

INTEREST RATE, INFLATION RATE AND GROSS DOMESTIC PRODUCT OF INDIA

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Abstract-Macroeconomic variables such as interest rate, exchange rate, inflation and deficit finance have significant impact on economic performance of a country. The main aim of this study is to investigate the effect of changes in interest rate and inflation rate on Gross Domestic Product of India (GDP). In this paper we have used multiple linear regression with the help of SPSS software to show that there exists a strong positive correlation between GDP, interest rate and inflation rate, but interest rate and inflation rate could together explain 32% changes in GDP during study period. The study further shows that there is negative relation between GDP and interest rate and positive relationship between inflation and GDP of India during study period.

Key words: Interest Rate, Inflation Rate, GDP, India, Regression Analysis.

1. INTRODUCTION

Like many emerging economies, one of the most fundamental objectives of macroeconomic policies in India are to achieve and sustain high economic growth rates in terms of GDP together with low interest rate and inflation rates. The monetary policy stance in 2010-11 by Reserve Bank of India was calibrated on the basis of the domestic growth-inflation dynamics amidst persistent global uncertainties. Repo Rate was increased under the liquidity adjustment facility (LAF) by 50 basis points from 6.75 per cent to 7.25 per cent. Reverse Repo Rate under the LAF, determined with a spread of 100 basis points below the repo rate, automatically adjusts to 6.25 per cent. Marginal Standing Facility (MSF) Rate, determined with a spread of 100 basis points above the repo rate, stands calibrated at 8.25 per cent. Bank rate has been retained at 6.0 per cent. Cash Reserve Ratio (CRR) of scheduled banks has been retained at 6.0 per cent of their NDTL. (RBI 2010-11). This was triggered to stabilize interest rates and reduce inflationary effects on economic growth. Boyd et al (2001) examines five- year average data on bank credit extension to the private sector, the volume of bank liabilities outstanding, stock market capitalization and trading volume (all as ratios to GDP) and inflation for cross section sample over 1960-95, Boyd et al (2001) found that , at low to moderate rates of inflation, increases in the rate of inflation lead to markedly lower volumes of bank lending to the private sector, lower levels of bank liabilities outstanding and significantly reduced levels of stock market capitalization and trading volume. According to the Frimpong and Oteng 2010, a high rate of inflation beyond 14% will always hurt to the GDP. Macroeconomic variable such as interest rate, inflation rate, exchange rate etc. have been found as the deterrents of GDP of a country. Ample literature is available on these variables. Lupu D. V. (2007) established that there is a positive relationship between inflation and GDP growth in Romanian the short run. This implies that, as inflation increases GDP must also increase in the short run. However, when inflation decreases, GDP should also decrease. Drukker et al (2005) established that, if inflation rate is below 19.16%, increases in inflation do not have a statistically significant effect on growth, but, when inflation is above 19.16%; further increases in inflation will decrease long run growth. This affirmation is in line with Lupu D. V. (2007) but only that, it establishes a threshold beyond which the assertion of Lupu D. V. (2007) will not hold. Mallik et al (2001) established a long run positive relationship between GDP growth rate and Inflation among four South Asian Countries. However, Kasim et al (2009) was able to establish the non-linearity between inflation rate and GDP growth rate in Malaysia. His study analyzed the relationship between inflation rate and economic growth rate in the period 1970-2005 in Malaysia. A specific question that is addressed in this study is what the threshold inflation rate for Malaysia. The findings suggest that there is one inflation threshold value exist for Malaysia. This evidence strongly supports the view that the relationship between inflation rate and economic growth is nonlinear. The estimated threshold regression model suggests 3.89% as the threshold value of inflation rate above which inflation significantly retards growth rate of GDP.

2. THE RELATIONSHIP BETWEEN INTEREST RATE, INFLATION AND GDP

Evans Agalega & Samuel Antwi (2013) found that there is positive relationship between GDP and inflation rate, and interest rate and GDP is inversely related to each other. That means when inflation increases GDP also increases. As interest rate increases GDP decreases and vice versa. Obamuyi T.M. (2006) found that lending rates have significant effects on GDP; this implies that there is an inverse long run relationship between GDP growth and

interest rates. That means when interest rate reduces, GDP in the short run will increase, but when interest rate declines GDP will increase.

3. DATA AND METHODOLOGY

The data used in the study is secondary and is collected from Bloomberg database, IFS and BIS. The study period spanned from 1998 to 2012, which covers 15 years. The frequency of data is monthly. There is no problem of multicollinearity between the independent variables i.e. interest rate and inflation rate used in the study.

