Demonetization Impeded Indian Economic Growth? Test of Hawtrey's Theory of Business Cycles

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Many national and international agencies blame demonetization as a major factor behind the deceleration in the growth rate of Indian economy in recent quarters. Such linkages of economic growth with monetary shocks have been well explained by Hawtrey's monetary theory of business cycles. The present paper attempts to test Hawtrey's theory in the context of demonetization in India. The results indicate that the Indian economy did experience fourteen growth-rate cycles over the period 1970 to 2017. Given that M3 takes an average 7 months lead in explaining the low growth (i.e., downswing) phase, the demonetization (i.e., fall in money supply) can be admitted as a lead because of falling growth rate of Indian economy.

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Introduction

The Indian government announced sudden demonetization on 8th November, 2016 that can be considered as a monetary shock to the Indian economy which resulted in the cancellation of legal tender of 85 per cent of Indian currency (i.e., making it redundant). Subsequently, the Indian economystarted experiencing a dip in the growth rate from 7 per cent in quarter January-March, 2017 to 5.7 per cent in quarter April-June, 2017. The demonetization has been blamed as the sole demon behind this deceleration in economic growth rate. This study has been investigating this low growth phase of the economy through the growth rate cycle approach. Amongst various theories explaining business cycle phenomenon[1], Hawtrey (1927) had given his monetary theory of business cycles according to

Business cycles occur due to changes in effective demand through changes in bank credit.

[1] See Gabisch, G.& Lorenz, H. W. (1989) for theories on business cycles.

which business cycles occur due to changes in effective demand through changes in bank credit. The credit creation leads to increase in money supply which further affects the effective demand and eventually business cycles are experienced by the economy. So, according to the monetary theory of business cycles, only monetary factors are responsible for fluctuations in overall economic activity, meaning thereby, the monetary factors are playing a key role as leads for the business cycles to occur. In this paper, an attempt has been made to identify the relationship between changes in money stock and fluctuations in overall economic activity for the Indian economy on the line of reasoning advocated by Hawtrey (1927).

The fluctuations in the economic activity are captured and represented by the trade cycles or more popularly known as the "business cycles". The fluctuations affect all dimensions viz. output, employment, price and GDP of an economy. Therefore, such volatility in economic activities is necessary to examine as it helps in comprehending the nature of the economy and facilitate the formulation of appropriate monetary, fiscal and foreign policies. For the Indian economy, the business cycle research is gaining importance day by day because of its growing openness and inter-linkages with rest of the world and the structural transformation of the economy.

Mechanism of Business Cycles: A Theoretical Survey

There are various views of leading economists and their respective theories trying to explain the causes of business cycles. The classical economists always believed in full employment equilibrium in the long-run therefore, could not develop any full-fledged theory of trade cycles in terms of recurring pattern generated by the endogenous forces. Some of the economists like David Ricardo, John Stuart Mill talked about revulsions and crisis but, by and large, the systematic study of trade cycles as a recurring phenomenon in business activity did not begin. Thomas Robert Malthus also could not explain the causes of depression and unemployment. Thus, the classical macroeconomic theory is deficient in respect of the trade cycle analysis. According to Schumpeter (1939), Clement Juglar was the first to make a systematic study of the trade cycle. Juglar (1862) discussed the trade cycles with three phases of prosperity, crises and liquidation with the cycle length of 9-10 years. Also, Schumpeter (1939) made innovations the central cause of the recurrence of business cycles in the modern industrial economies. Accordingly, the recurring bursts of innovational investment activity can clearly explain the trade cycle phenomenon. Hawtrey (1927) attributed the trade cycle phenomenon to the monetary disturbances taking place in the economy and has advocated that depressions can be corrected through injecting monetary stimulus in an economy, however,Hayek (1929)developed his monetary over-investment theory and held the inequality between market and natural interest rates to be responsible for the occurrence of business cycles. According to Keynes (1936), the problem of trade

