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Population Explosion & Its Impact on India's Economy

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ABSTRACT

This study aims to see the impact of population growth on the economy of India. The study aims to analyse how the rapid increase in population affects the country's economy in terms of resource utilization, employment, income distribution, poverty, and inequality.Data was collected from the official website of the World Bank.Analysis was conducted using Multiple Regression Model in Excel.This study found the main independent variables impacting the dependent variable (i.e.; India's GDP.) It is useful for students, researches and managers who would want to understand the impact of population growth on a country's economy.This is one of the few studies to investigate the impact of population explosion on a nation's economy.

Keywords- Population, Economy, GDP, Regression.

INTRODUCTION

There has been a question risen for almost 10 years – has population growth inhibited improvements in the social and economic conditions or has led to downfall ? .

If negative, what, if any, government actions and initiatives to promote lower fertility and hence slower population increase make sense for the economy and the welfare of people and families?

These issues have generated fruitful and heated discussion among economists as well as betweenother social scientists. It has been fruitful in the conventional academic sense, contributing to work that is getting more complex and is based on a constant stream of fresh theoretical and modelling ideas as well as the use of data that is getting better and better.The population boom or "Explosion" that the world saw had virtually tripled, from 2.5 billion in 1950 to over 6 billion at the turn of the millennium, before levelling off at as many as 11 billion in the middle of the twenty-second century.Global urbanisation has advanced quickly since the turn of the twenty-first century. By 2018, there were 55% more people living in urban areas than there were in 1950.The purpose of the study on the content" Population explosion and its impact on India's GDP" is to understand the relationship between the population growth rate in India and its impact on the country's profitable growth. The study aims to dissect how the rapid-fire population growth affects the GDP and the standard of living of people in the country. India's population growth is significantly affecting the economics of the nation, especially its Gross Domestic Product (GDP). The population is expanding at an unsustainable rate, which is creating a number of problems including a strain on the infrastructure and a burden on the nation's natural resources. The research has a significant impact on a nation's frugality. With a growing population, the demand for goods and services increase, leading to an increase in product and employment openings. still, if the population growth outpaces the coffers available, it can lead to resource reduction, severance, and poverty. The study's findings could be used to inform policy decisions and strategies that support sustainable development and improve the standard of living of people in India.

LITERATURE SURVEY

The economic phases of expansion and recession in Spain in the first two decades of the 21st century have had a significant impact on population stocks and migratory flows in the country's five largest metropolitan areas. During the expansion phase, suburbanization was the main trend, while during the recession, recentralization became more common. These trends have continued in the post-recession period, with large urban areas becoming increasingly attractive to both native and foreign-born populations. Rural areas and small and medium-sized towns have suffered from this trend, as they have experienced population losses due to negative net migration. (Ravenstein (1885).

The author of the research paper discusses the impact of population growth on South Africa's economy over the past 25 years. The paper highlights two key characteristics of the South African economy: high inequality and rapid population growth. The paper then calculates the impact of these factors on per capita GDP growth. The results show that even though the components of economic welfare are growing at a healthy rate, the interaction of uneven population growth and high inequality can result in an apparent drag on recorded economic growth.

In other words, the paper shows that South Africa's economic growth has been slower than it would have been if the population had grown more evenly and if inequality had been lower. (William Nordhaus (2008)).

This study examines the impact of India's population and per capita income on the use of agrochemicals. The study found that there is a nonlinear relationship between per capita income and agrochemical consumption per acre. The study also found that there is an inverse association between pesticide use per hectare and population per hectare. This suggests that the general public is aware of the risks associated with intensive pesticide use. (Amarendra Singh & K. Narayanan (2015)).

