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# Analysis of monetary policy tools in India and the US and its impact on GDP

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## ABSTRACT

*In simple terms, the policy undertaken by the apex bank for regulating the supply of money in order to maintain economic stability keeping into consideration the process of economic development and interest of the public is called monetary policy.*

*The purpose of this paper is to very intricately present an understanding about the monetary policy tools that hugely impact the economy on a major basis by affecting the inflow and outflow of cash based on various measures or instruments that the monetary policies consist of. Over the years the functioning of the economy has always been for credit creation which would eventually lead to the economic growth and development of nations. It is also extremely essential to create an understanding of the whole agenda of interdependence of various monetary policy tools and GDP on each other. GDP, is solely the only variable that has the most impact on monetary policy tools because in a very simple sense GDP is the monetary value of goods and services produced within a country during a year as it determines the demands and supply of citizens.*

*Thus, analysing the monetary policy tools of India and the USA using correlation would give a complete comparative study for both the countries for over a span of 20 years.*

**Keywords:** *Monetary Policy Tools, Gross Domestic Product, Bank Rate and Correlation*

## I. INTRODUCTION

Macroeconomics is an umbrella term that very accurately explains the series of performance, growth, stability, structure and decision making of the economy of a country as a whole. It consists of numerous variables that basically facilitates the economy to function properly. It includes factors like taxes, interest rate, Gross Domestic Product, Gross National Product etc. It also sums up as the study of interdependence of such factors on one another. They typically influence one another.

In Economic theory, monetary policy is the policy which regulates the demand for money and supply of money in the economy. It is essential to regulate these, as an imbalance between demand for money and supply can result in inflation or deflation and can result into the value

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of currency being impacted or the economy being destabilized. Hence, monetary policy is also known as one of the stabilization policies.

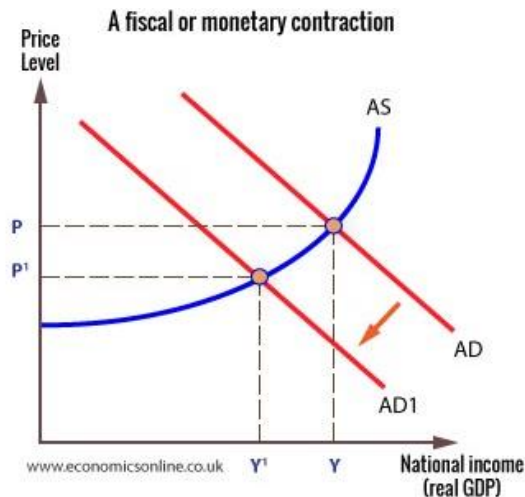
The purpose of monetary policy in India was more to regulate the volume of money, value of money and nature of money. Monetary tools now are majorly used for credit creation. Monetary policy constitutes the conscious steps undertaken by the monetary authority which bring about changes in the stock of money, generation of money and cost of money. It is also about entrusting various tools of regulating supply of money in the hands of apex bank with the purpose of achieving general economic objectives. These policies are important to maintain a balance and create stability in the economy which also takes into consideration the interests of public.

Gross Domestic Product is the total monetary or market value of goods and services produced within a country during a specific period of time. Calculating GDP acts like a scorecard as it helps understanding a country's economic health and gives a proper analysis of where the country stands in terms of its economic growth rate. The calculation of GDP consists of all private as well as public consumption, government outlays, investments and balance of trade where exports are added to the final value and imports are deducted from the final value. GDP helps in getting a view of long term national economic performance because it is valued in dollars which is the purchasing power parity and it becomes easy for a country to determine its economic growth and development as it is converted and measured in an economy which is considered to be stable.

There are two types of impact of monetary policy tools on Gross Domestic product (GDP). They are: Contractionary Monetary Policy and Expansionary Monetary Policy.

#### **(A) Contractionary Monetary Policy**

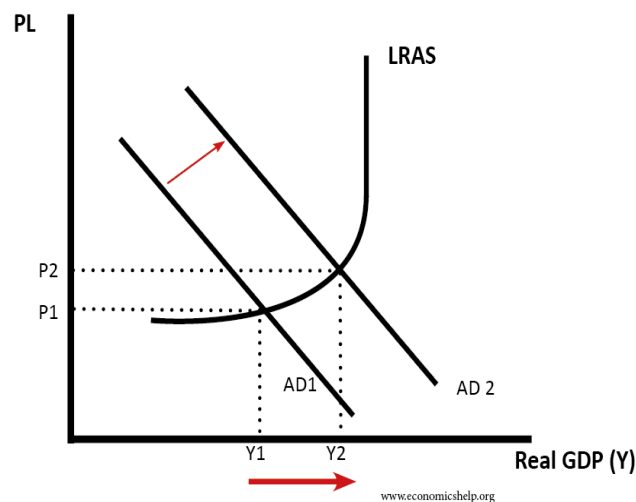
This policy decreases the money supply in an economy, it contracts the free flow of money in the economy. Similarly, the decrease in money supply amounts to an equal decrease in the nominal output, also known as GDP. This decrease in money supply will lead to a decrease in consumer spending. Various tools that come under the monetary policies affect the generation and flow of money in the economy. Due to this reduction in spending of money, the aggregate demand curve which represents the total spending on goods and services at each price level, shifts to the left. This reduction in money supply affects the price levels and real outputs drastically, as due to less supply of money there is less capital available in the economic system.