cycles in the economy was caused by a cyclical change in the marginal efficiency of capital, though complicated and often aggravated by associated changes in the other short-period variables of the economic system. In Kaldor's (1940) model of the trade cycle, the non-linear investment demand and saving supply functions are crucial in explaining the occurrence of the trade cycles. Samuelson's(1939) basic linear multiplier accelerator model attributes the occurrence of business cycles to the change in net investment caused by change in aggregate income through interactions between accelerator and multiplier. Metzler (1941) has shown the effects of different inventories and explicit expectations in his model for explaining the reasons responsible for the occurrence of trade cycles. Victor Zarnowitz has termed the good times in the economy as "prosperity" and the bad times as "depression", thus, transition from prosperity to depression was labeled as "crisis" and the transition from depression to prosperity was called "revival" (Zarnowitz, 1991). However, the term used for a mildly depressed period is "recession".

The National Bureau of Economic Research (NBER), founded in New York in 1920, initiated research into understanding the repetitive sequences that trigger business cycles and the NBER's Business Cycle Dating Committee has been dating the turning points for the US economy since 1978.The business cycle research was pioneered by Wesley C. Mitchell and Arthur F. Burns through their work Measuring Business Cycles published in 1946. Wesley C. Mitchell first established a working definition of the business cycle that he, along with Arthur F. Burns, later characterized as:"Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own."

However, Koopmans (1947), while reviewing the Burns and Mitchell's work (1946), has also pointed towards the absence of theoretical propositions in their explanations of cyclical fluctuations. In his view, it is the "measurement without theory". In the existing literature, it has also been emphasized that a business cycle is an empirical phenomenon (Zarnowitz, 1991).

The area of business cycle research and analysis is new for developing nations. In fact, theory and empirical evidence on business cycles originated in developed industrialized nations only. Moreover, the past research on developing nations reveals that the features of business cycles in developing countries are different from those of developed countries.

For the Indian economy, the business cycle research is gaining importance because of its growing openness and interlinkages with rest of the world and the structural transformation of the economy. In the good old days, business cycle phenomenon was not so prevalent in the Indian economy since it was predominantly agricultural in nature and investment demand was also highly stable as it was majorly in the hands of government sector but in the following years, the Indian economy has undergone major changes. (Patnaik & Sharma, 2002; Shah, 2008). The nature of the Indian business cycles has changed dramatically after India's liberalization reforms in 1991. After the mid-1990, the properties of Indian business cycles have moved closer in key respects to selected advanced countries (Ghate et al., 2013). It has been observed that the Indian business cycles were synchronized with U.S. and other industrial economies and the synchronization level has further increased over time (Jayaram et al., 2009). Though the business cycle research is meager in India, still some major experiences have been captured by various researchers e.g. Chitre (2001), Banerji and Dua (2011), Dua and Banerji (2001, 2007, 2012), Mohanty et al. (2003), Bordoloi (2007), Jayaram et al. (2009) etc.

Some important research studies that have been undertaken for examining the role of monetary variables in explaining business cycles differ in their conclusions. Like, Friedman and Shwartz (1987) and Cooley and Hansen (1998) have supported the view that money supply acts as a lead indicator for business cycles in

Monetary policy can lead to output stability and growth sustainability through price stability.

the US economy. Papademos (2003) has also concluded that monetary policy can lead to output stability and growth sustainability through price stability. However, Davis (1968)and Ireland (2004) have concluded that money supply may influence business cycles but in order to know the exact route and exact amount of effect a proper quantitative econometric model is required.

Selection of Business Cycle Analysis Approach

There are three approaches to business cycle analysis viz.i) Classical cycle approach, ii) Growth cycle approach, and iii) Growth rate cycle approach. The classical cycle describes movements in actual economic time series i.e., the identification of expansions and contractions in the absolute level of aggregate economic activity (Burns & Mitchell, 1946). The growth cycle, however, focuses on deviations in economic activity from a long-term trend so that growth expansions and growth contractions are described as periods when the growth rates are above or below the long-term trend rate of growth in aggregate economic activity (Hodrick & Prescott, 1997). In addition to these two, the third category of growth rate cycles represents the cyclical upswings and downswings in the growth rate of economic activity. The growth rates can be calculated as month-to-

month changes or same-month-year-ago (annual point-to-point) changes. The growth rates calculated on monthly basis generates a relatively noisy series, therefore, the annual point-to-point criteria is used for calculating the growth rates in the series. The cyclical turns in these growth rates will define the growth rate cycles.

