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RESEARCH ARTICLE

TIME SERIES ANALYSIS AND FORECASTING OF INDIAN ECONOMY

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ABSTRACT

India being an entity of highly populated nation across the globe, stands as a developing country with a perceptible economic status relative to the other countries. Integrals such as socio-political activities exert influence on the ups and downs of the economic development of any country. India was the sprightly growing economy in the early 2000's but at the neoteric time, it is said that the economical maneuver of India has been directing towards the downhill. Prepending to the outbreak of Covid-19, the GDP discern to deflate below 0% at the onset but has shown a substantial upward movement post lockdown period. Thus, it can be ensured that the economical movement of India is progressing in a consistent approach despite the decline. In this paper, we aim at analyzing the historical movement of Indian economy in view with the recent up and downs and thereby also forecast the future economic movement with the help of time series.

Keywords: Economy, GDP, GST, Inflation, Repo and Reverse repo rates, National Income, Covid-19, Trend line, Extrapolation, Time series, Investment

1. INTRODUCTION

An economy is the larger set of all resource hub relating production and consumption activities that aid in determining the wealth perspective of any country. Being constituted by the major arenas that support to the sectorial development of the nation, India is ranked the seventh largest economy at present, holding the ascendancy of the country towards a developing nation. One of the influential sectors of the Indian economy remains Agriculture. Its share in the GDP of the country has declined in the past few years but aims to double farmer's income by 2022 through various schemes introduced in the union budget. The other support hold of Indian economy is the Industry sector, the potential of which has been increased since 1991. Forbye the developments, it is exigent to consider that in order to hold the highest potential of the economy, an optimal level of coaction is required throughout the sectors. Hence appending strength to the union of federal structure, thereby also reinforcing India's economy with initiatives as of Goods and Services Tax (GST), Insolvency and Bankruptcy Code (IBC), Start-up India, Digital India and hence framing a new portrait to its enlightening outwork in the nation's financial status, have aided the Indian economy jump to reach a determined outcome in the recent times and have cemented India's prominence as major silver lining of global economy.

India is one among the fastest growing major economies, underpinned by a stable macro-economy with declining inflation and improving fiscal and external balances. In this paper, the Gross Domestic Product (GDP) of our country collectively has been taken as the population for our study, the Goods and Service Tax (GST) and the Gold rates serve as the samples. We analyze their movements for the past 5 years and further forecast their movements for the upcoming year. We also take into consideration, the impact of the Covid-19 pandemic and the lockdown imposed during this study. It further restrained India's economy to a decline rate at extremities but on the other hand, the downswing has later started to reshape and progress with an accelerating momentum, which in turn makes sure that the economic growth of India is steady. Thus, this study stands as the supportive evidence for the fact that economic status of our country is moving in a standard manner, irrespective of the external factors.

2. Preliminaries

In this section, we shall mention the basic terminologies relevant to our study.

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Economy

An economy constitutes numerous activities related to the production and consumption and aid to determine the financial status and hold to serve the citizens of the country.

Capital and investment

The financial assets, constituting the funds in deposit accounts and similarly obtained from other financing sources are known as Capital.

The fixed capital assets, produced in an economy as the creation of capital goods over a time period is known as investments.

GDP

GDP the Gross Domestic Product is a mark for the economic production of the country and is the final value of goods and services produced within the territory over a period of time.

GST

GST, the Goods and Service Tax is a value added tax that is paid by the consumers on the goods and services sold for domestic consumption and needs.

Inflation [1]

Inflation refers to the persistent rise in general price level in the country over a period of time. Inflation could be monetary or price inflation. During periods of inflation, there is an increase of the money supply.

Repo rate [1]

It is the rate at which the Reserve Bank of India (RBI) lends short term money to the banks against securities. When the repo rate increases, borrowing from the RBI becomes more expensive and when the repo rate decreases, borrowing becomes cheaper.

Reverse repo rate [1]

It is the rate, at which banks park short-term excess liquidity with the RBI. An increase in the reverse repo rate means that the RBI is ready to borrow money from the banks at higher rate of interest.

Moving Average

A simple technical analysis tool that helps us to arrive at the price data graph by updating the average price constantly taken over a period of time is known as Moving Average.