The article discusses the global experience of budget support in several foreign nations affected by the coronavirus pandemic. It also takes into account state support measures for Russia's population and economy. The article concludes that Russia has set aside a relatively small amount of money to support its economy, compared to other industrialized nations. It also concludes that small and medium-sized businesses have been severely hurt by the pandemic, and that more direct financial assistance to the populace or a reduction in the tax and administrative burden placed on business owners is needed to revive the economy. (O. M. Makhalina & V. N. Makhalin (2021))

DATA METHODOLOGY

Data Collection:
The data on which the analysis was done is of quantitative type. The data collected was from the official site of the "World Bank". The sample data was taken of last 20 years (from 2000 to 2020) which is a sufficient sample size for us to continue with our quantitative research.

Country Name	Indicator Name	Indicator Name	Indicator Name	Indicator Name	Indicator Name	Indicator Name
INDIA	YEAR	GDP (current US$)	Total Population	Urban population (% of total population)	GDP per capita (current US$)	Life expectancy at birth, total (years)	Employment to population ratio, 15+, total (%) (modeled ILO estimate)
	2000	468394937262.37	1059633675	27.667	442.0347789	62.669	52.75600
	2001	485441014538.64	1078970907	27.918	449.9111249	63.091	52.18000
	2002	514937948870.08	1098313039	28.244	468.8444283	63.616	51.62800
	2003	607699285433.87	1117415123	28.572	543.8437989	64.094	51.01400
	2004	709148514804.66	1136264583	28.903	624.1050944	64.524	50.44900
	2005	820381595512.90	1154638713	29.235	710.5093449	64.996	49.88600
	2006	940259888792.14	1172373788	29.569	802.013742	65.412	49.94400
	2007	1216735441524.86	1189691809	29.906	1022.731629	65.788	50.00900
	2008	1198895582137.51	1206734806	30.246	993.5037725	66.149	50.12500
	2009	1341886602798.69	1223640160	30.587	1096.63498	66.513	50.12500
	2010	1675615335600.56	1240613620	30.93	1350.634322	66.909	50.17700
	2011	1823049927772.05	1257621191	31.276	1449.601789	67.359	49.65900
	2012	1827637859506.25	1274487215	31.634	1434.018198	67.887	49.09600
	2013	1856722121394.42	1291132063	32.003	1438.05748	68.46	48.23100
	2014	2039127446299.30	1307246509	32.384	1559.864518	69.074	47.36200
	2015	2103587813812.75	1322866505	32.777	1590.173918	69.636	46.49500
	2016	2294797980509.01	1338636340	33.182	1714.280355	70.117	45.63100
	2017	2651472946375.05	1354195680	33.6	1957.968841	70.467	44.78300
	2018	2702929718960.46	1369003306	34.03	1974.377788	70.71	43.92200
	2019	2831552222519.99	1383112050	34.472	2047.232704	70.91	46.13700
	2020	2667687951796.50	1396387127	34.926	1910.421473	70.15	43.25300

Fig. 1: Data collected from World Bank

HYPOTHESIS:
With these variables I have created the following hypothesis :
1. To check whether Total population have any significant impact on India's GDP.
H0: Total population ***does not have*** a significant impact on GDP of India.
H1: Total population ***does have*** a significant impact on GDP of India.

2. To check whether urban population have any significant impact on India's GDP.
H0: Urban Population ***does not have*** a significant impact on GDP of India.
H1: Urban Population ***does have*** a significant impact on GDP of India.

3. To check whether GDP per capita have any significant impact on India's GDP.
H0: GDP Per capita ***does not have*** a significant impact on GDP of India.
H1: GDP Per capita ***does have*** a significant impact on GDP of India.

4. To check whether Life Expectancy at Birth have any significant impact on India's GDP.
H0: Life Expectancy at Birth ***does not have*** a significant impact on GDP of India.
H1: Life Expectancy at Birth ***does have*** a significant impact on GDP of India.

5. To check whether Employment to Population Ratio have any significant impact on India's GDP.
H0: Employment to Population Ratio ***does not have*** a significant impact on GDP of India.
H1: Employment to Population Ratio ***does have*** a significant impact on GDP of India.

I have used regression analysis as my part for analysing the data. Regression analysis is a statistical method that helps in understanding the relationship between a dependent variable and one or more independent variables. It can be used for both descriptive and predictive analysis. Given below is the data provided by World Bank on – Total Population, Urban Population, GDP Per Capita, Life Expectancy at birth and Employment to Population Ratio.

