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The Relationship between Unemployment and Economic Growth in India: Granger Causality Approach

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Abstract

The primary objective of this study is to investigate the relationship between unemployment and economic growth in India, with a particular focus on the impact of economic growth on unemployment from 1990 to 2020. Before and after the Hodrick-Prescott filter was used to correct for non-stationarity in the time series data used for the study, descriptive statistics, Granger causality, and the Ordinary least squared model were used to study the impact of economic growth on unemployment. The Granger causality test found no link between the two variables, indicating that neither UNEMP causes GDP and nor GDP causes UNEMP. The results of the estimated regression of unemployment and economic growth as an explanatory variable, on the other hand, exhibit that only 6 per cent of the impact of economic growth on unemployment and are inversely related to each other, while the remaining 94 per cent is caused by other factors that are detrimentally affecting India's unemployment rate.

Keywords: Economic Growth, Unemployment, Employment, Granger Causality, Ordinary Least Squared.

1. Introduction

Rapid economic growth generally ameliorates unemployment concerns. In India's scenario, however, rapid economic growth would not alleviate the country's unemployment problem immediately. Because, even when India's GDP increased rapidly in the past, the nature of that expansion resulted in the creation of just a limited number of well-paying employments. Vijay Joshi points out the lopsided nature of India's growth in his book "India's long road", "India's entire workforce increased by 63 million persons between 1999-00 and 2009-10. 22 million of these 44 million became unorganized workers in the organized sector, while the number of official workers in the organized sector fell by 3 million". Even while all growth indicators, including the gross domestic product (GDP), imply a strong economic improvement, unemployment in the country continues to rise. While major economic indicators point to a fast rebound, the employment market as a whole is still struggling. A lack of job possibilities may stifle long-term economic growth by lowering general purchasing power, which would lead to a drop in consumption demand.

India's macroeconomic challenges continue to be stagnant economic growth and high unemployment. According to the latest available employment data collected by the Labour Bureau, employment growth in India slowed dramatically from 2012 to 2016, with an absolute decline in employment from 2013-14 to 2015-16, possibly for the first time in independent India (Abraham, 2017). Independent surveys initiated in 2016 by a prominent private agency also reported a net decline in employment and an increase in unemployment (Kannan & Raveendran, 2019). According to the UN (ILO), unemployment in 2017 is expected to be 17.8 million, down from 17.6 million in 2016 and 18 million in 2018. It is also stated that global unemployment issues exist as a result of social and economic crises, as well as a failure to create high-quality jobs for the

labour market. Between 2016 and 2017, the number of unemployed people in developing countries increased by about 3.6 million (UN Report - Times of India, n.d.).

Unemployment in India is attributed to the negative development of economic activities, the substitution of labour by capital, and an increase in workforce supply. Every day, India is confronted with a serious problem of unemployment (Chand, Tiwari, & Phuyal, 2017). The country was facing these challenges as early as the 1980s when the country was operating under a 'one-sector growth model'. India had taken initiatives in the 1990s, to curb the problem of rising unemployment and stagnant growth, but the implications of these policies have lagged behind the economic and employment growth, leads to more unemployment, which economists are concerned to portray the recent experience as one of "jobless growth" (Padder, 2018). Michael, Emeka, & Emmanuel (2016) provides an extensive summary of results regarding Granger causality between economic growth and unemployment for Nigeria. However, it has been found that the unidirectional relationship between unemployment and economic growth, with causality running from real GDP to unemployment. Rosoiu & Rosoiu (2014) examined that unemployment and economic growth have a strong negative relationship in the USA over the period 1977-2011.

2. Objective of the study

The purpose of this research is to look at the relationship between unemployment and real gross domestic product in India's economy from 1990 to 2020. Following India's 1990s reforms, the relationship between unemployment and gross domestic product (a real indicator of economic growth) has been widely investigated. Since the beginning of India's economic reforms, the central question has been whether economic growth stimulates the unemployment rate or the unemployment rate itself is a stimulus for economic growth. Furthermore, Okun's law, which describes the relationship between these two variables, is well-known in the economic literature.