This diagram shows a relation of price levels and the GDP of an economy. As the price level decreases the aggregate demand for products and services impacting the growth of a nation decreases and as shown in the diagram it shifts to the left. The aggregate supply also reduces due to there being no demand and hence GDP takes a hit due to there being less market value being generated.

### **(B) Expansionary Monetary Policy:**

This policy increases the money supply in an economy, it expands the free flow of money in the economy. Similarly, the increase in money supply amounts to an equal increase in GDP. This increase in money supply leads to increase in consumer spending. Like contractionary monetary policy, all the tools affect the generation and flow of money in the economy. Due to this reduction in spending of money, the aggregate demand curve which represents the total spending on goods and services at each price level, shifts to the right. This increase in money supply affects the price levels and real outputs drastically, as due to more supply of money there is more capital available in the economic system.



This diagram shows a relation of price levels and the GDP of an economy. As the price level increases the aggregate demand for products and services impacting the growth of a nation increases and as shown in the diagram it shifts to the right. The aggregate supply also increases due to there being demand and hence GDP rises due to there being more market value being generated.

## **II. LITERATURE REVIEW**

**Irfan Hameed and Ume-Amen (2011) “Impact of monetary policy on Gross Domestic Product (GDP)” *Interdisciplinary Journal of Contemporary Research in Business* Volume 3, Number 1.** The authors of the paper have defined the monetary policy to be the process which facilitates the government, central authority to control the supply of money, its cost of money or rate of interest. Monetary policy tools have the principal of stabilization and it utilizes its outcomes to measure economic growth, inflation and exchange rate. This paper gives an overview of monetary policy management of Pakistan. Even price stability impacts the Gross Domestic Product as the market value gets fluctuated. To make the understanding clearer, the model fit summary has been applied and approved as it plays a key role in the economic growth. Even the interest rate has a relation with GDP. Thus, the monetary policy tools depend on the situation of the economy worldwide and impacts the GDP due to market value and prices being fluctuated.

**Joe Ganley and Chris Salmon (1977) “The Industrial Impact of Monetary Policy Shocks: Some Stylised Facts.”** The authors give a sectoral breakdown of GDP and try to analyse the effects of an unexpected monetary tightening on output has usually been approached by in a Vector Autogressions (VAR) frameworks. VAR techniques do not differentiate accurately between theoretical explanations of observed behaviour. To determine VAR, it is important to determine the time series properties of data. Each variable of the monetary policy tools has to be interpreted as interest rates in log terms. The monetary policies have a vast impact even on the industry output. Industries that are totally dependent on the consumer expenditure are affected the most due to the change in policy attributes. Thus, the variation of change in monetary policy is unevenly distributed in different sectors of the economy as the dependence and correlation of GDP from the output differs from the type of business.

**Michael Joyce, David Miles, Andrew Scott and Dimitri Vayanos (2012) “Quantitative Easing and Unconventional monetary policy- An Introduction” *The Economic Journal* Volume 122, Number 564.** The authors have described the importance of stability of Monetary policy tools for GDP by comparing it otherwise through an example of 2007-08 financial crisis.

During this period the tools were considered to be stable and its implementation robust, these measures were majorly used to achieve stable inflation by a way of short-term interest rates levied by the central bank. They have divided the policies into conventional and unconventional theories. Here, the conventional theories were based on theoretical foundations wanting to get a positive approach. It is also based on substantial evidence on how to short term official interest rates affect the economy. Unconventional theory provides empirical evidence of the relation of interest rates on GDP. The downfall of economy during this period was either recessionary or very strong. The implication is that central banks and financial regulators need to work on improving their micro and macro prudential frameworks so that the significant potency of unconventional theories is not relied upon in future as it extremely affects the overall growth of an economy.

**Dawn Holland, Aurelie Delannoy Tatiana Fic, Ian Hurst, Iana Liadze, Ali Orazgani and Pawel Paluchowski (2012), “World Overview – Focus on national monetary policies” National Institute Economic Review Number 219.** The authors have given a forecast summary in terms of percentage for real GDP and private consumption deflator. Many economies established the fiscal tightening measures despite the probability of widespread assumptions slowdown in GDP growth rate. There have been studies that identify evidence of an effect on the availability of bank credit despite the many significant effects on borrowing rates suggesting that the transmission to the real economy would be less effective. The increase in liquid assets in the banking system might ease up the liquidity constraints and decrease the lending constraints which would basically let the borrowings be high by mainly two sectors that are the household sector and firms. GDP is solely considered and evaluated on the basis of market value of goods and services produced in a year so the rate of lending also has an impact as it increases the monetary value of products and determine the economic growth of the nation.

**Hameed Gul, Dr. Khaid Mughal and Dr. Sabit Rahim (2012), “Linkage between Monetary Instruments and Economic Growth” Universal Journal of Management and Social Sciences Volume 2, Number 5.** The paper gives an overview of the influence of the monetary authorities on the macro-economic variables. There is an interdependence of monetary policy tools and the economic growth rate which indirectly affects the GDP of a country. As for the tools, it is essential that the policies support the increase in tight regulations for interest rates. Countries with high inflation rate tend to have a larger financial sector relative to GDP. If the banks in the countries don't regulate these policies there might be high fluctuations in the market which might also result in inflation. Money supply tends to have a positive impact on output that is positive inflation and negative output is also co related.

