A STUDY ON MONETARY POLICY IMAPCT ON IIP

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ABSTRACT: - Indian economy is mainly depending on agriculture and service sector monetary contribution is there from industrial activity to the GDP growth. This study has been emphasized from monetary policy angle to measure the impact on IIP which contributes less then to the Indian GDP growth rate when it is compared with the other segment. Augmented dickey fuller test has been applied to convert the raw data in to stationary; bi-variate correlation has been applied to measure the relation of select economic variables along with IIP to the key monetary policy rates. Granger causality test has been applied on johanssen co-integration data and observed CRR is not causing the IIP, regression weight estimation indicates that inflation not causing the CRR but it is affecting the other economic variables. This study is useful to the investors, RBI, industrial development banks and investors of FDI.

Key words:- IIP, CRR, GDP, Inflation, repo rate and reverse repo rate.

INTRODUCTION:-

Monetary policy is formulated by the central bank (RBI) to facilitate economic growth and to control the supply of money. Every month Reserve Bank of India changes the cash reserve ratio (CRR), statutory liquidity ratio (SLR), repo rate, reverse repo rate to control the money supply of the country. This study is aim to discuss about the impact of monetary policy on IIP. The IIP depend on the key interest rates of RBI. If RBI increases CRR the interest rates of the bank will increase. Hence all firms may not borrow money from banks which results reduction in the production of goods and services. Due to this imports will go upside and exports will go down, which causes the reduction of Gross Domestic Product of the country. In IIP a cut in interest rates will cause the positive impact. If CRR rates will decrease the bank savings will be not so attractive. Thus, depositors may move to the stock market, which results boost in the security prices. The liquidity in the stock market is generated by the central bank with monetary policy. IIP volatility is depends on the monetary policy rates. Hence NIFTY volatility is influenced by the CRR of RBI. Recently India has experienced high increasing inflation because; the RBI revised the Cash reserve ratio and policy rate (Repo rate). So, any fluctuation in the monetary policy will be having direct impact on IIP and overall economy of the nation

IIP data is as fallows for the last one year period
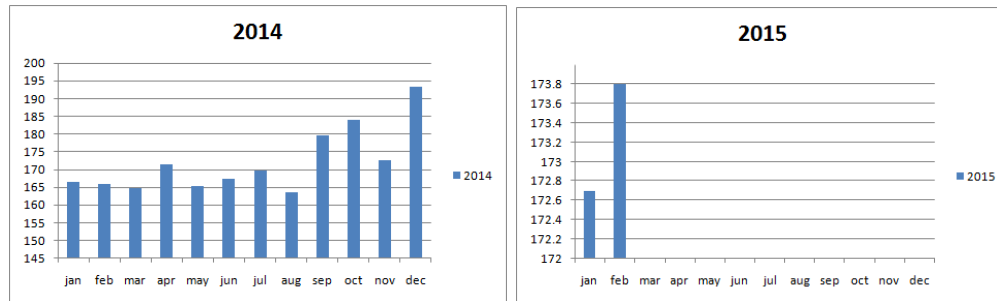
IIP data from the year 2014 to till date indicates that constantly moving in the same phase as it has moved before financial year last quarter i.e., jan-mar, central government and RBI had taken substantial measures to push the IIP upside, in spite of this measures there is no significant improvement in IIP growth prospects.

LITERATURE REVIEW:-

Anamika Singh-2014:- She had examined monetary policy impact on market volatility. It has been done by considering 15 years data. She has found that NIFTY volatility is getting influenced when ever monetary policy announced. Her study is only limited to market volatility. But our study is focused on IIP. So our study doesn't have any relevance to our study.

Vikram K Joshi-2012: - The researcher examined that monetary policy impact on CRR, repo rate, and reverse repo rate adopted by the monetary authority in curbing inflation rate decreased. He found that in the present market scenario by using other methods inflation should be curbed. This study is limited to 2009-2011 and only focused on inflation. Our study is related to IIP so this study does not have any relevance to our study.

Joe Peek and Eric S. Rosengren-2012: - This article provides an overview of recent research about the role played by bank lending in the transmission of monetary policy. It starts with a description of the mechanisms, under both the money view and the lending view, by which monetary policy is transmitted to the economy through the banking sector. The one section examines the empirical evidence on how bank lending responds to changes in monetary policy. The one more section briefly reviews some of the literature on the role of banks in other countries, many of which are far more reliable on bank lending than is the US. The one more section discusses how the role of bank lending may be altered by recent financial innovations and provides observations on the implications of recent events for the effectiveness of the bank lending channel. But our study is focused on the monetary policy effects on IIP, GDP, and Inflation. So this study doesn't have any relevance to our study.