Tools Used:
1. Multiple Regression: is a statistical method that allows us to analyse the relationship between a dependent variable and multiple independent variables. In other words, it helps to determine how different independent variables affect the dependent variable.

2. Microsoft Excel (2016): 2016 is a spreadsheet program developed by Microsoft Corporation. It is a part of the Microsoft Office suite and is used for data analysis, organization, and visualization. Excel 2016 is an upgraded version of Excel 2013 and includes new features and improvements.
Excel 2016 offers a range of tools for working with data, including:
- PivotTables: A powerful tool for summarizing and analysing large amounts of data.
- Charts: A variety of chart types to help visualize data.
- Formulas and Functions: Excel has a wide range of built-in functions to perform various calculations.
- Data Analysis Tools: Excel includes various data analysis tools such as regression analysis, data tables, and scenarios.
- What-If Analysis: Excel allows users to perform what-if analysis by changing values in a worksheet to see how they affect the outcome.

Here are some ways regression analysis can help:

•Understanding the relationship between variables: Regression analysis can help determine the strength and direction of the relationship between two or more variables.

•Predicting future outcomes: Regression analysis can be applied to predict future outcomes based on historical data. Take an example, a company can apply regression analysis to predict future sales based on past sales data.

•Identifying key factors: Regression analysis can help identify the key factors that affect the dependent variable. For example, a healthcare provider can use regression analysis to identify the factors that affect patient outcomes.

•Testing hypotheses: Regression Analysis can be used to test hypotheses about the relationship between variables. For example, a researcher can use regression analysis to test the hypothesis that there is a linear relationship between two variables

RESULTS (DATA ANALYSIS)

Correlation Statistics:

Regression Statistics	
Multiple R	0.999972004
R Square	0.999944008
Adjusted R Square	0.999924011
Standard Error	6838092946
Observations	20

Fig. 2: Regression Statistics Table

Multiple R: This statistic measures the strength of the linear relationship between the dependent variable and all the independent variables together. In this case, the multiple R is 0.999972004, which indicates a very strong positive relationship between the variables.

R Square: The R-squared value in this case is 0.999944008, which indicates that the independent variables explain almost all the variance in the dependent variable.

Adjusted R Square: The adjusted R-squared value in this case is 0.999924011, which indicates that the model is a good fit for the data.

Standard Error: This statistic measures the variability of the dependent variable around the regression line. In this case it is 6838092946, which is a large number, but the size of the number can be contingent on the units of measurement of the variables.

Observations: This statistic indicates the number of observations or data points in the sample.

ANOVA Table:

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.1691E+25	2.34E+24	50004.77	0.000000000
Residual	14	6.54633E+20	4.68E+19		
Total	19	1.16916E+25			

Fig 3 : ANOVA Table

The information provided in Figure 3 is the outcome of a regression analysis. The result indicates that the significance F-value is 0.000, indicating a very high level of statistical significance for the whole regression model.

DATA OUTPUT INTERPRETATION:

VARIABLE	Intercept	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
		-3.67202E+12	4.61352E+11	-7.95926	0.000001	-4.66152E+12	-2.68252E+12	-4.66152E+12	-2.68252E+12
Total Population	1059633675	-4976.950664	293.6942505	-16.946	0.000000	-5606.862183	-4347.039145	-5606.862183	-4347.039145