Trend line

A line drawn over pivot-high or pivot-low values to depict the current movement in direction of price is known as Trend line. The pattern of line describes the direction, speed of price and price contraction.

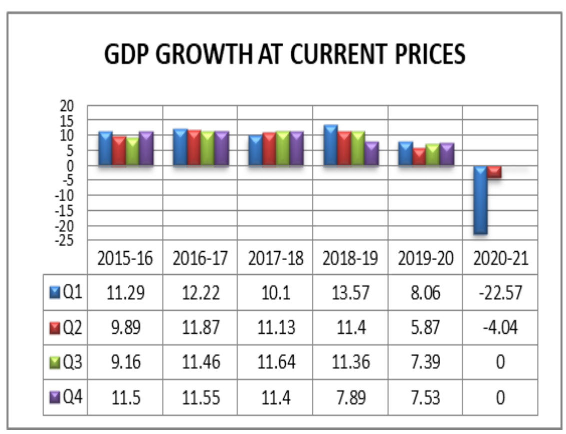
Extrapolation

The process of attaining a conclusion of something by assumption of the current method or the existing trend hoping it to continue further is known as Extrapolation.

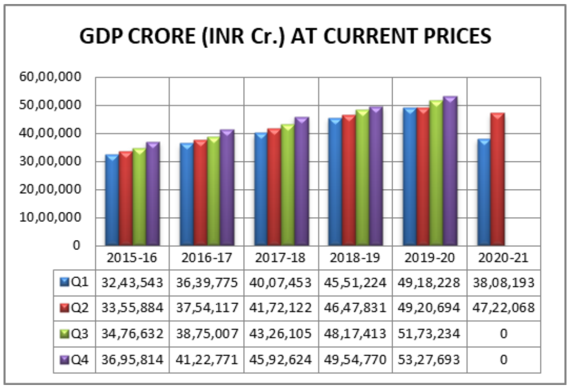
3. GDP Movement:

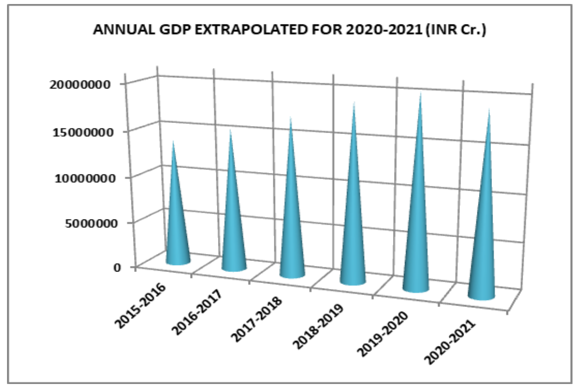
As the Gross Domestic Product (GDP) holds for the total value of goods and services produced, it serves as an indicator to assess the economic growth of any country. India now stands as the 11th largest across the world by its nominal GDP. The GDP of India is calculated from the functioning of various sectors including Agriculture, Trading, Industries, Forestry, Financing and several other public services. The Indian government usually releases the GDP value for each quarter of the financial year.

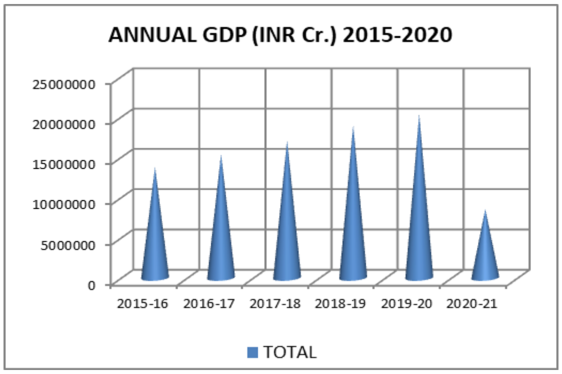
The data from the financial year 2015-2016 to the current year 2020-2021 has been collected for our study. The growth rate and the value of GDP are tabulated below and the same has been plotted in the graph. This can be used to elucidate that the India's economy had been decelerating even before the advent of the Covid-19 crisis. The rate of GDP growth went along the downside at a deeper note in the year 2019-2020. Before even making an attempt to recover from this deep fall, the impact of Covid-19 and the subsequent lockdown further let the GDP to reach the lowest low.

