An Empirical Insight of Examining Impact of Recent Demonetization on Monetary System: Evidence from India

Narayan Sethi*[1], Padmaja Bhujabal[2],
Devi Prasad Dash[3], Sanhita Sucharita[4]

Abstract

Demonetization initiative by Govt. of India in Nov-Dec, 2016 aimed at addressing the issues like black money, hoarding and overall cleansing the monetary system. This paper in this regard attempts to empirically examine the impact of demonetization drive upon the monetary system by taking data of 180 days prior to Nov, 2016. The cointegration results exhibit show a long run cointegration between the money supply, demonetization dummy, cash in hand, notes in circulation and bank deposits. Furthermore, our Bayer-Hanck cointegration also confirms the cointegration among the variables. Our error correction mechanism analysis shows the   long run relation between the variables. The variance decomposition analysis further states that effect of demonetization is widely visible upon the cash in hand followed by the notes in circulation. Despite the wider claims by the government regarding the positive impacts of demonetization drive, this initiative is fraught with several challenges and limitations. The implications of this initiative are discussed in this paper.
Keywords: Demonetization, Money Supply, ARDL, Macroeconomic variables, India.
JEL Classification: E50, E52, E59.

1. Introduction
Demonetization is a process of removing the values attached to the money or monetary system of any institution or the government bodies in

---

[1]. Department of Humanities and Social Sciences, National Institute of Technology (NIT) Rourkela, Odisha, India (Corresponding Author: sethin@nitrkl.ac.in).
[2]. Department of Humanities and Social Sciences, National Institute of Technology (NIT) Rourkela, Odisha, India (515HS3006@nitrkl.ac.in).
[3]. Department of Humanities and Social Sciences, Indian Institute of Technology (IIT), Ropar, Punjab, India (devi.dash@iitrpr.ac.in).
[4]. Centre for Humanities and Social Sciences, School of Humanities and Social Sciences, Central University of Jharkhand, Ranchi, Jharkhand, India (sanhita.sucharita@cuj.ac.in).

a country. The process is carried out to replace the old currency with a new one. It is basically carried out with an objective to tackle corruption, black money and to control fake currency notes that often finance terror activities in the country. In general, the high value currencies are used for unfair purposes and thus, it becomes essential to adopt such drastic measures for the betterment of the society from these social and economic evils. Demonetization as such is not new for the Indian economy. In 1946, the currency notes of Rs.1,000 and Rs.10,000 were removed from circulation. The ban really did not have much impact, as the currency of such higher denomination was not accessible to the common people. However, both the notes were reintroduced in 1954 with an additional introduction of Rs.5,000 currency.

Rs.500 and Rs.1000 notes were introduced in 1934 and after four years in 1938, Rs.10,000 notes were introduced. The second ban was carried out in 1978, in which Rs.1000, Rs.5000 and Rs.10000 currency notes were taken out of circulation with an aim to curb the black money generation in the country. But it did not have much effect on the common people and only affected few of privileged people. However, the latest round of demonetization accounted to make 86 per cent of the currency in circulation invalid. Prime Minister of India, Shri Narendra Modi on 8th November, 2016 announced demonetization by ceasing Rs.500 and Rs.1000 notes as a part of legal tender in India.

In the Indian economy, the Rs.500 currency note was the most favorable denomination in daily life. It constituted nearly 49 per cent of the previous currency supply. Nearly 16000 million Rs.500 notes were in circulation as on end of March 2016. Owing to the demonetization process, there has been a serious shortage of currency in the economy. The major issue arising from the demonetization has been the liquidity crunch. Higher the time is required to resupply Rs.500 notes, higher will be the duration of the liquidity crunch. Current deposits indicate that all security printing presses can print only 2000 million units of Rs.500 notes in 1 month.

With cash transactions impacted by a decrease in liquidity, alternative payment methods, such as e-wallets, online transactions using e-banking, debit and credit card usage have increased significantly. The key sectors of the economy have faced a major slowdown. Whether the effects are short term or long term are still debatable. This paper aims to throw a light at the impact of demonetization on the monetary structure of the economy. This paper examines the impact of demonetization on monetary system (e.g. money supply (M1), notes in circulation, and cash in hands with bank) in India.

In this paper, we examine the impact of demonetization on selected macroeconomic variables in India. We also analyze the trends of money supply (M1), notes in circulation and cash in hands with bank after the introduction of demonetization. The remaining of the paper is organized into eight sections including the present one. Section 2 presents some review of literature. Some cross country instances of demonetization has been discussed in section 3. Section 4 discusses the structure of the monetary system. Section 5 analyzes the impact of demonetization on selected macroeconomic variables. Section 6 reports the data and empirical methodology. The empirical results are reported in section 7. Section 8 presents conclusion with some policy observations.

2. Review of Literature

Demonetization has become a household name in India and tracking its effects is necessary from an economic point of view. Since it is a recent issue, very few studies have been done in the field of identifying the impact of demonetization on the Indian economy. Some of the major studies are reviewed and discussed below.

Ghandy (2016) examined the reasons behind the implementation of demonetization and examined its effect on the common people. He points out that though the main motive behind demonetization was to eradicate black money and to pave way for a cashless society, it has not achieved its main goals. Since less than 50 per cent of the Indian households have access to a bank and over 60per cent of the economy is in the informal

sector, it is quite difficult to switch over to a cashless society in a jiffy. According to the author, the demonetization drive has actually increased the sufferings of the poor and the middle class people rather than helping the society.

Kumar and Kumar (2016) studied the impact of demonetization on Indian economy by analyzing its effect on consumption, money supply, bank deposits and they found that it is having negative impact on the different sectors of the economy. They also pointed out that the majority of the negative effects are short run effects which can be overcome in the future by government intervention through favorable policies.