Fig 4: Coefficient table for Tot. Population

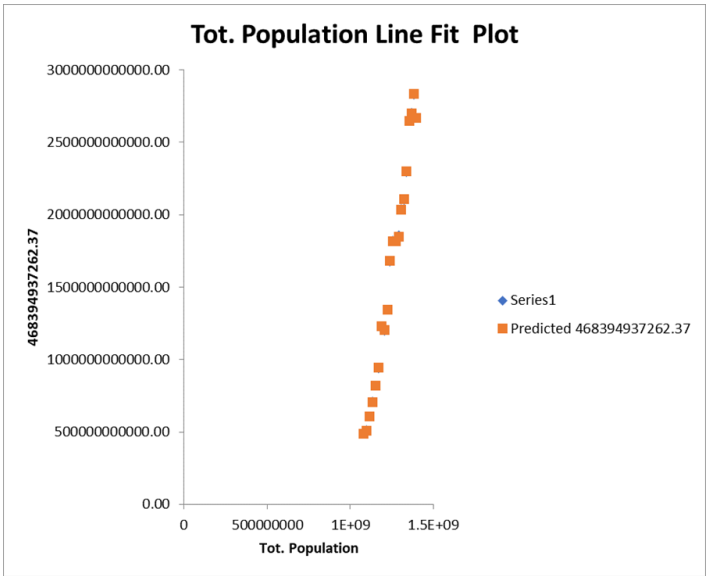

Fig. 5: Total Population Line Fit Plot

This data suggests that Total Population is a significant predictor of the outcome variable, with a negative relationship between the two. For every one unit increase in Total Population, the predicted value of the outcome variable decreases by 4976.950664 units.

Therefore, Total Population has shown a significant impact on India's GDP, hence H1 (Alternate Hypothesis) is accepted.

VARIABLE	Intercept	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
		-3.67202E+12	4.61352E+11	-7.95926	0.000001	-4.66152E+12	-2.68252E+12	-4.66152E+12	-2.68252E+12
Urban Population	27.667	2.30784E+11	1180695065	19.54645	0.000000	2.05461E+11	2.56108E+11	2.05461E+11	2.56108E+11

Fig. 6: Coefficient Table for Urban Population

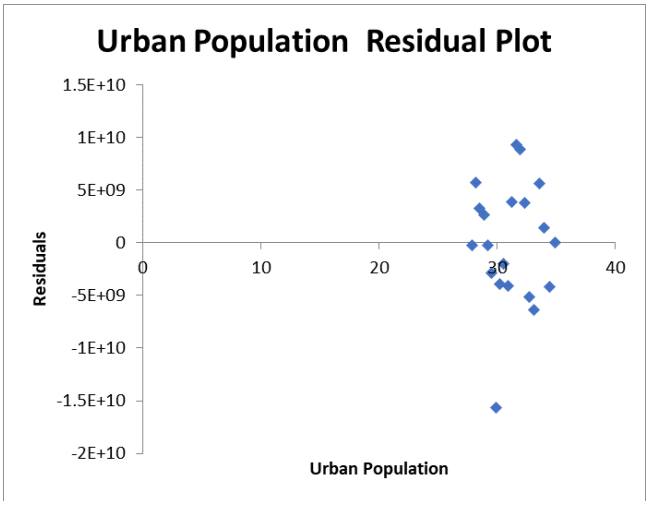

Fig 7: Urban Population Residual Plot

This data suggests that Urban Population is a significant predictor of the outcome variable, with a positive relationship between the two. For every one unit increase in Urban Population, the predicted value of the outcome variable increases by 2.30784E+11 units.Therefore, Urban Population has shown a significant impact on India's GDP, hence H1 (Alternate Hypothesis) is accepted.

VARIABLE	Intercept	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
		-3.67202E+12	4.61352E+11	-7.95926	0.000001	-4.66152E+12	-2.68252E+12	-4.66152E+12	-2.68252E+12
GDP per capita	442.0347789	1281682160	23368014.58	54.84771	0.000000	1231562753	1331801566	1231562753	1331801566