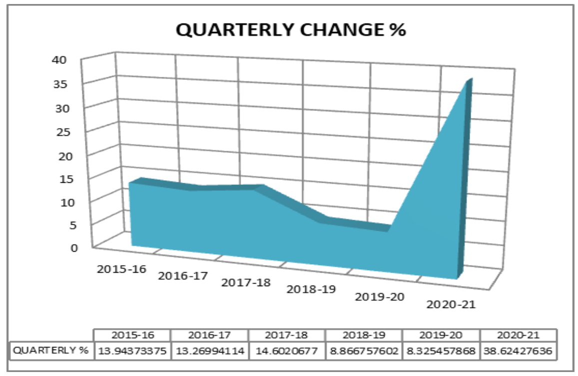


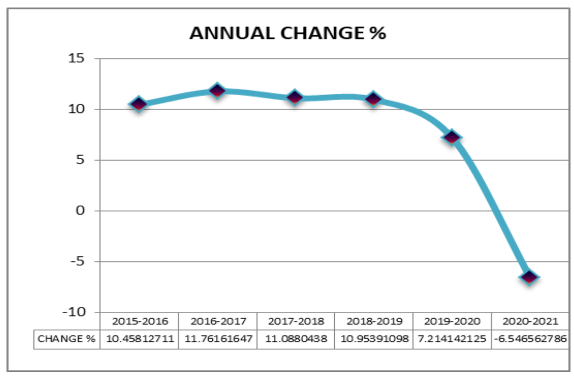
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Q1	11.29	12.22	10.1	13.57	8.06	-22.57
Q2	9.89	11.87	11.13	11.4	5.87	-4.04
Q3	9.16	11.46	11.64	11.36	7.39	0
Q4	11.5	11.55	11.4	7.89	7.53	0





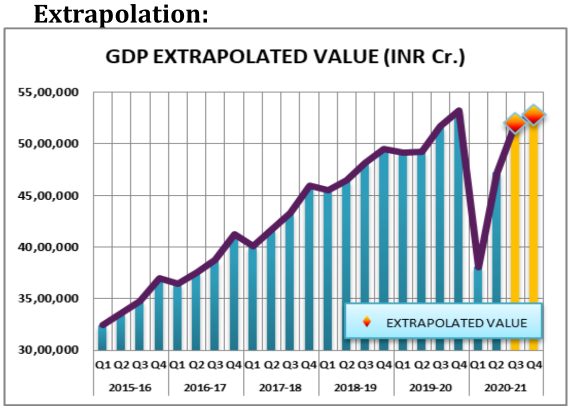






The above graphs show the higher contraction of GDP to around -23% in the Q1 (April-June) of the current financial year 2020-2021. This is reported to be the substantial contraction ever since the beginning of quarterly calculation of GDP in 1996. This downtrend reflects the unprecedented discontinuation of economic activity in the particular quarter which is certainly due to the effect of the restrictions imposed following the Covid-19 pandemic. Despite this downfall, it can be seen that the GDP has eventually increased in the successive quarter (July-September) soon after the relaxation of lockdown.

Extrapolation:

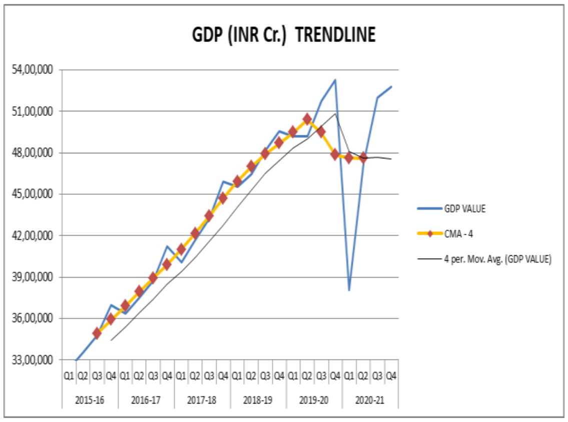


The method of Extrapolation is nothing but an estimation that can be highly useful in the prediction of the forth coming values of a system.