Umamaheshwari (2016) examined the process of demonetization and concludes that the process will slowly drive out the small vendors from business and will force people to use the larger retail outlets owned by big business firms. He also views that in a developing nation which has a large population of illiterate and poor people with no easy access to banking system, such a drive to initiate cashless economy is insensitive in the part of the Government.

Tax Research Team, NIPFP (2016) studied the short term and medium term impact of demonetization on the black money in India and concluded that demonetization is not that strong a tool to eradicate the lump sum amount of black money in India. According to them, there is a high possibility that the recent demonetization drive will be responsible for contraction of major economic activities in the country.

Lahiri (2016) studied the cash shortage and black money as an effect on demonetization and finds that the shortage of currency in the economy may affect the government adversely in the near future. He further emphasized on the role of the government in preventing the accumulation of new black money after the stabilization of the economy. Similarly, another study by Kumar (2016) focuses upon the economic consequences of demonetization by studying money supply and economic structure of the economy. According to him, the recent demonetization move which was expected to be a historic high for the Indian government, has rather led to a crisis due to the liquidity crunch.

According to Economic Survey 2016-17, after the demonetization process is settled in India after December 2016, the cash will recover but settle at a lower level. On the other hand, bank deposits will decline but probably settle at a slightly higher level. The RBI's balance sheet will shrink after the deadline for redeeming outstanding notes. It is also estimated that loan rates could fall further if much of the deposit increase proves durable. Also, it has been assumed that the government's wealth will increase when unreturned cash is extinguished, thus reducing the liabilities and on the other hand the wealth of the private sector could fall further if real estate prices continue to decline.

Kulkarni and Tapas (2017) compared the case of demonetization in India with demonetization in other countries such as Russia, Australia and Zimbabwe. According to them, the immediate impact may be negative but the massive expansion of bank deposits will hopefully bloat the contribution of financial services to the increase in Gross Domestic Product (GDP) in the later period and can impact the economic growth.

Table 1: Specific Recent Review of Literature on Demonetization

Author	Context	Subject	Result
Marin (2002)	Russia	Demonetization in former soviet union	No impacts in pricing behavior of non-cash transcation across sectors
Jing (2007)	China	Dynamics of gold demonetization	Gold as a currency weakens after demonetization and better starategy by people is to keep gold with them

			Mixed impact across sectors and is expected to give positive impact in controlling black money in long run
Mali (2016)	India	Impact of demonetization across sectors	Mixed impact across sectors and is expected to give positive impact in controlling black money in long run
Pachare (2016)	India	Demonetization and digital payment system	Demonetization post Nov 2016 has led to the e-wallet system
Raychadhuri (2017)	India	Demonetization-unsolved economic puzzles	Mixed impacts upon the economy with surprise elements for people and aim for erasing black money

Notes: Author's own compilation

3. Cross-Country Instances of Demonetization

In this section, we present major instances of demonetization along with their rationale and effects in case of underdeveloped, developing and developed countries. In case of *Underdeveloped Countries*, in 1985, 50 and 100 kyat notes were demonetized in Myanmar with limited exchange facility. Consequently, 75 kyat notes were introduced. The rationale behind executing this process was to fight black marketing. But this led to an outburst of public protests in the country. Again in 1987, the Myanmar Government demonetized 25, 25 and 75 kyat notes with hardly any exchange facility and introduced new denominations. As a result of this, inflation boomed and the public hurried up to buy and stock the goods.

*In case of Developing Economies i*n 1982, the Government of Ghana demonetized 50 cedi notes with no exchange facilities to control excess

liquidity and inflation. In addition to demonetization, it also put a freeze on the bank deposits. This led to loss of confidence in the banking system among the general public. Soviet Union in 1991 withdrew 50 and 100 ruble notes for exchange to new notes to fight organized crimes and address money overhang. The Government set a rule to exchange the notes in only three days and in very small amounts per person. This led to loss of public confidence, hyperinflation and unemployment situation in its economy. Similar to the steps carried out by Soviet Union in 1991, Russia also negotiated with its neighbors to establish a new ruble zone in 1993. This process was carried out as a measure to control inflation and also to complete the process of exchanging old bank notes. Only Belarus signed this agreement with Russia. Thus, it did not strengthen the ruble and also created problems for neighboring currencies. Southern Iraq was unable to cope up with UN sanctions and print money abroad. Therefore, it printed money locally to finance its fiscal deficits. In this process, in 1993, 25 dinar notes were replaced by new locally printed, low quality motes. Also limited time was given to exchange the notes. Due to limited time, the residents of Northern Iraq could not exchange their notes and their holding of old dinars in effect became their new currency. This uncontrolled printing of notes caused high inflation in the country. To control black currency market and fight inflation, North Korea in 2009 demonetized its old notes by revaluing it with strict limits on exchange. This led to public protests and there was panic in the country. Market activities halted for a week and there was depreciation of Won in the black market. To fight inflation and profiteering in Venezuela, it announced in December 2016 that 100 Bolivar notes would be recalled. This led to public unrest across the country. In Zimbabwe, due to hyperinflation, the Zimbabwean Dollar was effectively abandoned in 2009 and use of foreign currencies was legalized. In 2015, the Zimbabwean Dollar was demonetized with an aim to have complete switch to US Dollar and to adopt multiple currencies. The consumer prices were stabilized due to this process.