3. Materials and Methods

The study has been using annual statistical data on real gross domestic product and unemployment rate from the World Bank database for the period 1990 to 2020, to empirically examine the relationship between unemployment and economic growth in India. The analysis used descriptive statistics, the Augmented Dickey-Fuller test, the Granger Causality test, and the ordinary least squares model. The descriptive statistic is used to determine whether or not a set of two variables is normally distributed. For a unit root in the series, ADF tests were used, whereas the Granger causality test examines the causality between unemployment and economic growth in India. The ordinary least squares (OLS) model is used to determine the relationship between unemployment and economic growth, as described in Okun's Law.

3.1. Estimation Procedure

3.1.1 Unit Root Test

This stage of the estimation process tests the stationarity of the data employed in the study. The Augmented Dickey-Fuller (ADF) unit root test, proposed by Dickey and Fuller (1981), aids in determining the order of integration of data series. This test is used to determine the variables in the study's long-term properties. If a time series is determined to be stationary, it means that its variance, mean, and covariance remain constant over time, and that the result of their analysis is reliable and can be used to forecast future economic activities. The ADF test is carried out using the models listed below.

$$\Delta \boldsymbol{gdp_t} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha 1 gdp_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\alpha} \Delta \boldsymbol{gdp}_{;} + \boldsymbol{e_t} \quad (1)$$

$$\Delta \boldsymbol{unemp_t} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha 1 unemp_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\alpha} \Delta \boldsymbol{unemp}_{,} + \boldsymbol{e_t} \quad (2)$$

Where, $\Delta \boldsymbol{gdp_t}$ and $\Delta \boldsymbol{unemp_t}$ are data series, $\boldsymbol{t}$ is linear time trend, Δ is first difference operator, $\boldsymbol{\alpha_0}$ is constant, k is the optimum number of lags in the development variable and $\boldsymbol{e_t}$ is residual variable. Meanwhile, if the ADF result fails to reject the test in levels but rejects the test in first difference, it means that the series contains one unit root and is of integrated order one, and so on.

3.1.2 The Granger Causality Test

The Granger causality test, proposed by Eagle and Granger (1989), is used in the second stage of the estimation procedure to examine the causality between unemployment and economic growth. It was mainly concerned with determining the nature of the relationship between the two variables, specifically whether the relationship is unidirectional, bidirectional, or there is no causality between the two or more variables. As a result, the model is defined as:

$$\boldsymbol{unemp_t} = \sum_{j=1}^{p} \boldsymbol{\alpha_j\, unemp_{t-j}} + \sum_{j-1}^{p} \boldsymbol{\beta_j\, gdp_{t-j}} + \boldsymbol{\mu_t} \quad (3)$$

$$\boldsymbol{gdp_t} = \sum_{j=1}^{p} \boldsymbol{n_j\, unemp_{t-j}} + \sum_{j-1}^{p} \boldsymbol{y_j\, gdp_{t-j}} + \boldsymbol{v_t} \quad (4)$$

Where UNEMP is unemployment, GDP is economic growth, $\boldsymbol{\mu_t\ and\ v_t}$ are error terms, t is current period and $\boldsymbol{t - j}$ is lad period.

3.2 Ordinary Least Squares (OLS)

The model expressing the relationship among economic growth (GDP) and unemployment rate (UNEMP) is represented as follows:

UNEMP = f (GDP) (5)

Where UNEMP is the unemployment rate which represents the total unemployment level in the economy and GDP represents the real gross domestic product as a common measure of economic growth for the period under review. Above equation 5 above is further illustrated in linear form as:

$$\boldsymbol{UNEMP} = \boldsymbol{\alpha} + \boldsymbol{\beta_1 GDP} + \boldsymbol{\varepsilon_t} \quad (6)$$

Where UNEMP is the dependent variable; GDP is the explanatory variable; $\boldsymbol{\beta}$ is linear coefficient; $\boldsymbol{\alpha}$ is the constant term and $\boldsymbol{\varepsilon_t}$ is the residual variance.