It has been recognized that business cycles, growth cycles and growth rate cycles all need to be monitored in a complementary fashion. But, out of all the three approaches discussed, classical business cycles and growth rate cycles are more suitable for real-time monitoring and forecasting, while growth cycles are more suitable for historical analysis (Klein, 1998). Also, for the post reforms period in India, a monotonic increase has been observed in IIP series and therefore, classical business cycles cannot be identified for it in the absence of absolute decline(see AppendixI). In addition, the prime objective of the present study is to examine the impact of monetary shock (i.e., demonetization) on economic growth not on absolute economic activity. Although the demonetization has adversely affected growth rate,it has come down to 5.7 percent in April-June, 2017while in real economic activity, an increase has been noticed. Thus, the cycle is noticed in growth rate of economy not in absolute economic activity. Hence, growth rate cycle approach has been adopted to see the nature and size of economic fluctuations in Indian economy. For the identification of growth rate cycles, the annualized point-to-point growth rate of the series is estimated.

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Reference v/s Indicator Series & Growth Rate Cycle Analysis

For measuring the reference cycles, IIP on monthly basis has been taken as the reference series. Although, a reference series is meant to encompass the overall economic activity and amongst the single series, GDP is an ideal measure for being adopted as the reference series but high frequency data on GDP, such as on monthly frequency, is not available in India. Therefore, IIP has been chosen as a proxy variable for GDP.

Impact of Money Supply on Growth Rate Cycles

According to Hawtrey (1927), business cycles are purely a monetary phenomenon that means changes in the economic activity are a direct effect of changes in the stock of money. Therefore, M3 (i.e. money stock plus term deposits) has been used as indicator series for the identification of indicator cycles.The data on IIP series has been retrieved from International Financial Statistics database, published by International Monetary Fund (IMF). The data source for M3 series is Organization of Economic Cooperation and Development (OECD) database.The reference period for the study is from 1970:01 to 2017:03.

The following steps suggested by RBI Report, 2007 have been followed for estimating the growth rate cycles:

1. Seasonal adjustment of the series using X-12 ARIMA method, developed by US Census Bureau.
2. Calculation of simple annual point-to-point growth rates.
3. Elimination of short-term irregular component by applying weighted moving average technique.

The smoothened series obtained from the above steps are used for obtaining the growth rate cycles, by applying a dating algorithm developed by Bry and Boschan (1971); hereafter referred as BB-procedure. The BB-procedure was a replication of business cycles in the US as measured by the dating committee of the NBER. They coded the BB-procedure into an algorithm that could be easily applied. The Bry-Boschan Algorithm was originally based on monthly data. A variant of this method for dealing with quarterly data was also developed by Harding and Pagan (2002) and was called the BBQ procedure. The BB-procedure suggests the following rules for the identification of turning points:

1. Peaks (troughs) are always followed by troughs (peaks).
2. The duration of an upswing and downswing regime to be at least five months.
3. The minimum length required for any two alternate turning points (a cycle from peak to peak or trough to trough) is 15 months to distinguish business cycles from seasonal cycles.
4. Turning points within six months of the beginning or at the end of the time series are eliminated.
5. A turning point is the most extreme value between two adjacent regimes. If there are two or more equal values satisfying the first three requirements, the most recent is chosen as the turning point of the regime.
6. The dating algorithm provides dates of peaks, troughs and average duration and amplitude of expansions and recessions.