Moreover, the exchanges rate also have a negative value due to the constant change in values.

### **III. MONETARY POLICY TOOLS**

There are namely two types of monetary policy tools/instruments. They are:

- A. Quantitative Measures (General Measures)
- B. Qualitative Measures (Selective Measures)

Both the measures consist of tools separately that affect the GDP and growth of an economy.

#### **(A) Quantitative Measures:**

These general measures are used by the RBI. These instruments are basically related to the quantity and volume of money. These tools are designed in such a way that they control the total volume of money in the economy. These instruments influence the quantity of credit available in an economy. It consists of tools like:

##### **1. Bank Rate:**

When commercial banks have shortage of funds, they borrow from the Reserve Bank of India (RBI). The rate at which RBI lends to the commercial for long term is called the Bank Rate. The dynamics at which the money is lent to commercial banks depend on the situation of economy. When there's a possibility of inflation, the RBI increases the rate at which it lends the money to commercial banks, in result to this, these banks borrow less funds as the rate of borrowings are pretty high making it expensive to borrow. Following this, the commercial banks also lend money to general public at high interest rate result into them borrowing less and even lesser creation of money, lower demand for goods and circulation of money in the economy. This helps in controlling the inflation. Similarly, when there's a depression like state in the economy the RBI lends more on a less rate on interest which results into the commercial banks borrowing more money and then lending more to the general public at a low rate of interest. This would make the flow of money in markets very fluent and will help emerge the economy out of depression. The policy of keeping the bank rate very low is called the cheap money policy and the policy of keeping the bank rate very high is called the dear money policy.

Bank rate as a tool impacts the GDP of an economy. GDP being the market value of goods produced in a country depends on the rate of borrowing for commercial banks and rate of lending for RBI because if the rate of lending is high only few funds could be borrowed which in a way curb the free flow of money and comparatively fewer goods and services will be produced in the economy affecting the economic growth.

## **2. REPO rate and Reverse REPO rate:**

**a.** A REPO rate is a rate at which the commercial banks borrow funds from RBI for a short period of time (for a span of 1 day, 7 days, 15 days) by parking their securities with the RBI to maintain liquidity. These securities are held by RBI with a repurchase agreement at a particular rate known as the REPO rate. Commercial banks sell government securities to RBI in order to raise money for a very short period of time with a condition to repurchase them at some discount. The REPO rate is also known as repurchase rate. In the event of inflation, central banks increase repo rate as this acts a disincentive for banks to borrow from the central banks. Subsequently, they lend to the general at a higher rate and ultimately people borrow less and thus money supply and inflation are arrested.

**b.** A Reverse REPO rate means the agreed upon rate at which commercial banks lend money to RBI for a very short period of time when there's excess of liquidity in the market. In this case, the commercial banks get benefits by receiving the interest on their holdings with the RBI. The central bank has to borrow short term funds from the commercial banks by parking its securities. An increase in government REPO rate means that commercial banks will get more incentives to park either fund with the RBI by lending more to RBI, thereby decreasing their lending to general public and ultimately reducing the supply of money in the market and vice-versa.

The impact of REPO rate and Reverse REPO rate directly falls on the cost of borrowing, higher the quantities borrowed from the central bank, higher will be the cost of borrowing which might result into less flow of money into the market also resulting into less generation of money for production of goods thus, lower will the GDP be.

## **3. Stabilization under Emergency Situations:**

There is a special window for banks to borrow from the RBI against approved government securities in an emergency situation like an acute cash shortage. This rate is higher than the Repo rate. It is also known as marginal standing facility. In this state the inter-bank liquidity dries up completely. The banks can only borrow money when they are completely exhausted of all borrowing assistance. The MSF rate is pegged 100 basis points or a percentage point above the repo rate. Under MSF banks can borrow funds up to one percent on their net demand and time liabilities. The minimum amount that can be borrowed is Rs 1 crore and multiples of Rs 1 crore. The RBI does this to control interest rate volatility by allowing commercial banks to borrow against government securities at a higher rate than the prevailing repo rate (1 percentage point higher).

Whenever the commercial banks borrow money from RBI under MSF, they do it because of



the less liquidity of funds. Even though the money is lent for an emergency, a small period of time its lent on a very high rate of interest, leading the banks to ultimately borrow less and lend to the general public also in small ratios. This curbs the spending capacity of the public and the goods and services for the people cannot generate economy due to restricted spending structure. Hence, resulting into a lower GDP and numerically less economic growth.

#### **4. Cash Reserve Ratio:**

Under the RBI Act, 1934, all commercial banks have to keep a certain minimum amount of cash reserve with the RBI. Initially CRR was decided to be 5% of demand deposits and 2% of time deposits. It was variable as per the requirement felt by the RBI. Since 1962, CRR is variable between 3% and 15% of the total deposits of individual banks. CRR fulfils the need of a comfortable amount of cash reserves with the banking system, in case many customers start withdrawing their deposits and banks have to provide cash against their deposits. Besides this, it is also used as an instrument to control inflation. When CRR is higher, commercial banks have lesser deposit money to create credit. Thus, they give fewer loans to people and hence money supply and inflation are curtailed. CRR is reduced in times of deflation and depression.

GDP being the product of total goods produced in an economy is only possible when there is enough cash reserve ratio with the banks to lend to the general public. This also depends on the policies ascertained by government upon the rate of lending with the interest levied. Thus, if assumed that the banks have reserves, they would lend money leniently and credit creation will take place due to free generation of money in the markets benefitting into the country having a higher GDP.

