

Null Hypothesis: D (UINFLATION) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=3)				
			t - Statistic	Prob. *
Augmented Dickey - Fuller test statistic			- 3.023557	0.0506
Test critical values:	1% level		- 3.831511	
	5% level		- 3.029970	
	10% level		- 2.655194	
*MacKinnon (1996) one - sided p - values.				

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 19

Date: 01/30/18   Time: 17:17
Sample: 6 24
Included observations: 19

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.662	0.662	9.7114	0.002
		2	0.300	-0.24...	11.821	0.003
		3	0.099	0.027	12.064	0.007
		4	-0.11...	-0.26...	12.434	0.014
		5	-0.23...	-0.00...	14.020	0.015
		6	-0.16...	0.102	14.862	0.021
		7	-0.09...	-0.03...	15.132	0.034
		8	-0.07...	-0.06...	15.319	0.053
		9	-0.16...	-0.29...	16.447	0.058
		1...	-0.33...	-0.25...	21.432	0.018
		1...	-0.38...	-0.01...	28.767	0.002
		1...	-0.38...	-0.14...	36.990	0.000

$\Delta Y_t = \mu + \alpha_1 \Delta Y_{t-1} + \alpha 2\Delta Yt - 2 + \varepsilon_t + \beta_1 \varepsilon_t - 1$

Initial assumption can be taken as p = 1 of ARIMA (p, d, q) since AIC cuts after lag 1 but about the value of q & d it was undeceive so we had to test for all possible values of d = 0 & 1 & q=1, 2, 3 to get the model parameters according to model based on parsimony principle of optimality. Comparing two different combinations of p, d, q of ARIMA model value of p =1.

Dependent variable: UINFLATION				
Method: Least Squares				
Date: 01/30/18 Time: 17: 18				
Sample (adjusted): 7 24				
Included observations: 18 after adjustments				
Convergence achieved after 19 iterations				
MA Back cast: 6				
Variable	Coefficient	Std. Error	t - Statistic	Prob.
C	4.144266	0.432390	9.584564	0.0000
AR (1)	0.564097	0.167954	3.358637	0.0043
MA (1)	0.934434	0.116097	8.048714	0.0000
R - squared	0.812694	Mean dependent var		4.081667
Adjusted R - squared	0.787720	S. D. dependent var		0.903537
S. E. of regression	0.416295	Akaike info criterion		1.236166

Sum squared resid	2.599521	Schwarz criterion	1.384561
Log likelihood	- 8.125493	Hannan - Quinn criter.	1.256628
F - statistic	32.54137	Durbin - Watson stat	2.039955
Prob (F - statistic)	0.000004		
Inverted AR Roots	.56		
Inverted MA Roots	- .93		

The value of Durbin - Watson (DW) was 2.039955 for the inflation rate in urban area from 2016 to 2017which indicates that the data is suitable for time - series analysis. As DW ≈ 2 [1 - ρ (1)] hence ρ (1) = 0.662 which indicates that at 1st order auto - correlation. The ACF and PACF correlogram was plotted to identify the model of ARIMA

Estimate table ARIMA (2, 0, 1)

	Estimate	SE	t	Sig
Constant	4.144266	0.432390	9.584564	0.0000
AR 1	0.564097	0.167954	3.358637	0.0043
Difference	1			
MA 1	0.934434	0.116097	8.048714	0.0000

Thus, the model using the above table is

$X_{t} = 4.144\ (1+0.564) + X_{t-1} - 0.564\ (X_{t-1} - X_{t-1} - X_{t-2}) + 0.934\ e_{t-1}$

AR / MA	0.000000	1.000000	2.000000	3.000000
0.000000	3.025960	1.843233	1.288351	1.383471
1.000000	1.675832	1.236166	1.345549	1.387576
2.000000	1.588384	1.356058	NA	1.428933

Here we have done the chow breakpoint test to find out any specified breakpoint. Through this test we found there is no breaks at specified breakpoints.

Chow Breakpoint Test: 11			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 3 24			
Wald Statistic	1.401608	Prob. Chi - Square (3)	0.7052
WARNING: the MA back casts differ for the original and test equation. Under			
the null hypothesis, the impact of this difference vanishes			
Asymptotically.			

Chow Breakpoint Test: 12			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 3 24			
Wald Statistic	0.162837	Prob. Chi - Square (3)	0.9834
WARNING: the MA back casts differ for the original and test equation. Under			
the null hypothesis, the impact of this difference vanishes			
Asymptotically.			

Chow Breakpoint Test: 9			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 3 24			
F - statistic	3.579295	Prob. F (3, 16)	0.0375
Log likelihood ratio	11.29684	Prob. Chi - Square (3)	0.0102
Wald Statistic	6.040281	Prob. Chi - Square (3)	0.1097

Warning: the MA back casts differ for the original and test equation. Under the null hypothesis, the impact of this difference vanishes Asymptotically.

This is significant and there is a break.

The effect of demonetization studied on the inflation time series. Using ARIMA. The series attains stationarity at first difference. The ARIMA model revealed a structural break.

5. Conclusion

This paper is "an exploratory study on demonetization and the transition of India towards a digital economy". The rationale behind the implementation of demonetization in India is to initiate a change in the direction of transparent money transactions. An attempt has been made to analyze the impact and growth brought forward by demonetization towards the digital transaction in India. The study also looks at whether demonetization has made an impact on the life of ordinary people or not. Digital transaction has been viewed as a powerful medium for spreading the objectives of demonetization throughout the country. This transition is a gradual process. Although the effect of demonetization was short lived, its lingering effect continues to be felt on various segments of Indian economy.

At present Indian banks are investing huge amounts in the infrastructure to host online banking activities. In the era of internet technology, Wi - Fi services and smart - phone gadgets, the online banking services are considered to be very effective in reaching out to the target audience. At the same time government should also be concerned about the cyber - crimes which take place in mobile and net banking transactions. Frequent reports of such crimes hold people back from availing the facilities of digital transactions and prefer traditional mode of transactions to digital transactions.

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