

# An Analysis of the Components of the Gross Domestic Product of India

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**Abstract :** This study explored the trend of deviations amidst the GDP of India at market prices and factor costs keeping in purview its correlation with the growing population of the country and evaluating the most volatile sector out of the primary, secondary and the tertiary sector. The data in use was inclusive of the allied and related activities of the respective sectors and not just focussed on the real action of the sector. Recognition of trends and smoothening of the data after removal of residuals made it possible to demarcate major differences in the expected annual growth and the increase in GDP that was actually observed. There exist fluctuated relations amongst the sector-wise growth which are highly influenced by the financial states of the nation and that of the world. The results hence established depicted that there exists variance in the implications of the GDP in relation to the prices taken for calculations which aggravates the need to closely overview the reasons for such deviations in the prices of the same years. The study establishes patterns in the development of every segment significantly and perceives the requirement for an adjustment in technique of working of the country or monetary arrangement of the nation.

**Keywords:** GDP, market prices, factor costs, deviations, population.

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## I. Introduction

According to the websites heritage.com and statistictimes.com, with a population of 1.3 billion people, India enjoys a 7.3% growth rate at the GDP of Rs. 121,898.54 crores which is immense. The developing mixed economy has grown by leaps and bounds in terms of output and employment over 69years of its freedom and stands as the 6<sup>th</sup> largest nation on the globe in terms of the GDP which is the monetary measure of the value of all final goods and services produced in the domestic territory of a country amid a given timeframe and is one of the essential pointers used to check the strength of an economy. Employment is the outcome of population which is highly correlated to GDP of a country. In fact, some economists tend to use the terms employment and

output reciprocally. With high increase in the populace of a country, the growing demand must be compensated by growth in output. This can happen either by manifold increase in GDP or through a generous increment in the commitment of individuals to the economy. This may occur as a ruin in joblessness and a mayhem of work in the nation. The prices taken into consideration affect the GDP numbers in view largely. While the market price considers the sale value of the commodity, the factor cost evaluates the production involved in the good. With high deviations in these prices, the Real GDP and the Nominal GDP are influenced. Viewing the calculation of GDP in much detail, it is observed that a great deal of variables is contemplated from the three major sectors of the economy which are the essential, auxiliary and the tertiary areas in broad terms. In reality, the data used for authenticity includes collaborated exercises of these areas which influence development by a wide margin. It becomes necessary to demarcate deviations of the factors explained to establish the pros and cons of the economic policies in use over a period of 60 years. This investigation sets up trends in the performance of every segment in accordance with their costs so as to justify the measures keeping them in line with the consistently developing occupants of the landmass.

The investigation mentions the various theories and calculations of growth rates by different authors and describes the distinctive approaches and methodology. The laid down hypothesis forms the basis of their conclusions where they have also demarcated growth rates of the sectors and made effective comparisons amidst them. This paper is highly reliable and determines whether the conclusions drawn in the past hold true in recent times or not i.e. to determine whether the rate on growth is now constant, increasing or diminishing which is supported by index numbers of the respective years plotted on graphs and aims to understand long-term trends. (Nagaraj, 1990). The research successfully estimates quarterly GDP to determine break points in trend of growth in an interactive manner and highlights the fact that GDP started declining even before the economic crisis of 2008. Making use of the 'Chow test', seasonal trend from the quarterly results have been found and residuals over the years for conclusions have been taken into account for the purpose of evaluation. (Mukherjee, 2009)

The year of upward break of growth and significant change, 1980-81, forms the central core of this research. Productivity-led growth, modernisation of industries despite the high costs are only a few of the many major implications. They have discussed the impacts of liberalisation on evolution and ruled out its possibility to be a primary cause. Not all sectors, but agriculture mostly has been taken into account. Since focus is mainly on a single year, applicability of conclusions is subject to limitations. (Ajit Sinha, Shirin Tejani, 2004)

Using conventional approaches and 'Chow test', this study establishes the break points of trend which is useful for and similar to the study conducted. However, it does not take population, aspects of labour and unemployment into consideration and leads on to the belief of India's service-led growth in turn describing how sectors of GDP grew over decades keeping in view the economic and political scenarios in the respective years.

(Balakrishnan & Parameswaran, 2007). In recent times, development of the country has been scrutinised several times and has been declared stagnant. While in reality, the output of India shows growth, substantial boosts in the economy have been ignored by the eyes of many which lays the foundation of making such an analysis on the picture depicted by the GDP and its components and their reliance amidst the various sectors. With including the GDP factors, population figures have been used too, for the establishment of the predictions keeping in mind the contribution of the human capital of the nation. Being a labour-intensive country, India has high potential in its manpower which remains unleashed.

