Theoretical and Applied Economics
Volume XXVI (2019), No. 1(618), Spring, pp. 115-128

The relationship between unemployment and some macroeconomic variables: Empirical evidence from India

Malayaranjan SAHOO
National Institute of Technology (NIT) Rourkela, Odisha, India
sahoomalayaranjan4@gmail.com
Jayantee SAHOO
University of Hyderabad, India
jayantisahoo827@gmail.com

Abstract. *The study examined the relationship between some macro-economic variables and unemployment in India, it focuses on the impact of some macroeconomic variables on unemployment for the period 1991-2017.Cointegration test and its associated vector error correction model (VECM) and Granger causality test were used in the analysis. The variables such as unemployment rate (UNEMP), real gross domestic product (RGDP) used as common proxy for economic growth, consumer price index used as proxy for inflation, Gross fixed capital formation, literacy rate and labour force were employed in the investigation. Stationarity test was conducted through the application of the Augmented Dickey - Fuller (ADF) test, and the results indicated that all the variables became stationary after first differencing. Furthermore, the result of the Johansen cointegration test revealed that significant long run relationship exists among UNEMP, GDP, INFL, LF, LR and GFCF. Similarly, VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In the VECM, intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period. Finally, the result of the Granger causality test indicated unidirectional relationship between UNEMP and RGDP with causality running from RGDP to UNEMP. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi-directional Granger causality between labour force and unemployment Based on these findings, the study therefore recommends that government should as a matter of urgency create more employment opportunities in order to absorb the teeming population of the unemployed work force in the country through modernization of the agricultural sector, bring in modern equipment in the facilities of agriculture to make the sector more attractive to all citizens despite one's qualifications and profession.*

Keywords: unemployment; economic growth; co-integration; Granger causality India.

JEL Classification: F21, F43, J2.

1. Introduction

Unemployment is a multidimensional phenomenon; because it affects economic activity of a country as well as social structure of societies. So these two dimension create complexity and impose adopting extensive analysis to solve this problem. The main objective of every policy maker either from fiscal policy or monetary policy is to attain high economic growth. There are many determinants are responsible for detaining growth rate of a country. One of them is high rate of unemployment. As per Okun's law there is an inverse relationship between economic growth and unemployment rate. When unemployment's fall by 1%, GNP rises by 3%. The main objective of economic policies tends to high economic growth which leads to demand of more job by constructing investment programs. So unemployment is a global phenomena with economic and social effects (Al-Habeas et al., 2012).

A citizen is classified as a member of the labour force if he has a job or is actively looking for a job. The participation rate is the percentage of adult Americans, excluding those incarcerated or otherwise institutionalized, who are members of the labour force. The 21st century has seen a steady decline in labour force participation. In 2000, it was 67%; by October 2017, it had fallen to 62.7%. Many economists argue the labour force decline is the result of low-skilled workers losing their jobs to outsourcing or automation, having no success finding new employment and therefore dropping out of the labour force entirely. For this reason, they feel the participation rate is a more accurate measure of the state of the job market than the unemployment rate, which only considers those in the labour force. An unemployment rate of 5% means only 5 out of 100 workers in the labour force are without jobs, but it does not consider those unemployed workers who have given up looking altogether, even though they want to work.

In an ideal world, increase in employment leads to increase in wage earnings, hence, increase in consumer spending (and investment etc. through indirect effects), and eventually, an increase in overall demand in the economy. Since, the supply is fixed in short term, the price level rises and we observe inflation. However, there could be a scenario where the inflation is caused by factors on the supply side, that is, production side (production of goods and services). Let's just say that oil prices increase 50% overnight. This leads to a hefty increase in the cost of production and the producer pass it on through to the consumers through price increase (as the operating increases, so does the market price). Now, with higher prices, there will be less demand, and cutbacks on production, which will lead to higher unemployment.