#### **5. Statutory Liquidity Rate:**

Under the Banking Regulations Act, 1949, all banks have to maintain equal to and not less than 25% of their total deposits in the form of cash, gold and unencumbered approved securities. A higher SLR diverts bank funds from loans and advances to approved government securities and helps to meet government expenditures, on the other hand, it reduces the capacity of banks to create loans and raise money supply by credit creation and a lower SLR increases the capacity of banks to create loans and raise money supply by credit creation. If SLR is higher people get lesser credit and vice versa.

In this case, a lower SLR has the capability to raise more supply of money in the market and therefore, the GDP of the nation will be benefitted due to free flow and increased production of products.

## **6. Open market operations:**

OMO refers to sale of purchase of government securities/bonds by the RBI in the open market. When the RBI purchases government bonds from the market, the supply of money in the economy rises. The supply of money in the economy falls when RBI sells such bonds in the open market. Such operations are undertaken to regulate inflations and depressions. When the central bank buys securities, it adds cash to the banks' reserves. This gives them more money to lend. Quantitative easing (QE) is open market operations that purchase long-term bonds, which has the effect of lowering long-term interest rates. Buying securities adds money to the system, making loans easier to obtain and interest rates decline. Selling securities from the central bank's balance sheet removes money from the system, making loans more expensive and increasing rates. These open market operations are a method the Fed uses to manipulate interest rates.

Thus, as the other tools impact the GDP, the open market operations play a major role because the economic growth is also affected by the purchase of government securities and bonds. Interference of the government directly affects the production in an economy.

## **(B) Qualitative Measures:**

Tools adopted under selective measures act as tools for credit control. Qualitative instruments are also known as selective instruments of the RBI's monetary policy. These instruments are used for discriminating between various uses of credit; for example, they can be used for favouring export over import or essential over non-essential credit supply. This method has an influence on both borrowers and lenders.

### **1. Security requirement/ Credit Rationing:**

Banks must ensure that public returns the loans given to them. They lend money against some security deposits from the borrowers. In case the borrower is not able to repay the loan, the bank uses the security to recover its dues. For example, a bank can take deposits as security. Security specifications are different for different segments of the population so that all sectors including the agricultural sector can develop well. Hence, RBI directs commercial banks regarding the amount of security which they may ask for in case of different types of loans or from different sections of the people. This instruments also controls the bill rediscounting.

### **2. Change in Marginal Requirement:**

The RBI also sets margins for granting loans against security. An individual is given only a certain percentage as loan of the total value of assets offered as security. Banks are directed to

selectively keep different margins for different purposes. This instrument is used to encourage the credit supply for the necessary sectors and avoid it for the unnecessary sectors. This can be easily done by increasing the marginal of unnecessary sectors and by decreasing the marginal of other needy sectors. For instance, if RBI feels that more credit should be allotted to the agricultural sector, then RBI will reduce the margin.

### 3. Regulation on consumer credit/ Ceiling on Credit:

The RBI prescribes ceilings for credits for different purposes. In this instrument, shoppers' credit supply is controlled through the portion of offer and recruit acquisition of buyer products. Here, highlights like portion sum, up front installments, advance span, and so forth, are completely fixed ahead of time, which assists with checking the credit and swelling in the country. This is a policy maintained to check the flow of credit for consumer durable goods. This can very easily be done by regulating the total volume of credit that may be extended for purchasing specific durable goods and regulating the number of installments.

### 4. Moral Suasion:

Moral suasion alludes to the ideas to business banks from the RBI that aides in controlling credits in the inflationary period. RBI infers tension on the Indian financial framework without making any exacting move for consistence with rules. Through financial strategy, business banks get educated regarding the assumptions for RBI. The RBI can give mandates, rules, ideas for business banks in regards to diminishing credit supply for speculative purposes under the ethical suasion.

## IV. VARIABLES

YEAR	USA	USA	INDIA	INDIA
	BANK RATE	GDP	BANK RATE	GDP
1998	7.15%	4.48%	8.3%	6.18%
1999	6.46%	4.75%	6.79%	8.85%
2000	6.85%	4.13%	6.24%	3.84%
2001	4.63%	1.00%	4.25%	4.82%
2002	3.05%	1.74%	6.25%	3.80%

<b>2003</b>	2.22%	2.86%	6.00%	7.86%
<b>2004</b>	1.61%	3.80%	5.49%	7.92%
<b>2005</b>	3.00%	3.51%	5.37%	7.92%
<b>2006</b>	4.79%	2.86%	6.02%	8.06%
<b>2007</b>	5.22%	1.88%	6.34%	7.66%
<b>2008</b>	3.08%	-0.14%	6.03%	3.09%
<b>2009</b>	2.47%	-2.54%	4.25%	7.86%
<b>2010</b>	2.06%	2.56%	4.75%	8.50%
<b>2011</b>	1.13%	1.55%	6.00%	5.24%
<b>2012</b>	1.30%	2.25%	9.50%	5.46%
<b>2013</b>	1.47%	1.84%	10.25%	6.39%
<b>2014</b>	1.38%	2.53%	9.00%	7.41%
<b>2015</b>	2.20%	2.91%	8.75%	8.00%
<b>2016</b>	2.45%	1.64%	7.75%	8.26%
<b>2017</b>	2.17%	2.37%	6.75%	7.04%
<b>2018</b>	2.41%	2.93%	6.25%	6.12%
<b>2019</b>	3.28%	2.16%	6.75%	4.18%

## V. SELECTED VARIABLES

The topic is to explain the impact of monetary policy tools on Gross Domestic Product and show the comparison of impact of these tools on GDP of India and the USA. The goal was to show the correlation of the tool that has the greatest impact on GDP. After an extensive research it was known that the bank rate has the greatest impact on GDP. Bank rate is the lending rate imposed by the central bank on commercial banks for a long period of time.

