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Interest Rate and Economic Growth Linkages: An experience of the Indian Economy

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Abstract: According to many studies, many developing as well as developed economies have found a significant relationship between interest rate and economic growth. This paper studies the interaction between Interest rate and the Economic growth of Indian economy. We analyzed the related data connecting with other factors that might have an impact on the particular linkage such as FDI, Inflation, unemployment and National Income. This study is based on annual time series data for the period from 1980 to 2020. We incorporated the use of analytical model such as unit root test, cointegration test, vector error correction model and Granger's Causality Test. The findings shows that Interest rate has a significant impact on economic growth during the time period. The economic growth in turn also affects the FDI inflow into the country.

Keywords: Interest rate, Economic growth, FDI.

Introduction

Due to their significance to the economy, interest rates have drawn a lot of attention from economists, lenders, and borrowers. The interest rate makes it easier for money to travel from lenders to borrowers. This is what a borrower pays the lender for the usage of the funds and is known as the cost of borrowing. Interest rates allow financial institutions, including corporate organisations, banks, mutual funds, and insurance firms, fulfil their intermediary function by facilitating the flow of credit into the economy (Eregha, 2010). The demand for and distribution of available money are impacted by interest rates, Oliver (2016) noted. It also affects how much is consumed as well as how much is invested and how it is structured. Borrowing is discouraged by high interest rates, which promotes economic decline. On the other hand, low interest rates promote borrowing and economic growth since firms expect to pay a small percentage of their profits as interest on borrowed funds, which means that the lower the interest rate, the higher the earnings expectations (all other things being equal) (Mahmudul, Gazi Salah, 2009). On the other hand, profit margins decrease as interest rates rise. Money is used to exchange products and services in the modern world. Most people preserve all of the money that is left over after paying for goods and services and could be utilised to make investments in the economy. To facilitate this procedure, the usage of this money is always subject to a fee known as the interest rate. Generally speaking, depending on the viewpoint, the interest rate can be thought of as either the cost of borrowing or the return on money

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loaned. In any case, the interest rate reflects the notion that individuals typically prioritise having money now or the temporal worth of money. (Obute, 2012)

According to various studies, many developing as well as developed economies have found a significant relationship between interest rate and economic growth. This paper studies the interaction between Interest rate and the Economic growth of Indian economy. We analyzed the related data connecting with other factors that might have an impact on the particular linkage such as FDI and Inflation. This study is based on annual time series data for the period from 1991 to 2019. We incorporated the use of analytical model such as unit root test, cointegration test, vector error correction model and Granger's Causality Test. The findings shows that Interest rate has a significant impact on economic growth. The paper implications for the economic growth and its influence by inflation rate and interest rate.

This paper is divided into four sections. In the following section which is second section consist of the literature review and concepts of the variables being used. The third section identifies the data representing those variables and its methodology and the fourth section consist of Results and conclusion.

Literature and the concepts

Unlike other non-monetary neoclassical growth theories, which link economic growth with factors like capital productivity, J. Tobin's theory of the relationship between interest rates and economic growth claims that there is evidence for the role of interest rates in how it affects savings and investment, and consequently, economic growth.

The theory of financial liberalisation put forth by Mckinnon and Shaw (1973) contends that interest rate regulation often results in low and negative real interest rates, which inhibit the development of the economies of developing countries. Low interest rates brought on by financial instability make saving less alluring and deter investment. The quality of the investment will be inferior due to the low rate of return on initiatives that will be carried out under a repressive regime. They argued that deregulating interest rates would result in greater rate increases, which would encourage saving and investment and speed up economic growth. All of these variables, including the real exchange rate and the unemployment rate, had no statistically significant link, according to Waqas et al. (2017). According to Ahmad et al. (2010), increased stock market capitalization is a result of higher interest rates.

According to econometric analysis for Germany and France from 1991 to 2021, sustained inflation is necessary and has a big impact on economic growth.

The empirical findings are consistent across interest rates and show that real interest rates, real government spending, real money supply, foreign interest rates, and the forward premium have a cointegrating connection. The estimates also demonstrate that both internal and external influences can affect interest rates. Therefore in this paper we are looking at the effect of interest rate on the Indian economy's outcome post reform period.