The effects of capital investments on employment is a complex and sensitive matter, because the impact on the economy (and thus on unemployment) depends not only on their volume but also of the establishment, the field concerned, the input modality and the existing conditions in the economy in which investments are made. In the case of foreign direct investment (FDI), the economic and social effects also depend on the motivation of investors and the investing business strategy.Net investments lead to enhanced existing activities in the economy, with positive impact on employment, while replacement investments of the worn fixed asset, representing that part of gross investments made of the depreciation fund, do not generate new jobs, their positive effect being materialized mainly

in maintaining existing jobs. Similarly, Economic growth refers to increase in goods and services produced by an economy over time. It is conventionally measured as percentage of increase in real gross domestic product (GDP). Growth is usually calculated in real terms i.e. inflation adjusted terms to make it comparable nationally and internationally. The increase in GDP is supported increase in agricultural and industrial production. When there is economic growth in the country there should be increase in exports and imports as well. The increase in exports should result in increase in foreign exchange reserve in the country. The increase in income of the people should be able to increase the saving and capital formation in the country. Besides, there are some social indicators of economic growth, as well, like falling birth and death rates, increase life expectancy at birth and literacy rates.

2. Review of literature

Hussain et al. (2010) investigated the causality between growth and unemployment in Pakistan for the period 1972-2006 and found that unemployment has negative relationship with economic growth in Pakistan. Similarly, Zagler (2006) examined the links between growth and unemployment in the United Kingdom for the period 1982-1999, and the result indicated negative relationship between unemployment and growth in the economy of United Kingdom. Oluyomi and Ogunrinola (2011) studied the relationship between employment and economic growth in Nigeria for the period 1986-2010, and found that positive and significant relationship exists between employment and the real GDP in the economy. Stephen (2012) investigated the impact of unemployment on economic growth in Nigeria for the period 1980-2008, and the study found that unemployment has negative relationship with economic growth in Nigeria.

Bashir et al. (2012) uses data for the period from 1972 to 2010. With the object of long run and short run estimates, they have taken Cointegration test and VECM respectively. They conclude that in long run educational expenditure, health expenditure and gross fixed capital formation are significant features in magnifying employment level in Pakistan. At the end it is suggested that there should be more spending on education to support enrolment at primary and expert levels by offering scholarships to students. For superior health and education, Govt. should extend health expenditure as well. They also play very important role in enhancing employment level, output and economic growth by providing identical opportunities of education and health to all people of any nation all differences can be removed. Considering the importance, this Study indicates some of the important elements of education and health in reducing unemployment level in the long run as well as in the short-run.

Faridi et al. (2010) prepared research on primary data collected through field survey from district Bahawalpure. For the measurement of coefficients of variables Logistic regression technique has been used. The study has concluded that education is negatively and significantly related to unemployment level. The human condition of the worker for work has also important impact on unemployment. The study advocates that Government should suggest health and education services to all the people of the country. Health and education has an important function in the process of human capital improvement. A country well-off

in human capital can cover the growth and development in that country. Manoj and Pandey (2009) measures the change in labour force participation rate due to change in health structure of the people. Study takes unemployment as dependent variable and health expenditures and number of hospitals are used as independent variables 2SLS method is used to estimate results. Results indicates negative and significant results for the case of India.

Christelle et al. (2010) examines the relationship between long-term unemployment and education. The study has been run using both a binary logit model and a binary Scobit model for time period 2004-2006 to investigate the impact of education on unemployment. The outcome suggests that the chances of a person to be remain in long-term unemployment decreases with increases in her/his educational level. Study also told that younger workers (20-30) are more beneficial than older workers (50-65) and there is a decline in returns of education after the age of 40.

Makaringe and Khobai (2018) explored the relationship between unemployment and economic growth on South Africa. Taking the quarterly data from $1994Q_1$ to $2016Q_4$. They used ARDL bound testing approach to show the long run relationship between the variables. They found that there is negative relationship between unemployment and economic growth in short run as well as long run. This also validates the Okun's law (1962), which discovered the linkage unemployment and economic growth. They suggested that government should come up with efficient macroeconomic policies, needful structural change in the economy, stabilizing growth, flexible labour market policies to reduce unemployment rate.

Alhabees and Rumman (2012) verified the causal relationship between economic growth and unemployment rate. The study focused on some Arab countries and more details analysis for the case of Jordan. They used application of Okun's law, which shows the linkage between potential or actual rate of economic growth and unemployment rate prevailing in an economy. They indicate that high growth rate leads to high operational rate which reduce unemployment rate. They found that rich Arab countries are less unemployment than poor Arab countries. They attributed that main cause of unemployment in Arab countries due to political, social and economic instability and high population growth rate. They suggested that social development is most important for efficiently and effectively increasing of growth rate. Separate policies should be need to address the problems in Arab country.