*In case of Developed Economies, t*o overcome fiscal and banking crisis, Greece in June 2015, closed its banks for a month and imposed capital controls. The banks reopened in July 2015 but the capital controls remained. Two years after Singapore's independence from Malaysia in 1965, the monetary union broke down. In June 1967, the currency union of Malaysia, Singapore and Brunei ended and each issued its own currency. As per Interchangeability Agreement 1967, the three currencies were interchangeable at par. Interchangeability is still maintained with Brunei dollar. To prevent counterfeiting of money in Australia, after thorough research during 1970s-80s on higher quality reprographic technology, counterfeit resistant polymer bank notes were released in 1988. In February 2015, next generation notes were introduced with a tactile feature to assist the visually challenged. Australia became the first country to have a full series of circulating polymer bank notes. To create a common currency for the European Union, after careful planning and announcement of design, Euro was introduced in non-physical form in January 1999. The old currencies remained legal tender till January 2002 when new notes were issued. Old currencies were exchangeable till June 2002 and even beyond. The transition from old currency to new and single currency was generally smooth.

4. Structure of the Monetary System

The structure of the monetary economy is such that the central bank of a country releases the cash circulating in the economy. There are two propositions of quantity theory of money (e.g. MV= PT). First, in the long run, the rate inflation grows as the quantity of money increases. Second, in the long run, output and velocity of money remains constant with a permanent increase in money growth. This proposition proves that inflation is always and everywhere a monetary phenomenon. In our case, The Reserve Bank of India (RBI) circulates the cash in the economy. Then the banking system of the country creates more money by lending the deposits it gets to others. This money is spent by those taking the loans and it flows back to the banks which then lend it out again (Kumar,

2016). If purely the transaction aspect of the money is taken into account, then according to existing theory, money (M) is used many times in a year for transaction purposes. The number of times it goes around in a year is known as its velocity of circulation (V). Thus, total supply of money is M*V. If the transactions in a year is T and the average price is P then, total demand for money is P*T. As supply is equal to demand, therefore,

$$M.V = P.T \tag{1}$$

This aggregate relationship can be represented differently by taking the variations from the Indian heterogeneous economy. The main distinction arises from the variation in unorganized and organized sectors of our country. The unorganized sector generally depends on cash transactions while the organized sector uses both the cash and banking channel for carrying out its transactions. So, we can rewrite the equation (1) as:

$$M_u.V_u + M_o.V_o = P_u.T_u + P_o.T_o \tag{2}$$

Where, u stands for the unorganized sector and o for the organized sectors.

5. Impact of Demonetization on Selected Macroeconomic Variables
Demonetization has had immediate and significant impacts on the Indian economy. The common public has been the worst sufferer. What was supposed to be a masterstroke to curb the corruption and circulation of black money rather got affected by the sudden cash shortage in the economy. The chaotic effects of demonetization had been in the banks and ATMs which were out of cash, the businesses suffered severe losses, and there was loss of income and assets of the poorest (Bharadwaj, 2016).

5.1 Impact on Money Supply

Demonetization has significantly reduced the circulation of cash in the economy as the old currency notes are no more a part of the legal tender. The public was allowed to deposit the old notes in the banks up to a certain date. These become the public's deposits with the banks. So, while currency in circulation sharply contracted, the deposits with the banks increased slowly so that the money supply in the economy has also contracted. Since the money deposited by the public with the banks was to be returned to the central bank, it was not available to the banks to lend out immediately. Further, the banks were too busy with the return of the currency and the issuing of new currency so that they have had no time to lend the money they had collected. Finally, the money that has come in is only temporary since the public is likely to draw it back for the purposes for which it held the currency. Expenditures by the public have fallen sharply since they have lost their capacity to spend. Discretionary expenditures have been postponed and hoarding of currency is going on, leading to non-circulation of money (which is newly released by the banks and the small denomination currency already in circulation). Thus, the velocity of circulation has come down.
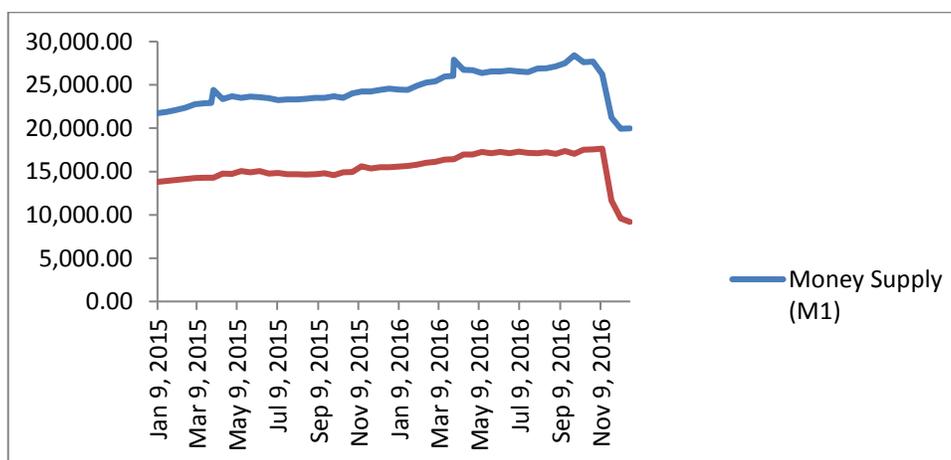

Figure 1: Trend of Money Supply and Notes in Circulation
Source: Data Base on Indian Economy, RBI

The above Figure 1 shows the trend of money supply and notes in circulation in the economy from January 2015 to December 2016 by taking bi-monthly data. It can be seen that both the money supply and notes in transaction were somewhat stable before the demonetization process. After the announcement of demonetization, there was a drastic fall in both the money supply and notes in circulation in the economy.