However, before the application of BB-procedure, the presence of unit-root and seasonality in IIP and M3 series have been detected and resolved with the help of *X-12ARIMA*[2] method (developed by US Census Bureau)and later, the simple annual point-to-point growth rates are calculated for identifying the growth rate cycles. For the identification of turning points in the reference and the indicator series, the BB Procedure has been applied using the package *datation*[3] developed by Frank Arnaud, under the environment of R project for statistical computing.

After dating the cycles, the lead/lag analysis has been performed to know whether indicator series money supply (i.e., M3) acts as a lead or lag indicator

[2]http://www.spiderfinancial.com/support/documentation/numxl/users-guide/x-12-arima

[3]http://arnaud.ensae.net/Rressources/Rressources.html#datation

in explaining the growth rate cycles in reference series IIP. Also, the following Mean Generalized Autoregressive Conditional Heteroscedasticity [i.e., GARCH-M(p,q)]model has been estimated for analyzing the significance of money supply in explaining the volatility in reference series IIP. The volatility in IIP growth, that has been assumed as function of money supply in variance equation, has further been hypothesized to be affecting the growth rates of reference series IIP in mean equation. The model is as follows:

$$\left.\begin{aligned} \Delta \ln IIP_t &= \phi_0 + \phi_1 \sigma_t^2 + \varepsilon_t; \quad \varepsilon_t \sim N(0, \sigma_t^2) \\ \sigma_t^2 &= \alpha_0 + \alpha_1 \sum_{p=1}^{P} \hat{\varepsilon}_{t-p}^2 + \beta_1 \sum_{q=1}^{Q} \sigma_{t-q}^2 + \partial_0 \Delta \ln\left(\frac{M^s}{P}\right) + v_t \end{aligned}\right\} \quad (1)$$

The above model (1) consists of two equations: i) the first equation is called mean equation where the first difference of natural log of IIP series has been regressed on volatility σ_t^2 in reference series IIP, and ii) the second is variance equation in which the real money supply has been included as explanatory variable along with *ARCH(P)* and *GARCH(Q)* terms. A significant ∂ will confirm the hypothesis that money supply causes volatility in reference series IIP and the significance of shall reflect that volatility so caused by real M3 series significantly affect variations in growth rate of IIP series.

Turning Points in Reference & IndicatorSeries

The visualization of Table1 shows the chronology of growth rate cycles in monthly IIP series. During the period 1970:01 to 2017:03, fourteen growth rate cycles have been identified with the duration of the cycles ranging between 16 (i.e., from 1985:02 to 1986:06) to 89 (i.e., from 2001:11 to 2009:04) months. The longest cycle of 89 months can be bifurcated into i) the first 37 months (from 2001:11 to 2004:12) of high growth phase (upswing period), and ii) the subsequent 52 months (from 2004:12 to 2009:04) of lower growth phase (downswing period). The longer downswing period seems to be the outcome of global recession. The high growth phase or the upswing varied within the range of 5 (from to 1997:03 to 1997:08) to 37 (from 2001:11 to 2004:12) months while that of the low growth phase or the downswing of 5 (1984:09 to 1985:02) to 52 (from 2004:12 to 2009:04) months.However, the average duration of a downswing is found to be 20 months which is higher than the average duration of upswing that is reported to be 15 months. The average duration of the complete cycle (i.e., trough to trough) is 35 months.

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Table 2 portrays the combined picture of peak and trough analysis of growth rate cycles in IIP and M3 series.The table shows the lead/lag relationship between the reference (i.e. IIP) and the indicator (i.e. M3) cycles. For the turning points, identified in the time-period 1970:01 to 2017:03, the leads/lags are identified in the indicator series M3.For the period up to 1980s, M3 has

Table 1 Growth Rate Cycle Chronology for IIP (period in months)