The GDP value has been statistically extrapolated for the next quarter and it has been shown in the above graphs. The quarterly change percentage from Q1 to Q4 for each year and the subsequent annual change percentage have also been depicted.

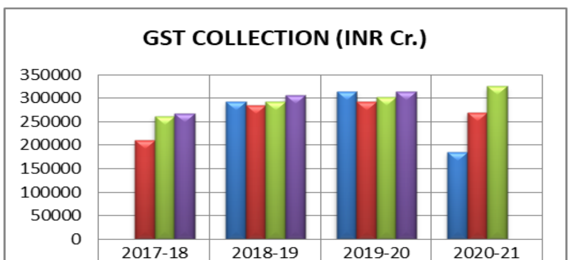
Trend line:

A Trend Line can be seen as a technical bounding line that is drawn over a chart to easily recognize the direction of any specific price or rate.

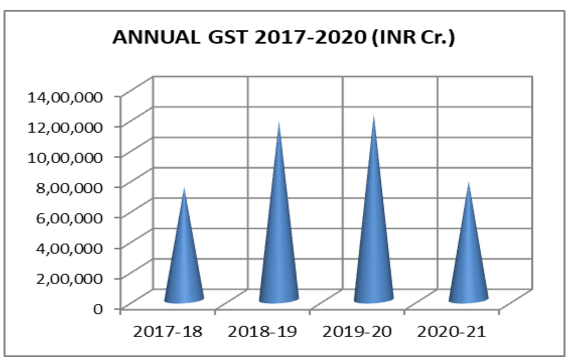


The Trend Line considered here is the 4 period Moving Average line that connects the GDP value of Q1 of 2015-2016 to Q4 of 2020-2021. The single line drawn on the Centered Moving Average (CMA) for a period of 4 indicates the movement of GDP.

4. GST – The Economic Booster



	2017-18	2018-19	2019-20	2020-21
Q1	0	2,93,085	3,14,093	1,85,240
Q2	2,11,269	2,84,885	2,92,201	2,69,351
Q3	2,61,427	2,93,073	3,02,054	3,25,292
Q4	2,67,954	3,06,327	3,13,781	0

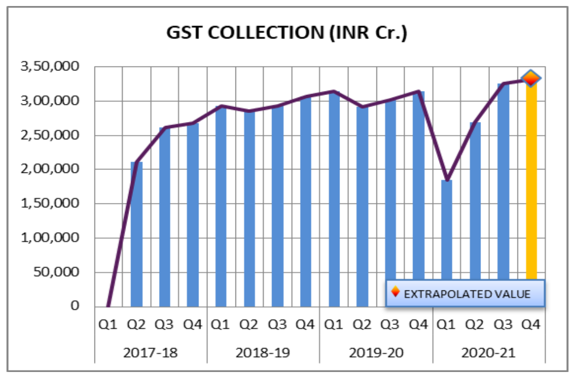


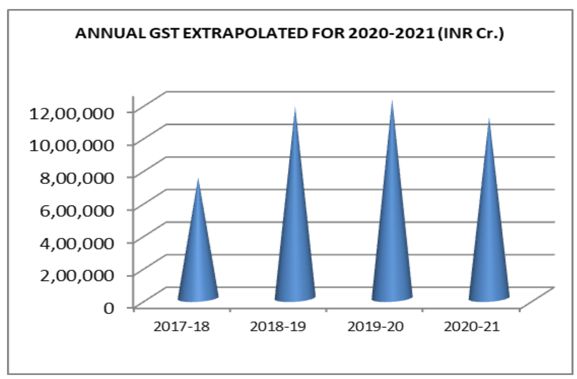
GST is basically an indirect tax system that is imposed on the supply of goods and services, implemented in July 2017. The Council has assigned different GST rates to different goods and services.

The data has been taken from the implemented fiscal year 2017-2018 to the current year 2020-2021. The quarterly and the annual collection of GST has been listed and represented in the above graph. The GST revenue collections were seen falling down for the first quarter (April-June) of this fiscal year, with the lowest record collection since 2017. This is due to the consequences of the Covid-19 lockdown in the country.