Goodfriend (1993) finds that changes in the rate of interest in federal reserve makes a significant impact on the macro economic indicator such as inflation and therefore the outcome of the economy. Tomori (2012) claims that inflation does effects the interest rate. Due to the necessity to maintain a positive real interest rate to stimulate other economies, the interest rate is expected to be greater the higher the anticipated inflation rate. Other things being equal, the interest rate would decrease if anticipated inflation decreased.

Interest rates are normally lower when inflation is low and when inflation expectations are improving, but they are more likely to increase when inflation is high and prices are rising. As a result, inflation and interest rates have a positive association. Savings are safeguarded against the negative effects of inflation

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when interest rates are higher than inflation rates; however, when inflation rates are higher than interest rates, borrowers often gain at the expense of savers. (Tomori, 2012). Ayub et.al (2014), Asari et.al (2011) also found in different case studies that there exist a strong relationship between the interest rate and inflation.

Concept of Interest Rate

In economic theory, the term "interest rate" refers to the value that is produced by the labour of a value that has been saved or invested. These rates will show the relationships between various currency trades (Patterson dan Lygnerud, 1999). There are short-term and long-term rates, say Patterson and Lygnerud (1999). Money is monopolised in this way because the Central Bank controls short-term rates. Long-term rates, however, show the current economic situation and the risk of inflation. The two rates are linked and rely on one another. According to Certified Public Accountant (CPA) Australia, there are two ways to identify the risks connected to interest rates: sensitivity analysis and repricing profiles.

According to Teriba (2012), interest rate is the fee charged by a lender to a borrower for using borrowed funds, expressed as a percentage of the principal. It is typically expressed as a percentage of the (principal amount borrowed) for a year or for any other time period, such as a month, week, or day, as agreed upon by the borrower and the lender at the time the loan was obtained.

The percentage of the principal that is paid as a fee over a specified term is what is specifically referred to as the interest rate. It might also be compared to lease payments for the usage of credit by borrowers and the periodic return by lenders to get rid of liquidity. Depending on whether inflation is taken into account in the computations of interest rates, they may be expressed in nominal or real terms. The interest rate is expressed in nominal terms if there is no adjustment made for changes in price level. The interest rate that excludes inflation is known as a nominal interest rate. It is essentially the simplest example of an interest rate. (Teriba, 2012)

Inflation

The best way to characterise inflation is as an increase in prices generally, where inflation reduces a currency's purchasing power (McConnel and Brue, 2008). There are a few reasons for inflation when the cost of products and services goes up because overall demand grows more quickly than overall supply. The government's deficit, the rise in bank interest rates, and the rise in foreign demand are all factors that contribute to the imbalance of overall demand and supply (Haberler, 1960). The cost of goods and the selling price rise as a result of inflation, which also raises the price of goods and the cost of labour (Sukimo, 2000). The Consumer Price Index (CPI), Wholesale Price Index (WPI), and Implicit Price Index (deflator GDP) are a few indicators of inflation (Majalah Tempo, 2002).

The study looked at whether there would be a threshold effect of inflation on economic growth in the Azerbaijani economy from 2000 to 2009 (Hasanov, 2010). According to the estimated threshold model, the threshold level of inflation for GDP growth in the Azerbaijani economy is 13%. Economic expansion and inflation have a nonlinear relationship.

Investment

As per Mahmudul and Gazi (2009), a high-interest rate makes borrowing expensive and has a detrimental impact on the level of investment. This can be explained by the fact that individuals, corporations, and governments routinely borrow money to finance investments from banks and other credit institutions.

In a manner similar to this, high-interest rates serve as a cue for people to save more money in order to profit from it more. Low-interest rates can signal more investment because they make borrowing money more affordable. In the hopes of generating a larger return, businesses frequently use their funding sources

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to invest in new factories, machinery that is more productive, raw materials, etc. However, if the interest rate (loan cost) exceeds the expected return on investment, making such an investment would not be economically feasible. Consequently, when lending rates are lower, businesses are more inclined to invest (Acha &Acha 2011).