As the public was allowed to deposit the old currency notes within a particular time in the banks and the amount to be withdrawn was specified, there was a sudden increase in the bank deposits after November 9th 2016. The deposits in the short term increased. People saved this money into banks just to convert the old notes into new notes. These were not voluntary savings aimed to get interest. It was soon converted into active liquidity by the savers when full-fledged new currency was out. This means that new savings with banks was only transitory or short-term deposit.
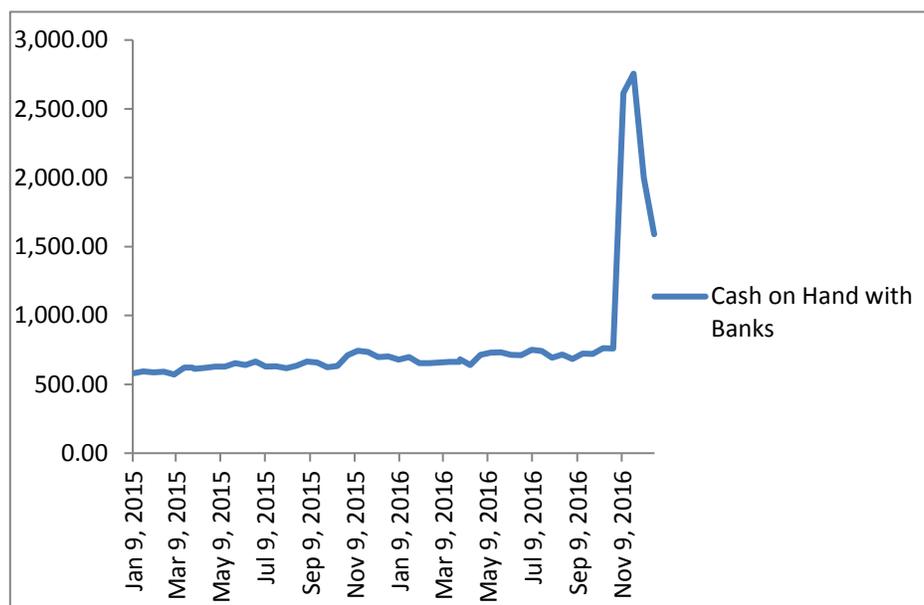
Figure 2: Trend of Cash on Hand with Banks
Source: Data Base on Indian Economy, RBI

The above figure 2 shows the trend of cash on hand with banks. After the announcement of demonetization, that is, after November 9th, 2016 there was a drastic increase in the bank deposits as the common public deposited their old currency notes in the banks. Later, after the circulation of the new currency notes, the deposited amount was gradually withdrawn from the banks leading to a decrease in the cash on hand with banks.

5.2 Impact on Inflation

Demonetization is expected to have a negative impact on inflation. Due to demonetization, consumption decreased. The spending activities of the consumers have been severely affected. Consumers refrained from making any purchases apart from purchases of essential items. The key sectors were affected. The real estate sector faced a major blow down since there was a 30per cent fall in house prices in metropolitan cities as

per the RBI reports. Also, the supply and demand of food items fell, which will exert more downward pressure on inflation. Since there is less money circulation in the economy, people will tend to spend less, firm will become cautious about their investment plans, overall consumption rate will decline and investment will fall. So the inflation rate will automatically come down because demand is less, money with the people is also less. Firms cannot raise the price of general goods and services in such situations and thus reducing the overall inflation rate.
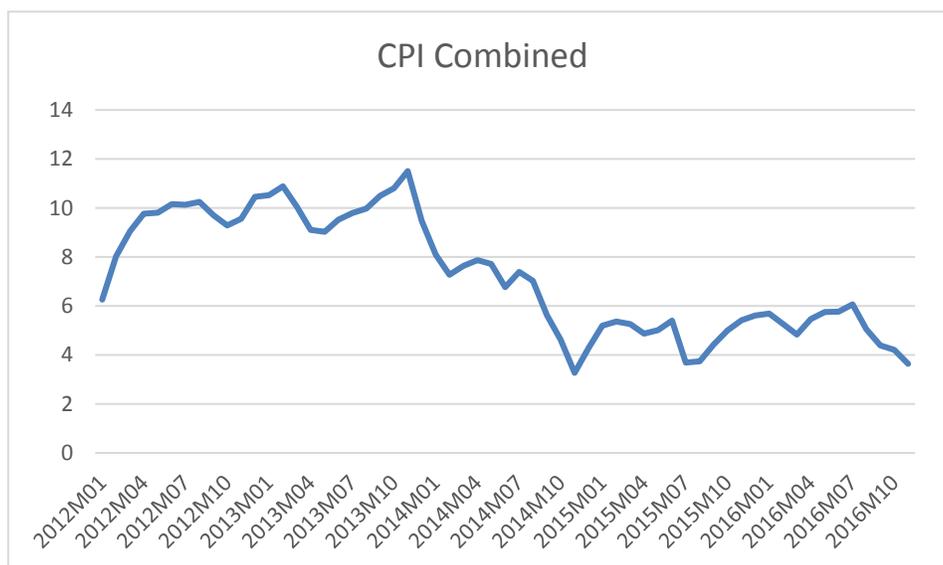
Figure 3: Trend of Inflation Rate (CPI based)
Source: Data Base on Indian Economy, RBI

It is always believed that money cannot affect the supply side problem of Inflation but demonetization proves it wrong. Withdraw of large amount of money from circulation has immediately slow down the economy by collapsing the demand side, which leads to an immediate fall in CPI inflation. If this scenario continues, it will also affect supply side of the inflation by blocking transportation of food items to the market and

discouraging farmers to sell their products with a low price. A fall in CPI inflation because of demand side problem may suddenly turn to a high inflationary scenario because of supply side problem as food is a basic need of every individual which cannot be avoided for a long period of time.

6. Data and Empirical Methodology

The foremost motivation behind this study is to empirically find out the effect of demonetization on the Indian economy specifically on Money Supply (M1), Notes in Circulation (NC), Deposit Money of the Public (DMP) and Cash on Hand with Banks (CHB).