Eze and et al. (2016) examined the relationship between economic growth, structural change and unemployment in case of Nigeria during 1980-2013. The cointegartion analysis and VECM approach are used to show the results. The study reveals that structural change affect both economic growth and unemployment. They found that unemployment has negative and significant impact on economic growth. It was recommended that Govt. should create more employment, modernizing agricultural sector, so that some part of total labour force will absorb by agricultural sector despite of profession and skill.

Nikolli (2014) examined the relationship between economic growth and unemployment rate in Albania. As Okun's law state that, 1% decline in unemployment rate leads to GDP

will increase by 3%. The study analysed data from 2000 to 2013 by using regression between gross domestic product and unemployment rate. The study does not found any significant or stable relationship between economic growth and unemployment rate due to economic crisis during this period.

3. Theoretical framework and background

Economic growth and unemployment are clearly discussed by different school in different way. Adam smith claim that economic growth can be possible by division of labour and specialization. Followed by classical economist Karl Marx considered surplus value is only means of increasing production or economic growth in a cumulative process (Ajamieh, 1983). In his theory entrepreneur plays an important role for increasing production or economic growth. Rostow's stages of economic growth is one of most important theory of growth. He discussed that from traditional society to high mass consumption, he puts different conditions in each stage to achieve high growth rate. Harrod-Doamar more focus on investment for economic growth. On the other hand, Arthur Lewis states that movement or shifting of surplus labour from agricultural sector to industrial sector for the economic development. Keynesian theory on economic growth and development based on demand side. In his book "The General Theory of Employment, Interest and Money" particularly with regard to the role of government in stimulating and regulating a nation's economic life.

4. Data and methodology

In order to examine the relationship between unemployment and some macroeconomic indicators like GDP, LR, GFCF, LF, INFL in India. The study employed annual time series data from the 00 world development indicator for period ranging from the 1991 to 2017.cointegration test, Vector Error Correction Model and Granger causality tests are applied in the analysis. Cointegration test is applied to know the long run relationship among the variables, VECM applied for to study the short run and long run dynamic relation and Granger causality test used to know the causality unemployment and other variables. All the variables are expressed in terms of their real values in this study. Applying econometric modelling requires the same order of integration in the data set. So, we transform the data set into log linear specification to have consistent estimates, Shahbaz and Rahman (2010).

Model specification

The model express the relationship between unemployment and other macro-economic indicators like inflation (INFL), gross fixed capital formation (GFCF), labour force (LF), literacy rate (LR) and gross domestic product (GDP) are represented follows

$$UNEMP = f(GDP, INFL, GFCF, LR, LF) \quad (1)$$

We estimate the long run impact of the indicators on unemployment by employing the Johansen-Juselius multivariate co-integration test which can be written as:

$LUNEMP_t = \alpha_1 LGDP_t + \alpha_2 LINFL_t + \alpha_3 LGFCF_t + \alpha_4 LLR_t + \alpha_5 LLF_t + u_t$ (2)

Where:

$LGDP_t$ – indicates economic growth in terms of GDP per capita in current US $ during the time period t (indicator of economic growth).

$LGFCF_t$ – indicates Gross Fixed Capital Formation in current US $ during the time period t (as private domestic investment).

LLF_t – indicates Labour Force, measured as the % of total population aged 15-64 during the time period t.

$LINFL_t$ – indicates inflation rate (as CPI) during the time period t.

LLR_t – indicates literacy rate during the time period t (proxy of school enrolment secondary, % gross).

Unit root test:

This stage of estimation procedure tests the stationarity of the variables employed in the study. It helps to determine the order of integration of the data series by applying the Augmented Dickey-Fuller (ADF) unit root test, postulated by Dickey and Fuller (1981). This test is adopted in order to find the long term properties of the variables in the study. If the time series are found to be stationary, it means that their variance, mean and covariance are constant overtime and that the result obtained from their analysis is reliable and can be used to predict future economic activities of the economy. The ADF test is conducted through the following models.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i-1}^{k} \beta_i Y_{t-i} + \varepsilon_t \quad (3)$$

Where:

Y is a data series, t is linear time trend, Δ is first difference operator, $\alpha 0$ is constant, n is optimum number of lags in the development variable and it is stochastic variable. Meanwhile, if the ADF result fails to reject the test in levels but rejects the test in the first difference, it means that the series contains one unit root and is of integrated order one. More so, if the test fails to reject the test in levels and at first difference but rejects it in second differences, it therefore implies that the series contains two unit roots and is of integrated order two.