Peak	Trough	Upswing(Trough to Peak)	Downswing(Peak to Trough)	Full Cycle Duration
12/1972	6/1973	-	16	-
7/1974	12/1974	13	5	18
6/1976	3/1978	18	21	39
111978	4/1980	8	17	25
4/1981	10/1982	12	18	30
9/1984	2/1985	23	5	28
12/1985	6/1986	10	6	16
5/1987	6/1989	11	25	36
7/1990	9/1991	13	14	27
12/1992	3/1997	15	51	66
8/1997	8/1998	5	12	17
3/2000	11/2001	19	20	39
12/2004	4/2009	37	52	89
4/2010	7/2012	12	27	39
2/2013	2/2014	7	12	19
10/2015		20	-	-
Average Duration	14.87	20.07	34.86	
Median	13	17	29	
Standard Deviation	7.92	14.39	20.37	

Source: Authors' Calculations

been identified as lag indicator of IIP i.e., a particular phase in IIP was imitated by M3 after a certain time lag e.g., IIP growth rate cycle achieved its trough in 1974:12 while M3 growth rate cycle attained that trough in 1975:07, after a lag of 7 months. However, since1990s, the M3 has taken the charge and become a lead indicator for movements in IIP i.e., a particular phase of M3 is being imitated by IIP series after a certain lag e.g., IIP growth rate cycle accomplished trough in 1982:10 however, M3 growth rate cycle reached its trough in 1982:07, with a lead of 3 months.Also, there are a few instances of false and missing signals in M3. A signal through M3 will be designated as a false signal if the identified phase is not being imitated in IIP series after a few periods. However, the signal is termed as missing if IIP observed a peak/trough without any such lead observation in M3.

The same lag lead relationship can be observed in Fig.1 that presents the plot of chronology of growth rate cycles of IIP and M3 time-series to make lead/lag record of M3 visually prominent. The grey area represents the downswing period in growth rates of reference series IIP while white area shows the upswing period for the same series. The oscillating line represents fluctuations in growth rates of indicator series M3. In the Fig.1, the period of grey area can be confirmed from Table 1 while the lead/lag record can be verified from Table 2. It can be seen that M3 is giving sufficient leads to the turning points attained by IIP in the post reforms period. However, for the initial time period of 1970s and early 1980s, the leads in

Table 2 Lead/Lag Record of M3 for the Indian Growth Rate Cycles

Reference Cycles (IIP)		Indicator Cycles (M3)		Lead(-)/ Lag(+)	
Peak	Trough	Peak	Trough	Peak	Trough
12/1972	6/1973	-	-	N.S.	N.S.
7/1974	12/1974	11/1973	7/1975	-8	+7
6/1976	3/1978	4/1977	4/1978	+10	+1
11/1978	4/1980	10/1979	10/1980	+11	+6
4/1981	10/1982	9/1981	7/1982	+5	-3
9/1984	2/1985	-	-	N.S.	N.S.
12/1985	6/1986	3/1985	3/1986	-9	-3
5/1987	6/1989	4/1987	6/1988	+1	-12
7/1990	9/1991	5/1990	4/1991	-2	-5
12/1992	4/1993	8/1992	10/1993	-4	+6
9/1995	3/1997	12/1994	3/1996	-9	-12
8/1997	8/1998	-	-	N.S.	N.S.
3/2000	11/2001	12/1998	10/2000	-15	-13
-	-	9/2001	4/2002	F.S.	F.S.
-	-	9/2002	9/2003	F.S.	F.S.
12/2004	4/2009	6/2004	6/2005	-6	-46
4/2010	7/2012	2/2008	9/2010	-26	-22
2/2013	2/2014	4/2011	2/2013	-22	-12
10/2015	-	12/2013	-	-22	-
Average Duration	-6.86	-8.31			

Note: N.S. stands for *No Signal* and F.S. stands for *False Signal*.
Source: Authors' Calculations.