Money Supply (M1): M1 also known as narrow money, normally include coins and notes in circulation and other money equivalents that are easily convertible into cash.

Notes in Circulation: Notes in circulation is a part of currency in circulation, which also includes circulation of rupee coins, circulation of small coins and cash on hand with banks. But in our study we are only considering notes in circulation as only □ 500 and □ 1000 are withdrawn from the circulation.

Deposit Money of the Public: Deposit money of the public consists of demand deposit with banks and other deposits with reserve bank. Demand deposit with banks is money that is an individual deposit into bank account and from which he/she can withdraw on demand at any time.

Cash on Hand with Banks: Cash on hand with banks is also a part of currency in circulation. With the implementation of demonetization, suddenly there was a rise in the cash on hand with public with rise of deposit money of the public.

The above mentioned data are collected from official website of Reserve Bank of India.

6.1 Materials and Methods

Johansen's Method of Cointegration

The maximum likelihood approach of Johansen and Juselius (1990) is used to establish whether there is a long-run relationship between the variables in the model. The model is based on the error correction representation given by

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-k} + \Pi X_{t-k} + \varepsilon_t \qquad (1)$$

where X_t is an (nx1) column vector of p variables, μ is an (nx1) vector of constant terms, Γ and Π represent coefficient matrices, Δ is a difference operator, k denotes the lag length, and ε_t is a disturbance term independently and identically distributed with zero mean and constant variance. The coefficient matrix Π is known as the impact matrix and it contains information about the long-run relationships.

Dynamic OLS (or DOLS) Procedure

This procedure, developed by Saikonnen (1991) and Stock and Watson (1993), has the advantage that the endogeneity of any of the regressors has no effect, asymptotically, on the robustness of the estimates. Further, statistical inference on the parameters of the co-integrating vector is facilitated by the fact that the t-statistics of the estimated co-efficient have asymptotic normal distribution, even with endogenous regressors (Stock and Watson 1993). This procedure also allows for direct estimation of a mixture of I (1) and I (0) variables.

The DOLS procedure incorporates the lags and leads of the first differences of the I(1) variables. Thus estimation of the long-run relation between Y and X is carried out with a regression of the type:

$$Y = \lambda^{d\prime} X + \Sigma_{-n}^{n} a_i \Delta X_{t-i}$$

where λ^d denotes the vector of long run coefficients of X using the DOLS procedure. The inclusion of ΔX_{t+j} terms take care of the possibility of

endogeneity of X, i.e., feedback from Y to future values of X (see Stock and Watson, 1993).

Error Correction Mechanism (ECM)

Since there is small sample size, error correction mechanism (ECM) test developed by Banerjee, Dolado and Mestre's (1998) may be deemed inappropriate, where the critical values are available for a minimum sample size of 25. The ECM procedure provides a more reliable test of co-integration as well as an unbiased estimate of the long-run relation when the explanatory variables are weakly exogenous for the parameters of interest. The model is anchored to the autoregressive distributed lag specification - with the choice of lagged dependent variable being crucial. It depends on the significance of the ordinary least squares coefficient of the lagged dependent variable in an autoregressive distributed lag model augmented with leads of the regressors. Specifically, the t statistics of the coefficient of the lagged dependent variable, t_b, is derived from the following form:

$$A(L)dy(t) = B(L)dX(t) + by(t-1) + CX(t-1) + \Sigma_{i=1}^{s} f_i dX(t+i) + u(t)$$

where y, X and u show the regressand, the vector of regressors and the error term, respectively. L and d denote the lag operator and the differenced form of the concerned variable, respectively.

6.2 Econometric Models

As the data collected above, we fit an empirical model for the basic estimation procedure. Before this, we want to set the functional form of our basic equation.

$$M1_t = f(Cash_T, DMP_T, NC_T, D1_T) \tag{1}$$

Where money flow of M1 is treated as the function of cash held by bank, deposit held by money, notes in circulation and demonetization dummy at a particular point of time **T.**

The basic functional form of the equation can be expressed in terms of linear forms, which is shown as below:

$$M1_T = \alpha Cash_T + \beta DMP_T + \chi NC_T + \delta D1_T + \varepsilon_T \tag{2}$$

In the above equation, α is the parameter associated with the cash deposit with the bank for a particular time period T. β is the parameter associated with the deposit of money held by public at particular time period T. Likewise, χ is the parameter associated with the notes in circulation in the system for particular time period T. δ is the parameter associated with the demonetization dummy for a particular time period T. The value of demonetization dummy varies from 0 to 1.

For empirical estimation, we first normalize the data of M1 flows. In addition to this, for the sake of simplicity, we have normalized the data for cash in circulation, deposit held by the banks and cash held by the public. The present study has used an Auto-Regressive Distributed Lag (ARDL) model to analyze the long run relationship among the variables. The following model can be presented as follows:

$$\Delta M1_t = \alpha_t + \beta_1 Cash_t + \beta_2 DMP_t + \beta_3 NC_t + \beta_4 D1_t + \sum_{i=1}^{p} \delta_t \Delta Cash_{t-1} + \sum_{i=1}^{p} \delta_t \Delta DMP_{t-1}$$

$$+ \sum_{i=1}^{p} \delta_t \Delta NC_{t-1} + \sum_{i=1}^{p} \delta_t \Delta D1_{t-1} + \varepsilon_{1t}$$

$$\tag{3}$$

where M1 = total flow of M1 supply
Cash = cash held by the public, DMP = deposit held by the banks
NC = notes in circulation in the entire system
D1 = Demonetization dummy (1= dates on demonetization period, 0 = otherwise)