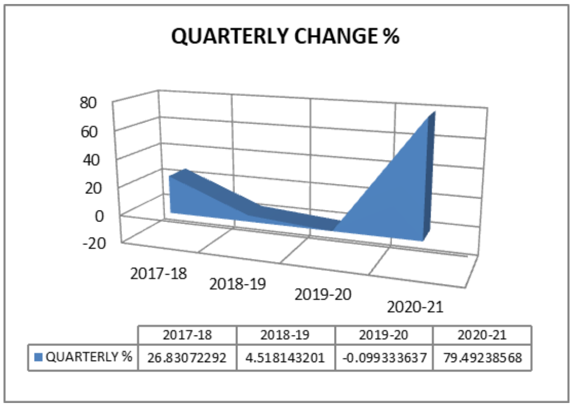
Soon after the relaxation of lockdown, GST revenue has begun to rise since September 2020. Particularly, during the month of December 2020, the GST revenue collection has created a history by making the highest collection of Rs.1.15 lakh Crore, ever since 2017. Thus, in spite of beginning at a lowest position, the revenue has just stood up enormously, indicating the positive direction of our country's economic movement.

Extrapolation:

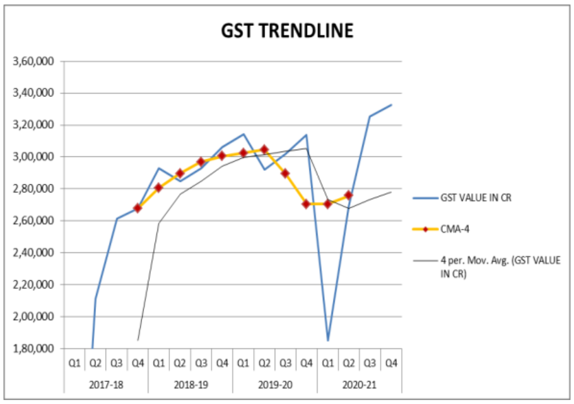




By the method of Extrapolation, the GST revenue for the fourth quarter of this financial year has been calculated. Further, it helped us to find the quarterly and the annual change percentage. The quarterly change between Q1 and Q4 for the year 2020-2021 was also calculated in the same way ad we notice that the change happens to be nearly around 80% which is quite unbelievable.



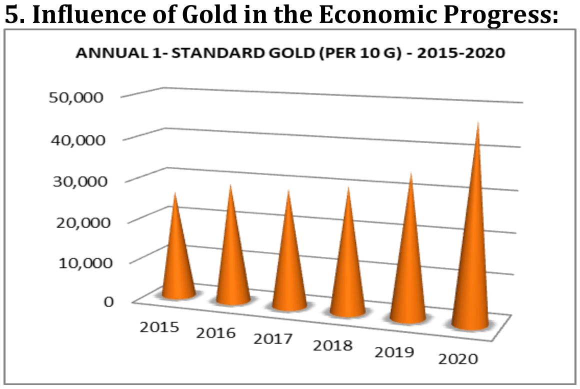
Trend line:

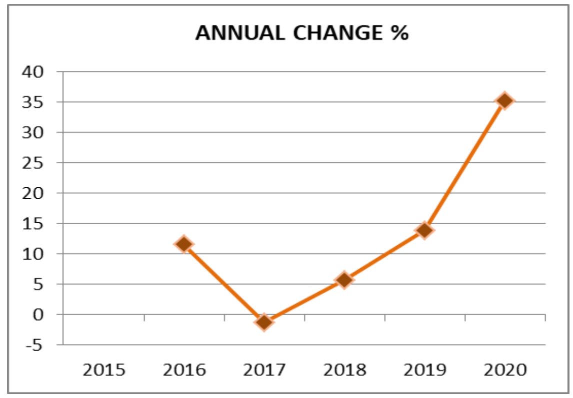


The values of GST revenue since 2017 has been plotted in a line graph, on which the CMA-4 and 4-period moving average are drawn. The trend line for the CMA can be seen from the above graph, which clearly shows the up and down trends in the collection of the revenue.

Further, this trend line reveals that the price movement is approaching an upward momentum, indicating that the revenue shall still tend to increase, thereby boosting the Indian economic status.