Fig 8: Coefficient Table for GDP Per Capita

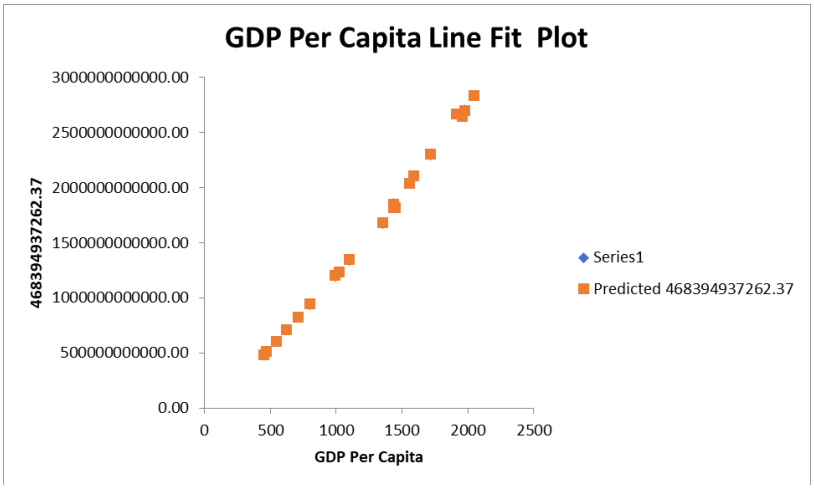

Fig. 9: GDP Per Capita Line Fit Plot

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The coefficient's t-statistic value is 54.84771. Overall, this data suggests that GDP per capita is a highly significant predictor of the outcome variable, with a positive relationship between the two. For every one unit increase in GDP per capita, the predicted value of the outcome variable increases by 1281682160 units.Therefore, GDP Per Capita has shown a significant impact on India's GDP, hence H1 (Alternate Hypothesis) is accepted.

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VARIABLE	Intercept	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
		-3.67202E+12	4.61352E+11	-7.95926	0.000001	-4.66152E+12	-2.68252E+12	-4.66152E+12	-2.68252E+12
Life Expectancy	62.669	39296747362	5994906609	6.555022	0.000013	26438951471	52154543253	26438951471	52154543253

Fig 10: Coefficient Table for Life Expectancy at Birth

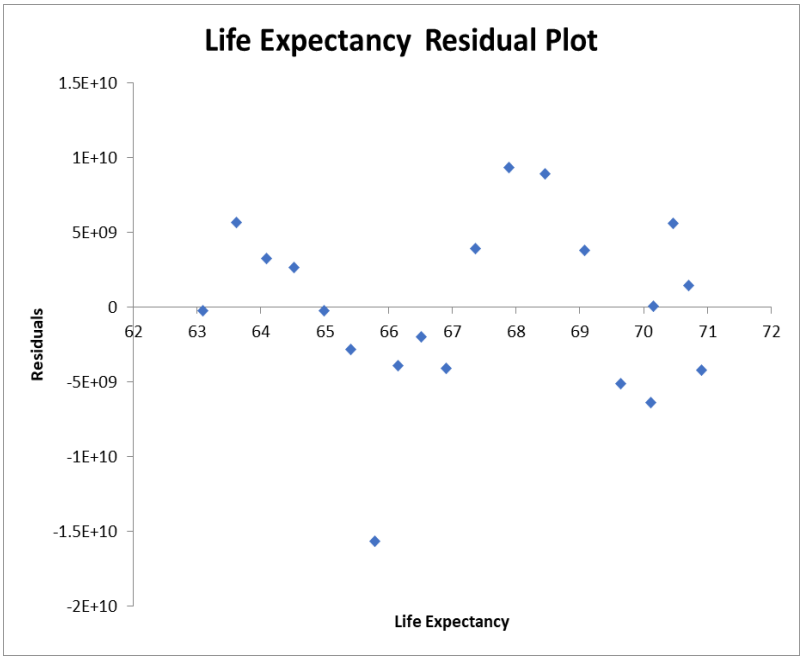

Fig. 11: Life Expectancy Residual Plot

This data suggests that life expectancy is a highly significant predictor of the outcome variable, with a positive relationship between the two. For every one unit increase in life expectancy, the predicted value of the outcome variable increases by 39296747362 units.