7. Empirical Analysis

Table 1: Descriptive Statistics and Correlation Matrix

	Descriptive statistics			
	$\ln M1_t$	$\ln Cash_t$	$\ln Deposit_t$	$\ln NC_t$
Mean	9.866	6.221	8.960	9.377
Median	9.856	6.216	8.910	9.387
Maximum	10.254	7.921	9.405	9.778
Minimum	9.514	5.643	8.709	8.923
Std. dev.	0.191	0.338	0.167	0.226
Skewness	0.194	1.591	0.691	-0.063
JB stats	9.460*	398.600*	16.650*	7.106**
	(0.008)	(0.000)	(0.000)	(0.028)
	Correlation matrix			
$\ln M1_t$	**1.000**			
$\ln Cash_t$	0.794*	**1.000**		
	(0.000)			
$\ln Deposit_t$	0.914*	0.860*	**1.000**	
	(0.000)	(0.000)		
$\ln NC_t$	0.980*	0.741*	0.821*	**1.000**
	(0.000	(0.00)	(.000)	

Note: Values in ( ) indicate p-values. *, ** and *** indicate statically significant at 1, 5 and 10per cent, respectively.

7.1 Unit Root Test

Table 2: Unit Root Test Result

	ADF Test			
	Level		First Difference	
	Intercept	Intercept and trend	Intercept	Intercept and trend
CB	-4.100*	-7.422	-15.103*	-15.154*
DP	-2.427	-3.810	-25.141	-25.188*
M1	-0.017	-9.697*	-12.300*	-12.448*
NC	0.587	-16.110*	-5.175*	-5.226*
	Philip-Perron test			
	Level		First Difference	

	Intercept	Intercept and trend	Intercept	Intercept and trend
CB	-3.289*	-5.544	-15.821*	-16.008*
DP	-2.488	-5.845	-33.674*	-41.431*
M1	-0.057	-7.646*	-12.349*	-12.500*
NC	-0.911	-11.171*	-9.642*	-9.873*

Notes: All variables are converted into natural log. (*), (**) and (***) represent the levels of significance at 1%, 5% and 10% respectively.

This study employs the ADF and Philip-Perron unit root tests to identify the level of stationarity for each of the variable. The Newey-West estimation technique is being employed in order to identify the optimal lag length. Here we employ the unit root tests at both level and first difference. At the intercept level, we find that most of the variables are not stationary especially at the level. In case of intercept and trend cases, we find that most of the variables are stationary. In cases of using first differences, we find that almost all variables are stationary at both intercept and intercept & trend cases. This overall indicates that all variables are integrated of order one. As per these results, we next proceed to utilise the Johansen cointegration test to examine the long run cointegrating relation between these variables.

7.2 Johansen Cointegration Test

Table 3: Johansen Cointegration Test *M1= f (NC, DMP, CASH)*

No trend and intercept	Eigen value	Trace Statistic	P value
None	0.203	69.543	0.000*
At most 1	0.095	27.351	0.019*
At most 2	0.038	7.958	0.129***
At most 3	0.003	0.612	0.494
Intercept (No trend)	**Eigen value**	**Trace Statistic**	**P value**
None	0.247	96.034	0.000*
At most 1	0.110	43.366	0.053**
At most 2	0.078	20.550	0.045*
At most 3	0.028	5.370	0.245

Intercept and Trend	Eigen value	Trace Statistic	P value
None	0.214	100.71	0.000*
At most 1	0.171	56.071	0.001*
At most 2	0.078	21.271	0.128***
At most 3	0.032	6.103	0.447

7.2.1 Bayerhanck Cointegration Test

Table 4: Bayerhanck Cointegration Test

Model	Lag structure	EG-JOH	EG-JOH-BO-BDM	Cointegration
M1 = f (NC, CB, DP)	1	110.52**	221.04**	Yes
M1 = f (NC, CB, DP)	2	110.52**	221.04**	Yes
M1 = f (NC, CB, DP,D1)	1	110.52**	221.04**	Yes
M1 = f (NC, CB, DP,D1)	2	110.524**	184.20**	Yes
M1 = f (NC, CB, DP,D1)	1 (10% Critical value)	110.52***	221.048***	Yes
M1 = f (NC, CB, DP,D1)	2 (10% Critical value)	110.524***	184.20***	Yes

Notes: (**) and (***) represent the 5% and 10% levels of significance respectively. The critical values at 5% level of significance are 10.637 (EG-JOH) and 20.486 (EG-JOH-BO-BDM) respectively. The critical values at 10% level of significance are 8.301 (EG-JOH) and 15.938 (EG-JOH-BO-BDM) respectively.

Engle and Granger (1987) proposed the residual based cointegration tests. The major problem lies with the fact that all these long run cointegration results do not provide unifying results w.r.t long run cointegration. B-H test (2013) proposes the new forms of combined cointegration test. This cointegration test takes into account probability

values of all cointegration tests with the Fisher's formula. It combines the prob values of Engle and Granger, Johansen, Boswjik and Banerjee-Dolados-Mestre cointegration tests. Our empirical results in above table indicate that most of the results establish the long run cointegration between the variables. As a part of the empirical strategy, we employ two types of models, where M1 is the function of NC, CB and DP. Second model takes into account the variables including demonetization dummy. The null hypothesis states that there exists no cointegration between these variables. Our empirical results reveal that there exists long run cointegration between the variables, as the critical values of B-H test exceed the values of fisher test statistics in all specifications mentioned in the above table. The results overall indicates that all the variables are well cointegrated at 5% and 10% levels of significance.