When there's a shortage of funds with the commercial banks, they approach the central bank

to help them out with the lending's to public when need arises. The central banks also play an important role over here, they consider the state of market affecting the economy. When there's an inflation like situation where there's an increase in prices over a given a period of time which leads to the increase in cost of living of the country it becomes essential to curb a situation and bring down prices to a level that the majority of population could afford. Thus, when the central bank realizes of such a situation, it lends money at a comparatively higher rate of interest. Considering this, the commercial banks who lend to the general public and small institutions also increase the lending rates which leads to these entities borrowing less because it becomes very expensive to borrow money from banks. This is how they curb inflation by slightly trying to restrict the spending capacity and control inflation. Its impact on GDP is also huge. A GDP of the country shows the market value of goods produced in a country, it has a direct proportion, higher the market value, better it is for the country. But in the situation of inflation as the lending's are less, not enough money is generated to produce goods and hence the market value of the production of goods remains low which is contrary to the concept of development of the country as there is very minimum growth rate.

The whole scenario is reversed when there's a state of depression, the central bank tries to lend more money to commercial banks for a longer period of time at very low rates of interest which leads to the commercial banks borrowing more and lending more to the general public and small institutions. This makes the flow of money in the market very fluent and the generation is also more because there's constant movement of money and funds in the market. Due to the easy generation of money in the market, the employment rates increase, the goods are produced at small costs so the demand also starts to increase. This in turn benefits the GDP of the country, because when the banks are lending at nominal rates more people will borrow and due to availability of funds demand will increase and more goods will be produced resulting into better and improved economic growth.

Thus, these two variables namely: Bank Rate and GDP have correlation between them and has the biggest impact on the economy and the economic growth and market structure is somewhat influenced by their interdependence.

## **VI. SELECTED COUNTRIES**

The countries chosen here are the USA and India. USA being a superpower here has the series of data for the following years selected to compare with the data of India. The USA has been a developed country since a long time with the wrong conception of always having a stable economy and market structure. The fact that USA's currency is considered to have a purchasing

power parity which means every calculation to be considered for the economic growth or every comparison between two or more economies or between their economic growth is done by converting into the exchange rate of US dollars.

This is partly the reason why USA is a strong economy. The economy is also stable which means the fluctuations in bank rate that affects the GDP must also not be high and in different quantities. There have been instances in the history of the US economy that there has been period of depressions which really proved to be a downward trend not only for the condition of USA but also for the other countries as the impact on the superpower's economy affects all economies eventually. Moreover, there might have been less variations in the bank rate which might not have had a lot of impact on the change in GDP.

The reason to take India as the second country was somewhat similar to the reason for taking USA's economy. India is a developing economy which basically means there are more fluctuations in its growth. There have been more instances seen in India's economy that more times depression and inflationary rates have occurred which has basically affected the bank rates and lending rates that has affected GDP and the whole market value of goods produced has seen a drastic change according to the change in situation. Thus, the whole purpose of selecting these two countries was to show a contrast of fluctuations in a country with less fluctuations and comparatively more stability and the other country which is still developing and see drastic fluctuations frequently.

## **VII. DATA ANALYSIS**

Using the various measures included in Monetary Policy tools, Bank rate seem to have the most impact on GDP, maybe, because of the ratio of borrowings by central bank to commercial bank is on a larger scale.

Correlation is basically the comparison of two variables to show the relation between them. Thus, correlation has been chosen as the form of method through which the relation between Bank Rate and GDP can be detected and then individually compare it with each other's outcomes.

### **(A) USA**

When the correlation of the United States of America was calculated, it was derived that

$$\text{Correlation} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

This is Karl Pearson's method that helps in measuring the level of relation between linearly

related variables.

The correlation between bank rate and GDP for the country USA is,  $r = 0.381672$ .

Here, the value of  $r$  is positive and near to 0. This indicates a moderate degree of positive correlation between the bank rate and GDP of the USA, this means that they have a positive relationship and a positive interdependence on each other.

### 1. Observations

- The Bank rate influences the change in GDP due to it being a monetary tool and controlling the supply of money in the market.
- There has been no uniformity seen in the initial rise or slowdown in the bank rate affecting the GDP.
- There have been a few years 1998, 1999, 2000 where the bank rate was extremely high and the country still managed to have a higher GDP rate.
- For years like 2008 and 2009 when there was a recession in the country due to defaults in its central bank, there was negative growth, there was no substantial increase in the growth rate, in fact there was negative growth due to the absolute depression like situation.
- After the period of downfall, when the economy was picking up in 2010 and 2011 the bank rate was kept low only so the commercial banks could borrow more which indirectly motivated the general public to borrow money from banks at a low rate. This led to the free generation of economy in the country after which the GDP also started picking up.
- After 2011 it has been noticed that the bank rate has comparatively stayed less which indicates that the central bank didn't feel the need to keep a high rate on lending's as there might not have been traces of inflation and the prices for goods and services have remained normal with considerable demand for goods and equitable supply in terms of the necessity in the market.