M3 are not consistent and in certain periods M3 appears to be lag indicator for IIP i.e., the money stock was not behaving consistently like a lead indicator for the IIP series, as reflected by backward arrows. This kind of behavior can be attributed to the features of Indian economy during period of 1970s, namely, agricultural sector as the major activity and high dependence on weather conditions, restricted and closed economy, dominant role of public sector, ineffectiveness of monetary policy etc. But later on, after the economic reforms of 1990s, a significant change in the lead characteristic of money can be observed as shown with forward arrows. This can be explained with the fact that the modified state of Indian economy with free and liberalized markets has offered opportunities for effective functioning of monetary policy as well. That is why after the period of economic reforms, the money stock has very well recorded leads for the subsequent movements in IIP. However, on an average, the money stock has reported leads for the turning points attained by IIP.

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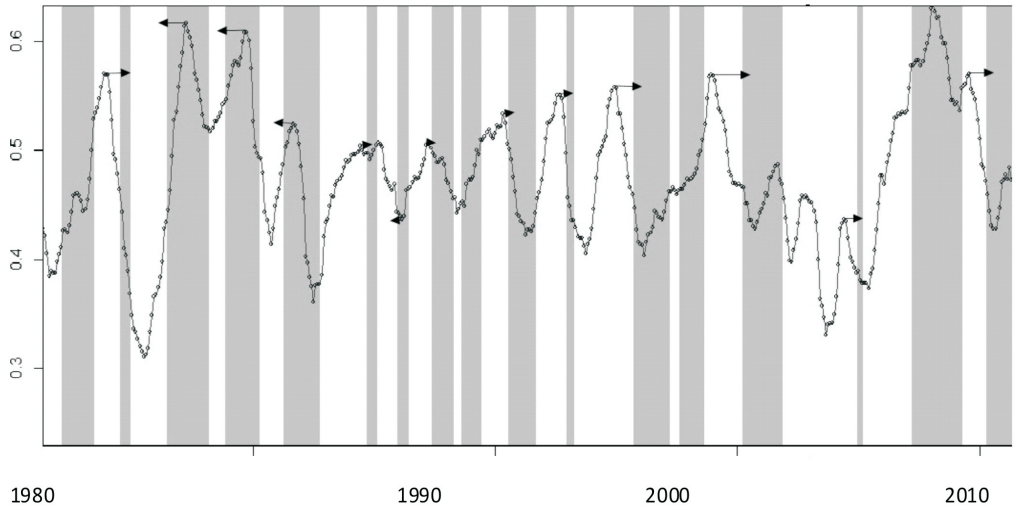
It can be concluded from the results reported in Table 2 that after the economic reforms, a sufficient degree of lib-

eralization has taken place in the Indian economy for the money supply to report consistent leads. The average lead for peak is about 7 months and the average lead for trough is about 8 months. However, for six turning points identified in IIP series there are no signals in the M3 series, though, four false/extra signals,for possible occurrences of peaks and troughs, are reported by M3 series for which there are no turning points registered in the IIP series.

Fig. 1 Chronology of IIP Growth Rate Cycles with M3 as Lead Indicator



Source: Authors' Elaborations using package *datation* in *R*

After the lag/lead analysis, the GARCH-M(p,q) estimates have been reported in Table 3. The preliminary analysis reveals that GARCH-M(1,0) is most suitable model for defining volatility in growth rate of reference series IIP(i.e., $\Delta \ln IIP$)[4]. A positive and significant coefficient of $\Delta \ln\left(\frac{M^*}{P}\right)$ series in variance equation substantiates the inference that indicator series (M3) is positively affecting the variance in growth of economy and (i.e., in growth rate of reference series IIP).Further, the coefficient (i.e., φ_1) of σ_t^2 (*i.e., GARCH* term) in mean series reflects that volatility caused by the indicator series real money supply (M3) also bears a positive and significant impact on growth rate of reference series IIP. Thus, the money supply shock has a double impact in the sense that it affects both mean growth and volatility in the growth of Indian economy.

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[4] Interested readers may contact authors for detailed preliminary and goodness of fit analysis.