7.4 ARDL Test Results
7.4.1 without Trend Specification Analysis of ARDL

Table 5: ARDL Analysis without Trend Specifications

M1	ARDL Long Run Cointegration (1, 1, 1, 1, 1) No Constant and Trend		
	Coefficient	Standard Error	T statistics
M1 (-1)	0.861	0.031	27.253*
CASH	-0.036	0.003	-10.658*
CASH (-1)	0.016	0.004	3.648*
DMP	0.417	0.004	87.054*
DMP (-1)	-0.360	0.015	-23.846*
NC	0.648	0.009	71.699*
NC (-1)	-0.544	0.026	-20.249*
D1	-0.017	0.003	-5.260*
D1 (-1)	0.017	0.002	7.714*
R^2	0.999		
Adjusted R^2	0.999		
Short Run Cointegration No Constant and Trend			

D (CASH)	-0.036	0.003	-12.270*
D (DMP)	0.417	0.004	99.416*
D (NC)	0.648	0.007	88.600*
D (D1)	-0.017	0.002	-8.730*
ECM (-1)	-0.138	0.009	-15.179*
F Bounds test	3.470		
T Bounds test	-3.179 (satisfying the bounds test criteria)		

The above table presents both long run and short run cointegration from ARDL test analysis. The empirical result shows that coefficient of lagged value of M1 is found to be positive and significantly associated with the M1 flows. We further find negative and significant association between cash flows and M1supply at the 1per cent level of significance. Likewise, we obtain positive and significant association between money held by public to that of M1 flows. But the lagged value of money held by public is found to be negative and significant association with M1 flows at the conventional level of significance. As far as the note in circulation is concerned, we find long run association between notes in circulation to that of M1 flows at the conventional level of significance. More importantly, we find inverse association between demonetization dummy and M1 flows at the 1per cent level of significance, suggesting that impacts of demonetization severely impacts M1 flows to a significant extent. It is also evident from the inverse association between lagged values of demonetization to that of M1 flows. This overall implies that demonetization in forms of withdrawal of larger denomination of notes impact the money flow of the economy to the considerable extent. Furthermore, the short run coefficients as seen from the first difference of the above variables represent that all the variables exhibit short run association with the M1 flows at the conventional level of significance.

The error correction term in above case is negative and statistically significant, showing that the speed of adjustment of any disequilibrium towards along run equilibrium ranges around 15per cent within a month.

7.4.2 with Trend and Constant Specification Analysis of ARDL

Table 6: ARDL Analysis with Trend Specifications

M1	Long Run Cointegration ARDL (1, 1, 1, 1, 1) Constant and Trend		
	Coefficient	Standard Error	T statistics
M1 (-1)	0.500	0.081	6.161*
Cash	-0.031	0.034	-9.017*
Cash (-1)	0.009	0.004	2.190*
DMP	0.411	0.004	86.872*
DMP (-1)	-0.200	0.036	-5.519*
NC	0.591	0.014	40.030*
NC (-1)	0.278	0.061	4.551*
D1	-0.011	0.033	-3.294*
D1 (-1)	-0.009	0.002	-3.707*
Constant	0.105	0.022	4.787*
R^2	0.998		
	Short Run Cointegration		
	Coefficient	Standard Error	T statistics
D (CASH)	-0.031	0.002	-10.724*
D (DMP)	0.411	0.003	103.97*
D(NC)	0.591	0.004	118.32*
D (D1)	-0.011	0.001	-6.397*
ECM (-1)	-0.499	0.029	-16.836*
R^2	0.990		

The above ARDL cointegration technique seeks to identify the short run and long run cointegration relation in case of inclusion of both trend and constant in the analysis. The above empirical relation states that coefficient of lagged values of M1 is positively and significantly associated with M1 flows at the conventional level of significance. Furthermore, we find that cash held in banks is found to be positively and significantly associated with the M1 flows at an acceptable level of significance. This implies that cash with the banks normally prompts the

flow of more M1 in the market. However, we find the inverse association between M1 and cash with the banks in case of lagged value of M1 at 1per cent level of significance. Furthermore, we obtain positive association between deposits of money held in bank to that of M1 flows at the conventional level of significance. Our empirical estimate shows that every 1per cent increase in deposit in banks has led to the 0.41per cent increase in M1 flows in the system.

Notes in circulation tends to exhibit some positive and significant association with the M1 flows, implying that increase in circulation of money in the economy conventionally leads to more M1 concentration in the system. We also find similar impact in case of lagged value of notes in circulation to that of M1 flows in the system. More importantly, we find inverse and significant association between demonetization dummy and M1 flows in the system. It captures the fact that withdrawal of higher denomination of currency from the economy leads to the decline in the flow of M1 in the system. Similarly, we obtain positive and significant correlation between the lagged values of demonetization dummy and M1 flows in the system. Our empirical estimate in this regard shows that 10per cent increase in demonetization has resulted in 1.1per cent decline in M1 flows in the economy.

Furthermore, the short run coefficients from ARDL analysis states that most of the short run coefficients exhibit inverse and significant association with the M1 flows. More importantly, the error correction mechanism is found to be negative and significant implying that the adjustment from the disequilibrium to equilibrium in the system normally varies for approximately 50 per cent.