Therefore, Life Expectancy has shown a significant impact on India's GDP, hence H1 (Alternate Hypothesis) is accepted

VARIABLE	Intercept	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
		-3.67202E+12	4.61352E+11	-7.95926	0.000001	-4.66152E+12	-2.68252E+12	-4.66152E+12	-2.68252E+12
Employment to Pop Ratio	52.75600052	550753219.1	248614 1518	0.221529	0.827879	-478149 0014	588299 6452	-478149 0014	588299 6452

Fig. 12: Coefficient Table for Employment to Population Ratio

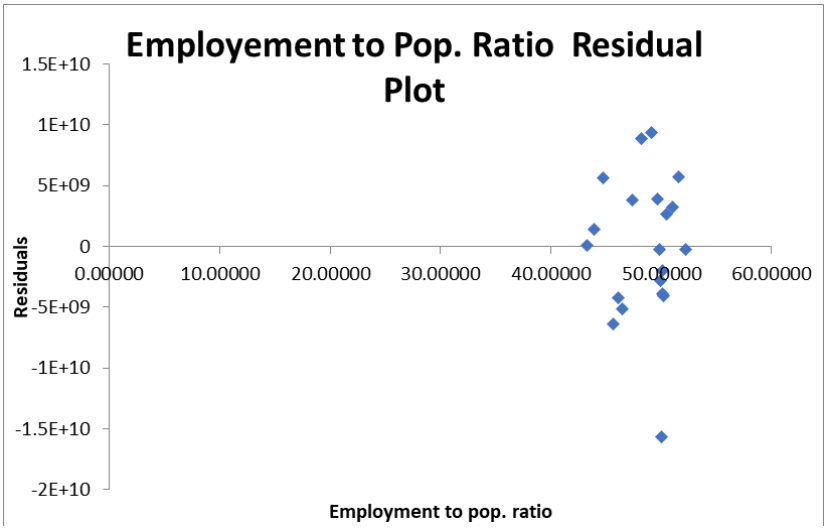

Fig 13: Employment to Population Ratio Residual Plot

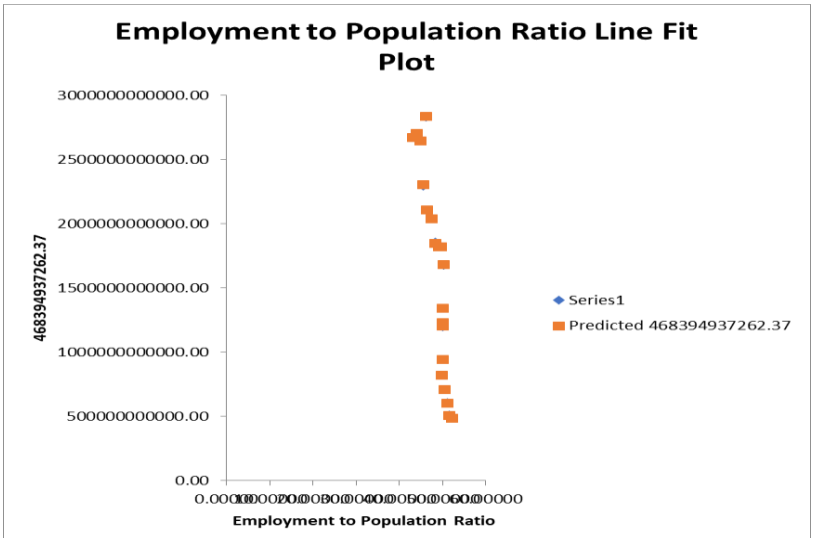

Fig 14: Employment to Population Ratio Line Fit Plot

Based on the information provided, it appears that the coefficient for "Employment to Pop Ratio" is not statistically significant, as its p-value is 0.827879, which is greater than the typical threshold for statistical significance (usually 0.05). This suggests that there is no significant linear relationship between the "Employment to Pop Ratio" and the outcome variable (which is not provided in this information). Additionally, the confidence interval for the coefficient is quite wide, ranging from -4.781E+09 to 5.883E+09, further indicating that the coefficient estimate is imprecise.Therefore, Employment to Population Ratio has not shown a significant impact on India's GDP, hence H0 (Null Hypothesis) is accepted.