Shahmoradi and Baghbanyan's (2011) study, which covered the years 1990–2007, focused on the variables that affected the inflows of foreign direct investment into emerging nations.

GDP as an indicator of economic growth

Several economists, like Ricardo et al. (1819), Solow (1956), and others, see the economy as a machine that produces economic output in response to inputs like labour, land, and machinery.

Giovanni and Shambaugh (2007) looked at the connection between annual real output growth in other countries and interest rates in the largest industrialised nations. The results show that, although this influence is concentrated in countries with fixed exchange rates, high international interest rates have a contractionary effect on local real GDP growth.

An accurate indicator of a country's microeconomic health and development is its GDP (Haggart, 2000). There are two ways to look at GDP: the expenditure method and the income approach. Starting off, let's examine the spending plan. It covers all goods and services over a certain period of time. The regular purchases of household items, purchases made from foreign investors, and services would serve as an appropriate example (Andolfatto, 2005).

The Impact of the Interest Rate on the Economy.

It is impossible to overestimate how important interest rates are to the economy. Financial intermediaries utilize the interest rate as a tool in the economy. It has an impact on how much money has been saved and invested in the economy. It also regulates the flow of funds between lenders and investors. These funds are channeled through financial intermediaries such as MDBs, money and financial markets, insurance companies, mutual funds, government securities, etc. How consumers and businesses spend and save money can provide evidence of the crucial role that interest rates play in the economy (Acha &Acha 2011). Interest rate changes would have an impact on consumer spending, household savings, company productivity, and investment decisions. The money market and the goods sectors' balance and imbalance situations are the best indicators of this behaviour. While the currency sector shows the connection between the amount of money requested and the quantity provided, which characterises the credit market and represents the supply and demand of credit, the products sector shows revenue and interest rate arrangements at equilibrium. Any deviation from equilibrium in any market will necessitate an adjustment to the interest rate since the level of economic production equilibrium is compatible with the balance of the goods and credit markets (Eregha, 2010).

Using the joint integration technique, Ologunde et al. (2006) investigated the effect of interest rates on investment in Jordan between 1990 and 2005. The study revealed that the real interest rate negatively affects investment. A 1 per cent increase in the real interest rate reduces the level of investment by 44 per cent. Kurihara (2016) examined the determinants of private investment in the least developed and developing countries for 23 countries between 1975 and 1987 and found that the interest rate on real deposits hurt private investment. Doong, Wang, and Yang (2015) investigated Pakistan's fall in private investment. They discovered that increased real interest rates hurt private investment.

The relationship between inflation with GDP

Suva and Fiji (2004) claim that there is a negative correlation between GDP and inflation. A particular degree of inflation will result in a favorable effect on GDP. The GDP won't be much impacted by low

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inflation; in fact, it might even have a positive impact. However, excessive inflation will have a detrimental effect on GDP (Li, 2003). The GDP per person and investors will decline as inflation rises (Barro, 1995).

The relationship between interest rates with GDP

When seen from the perspective of GDP, interest rates, according to Udoka and Roland (2012), are one of the factors that indicate a country's economic growth. However, they also point out that an increase in interest rates also signals a decline in GDP. The good news is that their analysis shows that interest rates don't significantly affect economic growth. According to research conducted in Europe, real growth rates will decrease as interest rates rise (Giovanni et al., 2009).

The relationship between interest rates with inflation

Interest rates serve as a part of monetary policy, a gauge of the market's money supply, and a weapon against inflation (Asghapur et al., 2014). Asghapur, Kohnehshahri, and Karami (2014) concurred that there is a negative correlation between interest rates and inflation. Additionally, Kandel, Ofer, and Sarig's (1996) finding that there is a negative relationship between interest rates and inflation supports it. The Fisher Hypothesis from 1930 states that interest rates shift in response to changes in inflation. Interest rates can, on the other hand, have a positive connection, according to Mishkin (1988) and Gibson (1982). Ghazali's 2003 analysis found no obvious relationship between interest rates and inflation.