7.5 Variance Decomposition

Table 7: Variance Decomposition

Periods	V.D of M1				
	M1	**CB**	**DP**	**NC**	**D1**
1	100.00	0.000	0.000	0.000	0.000
5	77.998	4.631	11.140	5.794	0.437
10	63.932	7.815	23.584	4.134	0.532

25	40.215	16.328	40.356	2.580	0.519
50	26.159	22.907	48.752	1.731	0.448
	V.D of CB				
1	7.888	92.111	0.000	0.000	0.000
5	6.492	70.465	5.561	16.213	1.266
10	5.658	67.532	11.985	13.739	1.083
25	5.518	58.740	24.955	9.944	0.840
50	6.749	50.355	35.105	7.104	0.684
	V.D of DP				
1	76.719	0.032	23.205	0.000	0.000
5	81.996	4.598	12.915	0.233	0.254
10	83.854	4.490	10.538	0.777	0.340
25	79.251	4.695	14.346	1.257	0.449
50	64.986	9.587	23.748	1.228	0.449
	V.D of NC				
1	4.179	8.600	82.733	4.485	0.000
5	3.191	36.549	47.819	10.799	1.639
10	3.699	36.878	52.601	5.849	0.970
25	5.979	34.786	55.787	2.858	0.587
50	7.932	33.005	56.744	1.846	0.470
	V.D of Dummy				
1	10.311	23.481	2.424	36.807	26.975
5	8.352	17.977	7.812	47.512	18.344
10	8.662	18.040	7.825	47.231	18.239
25	8.778	18.100	7.850	47.087	18.182
50	8.779	18.109	7.861	47.072	18.177

The above table shows the variance decomposition analysis for money supply (M1), notes in circulation (NC), cash in hands (CB), deposit of money with public (DP) and demonetization dummy (D1). Our empirical results indicate that 100% variation in money supply is influenced by the changes in entire money supply in the initial period. At 5th period, 100% variation in money supply is effected by the changes in money supply by 78%, 4.63% changes in cash held in banks, 11% change in deposit of money with public, 5.75% change in notes circulation and 0.437% change in demonetization period. However, the influences of money supply get reduced significantly over the time period and deposit of money with

public increase significantly with the 100% variation in the money supply. Similarly, we notice the rising influence of money deposit with public in terms of influencing the variation in cash in hands over the years. It indicates positive correlation between cash with banks and money deposit with the public. While analysing the case of money deposit with public, our empirical results reveal that money supply plays vital role in influencing the public deposit. Demonetization has least impact in terms of influencing the cash deposit with the public over the years. Furthermore, our empirical results state that 100% variation in notes in circulation over the year is largely explained by the cash in hands and money deposits with the public. Lastly, we find the greater impact of demonetization upon the notes in circulation. Our empirical results reveal that 100% change in demonetization is largely explained by the 47% change in notes in circulation followed by the 18% changes in cash in hands and 8.775% change in M1 flows.

8. Conclusion and Policy Implication

The popular perception exists that effect of demonetization has certain negative impact upon the economic system. Overall, this study has investigated the impact of demonetization upon the Indian monetary system by utilizing the daily data for last six months prior to December, 2016. It is important to bring empirical evidences to bear the policy findings arising out of it. Our empirical estimation shows that instant strike upon the monetary system might dent the system instantly. Initially, our unit root tests indicate that most of the variables are stationary at the first difference. We further apply Johansen cointegration test and find the long run cointegration relationship between the variables. Furthermore, our Bayerhancks cointegration test confirm the long run cointegration relationship between the variables like notes in circulation, money supply, demonetization dummy, cash in hand and notes circulation in banks. Our ARDL results indicate that demonetization certainly puts negative impact upon the money supply and cash in hand. Furthermore, the variance decomposition analysis shows that 100% change in demonetization is

largely explained by the 47% change in notes in circulation followed by the 18% changes in cash in hands and 8.775% change in M1 flows. The overall results in fact state that demonetization impacts the money supply negatively in the economy, thus straining the capital formation and development processes across sectors.

Seen in this light, it is still inaccurate to say that the demonetization has successfully fulfilled the basic target to be meant for. Although it has curbed some amounts of hoarded money from the businessmen, small business holders, petty businessmen, corrupted individuals and people indulging in funding illegal activities, still the mission needs more systematic effort to redress the problem of black money, not at the cost of general public. However, such drive has given rise to some welcoming steps like increase in banking transactions, striving for financial inclusion, vying for various online money wallets and other types of cashless transaction modes. As a whole, it is quite premature to view that demonetization has actually reached its goal of weeding out the black money issues.

References

Bharadwaj, A. (2016). Demonetization and the Economy: Signs of Distress Everywhere. *Business Standard, 1*, 1-10.

Ghandy, K. (2016). Demonetization: One Step Forward, Two Steps Back. *Economic and Political Weekly, 51*(50), 28-30.

Jing, G. J. L. (2007). A Study of Dynamics of Gold Reserve after Demonetization. *Studies of International Finance*, Retrieved from http://en.cnki.com.cn/Article_en/CJFDTOTAL-GJJR200704011.htm.

Kumar, S. V., & Kumar, T. S. (2016). "Demonetization and Complete Financial Inclusion". *International Journal of Management Research and Reviews*, *6*(12), 1703-1707.

Lahiri, A. K. (2016). Demonetization, the Cash Shortage and the Black Money. *Working Paper*, Retrieved from https://nipfp.org.in/media/medialibrary/2016/12/WP_2016_184.pdf.

Mali, V. (2016). Demonetization: A step towards modified India. *International Journal of Commerce and Management Research, 2*(12), 35-36.

Marin, D. (2002). Trust versus illusion: What is driving demonetization in the former Soviet Union? *Economics of Transition*, *10*(1), 173-200.

Pachare, S. M. (2016). Demonetization: Unpacking the Digital Wallets. *We'Ken-International Journal of Basic and Applied Sciences*, *1*(4), 180-183.

Raychaudhuri, A. (2017). Demonetization in India: Some Unsolved Economic Puzzles. *Trade and Development Review*, *9*(1-2), 74-85.

Tax Research Team. (2016). *Demonetization: Impact on the Economy*. Retrieved from https://ideas.repec.org/p/npf/wpaper/16-182.html.

Umamaheswari, D., & Suganthi, M. K. (2017). Demonetization-Cash Crunch or Cash Curse. *International Journal of Latest Transactions in Engineering and Science, 2*(2), 1-4.