Dr.Chacko Jose P and Ms.Bindu Balagopal-2013: - The study is mainly focus to analyze trends in monetary policy reforms in India during the post liberalization period and to study the changes in the key policy variables to analyze the trends in monetary policy reforms in India. The study found that the challenge for India is to unwind the expansionary policies harmoniously

since inconsistencies between fiscal and monetary policies can be costly in economic terms in future. This study is only limited to monetary policy in India during the post liberalization period. Our study focused on monetary policy impact on IIP.

Minella Andre-2003: - This study investigates the relationship between monetary policy and bank macro economic variables. This study comprises of 3 periods. 1. Moderately increasing inflation. 2. High inflation. 3. Low inflation. This study found that inflation rate; interest rate, liquidity and output variables are closely associated with the key policy rates. This study is limited to BRAZIL, where as our study confined to India. Hence this study doesn't have any relevance to our study.

Pankaj Vashisht, Bl Pandit-2011: - This study examined small and medium enterprise credit demand influenced by the monetary policy. The researcher has considered 7 emerging economies including India. This study result unveils that monetary policy is an important counter cyclic tool which sets the pace for the economy. This study is limited to SME segment. But our study on macro level impact on IIP with monetary policy.

Michael Debabrata Patra-2010:-The researcher has considered exchange rates and interest rates impact on inflation. The study found that inflation turns to be a dominant focus of monetary policy. This study is only focused on inflation. Our study is focused on IIP, so our study doesn't have any relevance to this study.

Glenn Hoggarth-1996: - The researcher use instruments such as interest rates, the effects on the economy are uncertain. And they have to rely on accurate information about the economy and its prospects. Central banks use money growth or the exchange rate as intermediate targets to guide policy decisions. Others take a more dynamic approach and consider a range of factors. Monetary policy has covered much time of the world's most distinguished economists over the years. This study provides an introductory overview to the subject. The next section provides an overview of the various routes by which monetary policy transmits through the economy. Describes the alternative targets which central banks can use to guide policy. Some closings are provided in Section. It is predicted; find this a useful starting point for further reading and research. This study is only focused on inflation. Our study is related to IIP so this study doesn't have any relevance to our study.

Rongrong Sun-2012: - This study applies the narrative approach to monetary policy in China to tackle two problems of policy measurement. The first problem comes because the PBC (the central bank of China) applies multiple instruments and none of them per se can adequately reflect changes in its monetary policy. The second one is the identification problem: the causation direction of the observed interaction between central bank actions and real activity needs to be identified. The PBC's are used to infer the intentions behind policy movements. Three trends are identified for the period 2000-2011 that are exogenous to real output. Estimates using these trends and various robustness tests indicate that monetary policy has large and

persistent impact on outputting China. But our study is focused on India so this study doesn't have any relevance to our study.

Asiyeh Mohammad aliyan-**2013**:-Increase in oil price can affect industrial productions and price index of industries in oil exporting country such as Iran in two phases: increase in oil price causes increase in monetary base and this is an experience which has occurred in Iran's economy in recent times. Increase in liquidity and monetary base increases the price and industrial productions by increasing demand. On the other side, increase of oil price influences price and production through production cost. Increase in oil revenues through importing raw materials causes decrease in production cost and supply of industries and leads to decrease of price and increase of production. This study shows oil price impact on IIP. But our study shows the interest rate impact on IIP; our study doesn't have any relevance to our study.

NEED OF THE STUDY:-

We have observed from the various papers that all the researchers had examined the monetary policy impact on different factors such as stock markets, bank liquidity, problems on monetary policy measurements, and oil price effects on IIP and so on. No research has examined the monetary policy impact on IIP. We found that there is a need for the study of monetary policy impact on IIP by considering other economic variables with 15 years data i.e., 2000-2014.

OBJECTIVES:-

1. To find the relationship of select rate of monetary policy with Inflation, IIP &GDP.

2. To measure the CRR impact on Inflation and IIP.

3. To know the SLR impact on IIP & GDP.

4. To measure the impact of inflation on IIP, GDP & CRR.

Hypothesis:-

Null hypothesis-H0: CRR will not impact inflation.
Null hypothesis-H0: CRR will not impact IIP.
Null hypothesis-H0: SLR will not impact IIP.
Null hypothesis-H0: SLR will not impact GDP.

SCOPE:-

The analysis has been emphasized on 15 years period i.e. from 2000-2014. The aim of the analysis is to find monetary policy impact on IIP, this analysis is confined to monetary policy key rates influence on IIP where as IIP depends on various other factors but these factors were not considered for this study, for this analysis few key rates has been considered along with the select economic factor.