Thus, the moderately positive correlation shows positive interdependence of both the variables on each other that highly affects the state of economy.

### (B) India

When the correlation of India was calculated, it was derived that

$$\text{Correlation} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

This is Karl Pearson's method that helps in measuring the level of relation between linearly related variables.

The correlation between bank rate and GDP for the country India is,  $r = -0.00053$ .

Here, the value of  $r$  is negative and near to 0. This indicates a low degree of negative correlation between the bank rate and GDP of India, this means that they have a negative relationship and a negative interdependence on each other.

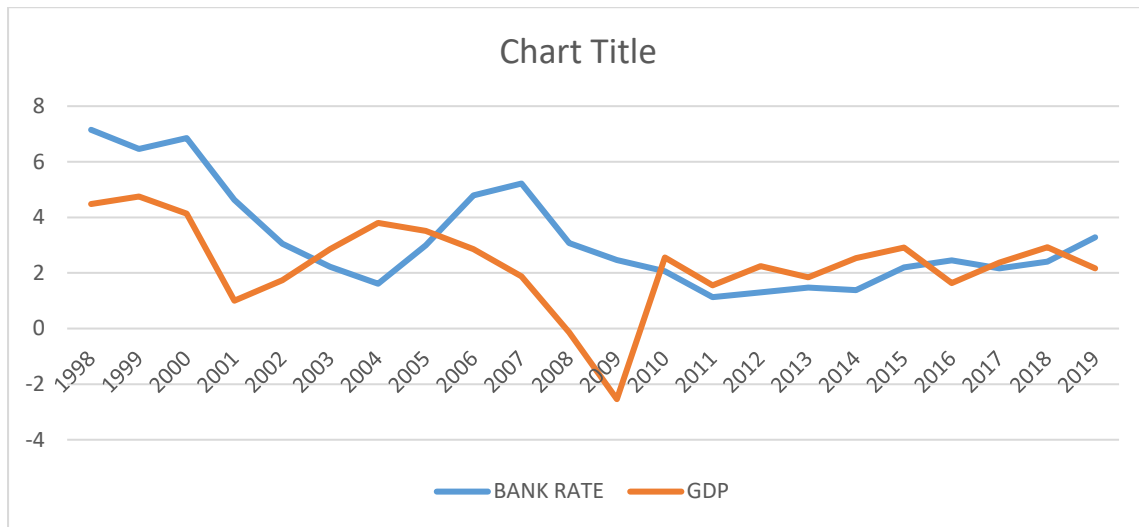
### **1. Observations**

- The Bank rate influences the change in GDP due to it being a monetary tool and controlling the supply of money in the market.
- There has been no uniformity seen in the initial rise or slowdown in the bank rate affecting the GDP.
- It has been noticed that the bank rate of India has always been high, there has been no instance where the bank rate of India dipped, this indicates that most of the times there was inflation like situation in the Indian economy.
- Though the bank rate was high the GDP throughout these years was also high which points out that as India was a developing country there was more scope for development because of which even if there were no available funds, people were still investing in the economy that helped maintained the GDP.
- When there was a state of depression in the USA, as explained before also there were traces of impact on the Indian economy in 2008 and 2009, still the GDP managed to sustain itself highly.
- The main problem detected throughout these years was that though the outcome of GDP was high, it didn't make much a difference because at that time India was still becoming a developing country and to become economically stable and to have a considerable amount of growth the provided GDP was needed.

Thus, the low degree of negative correlation shows less interdependence of both the variables in the sense that both are interdependent on each other but the outcome that comes out by comparing them affects the economy of the country.