Test of cointegration

The second estimation procedure involves the test of the level of cointegration among the variables of the same order through the application of the Johansen cointegration test. The implication is that, if in the long run, two or more series move closely together, whether the series itself is trend, the difference between them is constant. In theory, they can wander arbitrarily far away from each other. According to Johansen and Juselius (1990) achieving empirical result amount to establishing maximum-likelihood test procedure. Trace test statistic (λ_{trace}) given below:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (4)$$

Where λ_i are the estimated values of characteristic roots or the eigenvalues, T is the number of observations and n is the number of variables. The second test statistic is known as the maximal eigenvalue test statistic (λ_{max}) which tests the null hypothesis that there are exactly r co-integrating vectors in X_t and is given by:

$$\lambda_{max}(r+1) = -T \ln(1-\lambda_r) \quad (5)$$

The distributions for these test statistics are not given by the usual chi-squared distributions. The asymptotic critical values for these likelihood ratio tests are calculated via numerical simulations (Johansen and Juselius, 1990).

Granger causality

The third stage of the estimation procedure examine the causality between unemployment and other macro-economic variables through the application of Granger causality test propounded by Engle and Granger (1989). It focused on determining the nature of relationship among the variables; that is whether the direction of the relationship is bi-directional, unidirectional, feedback or no causation between the variables. Thus the model is specified as

$$UNEMP_t = \gamma_0 + \sum_{i=1}^{n} \alpha_{1t} GDP_{t-1} + \sum_{j-1}^{n} \beta_j S_{t-j} + u_{1t} \quad (6)$$

$$LUNEMPt = \lambda 0 + \Sigma\lambda 1tLGDPt\text{-}1 + \Sigma\lambda 2tLINFLt\text{-}1 + \Sigma\lambda 31tLGFCFt\text{-}1 +$$

$$+ \Sigma\lambda 4tLLRt\text{-}1 + \Sigma\lambda 5tLLFt\text{-}1 + \acute{\varepsilon}1t \quad (7)$$

Where LUNEMP = unemployment, LGDP = gross domestic product at constant price, LGFCF = gross fixed capital formation, LLR = literacy rate, LLF = labour force, ε_t = error term, t = current time period, t-1= lag time period.

Vector error correction model (VECM)

This step of estimation procedure is possible if the results of the cointegration test showed evidence of long run relationship among the variables. The conventional vector error correction model (VECM) is employed to examine the short run dynamics and cointegrating equation among the series. The term 'error correction term is estimated for the coefficients, such that when the series fails to cointegrate, it means that the short run model Unit root test:

This stage of estimation procedure tests the stationarity of the variables employed in the study. It helps to determine the order of integration of the data series by applying the Augmented Dickey-Fuller (ADF) unit root test, postulated by Dickey and Fuller (1981). This test is adopted in order to find the long term properties of the variables in the study. If the time series are found to be stationary, it means that their variance, mean and covariance are constant overtime and that the result obtained from their analysis is reliable and can be used to predict future economic activities of the economy. The ADF test is conducted through the following models.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \gamma Y_{t-1} + \sum_{i-1}^{k} \beta_i Y_{t-i} + \varepsilon_t \quad (8)$$

Where:

Y is a data series, t is linear time trend, Δ is first difference operator, α is constant, n is optimum number of lags in the development variable and it is stochastic variable. Meanwhile, if the ADF result fails to reject the test in levels but rejects the test in the first difference, it means that the series contains one unit root and is of integrated order one. More so, if the test fails to reject the test in levels and at first difference but rejects it in second differences, it therefore implies that the series contains two unit roots and is of integrated order two.