Empirical study:-CRR (Cash Reserve Ratio), SLR (Statutory Liquidity Ratio), Repo Rate, Reverse Repo Rate IIP (Index of Industrial Production), GDP (Gross Domestic Product), Inflation.

Research methodology:-

Pearson bi-variate correlation formula:-

$$r = \frac{\Sigma fuv - \frac{(\Sigma fu)(\Sigma fv)}{n}}{\sqrt{\Sigma fu^2 - \frac{(\Sigma fu)^2}{n}} \times \sqrt{\Sigma fv^2 - \frac{(\Sigma fv)^2}{n}}}$$

Pearson's correlation coefficient between two variables is defined as the covariance of the two variables divided by the product of their standard deviation. The form of the definition involves a "product moment", that is, the mean (the first moment about the origin) of the product of the mean-adjusted random variables; hence the modifier *product-moment* in the name.

ANOVA Formula:-

$$SS_{total} = \sum_{j=1}^{p}\sum_{i=1}^{n_j}(x_{ij} - \bar{x})^2$$
$$SS_{between} = \sum_{j=1}^{p} n_j(\bar{x}_j - \bar{x})^2$$
$$SS_{within} = \sum_{j=1}^{p}\sum_{i=1}^{n_j}(x_{ij} - \bar{x}_j)^2$$

Analysis of variance (ANOVA) is a method for decomposing variance in a measured outcome in to variance that can be explained, such as by a regression model or an experimental treatment assignment, and variance which cannot be explained, which is often attributable to random error.

The Granger causality test: It is a statistical hypothesis test for ascertaining whether one time series can be used for forecasting another time series. It is originally considered that regressions reflect "mere" correlations, but Clive Granger on the other hand argued that causality in economics could be reflected by measuring the ability of predicting the future values of a time series using historical values of another.

$$\mathbb{P}[Y(t+1) \in A | \mathcal{I}(t)] \neq \mathbb{P}[Y(t+1) \in A | \mathcal{I}_{-X}(t)]$$

Johansen test: It is used for co integration that allows for more than one co integrating relationship i.e. large data samples. Therefore this test is more generally applicable than the Engle–Granger test which is based on the Dickey–Fuller (or the augmented) test for unit roots $X_t = \mu + \Phi D_t + \Pi_p X_{t-p} + \cdots + \Pi_1 X_{t-1} + e_t, \quad t = 1, \ldots, T$

Augmented Dickey–Fuller test (ADF): It is for a unit root in a time series sample. It is an improved version of the Dickey–Fuller test for a larger and more complex set of time series models. In ADF statistic, a negative number is used in the test. The more negative it is, the

greater the rejection of the hypothesis. It is given by the following Formula:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t,$$

Limitations:-

1. IIP data has been considered from the year 2005 onwards.

2. Inflation calculation base years as been changed by the government 3 times during the study period those changes impact may differ with our analysis.

DATA ANALYSIS:-

1. To find the relationship of rate of monetary policy with Inflation, IIP and GDP.

		inflation	iip	gdp
repo	Pearson Corre	-0.467	0.308	-0.241
	Sig. (2-tailed)	0.079	0.386	0.388
	N	15	10	15
Reverserepo	Pearson Corre	-0.102	0.338	-0.512
	Sig. (2-tailed)	0.716	0.339	0.051
	N	15	10	15
crr	Pearson Corre	0.087	0.42	-0.508
	Sig. (2-tailed)	0.758	0.226	0.053
	N	15	10	15
slr	Pearson Corre	0.374	-.669*	0.458
	Sig. (2-tailed)	0.17	0.035	0.086
	N	15	10	15

Interpretation:-The above analysis of bi-variate correlation has been applied between monetary policy rates to inflation IIP & GDP. The repo rate and reverse repo rate correlation is likely to moderately negative correlation with the inflation and GDP.IIP is moderately correlated with all the rates except SLR which is having strongly negative correlation during the analysis period .GDP is having negative correlation with all the rates except SLR which is having moderately positive correlation during the analysis period.