5. Influence of Gold in the Economic Progress:

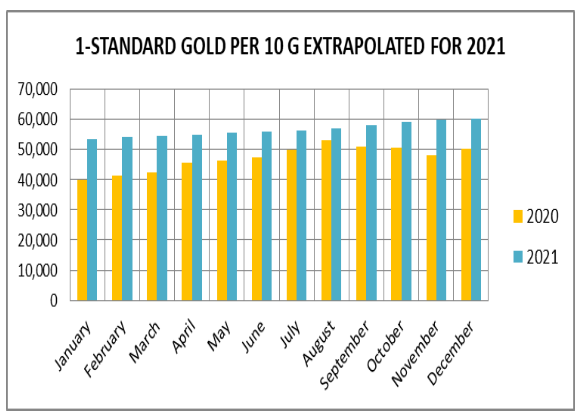


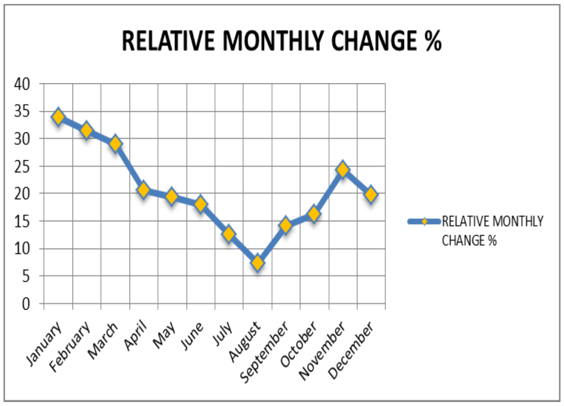


Our country is one of the leading consumers of the Yellow metal, which constitutes an integral portion of our total import goods. Gold is often relied upon to be the safest investment and hence it is considered as an alternate investment option for equity. So whenever the stock market falls, the Gold investment abruptly increases and causes a great demand among the investors.

From the historical data, we can observe that the 10 gram gold rate during 2012 was somewhere around Rupees 25,000 but it has now claimed up-to nearly Rupees 50,000. Thus to make a 100% growth, it has merely taken around 7 to 8 years. From the above graph, we can notice that the gold rate has increased around 80% from 2015 to 2020, which represents the enormous growth rate of this precious metal.

Extrapolation:

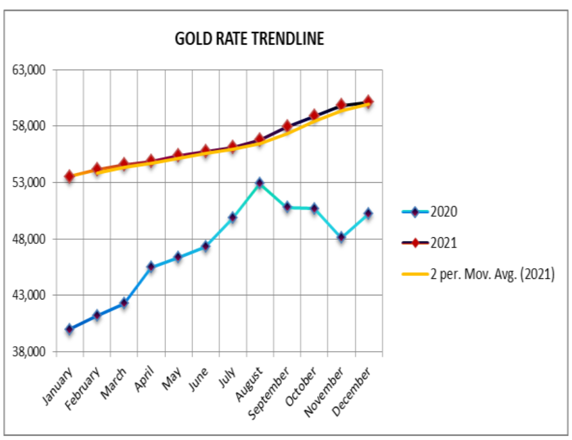




The price of 1-Standard Gold per 10 Gram has been extrapolated for the next year 2021 using the time series data of 2020. The comparison of the same can be seen from the above graph.

The graph clearly depicts the relative monthly change percentage for each month belonging to the years 2020 and 2021 respectively. The varying percentage tends to fall at the mid year while both at the beginning as well as at the end of the year, it has shown a reasonable progress.

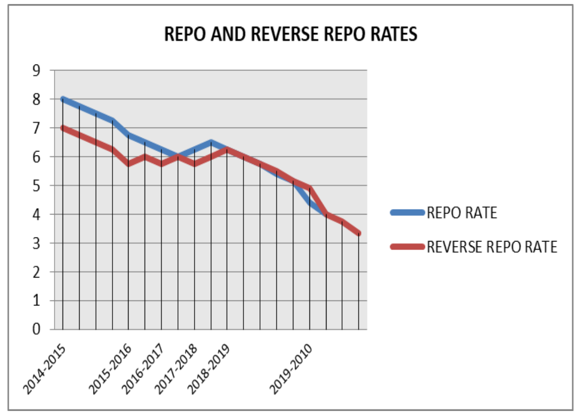
Trend line:



The trend line for the gold rate distinctly represents the relative price movement during the years 2020 and 2021. The 2 period moving average line shows the futuristic progression of the gold rate in India, which is expected to reach a new height.