5. Data analysis and discussion of empirical results

Table 1. *Augmented Dickey-Fuller unit root test*

	level			1st Difference			
variables	ADF statistics	5% critical value	10% critical value	ADF statistics	5% critical value	10% critical value	Remarks
UNEMP	-2.84	-3.00	-2.64	-4.16	-2.98	-2.63	I(1)
GDP	1.30	-2.98	-2.62	-4.11	-2.98	-2.63	I(1)
INFL	-0.38	-3.01	-2.64	-5.44	3.02	-2.65	I(1)
GFCF	0.75	-2.99	-2.63	-5.09	-2.99	-2.63	I(1)
LR	-0.29	-2.98	2.62	-4.48	-2.98	-2.63	I(1)
LF	-1.17	-2.98	-2.63	-4.73	-2.99	-2.63	I(1)

Source: Author's calculation.

The Table 1 depicts stationary test of the time series employed in this investigation through the application of the Augmented Dickey-Fuller (ADF) stationary test. The results of the test indicate that all the variables i.e. UNEMP, GDP, GFCF, INFL, LR and LF were non-stationary at level; however, the variables became stationary after first differencing at 5% and 10% critical values. This claim is supported by the ADF statistics and the critical values as shown in the table 1. However, after first differencing, the ADF statistics of all the variables are greater than the critical values, which imply that all the series became integrated of the same order after first differencing. The attainment of stationary of the variables as indicated in the first difference implies that their variance, mean and covariance are constant overtime and that long term properties of the series are established.

Optimal lag order selection criteria

Table 2. *Optimum lag order selection criterion*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	329.15	NA	2.52	-28.10	-27.80	-28.02
1	529.69	278.93*	1.74	-42.40	-40.33*	-41.88
2	581.76	45.31	9.93	-43.80*	-41.95*	-42.83*
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's calculation.

Further, we have employed optimum lag selection criteria to choose the appropriate lag as it is essential for using any advanced econometric techniques such as Cointegration test, VECM test and Granger-Causality test. While determining lag length, econometricians have either fixed the lag length arbitrarily or chosen it through some statistical procedure. For this study, we use five lag order selection criterion such as Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ) to select the optimum lag. The lowest value of each criterion is used to select the optimum lag. The Table 2 shows the selection procedure of the optimum lags by using the five criterion such as LR, FPE, AIL, SC, HQ.

Co-integration Test

Table 3. *Cointegration rank test (trace)*

Hypothesized No. of CE(s)	Eigenvalue	Trace statistics	0.05 critical value	Prob.**
None*	0.94448	182.92	95.7536	0.0000
At most 1*	0.8620	116.29	69.8189	0.0000
At most 2*	0.7189	70.7383	47.8561	0.0001
At most 3*	0.6246	41.5448	29.7907	0.0014
At most 4*	0.5588	19.0061	15.4947	0.0142
At most 5	0.0078	0.1814	3.8416	0.6701

Source: Author's calculation.

Table 4. *Cointegration rank test (maximum eigenvalue)*

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen statistics	0.05 critical value	Prob.**
None*	0.94448	66.6279	40.0775	0.0000
At most 1*	0.8620	45.5606	33.8768	0.0013
At most 2*	0.7189	29.1935	27.5843	0.0308
At most 3*	0.6246	22.5386	21.1316	0.0315
At most 4*	0.5588	18.8246	14.2646	0.0089
At most 5	0.0078	0.1814	3.8414	0.6701

Source: Author's calculation.

Tables 3 and 4 represented the analysis of co-integration test through the application of Johansen
co-integration test. The results indicated five co-integrating equations in both the trace statistic and the maxeigen statistic respectively. In Johansen co-integration method, the trace statistic and max-Eigen statistic in any investigation determines level of cointegration among the data series employed in the study. In this sense, the results of the Johansen cointegration test in this study indicate long run relationship among the variables such as UNEMP, GDP, INFL, GFCF, LR and LF by indicating five cointegrating equations. Judging from the results, the study rejects the null hypothesis of no long run relationship and concludes that long run relationship exist among the variables under study. Specifically, the result showed that all macro variables has significant long run relationship with unemployment in India.

Granger causality test

Granger's Causality Test (Granger, 1969, 1981) is used to examine for the forecasting relationship between two variables. Introduced by Granger (1969), it was popularized by Sims (1972). The Granger-causality test is used, since it is very sensitive to the number of lags used in estimation procedure, the Schwarz Criterion (SC) has been applied to

determine the optimum lag length. The optimum lag length k, according to this criterion, is obtained by minimizing the function. The co-integration test ignores the effect of the past values of one variable on the current value of the other variable. The Granger causality test was hence used to examine such possible instances. As this test is sensitive to the choice of lag length, to avoid this problem, different lag length criterion has been applied to choose the optimum lag length (Enders, 1995).