The work power of a country exceedingly contributes towards its development, which in wide situation is estimated as the yield or GDP of the economy. The number of inhabitants in a nation and GDP are henceforth bound in a relationship of comparative pattern laying base to a high coefficient of connection. In all actuality, both the factors share high reliance on each other. This is on account of, with increment in the populace, total appeal of the economy manifolds achieving an expansion in the creation and henceforth expanding business which in turns implies higher yield or GDP. A recurrent idea of development is consequently framed, encouraged by the way that with higher GDP, the way of life of the general population of the economy rises which is a result on increment in the discretionary cashflow of the nationals.

When it comes to the factors concerned, three major industries play the key role in making the GDP what it is, as a whole. Farming and its allied activities, poultry, horticulture amidst others, comprise of the agriculture sector which largely forms the GDP. In the sector of manufacturing, any and all industries involved in the tasks of mining, minting, manufacturing take up the chunk. Services of all kinds form an integral part of the GDP through the service industry of the country which majorly is responsible for the development today. For years, India has been known for the growth of its agricultural sector. Whether it is the Green Revolution and the introduction of hybrid seeds or the White Revolution, the country has always been on its toes in search for an economic boom. Laying importance on the industrial sector now, it has forever been an issue of discussion for economists of modern times of how and why the manufacturing sector in the country could not grow by leaps and bounds in any era of history while being a destination for investors. Not stating that there was no

flourishment, in fact, the mining component of this sector has shown substantial growth over and over again. But now that the influence is on the service sector or the tertiary style of development, India is being established as a destination of investments in the IT industry being home to the largest number of BPOs. Furthermore, India's service-led growth is reason for the continuous increase in revenues of industries like tourism, communication, media and others. While the others made merry in metal, India made wire and has a web of networks built to be outsourced thus providing employment and enhancing future goals to be achieved backed by technology. An understanding of what prevails in the world GDP competition tells us of how the nation works as an entity. However, the insights on these sectors provide meaningful conclusions of what trend the industries and markets of India are prone to in the future.

The data taken into account for the research consisted of the population count, GDP at factor cost and market price along with their bifurcation in detail for 60 years commencing from 1959 until the fiscal year 2017. First and foremost, Descriptive statistics has been brought in the view of the study to enlighten how no value of mode can be calculated which depicts that in a time period of 60 years, the GDP at Market Price (MP) and at Factor Cost (FC) both, has not repeated itself. Furthermore, the probability of the same has low value in the future of the nation which means however stagnant growth may be, it cannot be constant.

The table showing the results obtained using descriptive statistics performed in Excel has been attached below which confirms the application of the mode in the data set of GDP at Factor Cost.

<b>Sector</b>	<b>Primary</b>	<b>Secondary</b>	<b>Tertiary</b>
Mean	10053.45	32334.54	76748.35
Standard Error	1280.702	5991.622	15342.77
Median	6992.27	14023.2	27252.22
Mode	#N/A	#N/A	#N/A
Standard Deviation	9837.261	46022.52	117850.1
Sample Variance	96771711	2.12E+09	1.39E+10
Kurtosis	4.596925	4.737011	4.696863
Skewness	2.364211	2.385077	2.369835
Range	39533.01	186007.4	476978.5
Minimum	3338.77	4495.48	7339.64
Maximum	42871.78	190502.8	484318.2
Sum	593153.7	1907738	4528152
Count	59	59	59
Largest(1)	42871.78	190502.8	484318.2
Smallest(1)	3338.77	4495.48	7339.64
Confidence Level(95.0%)	2563.604	11993.54	30711.9

Keeping the factors in purview identical, the following table highlights the descriptive analysis of GDP at the Market prices.

<b>Sector</b>	<b>Primary</b>	<b>Secondary</b>	<b>Tertiary</b>
Mean	18787.23	45849.91	107655.5
Standard Error	3008.114	9524.671	22435.15
Median	9207.58	15646.73	31134.6
Mode	#N/A	#N/A	#N/A
Standard Deviation	23105.76	73160.38	172327.7
Sample Variance	5.34E+08	5.35E+09	2.97E+10
Kurtosis	3.835504	5.070762	4.473402
Skewness	2.158195	2.453287	2.309629
Range	92141.62	298940.9	697509.4
Minimum	3468.57	4540.28	7468.65
Maximum	95610.19	303481.1	704978
Sum	1108447	2705145	6351672
Count	59	59	59
Largest(1)	95610.19	303481.1	704978
Smallest(1)	3468.57	4540.28	7468.65
Confidence Level(95.0%)	6021.395	19065.7	44908.84

Using Excel, the population and the two GDP were tested on the basis of correlation which yielded that there exists high positive correlation among the population and the GDP at both the price levels, the table of which has been attached below.