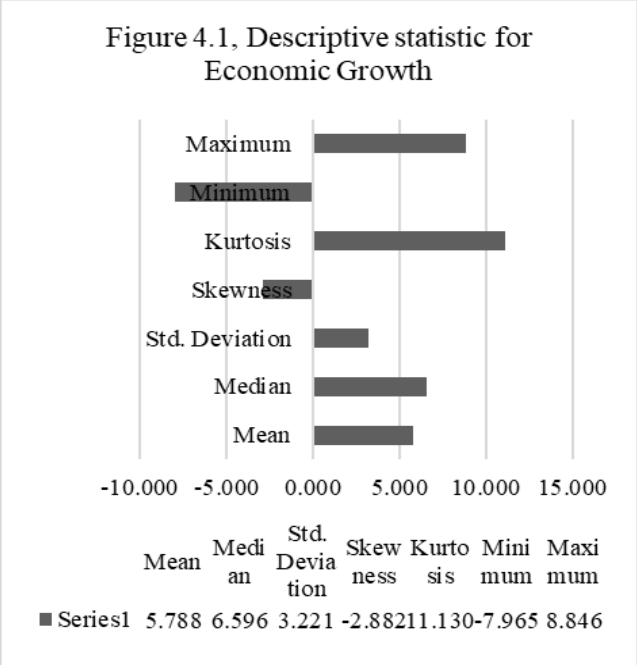
4. Results and Discussion

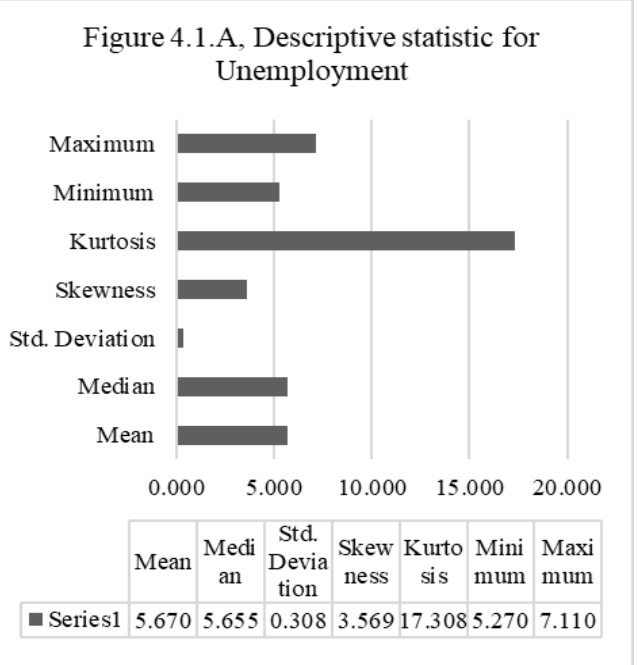
4.1 Descriptive Statistics

Figures 4.1 and 4.1.A shows the descriptive statistic for both the variables, whether the series are normally distributed or asymmetrical from the mean. The economic growth of India is congregating around the mean value of 5.79 and is fluctuating between -7.97 (minimum value) and 8.85 (maximum value), while the unemployment rate is congregating around the mean value of 5.67 and is fluctuating between 5.27 and 7.11. Though the mean value of both the series are almost the same but differs with the standard deviation, which is higher in economic growth. This emphasises that real economic growth is more volatile than the unemployment rate. The values recorded by Skewness and Kurtosis coefficients shows that real economic growth and unemployment rate are not normally distributed and are asymmetrical, as the values obtained from the descriptive analysis are either greater or lesser than $\pm\mathbf{1}$. To carrying out this analysis for stationary, the data series are not satisfied while running the ADF test. Hence, based on the above results, the data series cannot be used for further analysis without detrending the series. To ensure stationarity of the data

series of the variables, the Hodrick-Prescott filter was used. The Hodrick-Prescott filter is a smoothing method popular among macroeconomists for acquiring a smooth estimate of a series' long-term trend component **(Ayoyinka & Isaiah, 2011)**.