Table 5. *Granger causality test*

Null Hypothesis	Direction of causality	F-Statistic	P-value
LGDP does not Granger Cause LUNEMP	LGDP ⟹ LUNEMP	6.09604	0.0086
LGFCF does not Granger Cause LUNEMP	LGFCF ⟹ LUNEMP	3.75987	0.0414
LINFL does not Granger Cause LUNEMP	LINFL ⟹ LUNEMP	2.91703	0.0773
LLF does not Granger Cause LUNEMP	LLF ⟹ LUNEMP	2.55788	0.1025
LLR does not Granger Cause LUNEMP	LLR ⟹ LUNEMP	4.6913	0.0229
LUNEMP does not Granger Cause LLR	LUNEMP ⟹ LLR	3.0768	0.0709
LGDP does not Granger Cause LINFL	LGDP ⟹ LINFL	4.8563	0.0191
LLF does not Granger Cause LGDP	LLF ⟹ LGDP	1.79133	0.1925
LGDP does not Granger Cause LLF	LGDP ⟹ LLF	4.8017	0.0198
LGDP does not Granger Cause LLR	LGDP ⟹ LLR	5.1366	0.0172
LGFCF does not Granger Cause LUNEMP	LGFCF ⟹ LUNEMP	4.60844	0.0226
LLF does not Granger Cause LGFCF	LLF ⟹ LGFCF	3.7435	0.00416
LGFCF does not cause LLF	LGFCF ⟹ LLF	4.3028	0.0279
LLR does not Granger cause LGFCF	LLR ⟹ LGFCF	2.4700	0.1127
LGFCF does not Granger cause LLR	LGFCF ⟹ LLR	4.5313	0.0255
LLR does not Granger cause LINFL	LLR ⟹ LINFL	2.5690	0.1043
LINFL does not Granger cause LLR	LINFL ⟹ LLR	1.8483	0.1862
LLR does not Granger cause LLF	LLR ⟹ LLF	7.6016	0.0040

Note:
(i) Optimum lag lengths (m) are determined by minimizing the Akaike Information criteria (AIC) by E-views package.
(ii) * Denotes significant at 5% confidence level.
(iii) The significant result only presented in the table.

From Table 5, the results of the Granger causality test revealed unidirectional relationship between unemployment (UNEMP) and gross domestic product (RGDP) with causality running from GDP to UNEMP in the economy. Like there is reversed unidirectional between UNEMP to GFCF, INFL, LR and LF. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi-directional Granger causality between labour force and unemployment. As labour participation rate increases unemployment decreases and vice versa. Similarly, labour force and gross domestic product, labour force and private investment, literacy rate and private investment; when literacy rate increases it may increase private domestic investment that leads to greater employment. These are Granger causes with each other.

Vector Error Correction Model (VECM)

Having established the existence of long run equilibrium relationship among the variables employed in the study through the application of Johansen cointegration test, the study proceed to carry out the estimation of the vector error correction model (VECM) in order to examine the short run dynamics and long run relationship among the variables of the study. The estimation result of the test is presented below

$$\Delta Y_t = \beta_0 + \varphi_i z_{t-1} + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta x_{t-i} + u_t \quad (9)$$

$$LUNEMP_t = 0.147108 + 0.048995 ect_{t-1} - 0.316055 \Delta lUNEMP_{t-1} +$$

$$+ 1.828525 \Delta lGDP_{t-1} + 0.161030 \Delta lINFL_{t-1} + 0.554847 \Delta lGFCF_{t-1} +$$

$$+ 0.661855 \Delta lLR_{t-1} - 0.113884 \Delta lLF_{t-1} + u_t \quad (10)$$

Table 6. *Vector Error Correction Model (VECM)*

	Coefficient	Std. Error	t-statistics	Prob.
β_0	0.147108	0.07289	2.01816	0.00010
φ_1	0.048995	0.01703	2.87700	0.00012
β_{lunemp}	-0.316055	0.27576	-1.14612	0.00102
β_{lgdp}	1.828525	0.73334	2.49342	0.00012
β_{linfl}	0.161030	0.10729	1.50092	0.10194
β_{lgfcf}	0.554847	0.17046	3.25504	0.00000
β_{llr}	0.661855	0.40960	1.61587	0.10970
β_{llf}	-0.113884	0.07437	-1.53133	0.10094
F-statistic	4.6665			
Prob(F-statistic)	0.0000			

Source: Author's calculation.