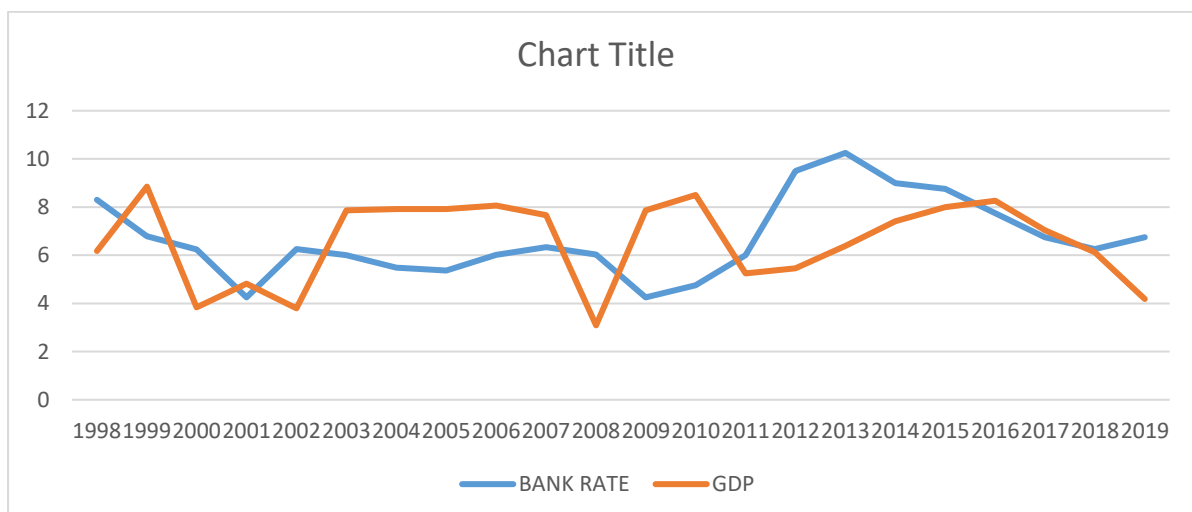


**VIII. TIMELINES**



This is a line graph and it is used to present information that changes over time. The orange stripe depicts the GDP and the blue stripe depicts the bank rate. The numbers depicted on the Y-Axis are in the form of percentage. They have already been compared over the interdependence using correlation. Years from 1998 to 2019 have been taken into consideration here. As explained above also there has been a low degree of positive correlation between the two variables as it can be seen in the graph also.

Mostly the GDP, has always been higher here and the central bank has put the bank rates in such a way that it has always supported the growth in GDP, except for a period of two years when there was a depression like state in the country. Other than those years, the growth has been more or less stable and the bank rates have been put in such a way that it doesn't affect the production and market values of goods and maintains the healthy level of economic growth.



This is a line graph and it is used to present information that changes over time. The orange stripe depicts the GDP and the blue stripe depicts the bank rate. The numbers depicted on the Y-Axis are in the form of percentage. They have already been compared over the interdependence using correlation. Years from 1998 to 2019 have been taken into consideration here. As explained above also there has been a moderate degree of negative correlation between the two variables as it can be seen in the graph also.

The GDP has been comparatively high in the span of these 21 years. India is a developing country so even though the bank rates are less the higher GDP is still not going to be enough because the country is getting acquainted with the production of goods. It is also important to understand that a higher GDP is needed for developing countries like India for their economic growth. Thus, the bank rate and GDP of India has always been high.

Using the formulae of correlation and by studying the graphs it is clear that out of the monetary policy tools bank rate has a high impact on GDP.

## **IX. CONCLUSION**

The purpose of this paper was to analyze the monetary policy tools that are taken into account by all the countries to control the supply of money. These monetary policy tools have a direct impact on the GDP of the nation. The market value of the goods produced depend on the supply of money by banks which is controlled by these measures.

There are two types of measures namely, quantitative and qualitative. Bank rate from the quantitative measure has always had more impact on GDP. Bank rate being the rate which is decided by the central bank affects the generation of money in the market. If the central bank levies high interest rate on lending's the commercial bank will borrow less and lend less to the general public which affects the flow of money in the market and results to having a low GDP rate for the following year.

However, it has been ascertained that the bank rate impacting the GDP differs from country to country. This is because of the already achieved level of economic growth. Here, India and the USA have been taken into account where after deriving the data for the respective years taken into consideration their correlation amongst their countries bank rate and GDP was found out and an analysis was done, where the correl of the USA was a positive interdependent relation of the variables whereas, India had a negative correl of the variables. This also might have varied due to different economic conditions of the respective countries. India still being a developing nation has to go through the whole process of building up its bases while also trying to eradicate unemployment and poverty so that the GDP which determines the market value of

total goods produced could be higher.

Similarly, USA has always been a developed country, thus, it has had a stable growth rate. Moreover, monetary policy tools control the supply of money in the market and hence the production of goods in the market is affected because of the supply of money and impacts the growth rate. The comparison between the countries was done to show the variance between a developed and a developing country.

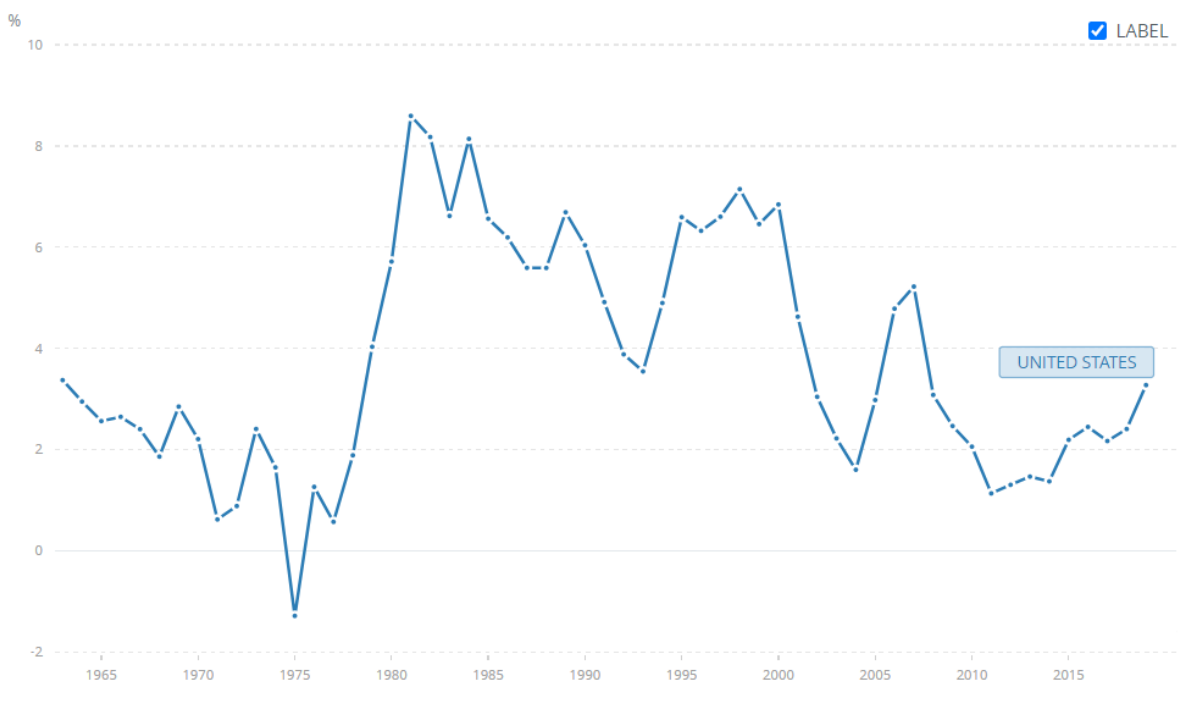
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**XI. APPENDIX**