Figure 4.1 and 4.1.A, Descriptive Statistics for Economic Growth and Unemployment





4.2 Augmented Dickey-Fuller Test

Table 4.2, (ADF-Test) Unit Root Test

	Levels			After Detrending (1st Diff.)		
Variables	ADF Statistic	5% Critical Value	10% Critical Value	ADF Statistic	5% Critical Value	10% Critical Value
UNEMP	-2.846	-2.992	-2.626	-4.417	-2.992	-2.626
GDP	-1.438	-2.992	-2.626	-5.359	-2.992	-2.626
Source: Researcher's computation from Stata 13						

Table 4.2 above depicts the stationarity test of the time series employed in this investigation through the application of the Augmented Dickey-Fuller (ADF) test. The results of the test indicate that all the variables are non-stationary at levels of 5% whereas, unemployment is stationary at 10%. So, the series before detrending cannot be used for further analysis may be led to spurious results. The detrending series while using by Hodrick-Prescott filter is survived at 1st difference portrayed in Table 4.2. In the table, the absolute value of ADF statistics of the variables after detrending at 1st difference is more than critical values at 5% and 10%, which imply that all the series became integrated of the same order after first differencing implies that their variance, mean and covariance are constant over time and those long-term properties of the series are established.

4.3 Granger Causality Test

From table 4.3, the results of the Granger causality test revealed no significant causation between the unemployment rate and real gross domestic product in India. This emphasises that neither the unemployment nor the real gross domestic is significantly influencing each other. This is evidenced by the p-values of the variables are shown in the estimation results of the Granger causality test. In the results, the F-

statistic value of the causality that runs from UNEMP to GDP is 0.12848, and its associated p-value is 0.7228; whereas, the F-statistic value of the causality that runs from GDP to UNEMP is 2.2086, and its associate p-value is 0.1488. From the above facts, it, therefore, observed that the p-value of both the null hypotheses is more than 0.05 level of significance; Therefore, we cannot reject the null hypothesis rather we are accepting the null hypothesis. This implies that the changes in any of the above variables does not make the changes in other variables, but by other factors which are not part of this study.

Table 4.3, Granger Causality Test

Null Hypothesis	N	F-Statistic	Prob.
UNEMP does not Granger cause GDP	27	0.12848	0.7228
GDP does not Granger cause UNEMP	27	2.2086	0.1488
Source: Researcher's computation from Stata 13.			

4.4 Ordinary Least Squares

Though the result of the Granger causality test has shown no causation between the economic growth and unemployment in India over the period 1990 to 2020; whereas, Okun's law describes the strong negative relationship between economic growth and unemployment in India (Chand et al., 2018). The results of the Granger causality test and the results of Chand's study are found to contradict each other. For that, a simple regression analysis is used to find the intensity of the unemployment rate concerning the real gross domestic product in India portrayed in Table 4.4.

Table 4.4, Ordinary Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP Growth Rate	-0.061	0.018	-3.480	0.002
R^2	0.295		Std. Error of the Estimate	0.175
Adjusted R^2	0.270		Durbin-Watson	2.047
F-Statistic	11.726		Prob. (F-statistic)	0.002
Source: Researchers computation from Stata 13.				

Table 4.4 shows the results obtained from OLS between the unemployment rate and real gross domestic product in India. This relation is investigated by estimating the regression with the dependent variable, which is the unemployment rate and one explanatory variable, which is the real GDP growth rate. Several statistics and the associated probabilities are taken under consideration to obtain reliable results from the data series such as t-statistic, R-squared, Adjusted R-squared, F-statistic and Durban-Watson test.