In equation 10, the VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In above table, the VECM intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period.

In Table 6 and Equation 10, the first error correction term φ_1 is positive and significant at 1% level confirms the unemployment is not departed from the long run equilibrium. Hence there error correction term is a positive impact on unemployment.

Moreover, the short run coefficient (β) of the lagged values of GDP are positive and statistically significant at 1% level confirming a significant short run positive impact of the said variable on Unemployment.

Likewise if we consider other variable like inflation, literacy rate, GFCF which are positive and significant at 5% level hence it confirms that there is short run causality with unemployment. If we focus on another variable labour force give us the idea that there is a negative relationship exist with labour and unemployment .Where it statistically significant at 5% level.

$$ect_{t-1} = Y_{t-1} - \beta_0 + \beta_1 X_{1_{t-1}} + \beta_2 X_{2_{t-1}} + \cdots + \beta_n X_{n_{t-1}} \ldots \quad (11)$$

After putting the values of the coefficient, the equation stands as;

$$Ect_{t-1} = 1.00LUNEMP_{t-1} - 8.9436 + 0.1148LGDP_{t-1} + 0.2145\ LGFCF_{t-1} +$$

$$+ 3.8554LLF_{t-1} - 0.9101LLR_{t-1} + 0.2147LINFL_{t-1} \quad (12)$$

The intercept β_0 is negative (-8.9436) verifies an overall long run negative causal relationship of the explanatory variables with the unemployment. The cointegrating coefficients of literacy rate, is negative which indicates the long run causal relationship with unemployment.

Diagnostic test

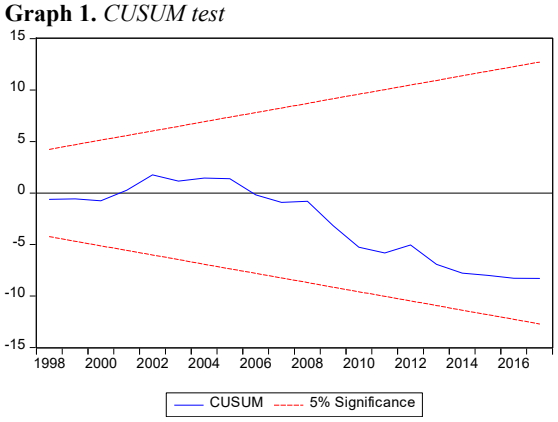
The results of diagnostic are shown in the Table 7. This indicate that model has no serial correlation, homoscedasticity and normal distribution

Table 7. *Diagnostic tests*

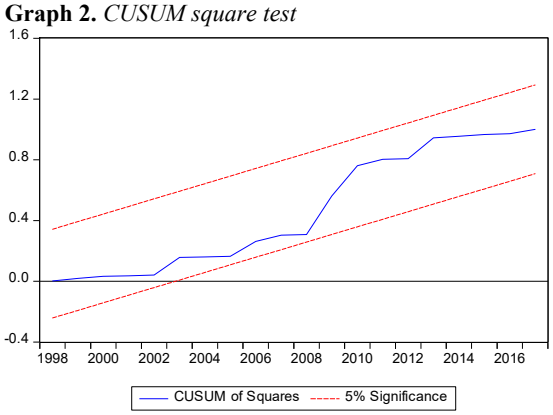
Test	Null hypothesis	Test statistics	Probability
Serial correlation	No serial correlation	0.77	.0.7489
Heteroskedasticity	homoscedasticity	0.71	0.62
Jarque-bera	There is normal distribution	0.78	0.67

Source: Author's calculation.

Graph 1. *CUSUM test*



Graph 2. *CUSUM square test*



Source: Author's calculation.

Graph (1) and (2) tests the CUSUM and CUSUM square test for stability properties. It point out that both test are satisfy the properties because both residuals are lies within the range of 5% level of significance.