2. To measure the CRR impact on Inflation and IIP.

Co integrating Relations by Model:-
Criteria by Rank and Model:-

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Log Likelihood by Rank (rows) and Model (columns)					
CRR impact on Inflation :-					
0	42.28277	42.28277	42.76320	42.76320	43.44790
1	47.82825	47.82829	48.15587	50.25057	50.90691
2	48.42156	48.96904	48.96904	53.23134	53.23134
AIC-(-6.380461) SIC-(-6.218825)					
CRR impact on IIP					
0	-84.999	-84.999	-84.5542	-84.5542	-84.1779
1	-81.1642	-81.0543	-80.9452	-78.4713	-78.1365
2	-79.7905	-79.0052	-79.0052	-75.2659	-75.2659
AIC-(-14.83317*) SIC-(- 14.99480*)					

Interpretation:-The above analysis of Johansen co-integration test has been applied between CRR & Inflation. The log likelihood rank values were observed in decreasing trend in both liner and quadratic model along with the alpha level. Hence the data is said to be co-integrated between CRR and Inflation. The null hypothesis of granger analysis probability value is observed significant accept the null hypothesis and reject the alternative hypothesis when CRR is not causing the Inflation.

Granger causality test:-

Null Hypothesis:	Obs	F-Statistic	Prob.
CRR impact on Inflation:-			
INFLATION does not Granger Cause CRR	12	0.30996	0.7431
CRR does not Granger Cause INFLATION		1.08951	0.3873
CRR impact on IIP:-			
DIIP does not Granger Cause CRR	12	0.14959	0.8637
CRR does not Granger Cause IIP		0.02813	0.9724

Interpretation:-The above analysis of Johansen co-integration test has been applied between IIP & Inflation. The log likelihood rank values were observed in decreasing trend in both liner and quadratic model along with the alpha level. Hence the data is said to be co-integrated between CRR and Inflation. The null hypothesis of granger analysis probability value is observed not significant accept the alternative hypothesis and reject the null hypothesis when IIP is causing the Inflation.

3. To know the SLR impact on IIP and GDP.

Model Summary		ANOVA					
			Sum of Squares	df	Mean Square	F	Sig.
Multiple R	0.742						
R Square	0.551						
Adjusted R Square	0.422	Regression	2213.854	2	1106.927	4.289	0.061
Std. Error of the Estimate	16.065	Residual	1806.532	7	258.076		
Log-likelihood Function Value	-8.602	Total	4020.386	9			

Coefficients						
	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta	Std. Error		
(Constant)	25.303	1.896			13.348	0
Iip	-0.012	0.008	-0.462	0.3	-1.541	0.167
gdp	0.777	0.608	0.384	0.3	1.279	0.242

Interpretation:-The above analysis of regression weight estimate has been applied to measure the SLR impact on IIP and GDP. The probability value is found to be significant where SLR

causing both the variables. During the analysis period the R-square is observed near to the slab value that is 55%. IIP and GDP coefficient probabilities both are significant during the analysis period.

4. To measure the impact of inflation on IIP, GDP and CRR.

Model Summary									
Multiple R	0.875		ANOVA						
R Square	0.766			Sum of Squares	df	Mean Square	F	Sig.	
Adjusted R Square	0.649								
Std. Error of the Estimate	0.531	Regression	5.529	3	1.843	6.548		0.025	
		Residual	1.689	6	0.281				
Log-likelihood Function Value	60.271	Total	7.217	9					

Coefficients						
	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta	Std. Error		
(Constant)	-0.004	0.002			-1.872	0.11
Iip	8.93E-06	0	0.186	0.22	0.848	0.429
gdp	0.002	0.001	0.887	0.254	3.49	0.013
crr	5.31E-05	0	0.079	0.27	0.293	0.78

Interpretation:-the above analysis has been applied to know the inflation impact on IIP, GDP and CRR. The r-square value is observed stronger which above the slab value that is 76%. The analysis of variance probability value is significant which indicates that inflation is having stronger influence on IIP and GDP growth rate. But CRR coefficient probability value is found to be non-significant which indicates that inflation is not affecting the RBI monetary policy rate CRR during the analysis period.

FINDINGS:

1. Repo rate, reverse repo rate and CRR is having negative correlation with GDP during the study period.

2. SLR is having strongly negative correlation with IIP.

3. CRR is not cussing inflation but it is having effect on IIP during the study period.

4. This study had observed SLR affected the IIP and GDP growth during the study period from year 2005-2014.

5. Inflation is causing the IIP and GDP but failed to influence the CRR during the study period.

CONCLUSION: We conclude the analysis monetary policy impact on industrial production in this analysis IIP data has been considered from the year 2005 but the rest of the variables considered from 2000-2014. The emphasis of analysis is focused to find the monetary policy key rates repo, CRR, SLR a relation and effect on the selected variables like GDP, IIP and inflation.

IIP is having the positive correlation with all the key rates of monetary policy except with SLR and also observed that monetary policy key rates were influencing the industrial production growth rates during the study period. Hence further study is recommended in this area where the economic variables which influence the IIP growth rate along with the monetary policy rates, so that the exact impact can be measured.

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