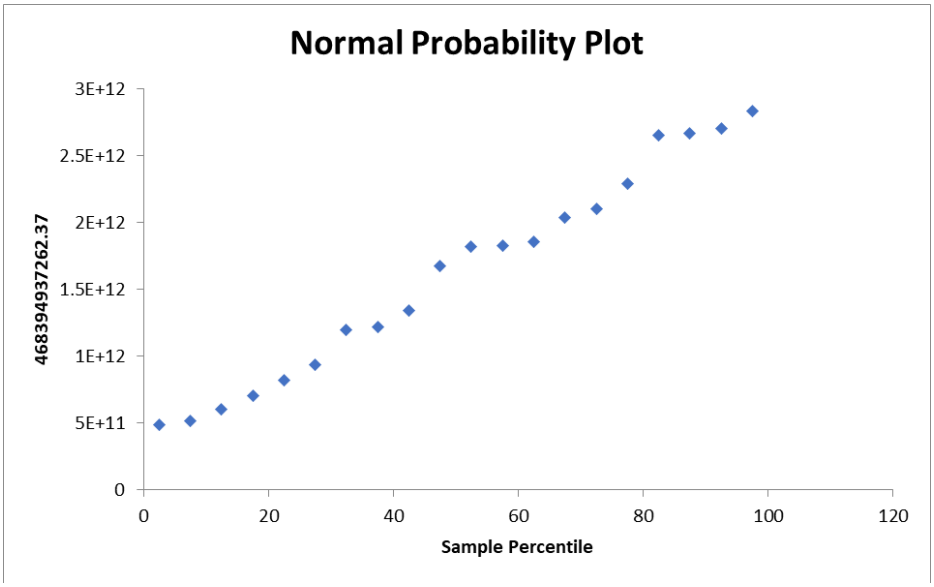

Fig 15: Normal Probability Plot Graph

Overall, this output can be used to understand the variability in the predicted values and the likelihood of observing certain values within that range.

CONCLUSION

Therefore, from the above data analysis and hypothesis, we can conclude that Total Population, Urban Population, GDP Per capita and Life expectancy at Birth plays a significant impact on India's GDP; whereas Employment To population Ratio does not show a significant impact on India's Economy (GDP) according to regression analysis.

Here are some of the few suggestions which we have highlighted after the data analysis are as follows:

Look for outliers: Because outliers can greatly affect the outcomes of a regression analysis, it is crucial to look for them in your data. Making a scatter plot of the anticipated values versus the residuals will allow you to achieve this. If you spot any odd patterns, look into those points to see if there are any outliers or data input mistakes.

Make sure the relationship between the independent and dependent variables is linear by checking for it: You can plot the independent variable versus the dependent variable in a scatter plot and search for a linear pattern. You might need to alter one or both variables or use a non-linear regression model if the pattern is not linear.

To evaluate model fit, one can look at the standard residuals: The model might not be a good match for the data if the standard residual is bigger than 2 or lower than -2. Furthermore, you may evaluate how well the model fits the data using goodness-of-fit tests, including the R-squared value.

If the model fit is inadequate, you might need to take into account other variables that could help explain the variability in the dependent variable: This can be accomplished either by utilising a different model entirely or by including more variables in the regression model.

Think about cross-validation: It's crucial to evaluate the model's precision on fresh data. A method called cross-validation can be used to assess the model's performance on new data. This involves splitting the data into training and testing sets and using the training set to develop the model and the testing set to assess its performance.

Validate the model: It is important to validate the model by testing its performance on new data. This can be done by splitting the data into training and testing sets and using the training set to develop the model and the testing set to assess its performance. Cross-validation techniques can also be used to assess the model's performance.

Interpret the results: It is essential to interpret the results of the analysis carefully. For example, if the value of the dependent variable is below the 2.5th percentile or above the 97.5th percentile, it may indicate an unusual or extreme value. This can be investigated further to determine if it is a data entry error or if there are other factors at play.

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