6. Repo Rate and Reverse Repo Rate Trend:

Both the repo rate and the reverse repo rate, being related to the RBI, have a considerable effect on the economy. It can be understood that an increase in these rates decreases the flow of money in the economy, while the decrease in the rates increases the cash-flow. The repo rate and the reverse repo rates since 2015 to till date have been collected and the same has been represented graphically. Both the rates were dropped down from nearly 8 to 3.2 over the past five years.



7. Analysis and Forecasting

As per the statistical data and our analysis, we observe that the Indian economy was already in a negative acceleration even before seven to eight quarters. Drastically, it touched the lowest low ever in the history, due to the global pandemic caused by the corona virus. Thus, the outbreak of Covid-19 has further declined the GDP of India. But on the lighter note, the pharmaceutical sector and the IT sector have really performed well despite the negative impact of Covid-19, extending their hands for the gradual recovery of GDP in the recent quarters. The same conclusion has been obtained from the extrapolation examination as well.

Despite the major fall back, the Indian economy has started to regain its momentum since the second quarter of this fiscal year. This is evident from the colossal collection GST in December 2020 which is the highest collection ever since the implementation of GST in 2017. It is satisfactory to see that around 1.5 lakh Crore Rupees has been collected as revenue in December 2020. This is almost 12 per cent higher than the same period a year ago. The explanation for this massive growth in GST collections could be due to the increase in economic activities. In the recently released report by the Finance Minister of India, it is reported that the collection of GST due to domestic transactions added up to 8 percentage of growth while the imports raised the rate by 27 per cent.

It is always dependable to invest in the ever safe commodity which is Gold, even during the economic slowdown. The downtrend of the economy and the rising inflation rates have thus boosted up the Gold price in India. The same has been observed from our analysis. The prices are believed to be in a rising movement due to the social and psychological impact of the pandemic among the people. Thus the inflation of gold rate will further add up to the economy of our country.

Thus, from our time series analysis, we can forecast that the movement of current Indian economy can adapt itself to the unprecedented times and can also regain its position to hold the nation in a developing path.

8. Conclusion

Economic growth can not only be seen as the increased rate of the production and consumption of economic goods but also to occupy a significant position which can act accordingly to maintain the stability. The increased innovations and investments, increased employments, tackling the environment challenges and decrease in the poverty and illiteracy can also account for the development of a country’s economy.

Beaten up by Covid-19, there are reports that the economies across the globe are expected to shrink to a rate like never before. Since the uncertainties of the pandemic continue to sustain, some changes like building a social capital and a stronger economic infrastructure can aid in saving the huge economic decline.

Keeping this in view, our Indian government has implemented several schemes that aid in holding back the economy of our country. The major schemes include the Atmanirbhar Bharat Abhiyan (Self-reliant India Mission), Garib Kalyan Rojgar Abhiyaan, Way for the Robust and Resilient Agricultural Sector and many other applicable schemes to tackle the impact of the pandemic on the economic growth. Further, encouraging and providing financial support for the Self Help Groups (SHG), small scale industries, handmade artistic works by the tribal, etc., is a commendable activity to increase the economy. This kind of implementations and innovations can thus bring forth the ability to maintain a stable economy.

Considering the poverty line of India, the reports propose that the poverty rate of our country has convincingly reduced, declining from 54.7% in the year 2005 to 68.8% in the year 2020. Thus the Indian economy could be counted on to retain this steady progression since the opportunities in the investment, financial, industrial, pharmaceutical and agricultural sectors will remain the same at any cause.

Thus, by the analysis across the globe and also from our forecasting, India which has been repulsed to the world's sixth largest economy in 2020, will again outstrip the United Kingdom to appear as the fifth largest in the year 2025 and race to the third place by the year 2030. The Centre for Economics and Business Research (CEBR) predicts that the economy of India will inflate by 9 percentage in the year 2021 and by 7 percentage in the year 2022. It is clear that our study is also in the same trend.

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