Below is the correlation table performed in Excel.

<b><u>Table of correlation</u></b>			
	<b>population</b>	<b>GDP - FC</b>	<b>GDP - MP</b>
<b>population</b>	<b>1</b>		
<b>GDP - FC</b>	<b>0.802013955</b>	<b>1</b>	
<b>GDP - MP</b>	<b>0.801579531</b>	<b>0.999960386</b>	<b>1</b>

The factors that lay demarcation between the market price and factor cost are mainly composed of the taxes, net indirect taxes to be specific. The factor cost initiates the price at the level of the product cost which is the constant price in most cases while the current price is the market price that depicts the monetary value of the products in consideration.

The labour force of a nation highly contributes in development, which in broad scenario is measured in terms of output or GDP. The population of a country and GDP are hence bound in a relationship of similar trend laying base to a high coefficient of correlation. In reality, both the variables share high dependency on each other. This is because, with increase in the population, aggregate demand of the economy manifolds bringing

about an increase in the production and hence increasing employment which in turns means higher output or GDP.

A cyclic notion of growth is hence formed, facilitated by the fact that with higher GDP, the standard of living of the people of the economy rises which is an outcome on increase in the disposable income of the citizens.

Through the tools of regression, the factors affecting GDP and by what measure were known and an equation was hence devised to make predictions.

GDP happens to be the dependent variable in our study while the independent variables include Agriculture, Agriculture and allied activities, Industry, Manufacturing, Mining and Quarrying, Electricity and gas supply, Services, Construction, Trade, hotel, transport and communications, Financing, Insurance, Real estate and business services, Public administration, Defence and other services.

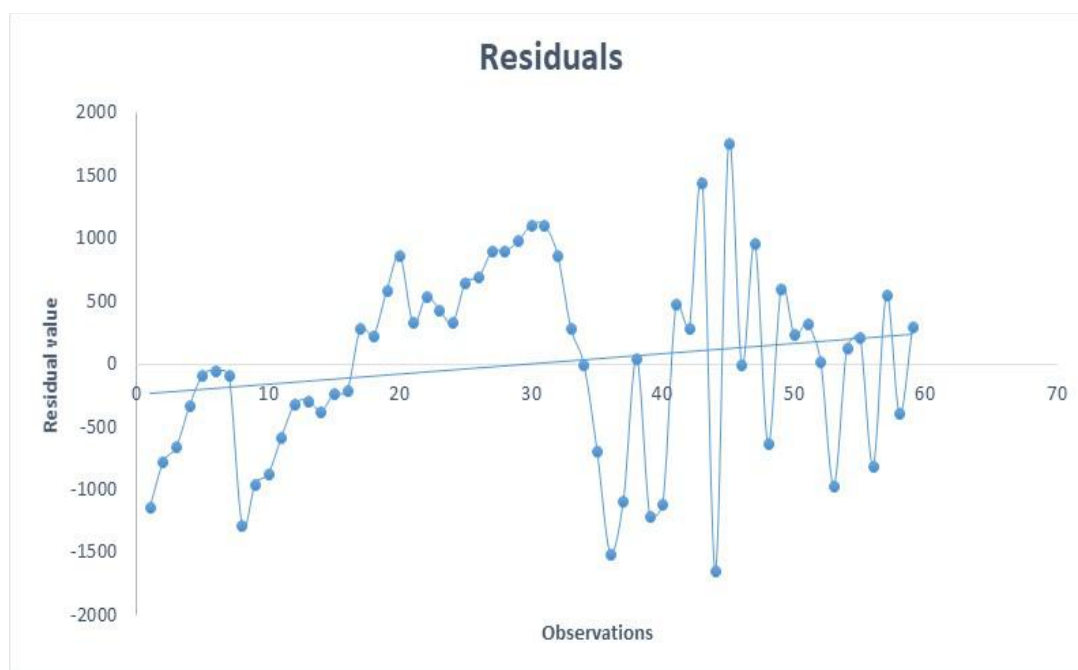
The equation so derived has involved the coefficients of the independent variables and the value achieved by assigning output values to them, results in a final output estimation of the GDP which is,

$$Y = 5668.34X_1 + 25.38616X_2 + (-25.7232) X_3 + (-27.3852) X_4 + 51.12171X_5 + 29.4131X_6 + 48.18637X_7 + 22.21332X_8 + (-15.9643) X_9 + (-29.2758) X_{10} + (-18.9621) X_{11} + (-26.2033) X_{12}$$

This equation, based on coefficients calculated through regression analysis, successfully estimates the GDP as soon as the outputs of each sector are known. The prediction is reliable enough because of the confidence level 95%, also, smoothening of data and removal of residuals ensured the clearance of all outliers which provides a sharp trend laid in place.