Table 3 Testing Money Supply as Cause of Volatility in IIP Growth

Variable	Coefficient	Prob.
Mean Equation		
	-7.945162***	0.0000
	0.024868***	0.0000
Variance Equation		
	0.001491***	0.0000
	0.511297***	0.0000
	0.018310***	0.0000

Notes: *** reflects coefficient is statistically significant at 1 percent level.
Source: Authors' Calculations

Summary & Conclusions

The primary objective of the present study was to analyze the impact of recent episode of demonetization on the consequent decline in the growth rate of economy through the growth rate cycle analysis. In the light of Hawtrey's theory, an attempt has been made in the present study for identifying the role of demonetization in deceleration of economic growth rates. For carrying out this exercise, monthly growth rate cycles have been identified by taking IIP as a proxy variable for overall economic activity over the period 1970:01 to 2017:03. It was evident from the peaks and troughs reported in both the reference (IIP series) and the indicator series (real money supply M3) that money stock is a leading indicator for the cycles in IIP.

The average duration of lead in growth rate cycles for peak and trough is reported to be 7 months and 8 months,respectively.The leads reported are clear indications of strong relationship between money stock and economic activity.Also, the execution of GARCH-M (1,0) process reveals that the money supply causes significant volatility in IIP growth rate series and the volatility caused by M3 is also a significant variable in explaining fluctuations in growth rates of IIP.Therefore, the money supply shock observed having a double impact in the sense that it affects both mean growth and volatility in growth of Indian economy.

The growth rate declined from 7 per cent in 2016:Q4 to 5.7 per cent in 2017:Q1 and the observed decline can therefore be attributed to the demonetization introduced during 2016.

A thorough analysis of economic growth rates for the last one year reveals a continuous dip in economic activity. The growth rate declined from 7 per cent in 2016:Q4 to 5.7 per cent in 2017:Q1 and the observed decline can therefore be attributed to the demonetization introduced during 2016:Q3 because i) the money supply has strong impact on growth of Indian economy; and ii)M3 has been observed as a lead indicator with an average lead of 7 months in explain-

ing the low growth phase (i.e., downswing) of growth cycle.In addition, the validity of Hawtrey's theory has been proved in the Indian context and thus, entails the fact that liquidity conditions enhance smooth flow of transactions in Indian economy. The smooth transaction flow is thereby having a positive impact on the level of output. Therefore, it is pertinent to mention here that money supply change is playing a vital role in determining the growth levels in India and a money supply shock during the episode of demonetization has surely impeded the economic growth.

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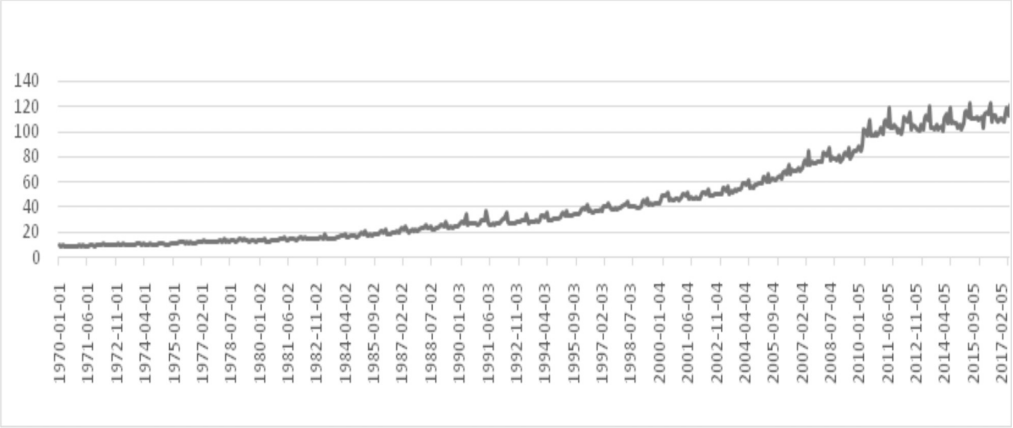
Appendix 1 Plot of Index of Industrial Production (IIP) Series



Source: Authors' Elaborations Using MS-Excel 2016