From table 4.4, if the p-value for the independent variable included in the model is higher than 0.05 level of significance, the null hypothesis which says that the variable is not significant for the dependent variable evolution should be accepted and therefore, it should be eliminated from the model. Otherwise, the null hypothesis is rejected and the independent variable is considered to have a significant impact on the evolution of the dependent one. The probability associated with t-statistic computed for the coefficient corresponding to the independent variable is equal to 0.002, which is smaller than the significance level of 1 and 5 per cent, therefore we cannot reject the null hypothesis. This emphasises that the coefficient estimated by the OLS is significantly different than zero, so the evolution of the unemployment rate has been influenced by the evolution of economic growth, and will explain the regression coefficient. If the regression coefficient is negative, it suggested that the independent variable will determine a decrease of the dependent variable or vice-versa. The value recorded by this coefficient is -0.061, the minus sign implies the negative relationship between the unemployment rate and economic growth, but the intensity of change in the unemployment rate by the change in the economic growth is highly small. Therefore, it can be concluded that the economic

growth rate has influenced the unemployment rate only by 6 per cent, the remained 94 per cent is by other factors which are not included in this study.

R-squared value shows the proportion of the dependent variable explained by the independent variable evolution. To accept that the model is a valid one and that the interpretation of the R-squared value makes sense for the analysis, and the F-probability value should be smaller than a five per cent level of significance. The R-squared statistic for this model is equal to 0.295 and the associated F-statistical probability value is 0.002 which is significant at both 1 and 5 per cent levels of significance. We can conclude that the model is valid, so Okun's law is not wholly applicable in India over the period from 1990-2020. The value of R-squared and Adjusted R-squared is not very high, which means that there are also other variables other than the economic growth rate that might explain the strong relationship between unemployment and economic growth in India. From the Durban-Watson test, it could be concluded that the series is free from collinearity which is commonly present in the times series and may lead to spurious regression, table 4.4. The value of the Durban-Watson test is equal to 2.04, which indicates that the data series are from collinearity.

5. Conclusion

The main purpose of this study is to examine the relationship between unemployment and economic growth in India; especially, it focuses on the impact of economic growth on unemployment for the period 1990-2020. Descriptive statistics for normal distribution, Granger causality test for the causation between variables and finally the Ordinary least squared model for the impact of economic growth on unemployment were used in this analysis. The variables such as a gross domestic product which is the real indicator of economic growth and unemployment rate were employed in the investigation. Furthermore, the results of descriptive statistics revealed that the variable was not normally distributed. The stationarity test was conducted through the application of the Augmented Dickey-Fuller (ADF) test, and the results indicated that all the variables were stationary after detrending the series by the Hodrick-Prescott filter at the first difference. Similarly, the result of the Granger causality test indicated no causation between the variables, that is neither from UNEMP to GDP and nor from GDP to UNEMP. Finally, the result obtained from estimated the regression of unemployment and economic growth as an explanatory variable, for India, confirms only 6 per cent impact of economic growth on unemployment and are inversely related to each other, while the remaining 94 per cent are by other factors.

The relatively small value of R-squared shows that unemployment rate evolution is largely influenced by other factors, which are not part of this study. Based on these findings, the study, therefore, indicated that the strong relationship between economic growth and the unemployment rate is not wholly applicable to the Indian economy and is contradicting with the Chand et al., (2018) study, in terms of the intensity of the relationship between the two variables. Since India is a labour abundant country, but the reforms of the 1990s have adopted the policies which are majorly capital-intensive and retards the employment growth in India with the increase in the GDP. The study, therefore, suggests that government should as a matter of urgency create more employment opportunities to absorb the teeming population of the unemployed workforce in the country through the modernization of the agriculture sector, which is the utmost sector providing more than 42 per cent of livelihood and is contributing merely 13 per cent towards the gross domestic product.

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