III. Data and its methodology

The data for the analysis is based on secondary sources and it has all been collected from World Bank data Databases from the World Bank are crucial resources for supporting important management choices and providing vital statistical data for Bank operational activities. An accurate source of information is produced by using internationally recognised standards and norms. The Development Data Group at the World Bank manages a range of macro, financial, and sector databases and organises statistics and data activity. To guarantee that all data consumers may have faith in the quality and integrity of the data produced, the group collaborates closely with the Bank's regions and Global Practices while adhering to professional standards in the collection, compilation, and dissemination of data. The statistical systems of the member countries provide the majority of the data, and the effectiveness of these national statistical systems perform. (World Bank)

The cointegration test can be used to analyse the link between the interest rate and economic growth as well as other variables. It is crucial to verify each time series' stationarity before running the cointegration test. Traditional regression analysis will yield false conclusions if a time series is non-stationary. As a result, the unit root test is carried out first.

The real rate of interest rate is taken for interest rate, and for economic growth the real GDP is taken. Other factors such as foreign capital inflow and inflation have been taken from the data of FDI and inflation given in the world bank data.

Model specification

Economic growth is represented by the GDP growth rate in relationship with factors such as real rate of interest (ROI), inflation (INF) and foreign direct investment (FDI).

The equation is as follows:

$GDP = \alpha + \beta_1 (ROI) + \beta_2 (INF) + \beta_3 (FDI) + \varepsilon$ …….. eq (1)

α = constant , β = the coefficient of the variables, ε = error term.

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The statement goes that as there is a change in one of these independent variables there may be a significant change in the GDP.

Co-integration test

The Variables' Integration Order The appropriate method of the estimate is determined by the variables' integration order. The Ordinary Least Squares (OLS) approach can be used if all the variables are integrated in the same order. If not, the OLS results might be deceptive, hence it's important to look into alternative estimation techniques. Two tests have been utilised in the following ways to specify the sequence of the variables' integration and for comparison purposes: First: The Phillips-Person unit root test. This test is a test of the hypothesis ρ=1 in the equation:

$$\Delta Xt = \mu + \rho Xt\text{-}1 + \varepsilon t \quad (1)$$

The Analysis of Cointegration, Generally speaking, we must determine whether the variables in this study are cointegrated, or if a linear combination of these variables is stationary. If so, regression on the amounts of these variables would be significant, and we would not lose any important long-term information (Gujarati, 1995, 726). The Johansen Cointegration test, which examines the assumption of a linear deterministic trend in the data, is one of the most effective cointegration tests. The probability ratio is employed to determine how many cointegrating vectors there are. The trace test's likelihood ratio statistic is:

$$LHR = -T \sum_{i=r+1}^{p-r} \ln(1-g_i)$$

where the estimated p-r eigenvalues are gr+1,.., and gp. The null hypothesis to be tested is that there are only r or fewer cointegrating vectors, where r is 0 or 1, 1 or 2, and the number of cointegrating vectors is less than or equal to r. In this instance, the broad alternative of r+1 cointegrating vectors is tested against the null hypothesis. Therefore, the alternative r=2 is compared to the null hypothesis r=0, r=1 is compared to the alternative r=2, and so on (Alkhatib, 2005).

Table 1: The cointegration test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.740207	66.61610	47.85613	0.0004
At most 1 *	0.636193	34.26723	29.79707	0.0143
At most 2	0.243287	10.00009	15.49471	0.2807
At most 3	0.128814	3.309589	3.841465	0.0689

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.740207	32.34887	27.58434	0.0113
At most 1 *	0.636193	24.26714	21.13162	0.0175
At most 2	0.243287	6.690502	14.26460	0.5264
At most 3	0.128814	3.309589	3.841465	0.0689

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors calculation

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Table 1 shows that there is a cointegration at the significant level for both trace and maximum eigenvalue. The relationship between economic growth and inflation, FDI and Real rate of interest indicates a long-run relationship from the given data.