	A	B	C	D	E	F	G	H	I	J	K	L
1				0.381672					<b>INDIA</b>	<b>INDIA</b>	-0.00053	
2		<b>BANK RATE</b>	<b>GDP</b>	<b>CORRELATION</b>					<b>BANK RATE</b>	<b>GDP</b>	<b>CORRELATION</b>	
3												
4	<b>1998</b>	7.15%	4.48%	0.381672				<b>1998</b>	8.30%	6.18%	-0.00053	
5	<b>1999</b>	6.46%	4.75%					<b>1999</b>	6.79%	8.85%		
6	<b>2000</b>	6.85%	4.13%					<b>2000</b>	6.24%	3.84%		
7	<b>2001</b>	4.63%	1.00%					<b>2001</b>	4.25%	4.82%		
8	<b>2002</b>	3.05%	1.74%					<b>2002</b>	6.25%	3.80%		
9	<b>2003</b>	2.22%	2.86%					<b>2003</b>	6.00%	7.86%		
10	<b>2004</b>	1.61%	3.80%					<b>2004</b>	5.49%	7.92%		
11	<b>2005</b>	3.00%	3.51%					<b>2005</b>	5.37%	7.92%		
12	<b>2006</b>	4.79%	2.86%					<b>2006</b>	6.02%	8.06%		
13	<b>2007</b>	5.22%	1.88%					<b>2007</b>	6.34%	7.66%		
14	<b>2008</b>	3.08%	-0.14%					<b>2008</b>	6.03%	3.09%		
15	<b>2009</b>	2.47%	-2.54%					<b>2009</b>	4.25%	7.86%		
16	<b>2010</b>	2.06%	2.56%					<b>2010</b>	4.75%	8.50%		
17	<b>2011</b>	1.13%	1.55%					<b>2011</b>	6.00%	5.24%		
18	<b>2012</b>	1.30%	2.25%					<b>2012</b>	9.50%	5.46%		
19	<b>2013</b>	1.47%	1.84%					<b>2013</b>	10.25%	6.39%		
20	<b>2014</b>	1.38%	2.53%					<b>2014</b>	9.00%	7.41%		
21	<b>2015</b>	2.20%	2.91%					<b>2015</b>	8.75%	8.00%		
22	<b>2016</b>	2.45%	1.64%					<b>2016</b>	7.75%	8.26%		
23	<b>2017</b>	2.17%	2.37%					<b>2017</b>	6.75%	7.04%		
24	<b>2018</b>	2.41%	2.93%					<b>2018</b>	6.25%	6.12%		
25	<b>2019</b>	3.28%	2.16%					<b>2019</b>	6.75%	4.18%		



**India GDP Growth Rate - Historical Data**

<b>Year</b>	<b>GDP Growth (%)</b>	<b>Annual Change</b>
2019	4.18%	-1.94%
2018	6.12%	-0.92%
2017	7.04%	-1.21%
2016	8.26%	0.26%
2015	8.00%	0.59%
2014	7.41%	1.02%
2013	6.39%	0.93%
2012	5.46%	0.22%
2011	5.24%	-3.26%
2010	8.50%	0.64%
2009	7.86%	4.78%
2008	3.09%	-4.57%
2007	7.66%	-0.40%
2006	8.06%	0.14%
2005	7.92%	0.00%
2004	7.92%	0.06%
2003	7.86%	4.06%

2002	3.80%	-1.02%
2001	4.82%	0.98%
2000	3.84%	-5.00%
1999	8.85%	2.66%
1998	6.18%	2.13%

<b>U.S. GDP Growth Rate - Historical Data</b>		
<b>Year</b>	<b>GDP Growth (%)</b>	<b>Annual Change</b>
2019	2.16%	-0.77%
2018	2.93%	0.56%
2017	2.37%	0.73%
2016	1.64%	-1.27%
2015	2.91%	0.38%
2014	2.53%	0.68%
2013	1.84%	-0.41%
2012	2.25%	0.70%
2011	1.55%	-1.01%
2010	2.56%	5.10%
2009	-2.54%	-2.40%
2008	-0.14%	-2.01%
2007	1.88%	-0.98%
2006	2.86%	-0.66%
2005	3.51%	-0.29%
2004	3.80%	0.94%
2003	2.86%	1.12%



2002	1.74%	0.74%
2001	1.00%	-3.13%
2000	4.13%	-0.63%
1999	4.75%	0.27%
1998	4.48%	0.03%

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