4. MODEL SPECIFICATION

The model used in this study is multiple linear regression models. This attempted to look at the effects or the relationship between a dependent (responsive) variable and number independent (explanatory) variables.

With regard to this study, the dependent variable is Gross Domestic Product (GDP) and the independent or explanatory variables are inflation and interest rates.

The model specified is therefore:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + e_{ij}$. Letting GDP = Y, Inflation = X₁, and Interest rate = X₂. The model is re-specified as $GDP = \beta_0 + \beta_1 \text{Inflation rate} + \beta_2 \text{Interest rate}$, where β_0 , β_1 and β_2 are the regression coefficients which are estimated from the sample data. The e_{ij} is the random error term.

6. EMPIRICAL ANALYSIS AND DISCUSSIONS

6.1 Model formulation

To check the relationship of our responsive variable (GDP) with explanatory variables (interest rate and inflation rate) a linear Regression model was developed.

Table-6.1 Regression Coefficients

Model		Unstandardized Coefficients		T	Sig.
		B	Std. Error		
1	(Constant)	15.097	.093	1.047	.296
	interest	-.424	.014	9.017	.000
	inflation	.067	.000	-.359	.020

From table 6.1 above, the exact regression model that can be developed is $Y = 15.097 - 0.424X_1 + 0.067X_2$. Where Y, X₁ and X₂ denote their usual meanings. The model is thus interpreted as follows.

The constant value of 15.097 is the intercept which represents total output of the Indian economy in terms of GDP given that interest rate, (X₁) and inflation rate (, X₂) are zero. All others factors remain constant. The coefficients of interest rate (X₁) of -0.424 implies change in GDP when there is one unit change in interest rate (X₁). The result shows that there is inverse relationship between interest rate and GDP. It means that GDP decreases with increase in interest rate and vice versa. this relationship is supported by literature as reviewed above that if inflation is rising the central bank raises the interest rate, meaning that the cost of borrowing increases so the amount of money borrowed by individuals and companies decreases which in turn decreases the amount of money in the economy (money supply) resulting in low economic output and for that matter GDP And also the coefficients of inflation rate (X₂) is 0.067 implies how much dependent variable i.e. GDP will change when there is one unit change in inflation rate (X₂). It shows that there is positive relationship between GDP and inflation during the period of study, that means both GDP and inflation rate behave or move in the same direction. As inflation rate increases GDP also increase. Inflation and GDP move together because, during the period of inflation, especially the demand pull inflation, could lead to increase in demand for goods and services, this could lead to increase in productivity and for that matter increasing the GDP consequently. During the period of mild inflation or decrease in inflation, it could lead to decrease in demand for most goods and services and for that matter, a decrease in productivity of factors of production and consequently decrease in Gross Domestic Product (GDP).

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Table- 6.2 Model Summary of other Regression Coefficients

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.566 ^a	.320	.312	.2229104	.306

The table-6.2 shows R (0.556) that there is a strong positive correlation between responsive variable (GDP), and explanatory variables (interest rate and inflation rate). It is therefore evident from the results that the behavioral pattern of interest rate and inflation rate did influence India's GDP. The relationship is corroborated with existing literature that if inflation is rising the central bank raises the interest rate, meaning that the cost of borrowing is increases so that the amount of money borrowed by individuals and companies decreases. This in turn decreases money supply in the whole economy, resulting in lower economic output. Furthermore Fisherian old law of consistency of real rate of interest was tackled by Mundell, i.e. where $r = i - \pi$ where if inflation (π) rises, then nominal interest rate (i) will also rise one for one to keep real interest rates (r) constant. On the other hand interest rate and GDP are inversely related to each other. They move in opposite direction as interest rate increases GDP decreases and vice versa. This relation is corroborated by negative coefficient of interest rate in regression model developed in table 1. This relationship is also supported by existed literature which reveals that GDP falls as interest rate increases. This is because increasing GDP is having potential to decrease the inflation, which in turn leads to decrease in interest rate. As far as R^2 (0.320) is concerned, 32% of the proportion of variations in GDP are explained by both interest rate and inflation rates. In other words interest rate and inflation rate explains 32% of changes in GDP during study period. Moreover adjusted R square value of (0.312) is in line with R^2 . This also implies that interest rate and inflation rate explains approximately 32% of changes in GDP of India during study period.