Granger's Causality test

Many models assume different hypotheses to discuss variables' relationship, but they could not make sure variables' cause and effect relationship. However, Granger (1969). was the first person who defined lead and lag relations based on the role of predictability; He used twin factors of VAR to find variables' causal relationships. This test assumed two series Xt and Yt that define those messages set.

$$X_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} X_{t-1} + \sum_{i=1}^{k} \alpha_{2i} Y_{t-1} + \varepsilon_{1t}$$

$$Y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} X_{t-1} + \sum_{i=1}^{k} \beta_{2i} Y_{t-1} + \varepsilon_{2t}$$

To test four coefficients find out variables' relationship.

a. $\alpha_{2i} \neq 0 \; and \; \alpha_{1i} = 0$: It means Y lead X or X lag Y.

b. $\beta_{1i} \neq 0 \; and \; \beta_{2i} = 0$: It means X lead Y or Y lag X.

c. $\alpha_{2i} = 0 \; and \; \beta_{1i} = 0$: It means both of variables are independent.

d. $\alpha_{2i} \neq 0 \; and \; \beta_{1i} \neq 0$: It means both of variables are interactive each other and have feedback relationship.

Table 2: The Granger Causality test

Pairwise Granger Causality Tests
Date: 09/05/22 Time: 10:17
Sample: 1991 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LGFDI does not Granger Cause LGGDP	27	0.22631	0.7993
LGGDP does not Granger Cause LGFDI		4.83014	0.0182
LGINF does not Granger Cause LGGDP	27	1.34940	0.2800
LGGDP does not Granger Cause LGINF		2.55358	0.1006
LGROI does not Granger Cause LGGDP	24	5.19695	0.0158
LGGDP does not Granger Cause LGROI		0.08479	0.9191
LGINF does not Granger Cause LGFDI	27	0.36994	0.6950
LGFDI does not Granger Cause LGINF		0.99038	0.3874
LGROI does not Granger Cause LGFDI	24	1.86639	0.1820
LGFDI does not Granger Cause LGROI		0.03026	0.9702
LGROI does not Granger Cause LGINF	24	2.50691	0.1081
LGINF does not Granger Cause LGROI		1.19910	0.3233

Source: Author's own calculation

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The result in the above table shows that there is Granger causality between GDP and FDI as more growth granger causes new economic opportunities so more FDI entry and more amount of FDI inflows. The rate of interest also granger causes GDP or economic growth showing that the change in real rate of interest determines investment and spending and therefore the economic activity resulting in a change in economic growth.

Diagnostic test

This study conducted a diagnostic test to determine how reliable and valid the result analyzed above were. The probability value of Jarque-Bera statistics which is greater than 5% below indicates that the residuals from the estimates were normally distributed. Also, the probability value of Breusch-Godfrey Seria heteroscedasticity (ARCH test) which is greater than 5% as revealed in table 3 below indicates that the residuals are Homoscedasticity. Lastly, the probability value of the Breusch-Godfrey Serial correlation test is greater than 5% also means that there is no serial correlation in the estimate.

Table 3: Diagnostic test table

Heteroskedasticity test	F-Statistic	Probability
Breusch-Godfrey Serial	1.229056	0.3208
Breusch-Godfrey Serial correlation test	0.273476	0.7633
Normality Test	3.790702	0.150266

Source : Author's Own calculation

Conclusion

The paper tries to understand the relationship between the real rate of interest rate fluctuations and the trend of GDP change along with changes in the FDI inflows and inflation. The data is secondary data and the idea of the study is to understand for the last three decades the inter relationship of GDP growth and interest rate and other macroeconomic variables. As already discussed according to various studies FDI inflows and inflation do have some significant relationship with the GDP also. According to our study of India for the period of 1991 to 2019 the result shows that the economic growth has a long run cointegration with the variables namely the inflation, rate of interest and the FDI. However in terms of granger causality test shows that GDP growth causes the FDI inflows to increase and the rate of interest tend to influence the GDP growth of Indian economy. Higher development in terms of infrastructure and more investment results into more inflows of FDIs for better gains. There is also a unidirectional causality from interest rate to GDP growth which suggest that interest rate has more role to play in impacting the change in GDP rather than GDP changing the interest rate. More research can be done in understanding the policy changes during the phases of the post reform era.

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