SUMMARY OUTPUT					
<i>Regression Statistics</i>					
Multiple R	0.999605				
R Square	0.99921				
Adjusted R Square	0.999026				
Standard Error	851.0552				
Observations	59				
<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	11	4.31E+10	3.92E+09	5406.56766	5.66651E-69
Residual	47	34041867	724295		
Total	58	4.31E+10			

Factor	X	Y
Agriculture & allied activ	500	-84885
Agriculture	1000	
Industry	1500	
Mining & Quarrying	2000	
Manufacturing	2500	
Electricity, Gas & Wate	3000	
Services	3500	
Construction	4000	
Trade, Hotel, Transport	4500	
Financing, Insurance, Re	5000	
Public Administration, De	5500	



For the understanding of the strength of each sector and look at the measures by which growth is being achieved, thorough analysis of the three major sectors of GDP needs to be carried out so as to evaluate them against one another and against the sectorial demarcation of other countries that share the belt of India in being called as the developing nations of the world.

In order to compare the contribution of each sector towards the GDP of the country, means of the output of the three sectors we calculated using Anova table, where

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$$H_1 : \mu_1 \neq \mu_2 \neq \mu_3$$

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Column 1	59	593153.7	10053.45	96771711		
Column 2	59	1907738	32334.54	2.12E+09		
Column 3	59	4528152	76748.35	1.39E+10		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.36E+11	2	6.8E+10	12.67171	7.28E-06	3.047906
Within Groups	9.34E+11	174	5.37E+09			
Total	1.07E+12	176				



single-factor or one-way Anova tells us whether the means of two population are equal or not. It takes into consideration on a single set of information, hence the name. But Anova doesn't state where the difference lies, for which t-test was to be conducted, which it should be known whether the variances of the sectors are equal or not. This was concluded with the help of the F-test, where

$$H_0: \sigma_1^2 = \sigma_2^2$$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

Furthermore, the t-test was carried out, where

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_1: \mu_1 - \mu_2 \neq 0$$

**t-Test: Two-Sample Assuming Unequal Variances**

	Variable 1	Variable 2
Mean	23675.12	25681.92
Variance	7.43E+08	8.69E+08
Observations	59	59
Hypothesized Mean Difference	0	
Df	115	
t Stat	-0.38387	
P(T<=t) one-tail	0.350893	
t Critical one-tail	1.658212	
P(T<=t) two-tail	0.701785	
t Critical two-tail	1.980808	

In the entire data set, no repetition of data was observed hence a common mode was not derived. This observation holds true for both GDP at FC and GDP at MP.

Regression results are the “goodness of fit” measures where the Multiple R is the correlation coefficient depicting how strong the linear trend in the data is. The later part of the regression study, the Anova table, has interpretations that are worthy of making note. Through the regression analysis the estimation of R square clarified that 99% of the variety happening in GDP was because of the expressed elements and the model is factually noteworthy on the grounds that the confidence level is 95% and the p-value is well below 0.01.

Using the Anova table for analysis of means of observations, the f-value was observed to be greater than f-critical, hence we reject the null hypothesis i.e. the means of the three sectors are not equal. This happens due to the fact that high F-value shows that the data in consideration does not support the null hypothesis of the study and that the alternative hypothesis is compatible with the data under scrutiny.

During the t-test, it is observed that unequal means are calculated and also shows the deviation between means of two sectors. If  $t \text{ Stat} < -t \text{ Critical two-tail}$  or  $t \text{ Stat} > t \text{ Critical two-tail}$ , we reject the null hypothesis. This is the case of the GDP. Hence, the two averages of the GDP differ significantly.

## **II. Conclusion**

With high reliability of the data set, observations made and interpretations derived are highly compatible with the scenario of the economy. The GDP of a country is a key factor for evaluation of its development and by making use of the sectors to find their implications on GDP and each other, also taking population into account, this research finds trends and makes successful use of residuals in the data beyond smoothening. Ensuring that the hypothesis and tests involved are exploited to the best of their capacity, the study has hence been able to demarcate the positive and negative growth patterns in accordance with the economic policies of the nation as a whole.

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