Table-6.3 Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	4.071	2	2.036	40.965	.000 ^b
	Residual	8.646	174	.050		
	Total	12.717	176			

Note :a. Dependent Variable: GDP b. Predictors: (Constant), inflation, interest

The analysis of variance (ANOVA) is used to check the overall significance of the model developed to know whether beta coefficients are same or not. Here the hypothesis is

H₀: the overall model is not significant i.e. $H_0: \beta_j = 0$

H₁: the overall model is significant i.e. $H_1: \beta_j \neq 0$

In the table the significance value (.000) is less than 5%, therefore null hypothesis is rejected and thus it is concluded that at least one beta coefficient is not zero and thus overall model is significant.

7. REGRESSION STATISTICS OF GDP AND INTEREST RATE OF INDIA DURING THE PERIOD OF 1998 TO 2012

Table-7.1 Regression Statistics of GDP and Interest Rate

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.565	.320	.316	.2223550

With regard to the nature of relationship between responsive variable (GDP) and explanatory variable (interest rate) is concerned. The results revealed based on R (0.565) there exists a strong relationship between GDP and interest

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rate. Also base on R square (0.320) it can be concluded that interest rate could explain 32% of variations in GDP over a period. Therefore implies that rest 68% are explained by other macroeconomic variables.

Table-7.2 Regression Coefficients

	Coefficients	Std. Error	t. stat	P .value
(Constant)	.095	.092	1.030	.304
interest	-.124	.014	9.067	.000

The results in the table show that GDP increases with corresponding decrease in interest rate. This increment is also significant since the p.value for the coefficients is significant. Reliability of the model is tested below using the analysis of variance table below.

Table-7.3 Analysis of Variance (ANOVA)

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4.065	1	4.065	82.211	.000 ^b
Residual	8.652	175	.049		
Total	12.717	176			

a. Dependent Variable: GDP b. Predictors: (Constant), interest

The reliability model is vital here since it would go a long way to informing its usage in estimation and forecasting. Since the calculated F of 82.211 is extremely higher than F significance, the null hypothesis is not rejected. It therefore can be concluded that the model developed for GDP and interest rate for India using data spanned these two variables from 1998 to 2012 is quite significant.

8. REGRESSION STATISTICS OF GDP AND INFLATION OF INDIA DURING THE PERIOD OF 1998 TO 2012

Table-8.1 Regression Statistics of GDP and Inflation

Model	R	R Square	Adjusted R Square	Std. Error
1	.050	.021	.003	.2692395

The results in the table reveals that there exists a weak relationship between GDP and inflation since the value of R (.050) . as far as results of coefficients of determination (.021) are concerned It can be concluded that inflation explains only 2% of GDP during study period and rest 98% are explained by other macroeconomic variables.

Table-8.2 Regression Coefficients

	Coefficients	Std. Error	t.stat	P value
(Constant)	.919	.020	45.320	.000
Inflation	.032	.001	-.656	.513

The results in the table shows that GDP will increase with corresponding increase in inflation the increment is also significant as the p.value of constant is significant.

Table-8.3 Analysis of Variance ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.031	1	.031	.431	.513 ^b
Residual	12.686	175	.072		
Total	12.717	176			

a. Dependent Variable: GDP b. Predictors: (Constant), inflation

The above test is used to check the overall significance of model developed for inflation and GDP. It can be revealed that the sum of squares values of residuals (12.686) is far bigger than the regression sum of squares (.031) this is affecting the reliability of the model. The results show that significance value is slightly higher than 5% so we

cannot reject null hypothesis and we can conclude that the model developed for GDP and inflation rate is not significant.

CONCLUSION

The results and findings reveals that there exists a strong positive relationship of (0.556) i.e. 55.6% of GDP with interest rate and inflation rates and rest 44.4% is with other macroeconomic variables during the period of study. It also reveals that the behavioral pattern of interest rate and inflation rates have had some influence on GDP. The study also revealed an R² value of (.320). This implies that 32% of the proportion of variations is explained by both interest rate and inflation rates. In other words, interest rate and inflation are explained only 32% of GDP of India during study period. It was also revealed that there is negative relationship between interest rate and GDP there is positive relationship between GDP and inflation during the study period. This means that interest rate and GDP move in opposite direction, as interest rate increases GDP decreases and vice versa. On other hand GDP and inflation moves in same direction means when inflation increases GDP also increases. The analysis of variance table shows that overall multiple regression models developed for GDP, interest rate and inflation rate is significant with individual parameters also being significant. It is recommended that government of India with the Reserve Bank of India should frame and pursue efficient monetary policies that will help in reducing and stabilizing both interest rate and inflation rate to enhance the economic growth of India.

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