6. Conclusion

The main purpose of this study is to examine the relationship between some macroeconomic variables and unemployment in India; specifically, it focuses on the impact of some macroeconomic variables on unemployment for the period 1991-2017.Cointegration test and its associated vector error correction model (VECM) and Granger causality test were used in the analysis. The variables such as unemployment rate (UNEMP), real gross domestic product (RGDP) used as common proxy for economic growth, consumer price index used as proxy for inflation, Gross fixed capital formation, literacy rate and labour force were employed in the investigation. Stationarity test was conducted through the application of the Augmented Dickey - Fuller (ADF) test, and the results indicated that all the variables became stationary after first differencing. Furthermore, the result of the Johansen cointegration test revealed that significant long run relationship exists among UNEMP, GDP, INFL, LF, LR and GFCF. Similarly, VECM shows that the economic unemployment of India is somewhat predictable by the given explanatory variables. In the VECM, intercept β_0 is positive 0.147108 and significant at 1% level indicating overall unemployment's increases proportionately during that period. Finally, the result of the Granger causality test indicated unidirectional relationship between UNEMP and RGDP with causality running from RGDP to UNEMP. From gross domestic product, domestic private investment (GFCF) and labour force significantly causing unemployment as per there probability value. There is bi directional Granger causality between labour force and unemployment Based on these findings, the study therefore recommends that government should as a matter of urgency create more employment opportunities in order to absorb the teeming population of the unemployed work force in the country through modernization of the agricultural sector, bring in modern equipment in the facilities of agriculture to make the sector more attractive to all citizens despite one's qualifications and profession.

References

Abdul-Khaliq, S., Soufan, T. and Shihab, R.A., 2014. The relationship between unemployment and economic growth rate in Arab Country. *Journal of Economics and Sustainable Development, ISSN*, pp. 2222-1700.

Al-Habees, M.A. and Rumman, M.A., 2012. The relationship between unemployment and economic growth in Jordan and some Arab countries. *World Applied Sciences Journal*, *18*(5), pp. 673-680.

Anghel, M.G., Anghelache, C. and Manole, A., 2017. The Effect of Unemployment on Economic Growth. *Romanian Statistical Review Supplement*, *65*(7), pp. 174-186.

Castells-Quintana, D. and Royuela Mora, V., 2012. Unemployment and long-run economic growth: The role of income inequality and urbanization. *Investigaciones Regionales,* Vol. 24, pp. 153-173.

Enejoh, S.Y., and Tsauni, A.M., 2017. An Analytical Study of the Impact of Inflation on Economic Growth in Nigeria (1970-2016). *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *7*(4), pp. 110-120.

Garavan, s. Okun's law: an empirical investigation into Eurozone growth and unemployment.

Makaringe, S.C. and Khobai, H., 2018. The effect of unemployment on economic growth in South Africa (1994-2016). Retrived from <https://mpra.ub.unimuenchen.de/85305/1/MPRA _ paper_85305.pdf>

Mohseni, M. and Jouzaryan, F., 2016. Examining the Effects of Inflation and Unemployment on Economic Growth in Iran (1996-2012). *Procedia Economics and Finance*, *36*, pp. 381-389.

Nagel, K., 2015. Relationships between unemployment and economic growth–the review (results) of the theoretical and empirical research. *Journal of Economics & Management*, *20*, pp. 64-79.

Nikolli, E., 2014. Economic growth and unemployment rate. Case of Albania. *European Journal of Social Sciences Education and Research*, *1*(1), pp. 217-227.

Omitogun, O. and Longe, A.E., 2017. Unemployment and Economic Growth in Nigeria in the 21st Century: VAR Approach. *Acta Universitatis Danubius. Œconomica*, *13*(5).

Soylu, Ö.B., Çakmak, İ. and Okur, F., 2018. Economic growth and unemployment issue: Panel data analysis in Eastern European Countries. *Journal of International Studies,* Vol *11*(1).

Stats, S.A., 2014. Employment, unemployment, skills and economic growth: An exploration of household survey evidence on skills development and unemployment between 1994 and 2014. *Pretoria: Statistic South Africa*.

Zagler, M., 2009. Economic growth, structural change, and search unemployment. *Journal of Economics*, *96*(1), pp. 63-78.